PROJECT SPECIAL PROVISIONS

KING COUNTY, WA

SOUTH PARK BRIDGE #3179 REPLACEMENT,

King County CIP 300197

95% SUBMITTAL

(NOT FOR CONSTRUCTION)

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KING COUNTY DEPARTMENT OF TRANSPORTATION

SEPTEMBER 4, 2009

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1-01 DEFINITIONS AND TERMS

1-01.3 DEFINITIONS

The definition for "Contracting Agency" is deleted and replaced with the following:

(*****)

Contracting Agency

Agency of Government that is responsible for the execution and administration of the contract. Also means King County, Department of Transportation, Roads Services Division.

The definition for "Engineer" is deleted and replaced with the following:

(*****)

Engineer

The Contracting Agency's representative who administers the construction program for the Contracting Agency. Also means King County Road Engineer or the King County Road Engineer's authorized assistants.

The following definitions are added to this section:

(*****)

Change Order

A document required by the Engineer which authorizes an addition, deletion, or revision in the Work, or an adjustment in the Contract Price or the Contract Time, issued on or after the effective date of the Agreement.

Contract Documents

The terms "Contract Documents" shall have the same meaning as Contract.

(*****)

County

King County, Department of Transportation, Road Division (KCDOT).

Notice to Proceed

The written notice by the County to the Contractor fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform Contractor's obligations under the Contract Documents.

Performance and Payment Bond

The definition is the same as that provided for the term "Contract Bond." If a bond is submitted, the Contractor will be required to submit a performance and payment bond, in triplicate, on the County provided form within 10 days of receipt of Notice of Selection.

1-02 BID PROCEDURES AND CONDITIONS

Section 1-02.1 is deleted and replaced with the following:

(March 25, 2009 APWA GSP)

1-02.1 QUALIFICATIONS OF BIDDER

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Bidders must meet the minimum qualifications of RCW 39.04.350(1), as amended:

"Before award of a public works contract, a bidder must meet the following responsibility criteria to be considered a responsible bidder and qualified to be awarded a public works project. The bidder must:

a) At the time of bid submittal, have a certificate of registration in compliance with chapter 18.27 RCW;
b) Have a current state unified business identifier number;
c) If applicable, have industrial insurance coverage for the bidder's employees working in Washington as required in Title 51 RCW; an employment security department number as required in Title 50 RCW; and a state excise tax registration number as required in Title 82 RCW; and
d) Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3)."

Bidders shall be qualified by experience, financing, equipment, and organization to do the work called for in the Contract Documents. King County reserves the right to take whatever action it deems necessary to ascertain the ability of the Bidders to perform the work satisfactorily.

1-02.4 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE OF WORK

Section is supplemented with the following:

(*****)

The "PHASE II ENVIRONMENTAL SITE ASSESSMENT REPORT, South Park Bridge Replacement Project Seattle, Washington - September 2009" will be made available for review by the Bidders at the Map Counter of the Engineering Services Section, 39 Road Services Division, Department of Transportation, 1st Floor, 201 South Jackson Street, 40 Seattle, Washington, 98104-3856

1-02.4(1) GENERAL

Section is supplemented with the following:

(*****)

If a bidder, or Contractor, discovers any provision in the Plans, Specifications, or Contract which is contrary to or inconsistent with any law or regulation, such bidder or Contractor shall immediately report this discovery in writing to the Engineer.

1-02.4(2) SUBSURFACE INFORMATION

Section is supplemented with the following:

(*****)

In reference to this section, the soils information used for study and design of this project is available for inspection at the Map Counter of the Engineering Services Section, Road Services Division, Department of Transportation, 1st Floor, 201 South Jackson Street, Seattle, Washington, 98104-3856.

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Add the following new Section:

(*****)

1-02.4(3) ADDITIONAL SITE INFORMATION

King County is aware of that the following historic projects which occurred at, or near the Site of the proposed Work:

1. South Park Bridge Plans and Specifications (circa 1929)
2. South Park Bridge, Bridge Span resurfacing (circa 1950)
3. Partial 14th Avenue Bridge Plans and Specifications (circa 1916)
4. Partial Boeing Wharf Plans (circa 1952)

Information King County posses relating to these historical projects will be made available for inspection by the Bidders at the Map Counter of the Engineering Services Section, 39 Road Services Division, Department of Transportation, 1st Floor, 201 South Jackson Street, 40 Seattle, Washington, 98104-3856, however these documents shall not be considered as part of the Contract. King County makes no representation or warranty expressed or implied that the:

1. The Bidders' interpretations of the historical project documents is correct;
2. Locations of features or conditions indicated in historical project documents are correct; or
3. The features or conditions indicated in historical project documents have not been altered or removed.

King County makes no representations, guarantees, or warranties as to the accuracy of the historical project documents. The availability of historic project documents from King County shall not relieve the Bidder or the Contractor from any risks or of any duty to make examinations and investigations as required by Section 1-02.4(1) or any other responsibility under the Contract or as may be required by law.

1-02.5 PROPOSAL FORMS

Section is supplemented with the following:

(*****)

The proposal invites bids on definite Plans and Specifications. Only the amounts and information asked for on the proposal form furnished will be considered as the bid. Each bidder shall bid upon the work exactly as specified and as provided on the proposal form.

1-02.6 PREPARATION OF PROPOSAL

Section is supplemented with the following:

(*****)

If the contract provisions establish a minimum bid amount for the item "Plant Establishment", the bid for the item in the proposed form shall equal or exceed that amount. If the Contractor's bid is less than the minimum specified amount, the County will unilaterally revise the bid amount to the minimum specified amount and recalculate the Contractor's

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total bid amount. The corrected total bid amount will be used by the County for award purposes and to fix the amount of the contract bond.
Add the following new Section:

(*****)

1-02.8(3) CONFLICT OF INTEREST AND NON-COMPETITIVE PRACTICES

The Contractor shall comply with Chapter 3.04 of the King County Code, pertaining to conflicts of interest, and contingent fees and gratuities. Section 3.04.060 of the King County Code authorizes criminal liability, and civil penalties, including the cancellation of current contracts and disqualification from bidding for a two-year period, for any person who violates Section 3.04.060 of the King County Code.

1-02.9 DELIVERY OF PROPOSAL/DATE OF OPENING BIDS

The first paragraph is deleted and replaced with the following:

(*****)

Sealed bids will be received at King County Procurement and Contract Services Section, Chinook Building, 401 Fifth Avenue, 3rd Floor, Seattle, Washington 98104 until 1:30 p.m., _____, 2009, and then and there publicly opened and read aloud.

1-02.10 WITHDRAWAL OR REVISION OF PROPOSAL

Section is supplemented with the following:

(*****)

No oral or telephonic proposals or modifications will be considered.

1-02.13 IRREGULAR PROPOSALS

Item 1 is deleted and replaced with the following:

(March 25, 2009 APWA GSP)

1. A proposal will be considered irregular and will be rejected if:
   a. The bidder is not prequalified, when so required;
   b. The authorized proposal form furnished by the Contracting Agency is not used or is altered;
   c. The completed proposal form contains any unauthorized additions, -deletions, alternate bids, or conditions;
   d. The bidder adds provisions reserving the right to reject or accept the award, or enter into the contract;
   e. A price per unit cannot be determined from the bid proposal;
   f. The proposal form is not properly executed;
   g. The bidder fails to submit or properly complete a subcontractor list, if applicable, as required in Section 1 02.6.
   h. The bidder fails to submit or properly complete a Disadvantaged, Minority or Women's Business Enterprise Certification, if applicable, as required in Section 1-02.6; or

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i. The bid proposal does not constitute a definite and unqualified offer to meet the material terms of the bid invitation; or

j. More than one proposal is submitted for the same project from a Bidder under the same or different names.

1-02.14 DISQUALIFICATION OF BIDDERS

Section is deleted and replaced with the following:

(March 25, 2009 APWA GSP)

A Bidder will be deemed not responsible if:

1. the Bidder does not meet the mandatory bidder responsibility criteria in RCW 39.04.350(1), as amended; or
2. evidence of collusion exists with any other Bidder or potential Bidder. Participants in collusion will be restricted from submitting further bids; or
3. the Bidder, in the opinion of the Contracting Agency, is not qualified for the work or to the full extent of the bid, or to the extent that the bid exceeds the authorized prequalification amount as may have been determined by a prequalification of the Bidder; or
4. an unsatisfactory performance record exists based on past or current Contracting Agency work or for work done for others, as judged from the standpoint of conduct of the work; workmanship; or progress; affirmative action; equal employment opportunity practices; termination for cause; or Disadvantaged Business Enterprise, Minority Business Enterprise, or Women's Business Enterprise utilization; or
5. there is uncompleted work (Contracting Agency or otherwise), which in the opinion of the Contracting Agency might hinder or prevent the prompt completion of the work bid upon; or
6. the Bidder failed to settle bills for labor or materials on past or current contracts, unless there are extenuating circumstances acceptable to the Contracting Agency; or
7. the Bidder has failed to complete a written public contract or has been convicted of a crime arising from a previous public contract, unless there are extenuating circumstances acceptable to the Contracting Agency; or
8. the Bidder is unable, financially or otherwise, to perform the work, in the opinion of the Contracting Agency; or
9. there are any other reasons deemed proper by the Contracting Agency.

As evidence that the Bidder meets the bidder responsibility criteria above, the apparent two lowest Bidders must submit to the Contracting Agency within 24 hours of the bid submittal deadline, documentation (sufficient in the sole judgment of the Contracting Agency) demonstrating compliance with all applicable responsibility criteria, including all documentation specifically listed in the supplemental criteria. The Contracting Agency reserves the right to request such documentation from other Bidders as well, and to request further documentation as needed to assess bidder responsibility.

The basis for evaluation of Bidder compliance with these supplemental criteria shall be any documents or facts obtained by Contracting Agency (whether from the Bidder or third parties) which any reasonable owner would rely on for determining such compliance, including but not limited to: (i) financial, historical, or operational data from the Bidder; (ii) information obtained directly by the Contracting Agency from owners for whom the Bidder has worked, or other public agencies or private enterprises; and (iii) any additional

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information obtained by the Contracting Agency which is believed to be relevant to the matter.

If the Contracting Agency determines the Bidder does not meet the bidder responsibility criteria above and is therefore not a responsible Bidder, the Contracting Agency shall notify the Bidder in writing, with the reasons for its determination. If the Bidder disagrees with this determination, it may appeal the determination within 24 hours of receipt of the Contracting Agency's determination by presenting its appeal to the Contracting Agency. The Contracting Agency will consider the appeal before issuing its final determination. If the final determination affirms that the Bidder is not responsible, the Contracting Agency will not execute a contract with any other Bidder until at least two business days after the Bidder determined to be not responsible has received the final determination.

1-02.15 PRE AWARD INFORMATION

Section is deleted and replaced with the following:

(October 1, 2005 APWA GSP)

Before awarding any contract, the Contracting Agency may require one or more of these items or actions of the apparent lowest responsible bidder:

1. A complete statement of the origin, composition, and manufacture of any or all materials to be used,
2. Samples of these materials for quality and fitness tests,
3. A progress schedule (in a form the Contracting Agency requires) showing the order of and time required for the various phases of the work,
4. A breakdown of costs assigned to any bid item,
5. Attendance at a conference with the Engineer or representatives of the Engineer,
6. Obtain, and furnish a copy of, a business license to do business in the city or county where the work is located.
7. A copy of State of Washington Contractor's Registration, or
8. Any other information or action taken that is deemed necessary to ensure that the bidder is the lowest responsible bidder.

1-03 AWARD AND EXECUTION OF CONTRACT

1-03.1 CONSIDERATION OF BIDS

Section is supplemented with the following:

(*****)

Form of Protest

In order to be considered, a Protest shall be in writing, addressed to the Manager of the King County Procurement and Contract Services of the Department of Executive Services, and include:

1. The name, address, and phone number of the Bidder or Proposer protesting, or the authorized representative of the Bidder or Proposer;
2. The Solicitation Number and Title under which the Protest is submitted;
3. A detailed description of the specific grounds for protest and any supporting documentation. It is the responsibility of the Protesting Bidder/Proposer to

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supplement its Protest with any subsequently discovered documents prior to the Manager's decision;

4. The specific ruling or relief requested; and
5. Evidence that all persons with a financial interest in the procurement have been given notice of the Protest or if such persons are unknown, a statement to that effect.

Who May Protest

1. *Protests based on specifications*: Any prospective Bidder/Proposer.
2. *Protests following Bid opening*: Any Bidder or Proposer submitting a bid/proposal showing a substantial financial interest in this solicitation or award of a Contract.

Time to Protest

Protests based on specifications or other terms in the Solicitation documents which are apparent on the face of said documents must be received by the County no later than ten calendar days prior to the date established for submittal of Bids/Proposals. Protests based on other circumstances must be received by the County within five calendar days after the protesting Bidder/Proposer knows or should have known of the facts and circumstances upon which the Protest is based. In no event shall a Protest be considered if all bids are rejected or after award of the Contract.

Determination of Protest

Upon receipt of a timely written Protest, the Procurement Manager shall investigate the Protest and shall respond in writing to the Protest prior to the award of contract. Except as provided below, the decision of the Procurement Manager shall be final.

Reconsideration of Manager's Decision. A financially interested Bidder or Contractor may request that a Manager's adverse decision be reviewed by the Director of the King County Department of Executive Services ("Director") on a reconsideration basis only. The only justification for reconsideration are (1) new data, relevant to the underlying grounds for protest and unavailable at the time of the Protest to the Manager; or (2) the Manager made an error of law or regulation. The following procedures shall be followed for a reconsideration of the Manager's decision:

1. Form of Request for Reconsideration. In order to be considered, a Request for Reconsideration must be filed with the Director in writing and include:
   a. Name, address, and telephone number of the person protesting or their authorized representative;
   b. A copy of the written decision of the Manager; and
   c. Justification for a reconsideration by the Director, including all pertinent facts and law on which the Bidder or Proposer is relying.
2. Time for Filing Request for Reconsideration. The financially interested Bidder or Proposer must file the Request for Reconsideration no later than five calendar days of receiving the Procurement Manager's decision.
3. Review of Manager's Decision. Upon receipt of a Request for Reconsideration, the Director or his/her designee shall review (1) the information submitted to and reviewed by the Manager and (2) the decision of the Manager and shall thereafter issue a final determination regarding the

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Request for Reconsideration. No other information will be reviewed unless the basis for the request for reconsideration is new data.

Failure To Comply

Failure to comply with the procedures set forth herein may render a Protest untimely or inadequate and may result in rejection thereof by the County.

1-03.1(1) <u>ESCROW BID DOCUMENTATION</u>

(NEW SECTION)

This specification specifies the submittal, use, and preservation of Bidder's (Contractor's and subcontractor's) Escrow Bid Documentation, as defined herein. The Bid Documents provided by the Bidders(s) shall be specific enough that a third person could look at the Bid Documents and determine the labor, material and equipment costs for each individual bid item in the Contract Proposal. The Bid Documents should also identify field and home office overhead and profit.

<u>Bidder Responsibilities</u>: The apparent low Bidder and second low Bidder shall submit a legible copy of any and all Escrow Bid Documentation used to prepare the bid for this Contract and an executed Escrow Bid Documentation Agreement, in the Appendix, no later than the time specified under the subtitle "Delivery of Bid Documentation to the County".

The County may also request Bid Documentation from any other Bidder and such Bid Documentation shall be provided to the County within two (2) business days of such request.

<u>Escrow Bid Documentation Definition</u>: The terms "Escrow Bid Documentation", "Bid Documentation", "Bid Documents" and "Documents" as used in this Specification include but are not limited to the following documents:

1. Quotes from subcontractors, suppliers, subconsultants, and materialmen with any and all backup documentation;
2. Takeoff sheets, cut and add sheets, and any and all backup documentation;
3. Any and all writings, drafts, working papers, take off sheets, phone logs, computer printouts, charts, electronic data, spreadsheets, drawings, scope of work narratives or outlines, photographs, and any other documentation or data compilations which contain or reflect any and all information, data, and calculations compiled to, referred to, related to, and/or used to:
    a. estimate and/or prepare the bid;
    b. estimate productivity, types of equipment and materials, and manpower; and
    c. estimate, determine, evaluate, and/or compare equipment rates, labor rates, efficiency or productivity factors, and overhead and profit rates.
4. Any and all survey notes or calculations, and/or site visit notes or documents; and
5. Any and all manuals, books, and/or reference guides which were used by the Bidder in determining the bid for this Contract. If such manuals, books, and/or reference guides are standard in the industry, they may be included in the Bid

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Documentation by reference provided the reference includes the title, edition, publication date, and author. At the request of the County, the Bidder shall provide a copy of the manuals, books, and reference guides at no cost to the County.

If Bidders provide rolled up take off sheets or electronic data for any aspect of the Escrow Bid Documentation, Bidders must also provide the backup documentation supporting the rolled up take off sheets and electronic data.

The Bidder(s) shall provide the Escrow Bid Documentation as defined above for all subcontractors, suppliers, and materialmen.

The term Escrow Bid Documentation does not include the bid documents provided by King County for use by the Bidders in bidding on this Contract.

Unsuccessful Bidders shall not destroy, throw away, write over any Escrow Bid Documentation or any other documentation used in, referenced, referring to the Bidder's bid until the return of the Bidder's bid bond by King County.

Delivery Of Bid Documentation To The County: Within four (4) business days after bid opening the apparent low Bidder and second low Bidder shall submit Bid Documentation to _____**, King County Procurement and Contract Services Section, Chinook Building, 401 Fifth Avenue, 3rd Floor, Seattle, Washington.**

If a Bidder has submitted Escrow Bid Documentation pursuant to this section, but does not become the Contractor, its Escrow Bid Documentation will be returned with its bid bond.

Escrow Bid Documentation shall be submitted as follows:

1. All Escrow Bid Documentation shall be in folder(s) or three-ring binder(s). The folder(s) or three ring binder(s) shall be clearly marked "Escrow Bid Documentation - Contract No. C_____C__**"** and shall contain the Bidder's name, contact person, telephone number, and date of submittal. Such Escrow Bid Documentation shall be kept by King County Procurement and Contract Services Section (PCSS) in a separate sealed container for the duration of the Contract.

2. Bidders shall mark any of all of pages of the Bid Documentation it considers proprietary or confidential accordingly. Such information will be treated as such by King County; however, the County cannot insure that this information would not be subject to release pursuant to a public disclosure request. In the event the County receives a request for such information, the County will immediately advise the Bidder and will not release the marked documents for a period of not less than ten days in order to give the Bidder an opportunity to obtain a court order prohibiting the release of the information in response to the public disclosure request.

3. The writing on the pages shall be legible.

4. The paper shall be white in color or some other light (neutral) colored paper.

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Bidders shall include with their Escrow Bid Documentation an affidavit signed under oath by an individual authorized by the Bidder to execute bids and contracts.

1. The affidavit shall list each document with sufficient specificity and reference page number(s) so that a comparison can be made between the list, the Contract specification numbers, and the Bid Documentation to ensure that all Escrow Bid Documentation listed in the affidavit has been enclosed and that all documentation has been provided to the County.

2. The affidavit shall state that the affiant has personally examined the Escrow Bid Documentation and that any and all documentation that was used in preparing the bid and that supports how the bid price was calculated was provided to the County.

Documents listed in the affidavit but not included in the folder(s) or three ring binder(s) through error or oversight by the Bidder shall be submitted to the County within two business days after notification from the County that Bid Documentation is missing or within two business days after the Bidder becomes aware of the error.

Prior to Contract execution, the County and the apparent low Bidder shall meet to review the Bid Documentation to ensure that the submitted Bid Documentation satisfies the requirements of this Specification.

If the County determines that the Escrow Bid Documentation is illegible, not electronically accessible, or not submitted in accordance with this section, the Bidder shall:

1. Provide legible copies of the Bid Documentation;

2. Supply the software necessary to access the of the Bid Documentation; and,

3. Comply with the requirements of this section within two business days of the County's request.

If the County believes that the Bidder has not provided all Escrow Bid Documentation, the Bidder must, within two business days of the County's request, supply additional documentation or an explanation as to why the documentation does not exist.

Failure to submit Escrow Bid Documentation within the times prescribed, failure to be cooperative with the County in providing the Bid Documentation, and destruction of Bid Documents is just reason for a Bidder to be found not responsible and the County may reject the Bidder as not responsible.

Use of Bid Documentation: The Bidder(s)/Contractor agrees that the Escrow Bid Documentation shall contain all documentation used in preparing the bid. No other Bid Documentation concerning the Contractor's calculation of its bid shall be utilized by the Contractor during disputes and/or litigation of claims brought by the Contractor arising out of this Contract, unless otherwise approved by King County.

The Escrow Bid Documentation may be reviewed and used by the County to determine the Contractor's bid concept, to evaluate the Contractor's breakdown of contract price, evaluate productivity and schedule, negotiate price adjustments under the Contract,

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evaluate Requests For Information, Requests For Change Order, Change Proposals, Claims or for any other reason related to the Contract.

The County may copy the Escrow Bid Documents and may provide the working copy(s) to County personnel, agents, or consultants. The County, its agents, and consultants, may maintain such working copies of the Bid Documents and at the request of Project Representative, all copies of Escrow Bid Documents will be returned to PCSS or destroyed.

If a Disputes Review Board or mediator is used to resolve disputed claims, the Board members and/or mediator shall have unrestricted use and access to the Escrow Bid Documentation for purposes of evaluating, understanding, resolving and settling disputes/claims. The Dispute Review Board or Mediator shall maintain submitted documents in a sealed file, marked confidential and proprietary and returned to PCSS at the conclusion of the DRB or mediation process.

1-03.3 EXECUTION OF CONTRACT

Section is deleted and replaced with the following:

(*****)

Copies of the Contract Provisions, including the unsigned Form of Contract, will be included with the Notice of Selection from the County for signature by the successful bidder. The number of copies to be executed by the Contractor will be determined by the County.

Within ten (10) business days after receiving the Notice of Selection, the successful bidder shall return the signed County-prepared contract, an insurance certification as required by Section 1-07.18, and a satisfactory bond as required by law and Section 1-03.4 Before execution of the contract by the County, the successful bidder shall provide any pre-award information the County may require under Section 1-02.15.

Until the County executes a contract, no proposal shall bind the County, nor shall any work begin within the project limits or within County-furnished sites. The Contractor shall bear all risks for any work begun outside such areas and for any materials ordered before the contract is executed by the County.

If the bidder experiences circumstances beyond their control that prevents return of the contract documents within 10 days after receiving the Notice of Selection, the County may grant up to a maximum of 10 additional days for return of the documents, provided the County deems the circumstances warrant it.

Add the following new Section:

(*****)

1-03.3(1) REQUIRED SUBMITTALS PRIOR TO CONTRACT EXECUTION

The selected Bidder shall submit the following Forms within ten days after receiving written Notice of Selection:

1. A Personnel Inventory Report on the form provided by the County.
2. An Affidavit and Certificate of Compliance Demonstrating the Contractor's commitment to comply with the provisions of KCC Chapter 12.16.
3. A Statement of Compliance with KCC Chapter 12.16 from any labor unions or employee referral agencies, which refers workers or employees, or provides or supervises apprenticeship or other training programs from whom Contractor obtains employees.

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4. A 504/ADA Disability Assurance of Compliance on the form provided by the County.
5. List of Subcontractors and Suppliers at all levels on the form provided by the County.
6.

The Contractor shall also submit Personnel Inventory Reports, Affidavits and Certificates of Compliance and Sworn Statements of Compliance from its subcontractors, regardless of tier. Such subcontractor information shall be submitted prior to the County processing and paying any progress payment which includes such subcontractor work .

Assistance with the requirements of this Section and copies of Chapters 12.16 and 12.18 are available from the Business Development and Contract Compliance Division, phone (206) 205-0700.

The County will not execute an agreement or contract without prior receipt of fully executed forms listed above.

1-03.7 JUDICIAL REVIEW

The final paragraph is deleted and replaced with the following:

(*****)

Such review, if any, shall be timely filed in the Superior Court of King County, Washington.

1-04 SCOPE OF THE WORK

1-04.1 INTENT OF THE CONTRACT

Section is deleted and replaced with the following:

(*****)

It is the intent of the Contract Documents to describe a functionally complete Project to be constructed in accordance with the Contract Documents. Any Work, materials, or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be furnished and provided whether or not specifically called for. When words which have a well- known technical or trade meaning are used to describe Work, materials, or equipment such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual, or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of the County, Contractor, or Engineer, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to the Engineer, or any of the Engineer's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work.

If, during the performance of the Work, the Contractor finds a conflict, error or discrepancy in the Contract Documents, the Contractor shall so report to the Engineer or the

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Engineer's authorized assistant in writing at once and before proceeding with the Work affected. The Contractor thereby shall obtain a written interpretation or clarification from the Engineer.

1-04.2 COORDINATION OF CONTRACT DOCUMENTS, PLANS, SPECIAL PROVISIONS, SPECIFICATIONS AND ADDENDA

The precedence list in the second paragraph is deleted and replaced with the following:

(*****)

1. Change Order
2. Agreement Form
3. Addenda
4. Proposal Form
5. Special Provisions, including permit conditions
6. Contract Plans
7. Amendments to the Standard Specifications
8. Standard Specifications
9. King County Road Standards
10. Standard Plans
11. Remainder of Contract Documents

1-05 CONTROL OF WORK

1-05.1 AUTHORITY OF THE ENGINEER

Section is supplemented with the following at the beginning of the section:

(*****)

The Engineer is the County's point of contact for the Contractor. The County shall identify a Project Engineer and Inspector and delineate the Project Engineer's and Inspector's authority prior to or concurrent with the County's issuance of the Notice to Proceed. Unless the County, in writing, indicates otherwise, the authority to (1) commit to or bind the County to any Change Orders or (2) sign the contract or change orders rests solely in the King County Executive or its designee. When appropriate, the Engineer shall provide the Contractor with a delegation of authority which identifies the person who has authority to sign the contract and/or bind the County to changes in Contract Price.

The Engineer shall be responsible for ensuring strict compliance with the terms of the Contract and safeguarding the interest of the County in its contractual relationships. The Engineer shall have the authority to administer the Contract. Administration of the contract by the Engineer includes but is not limited to:

1. Receiving all correspondence and information from the Contractor;
2. Issuing Field Directives;
3. Issuing Request for Change Proposals;
4. Responding to Requests For Information;
5. Reviewing the schedule of values, project schedules, submittals, testing and inspection reports, substitution requests, and other documentation submitted by the Contractor;

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6. Negotiating Change Proposals and Change Orders;
7. Recommending Change Orders for approval by the King County Executive or its designee;
8. Issuing decisions with respect to Requests for Change Orders and Claims;
9. Processing payment requests submitted by the Contractor, and recommending payment;
10. Monitoring the quality of the work and recommending acceptance of the work;
11. Transmitting executed Change Orders, Amendments, and other contract documents to the Contractor; and
12. Performing all other contract administrative functions.

All correspondence, questions, and/or documentation shall be submitted to the Engineer and the Engineer shall disseminate such documentation appropriately. The Engineer may designate an authorized assistant to perform functions under the Contract, such as review and/or inspection and acceptance of supplies, services, including construction, and other functions of a technical or administrative nature. The Engineer will provide a written notice of such designation to the Contractor. The Engineer may add to or modify in writing these designations from time to time. The designation letter will set forth the authorities and limitations of the authorized assistants under the Contract. The Engineer authorized assistants cannot grant greater authority than the authority of the Engineer.

1-05.3 PLANS AND WORKING DRAWINGS

The second paragraph is deleted and replaced with the following:

(*****)

In the event that it is found that the instructions and drawings contained in the contract documents are not sufficiently clear to permit the Contractor to proceed with the work, the Engineer will either upon his own motion or upon request from the Contractor, furnish such additional written instructions together with such additional drawings as may be necessary. When such request is made by the Contractor it must be made in ample time to permit the preparation of the instructions and drawings by the Engineer before construction of the work covered by them is undertaken. Such additional instructions and drawings will not be inconsistent with the contract documents and shall have the same force and effect as if contained in the contract documents.

Add the following new Section:

(*****)

1-05.3(1) EQUIPMENT LISTS AND OTHER SUBMITTALS

The Contractor shall submit Equipment lists and schedules of reinforcement bars (Bar Lists), and other required submittals for approval by the Engineer. The Engineer will respond to requests for approval within time frames specified in each Section of the Specifications that requires such approval.

1-07.5 ENVIRONMENTAL REGULATIONS

Section is supplemented with the following:

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(August 3, 2009)

Environmental Commitments

The following provisions summarize the requirements, in addition to those required elsewhere in the contract, imposed upon the Contracting Agency by the various documents referenced in the Special Provision PERMITS AND LICENSES. Throughout the work, the Contractor shall comply with the following requirements:

General: The Contractor shall ensure that the Project Manager representing the Prime Contractor and all subcontractors has read and understands this Special Provision. Prior to commencing any work on site, the Contractor shall provide the Engineer with a signed statement from the Project Manager stating that the Project Manager has read, understands and will abide by the conditions of this Special Provision.

Wetlands and Water Quality: The following restrictions and requirements pertain to work throughout the project limits:

(August 3, 2009)

The Contractor shall dispose of all creosoted timber, creosote piling and associated debris as shown in the Plans in accordance with current federal, state, and local regulations and provisions, and following Best Management Practices. Disposal shall be made in a landfill which meets the liner and leachate standards of the Minimum Functional Standards, Chapter 173-304 WAC. The Contractor shall provide receipts from the disposal facility to the Project Engineer. If the material is transported to a transfer station, the Contractor shall obtain documentation indicating that final disposal will comply with the standards referenced above.

1-05.4 CONSTRUCTION STAKES

The third paragraph is supplemented with the following:

(*****)

For projects involving the construction of swales, rain gardens and earth berms, the Engineer will furnish the Contractor with stake-out sheets of construction points for drainage structures on each street of the Project Site. The stake out sheets shall list the street monument line alignment stationing, the offset from street monument line and the elevation. (See Section 2-03.3(19) Swales, Rain Gardens and Earth Berms for additional survey information.)

1-05.5 CONTRACTOR SURVEYING – STRUCTURE (NEW SECTION)

Copies of the County- provided primary survey control data are available for the bidder's inspection at the office of the Project Engineer.

The Contractor shall be responsible for setting, maintaining, and resetting all alignment stakes, slope stakes, and grades necessary for the construction of bridges, noise walls, and retaining walls. Except for the survey control data to be furnished by the County, calculations, surveying, and measuring required for setting and maintaining the necessary lines and grades shall be the Contractor's responsibility.

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Detailed survey records shall be maintained, including a description of the work performed on each shift, the methods utilized, and the control points used. The record shall be adequate to allow the survey to be reproduced. A copy of each day's record shall be provided to the Engineer within three working days after the end of the shift.

The meaning of words and terms used in this provision shall be as listed in "Definitions of Surveying and Associated Terms" current edition, published by the American Congress on Surveying and Mapping and the American Society of Civil Engineers.

The survey work by the Contractor shall include but not be limited to the following:

1. Verify the primary horizontal and vertical control furnished by the Contracting Agency, and expand into secondary control by adding stakes and hubs as well as additional survey control needed for the project. Provide descriptions of secondary control to the Contracting Agency.

2. Establish, by placing hubs and/or marked stakes, the location with offsets of foundation shafts and piles.

3. Establish offsets to footing centerline of bearing for structure excavation.

4. Establish offsets to footing centerline of bearing for footing forms.

5. Establish wing wall, retaining wall, and noise wall horizontal alignment.

6. Establish retaining wall top of wall profile grade.

7. Establish elevation benchmarks for all substructure formwork.

8. Check elevations at top of footing concrete line inside footing formwork immediately prior to concrete placement.

9. Check column location and pier centerline of bearing at top of footing immediately prior to concrete placement.

10. Establish location and plumbness of column forms, and monitor column plumbness during concrete placement.

11. Establish pier cap and crossbeam top and bottom elevations and centerline of bearing.

12. Check pier cap and crossbeam top and bottom elevations and centerline of bearing prior to and during concrete placement.

13. Establish grout pad locations and elevations.

14. Establish structure bearing locations and elevations, including locations of anchor bolt assemblies.

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15. Establish box girder bottom slab grades and locations.

16. Establish girder and/or web wall profiles and locations.

17. Establish diaphragm locations and centerline of bearing.

18. Establish roadway slab grades and provide dimensions from top of girder to top of roadway slab. Set elevations for deck paving machine rails.

19. Establish traffic barrier and curb profile and alignment on roadway slab.

The Contractor shall provide the County copies of any calculations and staking data when requested by the Engineer.

To facilitate the establishment of these lines and elevations, the County will provide the Contractor with the following primary survey and control information:

1. Descriptions of two primary control points used for the horizontal and vertical control. Primary control points will be described by reference to the project alignment and the coordinate system and elevation datum utilized by the project. In addition, the County will supply horizontal coordinates for the beginning and ending points and for each Point of Intersection (PI) on each alignment included in the project.

2. Horizontal coordinates for the centerline of each bridge pier.

3. Computed elevations at top of bridge roadway decks at one-tenth points along centerline of each girder web. All form grades and other working grades shall be calculated by the Contractor.

The Contractor shall give the County three weeks notification to allow adequate time to provide the data outlined in Items 2 and 3 above. The Contractor shall ensure a surveying accuracy within the following tolerances:

	Vertical	Horizontal
1. Stationing on structures		±0.02 feet
2. Alignment on structures		±0.02 feet
3. Superstructure elevations	±0.01 feet variation from Plan elevation.	
4. Substructure	±0.02 feet variation from Plan grades.	

The County may spot-check the Contractor's surveying. These spot-checks will not change the requirements for normal checking by the Contractor.

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When staking the following items, the Contractor shall perform independent checks from different secondary control to ensure that the points staked for these items are within the specified survey accuracy tolerances:

Piles
Shafts
Footings
Columns

The Contractor shall calculate coordinates for the points associated with piles, shafts, footings and columns. The County will verify these coordinates prior to issuing approval to the Contractor for commencing with the survey work. The County will require up to seven calendar days from the date the data is received to issuing approval.

Contract work to be performed using contractor-provided stakes shall not begin until the stakes are approved by the County. Such approval shall not relieve the Contractor of responsibility for the accuracy of the stakes.

Payment: Payment will be made in accordance with Section 1-04.1 for the following bid item when included in the Proposal:

"Structure Surveying", lump sum.

The lump sum contract price for "Structure Surveying" shall be full pay for all labor, equipment, materials, and supervision utilized to perform the work specified, including any resurveying, checking, correction of errors, replacement of missing or damaged stakes, and coordination efforts.

1-05.7 REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

Section is supplemented with the following:

(*****)

Any nonconforming or defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness, failure to furnish materials or to perform the work in accordance with the contract documents, or any other cause found to exist during construction or prior to final acceptance, shall be removed immediately and replaced by work and materials which shall conform to the contract documents or shall be remedied otherwise in a manner acceptable to and as authorized by the Engineer. These provisions shall have full effect regardless of the fact that the defective work was performed, or the defective materials were used, with the full knowledge of the Engineer. The fact that the Engineer may have previously overlooked such defective work shall not constitute an acceptance of any part of work or a waiver. Nothing stated herein shall be deemed to shorten the term of any statute of limitations applicable to claims which the County may have against the Contractor.

Work done contrary to or regardless of the instructions of the Engineer, work done beyond the requirements of the contract documents, or any extra or additional work done without authority, will be considered as unauthorized and will not be paid for by the County,

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even if retained. Work so performed may be ordered removed or replaced at the Contractor's expense.

While the Engineer will endeavor to point out to the Contractor any defective work which comes to the attention of the Engineer during these observations, the Engineer's failure to do so shall not constitute the basis of any claim, suit or cause of action by the Contractor or any other party against the Engineer or the County, and shall not excuse nonconforming or defective work by the Contractor.

The Engineer or the County shall be allowed access to all parts of the work at all times and shall be furnished with every reasonable facility for ascertaining whether the work as performed is in accordance with the requirements and intent of the Plans and Specifications. If directed by the Engineer, the Contractor, at any time before acceptance of the Work, shall remove or uncover such portions of the finished work. After examination, the Contractor shall restore said portions of the Work to the standards required by the Specifications. Should the work thus exposed or examined prove acceptable, the uncovering or removing and the replacing of the covering or making good of the parts removed, will be paid for as provided under Section 1-04.4, but should the work so exposed or examined prove unacceptable, the uncovering or removing and the replacing of the covering or making good of the parts removed, shall be at the Contractor's expense. Observation of the work by the Engineer shall not be considered as direct control of the individual workman and his work. The direct control shall be solely the responsibility of the Contractor.

Add the following new Section:

(*****)

1-05.5 RECORD DRAWINGS AND CONTRACT DOCUMENTS

The Contractor shall keep one copy of the Contract Documents, including the Standard Specifications on the job site, in good order, available to the Engineer, the Engineer's authorized assistants and the County.

The Contractor shall maintain, updated on a daily basis at the job site, and make available to the Engineer on request, a record set of the Plans accurately marked to indicate modifications in the completed work that differ from the design information shown in the Plans.

1-05.12 FINAL ACCEPTANCE

Section is deleted and replaced with the following:

(*****)

The Contractor must perform all the obligations under the contract before a completion date and final acceptance can occur. Failure of the Contractor to perform all the obligations under the contract shall not bar King County from unilaterally accepting the contract as provided in Section 1-09.9.

The Director of Transportation, or a duly authorized assistant, accepts the completed contract and the items of work shown in the Comparison of Quantities by signature of the Notice of Completion and Acceptance. The date of that signature constitutes the acceptance date. Progress estimates or payments shall not be construed as acceptance of any work under the contract.

The Contractor agrees that neither completion nor final acceptance shall relieve the Contractor of the responsibility to indemnify, defend and protect King County against any

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claim or loss resulting from the failure of the Contractor (or the subcontractors or lower-tier subcontractors) to pay all laborers, mechanics, subcontractors, materialpersons or any other person who provides labor, supplies or provisions for carrying out the work.

Final acceptance shall not constitute acceptance of any unauthorized or defective work or material. King County shall not be barred from requiring the Contractor to remove, replace, repair or dispose of any unauthorized or defective work or material or from recovering damages for any such work or material.

1-05.13 SUPERINTENDENTS, LABOR AND EQUIPMENT OF CONTRACTOR

The seventh paragraph is deleted and replaced with the following:

(*****)

Whenever the Contracting Agency evaluates the Contractor's qualifications pursuant to Section 1-02.1, it will take these performance reports into account.

1-05.15 METHOD OF SERVING NOTICES

The second paragraph is deleted and replaced with the following:

(March 25, 2009 APWA GSP)

All correspondence from the Contractor shall be directed to the Project Engineer. All correspondence from the Contractor constituting any notification, notice of protest, notice of dispute, or other correspondence constituting notification required to be furnished under the Contract, must be in paper format, hand delivered or sent via mail delivery service to the Project Engineer's office. Electronic copies such as e-mails or electronically delivered copies of correspondence will not constitute such notice and will not comply with the requirements of the Contract.

1-06 CONTROL OF MATERIAL

1-06.1 APPROVAL OF MATERIALS PRIOR TO USE

The first sentence is deleted and replaced with the following:

(*****)

Prior to use or delivery to the project site, the Contractor shall notify the Engineer of all proposed materials. The Contractor shall use the Request for Approval of Material Sources (RAMS) form. These sources must be approved by the Engineer before delivery to the project site begins. The Contractor may utilize pre-approved materials shown on the Qualified Products List (QPL), but submittal of such items shall be documented on a RAMS.

1-06.1(2) REQUEST FOR APPROVAL OF MATERIAL SOURCES (RAMS)

The first paragraph is deleted and replaced with the following:

(*****)

The RAMS shall be used for all materials to be incorporated into the work. The RAMS shall be prepared by the Contractor in accordance with the instructions on the form and submitted to the Engineer for approval before the material is delivered to the project site or incorporated into the work. When pre-approved items from the QPL are proposed, a copy of

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the applicable page from the QPL, marked per the instructions in the QPL, shall be submitted with the RAMS.

1-06.1(2)A BUY AMERICA

(NEW SECTION)

(August 6, 2007 WSDOT GSP)

The major quantities of steel and iron construction material that is permanently incorporated into the project shall consist of American-made materials only. Buy America does not apply to temporary steel items, e.g., temporary sheet piling, temporary bridges, steel scaffolding and falsework.

The Contractor may utilize minor amounts of foreign steel and iron in this project provided the cost of the foreign material used does not exceed one-tenth of one percent of the total contract cost or $2,500.00, whichever is greater.

American-made material is defined as material having all manufacturing processes occurring domestically. To further define the coverage, a domestic product is a manufactured steel material that was produced in one of the 50 States, the District of Columbia, Puerto Rico, or in the territories and possessions of the United States.

If domestically produced steel billets or iron ingots are exported outside of the area of coverage, as defined above, for any manufacturing process then the resulting product does not conform to the Buy America requirements. Additionally, products manufactured domestically from foreign source steel billets or iron ingots do not conform to the Buy America requirements because the initial melting and mixing of alloys to create the material occurred in a foreign country.

Manufacturing begins with the initial melting and mixing, and continues through the coating stage. Any process which modifies the chemical content, the physical size or shape, or the final finish is considered a manufacturing process. The processes include rolling, extruding, machining, bending, grinding, drilling, welding, and coating. The action of applying a coating to steel or iron is deemed a manufacturing process. Coating includes epoxy coating, galvanizing, aluminizing, painting, and any other coating that protects or enhances the value of steel or iron. Any process from the original reduction from ore to the finished product constitutes a manufacturing process for iron.

Due to a nationwide waiver, Buy America does not apply to raw materials (iron ore and alloys), scrap (recycled steel or iron), and pig iron or processed, pelletized, and reduced iron ore.

The following are considered to be steel manufacturing processes:

1. Production of steel by any of the following processes:
   a. Open hearth furnace.
   b. Basic oxygen.
   c. Electric furnace.
   d. Direct reduction.
2. Rolling, heat treating, and any other similar processing.
3. Fabrication of the products.
   a. Spinning wire into cable or strand.
   b. Corrugating and rolling into culverts.
   c. Shop fabrication.

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A certification of materials origin will be required for any items comprised of, or containing, steel or iron construction materials prior to such items being incorporated into the permanent work. The certification shall be on DOT Form 350-109EF provided by the Engineer, or such other form the Contractor chooses, provided it contains the same information as DOT Form 350-109EF.

1-06.1(3) SHOP INSPECTION EXPENSE

(NEW SECTION)
(October 25, 1999 WSDOT GSP)

Additional shop inspection expenses will be sustained by the County if all or a portion of the following listed bid item(s) containing structural steel construction materials are fabricated at some distance from County inspection facilities:

_____

It is impractical and difficult to determine the actual increase in inspection expenses. To cover such additional fabrication inspection expenses for the above specified construction materials, the Contractor agrees to pay and authorizes and directs the County to deduct from any monies due or coming due to the Contractor the sums shown on the following schedule for fabrication inspection expenses:

Zone	Place of Fabrication	Reduction in Payment
I	Within 300 air line miles of Seattle	None
II	Between 300 and 3,000 airline miles from Seattle	$0.005 per pound but not less than $2,000
III	Over 3,000 airline miles from Seattle	$0.006 per pound but not less than $4,000

Where fabrication of a member takes place in more than one zone, the reduction in payment will be computed on the basis of the entire member being fabricated in the farthest of the zones where any fabrication takes place on that member.

1-06.2(1) SAMPLES AND TESTS FOR ACCEPTANCE

The first sentence of the fifth paragraph is deleted and replaced with the following:

(*****)
All field and laboratory and materials testing by the Engineer will follow methods described in the contract documents, in the Washington State Department of Transportation Materials Manual, or ASTM or AASHTO national standard test procedures, using qualified testing personnel and calibrated or verified equipment.

1-06.3 MANUFACTURER'S CERTIFICATE OF COMPLIANCE

The third paragraph is deleted and replaced with the following:

(*****)

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The Manufacturer's Certificate of Compliance must identify the manufacturer, the type (and lot number, if applicable) and quantity of material being certified, the applicable specifications being affirmed, and the signature of a responsible corporate official of the manufacturer and include supporting mill tests or documents. An invoice and a Manufacturer's Certificate of Compliance shall be furnished with each truckload of material delivered to the work and the truckload so certified shall be clearly identified in the certificate.

1-07 LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

1-07.1 LAWS TO BE OBSERVED

Section is supplemented with the following:

(January 5, 2004)

LEAD HEALTH PROTECTION PROGRAM

Structural and non-structural materials located at the project site *** $$1$$ *** contain lead-based products. The Contractor shall be fully responsible for the safety and health of all on-site workers and compliant with Washington Administrative Code (WAC 296-155-176). The Contractors Lead Health Protection Program shall be sent to the Contracting Agency at least 2 weeks prior to the Contractor beginning work involving exposure to lead contamination. The Contractor shall communicate with the Project Engineer to ensure a coordinated effort for providing and maintaining a safe worksite for both the Contracting Agency's and Contractor's workers.

CONSTRUCTION REQUIREMENTS

The Contractor shall be responsible for the containment measures required to provide and maintain a safe and healthful jobsite for the duration of the project in accordance with all applicable laws and this Special Provision.

PAYMENT

All costs to comply with this Special Provision for the Lead Health Protection laws and regulations are the responsibility of the Contractor and shall be included in related items of work.

1-07.2 STATE SALES TAXES

Section is supplemented with the following:

(*****)

The work on this contract will be performed upon non-State lands. The Contractor shall pay State sales tax in accordance with the provisions of Section 1-07.2(1) of the Standard Specifications.

1-07.5 ENVIRONMENTAL REGULATIONS

Section is supplemented with the following:

(August 3, 2009)

Environmental Commitments

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The following provisions summarize the requirements, in addition to those required elsewhere in the contract, imposed upon the Contracting Agency by the various documents referenced in the Special Provision PERMITS AND LICENSES. Throughout the work, the Contractor shall comply with the following requirements:

General: The Contractor shall ensure that the Project Manager representing the Prime Contractor and all subcontractors has read and understands this Special Provision. Prior to commencing any work on site, the Contractor shall provide the Engineer with a signed statement from the Project Manager stating that the Project Manager has read, understands and will abide by the conditions of this Special Provision.

Wetlands and Water Quality: The following restrictions and requirements pertain to work throughout the project limits:

(August 3, 2009)

The Contractor shall dispose of all creosoted timber, creosote piling and associated debris as shown in the Plans in accordance with current federal, state, and local regulations and provisions, and following Best Management Practices. Disposal shall be made in a landfill which meets the liner and leachate standards of the Minimum Functional Standards, Chapter 173-304 WAC. The Contractor shall provide receipts from the disposal facility to the Project Engineer. If the material is transported to a transfer station, the Contractor shall obtain documentation indicating that final disposal will comply with the standards referenced above.

Add the following new Section:

(*****)

1-07.5(4)A FUGITIVE DUST

The Puget Sound Clean Air Agency and King County recognize that fugitive dust from construction projects can become an air pollution problem; both organizations share the goal of controlling fugitive dust emissions.

Fugitive Dust control planning represents a partnership between the County, the Contractor, its subcontractors and any other parties whose activities during the project may lead to the generation of fugitive dust. Such a partnership extends to legal responsibilities as well: all parties can be held liable for non-compliance and subsequent regulatory actions up to and, including monetary liabilities.

The Contractor shall incorporate a Fugitive Dust Control Plan (FDCP) as part of its Temporary Erosion and Sediment Control (TESC) Plan. The FDCP shall reflect conditions specific to the project site, the Contractor's operations, and the schedule of work. At a minimum, the Contractor shall develop FDCP in accordance with the Best Management Practices (BMPs) identified in the Associated General Contractors of Washington Education Foundation and Fugitive Dust Task Force pamphlet, "Guide To Handling Fugitive Dust From Construction Projects."

Add the following new Section:

(*****)

1-07.5(5) RECYCLED PAPER PRODUCTS

NOT FOR CONSTRUCTION

The Contractor shall use recycled paper for the production of all printed and photocopied documents related to the fulfillment of this Contract. If the cost of recycled is more than fifteen percent higher than the cost of non-recycled paper, the Contractor shall notify the County, who may waive the recycled paper requirement.
The Contractor agrees to use both sides of paper sheets for copying and printing, and to use recycled/recyclable products wherever practical.

1-07.5(6) CONCRETE GRINDING AND SAWCUTTING RESIDUE AND SLURRY (NEW SECTION)

Construction activities that generate residue from asphalt concrete or Portland cement concrete grinding or sawcutting shall be subject to the following:

Collection, Containment, and Disposal: Removal of residue and slurry from the immediate roadway shall be done on a continuous basis. Residue and slurry shall not be allowed to drain across traffic lanes and shoulders or drain into any stormwater conveyance system, including catch basins, inlets, or ditches. Any discharge to surface waters, including wetlands, is a violation of State water quality standards.

The Contractor shall develop a Collection, Containment, and Disposal Plan identifying how the residue and slurry will be contained and collected. The residue and slurry shall become the property of the Contractor and shall be disposed of by hauling to a Contractor-provided disposal site.

The approved Collection, Containment, and Disposal Plan shall be implemented prior to commencing any pavement grinding or sawcutting operation.

On-Site Disposal: No on-site disposal shall be allowed for this contract.

Submittals: The Contractor shall submit the following items to the Engineer for review and approval a minimum of 21 calendar days prior to commencing the grinding or sawcutting operation:

1. Collection, Containment, and Disposal Plan (identifying all proposed methods to prevent discharges into the existing drainage systems).
2. Location of all off-site disposal sites, including copies of all applicable permits and approvals for the use of those sites.

Payment: All costs with developing the Collection, Containment, and Disposal Plan and collecting, containing, loading, hauling, and disposing of pavement grinding and sawcutting residue and slurry shall be included in the unit contract prices for the applicable items of work and no additional compensation will be made.

1-07.6 PERMITS AND LICENSES

Section is deleted and replaced with the following:

(*****)
King County has obtained the following permits and approvals for construction of this project:
Federal Permits:
NEPA – EIS

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Section 4(f) Evaluation
Section 404 – CWA Nationwide Permit
Section 10 – Rivers and Harbors Act of 1899
Section 9 – General Bridge Permit

Washington State Permits and Approvals:

Hydraulic Project Approval
ESA Section 7 – No Effect Concurrence
Section 401 – Water Quality Certification
Notification of Hazardous Waste Disposal: From II
Temporary Authorization for use of Surface Water
Coastal Zone Management Certification
National Pollutant Discharge Elimination System (NPDES)
Labor and Industries – Electrical Work Permit

King County Department of Development and Environmental Services Permits:

Clearing and Grading Permit
Exemption from the Shoreline Management Substantial Development Permit
Flood Hazard Certification
Critical Area Review
Noise Variance Street Use Permit
Easement to Control over Waterways

The Contractor shall comply with all provisions of the permits and approvals. All contacts with permitting agencies concerning the permits and/or approvals shall be through the Engineer.

All other permits and licenses required for the construction of this project shall be obtained by the Contractor. All permits and licenses shall be kept on-site during construction. The following is a minimum list of Permits to be acquired by the Contractor:

Asbestos Notice of Demolition (PSCAA)
Demolition Permit
Drainage Discharge Permit (if required)

The Contractor shall furnish the Engineer with one copy of each permit issued for borrow, filling, or wasting material required for or generated by the contract work. The Contractor shall notify the Engineer in writing of the location of all borrow, filling, and waste sites regardless of whether a permit is required.

All costs incurred by the Contractor in procuring permits and complying with stipulations in the permits and approvals shall be incidental to and included in the various items of work in the project; no additional compensation will be made.

(March 13, 1995)

The Contractor shall comply with all United States Coast Guard requirements.

The Contractor shall contact the Coast Guard at least 2 weeks in advance of all work in or near the navigable portion of the waterway and request that a Local Notice to Mariners be issued for the waterway at this site.

The Contractor shall contact the Coast Guard for requirements related to the mooring of barges, placement of log booms, and all other equipment that could be a hazard to waterway users.

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Provisions shall be made for the removal, on 2 hours notice, of all equipment that would block or partially block, the navigable portion of the waterway.
The Coast Guard contact is:

Bridge Specialist
Aids to Navigation Branch
Thirteenth Coast Guard District
915 Second Avenue
Seattle, WA 98174-1067
Telephone: (206) 220-7270

All costs incurred in contacting the Coast Guard and in complying with all the requirements specified herein shall be included in the contract prices for the items of work involved.
All costs in connection with delays in the construction caused by the Contractor's failure to contact the Coast Guard shall be at the Contractor's expense.

1-07.9(1)A FEDERAL WAGE RATES (NEW SECTION)

(February 11, 2008 WSDOT GSP)

In reference to this Section 1-07.9(1), the Federal wage rates incorporated in this contract have been established by the Secretary of Labor under United States Department of Labor General Decision No. WA080001.

1-07.9(1)B APPLICATION OF WAGE RATES FOR THE OCCUPATION OF LANDSCAPE CONSTRUCTION (NEW SECTION)

(April 2, 2007 WSDOT GSP)

State prevailing wage rates for public works contracts are included in this contract and show a separate listing for the occupation:

> Landscape Construction, which includes several different occupation descriptions such as: Irrigation and Landscape Plumbers, Irrigation and Landscape Power Equipment Operators, and Landscaping or Planting Laborers.

In addition, Federal wage rates that are included in this contract may also include occupation descriptions in Federal Occupational groups for work also specifically identified with landscaping such as:

> Laborers with the occupation description, Landscaping or Planting, or

> Power Equipment Operators with the occupation description, Mulch Seeding Operator.

If Federal wage rates include one or more rates specified as applicable to landscaping work, then Federal wage rates for all occupation descriptions, specific or general, must be considered and compared with corresponding State wage rates. The higher wage rate, either State or Federal, becomes the minimum wage rate for the work performed in that occupation.

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Contractors are responsible for determining the appropriate crafts necessary to perform the contract work. If a classification considered necessary for performance of the work is missing from the Federal Wage Determination applicable to the contract, the Contractor shall initiate a request for approval of a proposed wage and benefit rate. The Contractor shall prepare and submit Standard Form 1444, Request for Authorization of Additional Classification and Wage Rate available at http://www.wdol.gov/docs/sf1444.pdf, and submit the completed form to the Project Engineer's office. The presence of a classification wage on the Washington State Prevailing Wage Rates For Public Works Contracts does not exempt the use of form 1444 for the purpose of determining a federal classification wage rate.

Add the following new Section:

(*****)

1-07.10(1) EQUAL BENEFITS

King County's Equal Benefits (EB) Ordinance 14823 states that to be eligible for award of contracts at a cost of $25,000.00 or more, firms must not discriminate in the provisions of employee benefits between employees with spouses, and employees with domestic partners. The successful Contractor, bidder or proposer shall be required to complete a Worksheet and Declaration form. Compliance with Ordinance 14823 is a mandatory condition for execution of a contract. The EB Compliance forms, and Ordinance 14823 are available online at: www.metrokc.gov/finance/procurement/forms.asp.

Add the following new Section:

(*****)

1-07.11(1)B NON-DISCRIMINATION AND EQUAL EMPLOYMENT OPPORTUNITY (EEO)

Nondiscrimination in Employment and Provision of Services. During the performance of this Contract, neither the Contractor nor any party subcontracting under the authority of this Contract shall discriminate nor tolerate harassment on the basis of race, color, sex, religion, nationality, creed, marital status, sexual orientation, age, or the presence of any sensory, mental, or physical disability in the employment or application for employment or in the administration or delivery of services or any other benefits under this Contract.

Nondiscrimination in Subcontracting Practices. During the solicitation, award and term of this Contract, the Contractor shall not create barriers to open and fair opportunities to participate in County contracts or to obtain or compete for contracts and subcontracts as sources of supplies, equipment, construction and services. In considering offers from and doing business with subcontractors and suppliers, the Contractor shall not discriminate against any person on the basis of race, color, creed, religion, sex, age, nationality, marital status, sexual orientation or the presence of any mental or physical disability in an otherwise qualified disabled person.

Compliance with Laws and Regulations. King County Code Chapters 4.19, 12.16, 12.17 and 12.18 are incorporated by reference as if fully set forth herein and such requirements apply to this Contract. The Contractor shall further comply fully with any affirmative action requirements set forth in any federal regulations, statutes or rules included or referenced in the contract documents.

Record-keeping Requirements and Site Visits. The County may, at any time, visit the Project Site, Contractors' and subcontractors' offices to review records related to the solicitation,

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utilization, and payment to subcontractors and suppliers in compliance with Executive Order 11246. This provision includes compliance with any other requirements of this Section. The Contractor shall provide all reasonable assistance requested by King County during such visits. The Contractor shall maintain, for at least 12 months after completion of all work under this Contract, the following:

1. Records, including written quotes, bids, estimates or proposals submitted to the Contractor by all businesses seeking to participate on this Contract, and any other information necessary to document the actual use of and payment to subcontractors and suppliers in this Contract, including employment records.
2. The Contractor shall make the foregoing records available to King County for inspection and copying upon request. If this Contract involves federal funds, the Contractor shall comply with all record keeping requirements set forth in any federal rules; regulations or statutes included or referenced in the Contract documents.

Assistance with the requirements of this Section and copies of Chapters 4.19, 12.16 and 12.18 is available by contacting King County Business Development and Contract Compliance (BDCC) Section at the address below. Please include the contract number in all correspondence.
King County Business Relations and Economic Development
Business Development and Contract Compliance Section
Mail Stop: YES-EX-0510
400 Yesler Way, Suite 510
Seattle, WA 98104
Phone: 206-205-0700, TTY Relay 711
Fax: 206-205-0719

Sanctions for Violations. Any violation of the requirements of the provisions of this Section shall be a material breach of contract, which may result in termination of this Contract or such other remedy as the County deems appropriate, including but not limited to damages or withholding payment.

Add the following new Section:

(*****)

1-07.11(1)C COMPLIANCE WITH SECTION 504 OF THE REHABILITATION ACT OF 1973, AS AMENDED AND THE AMERICAN WITH DISABILITIES ACT OF 1990

The Contractor shall complete and require subcontractors to complete a Disability Self-Evaluation Questionnaire for all programs and services offered by the Contractor (including any services not subject to this Contract) and shall evaluate its services, programs and employment practices for compliance with Section 504 of the Rehabilitation Act of 1973, as amended ("504"), and the Americans with Disabilities Act of 1990 ("ADA").

1-07.11(2)C FEDERAL REQUIREMENT FOR AFFIRMATIVE ACTION (NEW SECTION)

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(March 6, 2000 WSDOT GSP)

Requirement For Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

1. The Contractor's attention is called to the Equal Opportunity Clause and the Standard Federal Equal Employment Opportunity Construction Contract Specifications set forth herein.
2. The goals and timetables for minority and female participation set by the Office of Federal Contract Compliance Programs, expressed in percentage terms for the Contractor's aggregate work force in each construction craft and in each trade on all construction work in the covered area, are as follows:

<u>Women – Statewide</u>

<u>Timetable</u>

<u>Goal</u>

Until further notice

6.9%

<u>Minorities - by Standard Metropolitan Statistical Area (SMSA)</u>

Spokane, WA:

SMSA Counties:

Spokane, WA

2.8

WA Spokane.

Non-SMSA Counties

3.0

WA Adams; WA Asotin; WA Columbia; WA Ferry; WA Garfield; WA Lincoln, WA Pend Oreille; WA Stevens; WA Whitman.

Richland, WA

SMSA Counties:

Richland Kennewick, WA

5.4

WA Benton; WA Franklin.

Non-SMSA Counties

3.6

WA Walla Walla.

Yakima, WA:

SMSA Counties:

Yakima, WA

9.7

WA Yakima.

Non-SMSA Counties

7.2

WA Chelan; WA Douglas; WA Grant; WA Kittitas; WA Okanogan.

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Seattle, WA:
SMSA Counties:
Seattle Everett, WA
7.2
WA King; WA Snohomish.
Tacoma, WA
6.2
WA Pierce.
Non-SMSA Counties
6.1
WA Clallam; WA Grays Harbor; WA Island; WA Jefferson; WA Kitsap; WA Lewis; WA Mason; WA Pacific; WA San Juan; WA Skagit; WA Thurston; WA Whatcom.

Portland, OR:
SMSA Counties:
Portland, OR-WA
4.5
WA Clark.
Non-SMSA Counties
3.8
WA Cowlitz; WA Klickitat; WA Skamania; WA Wahkiakum.

These goals are applicable to each nonexempt Contractor's total on-site construction workforce, regardless of whether or not part of that workforce is performing work on a Federal, or federally assisted project, contract, or subcontract until further notice. Compliance with these goals and time tables is enforced by the Office of Federal Contract compliance Programs.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, in each construction craft and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goal shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Engineer within 10 working days of award of any construction subcontract in excess of $10,000 or more that are Federally funded, at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the

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subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

4. As used in this Notice, and in the contract resulting from this solicitation, the Covered Area is as designated herein.

Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)

1. As used in these specifications:
    a. Covered Area means the geographical area described in the solicitation from which this contract resulted;
    b. Director means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
    c. Employer Identification Number means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U. S. Treasury Department Form 941;
    d. Minority includes:
        (1) Black, a person having origins in any of the Black Racial Groups of Africa.
        (2) Hispanic, a fluent Spanish speaking, Spanish surnamed person of Mexican, Puerto Rican, Cuban, Central American, South American, or other Spanish origin.
        (3) Asian or Pacific Islander, a person having origins in any of the original peoples of the Pacific rim or the Pacific Islands, the Hawaiian Islands and Samoa.
        (4) American Indian or Alaskan Native, a person having origins in any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.
2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be

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able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith effort to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of this Special Provision. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its action. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

    a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with

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specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunity and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the U.S. Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc.,

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prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

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p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of the obligations under 7a through 7p of this Special Provision provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensure that the concrete benefits of the program are reflected in the Contractor's minority and female work-force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrate the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspensions, terminations and cancellations of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of this Special Provision, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the

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Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the government and to keep records. Records shall at least include, for each employee, their name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, the Contractors will not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

1-07.11(7) DISADVANTAGED BUSINESS ENTERPRISE CONDITION OF AWARD PARTICIPATION (NEW SECTION)

(December 3, 2007 WSDOT GSP)

The Disadvantaged Business Enterprise (DBE) requirements of 49 CFR Part 26 apply to this contract. This goal is considered a condition of award.

DBE Goals: The Contracting Agency has established a goal in the amount of:

_____ percent (__%) of the contract total for DBE goals.

DBE Eligibility: DBEs proposed by the bidder shall be listed as DBEs on the current list of firms certified by the Office of Minority and Women's Business Enterprises (OMWBE.). In absence of being listed, the Contractor may provide written proof from OMWBE documenting that their proposed DBEs are currently certified. A list of firms certified by OMWBE is available from that office and on line through their website (www.omwb.wa.gov/directory/directory.htm) or by telephone at (360) 704-1181. It shall be the responsibility of the bidder to confirm with OMWBE that the certification of any proposed DBE firm is current and that the firm is certified in the North American Industry Classification System (NAICS) code for the work being proposed. In establishing the certification status of any subcontractor or supplier, the bidder may rely upon the website list or upon any written commitments from OMWBE provided that information is obtained no earlier than 24 hours prior to the time set for bid submittals.

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Proposed firms not meeting the specified requirements at the time fixed for the opening of bids will not be credited by the Contracting Agency for the purpose of meeting the goals. The amounts committed to a non-certified firm will not be counted in the evaluation of the bidder's DBE submittal.

In the event that a DBE firm listed is certified at the time of the submission of the bid, but the listed DBE firm is subsequently determined to be ineligible prior to execution of the contract, then the contract execution will proceed and the Contractor will be required to substitute a certified DBE firm for the same amount or to make a good faith effort to do so.

Counting DBE Participation Toward Meeting the Goal and Substitution Requirements: When a DBE participates in a contract, only the value of the work actually performed by the DBE will be counted towards the DBE goal.

1. Count the entire amount of the portion of the contract that is performed by the DBE's own forces. Include the cost of supplies and materials obtained by the DBE for the work of the contract, including supplies purchased or equipment leased by the DBE (except supplies and equipment the DBE Subcontractor purchases or leases from the Prime Contractor or its affiliates, unless the Prime Contractor is also a DBE). Work performed by a DBE, utilizing resources of the Prime Contractor or its affiliates will not be counted toward DBE goals. In very rare situations, a DBE firm may utilize equipment and/or personnel from a non-DBE firm other than the Prime Contractor or its affiliates. Should this situation arise, the arrangement must be short-term and must have prior written approval from the Contracting Agency. The arrangement must not erode a DBE firm's ability to perform a Commercially Useful Function (See discussion of CUF, below).

2. Count the entire amount of fees or commissions charged by a DBE firm for providing a bona fide service, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance.

3. When a DBE subcontracts part of the work of its contract to another firm, the value of the subcontracted work may be counted toward the DBE goal only if the DBE's lower tier Subcontractor is also a DBE. Work that a DBE subcontracts to a non-DBE firm does not count toward the DBE goal. The DBE firm may further subcontract to lower tier subcontractors to the extent specified by Section 1-08.1.

4. When a non-DBE subcontractor further subcontracts to a lower-tier subcontractor or supplier who is a certified DBE, then that portion of the work further subcontracted may be counted toward the DBE goal, so long as it is a distinct clearly defined portion of the work of the subcontract that the DBE is performing in a commercially useful function with its own forces.

5. Continue to count the work subcontracted to a decertified DBE firm after decertification, provided the Prime Contractor had a subcontract in force before the decertification and the Prime Contractor's actions did not influence the DBE's decertification.

DBE Prime Contractor: A DBE prime Contractor may only count the work performed with its own forces and the work performed by DBE Subcontractors and DBE suppliers. In the

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event that the DBE Prime Contractor becomes decertified during the contract, for reasons other than graduation from the program, the portion of the work performed after the decertification will not count toward the goal. If this work is part of the Condition of Award (COA), the Prime Contractor will be required to meet the Condition of Award and may do so by increasing the dollars and work to another DBE firm in an amount equal to that which cannot be counted, utilize the dollars committed/paid to a non-COA DBE who is already on the project, or make a good faith effort to do so. If the reason for decertification is for graduation, the work of the decertified DBE Prime Contractor may continue to be counted toward the goal..

Joint Venture: When a DBE performs as a participant in a joint venture, only that portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work that the DBE performs with its own forces will count toward the COA DBE goal. In the event that the DBE Joint Venture contractor becomes decertified during the contract, for reasons other than graduation from the program, the portion of the work performed after the decertification will not count toward the DBE goal. If this work is part of the Condition of Award, the Joint Venture will be required to meet the Condition of Award and may do so by increasing the dollars and work to another DBE firm in an amount equal to that which cannot be counted, utilize the dollars committed/paid to a non-COA DBE who is already on the project, or make a good faith effort to do so. If the reason for decertification is for graduation, the work of the decertified DBE Joint Venture contractor may continue to be counted toward the goal.

Changes in the Quantity of Work:

Owner-Initiated Change Orders:

In the event the Contracting Agency reduces quantities or deletes work items that impact a DBE's work and insufficient work remains on the contract, the Contracting Agency may relieve the Prime Contractor from attainment of that portion of the goal.

Original Quantity Underruns:

In the event that work committed to a DBE firm as part of the COA underruns the original planned quantities and that work is completed according to the contract, the Contractor shall not be required to substitute work for the portion of the COA not achieved.

Contractor-Initiated Proposals – General:

1. Reductions or Deletions

Any reduction or deletion of Condition of Award DBE work that is proposed by the Contractor under this provision shall not be permitted without the express prior written consent of the Contracting Agency, including concurrence by WSDOT/OEO, which shall have the discretion to deny approval.

The Contractor must notify and obtain written approval from the Contracting Agency prior to replacing a DBE of making any change in the participation. Approval for replacement will be granted only if it is demonstrated that the DBE is unable or unwilling to perform. The Contractor must make every good faith effort to find another certified DBE subcontractor to substitute for the original DBE. The

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good faith efforts shall be directed at finding another DBE to perform at least the same amount of work under the contract as the original DBE, to the extent needed to meet the contract goal.

Any deviation from the DBE condition-of-award letter or contract specifications must be approved by Change Order issued by the Contracting Agency. The Contractor shall notify affected DBEs in writing of any changes in the scope of work which result in a reduction in the dollar amount of condition-of-award to the contract.

In addition to the above requirements for reductions in the Condition of Award, additional requirements apply to the two cases of Contractor-Initiated work substitution proposals. Where the contract allows alternate work methods which serve to delete or create underruns in condition-of-award DBE work, and the Contractor selects that alternate method or, where the Contractor proposes a substitute work method or material that serves to diminish or delete work committed to a DBE and replace it with other work, then the Contractor must demonstrate one of the following:

a. That the replacement work will be performed by the same DBE (as long as the DBE is certified in the respective item or work) in a modification or the Condition of Award agreement; or

b. That the DBE is aware that its work will be deleted or will experience underruns and has agreed in writing to the change. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so; or

c. That the DBE is not capable of performing the replacement work or has declined to perform the work at a reasonably competitive price. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so.

2. Additions

As stated above, any change in the Condition of Award will be evidenced by a Change Order. Where the revision includes work committed to a new DBE subcontractor, not previously involved in the project, then a Request to Sublet shall be submitted in accordance with Section 1-08.1.

If the commitment of work is in the form of additional tasks assigned to an existing subcontractor, then a new Request to Sublet shall not be required. However, the Contractor must document efforts to assure that the existing DBE subcontractor is capable of performing the additional work and has agreed (in writing) to the change.

Commercially Useful Function: Payments to a DBE firm will count toward DBE goals only if the DBE is performing a commercially useful function on the contract.

1. A DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the DBE must also be responsible, with respect to

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materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material, installing (if applicable) and paying for the material itself. Two party checks are not allowed.

2. A DBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation.

Trucking: Use the following factors in determining whether a DBE trucking company is performing a commercially useful function:

1. The DBE must be responsible for the management and supervision of the entire trucking operation for which it is listed on a particular contract.

2. The DBE must itself own and, with its own workforce, operate at least one fully licensed, insured, and operational truck used on the contract.

3. The DBE receives credit only for the total value of the transportation services it provides on the contract using trucks it owns or leases, licenses, insures, and operates with drivers it employs.

4. For purposes of this paragraph a lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

5. The DBE may lease trucks from another DBE firm and may enter an agreement with an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE or employs a DBE owner-operator receives credit for the total value of the transportation services the lessee DBE provides on the contract.

6. The DBE may also lease trucks from a non-DBE firm and may enter an agreement with an owner-operator who is a non-DBE. The DBE who leases trucks from a non-DBE or employs a non-DBE owner-operator is entitled to credit only for the fee or commission it receives as a result of the lease arrangement. The DBE does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE.

7. In any lease or owner-operator situation, as described in paragraphs 5 & 6 above, the following rules shall apply:

   - A written lease/rental agreement on all trucks leased or rented, showing the true ownership and the terms of the rental must be submitted and approved by the Contracting Agency prior to the beginning of the work. The agreement must show the leasor's name, trucks to be leased, and the agreed upon method of payment (hour, ton, or per load). All lease agreements shall be for a long-term relationship, rather than for the individual project. Does not apply to owner-operator arrangements.

   - Only the vehicle (not the operator) is leased or rented. Does not apply to owner-operator arrangements.

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8. In order for DBE project goals to be credited, DBE trucking firms must be covered by a subcontract or a written agreement approved by the Contracting Agency prior to performing their portion of the work

Expenditures Paid to Other DBEs: Expenditures paid to other DBEs for materials or supplies may be counted toward DBE goals as provided in the following:

Manufacturer:

1. Counting

   If the materials or supplies are obtained from a DBE manufacturer, count 100 percent of the cost of the materials or supplies toward DBE goals.

2. Definition

   To be a manufacturer, the firm operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.

3. In order to receive credit as a DBE manufacturer, the firm must have received an "on-site" review and been approved by WSDOT/OEO to operate as a DBE Manufacturing firm prior to bid opening on any USDOT federally-assisted contract. Use of a DBE manufacturer that has not received an on-site review and approval by WSDOT/OEO prior to bid opening will result in the bid being declared non-responsive. To schedule a review, the manufacturing firm must submit a written request to WSDOT/OEO and may not receive credit towards DBE participation until the completion of the review. Once a firm's manufacturing process has been approved in writing, it is not necessary to resubmit the firm for approval unless the manufacturing process has substantially changed. Information on approved manufacturers (per contract) may be obtained from WSDOT/OEO.

Regular Dealer:

1. Counting

   If the materials or supplies are purchased from a DBE regular dealer, 60 percent of the cost of the materials or supplies will count toward DBE goals.

2. Definition

   a. To be a regular dealer, the firm must own, operate or maintain a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. It must also be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question.

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b. A person may be a regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business, as provided elsewhere in this specification, if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis.

c. Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not regular dealers.

3. Regular dealer status is granted on a contract-by-contract basis. To obtain regular dealer status, a formal written request must be made by the interested supplier (potential regular dealer) to WSDOT/OEO. WSDOT/OEO must be in receipt of this request at least seven (7) calendar days prior to bid opening. Included in the request shall be a full description of the project, type of business operated by the DBE, and the manner the DBE will operate as a regular dealer on the specific contract. Rules applicable to regular dealer status are contained in 49 CFR Part 26.55.e.2. Once the request is reviewed by WSDOT/OEO, the DBE supplier requesting it will be notified in writing whether regular dealer status was approved. DBE firms that are approved as regular dealers for a contract (whenever possible) will be listed on the WSDOT Internet Homepage at: www.wsdot.wa.gov/biz/contaa/ prior to the time of bid opening. In addition, bidders may request confirmation of the DBE supplier's approval to operate as a regular dealer on a specific contract by writing the Office of Equal Opportunity, Washington State Department of Transportation, P.O. Box 47314, Olympia, WA 98504-7314 or by phone at (360) 705-7085. Use of a supplier that has not received approval as a regular dealer prior to bid opening will result in the bid being declared nonresponsive. (unless the contribution of the regular dealer was not necessary to meet the project goal).

Materials or Supplies Purchased from a DBE: With respect to materials or supplies purchased from a DBE who is neither a manufacturer nor a regular dealer, the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site may be counted toward the goal. No part of the cost of the materials and supplies themselves may be applied toward DBE goals.

DBE Utilization Certification: To be eligible for award of the contract, the bidder must properly complete and submit a DBE Utilization Certification which has been made a part of the bidder's formal bid proposal. The Certification will be used by the Contracting Agency in determining whether the bidder's proposal satisfies the DBE contract requirements.

For each DBE described in the Certification, the bidder shall state the project role and work item in which the DBE will participate. A general description of the work to be performed by the DBE shall be included. If a DBE will perform a partial item of work, the bidder shall also include a dollar amount for each partial item of work. The bidder shall also include a dollar amount for each DBE listed in the Certification that will be applied toward the assigned DBE contract goal.

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In the event of arithmetic errors in completing the Certification, the amount listed to be applied towards the goal for each DBE shall govern and the DBE total shall be adjusted accordingly. The information and commitments demonstrated in the Certification shall become a condition of any subsequent award of a contract to that bidder and the Certification itself shall become a part of the subsequent contract.

The Contracting Agency shall consider as non-responsive and shall reject any bid proposal submitted that does not contain a DBE Certification or contains a DBE Certification that fails to demonstrate that the bidder will meet the DBE participation requirements in one of the manners permitted by the contract as described below.

Selection of Successful Bidder/Good Faith Efforts: The successful bidder shall be selected on the basis of having submitted the lowest responsive bid, which demonstrates good faith effort to achieve the goal. Good faith efforts must be provided with the bid proposal. The first step in demonstrating good faith efforts is to document, through the DBE Utilization Certification, that the bidder has obtained enough DBE participation to meet or exceed the assigned DBE goal. If the bidder is unable to meet the goal as demonstrate above, the bidder shall supply documentation in addition to the DBE Utilization Certification of their good faith efforts to meet the DBE assigned contract goal. The additional documentation, if required, must be provided with the bid proposal.

Based upon all of the relevant documentation submitted with the bid, the Contracting Agency shall determine whether the bidder has made a sufficient good faith effort to seek DBE participation. The Contracting Agency will make a fair and reasonable judgment whether a bidder that did not meet the goal made adequate good faith efforts. The quality, quantity, and intensity of the different kinds of efforts that the bidder has made will be considered. A determination will be made whether the efforts employed by the bidder were those one could reasonably expect a bidder to take of the bidder were actively and aggressively trying to obtain DBE participation sufficient to meet the DBE contract goal. Mere pro forma efforts will not be considered to be good faith efforts to meet the DBE contract requirements.

The following is a list of types of actions, which will be considered as part of the bidder's good faith efforts to obtain DBE participation. It is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases:

1. Attendance by the bidder at any pre-solicitation or pre-bid meetings that were scheduled by the Contracting Agency to inform DBEs of contracting and subcontracting or material supply opportunities available on the project;

2. Contacting local Tribes, Tribal Employment Rights Offices (TERO) concerning the subcontracting or supply opportunities in sufficient time to allow the enterprises to participate effectively;

3. Selection by the bidder of specific economically feasible units of the project to be performed by DBEs in order to increase the likelihood of participation by DBEs even if the bidder preferred to perform these work items as the prime contractor;

4. Advertising by the bidder in general circulation, trade association minority and trade oriented, women focused publications, concerning the subcontracting or supply opportunities;

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5. Providing written notice from the bidder to a reasonable number of specific DBEs, identified from the OMWBE Directory of Certified Firms for the selected subcontracting of material supply work, in sufficient time to allow the enterprises to participate effectively;

6. Follow-up by the bidder of initial solicitations of interest by contacting the DBEs to determine with certainty whether they were interested. Documentation of this kind of action may include the information outlined below:

    a. The names, addresses, telephone numbers of DBEs who were contacted, the dates of initial contact, and whether initial solicitations of interest were followed-up by contacting the DBEs to determine with certainty whether the DBEs were interested;

    b. A description of the information provided to the DBEs regarding the plans, specifications, and estimated quantities for portions of the work to be performed;

    c. Documentation of each DBE contacted but rejected and the reason(s) for that rejection;

7. Providing, to interested DBEs, adequate information about the plans, specifications, and requirements for the selected subcontracting or material supply work;

8. Negotiating in good faith with the DBE firms, and not, without justifiable reason, rejecting as unsatisfactory, bids that are prepared by any DBE;

9. Advertising and making efforts to obtain DBE participation that were reasonably expected to produce a level of participation sufficient to meet the goal or requirements of the Contracting Agency;

10. Making any other efforts to obtain DBE participation that were reasonably expected to produce a level of participation sufficient to meet the goal or requirements of the Contracting Agency;

11. Using the services of minority community organizations, minority contractor groups, local, state, and federal minority business assistance offices and other organizations identified by WSDOT and advocates for disadvantaged, minority, and women businesses that provide assistance in the recruitment and placement of disadvantaged, minority, and women business enterprises; and

12. Using DBE Supportive Services by contacting the Office of Minority and Women's Business Enterprises DBE Supportive Services Offices:

Seattle:	(206) 553-7356
Tacoma:	(253) 680-7393

If, after review of the documentation provided in the bidder's proposal, the Contracting Agency determines that a good faith effort was made to secure DBE participation, the assigned DBE goal will not be reduced to the bidder's partial commitment. However, the bidder will be formally advised in the award letter that the partial commitment will satisfy the

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terms of the contract and there will be no adverse effect on the Contractor as a result of the reduced attainment.

Should the low and otherwise responsive bidder fail to meet the DBE participation requirements in one of the manners provided in the proposed contract, its bid proposal will be rejected as non-responsive and the next lowest responsive bid accepted unless the Contracting Agency chooses to reject all bids.

Administrative Reconsideration:

1. A bidder has the right to reconsideration in the event its bid been found to be non-responsive due to a failure to meet the requirements of this specification. The bidder must request reconsideration within five working days of notification of being non-responsive or forfeit the right to reconsideration.

2. The Contracting Agency's decision on reconsideration shall be made by an official who did not take part in the original determination that the bidder failed to meet the goal or make adequate good faith efforts to do so.

3. The bidder shall have the opportunity to meet in person with the official for the purpose of setting forth the bidder's position as to why its bid proposal met the DBE contract requirements. The bidder's support for its position must be based on its bid submittal. The bidder may provide further explanation/clarification of the information and materials in the submittal, but no new materials of information will be considered by the official in reaching a decision on reconsideration.

4. The official shall send the bidder a written decision on reconsideration, explaining the basis for the finding as to whether the bidder's bid submittal met the DBE contract requirements.

The Contracting Agency has been advised that the United Stated Department of Transportation will not accept appeals concerning results of the reconsideration process.

Procedures Between Award and Execution: After award of the contract, the successful bidder shall provide the additional information described below. A failure to comply shall result in the forfeiture of the bidder's proposal bond or deposit.

The Contracting Agency will notify the successful bidder of the award of the contract in writing and will include a request for a further breakdown of the DBE information. After award and prior to execution of the contract, the bidder shall submit the following items:

1. Additional information for all successful DBEs as shown on the DBE Utilization Certification.

    - Correct business name, federal employee identification number (if available), and mailing address.
    - List of all bid items assigned to each successful DBE firm, including unit prices and extensions.
    - Description of partial items (if any) to be sublet to each successful DBE firm specifying the distinct elements of work under each item to be performed by the DBE and including the dollar value of the DBE portion.

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Total amounts shown for each DBE shall not be less than the amount shown on the Utilization Certification. This submittal, showing the DBE work item breakdown, when accepted by the Contracting Agency and resulting in contract execution, shall become a part of the contract. A breakdown that does not conform to the DBE Utilization Certification or that demonstrates a lesser amount of DBE participation than that included in the Certification will be returned for correction. The contract will not be executed by the Contracting Agency until a satisfactory breakdown has been submitted. A breakdown that conforms to the DBE Utilization Certification but demonstrates a greater total amount of participation than that included in the Certification will be accepted and the Condition of Award will be adjusted accordingly

2. A list of all firms who submitted a bid or quote in an attempt to participate in this project whether they were successful or not. Include the correct business name, federal employer identification number (optional), and a mailing address.

   The firms identified by the Contractor may be contacted to solicit general information as follows:

   1. age of the firm
   2. average of its gross annual receipts over the past three years

Procedures After Execution

Reporting: The Contractor shall submit a "Quarterly Report of Amounts Credited as DBE Participation" (actual payments) on a quarterly basis for any calendar quarter in which DBE work is accomplished or upon completion of the project, as appropriate. The quarterly reports are due on January 20th, April 20th, July 20th, and October 20th of each year. The dollars reported will be in accordance with the "**Counting DBE Participation"** section of this specification.

In the event that the payments to a DBE have been made by an entity other than the Prime Contractor (as in the case of a lower-tier subcontractor or supplier), then the Prime Contractor shall obtain the quarterly report, including the signed affidavit, from the paying entity and submit the report to the Contracting Agency.

Damages for Noncompliance: When a Contractor violates the DBE provisions of the contract, the Contracting Agency may incur damages. These damages consist of additional administrative costs including, but not limited to, the inspection, supervision, engineering, compliance, and legal staff time and expenses necessary for investigating, reporting, and correcting violations as well as loss of federal funding. Damages attributable to a Contractor's violations of the DBE provisions may be deducted from progress payments due to the Contractor or from retainage withheld by the Contracting Agency as allowed by RCW 60.28.021. Before any money is withheld, the Contractor will be provided with a notice of the basis of the violations and an opportunity to respond.

The Contracting Agency's decision to recover damages for a DBE violation does not limit its ability to suspend or revoke the Contractor's pre-qualification status or seek other remedies as allowed by federal or state law. In appropriate circumstances, the Contracting Agency may also refer the Contractor to state or federal authorities for additional sanctions.

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Required Disadvantaged Business Enterprise Provisions: The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of contracts, which contain funding assistance from the United States Department of Transportation. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Contracting Agency deems appropriate.

If the Contractor does not comply with any part of its contract as required under 49 CFR Part 26, and/or any other applicable law or regulation regarding DBE, the Contracting Agency may withhold payment, suspend, or terminate the contract, and subject the Contractor to civil penalties of up to ten percent of the amount of the contract for each violation. In the case of WSDOT contracts, repeated violations, exceeding a single violation, may disqualify the Contractor from further participation in WSDOT contracts for a period of up to three years. An apparent low bidder must be in compliance with these contract provisions as a condition precedent to the granting of a notice of award by the Contracting Agency. The Contractor is entitled to request an adjudicative proceeding with respect to the Contracting Agency's determination of contract violation and assessed penalties by filing a written application within thirty days of receipt of notification. The adjudicative proceeding, if requested, will be conducted by an administrative law judge pursuant to the procedures set forth in RCW 34.05 and Chapter 10.08 of the Washington Administrative Code.

Payment: Compensation for all costs involved with complying with the conditions of this specification and any associated DBE requirements is included in payment for the associated contract items of work.

1-07.11(8) SPECIAL TRAINING PROVISIONS (NEW SECTION)

(September 17, 2007 WSDOT GSP)

General Requirements

The Contractor's equal employment opportunity, affirmative action program shall include the requirements set forth below. The Contractor shall provide on-the-job training aimed at developing trainees to journeyman status in the trades involved. The number of training hours shall be _____. The training program shall assign a minimum of 200 hours per trainee. The Contractor may elect to accomplish training as part of the work of a subcontractor, however, the Prime Contractor shall retain the responsibility for complying with these Special Provisions. The Contractor shall also ensure that this training provision is made applicable to any subcontract that includes training.

Trainee Approval

The Federal government requires Contracting Agencies to include these training provisions as a condition attached to the receipt of Federal highway funding. The Federal government has determined that the training and promotion of members of certain minority groups and women is a primary objective of this training provision. The Contractor shall make every effort to enroll minority groups and women trainees to the extent such persons are available within a reasonable recruitment area. This training provision is not intended and shall not be used to discriminate against any applicant for training, whether that person is a minority,

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woman or otherwise. A non-minority male trainee or apprentice may be approved provided the following requirements are met:

1. the Contractor is otherwise in compliance with the contract's Equal Employment Opportunity and On-the-Job Training requirements and provides documentation of the efforts taken to fill the specific training position with either minorities or females

2. or, if not otherwise in compliance, furnishes evidence of his/her systematic and direct recruitment efforts in regard to the position in question and in promoting the enrollment and/or employment of minorities and females in the craft which the proposed trainee is to be trained

3. and the Contractor has made a good faith effort towards recruiting of minorities and women. As a minimum this good faith effort shall consist of the following:

    - Distribution of written notices of available employment opportunities with the Contractor and enrollment opportunities with its unions. Distribution should include but not be limited to; minority and female recruitment sources and minority and female community organizations;

    - Records documenting the Contractor's efforts and the outcome of those efforts, to employ minority and female applicants and/or refer them to unions;

    - Records reflecting the Contractor's efforts in participating in developing minority and female on-the-job training opportunities, including upgrading programs and apprenticeship opportunities;

    - Distribution of written notices to unions and training programs disseminating the Contractor's EEO policy and requesting cooperation in achieving EEO and OJT obligations.

No employee shall be employed as a trainee in any classification in which the employee has successfully completed a training course leading to journeyman status or in which the employee has been employed as a journeyman. The Contractor's records shall document the methods for determining the trainee's status and findings in each case. When feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

For the purpose of this specification, acceptable training programs are those employing trainees/apprentices registered with the following:

1. Washington State Department of Labor & Industries — State Apprenticeship Training Council (SATC) approved apprenticeship agreement:

    a. Pursuant to RCW 49.04.060, an apprenticeship agreement shall be;

        i. an individual written agreement between an employer and apprentice

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ii. a written agreement between (an employer or an association of employers) and an organization of employees describing conditions of employment for apprentices

iii. a written statement describing conditions of employment for apprentices in a plant where there is no bona fide employee organization.

All such agreements shall conform to the basic standards and other provisions of RCW Chapter 49.

2. Apprentices must be registered with U.S. Department of Labor — Bureau of Apprenticeship Training (BAT) approved program.

Or

3. Trainees participating in a non-BAT/SATC program, which has been approved by the Contracting Agency for the specific project.

4. For assistance in locating trainee candidates, the Contractor may call WSDOT's OJT Support Services Technical Advisor at (360) 705-7088, (206) 587-4954 or toll free at 1-866-252-2680.

Obligation to Provide Information

Upon starting a new trainee, the Contractor shall furnish the trainee a copy of the approved program the Contractor will follow in providing the training. Upon completion of the training, the Contractor shall provide the Contracting Agency with a certification showing the type and length of training satisfactorily completed by each trainee.

Training Program Approval

The Training Program shall meet the following requirements:

1. The Training Program (DOT Form 272-049) must be submitted to the Engineer for approval prior to commencing contract work and shall be resubmitted when modifications to the program occur.

2. The minimum length and type of training for each classification will be as established in the training program as approved by the Contracting Agency.

3. The Training Program shall contain the trades proposed for training, the number of trainees, the hours assigned to the trade and the estimated beginning work date for each trainee.

4. Unless otherwise specified, Training Programs will be approved if the proposed number of training hours equals the training hours required by contract and the training program assigns a minimum of 200 hours per trainee.

5. After approval of the training program, information concerning each individual trainee and good faith effort documentation shall be submitted on (DOT Form 272-050.)

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6. In King County, laborer trainees or apprentices will not be approved on contracts containing less than 1000 training hours as specified in this Section. In King County, no more than twenty percent (20%) of hours proposed for trainees or apprentices shall be in the laborer classification when the contract contains 1000 or more hours of training as specified in this Section. The training program shall assign a minimum of 200 hours per trainee.

7. Flagging programs will not be approved. Other programs that include flagging training will only be approved if the flagging portion is limited to an orientation of not more than 20 hours.

8. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Some off-site training is permissible as long as the training is an integral part of an approved training program.

9. It is normally expected that a trainee will begin training on the project as soon as feasible after start of work, utilizing the skill involved and remain on the project as long as training opportunities exist in the work classification or upon completion of the training program. It is not required that all trainees be on board for the entire length of the contract. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

10. Wage Progressions: Trainees will be paid at least the applicable ratios or wage progressions shown in the apprenticeship standards published by the Washington State Department of Labor and Industries. In the event that no training program has been established by the Department of Labor and Industries, the trainee shall be paid in accordance with the provisions of RCW 39.12.021 which reads as follows:

> Apprentice workmen employed upon public works projects for whom an apprenticeship agreement has been registered and approved with the State Apprenticeship Council pursuant to RCW 49.04, must be paid at least the prevailing hourly rate for an apprentice of that trade. Any workman for whom an apprenticeship agreement has not been registered and approved by the State Apprenticeship Council shall be considered to be a fully qualified journeyman, and, therefore, shall be paid at the prevailing hourly rate for journeymen.

Compliance

In the event that the Contractor is unable to accomplish the required training hours but can demonstrate a good faith effort to meet the requirements as specified, then the Contracting Agency will adjust the training goals accordingly.

Requirements for Non BAT/SATC Approved Training Programs

NOT FOR CONSTRUCTION

Contractors who are not affiliated with a program approved by BAT or SATC may have their training program approved provided that the program is submitted for approval on DOT Form 272-049, and the following standards are addressed and incorporated in the Contractor's program:

- The program establishes minimum qualifications for persons entering the training program.

- The program shall outline the work processes in which the trainee will receive supervised work experience and training on-the-job and the allocation of the approximate time to be spent in each major process. The program shall include the method for recording and reporting the training completed shall be stated.

- The program shall include a numeric ratio of trainees to journeymen consistent with proper supervision, training, safety, and continuity of employment. The ratio language shall be specific and clear as to application in terms of job site and workforce during normal operations (normally considered to fall between 1:10 and 1:4).

- The terms of training shall be stated in hours. The number of hours required for completion to journeyman status shall be comparable to the apprenticeship hours established for that craft by the SATC. The following are examples of programs that are currently approved:

CRAFT	HOURS
Laborer	4,000
Ironworker	6,000
Carpenter	5,200-8,000
Construction Electrician	8,000
Operating Engineer	6,000-8,000
Cement Mason	5,400
Teamster	2,100

- The method to be used for recording and reporting the training completed shall be stated.

- A numeric ratio of trainees to journeymen shall be established. It shall be consistent with proper supervision, training, safety and continuity of employment. The ratio language shall be specific and clear as to application in terms of job site and workforce during normal operations.

Measurement

The Contractor may request that the total number of "training" hours for the contract be increased subject to approval by the Contracting Agency. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other sources do not prohibit other reimbursement. Reimbursement to the Contractor for off-site training as indicated previously may only be made when the

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Contractor does one or more of the following and the trainees are concurrently employed on a Federal-aid project:

- contributes to the cost of the training,
- provides the instruction to the trainee,
- pays the trainee's wages during the off- site training period.

Reimbursement will be made upon receipt of a certified invoice that shows the related payroll number, the name of trainee, total hours trained under the program, previously paid hours under the contract, hours due this estimate, and dollar amount due this estimate. The certified invoice shall show a statement indicating the Contractor's effort to enroll minorities and women when a new enrollment occurs. If a trainee is participating in a SATC/BAT approved apprenticeship program, a copy of the certificate showing apprenticeship registration must accompany the first invoice on which the individual appears. Reimbursement for training occurring prior to approval of the training program will be allowed if the Contractor verbally notifies the Engineer of this occurrence at the time the apprentice/trainee commences work. A trainee/apprentice, regardless of craft, must have worked on the contract for at least 20 hours to be eligible for reimbursement.

Payment

The Contractor will be reimbursed under the item "Training" per hour for each hour of training for each employee.

1-07.12 FEDERAL AGENCY INSPECTION

(March 13, 1995 WSDOT GSP)

The following is added at the end of this section:

Required Federal Aid Provisions

The Required Contract Provisions Federal Aid Construction Contracts (FHWA 1273) and the amendments thereto supersede any conflicting provisions of the Standard Specifications and are made a part of this contract; provided, however, that if any of the provisions of FHWA 1273, as amended, are less restrictive than Washington State Law, then the Washington State Law shall prevail.

The provisions of FHWA 1273, as amended, included in this contract require that the Contractor insert the FHWA 1273 and amendments thereto in each subcontract, together with the wage rates which are part of the FHWA 1273, as amended. Also, a clause shall be included in each subcontract requiring the subcontractors to insert the FHWA 1273 and amendments thereto in any lower tier subcontracts, together with the wage rates. The Contractor shall also ensure that this section, REQUIRED FEDERAL AID PROVISIONS, is inserted in each subcontract for subcontractors and lower tier subcontractors. For this purpose, upon request to the Project Engineer, the Contractor will be provided with extra copies of the FHWA 1273, the amendments thereto, the applicable wage rates, and this Special Provision.

1-07.13(1) GENERAL

NOT FOR CONSTRUCTION

Section is supplemented with the following:

(*****)
King County reserves the right to use and occupy any portion of this improvement which has been completed sufficiently to permit use and occupancy and such use shall not be construed as an acceptance of the work or any part thereof, and any claims which King County may have against the Contractor shall not be deemed to have been waived by such occupancy.

1-07.14 RESPONSIBILITY FOR DAMAGE

This Section is deleted and replaced with the following:

(*****)
The Contractor shall protect, defend, indemnify, and save harmless the County, its officers, officials, employees, and agents, from any and all claims, demands, suits, penalties, losses, damages, judgments, or costs of any kind whatsoever (hereinafter "claims"), arising out of or in any way resulting from the Contractor's officers, employees, agents, and/or subcontractors of all tiers, acts or omissions, performance or failure to perform this Contract, to the maximum extent permitted by law or as defined by RCW 4.24.115, now enacted or as hereinafter amended.
The Contractor's obligations under this section shall include, but not be limited to
The duty to promptly accept tender of defense and provide defense to the County at the Contractor's own expense
The duty to indemnify and defend the County from any claim, demand, and/or cause of action brought by or on behalf of any of its employees, or agents. The foregoing duty is specifically and expressly intended to constitute a waiver of the Contractor's immunity under Washington's Industrial Insurance Act, RCW Title 51, as respects the County with a full and complete indemnity and defense of claims made by the Contractor's employees. The parties acknowledge that these provisions were mutually negotiated and agreed upon by them.
To the maximum extent permitted by law, the Contractor shall indemnify and defend the County from and be liable for all damages and injury which shall be caused to owners of property on or in the vicinity of the work or which shall occur to any person or persons or property whatsoever arising out of the performance of this Contract, whether or not such injury or damage is caused by negligence of the Contractor or caused by the inherent nature of the work specified.
King County may, in its sole discretion, (1) withhold amounts sufficient to pay the amount of any claim for injury, and/or (2) pay any claim for injury of which King County may have knowledge, regardless of the formalities of notice of such claim, arising out of the performance of this Contract.
An amount withheld will be held until the Contractor secures a written release from the claimant, obtains a court decision that such claim is without merit, or satisfies any judgment on such claim. In addition, the Contractor shall reimburse and otherwise be liable for claims costs incurred by King County, including, without limitation, costs for claims adjusting services, attorneys, engineering, and administration.
In the event the County incurs any judgment, award, and/or costs arising, including attorneys' fees, from enforcing the provisions of this provision, all such fees, expenses, and costs shall be recoverable from the Contractor.

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1-07.15(1) SPILL PREVENTION, CONTROL AND COUNTERMEASURES PLAN

Section is supplemented with the following:

(August 3, 2009)
The Contractor shall address the following items in the SPCC Plan in addition to the requirements of Section 1-07.15(1):

Mixing, Transfers, & Storage

1. All oil, fuel or chemical storage tanks or containers shall be diked and located on impervious surfaces so as to prevent spill from escaping.
2. All liquid products shall be stored and mixed on impervious surfaces in a secure water tight environment and provide containment to handle the maximum volume of liquid products on site at any given time.
3. Proper security shall be maintained to prevent vandalism.
4. Drip pans or other protective devices shall be required for all transfer operations.

Spills

Paint and solvent spills shall be treated as oil spills and shall be prevented from reaching storm drains or other discharges. No cleaning solvents or chemicals used for tool or equipment cleaning may be discharged to the ground or water.

Maintenance of Equipment

Fuel hoses, oil drums, oil or fuel transfer valves and fittings, etc, shall be checked regularly for drips or leaks and shall be maintained and stored properly to prevent spills into State waters.

Disposal

Spilled waste, chemicals or petroleum products shall be transported off site for disposal at a facility approved by the Department of Ecology. The materials shall not be discharged to any sanitary sewer without approval of the local sewer authority.

Reporting and Cleanup

The Contractor's designated person for managing and implementing the SPCC Plan shall report hazardous material spills as follows:

Spills into State water (including ponds, ditches, seasonally dry streams, and wetlands) – Immediately call all of the following:

National Response Center	1-800-424-8802
WA State Div. of Emergency Management (24 hr)	1-800-258-5990
Ecology *** Northwest *** Regional Office	*** 1-425-649-7000 ***

Spill to Soil (Including encounters of pre-existing contamination):

Ecology *** Northwest *** Regional Office *** 1-425-649-7000 ***
Report immediately if threatening to health or environment (i.e., explosive, flammable, toxic vapors, shallow groundwater, nearby creek), otherwise within 90 days

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Underground Storage Tank (confirmed release of material)
Ecology *** Northwest *** Regional Office *** 1-425-649-7000 ***
Report within 24 hours

1-07.16(1) PRIVATE/PUBLIC PROPERTY

Section is supplemented with the following:

(*****)
Existing survey monuments and utility covers shall be protected during the paving operation. Following the paving operation, the Contractor shall make a small depression in the asphalt mat over the cover and paint the area with silver spray paint. All costs and expense incurred for this operation shall be incidental to the various items of the project and no further compensation will be made.

1-07.16(4) ARCHAEOLOGICAL AND HISTORICAL OBJECTS

Section is supplemented with the following:

(December 6, 2004)
The project area potentially contains archaeological or historical objects that may have significance from a historical or scientific standpoint. To protect these objects from damage or destruction, the Contracting Agency, at its discretion and expense, may monitor the Contractor's operations, conduct various site testing and perform recovery and removal of such objects when necessary.
The Contractor may be required to conduct its operations in a manner that will accommodate such activities, including the reserving of portions of the work area for site testing, exploratory operations and recovery and removal of such objects as directed by the Engineer. If such activities are performed by consultants retained by the Contracting Agency, the Contractor shall provide them adequate access to the project site.
Added work necessary to uncover, fence, dewater, or otherwise protect or assist in such testing, exploratory operations and salvaging of the objects as ordered by the Engineer shall be paid by force account as provided in Section 1-09.6. If the discovery and salvaging activities require the Engineer to suspend the Contractor's work, any adjustment in time will be determined by the Engineer pursuant to Section 1-08.8.
To provide a common basis for all bidders, the Contracting Agency has entered an amount for the item "Archaeological and Historical Salvage" in the Proposal to become a part of the total bid by the Contractor.

1-07.16(5) ABANDON MONITORING WELL

Section 1-07.16 is supplemented with the following:

Abandon of Monitoring Well

The Contractor shall abandon monitoring well at the locations as shown in the Plans and in accordance with the Washington State Department of Ecology regulations WAC 173-160-450 and 460. This work shall be completed after clearing, grubbing and grading activities are complete for the wetland mitigation site.

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Payment

Section 1-07.16(5) is revised to read:

All costs to comply with this section and for the protection and repair specified in this section are incidental to the contract and are the responsibility of the Contractor. The Contractor shall include all related costs, except for the items listed below, in the unit bid prices of the contract.

No specific unit of measure will apply to the abandonment of monitoring wells. Payment will be made in accordance with Section 1-04.1 for:

"Abandon Monitoring Well", lump sum.

The lump sum contract price for "Abandon Monitoring Well" shall be full pay for performing the work as specified including meeting the requirements of WAC 173-160-450 and 460, and removing and disposing of all casings and casing pipe from the project limits.

1-07.17 UTILITIES AND SIMILAR FACILITIES

Section is supplemented with the following:

(April 2, 2007)

Locations and dimensions shown in the Plans for existing facilities are in accordance with available information obtained without uncovering, measuring or other verification. The Contractor shall attend a mandatory utility preconstruction meeting with the Engineer, all affected subcontractors, and all utility owners and their contractors prior to beginning onsite work.

The following addresses and telephone numbers of utility companies known or suspected of having facilities within the project limits are supplied for the Contractor's convenience:

Seattle City Light
Seattle Municipal Tower
700 Fifth Avenue, Suite 3200
Seattle, Wa 98124
Attn: _Richard Kent
tel: 206-684-3076
e-mail: Richard.Kent@seattle.gov

Seattle Public Utility
Seattle Municipal Tower
700 Fifth Avenue, Suite 4900
Seattle, WA 98124
Attn: Charles Madden
tel: (206) 684-5977
e-mail: Charlie.Madden@seattle.gov

Comcast
4020 Auburn Way N
Auburn, Wa 98002
Attn: Jim Nies
tel: 206-510-1337
e-mail:

Puget Sound Energy
PO Box 90868
Bellevue, Wa 98009
Attn: Kathy Johnson
tel: 425-462-3381
e-mail:

Qwest
23315 – 66th Ave S
Kent, Wa 98032
Attn: H A Sumner

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tel: 206-345-4475
e-mail:

Section 1-07.18 is deleted and replaced with the following:

(*****)

1-07.18 PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE

Prior to the execution of the contract, the Contractor shall provide to the County Certificates of Insurance and Endorsements acceptable to the County meeting the requirements of the Contract (specific insurance coverage limits are set forth below). Coverage shall be maintained without interruption from the commencement of the Contractor's Work until Final Acceptance, or for such longer time as required by the Contract. Each policy obtained by Contractor shall be endorsed to provide County with 45 days notice of material changes to or cancellation of such policy.

If the scope of Work is significantly expanded, or if the aggregate limits on any of the Contractor's policies are eroded, the County may require Contractor to obtain additional coverage or reinstate eroded coverage. If the need for additional coverage is due to the fault of the Contractor or any of its Subcontractors, the Contractor shall be responsible for the cost of such additional coverage or any of its Subcontractors coverage. The Contractor shall provide proof of additional insurance required because of changed Work (Change Orders).

If the Contractor is required to correct damaged, defective or incomplete Work after Final Acceptance, it shall obtain at its own expense such insurance coverage as is required by the Contract, for the construction period. Such coverage shall be maintained throughout the period in which corrective work is performed.

Review of Contractor's insurance by County shall not relieve or decrease the duty of the Contractor to comply with the requirements of the Contract Documents.

Nothing contained within these provisions shall affect and/or alter the application of any other provision within this agreement.

WAIVER OF SUBROGATION.

The Contractor waives all rights against the County, County's consultants, or any separate contractors, and their agents and employees, for damages caused by fire or other perils to the extent such damage cost is actually paid by property insurance applicable to the Work. The Contractor shall require similar waivers from all Subcontractors. This provision shall be valid and enforceable only to the extent permissible by the applicable property insurance policies.

EVIDENCE OF INSURANCE.

The Contractor shall furnish the County with Certificates of Insurance and endorsements required by this Contract. All evidences of insurance must be certified by a properly authorized officer, agent, general agent or qualified representative of the insurer(s) and shall certify the name of the insured, the type and amount of insurance, the location and operations to which the insurance applies, the expiration date of the policy. The Contractor shall, upon demand of King County, make available to King County, in King County, certified copies of all such policies of insurance required in this Contract. Failure to provide such policies of insurance within a time acceptable to King County shall entitle King County to

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suspend or terminate the Contractor's work hereunder. Suspension or termination of this Contract shall not relieve the Contractor from its insurance obligation hereunder.

All subcontractors shall be required to include the County and Contractor as additional insureds on all Liability policies except Workers' Compensation and Professional Liability Errors and Omissions.

MINIMUM SCOPE AND LIMITS OF INSURANCE.

The Contractor shall obtain and maintain the minimum insurance set forth below. By requiring such minimum insurance, King County shall not be deemed or construed to have assessed the risks that may be applicable to the Contractor under this Contract. The Contractor shall assess its own risks and if it deems appropriate and/or prudent, maintain greater limits and/or broader coverage. Each insurance policy shall be written on an "occurrence" form; excepting that insurance for professional liability, errors and omissions when required, may be acceptable on a "claims made" form. If coverage is approved and purchased on a "claims made" basis, the Contractor warrants continuation of coverage, either through policy renewals or the purchase of an extended discovery period, if such extended coverage is available, for not less than three years from the date of completion of the work which is the subject of this Contract Insurance coverage shall be at least as broad as stated below and with limits no less than:

General Liability. Coverage shall be at least as broad as Insurance Services Office form number CG 00 01 covering COMMERCIAL GENERAL LIABILITY. $1,000,000 combined single limit per occurrence and for those policies with aggregate limits, a $2,000,000 aggregate limit, including products and completed operations.

Explosion & Collapse, Underground Damage (XCU). Coverages shall apply for the same limits as the General Liability. Evidence of Insurance must specifically state coverage has not been excluded.

Automobile Liability. Coverage shall be at least as broad as Insurance Services Office form number CA 00 01 covering BUSINESS AUTO COVERAGE, symbol 1 "any auto"; or the combination of symbols 2, 8, and 9. $1,000,000 combined single limit per accident. If the work involves the transport of pollutants (as defined by the standard auto policy exclusion of pollution) the auto policy shall be endorsed to include endorsement CA 9948 (or its equivalent) and MCS 90.

Workers' Compensation. Statutory requirements of the State of residency. Coverage shall be at least as broad as Workers' Compensation coverage, as required by the Industrial Insurance Act of the State of Washington, as well as any similar coverage required for this work by applicable Federal or "other States" State Law.

Employer's Liability or "Stop Gap". Coverage shall be at least as broad as the protection provided by the Workers Compensation policy Part 2 (Employers Liability) or, in states with monopolistic state funds, the protection provided by the "Stop Gap" endorsement to the general liability policy.

Contractor's Pollution Liability. Contractor's Pollution Liability coverage in the amount of $1,000,000 per occurrence and in the aggregate to cover sudden and non-sudden bodily and/or property damage to include the destruction of tangible property, loss of use, cleanup costs and the loss of use of tangible property that has not been physically injured or destroyed.. If Asbestos, Lead or PCB's are a potential exposure, such insurance shall not exclude pollution arising out of Asbestos, Lead and/or PCB operations. Evidence of Insurance must specifically state that coverage is included.

DEDUCTIBLES/SELF-INSURED RETENTIONS.

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Any deductibles or self-insured retention's must be declared to, and approved by, the County. The deductible and/or self-insured retention of the policies shall not limit or apply to the Contractor's liability to the County and shall be the sole responsibility of the Contractor.

OTHER INSURANCE PROVISIONS.

The insurance policies required in this Contract are to contain and be endorsed to contain the following provisions:

With respect to all Liability Policies except Professional Liability and Workers Compensation:

The County, its officers, officials, employees, agents and consultants are to be covered as additional insureds as respects liability arising out of activities performed by or on behalf of the Contractor in connection with this Contract. Additional Insured status shall include Products-Completed Operations.

The _____ also to be covered as an additional insured as respects liability arising out of activities performed by or on behalf of the Contractor in connection with this Contract.

The Contractor's insurance coverage shall be primary insurance as respects the County, its officers, officials, employees, agents, and consultants. Any insurance and/or self-insurance maintained by the County, its officers, officials, employees, agents and consultants shall not contribute with the Contractor's insurance or benefit the Contractor in any way.

The Contractor's insurance shall apply separately to each insured against whom a claim is made and/or lawsuit is brought, except with respect to the limits of the insurer's liability.

A Per Project Aggregate shall apply to the General Liability policy.

For Protection and Indemnity Insurance the Contractor shall waive all rights of subrogation against the County.

ACCEPTABILITY OF INSURERS

Unless otherwise approved by the County:

Insurance is to be placed with insurers with a Best's rating of no less than A:VIII, or, if not rated with Best's, with minimum surpluses the equivalent of Best's surplus size VIII.

Professional Liability, Errors and Omissions insurance may be placed with insurers with a Best's rating of B+; VII.

If at any time the foregoing required policies shall fail to meet the above minimum requirements, the Contractor shall, upon notice to that effect from the County, promptly obtain a new policy, and shall submit the same to the County, with the appropriate certificates and endorsements, for approval.

SUBCONTRACTORS.

The Contractor shall include all subcontractors as insured under its policies, or shall furnish separate certificates of insurance and policy endorsements from each subcontractor. Insurance coverages provided by subcontractors, as evidence of compliance with the insurance requirements of this Contract shall be subject to all of the requirements stated herein

1-07.23 PUBLIC CONVENIENCE AND SAFETY

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Section is supplemented with the following:

(*****)
The Contractor shall be responsible to notify, in writing, local fire, school, law enforcement authorities, Metro Transit or other affected persons as directed by the Engineer, not less than five (5) working days prior to construction operations that will deviate and/or delay traffic from the existing traffic pattern, so that these agencies may reroute emergency vehicles as necessary.

1-07.23(1) CONSTRUCTION UNDER TRAFFIC

Section is supplemented with the following at the beginning of the Section:

(*****)
The Contractor shall keep all through traffic lanes open to travel without interference from work
operations between the hours of _____ and _____ a.m. and _____ and _____ p.m. The Contractor shall keep all turn movements, cross streets and approaches open to traffic at all times.
At other times, the Contractor may close one through-lane in each direction of travel on four-lane roadways. If the hours designated above do not conform to the actual peak traffic conditions, the Contractor shall curtail and adjust work operations according to the peak traffic hours as determined by experience and as approved by the Engineer.
No general closures or detours to local access will be allowed under this Contract.

1-07.23(2) CONSTRUCTION AND MAINTENANCE OF DETOURS

Section is supplemented with the following:

(December 1, 2008)
Pedestrian Control and Protection

If no alternative is proposed within the contract plans, all existing pedestrian routes and access points within the project limits, including sidewalks and crosswalks, shall remain open and clear at all times. The Contractor may propose Traffic Control Plans (TCP's) that comply with the MUTCD, ADA requirements, and these Specifications. Contractor proposed TCP's detailing the alternative accessible pedestrian route shall be approved by the Engineer prior to implementation. The plans will either be returned for correction, approved as noted, or approved for use by the end of a 10-day review period. Each time the plan is returned for correction, an additional 10-day review period may be necessary.

When the Engineer allows work areas to encroach upon a sidewalk or crosswalk area, and minimum clear width of 48-inches cannot be maintained for pedestrian use, an alternative accessible pedestrian route shall be provided. Separation of pedestrians from the work area and vehicular traffic is required.

Protective barricades, fencing, and bridges, together with warning and guidance devices and signs, shall be utilized so that the passageway for pedestrians is safe, well defined and accessible. Whenever pedestrian walkways are provided across excavations, they shall be provided with suitable handrails. Foot bridges shall be safe, strong, and free of bounce and sway, have a slip resistant coating, and be free of cracks, holes and

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irregularities that could cause tripping. Ramps, with a maximum slope of 8.3%, shall be provided at the entrance and exit of all raised footbridges. The maximum cross slope shall be 2.0%. When the existing facility is illuminated or TCP's requires illumination, illumination shall be provided during the hours of darkness. Retroreflective delineation shall be provided during hours of darkness.

Where accessible pedestrian routes are allowed to be closed by the Engineer during construction, an alternate accessible pedestrian route shall be provided that complies with the MUTCD, ADA requirements and these Specifications. The alternate accessible pedestrian route shall not have abrupt changes in grade or terrain. Barriers and channelizing devices shall be detectable to pedestrians who have visual disabilities. Where it is necessary to divert pedestrians into the roadway, barricading or channelizing devices shall be provided to separate the pedestrian route from the adjacent vehicular traffic lane. Barricading or channelizing devices used to separate pedestrian and vehicular traffic shall be crashworthy and, when struck by vehicles, present a minimum threat to pedestrians, workers, and occupants of impacting vehicles. At no time shall pedestrians be diverted into a portion of the street used concurrently by moving vehicular traffic.

In addition the Traffic Control Plan shall address the following:

All pedestrians, including persons with disabilities, shall be provided with a safe and accessible route.

The width of the existing pedestrian facility shall be maintained if possible. When it is not possible to maintain a minimum width of 60-inches throughout the entire length of the pedestrian route, a minimum width of 48-inches shall be provided with 60-inch x 60-inch passing zones spaced at maximum intervals of 200-feet to allow individuals in wheelchairs to pass.

Traffic control devices and other construction materials and features shall not intrude into the usable width of the sidewalk, alternate accessible pedestrian route, or other pedestrian facility.

Signs and other devices mounted lower than 84-inches above the temporary accessible pedestrian route shall not project more than 4-inches into the accessible pedestrian route.

A smooth, continuous hard surface shall be provided throughout the entire length and width of the pedestrian route throughout construction. There shall be no curbs or vertical elevation changes greater than ½-inch in grade or terrain that could cause tripping or be a barrier to wheelchair use. Vertical elevation differences between ¼-inch and ½-inch shall be beveled at a maximum 2:1 slope.

When channelization is used to delineate a pedestrian pathway, a continuous detectable edging shall be provided throughout the length of the facility such that pedestrians using a cane can follow it. Edging shall protrude at least 6-inches above the surface of the sidewalk or pathway with the bottom of the edging a maximum of 2-1/2 inches above the surface.

Temporary ramps shall be provided when an alternate accessible pedestrian route crosses a curb and no permanent curb ramps are in place. The width of the curb ramp shall be a minimum of 48-inches and the maximum slope of the ramp shall be 8.3%. The maximum cross slope shall be 2.0%. The bottom of the curb ramp shall be flush with the Roadway. Temporary detectable warning mats shall be installed at street crossings.

When possible, an alternate accessible pedestrian route shall be provided on the same side of the street as the disrupted route. When it is not possible, the alternate route shall be clearly identified at the nearest intersection crossing prior to the closure area.

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Information regarding closed pedestrian routes, alternate crossings, and sign and signal information shall be communicated to pedestrians with visual disabilities by providing devices such as audible information devices, accessible pedestrian signals, or barriers and channelizing devices that are detectable to the pedestrians traveling with the aid of a cane or who have low vision.

It is desirable that pedestrians cross to the opposite side of the roadway at intersections rather than mid-block. Appropriate signing shall be placed at the intersections prior to any pedestrian route closure.

If not otherwise stated in the contract provisions, access to transit stops shall be provided and maintained at all times. Transit stops may be temporarily relocated with approval of the transit agency and the Project Engineer.

At locations where adjacent alternate walkways cannot be provided, appropriate signs shall be posted at the limits of construction and in advance of the closure at the nearest crosswalk or intersection, to divert pedestrians across the street. Physical barricades shall be installed to prevent visually impaired people from inadvertently entering a closed area.

Measurement

No specific unit of measurement will apply to the lump sum item for pedestrian control and protection.

Payment

Payment will be made in accordance with Section 1-04.1 for the following Bid item included in the Proposal:

"Pedestrian Control and Protection", lump sum.

The lump sum contract payment shall be full compensation for all costs incurred by the Contractor for construction, maintenance, and removal of all protective barricades, fencing, and bridges, together with warning and guidance devices detailed in the Plans or any alternative accessible pedestrian routes proposed by the Contractor.

1-08 PROSECUTION AND PROGRESS

1-08.1 SUBCONTRACTING

(October 12, 1998 WSDOT GSP)

The following is added at the end of this section:

Prior to any subcontractor or lower tier subcontractor beginning work, the Contractor shall submit to the Engineer a certification (WSDOT Form 420-004) that a written agreement between the Contractor and the subcontractor or between the subcontractor and any lower tier subcontractor has been executed. This certification shall also guarantee that these subcontract agreements include all the documents required by the Special Provision titled "Federal Agency Inspection."

A subcontractor or lower tier subcontractor will not be permitted to perform any work under the contract until the following documents have been completed and submitted to the Engineer:

1. Request to Sublet Work (Form 421-012), and

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2. Contractor and Subcontractor or Lower Tier Subcontractor Certification for Federal-aid Projects (Form 420-004).

The Contractor's records pertaining to the requirements of this Special Provision shall be open to inspection or audit by representatives of the Contracting Agency during the life of the contract and for a period of not less than three years after the date of acceptance of the contract. The Contractor shall retain these records for that period. The Contractor shall also guarantee that these records of all subcontractors and lower tier subcontractors shall be available and open to similar inspection or audit for the same time period.

Add the following new Section:

(*****)

1-08.1(1) AFFIDAVITS OF AMOUNTS PAID

Upon completion of all work and as a condition precedent to final payment, the Contractor shall submit a final Affidavit of Amounts Paid, identifying amounts actually paid and amounts owed to each subcontracting firm for performance under the Contract. Failure to submit such affidavits may result in withholding of payments or the final payment. Affidavit forms will be provided by the County.

Site Visits: King County may at any time visit the site of the work and the Contractor's office to review records related to actual utilization of and payments to subcontracting firms. The Contractor shall maintain sufficient records necessary to enable King County to review utilization of subcontracting firms. The Contractor shall provide every assistance requested by King County during such visits.

1-08.3(2)B TYPE B PROGRESS SCHEDULE

The first sentence of the second paragraph is deleted and replaced with the following:

(*****)

The Contractor shall submit six color copies of a Type B Progress Schedule on sheet(s) measuring 22 in. x 34 in. minimum no later than 21 calendar days after the date the contract is executed.

Section is supplemented with the following:

(*****)

Preliminary, progress, and supplemental progress CPM schedules requested by the Engineer shall be submitted to the Engineer on compact discs (CDs) in Primavera P6 software format. The Contractor has provided the Engineer with a legal copy of the software and the manuals at no cost to King County. The software and manuals will be returned to the Contractor at project acceptance.

Section 1-08.4 is deleted and replaced with the following:

(*****)

1-08.4 PROSECUTION OF WORK

Notice to Proceed will be given after the Contract has been executed and the contract bond and evidence of insurance have been approved and filed by the Contracting Agency. The Contractor shall not commence with the work until the Notice to Proceed has been given by the Engineer. The Contractor shall commence construction activities on the project site

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within ten days of Notice to Proceed Date, unless otherwise approved in writing. The Contractor shall diligently pursue the work to the physical completion date within the time specified in the contract. Voluntary shutdown or slowing of operations by the Contractor shall not relieve the Contractor of the responsibility to complete the work within the time(s) specified in the Contract.

Add the following new Section:

(*****)

1-08.4(1) ORDER OF WORK

All work below the Mean Higher High Water (MHHW) that is not isolated from standing or flowing waters by a cofferdam or other means approved by the Engineer will be considered "in-water work". This includes but is not limited to sheet pile or pipe pile installation or removal, excavation, backfilling, concrete placement and demolition activities. Work performed from within the confines of an enclosed cofferdam and work from floating vessels will not be considered in-water work.

All pile driving that exceeds an accumulation of 45 minutes per hour will be considered "extended duration ".

The Contractor shall complete specific work elements within the allowable work period as follows:

Description of Work Element	Allowable Work Period
All in-water work below the MHHW, except extended duration pile driving within MHHW (see below)	August 1 to February 15
All in-water extended duration pile driving by means of impact hammer within MHHW All sheet pile and pipe pile driving or extractions	August 15 to November 15 Week days: 7:00 am to 7:00 pm Weekends and federal holidays: 8:00 am to 6:00 pm

Section is supplemented with the following:

(*****)

1-08.5 TIME FOR COMPLETION

This project shall be complete in 883 working days.

The proposed bridge shall be substantially complete and opened to traffic on or before October 17, 2011.

The Engineer will give the Contractor written notice of the physical completion date for all work the contract requires. That date shall constitute the physical completion date of the contract, but shall not imply the County's acceptance of the work or the contract.

The Engineer will give the Contractor written notice of the completion date of the contract after all the Contractor's obligations under the contract have been performed by the Contractor. The following events must occur before the Completion Date can be established:

1. The physical work on the project must be complete; and

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2. The required manufacturer's warranties have been provided; and
3. All spare parts and training of County personnel have been provided; and
4. The Contractor must furnish all documentation required by the contract and required by law, to allow the Contracting Agency to process final acceptance of the contract. The following documents must be received by the Project Engineer prior to establishing a completion date:

   a. Certified Payrolls (Federal-aid Projects)
   b. Material Acceptance Certification Documents
   c. Annual Report of Amounts Paid as MBE/WBE Participants or Quarterly Report of Amounts Credited as DBE Participation, as required by the Contract Provisions.
   d. FHWA 47 (Federal-aid Projects)
   e. Final Contract Voucher Certification

1-08.9 LIQUIDATED DAMAGES

Section 1-08.9 is deleted and replaced with the following:

(*****)
Time is of the essence in this Contract. Delays inconvenience the traveling public, obstruct traffic, interfere with and delay commerce, and increase risk to roadway users. Delays also cost taxpayers undue sums of money, adding time needed for administration, engineering, inspection, and supervision.

Accordingly, the Contractor agrees:

1. To pay (according to the following formula) liquidated damages for each working day beyond October 17, 2011that the proposed South Park Bridge is not substantially complete and operable and fully open to vehicular traffic, pedestrian traffic and marine traffic.

   LIQUIDATED DAMAGES FORMULA

   LD=0.15C/T

   where:
   LD = Liquidated damages per working day (rounded to the nearest dollar)
   C = Original Contract amount minus the cost of bridge removal and landscaping
   T = 498 Working Days

2. To pay liquidated damages in the amount of $500 per day, or a portion thereof, that a fully operational field office with the equipment required is not provided in accordance with Section 1-09.7 of these Special Provisions.

3. To authorize the Engineer to deduct these liquidated damages from any money due or coming due to the Contractor.

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When the Contract work has progressed to the extent that the Contracting Agency has full benefit of the facilities, both from the operational and safety standpoint, and only minor incidental work, replacement of temporary substitute facilities, or correction or repair remains to physically complete the total Contract, the Engineer may determine the Contract work is substantially complete. The Engineer will notify the Contractor in writing of the substantial completion date. For overruns in Contract time occurring after the date so established, the formula for liquidated damages shown above will not apply. For overruns in Contract time occurring after the substantial completion date, liquidated damages shall be assessed on the basis of direct engineering and related costs assignable to the project until the actual physical completion date of all the Contract work. The Contractor shall complete the remaining work as promptly as possible. Upon request by the Project Engineer, the Contractor shall furnish a written schedule for completing the physical work on the Contract.

No deduction or payment of liquidated damages will, in any degree, release the Contractor from further obligations and liabilities to complete the entire Contract.

1-09 MEASUREMENT AND PAYMENT

1-09.9 PAYMENTS

The fifth paragraph is deleted and replaced with the following

(*****)

Upon completion of all work and after final inspection (Section 1-05.11), the amount due the Contractor under the contract will be paid based upon the final estimate made by the Engineer and presentation of a Comparison of Quantities signed by Contractor. Such voucher shall be deemed a release of all claims of the Contractor unless a claim is filed in accordance with the requirements of Section 1-09.11 and is expressly excepted from the Contractor's certification on the Comparison of Quantities.

1-09.11(3) TIME LIMITATION AND JURISDICTION

Section is deleted and replaced with the following:

(*****)

For the convenience of the parties of the contract it is mutually agreed by the parties that any claims or causes of action which the Contractor has against King County arising from the contract shall be brought within 180 calendar days from the date of final acceptance (Section 1-05.12) of the contract by King County; and it is further agreed that any claims or causes of action shall be brought only in the Superior Court of King County. The parties understand and agree that the Contractor's failure to bring suit within the time period provided shall be a complete bar to any such claims or causes of action. It is further mutually agreed by the parties that when any claims or causes of action which the Contractor asserts against King County arising from the contract are filed with the County or initiated in court, the Contractor shall permit the County to have timely access to any records deemed necessary by the County to assist in evaluating the claims or action.

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1-10 TEMPORARY TRAFFIC CONTROL

1-10.1(2) DESCRIPTION

The third paragraph is deleted and replaced with the following:

(*****)

The Contractor shall provide signs and other traffic control devices not otherwise specified as being furnished by the Contracting Agency. The Contractor shall erect and maintain all construction signs, warning signs, detour signs, and other traffic control devices necessary to warn and protect the public at all times from injury or damage as a result of the Contractor's operations which may occur on or adjacent to highways, roads, streets, sidewalks, or paths. No work shall be done on or adjacent to any traveled way until all necessary signs and traffic control devices are in place.

1-10.2(1) GENERAL

In reference to this Section, the TCM and TCS shall be certified as worksite traffic control supervisors by one of the following organizations:

(*****)

The Northwest Laborers-Employers Training Trust 27055 Ohio Ave. Kingston, WA 98346 (360) 297-3035	Evergreen Safety Council 401 Pontius Ave. N. Seattle, WA 98109 1-800-521-0778 or (206) 382-4090

1-10.2(2) TRAFFIC CONTROL PLANS

The second paragraph is deleted and replaced with the following:

(*****)

When the Contractor's chosen method of performing the work in the contract requires some form of temporary traffic control, the Contractor shall either: (1.) designate and adopt, in writing, the traffic control plan or plans from the contract documents that support that method; (2.) submit a Contractor's plan that modifies, supplements or replaces a plan from the contract documents; or (3) where no traffic control plan appears in the contract documents, submit a Contractor-proposed traffic control plan. Any Contractor-proposed plan, modification, supplement or replacement shall show the necessary construction signs, flaggers, spotters and other traffic control devices required to support the work. Any Contractor-proposed traffic control plan shall conform to the established standards for plan development as shown in the MUTCD, Part VI. The Contractor's submittal, either designating and adopting a traffic control plan from the contract documents or proposing a Contractor-developed plan, shall be provided to the Engineer for approval at least ten calendar days in advance of the time the signs and other traffic control devices are scheduled to be installed and utilized. The Contractor shall be solely responsible for submitting any proposed traffic control plan or modification, obtaining the Engineer's approval and providing copies of the approved Traffic Control Plans to the Traffic Control Supervisor.

1-10.3(1)A FLAGGERS AND SPOTTERS

Section is supplemented with the following:

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(*****)

In addition to flagging or spotting duties, the Contractor shall provide personnel for all other traffic control procedures required by the construction operations and for the labor to install, maintain and remove any traffic control devices shown on Traffic Control Plans.

1-10.3(1)B **OTHER TRAFFIC CONTROL LABOR**

Section is deleted.

1-10.3(3)A **CONSTRUCTION SIGNS**

The fourth paragraph is deleted.

Add the following new Section:

(*****)

1-10.3(3)K **EXISTING SIGNING**

During the life of the contract, the Contractor shall be responsible for all existing signing damaged or removed by construction operations. Any signs damaged or removed shall be replaced by the Contractor, to the satisfaction of the Engineer, at Contractor expense. Warning and regulatory signs may be temporarily relocated to portable sign stands for convenience of construction, subject to the approval of the Engineer. When temporarily installed on posts, the signs shall be located at or as near as practical to their original locations and shall have a minimum vertical clearance above the pavement in accordance with the Manual on Uniform Traffic Control Devices. Upon completion of construction in the area immediately surrounding the permanent sign location, the Contractor shall reinstall the sign and support in its permanent location. All costs for the work shall be included in the unit contract bid prices for the various other items of work in the bid proposal.

Add the following new Section:

(*****)

1-10.3(3)L **PROJECT SIGNS**

King County shall furnish and erect new signs within the limits of the work. The Contractor shall coordinate with King County on installations, site access and schedule. The Contractor shall notify King County a minimum of two weeks in advance of opening new bridge for installation of required signage necessary of opening bridge to public.

The Contractor shall notify Richard Garcia (206-684-2732), King County Metro Construction Coordinator, for coordinating removals and relocations of bus stop signs and other Metro items during construction.

The Contractor shall notify Drew Robinson (206-684-2105) of King County Metro for coordinating removals and relocations of bus shelters during construction.

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DIVISION 2
EARTHWORK

2-01 CLEARING, GRUBBING, AND ROADSIDE CLEANUP

2-01.1 DESCRIPTION

Section is supplemented with the following:

(*****)

The Contractor shall not disturb or damage existing plant material designated for preservation and shall contact the Engineer if there is any conflict between the Plans and field conditions. All costs of protecting from damage those plants designated to be saved shall be incidental to the bid item "Clearing and Grubbing."

The Contractor shall remove all plants within the area to be cleared that are not designated for preservation. Prior to clearing operations, the Contractor shall flag all trees over 15 feet high or six-inch caliper or greater (measured six inches above ground line) that are to be removed. The Contractor shall notify the Engineer after flagging is completed and arrange a meeting prior to the removal of any existing trees on the project. At this meeting the Contractor and Engineer shall inspect those trees designated for removal and make any necessary changes.

If the Contractor removes or damages any existing plant or plants not designated for removal because of any act, omission, neglect, or misconduct in the execution of the work, such plant(s) shall be restored or replaced by the Contractor to a condition similar or equal to that existing before such damage or removal.

All replacements shall be inspected and approved prior to planting. Planting procedures will be subject to approval. All replacements shall be guaranteed to survive in a healthy condition.

The Contractor shall be responsible for the protection of tops, trunks, and roots of existing trees that are to remain on the project site. Existing trees subject to construction damage shall be boxed, fenced, or otherwise protected before any work is started. Heavy equipment or stockpiles shall not be allowed within the branch canopy. The Contractor shall remove interfering branches without injury to the tree trunks and cover cuts with tree paint.

Grading Around Trees: Where excavating, or filling within the branch spread of trees that are to remain, the work shall be performed as follows:

1. **Trenching**: When trenching occurs around trees to remain, the tree roots shall not be cut, but the trench shall be tunneled under or around the roots by careful hand-digging and without injury to the roots.
2. **Raising Grades**: When the existing grade at tree is below the new finished grade, and fill not exceeding 16 inches is required, clean washed gravel graded from one- to two-inch size shall be placed directly around the tree trunk. The gravel shall extend out from trunk on all sides a minimum of 18 inches and finish approximately two inches above the finished grade at tree. Install gravel and cover with filter fabric before any earth fill is placed. New earth fill shall not be left in contact with the trunks of any trees requiring fill. Trees marked for preservation that are buried in fills over 16 inches deep shall have an open dry well of durable masonry (without mortar) situated at least 12 inches from the tree trunk. All wells are to be properly drained. Before fills of over 16 inches are made upon the tree root areas, it is advisable to spread

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at least a six-inch minimum layer of broken stone or coarse gravel covered by inverted sod shall be spread to facilitate proper drainage and aeration.

3. **Lowered Grades**: Existing trees in areas where the new finished grade is to be lowered, shall have regrading work done by hand to elevation as indicated. Roots as required shall be cut cleanly three inches below finished grade and cuts covered with tree paint. Trees marked for preservation that are located more than six inches above proposed grades shall stand on broad rounded mounds and be graded smoothly into the lower level. Exposed or broken roots shall be cut clean and covered with topsoil.

2-02 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

2-02.1 DESCRIPTION

Section is supplemented with the following:

(March 13, 1995)

The following items shall be removed:

Street and Traffic Signs
Overhead Advertising Sign
Creosote Logs
Telephone Booth
Clothes Receiving Bin
Chain Link Fence

(*****)

Removals under this section also include, but are not limited to, pipes, catch basins, inlets, and manholes, asphalt pavement, approach walls, wharfs, concrete and/or asphalt sidewalks, buildings, curbs and curb and gutter, traffic islands and traffic curbs, beam guardrail, street and traffic signs, overhead advertising signs, underground storage tanks, mailboxes, luminaries (pedestal/pole/head/foundation), guard rails, bus stops, creosote logs, raised pavement markers, and buttons.

(March 13, 1995)

This work shall consist of removing, handling, and disposing of asbestos in the areas described in the 'PHASE II ENVIRONMENTAL SITE ASSESSMENT REPORT, South Park Bridge Replacement Project Seattle, Washington - September 2009". The Phase II Environmental Assessment Report will be made available to the Contractor as described in the Special Provisions to Section 1-02.4. In accordance with WISHA, OSHA and PSCA, the Contractor shall keep at least one copy of the Phase II Environmental Assessment Report on-site and available for review during the project duration.

2-02.3 CONSTRUCTION REQUIREMENTS

Section is supplemented with the following:

(March 13, 1995)

STREET AND TRAFFIC SIGNS

Where shown in the plans or specified by the Engineer, the Contractor shall remove existing street and traffic signs. The Contractor shall notify the Engineer 5 days in advance of removal. The Contractor shall deliver signs to the Engineer. The Contractor shall backfill any voids created by post removal with the same type of material surrounding the void.

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OVERHEAD ADVERTISING SIGN

Where shown in the plans or specified by the Engineer, the Contractor shall remove existing overhead advertising sign. The Contractor shall notify the Engineer 5 days in advance of removal. The Contractor shall deliver sign to the Engineer. The Contractor shall backfill any voids created by post removal with the same type of material surrounding the void.

CREOSOTE LOGS

Where shown in the plans or specified by the Engineer, the Contractor shall remove creosote logs. The Contractor shall notify the Engineer 5 days in advance of removal. The Contractor shall dispose of creosote logs in accordance with Federal and State Laws and Regulations.

TELEPHONE BOOTH

Where shown in the plans or specified by the Engineer, the Contractor shall remove existing telephone booth. The Contractor shall notify the Engineer 5 days in advance of removal. The Contractor shall deliver telephone booth to the Engineer. The Contractor shall backfill any voids created by telephone booth removal with the same type of material surrounding the void.

CLOTHES RECEIVING BIN

Where shown in the plans or specified by the Engineer, the Contractor shall remove existing Clothes Receiving Bin. The Contractor shall notify the Engineer 5 days in advance of removal. The Contractor shall deliver Clothes Receiving Bin to the Engineer. The Contractor shall backfill any voids created by post removal with the same type of material surrounding the void.

REMOVING CHAIN LINK FENCE

Chain link fence fabric, braces, and posts shall be completely removed. No breaking or cutting of the posts at the ground surface will be permitted.

Backfill the voids created by post removal with the same type of material surrounding the void. Backfilling and compaction shall be in accordance with Section 2-09.3(1)E.

Delivery of Contracting Agency Salvaged Materials

Chain link fence elements to be salvaged shall be as identified by the Engineer. The Contractor shall deliver the chain link fence elements determined to be salvageable to the following location:

XXX

The Contractor shall give three working days advance notice of delivery to the Engineer.

The Contractor shall unload and stockpile the chain link fence elements in the maintenance yard at the locations indicated by the Maintenance Supervisor. The Contractor shall stack the elements in neat and secure piles.

*** $$1$$ ***

(*****)

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REMOVAL, HANDLING AND DISPOSAL OF CONTAMINATED SOIL, SEDIMENTS AND HAZARDOUS MATERIAL

Hazardous material exist on this project. Approximate limits of contamination and hazardous materials are identified in the Environmental Reports. The area history, prior studies and/or test results indicate encountering soil and sediment containing metals, volatile organic chemical, semi-volatile organic chemicals, PCB, and petroleum contamination in the project limits. Contaminated soil is an industrial waste and requires disposal at municipal/commercial disposal facilities (such as sanitary landfills) reclamation facilities or at specialized facilities for the type of contamination present. For the purposes of this project dangerous or hazardous waste is soil that meets or exceeds the Model Toxics Control Act (MTCA) levels in soil or water.

The section incorporates by reference the latest revisions of the following documents.

1. The National Institute for Occupational Safety and Health (NIOSH)
   a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities

2. Code of Federal Regulations (CFR)
   a. 29 CFR 1910 Occupational Safety and Health Standards (OSHA)
   b. 29 CFR 1926 OSHA Construction Standards

3. Environmental Protection Agency (EPA)
   a. SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods

4. Washington Administrative Code (WAC)
   a. WAC 173-303 Dangerous Waste Regulations
   b. WAC 173-340 Model Toxics Control Act - Cleanup
   c. WAC 296-62 General Occupational Health Standards
   d. WAC 173-204

5. Washington State Department of Ecology
   a. Publication 94-49 Guidance on Sampling and Data Analyses Methods
   b. Publication 97-602 Analytical Methods for Petroleum Hydrocarbons

Definitions

Contaminated Material Health and Safety Plan (CMHSP): A supplemental plan to the Construction Safety and Security Manual which establishes in detail the protocols necessary for protecting workers, on-site personnel, visitors, potential off-site personnel, and the public from potential hazards that may be encountered during excavation, stockpiling, handling, sampling, transportation, and disposal of contaminated soils, water, and other material.

Certified Industrial Hygienist (CIH): A trained specialist with at least five years experience in contaminated material processing and working knowledge of selection and use of PPE, air monitoring, regulation, and other health and safety issues.
Site Safety and Health Officer (SSHO): A trained specialist in health and safety with a minimum of three years' experience and working knowledge of use of (Personal Protective Equipment) PPE, regulations and hazard identification.

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Contaminated Groundwater: Groundwater containing levels of contaminants in excess of Permissible Exposure Levels.

Contaminated Material: General term for soil, groundwater, or other debris below the ground surface that contains contaminants including petroleum hydrocarbons, polyaromatic hydrocarbons (PAHs), chlorinated volatile organic compounds (cVOCs), and arsenic, in excess of Permissible Exposure Levels.

Contaminated Soil: Soil containing levels of contaminants in excess of Permissible Exposure Levels.

Dangerous Waste: Solid wastes which are dangerous to the public health and environment, as defined in WAC 173-303.

Permissible Exposure Levels (PEL): Maximum amount or concentration for each contaminant that a worker may be exposed to under OSHA regulations.
Suspected Contaminated Material: Soil, groundwater, or other debris in contact or close proximity to known Contaminated Material, and that has not been tested yet for verification of contamination levels; or material that has visual or odor evidence of contamination.

The Contractor shall perform all testing of suspected hazardous or contaminated material. Qualifications of the personnel responsible for the testing will be approved by the Engineer.

Qualifications:

CIH:

1. Minimum of five years experience in contaminated material processing.
2. Demonstrable experience in Personal Protective Equipment (PPE) selection and use, contaminated material identification and disposal procedures, air monitoring techniques, and site control measures.
3. Working knowledge of federal and state OSHA regulations.
4. Completion of required OSHA Training in accordance with 29 CFR 1910.120, including completion of 40-hour supervisory training and eight hour annual update and completion of three days on-site training by a fully qualified instructor.

SSHO:

1. Minimum of three years experience in contaminated material and waste site remediation or related work, including air monitoring techniques and the development of health and safety programs for personnel working in potentially toxic environments.
2. Current certification in first aid and cardiopulmonary resuscitation (CPR).
3. Working knowledge of federal and state OSHA regulations.
4. Completion of required OSHA Training in accordance with 29 CFR 1910.120, including completion of 40-hour supervisory training and eight hour annual update and completion of three days on-site training by a fully qualified instructor.

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Responsibilities

CIH:

1. Responsible for certifying the CMHSP, any task specific CMHSPs, and all additions and/or modifications thereto.
2. Required to be accessible to the SSHO as necessary, to assist in the identification and evaluation of potential hazards and the development of appropriate procedures for addressing known or suspected conditions or activities that may pose routine occupational hazards or immediate danger to life or health of work site personnel, Sound Transit personnel, utility crews working in the project construction area, personnel related to third party stakeholders or the public.

SSHO:

1. Required to be on Site and present during contaminated material work to be completed as part of the Contract. Such work includes, but is not limited to: air monitoring, removal of contaminated soil and groundwater, removal of Underground Storage Tanks (UST), and work related to the presence or potential for unknown contaminated materials.
2. Responsible for the development, implementation, enforcement, and monitoring of the CMHSP for the project.
3. Responsible for conducting the pre-construction indoctrination, Pre-Entry Briefings, and other periodic training of on-site personnel with regard to contents of the CMHSP and other safety requirements to be observed during construction.
4. Responsible for performing air monitoring as required by the CMHSP.

Authority

1. The CIH and the SSHO have the authority to:
   a. Suspend field activities if health and safety of work site personnel, Sound Transit personnel, other crews working in the Project Site, or the public is endangered.
   b. Suspend individuals from field activities due to infractions of the CMHSP.

Certifications

1. CIH and SSHO current certifications:
   a. OSHA 29 CFR 1910.120 Training.
   b. CPR Training.

2. That work site and subcontractor personnel assigned for the purpose of performing or supervising contaminated materials work in accordance with the provisions of the CMHSP. Have the CIH certify the CMHSP.

Laboratories:

Use laboratories for analytical analyses which follow procedures that are consistent with the Model Toxics Control Act (MTCA) guidelines for selection of appropriate analytical procedures (WAC 173-340-830), The Washington State Department of Ecology's Guidance on Sampling and Data Analyses Methods (Ecology Publication number 94-49) and Analytical

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Methods for Petroleum Hydrocarbons ((Ecology Publication number 97-602), and USEPA's "Test Methods for Evaluating Solid Waste Physical/Chemical Methods", SW-846.

Copies of the environmental reports are available for review at the Engineer's office. Necessary permits for this work will be furnished by the Contracting Agency as noted in Section 1-07. The Contractor is responsible for all work, records, and reports required to perform the work described in this section. The contractor shall submit a hazardous and contaminated soil and sediment plan, health and safety plan, and debris containment system to the Engineer for approval, which shows excavation means and methods, stockpile locations and containment, transportation methods, treatment design, best management technologies, and disposal locations.

The Contractor shall notify the Engineer 20 working days prior to beginning work in the area identified in the environmental reports as contaminated or hazardous. The Contractor shall notify the Engineer immediately if contamination is discovered in areas other than those identified in the Reports, or is suspected through observations such as an oily sheen or discolored soils that may or may not emit strong chemical odors.

Contaminated Soil and Hazardous Material-Upland

The Engineer will determine the limits of excavation required. All material that is designated by the Engineer to be removed shall be handled and stored in a manner that prevents the spread of contamination to adjacent soil or water. Separate stockpiles shall be maintained for known hazardous or contaminated material and for suspected hazardous or contaminated material. An off-site stockpile location has been secured by the Contracting Agency located at: _____, A stockpile of contaminated soil cannot remain on-site longer than 90 days, without a permit. The Contractor shall place contaminated soil on a 6 mil polyethylene liner, within a bermed area and covered with plastic sheeting in accordance with WSDOT Standard Specification 8-01.3(5) to prevent infiltration of rain water. The Contractor shall inspect the stockpiles daily and maintain the sheeting, replacing any worn or ripped sections.

Contaminated soil and water encountered during construction must be handled and disposed of in accordance with Federal and State Laws and Regulations. The Contractor shall furnish all materials, equipment, labor and facilities for handling and disposal of any contaminated soil and/or water discovered during the project.

The Contractor shall divert surface water to prevent entry into the excavation to avoid and/or limit the need for dewatering. No dewatering from the excavation shall be performed without prior approval of the Engineer.

Stockpiles shall be sampled based on volume; three samples for 100 cubic yards, five samples for 500 cubic yards, seven samples for 1000 cubic yards and ten samples for 2000 cubic yards. Samples shall be tested for metals, volatile organics, semi-volatile organics and PCBs. Thirty samples are estimated. All samples shall be tested as directed by the Engineer. Each sample shall be tested by an accredited and licensed analytical laboratory. As approved by the Engineer, the Contractor shall transport and dispose of the contaminated soil and/or water at a legally permitted facility. If analytical results indicate soils are below the clean-up levels specified in the Model Toxics Control Act (MTCA) Method A, the material may be used in embankment or fill construction as directed by the Engineer. Alternative disposal sites for non-hazardous waste maybe allowed as approved or directed by the Engineer.

The Contractor shall be responsible for the health and safety conditions related to contaminated substances within the project limits, including the health and safety of workers and public during working and non-working hours. The Contractor shall provide a site health

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and safety plan to the Engineer two weeks prior to starting any excavation in areas identified as contaminated/hazardous. The plan shall include copies of training documentation for all personnel.

The Contractor shall transport hazardous or contaminated material and dispose of it at a permitted facility or approved location. The Contractor shall provide the Engineer with a copy of the shipping manifest or bill of lading indicating the amount of material hauled to disposal, and bearing the disposal site operator's confirmation for receipt of the material.

Contaminated Soil and Hazardous Material- Duwamish Waterway

Northern Coffer Dam: Duwamish waterway sediments removed from the northern coffer dam from the mud line (elevation__) to elevation _____ are Washington regulated dangerous waste and Federal hazardous waste and shall be excavated, transported and disposed of in accordance with WAC 173-303.

Sediments from elevation _____ to _____ shall be disposed at the Elliott Bay open water disposal site at coordinates:

Latitude 47 35.92' Longitude 122 21.38' NAD27
Latitude 47 35.91' Longitude 122 21.45' NAD83

Southern Coffer Dam: Sediments in the southern coffer dam from elevation ___ to elevation___ shall be disposed of at the Elliott Bay open water disposal site at coordinates:

Latitude 47 35.92' Longitude 122 21.38' NAD27
Latitude 47 35.91' Longitude 122 21.45' NAD83

Transportation and placement of sediments at the Elliott Bay site shall be in accordance with the Corp of Engineers Dredge Material Management permit.

Sediments Best management practices for preventing discharge of turbid water and sediments to the waterway shall be implemented in accordance with section_____.

Contaminated Water

All water that is removed from upland areas of contamination, including free water that leeches from contaminated soil stockpiles or water that is suspected of being contaminated, shall be collected, handled and stored in a manner that prevents the spread of contamination to adjacent soil or water. The Contractor shall transport contaminated water and dispose of it at a permitted facility. The Contractor shall provide the Engineer with a copy of the shipping manifest or bill of lading indicating the amount of material hauled to disposal, and bearing the disposal site operator's confirmation for receipt of the material.

All water from the coffer dams and upland areas shall be treated for shall meet water quality standards for freshwater in Chapter 173-201A WAC: pH 6.5-8.5, fecal colliform of 200 colonies/100 ml, total dissolved gas 110 percent of saturation, 10 NTU over background when the background is 50 NTU or less; or a 20 percent increase in turbidity when the background turbidity is more than 50 NTU; dissolved oxygen 6.5mg/L, 63.5 degrees F or an increase of .54 degrees F if over 63.5 degrees; metals shall not exceed background levels; and total petroleum hydrocarbons < 5mg/l. If these criteria are exceeded the contractor shall stop discharge to the river and adjust the treatment system, no additional compensation shall be provided. If Contractor elects to discharge contaminated water into the public sanitary sewer system, Contractor shall obtain Stormwater Discharge Permit from the City of Seattle.

(September 30, 1996)

ASBESTOS HANDLING AND DISPOSAL

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Prior to performance of any contract work, the Contractor shall obtain all permits from, and provide notification to, the Washington State Department of Labor and Industries, the U.S. EPA, the local air pollution control agency, and other permitting and regulatory agencies with jurisdiction over the work involving asbestos as the law requires.

Prior to commencing asbestos related work, the Contractor shall provide the Engineer with written verification of approvals and notifications that have been given and/or obtained from the required jurisdictional agencies, and the Contractor's schedule for all work involving asbestos removal. The schedule shall include the sequencing and scheduling of asbestos related work, and coordination with subcontractors. The Contractor shall notify the Engineer when all approvals have been received and notifications have been made, as required by the agencies involved.

The Contractor shall ensure the safety of all workers, visitors to the site, and the general public in accordance with all applicable laws, rules, and regulations.

The Contractor shall designate a Washington State Certified Asbestos Supervisor (CAS) to personally supervise the asbestos removal and to ensure that the handling and removal of asbestos is accomplished by certified asbestos workers, pursuant to Washington State Department of Labor and Industries standards. The Contractor shall ensure that the removal and disposal of asbestos meets the requirements of EPA regulation 40 CFR Part 61, local health department regulations, and all other applicable regulations.

The Asbestos Containing Materials (ACM) identified in the Phase II Report, as described in Section 1-02.4, shall be removed in their entirety. Materials containing less than one percent asbestos content shall be handled in accordance with WAC 296-62-077 and WISHA Regional Directive 23.30.

In accordance with WISHA and OSHA, removed ACM using trained and licensed contractors and certified asbestos abatement workers and supervisors (except for deregulated roofing sealants, mastics, and coatings). Contractor shall provide a 10-day notification before abatement begins. Contractor shall notify the Puget Sound Clean Air Agency, and pay required notification fee prior to beginning removal.

All maintenance and housekeeping personnel working in the building shall require annual two-hour asbestos awareness training in accordance with WAC 296-62-077 until all ACM has been removed. This training shall include a complete listing of known asbestos materials and their locations.

2-02.3(2) REMOVAL OF BRIDGES, BOX CULVERTS AND OTHER DRAINAGE STRUCTURES

Section is supplemented with the following:

(*****)

Removal of existing drainage structures not included as a specific bid item for removal and falling within the grading limits of the project shall be considered "Roadway Excavation" as specified in Section 2-03.3. Removal of existing drainage structures not included as a specific bid item and falling within the limits of structure excavation for the installation of new drainage structures shall be incidental to and included in the bid item for the "Excavation" for the drainage structure.

Removal of existing manhole or drainage structure when shown on the plans and identified as a separate bid item shall be paid for as Remove Manhole and/or Removing Drainage Structure per each.

NOT FOR CONSTRUCTION

Removal of existing drainage structures falling outside the above described limits shall be paid for as "Removal of Structure and Obstruction," which price shall be full pay for the removal and disposal of the existing drainage structure.
The Contractor shall remove catch basins where shown in the Plans or where designated by the Engineer. The Contractor shall excavate and completely remove the structure including casting and outlet trap, concrete encasement, and bricks, as applicable to each Bid item. Connecting pipes shall be plugged with a pumpable, flowable cement slurry and completely filling the pipe (see Section 7-08.3(4). The resultant void shall be backfilled with material approved by the Engineer and the material compacted to the satisfaction of the Engineer. All grates, frames and covers shall remain the property of King County and will be hauled from the project by County forces. The Contractor shall exercise reasonable care in the removal and salvaging of existing grates, frames and covers and shall stockpile the salvaged grates, frames and covers in locations designated by the Engineer.
(June 26, 2000)

The Contractor shall remove existing ***South Park Bridge*** in stages as shown in the Plans.
(June 26, 2000)

BRIDGE DEMOLITION PLAN

The Contractor shall submit a bridge demolition plan with working drawings and calculations to the Engineer for approval in accordance with Section 6-01.9, showing the method of removing the existing bridge(s), or portions of bridges, as specified.

The bridge demolition plan shall show support bents, bracing, guys, lifting devices, lifting attachments, the sequence of demolition and removal, the type of equipment to be used in all demolition and removal operations, the location of cranes and barges, the location of support or lifting points, and the weights of structure parts being removed. The plan shall include a crane stability analysis and crane load calculations based on the controlling crane picks of the Contractor's plan. The plan shall detail the containment, collection, and disposal of all debris. The plan shall show all stages of demolition.

The Contractor shall not begin removal operations until receiving the Engineer's approval of the bridge demolition plan.

USE OF EXPLOSIVES

(June 26, 2000)
Explosives shall not be used in the demolition.

2-02.3(3) REMOVAL OF PAVEMENT, SIDEWALKS, CURBS, AND GUTTERS

Section is supplemented with the following:

(*****)
Removal shall be accomplished by making a neat longitudinal vertical cut along the boundaries of the area to be removed. Cutting shall be accomplished with a self-propelled saw capable of cutting to a 12-inch depth. The use of pneumatic hammers or punches will not be permitted.
(*****)

Removing Cement Concrete Sidewalk

NOT FOR CONSTRUCTION

Sidewalk removal, both asphalt and concrete, shall be as indicated on the Drawings. Sawcut shall comply with the requirements of Section 2-02.3(6) and shall leave straight edges and vertical faces. The minimum width of sidewalk removal measured longitudinally shall be two (2) feet, or to the nearest score line as indicated on the Drawings or as directed by the Engineer.

Required sawcutting on the perimeter of sidewalk removal will be paid as "Saw Asphalt Concrete, Full Depth" or "Saw Cement Concrete, Full Depth"; except for sidewalk removal for curb ramp and driveway installations. Saw cutting on the perimeter of new curb ramps, new driveways, and all other sawcutting associated with removal of sidewalk shall be considered incidental to the removal bid item. Sidewalk removal areas will be a shown on the Drawings or as directed by the Engineer. Adjacent sidewalk removal areas shall be considered one area regardless of the method of work.

No sawing is required where sidewalk removal limits extend to joints or cracks.

Unless the Contract specifies otherwise, removal of parking pay stations, D-22 signage ("Pay L", "Pay R", "Pay H", and "Pay LR" signs and posts), and "numbered" base plates, parking meter, bus stop, and street name signs including their posts will be by SDOT. Should the Contractor require removal or relocation prior to scheduled Work, the Contract shall notify

SDOT in accordance with Section 1-07.28.

Removal of a bus shelter requires the notification specified in Section 1-07.28.

Removing Cement Concrete Curb and Gutter

There are four types of curb; doweled curb (includes mountable and other curb attached to underlying pavement structure), full depth curb, curb and gutter, and monolithic curb (cement concrete). Monolithic curb will be considered cement concrete sidewalk removal. Unless the Drawings indicate otherwise, doweled curb, full depth curb, or curb and gutter removal adjacent to full depth pavement removal will be considered to be part of the full depth pavement removal. If doweled curb, full depth, or curb and gutter removal is isolated from full depth pavement removal, removal of doweled curb and full depth curb will be considered curb removal, and removal of curb and gutter will be considered curb and gutter removal.

Curb shall be sawcut perpendicular to the curb line at the neat line limits of removal, or removed to the nearest joint as indicated on the Drawings or as directed by the Engineer. Sawcutting at the limits of removal (end points of removal segments) will be paid as "Saw Cement Concrete, Full Depth". Sawcutting between limits of curb removal, and all other sawcutting associated with removal of curb shall be considered incidental to the removal bid item. See Section 2-02.3(7)E for additional requirements when salvage is applicable.

Add the following new Section:

(*****)

2-03.3(18) SAND DRAINAGE BLANKET

This bid item shall include all work to furnish and install stakes in the river bottom indicating the depth for coverage of the sand drainage blanket. The material shall not be pushed off a barge into the river channel. The material shall be placed on the river bottom in a careful manner to minimize sediment suspension. The Contractor shall be responsible for

NOT FOR CONSTRUCTION

placing the sand drainage blanket around all areas that will be impacted by work activities and responsible for maintaining, monitoring, and adding new material should river scour erode any part of the sand drainage blanket area.

Add the following new Section

(*****)

2-02.3(4) REMOVAL OF APPROACH WALLS

The Contractor shall remove existing approach walls and retained fill to a point 4 feet below the finished ground elevation.

Add the following new Section

(*****)

2-02.3(5) BUILDING DEMOLITION

The Contractor shall demolish and remove the structure and foundation as shown in Plans. All demolition waste shall be removed from the site and properly disposed of at a licensed facility.

Written documentation shall be provided to the owner certifying the proper disposal of all waste materials. Adjacent properties shall be protected from project debris.

The Contractor shall properly retire any existing gas, water, septic systems, and sever services laterals to the property, including any other utility connections.

The Contractor shall properly remove any dispose of any asbestos, oil tanks or any other hazardous material that may be encountered on the property. Excavated areas shall be graded to match existing contours.

Add the following new Section

(*****)

2-02.3(6) REMOVAL OF WHARF STRUCTURE

The Contractor shall remove the wharf structure in accordance with the limits specified on the site preparation sheets. Remove of wharf structure shall include saw cutting concrete slab, removal of concrete, creosote piles, pavement, , chain link fence and miscellaneous debris. The Contractor shall also cap and remove utilities connected to or under wharf, and any other items that are part of the existing wharf. Existing sheet pile walls at the perimeter of the wharf shall not be removed nor disturbed as part of removal of wharf. Concrete rubble on riverbank shall not be removed as part of removal of wharf. All demolition waste shall be removed from the site and properly disposed of at a licensed facility.

Add the following new Section:

(*****)

2-02.3(7) REMOVAL OF PAVEMENT MARKINGS

Pavement marking removal shall be conducted in a manner consistent with Section 8-22.3(6)

Removal of Raised Pavement Markers

NOT FOR CONSTRUCTION

No portion of the raised pavement markers is to remain. The Contractor shall remove raised pavement markers including epoxy or other adhesive in a manner that will not damage the underlying pavement. Any damage to the underlying pavement caused by the Contractor's operations shall be repaired to the satisfaction of the Engineer at no additional cost to the Contracting Agency.

Debris resulting from the removal operation shall become the property of the Contractor and shall be disposed of outside the project limits.

Removal of Paint Line

Existing traffic paint lines shall be removed along the roadway where indicated on the Plans. Paint Line shall be removed by one of the following methods:

Turbo Blast Removal: The removal of existing striping accomplished using dry abrasive blasting of steel shot, and automated recovery system with a self contained collection system by vacuum. Damaged pavement shall be repaired by the Contractor to the satisfaction of the Engineer at no cost to the County.

Hydro Removal: The removal of existing lines shall be accomplished using high-pressure water/sand jets to prevent damage to the pavement. The use of chemicals or grinding will not be allowed. Damaged pavement shall be repaired by the Contractor to the satisfaction of the Engineer at no cost to the County.

Existing plastic stop bars, crosswalk lines and traffic arrows shall be removed, if conflicting, prior to paving. The Contractor shall use a method approved by the Engineer.
Care shall be taken in removing existing paint line, plastic stop bars, crosswalk lines and traffic arrows not to damage the existing pavement. Any pavement damaged due to the Contractor's operations shall be repaired or replaced by the Contractor, to the satisfaction of the Engineer, at Contractor expense.

Add the following new Section:

(*****)

2-02.3(8) REMOVING PORTION OF EXISTING STRUCTURE - FENDER

Remove fender in two phases to accommodate construction of the proposed bridge and demolition of the existing bridge.

Phase One

Phase one of the fender removal shall include removal of that portion of the existing fender system as necessary to construct the proposed bridge as depicted in the Contract Plans and/or that portion of the existing fender system which cannot be removed once the proposed bridge is commissioned and operational. The precise limits of the Phase One removal shall be identified by the Contractor and submitted to the Engineer for approval.

Phase Two

Phase two of the fender removal shall include removal of the remaining elements of the existing fender systems once the proposed bridge is commissioned and operational.

Fender System Removal and Disposal

All existing piling and associated timber fender system materials shall be considered to be creosote treated and shall be considered contaminated material.

Remove existing pile by means of a vibratory hammer. Remove piling slowly to minimize turbidity in the water column as well as sediment disturbance. The piling shall not

NOT FOR CONSTRUCTION

be broken off intentionally by twisting, bending or other deformations. If the piling has broken off at or near the mud line such that removal by a vibratory hammer is not practical the pile shall be cut off at the mud line by use of a pneumatic underwater chainsaw or other approved means. If a pile is broken off below the mud line it shall remain in place.

Remove piling during low current and low water to the extent possible.

Prior to commencement of pile removal the Contractor shall assess the condition of the existing piling. The Contractor shall create a log outlining the locations and number of pilings that are deemed to be deteriorated or damage to point that extraction by vibratory means are anticipated to be unsuccessful. Provide the Engineer with a copy of the log.

The Contractor shall locate the positions of all piling by means of Global Positioning System (GPS) to provide baseline information for debris characterization if any piling is broken off or cut off. The locations of the piling may be used should future dredging or construction in the vicinity be required. Locate the existing piling in the Project coordinate system.

The extracted piling shall be temporarily stored within a lined containment basin to prevent materials and sediments from re-entering the water column. Runoff water will be allowed to return directly to the waterway. Upon removal the extracted piling shall moved expeditiously from the water into the containment basin. The pilings shall not be shaken, hosed-off, left hanging to drip or other actions which would result in removal of adhering material from the piling.

Cut extracted piling to size as required by the Contractor selected disposal organization for transport and disposal. Collect all saw dust and cutting within the containment basin.

The Contractor shall use a floating boom to capture floating surface debris. The floating boom shall be equipped with absorbent pads to contain any oil sheens.

Cut up piling, floating debris, absorbent pads, sediments, construction/demolition residue and the containment basin liner shall be packed into a container. The contents of the container shall be considered creosoted timber, creosoted piling and associated debris and dispose in accordance with Section 1-07.5.

Holes remaining after extraction of the pilings shall not be filled.

2-02.4 MEASUREMENT

Section is supplemented with the following:

(*****)

The lump sum Contract price for “Removal of Structure and Obstruction” Contains the following approximate quantities of materials and completed work:

Street and Traffic Signs	20	Each
Overhead Advertising Sign	1	Each
Underground Storage Tanks	5	Each
Mailboxes	1	Each
Luminaries (pedestal/pole/head/foundation)	22	Each
Guard Rail	30	LF
Bus Stop	1	Each
Creosote Logs	5	each
Wharf Removal	115	LF

NOT FOR CONSTRUCTION

The quantities listed are only for the convenience of the Contractor in determining the volume of work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than for approved changes will be made in the lump sum contract price for "Removal of Structure and Obstruction" for the above items even though the actual quantities required may deviate from those listed.

Remove Cement Concrete Sidewalk will be measured per square yard of sidewalk removed.

Remove Cement Concrete Curb and Gutter will be measured per linear foot of curb and gutter removed along the face of curb.

Remove Raised Pavement Markers will be measured per one hundred individual markers.

Remove Pavement Markings will be measured per linear foot of marking removed.

No specific unit of measurement shall apply to the lump sum item of Removing Portion of Existing Structure – Fender.

(*****)

Hazardous material excavation including haul will be measured by the cubic yard. All excavated material will be measured in the position it occupied before the excavation was performed. In the upland side, an original ground measurement will be taken using cross-section or digital terrain modeling survey techniques. Original ground will be compared with a survey of the excavation area taken after the work is completed.

In the waterway, limits of contamination will be measured for by the neat line of contaminated material as identified in the plans.

2-02.5 PAYMENT

Section is supplemented with the following:

(*****)

Payment for “Hazardous Material Handling and Disposal”, by force account as provided in Section 1-09.6.

All costs associated with storing stockpiled hazardous waste and contaminated soils, collecting, handling and storing contaminated water, loading the stockpiled material into the hauling conveyance for transport to the disposal site, and transporting and disposing of hazardous or contaminated materials at an approved facility will be paid by force account under the item “Hazardous Material Handling And Disposal”.

To provide a common basis for all bidders, the Contracting Agency has entered an amount in the proposal to become a part of the Contractor’s total bid.

“Hazardous Material Excavation Incl. Haul”, per cubic yard.

The unit contract price for “Hazardous Material Excavation Including Haul” shall be full pay for all costs associated with excavating the material designated to be removed, hauling it to the stockpile location, and stockpiling the excavated material.

(September 30, 1996)

"Removing Miscellaneous Traffic Item", lump sum.

(June 26, 2000)

“Removing Existing Bridge”, lump sum.

(September 30, 1996)

NOT FOR CONSTRUCTION

"Removal and Disposal of Asbestos Material", lump sum.

(*****)

"Building Demolition -_____", lump sum.

"Removal of Wharf Structure", lump sum.

"Removing Portion of Existing Structure - Fender", lump sum shall be full payment for all costs associated with removing the existing fender system including removal, pile cutting, development of pile location log, locating piling, containment of materials and disposal of materials.

The unit contract price for "Remove portion of Existing Structure - Fender" shall be full pay for all costs associated with removing the materials of the existing structure, hauling it to the stockpile location, stockpiling the material, and disposing of material.

"Remove Cement Concrete Sidewalk", per square yard.

"Remove Cement Concrete Curb and Gutter", per linear foot.

"Remove Raised Pavement Markers" per one hundred individual markers.

"Remove Pavement Markings" per linear foot.

2-03 ROADWAY EXCAVATION AND EMBANKMENT

2-03.3(5) SLOPE TREATMENT

Section is supplemented with the following:

(*****)

Roadway excavation and embankments shall be constructed as shown on the typical roadway sections and details in the Plans.

On hillside construction, the existing ground shall be benched as the layers of embankment material are being placed. Each bench shall penetrate the slope at least four feet and shall not be more than four feet high. The horizontal face of the bench shall slope inward at approximately 0.1 foot per foot. The Engineer may order the Contractor to place gravel backfill for drains, drain pipe or both to control any seepage.

Benching construction shall be considered incidental to and included in the other roadway excavation and embankment items in the project. No further compensation will be made.

2-03.3(7)C CONTRACTOR-PROVIDED DISPOSAL SITE

The first paragraph is deleted and replaced with the following:

(*****)

No waste site has been provided by the County for the disposal of material and debris. The Contractor shall make all arrangements, at Contractor expense, for the disposal of waste materials and shall protect the County from any and all damages arising there from.

Add the following Section:

2-03.3(19) POND EXCAVATION INCL. HAUL

Rain gardens and earth berms shall be constructed as shown on the Drawings.

NOT FOR CONSTRUCTION

2-03.3(19)A GRADING FOR RAIN GARDEN

Rain garden survey staking shall be performed by the Contractor. The Owner will set control hubs on the street centerline with elevations (see Section 1-05.8). The Engineer will provide the Contractor with a stake-out sheet prior to construction. Each stake-out sheet will include horizontal and vertical control for rain garden construction.

The Contractor shall establish the number of survey points to clearly identify rain garden bottom and top, shape and elevations. After staking, the Contractor shall delineate rain garden shape with marking paint. The Engineer will approve survey information and rain garden shape before excavation begins. Upon approval of paint markings, the Contractor shall set stakes to maintain limits of excavation.

All rain gardens shown on the stake-out sheets shall be constructed to an accuracy of 0.25 feet in location and 0.02 feet in elevation unless otherwise noted. "Critical grading points" as shown on the stake out sheets shall require an elevation accuracy of 0.08 feet. All other remaining drainage features shall be constructed to an accuracy of 0.50 feet for location and 0.17 feet for elevation.

Finish grades at all the critical grading points shall be reported to the Engineer for approval prior to the placement of special soil mix (bioretention soil.) The Contractor shall provide 5 check elevation points within the bottom of each rain garden prior to placement of special soil mix.

Grading within root zones of existing trees to be protected shall be under the direction of the Engineer. Trees shall be protected per 1-07.16(2) and 8-02.3(7). Should grading conflict with existing Project Site conditions, the Contractor shall consult with the Engineer prior to proceeding with the Work.

No heavy equipment shall operate within the rain garden or earth berm perimeter during excavation, subsurface pipe placement, backfilling, tree pit preparation, or mulching.

Excavation within 6-inches of final native soil grade shall not be permitted if Project Site soil is saturated (3% above optimum moisture content).

No Materials or substances shall be mixed or dumped within the rain garden or earth berm area that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations.

Relocation and/or adjustments of water meters shall be coordinated per Section 7-15 Water Service Connection Transfers.

Rain gardens with a utility crossing through the rain garden soil or a side sewer within 18-inches from the bottom of the rain garden soil shall require a clay trench dam to be constructed within the existing utility trench to prevent migration of water along the utility service. A clay trench dam shall be placed and constructed at locations shown on the Drawings or as directed by the Engineer. Payment for rain garden liner will be made at the unit price bid for "Dam, Clay Trench".

Prior to finishing rain water excavation, the Engineer will inspect native soil to establish if there are any soil lenses that might direct significant volumes of water to a private property or other area of concern. If such a soil lens is identified the Engineer shall determine if a rain garden liner is necessary.

Prior to placement of special soil mix (bioretention soil) in each rain garden, the Contractor shall notify the Engineer to inspect and take a photograph of the rain garden. If any sediment laden runoff has entered the rain garden, the sediment deposition shall be removed by overexcavating the rain garden by a 3-inch minimum. An additional 3-inches of special soil mix (bioretention soil) shall be imported at the Contractor's expense.

NOT FOR CONSTRUCTION

The finished elevation shall be flush with walks, curbs, pavements and driveways, unless adjacent to a bermed area, as verified by the Engineer. Upon completion of finish grading work, all excess Material shall be removed from the Project Site and disposed of accordingly.

2-03.3(19)B GRADING FOR EARTH BERM (EMBANKMENT COMPACTION)

Finish grades at all the Critical Grading Points shall be reported to the Engineer prior to the placement of mulch. Earth berm elevations shall meet the accuracy as described in Section 2-03.3(19)A. If design elevations are not met, the Engineer will require the Contractor to rework the soil to meet the design requirements, solely at the Contractor's expense. Following placement of mulch, the Engineer shall verify a consistent uniform mulch depth of 3-inches or as indicated on the Plans.

All fill material import, placing, compacting, and work associated with berming, raising elevation, building slopes, embankments , and fills shall be considered incidental to the work and Bid item for Pond Excavation.

2-03.4 MEASUREMENT

Section is supplemented with the following after the first paragraph:

(*****)

Only one determination of the original ground elevation will be made on this project. Measurement for roadway excavation and embankment will be based on the original ground elevations recorded previous to the award of this contract, and the alignment, profile, grade and roadway section as shown in the Plans and as staked by the Engineer. Control stakes will be set during construction to provide the Contractor with all essential information for the construction of excavation and embankments.

Earthwork quantities will be computed, either manually or by means of electronic data processing equipment, by use of the average end area method.

Copies of the preliminary ground cross section notes will be available for the Bidder's inspection before the opening of bids at the Office of the Manager, Engineering Services Section, Road Services Division, Department of Transportation, 2nd Floor, 201 South Jackson Street, Seattle, Washington. At the time the bid is submitted, it shall be understood that the Bidder has inspected the cross sections.

Upon award of the contract, copies of the original ground cross sections will be furnished to the successful bidder on request of the Project Engineer.

Section is supplemented with the following:

(*****)

Pond and mitigation area excavation will be measured by the cubic yard in its original site and the quantities calculated by the neat lines of the staked cross-sections. Only one determination of the original ground elevation will be made on this project. Measurement for pond or wetland mitigation excavation and/or embankment will be based on the original ground elevations recorded previous to the award of this contract, minus the structure excavation removal quantities and the alignment, grade, and details shown in the Plans, and as staked by the Engineer. Control stakes will be set during construction to provide the Contractor with all essential information for the construction of excavation or embankment.

NOT FOR CONSTRUCTION

2-03.5 PAYMENT

Section is supplemented with the following:

(*****)

Payment for Rain Gardens, Conveyance Ditches & Earth Berms shall be made using the applicable bid items listed in the Bid Form.

No separate payment will be made for finish grading work required to hand grade Rain Gardens, Earth Berms and Conveyance Ditches to final shape as specified.

No separate payment will be made for connection of private drain pipes to the conveyance system or rain garden.

2-09 STRUCTURE EXCAVATION

2-09.3(1)E BACKFILLING

Section is supplemented with the following after the second paragraph:

(*****)

All trenches within the roadway prism shall be backfilled with gravel backfill for trench, except as specified in the Plans. Gravel backfill for trench shall meet the gradation requirements for crushed surfacing top course in Section 9-03.9(3).

Revise fourth paragraph to include:

Controlled Density Fill (CDF) or Controlled Low-Strength Material (CLSM) shall also meet City of Seattle material requirements:

Cement, ASTM C 150	Type I/II
Slurry Density, ASTM C 138	65 pcf (minimum)
Foamed Slurry Density, ASTM C 138	45 pcf (minimum)
Water/Cement Ratio	0.90 (maximum)
Flow, ASTM C939	18 seconds (maximum)
Shrinkage, ASTM C 827	non-shrink
Bleeding, ASTM C 232	no bleed
Set Time, ASTM C 403	3-6 hours

Compressive strength

ASTM C 403 @ 24 hours	75 psi (minimum)
ASTM C 495 @ 7 Days	150 psi (minimum)
ASTM C 495 @ 28 Days	250 psi (minimum)

Special Note: Set Time depends on temperature and site conditions.

Add the following new Section:

(*****)

2-13 EARTHQUAKE DRAINS

2-13.1 DESCRIPTION

NOT FOR CONSTRUCTION

2-13.1(1) GENERAL

This work consists of requirements for soil improvement beneath the South Park Bridge approach structures using Earthquake Drains. This work consists of furnishing and placing vertical drains (Earthquake Drains) to a minimum depth of 60-feet below grade of the north embankment and to the top of the glaciomarine drift (as defined in Figure 3 of the Final Geotechnical Report) below the south embankment, in accordance with the Contract Drawings and this Section or as directed by the Engineer. The Earthquake Drain System, including spacing and size of drains, shall be designed by the Contractor. The top of the drains shall extend a minimum of 3-inches into a 12-inch-thick reservoir stone layer under the SEW approach structures. An elbow shall be attached to the top of each of the drains. The Earthquake Drain System shall be installed under entire SEW approach structures footprint and shall extend a minimum of 10-feet beyond the approach structure footprint on all sides as denoted on the Contract Drawings.

Provide all means as may be required to mitigate liquefaction with ground improvement for 975-year return period design level ground motions. Determine the existing site conditions and provide everything that may be necessary; including but not limited to specialized equipment, additional soils investigations, and all other additional means that is determined to be necessary to meet the requirements indicated. Grain size analyses and other geotechnical information about subsurface conditions underlying the project site are provided in the geotechnical report.

2-13.1(2) REFERENCES

The following reports are included as part of this Contract by Reference and are available from the Owner for review and use during this project as required, upon request.

Geotechnical Report, Phase II, South Park Bridge Project, by Shannon & Wilson, Inc., dated March 29, 2004.

Supplemental Geotechnical Data Report, South Park Bridge Project, King County, Washington, by Shannon & Wilson, Inc., dated April 6, 2009.

Supplemental Geotechnical Report, Final Design, South Park Bridge, King County Washington, by Shannon & Wilson, Inc., dated July 17, 2009,

2-13.1(3) SUBMITTALS

The Contractor shall submit a sample of the vertical drain for testing to the Engineer at least 21 days prior to installation. The sample of Earthquake Drain material shall be at least 2-feet long. At the same time, the Contractor shall submit details of the sequence and proposed method for installation, including equipment, of the earthquake drain to the Engineer for review. Review by the Engineer shall not relieve the Contractor of the responsibility to install Earthquake Drains in conformance with the Contract Drawings and this Section.

The Contractor shall submit a working drawing to the Engineer that shows planned locations of Earthquake Drains in conjunction with all existing utilities. The Contractor shall resolve any conflicts between the locations of Earthquake Drains and utilities prior to submission.

Prior to the installation of earthquake drains within the designated area, demonstrate that the equipment, method, and materials produce a satisfactory installation in accordance with this Section. The method statement shall include procedures that shall be used when working next to existing utilities and buildings so that they will not be damaged.

NOT FOR CONSTRUCTION

The Contractor shall submit qualifications to the Engineer showing the Specialty Contractor performing the work has a minimum of 3 years experience and a record documenting five recent, successful projects completed with specific application to these site conditions and improvement criteria. The Contractor shall provide references asserting this documentation upon request.

2-13.1(4) PRECONSTRUCTION CONFERENCE

An Earthquake Drains System preconstruction conference shall be held at leave 5 working days prior to the Contractor beginning any Earthquake Drain construction work at the site to discuss construction procedures, personnel, and equipment to be used, and other elements of the approved drain installation plan as specified in this section. Those attending shall include:

1. Representing the Contractor: The superintendent, on-site supervisors, and all foremen in charge of installing the drains.
2. Representing the Owner: The Engineer.

If the Contractor's key personnel change, or if the Contractor proposes a significant revision of the approved earthquake installation plan, an additional conference shall be held before any additional drain installation operations are performed.

2-13.2 MATERIALS

Earthquake drains shall consist of prefabricated corrugated plastic pipe materials with slot-type perforations encased by filter fabric conforming to the following requirements:

2-13.2(1) PIPE

The pipe shall have an annular-corrugated interior and exterior. Pipe shall be a minimum of 3-inch and maximum of 8-inch I.D., and shall meet the requirements of ASTM F 405. All pipe sizes shall also meet the requirements of SCS 806. Pipe material shall be high-density polyethylene (HDPE) meeting the requirements of ASTM D 3350, Cell Classification 324420C; or ASTM D 1248 Type III, Class C, Category 4, Grade P33. Pipe splices shall be made in a workmanlike manner, so as to assure concentricity and continuity of the pipe conduit.

2-13.2(2) FILTER FABRIC

The filter fabric sock shall be non-woven and made of thermally spun-bonded polypropylene with minimum weight of 3.9-oz/ft^2, maximum apparent opening size (AOS) of U.S. No. 70 (0.0083 in), minimum grab strength of 100-lbs, and shall be factory applied. The prefabricated vertical drain shall not be exposed to sunlight for more than 72 hours.

2-13.2(3) RESERVOIR STONE

The drainage layer shall consist of reservoir stone meeting the requirements for AASHTO Grading No.4 as specified in Section 9-03.1(4)C. A geotextile, such as Mirafi 140N or equivalent shall be installed underneath the reservoir stone layer.

2-13.3 CONSTRUCTION REQUIREMENTS

NOT FOR CONSTRUCTION

2-13.3(1) INSTALLATION

Install prefabricated vertical drains using a mandrel that shall be advanced through the soil to the required depth. The installation rig shall utilize a vibrator with an eccentric moment of at least 500-in-lbs. to apply vertical vibration to the mandrel during installation. The mandrel shall be fitted with three symmetrically spaced fins for transmitting vibrations to the soil during installation. At locations within 50-feet of the existing building and vibration sensitive facilities as indicated on the Plans, a mandrel without these fins shall be used. Attach suitable shoe or lost point to the bottom of the drain to provide an anchor for the drain and to cover the lower open end of the mandrel during penetration. The mandrel shall protect the drains and filter sock from tears, cuts, and abrasions during installation and shall be retracted after each drain is installed. Provide equipment capable of exerting at least 12-tons of vertical force (static crowd) to the mandrel to aid in forcing the mandrel into the ground.

A drain may be abandoned before reaching design penetration if the rate of mandrel movement is less than 3-inches per second with the full static force and maximum vibrator output. Falling weight impact hammers or jetting will not be allowed for installing vertical drains; however, limited amounts of water may be introduced into the mandrel to facilitate anchoring of the drains. Augering auger or other methods to loosen stiff upper soils prior to installation of the earthquake drains shall be permitted, provided such augering does not extend more than 2-feet into the underlying liquefiable soils.

Where obstructions are encountered which cannot be penetrated using normal and accepted procedures, complete the drain from the elevation of the obstruction to the work surface and notify the Engineer. At the direction of the Engineer, install a new drain within 18-inches of the obstructed drain. A maximum of two attempts shall be made, as directed by the Engineer, for each drain at no additional cost to the Owner.

Plumb equipment for installing vertical drains prior to installation of each drain. Drains shall not deviate from the vertical by more than 1-inch per foot during installation. Number and stake earthquake drain locations for review by the Engineer prior to start of installation. Take all reasonable precautions to preserve the stakes. The location of the drains shall not vary by more than 6-inches from locations indicated on the working drawings or as directed by the Engineer. Install drains to the limits of the ground improvement areas as shown on the Contract Drawings. Drains that are out of the proper location or damaged will be rejected. Rejected drains may be abandoned in place or removed at the Engineer's option without additional cost.

Observe precautions necessary for protection of instrumentation devices. After instrumentation devices have been installed, replace any equipment that is damaged or becomes unreliable as a result of Contractor negligence at no additional cost to the Owner.

Provide the Engineer with suitable means of determining the quantity of Earthquake Drains installed at each location and provide suitable means for the Engineer to determine the depth of the drain at any time.

Cut off drains 3-inches above the bottom of the reservoir stone under the structure and asphalt surfaces and at grade in other areas. Attach an elbow to the top of each drain. Prevent reservoir stone from entering the drain upon the subsequent backfilling of drain rock.

2-13.3(2) INSPECTION

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Each drain shall be inspected to verify that no blockage exists at the top of each drain.

Sampling and testing for gradation of "Reservoir Stone" will be performed for every 200-cubic yards of used material. Gradation test report shall be submitted within 24 hours of the completion of each test.

2-13.3(3) ACCEPTANCE CRITERIA

2-13.3(3)A MINIMUM CRITERIA

The completed earthquake drains system installation shall contain earthquake drains that are no less than the number, spacing, area of coverage, and depths of installation shown on the working drawings submitted and reviewed in accordance with this Section.

2-13.3(3)B ADDITIONAL CRITERIA

Other acceptance criteria shall be as directed by the Engineer.

2-13.3(4) DAILY LOGS

For each earthquake drain, the Contractor shall keep a record of the location and maximum penetration depth and record refusal and/or any unusual occurrences during installation. The Contractor shall submit a daily log to the Engineer which includes: recording drain number, start/finish time of probe, vibration equipment identification, and depth of installation.

2-13.4 MEASUREMENT

No unit of measure shall apply to lump sum price for Earthquake Drain Systems.

The “Earthquake Drains System” contains the following approximate quantities.

Item	Approximate Quantity
Structure Excavation Class B incl. Haul	3,920 CY
Streambed Cobbles	820 CY
Quarry Spalls	820 CY
Earthquake Drains	49,000 CY

The quantity is provided only for the convenience of the Contractor in determining the volume of work involved and is not guaranteed to be accurate. The prospective bidders shall verify the quantity before submitting a bid. No adjustments other than for approved changes will be made in the lump sum contract price for “Earthquake Drains System” even though the actual quantity may deviate from those listed.

2-13.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following:

1. “Earthquake Drains System", per lump sum.

The lump sum Contract price for “Earthquake Drains System” shall be full pay for all costs of furnishing the full length of drain material, installing the drain including excavation, backfilling, coordination, testing, cleanup, and permit fees, altering equipment and methods

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of installation in order produce the required end result in accordance with the Contract Drawings and as described in this Section, and shall also include the cost of furnishing all tools, materials, labor, and all other costs necessary to complete the work. No payment will be made for unacceptable drains or for any delays or expenses incurred through changes necessitated by improper or unacceptable material or equipment.

Add the following new Section:

(*****)

2-14 BRIDGE MONITORING

2-14.1 DESCRIPTION

2-14.1(1) GENERAL

This item of Work consists of furnishing, installing and maintaining monitoring of the existing South Park Bridge movements and vibrations during construction of the caisson cofferdams, temporary trestle and caissons. The Contractor shall continuously monitor existing bascule piers and the existing northern in-water approach span pier for settlement, translation and vibration from a period of time starting 21 calendar days prior to placement of the temporary construction trestle pipe piles or caisson cofferdams, whichever occurs first, through completion of the placement of the caisson caps.

2-14.1(2) INSTRUMMENTATION SPECIALIST

The Contractor shall perform all monitoring work described in this Special Provision, including procurement, under the direct supervision of an Instrumentation Specialist retained by the Contractor and approved by the Engineer. The Instrumentation Specialist may be an independent individual or employee of an engineering firm, testing laboratory, or similar organization, and shall not an employee of the Contractor. The Instrumentation Specialist shall have a minimum of five years experience designing, installing, and monitoring instrumentation systems similar to those described in this Section. Demonstrate experience by resume and references.

2-14.1(3) PROJECT CONDITIONS

Monitoring data shall become the property of the County and are not to be disclosed to third parties or published without written permission of the Engineer. Data developed shall be immediately available to the Engineer and Contractor. The County will attempt to procure access agreements to Boeing properties for the Contractor's personnel. Provide information as requested in order to satisfy Boeing's requests for information.

Delays in schedule due to damage to instruments or readout units or similar factors shall not constitute a basis for schedule or cost adjustments of any kind.

2-14.1(4) DEFINITIONS

Maximum Level: Maximum allowable value for a specific instrument.

Trigger Level: Intermediate value less than the Maximum Level for a specific instrument that serves as a trigger for additional consideration of construction activities to be implemented.

2-14.2 MATERIALS

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2-14.2(1) GENERAL

Verify all monitoring devices and equipment are the manufacturer's standard products without modifications.

Ensure all monitoring devices, except survey equipment, and others which cannot be readily automated, are fully compatible with the datalogger and associated software described in this Special Provision, without loss of accuracy or function.

Unless otherwise indicated, only use signal cables for instruments provided by the manufacturer of the associated instrument and suitable for the expected environment. Do not splice cables between the instrument and datalogger unless absolutely necessary.

2-14.2(2) TILT METERS

The Contractor shall provide a total of six tilt meters with two installed on each of the three piers. Install one title meter on the westerly face of each pier. Install one tilt meter on the southerly face of the north bascule pier and the northern in-water approach pier. Install one tilt meter on the northerly face of the south bascule pier. All tilt meters shall be mounted at the same elevation of approximately +20 feet.

Measurement requirements of the tilt meters shall be a minimum of: Resolution: 1 arc second, Range: ± 40 degrees, Repeatability: ± 3 arc seconds

Ancillary equipment shall include: signal cables, mounting brackets and anchors, other parts.

2-14.2(3) LASER TOTAL STATION SYSTEM

The contractor shall provide a laser total station system to monitor settlement and movement of three piers. The monitoring may require multiple laser total stations to satisfy the coverage requirements. Utilize a software program that will model the monitoring as discrete surfaces so that movements of multiple piers can be determined. The software shall be able to filter out erroneous data points due to construction activities and traffic. The software package and any assumptions required for this data reduction process shall be submitted to the Engineer for approval.

1. Range: Total station system shall have sufficient range to monitor pier movements.
2. Accuracy: The total station system shall be able to discern movements greater than 2 mm at any location within the area based upon the survey points modeled by the processing software. Written confirmation shall be submitted to the Engineer that the proposed laser total station system can achieve this level of accuracy given the locations of the total station(s), locations of the piers, and the modeling process.
3. The total station(s) installed for this system shall be able to triangulate their position based upon reference survey targets. These reference survey targets shall be installed as part of the laser total station system. The location of the reference survey targets shall be submitted to the Engineer for approval.
4. System Reporting: The laser total station system shall report deformations at the survey point as determined by the Engineer, to the Instrumentation Data Management System.
5. Time: The laser total station system shall be capable of reporting deformations for all of survey points in less than 2 hours.

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2-14.2(4) VIBRATION MONITOR

The Contractor shall monitor vibrations of both existing bascule piers during the construction activities identified with this Special Provision. A vibration recording device shall be placed on or within the existing bascule piers closest to the westerly face as practical. Monitor particle velocities to the nearest 0.01 inch per second and frequencies to the nearest 0.1 cycle per second.

2-14.2(5) DATA LOGGER

The Contractor shall provide a datalogger capable of reading all monitoring devices described in this Special Provision complete with input, output, signal conditioning, communications, and other hardware for a complete and functional system, including but not limited to: multiplexers, local input/output connection for laptop computer, and telephone modem. Mount the datalogger in a protective enclosure that will accommodate each manufacturer's enclosures for components of the system. Provide mounting posts, concrete, and other materials / equipment for the protective enclosure as required for complete, reliable, and durable system over the duration of monitoring. Provide a continuous, adequate power source free of voltage transient surges/sags for the data logger in accordance with the manufacturer's recommendations.

2-14.2(6) INSTRUMENT DATA MANAGEMENT SYSTEM

The Contractor shall provide an instrument data management system (IDMS) capable of comparing the output of each monitoring device, in engineering units, against Engineer-selected alarm limits, and electronically relaying hourly logged readings to the Engineer office, the County's office and third office located within 30 miles of the Project Site. At each of these locations, provide a visible (e.g., warning light) and audible alarm system to be actuated if the Trigger or Maximum Level Instrument Response Value for the particular instrument is exceeded. The Contractor shall provide that the alarm system have 24 hour connection to three pagers, to be assigned to the Contractor the Engineer and the Engineer's representative.

The IDMS shall be capable of storing and disseminating all data from monitoring devices associated with instruments described in this Special Provision. It shall be provide automated processing of the instrumentation data to convert readings into meaningful engineering units, displays graphs of instrumentation data, generates reports of monitoring data. Access to the information shall be controlled.

2-14.3 CONSTRUCTION REQUIREMENTS

2-14.3(1) GENERAL

Allow time for and include all instrumentation installation, monitoring, baseline readings, and associated work in the construction schedule.

Install all instrumentation complete and functional to the satisfaction of the Engineer. Replace unsatisfactory instrumentation or associated equipment at Contractor's expense.

Notify the Resident Engineer at least seven calendar days prior to the start of work.

The monitoring equipment shall remain the property of the Contractor and shall be removed from the Project upon completion of the monitoring activities.

The Contractor shall be responsible for safety during all instrument installation and monitoring activities. Conduct all instrumentation activities in accordance with applicable

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Federal, State, and local regulations and all project-specific health and safety plans. Where conflicting requirements are encountered, the most stringent shall apply.

2-14.3(2) INSTRUMENTATION INSTALLATION

The Contractor shall provide a schedule and outline of procedures and timing for installation of the monitoring devices. Provide a summary table for all instrument installations by number and location showing timing of installation, initial monitoring readings schedule. Provide manufacturer's descriptive literature, including technical specifications, for proposed instruments, manufacturer's literature on protective enclosures, detailed manufacturer's literature on installation procedures for each instrument, including cable and locations, and methods for protecting instruments during construction. Provide calibration certificates for each instrument. Verify calibration sheets, and include at a minimum the zero correction value, the gauge factor, temperature correction factor, and calibration data at the time of manufacture.

Provide Sample reports for each instrument type indicating:

6. Description of the instruments to be used.
7. Description of installation procedures.
8. Plan showing proposed instrumentation locations, locations of data loggers or computers, cable routing to data loggers or computers, communication systems (if used)
9. Schedule of Instrumentation Installation.

2-14.3(3) CALIBRATION

Calibrate all monitoring devices prior to installation,

Verify calibration results are within the tolerances for the particular instrument as listed on the manufacturer's standard published data sheet for that instrument. Monitoring devices with calibration results that do not fall within the specified tolerances will be rejected,

Recalibrate monitoring devices, readout units, and other equipment that is used for monitoring on an on-going basis at the manufacturer's recommended intervals, or whenever, in the opinion of the Engineer or the Contractor, there is reason to suspect that the associated data is being affected by calibration changes or errors.

Perform all calibration in accordance with the instrument manufacturer's recommended methods.

Ensure calibration equipment and standards are traceable to National Institute of Standards and Technology standards and are themselves in current calibration. Submit evidence of traceability and calibration of standards to the Engineer upon request.

Confirm proper function of all monitoring devices upon completion of installation.

Make readout units available to the Engineer to verify proper function and monitoring of instrumentation.

2-14.3(4) INSTALLATION SCHEDULE

Install all monitoring devices and make operational, with stable baseline readings prior to the start of the identified work.

Obtain at least 3 sets of baseline readings prior to the start of identified work activities.

Verify baseline readings agree to within the accuracy of the instrument.

Do not begin construction activities without written approval from the Engineer.

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Portable readout units may be used for testing instrument function prior to connection with datalogger and at other times as necessary. However, implement fully automated (datalogger) reading function prior to the start of construction of the associated feature.

2-14.3(5) PROTECTION

Provide at installation protective enclosures, plates, cable conduit, and other equipment as required to protect the instrumentation system from damage during construction.

The Contractor shall at own expense for repairing or replacing instruments or associated components that are damaged during construction, as directed by the Engineer.

Route all signal cables to the corresponding readout station inside of protective conduit.

2-14.3(6) MAINTENANCE

Maintain all instrumentation in accordance with manufacturer's recommended procedures and schedule, or as directed by the Engineer.

Replace damaged installations which are the result of the Contractor's operations immediately.

Report all damaged or non-functional instrumentation to the Engineer.

If an instrument is repaired, replaced, or moved subsequent to installation, record new: instrumentation type, as built location, and calibration sheets. Report to the Engineer the reason the original instrument was altered and the date the new instrument was operational.

2-14.3(7) INSTRUMENT MONITORING

The Contractor shall monitor the existing bridge in accordance with the following:

A. Initial Readings:
   1. Obtain initial readings from all instrumentation.
   2. Provide initial readings by conducting three separate and complete sets of readings on each instrument. Readings shall be taken with sufficient accuracy to produce similar results in each of the three readings.
   3. Submit data via electronic copies and paper copies from all other instrumentation within 24 hours after the readings are taken.

B. Baseline Readings,
C. Routine Monitoring Readings,
D. System Maintenance,
E. Action Level Values:
   1. Action Level values will be provided by the Engineer and may be altered during the course of construction by the Engineer.
   2. When monitoring data has exceeded the Action Level values implement the following procedures specified herein.
   3. Exceeding Action Level Values:
      a. Trigger Level: Verify measurement and notify the Engineer immediately after obtaining measurements that exceed the Trigger Level for that instrument. Double the frequency of monitoring devices until movements have stabilized or as

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directed by the Engineer. Implement procedures to limit further movements as directed by the Engineer.

b. Maximum Level: Verify measurements and notify the Engineer immediately after obtaining measurements that exceed the Maximum Level for that instrument. For all values exceeding those indicated, and depending on conditions, the Engineer may suspend construction activities.

2-14.3(7) SUBMITTALS

The Contractor shall submit to the Engineer for review and approval the following:

A. Instrumentation Installation and Monitoring Plan,

B. Qualifications of Instrumentation Specialist,

C. Within 5 working days after approval of each instrument type, two sets of operating manuals for each type of instrument, including read-out devices and appurtenant equipment required for a complete installation,

D. Within 5 working days after completion of installation of each instrument, submit location data,

E. Baseline values for each instrument posted electronically to the IDMS

F. Data obtained during the monitoring posted electronically to the IDMS.

2-14.4 MEASUREMENT

No unit of measure shall apply to the lump sum price for Bridge Monitoring

2-14.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for each of the following "Bridge Monitoring", lump sum.

The lump sum Contract price for "Bridge Monitoring" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the manufacture, fabrication, transportation, installation, commissioning, monitoring activities and maintenance of all bridge monitoring as shown and noted in the Plans and as required or inferred by these Special Provisions and in the Standard Specifications.

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DIVISION 5
SURFACE TREATMENTS AND PAVEMENTS

5-04 HOT MIX ASPHALT

5-04.2 MATERIALS

In reference to this section, the grade of paving asphalt shall be HMA Cl. ½" PG 64-22.

5-04.3(3) HOT MIX ASPHALT PAVERS

Section is supplemented with the following:

(*****)

For any course of hot mix asphalt (HMA) used in traffic lanes with a depth of 0.08 feet or greater the direct transfer of the HMA from the hauling equipment to the paving machine will not be allowed. A material transfer device or vehicle (MTD/V) shall be used to deliver the HMA from the hauling equipment to the paving machine.

The MTD/V shall mix the HMA after delivery by the hauling equipment but prior to laydown by the paving machine. Mixing of the HMA shall be sufficient to obtain a uniform temperature throughout the mixture. If a windrow elevator is used, the length of the windrow may be limited in urban areas or through intersections, at the discretion of the Engineer.

5-04.3(13) SURFACE SMOOTHNESS

The second sentence is deleted and replaced with the following:

(*****)

The completed surface of the wearing course shall not vary more than 1/4 inch from the lower edge of a 10-foot straightedge placed on the surface parallel to centerline.

Add the following new Section:

(*****)

5-04.3(11)A FEATHERING HOT MIX ASPHALT

Where directed by the Engineer, the Contractor shall feather the HMA in a manner to produce a smooth riding connection to the existing pavement.

After application of the tack coat of asphalt, the area of the feathered joint shall be preheated using hand torches. The preheating operation shall continue during the raking process to ensure a smooth and well bonded joint.

HMA, utilized in the construction of the feathered connection to the existing pavement, shall be modified at the Contractor's plant or the commercial source from which the Contractor obtains the mix or by raking the joint, thereby removing the larger coarse aggregate, to the satisfaction of the Engineer.

Transverse joints shall be sealed with PG 58-22 or an approved equivalent grade of asphalt as directed by the Engineer.

All costs and expenses in connection with providing, placing and feathering the HMA and sealing with PG 58-22 or an approved equivalent shall be included in the unit price per ton for "HMA Cl. 1/2"PG 64-22" and no additional compensation will be made.

5-04.3(14) PLANING BITUMINOUS PAVEMENT

The third paragraph is deleted and replaced with the following:

(*****)

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Planing shall be performed in a manner such that the underlying pavement is not torn, broken or otherwise injured by the planing operation. The surface of the underlying pavement shall be slightly grooved or roughened sufficiently to ensure a bond when overlaid. In existing single layer pavements, care shall be taken that the planing does not penetrate into the subgrade. The Engineer will determine the planing depth in these situations. The Contractor shall immediately remove from the project any worker who continuously and carelessly puncture the existing pavement with the planing equipment.

The fourth sentence of the fourth paragraph of this section is deleted and replaced with the following:

(*****)
Unless otherwise provided, the Contractor shall provide a waste site for the disposal of these materials as specified in Section 2-03.3(7)C.
Pavement shall be planed as designated in the Plans, or as directed by the Engineer.
The Contractor shall coordinate planing and paving operations so that no planed area is left unpaved for more than five working days. Planing of bridge approaches shall be done on the same day as paving, unless previously approved by the Engineer. When approval is granted by the Engineer to pre-plane bridge approaches, the Contractor shall place a paper joint asphalt wedge at the bridge approach. The wedge dimensions shall be as directed by the Engineer. Removal of the asphalt wedge for final paving shall occur within five working days. All costs for installing and removing the asphalt wedge shall be included in the unit price for planing bituminous pavement. Liquidated damages, in accordance with Section 1-08.9 of these specifications, will be deducted from monies due the Contractor for failure to pave the roadway after planing within the time specified.

Add the following new Section:

(*****)

5-04.3(22) HOT MIX ASPHALT FOR PRELEVELING

HMA shall be placed to prelevel the existing roadway as shown on the typical roadway sections in the Plans in accordance with Section 5-04.3(5) of the WSDOT Standard Specifications in those areas directed by the Engineer.
The prelevel material shall be placed on the roadway to restore the pavement grade and cross section by filling dips, sags, wheel ruts and distorted areas within the roadway limits to be paved. The existing average slope from centerline for the roadway section shall be maintained.
Preleveling will be performed only where directed by the Engineer.
All costs for furnishing materials, labor, tools and equipment to prelevel the existing roadway shall be included in the unit contract price per ton for “HMA Cl. ½” PG 64-22” and no additional compensation will be made.

5-04.4 MEASUREMENT

Section is supplemented with the following:

(September 5, 2006)
No specific unit of measurement will apply to the calculated item of asphalt cost price adjustment.

5-04.5 PAYMENT

NOT FOR CONSTRUCTION

Section is supplemented with the following:

(September 8, 2008)

ASPHALT COST PRICE ADJUSTMENT

The Contracting Agency will make an Asphalt Cost Price Adjustment, either a credit or a payment, for qualifying changes in the reference cost of asphalt binder. The adjustment will be applied to partial payments made according to Section 1-09.9 for the following bid items when they are included in the proposal:

"HMA Cl. ___ PG ___"
"HMA for Approach Cl. ___ PG ___"
"HMA for Preleveling Cl. ___ PG ___"
"HMA for Pavement Repair Cl. ___ PG ___"
"Commercial HMA"

The adjustment is not a guarantee of full compensation for changes in the cost of asphalt binder. The Contracting Agency does not guarantee that asphalt binder will be available at the reference cost.

The Contracting Agency will establish the asphalt binder reference cost twice each month and post the information on the Agency website at:

http://www.wsdot.wa.gov/biz/construction/AsphaltIndex.cfm.

The reference cost will be determined using posted prices furnished by Poten & Partners, Inc. If the selected price source ceases to be available for any reason, then the Contracting Agency will select a substitute price source to establish the reference cost.

The base cost established for this contract is the reference cost posted on the Agency website for the period immediately preceding the bid opening date.

Adjustments will be based on the most current reference cost for Western Washington or Eastern Washington as posted on the Agency website, depending on where the work is performed. For work completed after all authorized working days are used, the adjustment will be based on the posted reference cost during which contract time was exhausted. The adjustment will be calculated as follows:

No adjustment will be made if the reference cost is within 5% of the base cost.

If the reference cost is greater than or equal to 105% of the base cost, then
Adjustment = (Current Reference Cost – (1.05 x Base Cost)) x (Q x 0.056).

If the reference cost is less than or equal to 95% of the base cost, then
Adjustment = (Current Reference Cost – (0.95 x Base Cost)) x (Q x 0.056).

Where Q = total tons of all classes of HMA paid in the current month's progress payment.

"Asphalt Cost Price Adjustment", by calculation.

"Asphalt Cost Price Adjustment" will be calculated and paid for as described in this section. For the purpose of providing a common proposal for all bidders, the Contracting Agency has entered an amount in the proposal to become a part of the total bid by the Contractor.

5-05 CEMENT CONCRETE PAVEMENT

Add the following new Section:

*(***COS 5-05.3(8)¶1***)*

5-05.3(8) JOINTS

5-05.3(8)A GENERAL

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Transverse and longitudinal joints shall be contraction or through joints (including construction joints). Joints shall be constructed in accordance with Standard Plan no. 405 and shall be of the type and at the locations indicated on the Drawings. The faces of all joints shall be constructed perpendicular to the surface of the cement concrete pavement.

5-05.3(8)B CONTRACTION JOINTS

5-05.3(8)B1 FORMED CONTRACTION JOINTS

Formed contraction joints shall be constructed by embedding a ¼-inch thick premolded joint Material as indicated on Standard Plan no. 405. The depth of the formed joints shall be 1/3 of the pavement thickness. The filler shall be cut to the exact section of the joint. The length of the premolded joint filler shall extend to within 1/4-inch of any panel edge.

Transverse contraction joints (dummy joints) shall be placed after compaction and finishing of concrete have been completed and before initial set. A vertical groove shall be cut into the surface at the location of the joint, using a tool provided with stops (tee iron) to prevent cutting the groove deeper than the planned depth. The preformed joint Material shall then be embedded into the groove until the top is flush with the pavement surface, with a deviation of not more than 1/8-inch below the surface. The joint filler shall be perpendicular to the surface and always in a straight line.

After the joint filler has been embedded in the concrete, the surface of the pavement shall be finished against the filler strip with hand floats to restore the surface finish. While performing this operation, the filler strip shall be maintained in a perpendicular position, true to alignment. After finishing the entire area, the joint shall be true to grade, smooth and without irregularities.

The premolded joint filler may be omitted provided the joints are subsequently sawed in accordance with the provisions of Section 5-05.3(8)B2.

5-05.3(8)B2 SAWED CONTRACTION JOINTS

Sawed contraction joints shall be constructed by sawing a vertical groove in the hardened concrete on an approved schedule after placing and before development of random cracks in the concrete slab. The depth of sawcut shall be 1/3 the pavement thickness and shall not cut underlying pavement tie bars and dowel bars (see Standard Plan no. 405). Transverse contraction joints shall be sawed before the longitudinal joints are sawed. The first set of transverse joints shall be sawed at a maximum of 60 foot intervals, as soon as the cut can be made without undue raveling of concrete. Intermediate joints shall be sawed immediately following the first set of joints. The Contractor shall provide the Engineer a minimum 4 hours advance notice of sawcutting.

Any scheduling for the sawing of joints that results in premature or uncontrolled cracking shall be revised immediately by adjusting the time interval between placing of concrete and the sawing of joints. After the revised schedule has been accepted by the Engineer, the sawing shall proceed as a continuous operation until all joints have been completed.

Two or more sawing units may be required to accomplish the sawing in order to minimize random cracking. Standby equipment shall be on the job to ensure continuity of sawing regardless of any breakdown of equipment.

Where curing membrane is used, the area disturbed by sawing of joints shall be resprayed immediately upon completion of the sawing operation and care shall be exercised to prevent the curing compound from getting into the groove. Joint sealing compound shall not adhere to concrete if curing compound is present.

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The concrete saw shall be powered adequately to perform the required cutting. It shall cut a uniform groove to the required depth and not less than 3/16-inch nor more than 5/16-inch in width. The Contractor will be expected to so arrange the schedule of sawing joints, including initial sawing, at the required intervals so that every possible effort is made to control cracking by the use of judiciously spaced and timed sawed joints. In the event random cracks occur, they shall be repaired in accordance with Section 5-05.3(22). The Contractor shall provide at least one standby saw in good working order to insure continuous sawing as specified regardless of any breakdown of equipment. An ample supply of saw blades shall be maintained at the site of pavement construction at all times during sawing operations. The Contractor shall provide artificial lighting facilities for night sawing. All equipment required for sawing shall be at the pavement construction site both before and continuously during concrete placement. Sawing equipment shall be available immediately and continuously on a 24 hour basis, including Saturdays, Sundays and legal Holidays.

Damage to curing Material caused by sawing operations shall be repaired immediately after completion of sawing.

Formed transverse contraction joints shall be installed where designated by the Engineer, if necessary to prevent uncontrolled transverse cracks from occurring before the pavement can be sawed.

5-05.3(8)B3 SEALING SAWED CONTRACTION JOINTS

Sawed contraction joints shall be filled with a joint sealant filler conforming to the requirements of Section 9-04.2. Joints shall be thoroughly cleaned at the time of sealing. If hot-poured type sealant is used, the joints shall be dry. Care shall be taken to avoid air pockets. The hot-poured compound shall be applied in two or more layers, if deemed necessary by the Engineer. The cold-poured compound shall be applied under sufficient pressure to fill the groove from the bottom to a point approximately 1/4-inch below the surface of the concrete. The joint filled with cold-poured compound shall then be covered with a strip of nonabsorptive paper at least twice as wide as the joint. The paper shall be left in place.

If contraction joints are formed with plastic strips, sealing is not required.

Excess sealing Material shall be cleaned off the surface of the pavement before opening to traffic.

5-05.3(8)C THROUGH JOINTS

5-05.3(8)C1 EXPANSION JOINTS

Expansion joints are placed only where shown on the Drawings. The joint alignment shall be at right angles to the pavement structure centerline unless otherwise specified in the Contract.

Longitudinal expansion joints shall be placed where shown on the Drawings or where required for concrete

pavement between or along retaining walls, curbs or other structures .

Expansion joints shall be constructed with premolded Material, 3/4-inch in thickness, and conform to Section

9-04.1(2). They shall extend from 1 inch below the subgrade to 1 inch below the top of the pavement. Transverse

expansion joints shall extend the full width of pavement structure.

The joint Material shall be held accurately in place during the placing and finishing of the concrete by a bulkhead, a

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holder, a metal cap or any other approved method. The joint shall be perpendicular to the paved surface and the holder

shall be in place long enough to prevent sagging of the Material, especially on streets having steep grades.

In multiple lane construction, the joints shall be matched so as to form a continuous alignment across all lanes.

Expansion joints shall extend continuously through all curbs, special care being exercised to preserve alignment perpendicular to the pavement in the curb section.

A wood filler strip or metal cap shall be placed on the top of the premolded joint filler to form the groove 1 inch deep, and it shall remain in place until after the finishing and the concrete is sufficiently set to resist sloughing into the groove. The joint filler shall be stapled together at the ends to preserve continuity.

Immediately after removal of side forms, the edges of the pavement shall be carefully inspected and wherever the joint filler is not fully exposed, the concrete shall be chipped down until the edge of the filler is fully exposed for the entire depth.

5-05.3(8)C2 CONSTRUCTION JOINTS

All longitudinal construction joints shall be constructed with keyway and tie bars as detailed on COS Standard Plan no. 405. Along with keyway and tie bars, a thickened edge shall be required on pavements less than 9 inches in thickness for Type B joints, and less than 10 inches thickness for Type A joints.

Transverse construction joints formed by placing a header board transversely across the subgrade shall be made at the end of each day's paving or when placing of standard mixed concrete is discontinued for more than 60 minutes or when placing of high early strength concrete is discontinued for more than 30 minutes. The header board shall be located to conform to the spacing for the transverse contraction joints (or an expansion joint) and shall be left in place until the paving is resumed. If the location of the header board is to be a contraction joint, then the header shall have fastened to the concrete side a wedge-shaped strip of wood or preformed plastic to form a key in the concrete. Thickened edge shall be constructed at the construction joint header to provide ample depth of concrete above and below the keyway. For dowel bar requirements, see Section 5-05.3(10).

Where preformed contraction joints are used, the joint made by the construction joint header shall have a 2-inch strip of joint Material imbedded against the hardened concrete when paving is resumed.

5-05.3(8)C3 SEALING THROUGH JOINTS

After the pavement is cured, and before carrying any traffic, the space left by the removal of the wood filler strip or the metal cap above the top of the expansion joint filler strip shall be thoroughly cleaned of all loose material. The 3/4-inch wide groove shall be completely free of any projecting concrete from the sides and the groove shall be continuous across the slab to each edge. It shall then be filled level with the pavement surface with joint sealant meeting the requirements of Sections 9-04.2(2).

The joint sealant Material shall be heated and placed in accordance with the manufacturer's instructions. Burned Material will be rejected. The through joint groove shall be dry at the time of pouring the sealing compound.

5-05.3(8)D JOINT LOCATION

5-05.3(8)D1 TRANSVERSE JOINTS

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Standard spacing of transverse contraction joints along straight sections of pavement structures (between through expansion joints or between intersections or other irregular areas), shall be at intervals no greater than 15 feet across the full width of the pavement structure and at right angles to the center line of Traveled Way. Where the spacing between transverse through expansion joints or between intersections or other irregular areas are not in even multiples of 15 feet, the last several spaces approaching the expansion joint or header shall be varied by shortening the spaces. The Contractor shall give advance notice to the Engineer and coordinate the spacing. On horizontal curves, the joint spacing of 15 feet shall be measured along the outer edge of the outside lane and at right angles to the center line.

When paving adjacent to existing pavement or a previously paved lane, the new transverse joints shall be placed to match joint locations in the adjacent pavement. Where the existing joint spacing is greater than 15 feet, intermediate transverse joints shall be constructed. The Contractor shall give advance notice to the Engineer and coordinate the spacing.

For intersections and other irregular areas, the arrangement of contraction joints shall be in accordance with standard intersection patterns. The area of any one irregular panel formed by contraction joints in intersections shall not exceed 225 square feet and its greatest dimensions shall not exceed 15 feet. The Contractor shall give advance notice to the Engineer and coordinate the spacing.

Where uncontrolled cracks have appeared or exist in the adjacent lane, they shall be matched as nearly as possible by uniform transverse joints in the second lane. In the event uncontrolled cracks in the existing paved lane are too frequent or in random locations and impossible to match with a uniform spacing in the second lane, the two lanes shall be completely separated by 3/4-inch joint Material along the length of the joint from 1/8 inch below the surface to one inch below the bottom of the concrete being placed.

Where integral curb or doweled curb is placed along the concrete pavement, premolded joint filler Material shall be placed transversely across the full section of the curb in true alignment with the pavement joint, perpendicular to the pavement grade.

All joints in an intersection shall be considered transverse joints except those joints that terminate normal to the curb radii.

5-05.3(8)D2 LONGITUDINAL JOINTS

Standard locations for longitudinal joints for the following pavement widths, whether contraction or construction, shall be in accordance with the following table unless specified otherwise in the Contract.

Width Curb to Curb	Joint Locations
25 Feet	Center line
32 Feet	Center line and 10 feet each side of enter
36 Feet	Center line and 10 feet each side of center
40 Feet	Center line and 12 feet each side of center
44 Feet	Center line and 11 feet each side of center or match existing joint

In the event the roadway is divided into two lanes, the construction joints shall be located on the center line of the roadway. In separate lane construction, a joint filler 1/4-inch by 2 inches shall be placed between the two lanes when the second lane is constructed.

Add the following new Section:

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*(***COS 5-05.3(9)¶1***)*

5-05.3(9) CASTINGS AND STEEL REINFORCING BARS IN CONCRETE PAVEMENT

Reinforcing steel bars shall be used to reinforce concrete pavement and rigid base around [COS] Standard Plan nos. 230 and 361 castings except when the casting crosses or is less than 18 inches near any pavement joint. A casting 18 or fewer inches clear from any pavement joint shall have 2 squares of steel reinforcement (rebar) placed around the casting at mid-depth of the concrete pavement slab. No. 4 rebar shall be used to form the 2 separate squares with the squares rotated 45 degrees from each other. The clearance of any rebar from the casting shall be a minimum of 2 inches to a maximum of 6 inches. Each set of 4 rebars shall have rebar length such that each bar is lapped at each end with connecting bars with 3 inch overlap. In no case shall any rebar be within 3 inches of any pavement joint.

Add the following new Section:

*(***COS 5-05.3(10)¶1***)*

5-05.3(10)A DOWEL BARS

Dowel bars will be required in new pavement at all transverse joints of arterials, intersections, and bus and commercial non-arterials. The dowels shall be installed at the midpoint of the thickness of the pavement, parallel to the surface of the pavement and perpendicular to the transverse joint. The tolerances for placement shall be 6 1/8-inch. The size and spacing of dowel bars shall be as indicated on COS Standard Plan no. 405. The dowel bars shall be held in place during the placing and setting of the concrete. Dowel bars are not required between new pavement and existing pavement, unless otherwise indicated in the Contract. Joints normal to curb radii will not require dowel.

The dowels shall be installed by method of seating the dowels or by use of a dowel bar cage extended across the width of the transverse joint or by other methods approved by the Engineer. Dowel bars shall be coated with grease to prevent corrosion and dowel seizure. The grease coating on the dowel bars shall remain intact after installing and placing the concrete. Where dowel cages are used to support the dowels, the metal rod or wire ties used to hold the cage together during shipping shall be totally removed after the cage has been placed and secured to the base or subgrade and prior to the placement of the concrete Material.

Add the following new Section:

(*****)

5-05.3(10)B TIE BARS

Tie bars shall be placed at all longitudinal construction joints in accordance with COS Standard Plan no. 405. Tie bars are not normally required at longitudinal contraction joints or longitudinal joints between new and existing pavement unless otherwise indicated in the Contract. Tie bars shall be located at the required elevation and spacing shown on the Drawings and placed in such a manner that the vertical edge of the concrete is not deformed or damaged during placement of the bars. Joints normal to curb radii will not require dowel.

5-05.4 MEASUREMENT

Section is supplemented with the following:

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(*****)

Third and Fourth paragraphs are delete and replaced with the following:

Tiebars and dowels required for pavement and curbs, and reinforcing steel for castings will not be measured.

5-05.5 PAYMENT

Section is supplemented with the following:

(*****)

Third paragraph is deleted and replaced with the following:

The unit Contract price per cubic yard for "Cement Conc. Pavement" shall include saw cutting and sealing joints, furnishing and installing dowel and tie bars, including dowel and tie bars drilled into cement concrete pavement.

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DIVISION 6
STRUCTURES

6-01 GENERAL REQUIREMENTS FOR STRUCTURES

Section 6-01.5 is re-titled, and revised to read as follows:

6-01.5 WORK ACCESS AND TEMPORARY STRUCTURES

(BSP July 9, 2007)

WORK ACCESS

The Contractor shall provide, design, fabricate, construct, maintain and removal work access to accommodate all work within the Duwamish Waterway and from the shorelines to the Duwamish Waterway. The Contractor shall provide, construct and remove the work access in accordance with all environmental regulations and permits, including those specified in Sections 1-07.5 and 1-07.6.

The configuration and extent of the work access will be at the Contractor's option provided the access conforms to the requirements of the Contract Plans. The work access is anticipated to include, but not be limited to: temporary construction trestles, temporary demolition trestles, temporary navigation lighting, temporary noise attenuation piles and construction support provided by marine vessels.

SUBMITTALS

The Contractor shall submit working drawings and associated executable computer aided drafting (CAD) files of the work access to the Engineer for review and comment.

If the Contractor chooses an access alternative using a work trestle structure, the work access submittal shall include six sets of working drawings and two sets of design calculations prepared in accordance with Section 6-01.9. The Contractor shall design the work access structure to withstand all applicable loads in accordance with the Contractor's means and methods of construction and accepted design codes. The Contractor shall specify the design code(s) in the design calculations and working drawings.

The Contractor shall include information with the work access submittal on the construction equipment that will be utilized. The Contractor shall specify the type and model of construction equipment to be used, and shall include equipment catalogue cuts with capacities and geometry. The Contractor shall include anticipated wheel or track loads, axle spacings, outrigger geometry and reactions, crane pick angles and reach, and other equipment details.

(BSP July 9, 2007)

WATERWAY CLEARANCE REQUIREMENTS

The work access structures shall be configured to such that they provide 71 feet clear horizontal distance from the centerline of the navigation channel to the work access structure. The bottom of the superstructure of the work access structure shall be at elevation +10.0 or higher. All waterborne debris that accumulate against the work access structure shall be removed by the Contractor on a weekly basis or as specified by the Engineer.

(*****)

PAYMENT

Payment will be made in accordance with Section 1-04.1 for the following bid item:
"Work Access – Temporary Trestle", lump sum.

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The lump sum Contract price for "Work Access - Temporary Trestle" shall be full pay for all costs required for constructing temporary trestles, maintaining and repairing, and removing temporary trestles in accordance with the Contract Drawings. Work shall also include all temporary lighting on and around trestles, mitigation during trestle construction and use, including fabrication and utilization of a temporary noise attenuation pile (TNAP), and maintenance cleaning, and all other costs necessary to complete the work.

6-01.9 WORKING DRAWINGS

The first sentence of the first paragraph is deleted and replaced with the following:

(*****)
The Contractor shall submit supplemental drawings [six (6) copies] with calculations [one (1) copy] as required for the performance of the work.

The seventh and eighth sentences of the first paragraph are deleted and replaced with the following:

(*****)
Unless otherwise stated in the contract, the Engineer will require up to fourteen (14) calendar days from the date the submittals are received until they are sent to the Contractor. No additional contract time will be allowed for rejected submittals. Furthermore, the required Engineer's review time will increase if the drawings submitted do not meet the contract requirements or contain insufficient details, requiring further revisions and Engineer review. The Contractor's progress schedule shall be updated to reflect an accurate accounting of project time including the Engineer's review and any increased time due to rejected or insufficient submittals.
Add the following new sections

(*****)

6-01.10(A) FIBERGLASS CONDUIT ON BRIDGE

Description

The Contactor shall install two vacant 4-inch diameter fiberglass conduits and one vacant 2-inch diameter fiberglass conduit for future installation of fiber optic cable (by others) as shown in the Plans. Structural supports in the form of inserts in the bridge deck slab, hanger rods, nuts, rollers and bracings as shown on the plans shall be furnished and installed for the conduits.

Block outs and penetrations for all utility lines shall be constructed as shown in the Plans.

Materials

Fiberglass Conduit for Fiber Optic Cable

Conduit nominal wall thickness shall be increased from NEMA TC 14 to 0.25". Provide single expansion joint socket x spigot, without O-ring.

The Contractor shall provide a bridge hanger assembly every 20 feet. Bridge hanger assembly shall consist of female anchors, with 3/4" 10NC threads, threaded support rods made from hot dip galvanized steel, stainless steel 304, or stainless steel 316, 2" x 1/2" flatbar and 1" OD fiberglass spacer tube. Provide nuts, washers, and flatwashers made from

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hot dip galvanized steel, stainless steel 304, or stainless steel 316. Hangers and supports shall be supplied by conduit manufacturer.

Construction Requirements

Fiberglass Conduit Installation

This work shall consist of furnishing and installing conduit and conduit hangers. The Contractor shall furnish and install all materials to construct two 4-inch diameter fiberglass conduits and one 2-inch conduit as shown in the Plans, including the concrete inserts, pipe hangers, pipe support assemblies, and utility markers.

Measurement

The lump sum bid item "Fiber Optic Conduit" Installation of 4 In. Diam. Fiberglass Conduit" contains the following approximate quantities of materials and work:

Item	Quantity	Unit
4-inch Fiberglass Pipe	XX	LF
2-inch Fiberglass Pipe	XX	LF
Expansion Coupling	X	EA
Pipe Hanger	X	EA
Concrete Inserts	X	EA

Payment

All costs in connection with constructing a Fiber Optic Conduit fiberglass electrical conduit on and through the superstructure of the South Park Bridge as shown in the Plans, including all concrete inserts, conduits, hangers, penetrations, and block outs shall be included in the lump sum item "Fiber Optic Conduit".

6-01.10(B) UTILITIES ON BRIDGE

Description

The Contactor shall install five (5) rows of utility hangers and the attached concrete inserts for the following utilities on the South Approach Span: two for 12-inch diameter storm drains, one for a 6-inch diameter sewer line, one for an 8-inch diameter insulated fire protection and 1 ¼-inch insulated water line, and one for a conduit cluster of two 4-inch diameter and one 2-inch diameter conduits as shown in the Plans. Structural supports in the form of inserts in the bridge deck slab, hanger rods, nuts, rollers and bracings as shown on the plans shall be furnished and installed for those utilities on the bridge deck.

The Contactor shall install five (5) rows of utility hangers and the attached concrete inserts for the following utilities on the North Approach Span: two for 12-inch diameter storm drains, one for a 6-inch diameter sewer line, one for an 8-inch diameter insulated fire protection and 1 ¼-inch insulated water line, and one for a conduit cluster consisting of two 4-inch diameter, two 3-inch diameter and one 2-inch diameter conduits as shown in the Plans. Structural supports in the form of inserts in the bridge deck slab, hanger rods, nuts, rollers and bracings as shown on the plans shall be furnished and installed for those utilities on the bridge deck.

The Contactor shall install steel pipe sleeve in the penetrations at the bridge abutments as shown in the Plans. Block outs and penetrations for all utility lines on the South Park Approach Spans shall be constructed as shown in the Plans.

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Materials

All materials shall be new, free from defects, of current manufacture, and of the quality specified or shown.

Inserts and Hanger Assemblies for Utilities on the Bridge

Inserts shall be of the type and model specified in the Plans. Inserts shall be galvanized in accordance with AASHTO M 111.

Steel bars, plates, and shapes shall conform to AASHTO M 270, Grade 36 and shall be galvanized in accordance with AASHTO M 111.

Horizontal strut bolts, and associated nuts and washers, shall conform to Section 9-06.5(3), and shall be galvanized in accordance with AASHTO M 232.

Pre-formed fabric pads shall be composed of multiple layers of duck, impregnated and bound with high quality oil resistant synthetic rubber, compressed into resilient pads of uniform thickness. The duck shall be of highest quality cotton or cotton-polyester 50-50 blend, and shall weigh a minimum of eight ounces per square yard. The cotton warp and the filling yarn shall be 2-ply. The cotton-polyester warp and fill shall be single yarn, with a minimum breaking strength by grab method of 150 pounds per inch per width (piw) warp, and 140 piw fill. The filling count of the duck shall be 40± 2 threads per inch and the warp count shall be 50± 1 thread per inch. The number of piles shall be sufficient to produce the specified thickness, after compression and vulcanizing.

The finished pads shall withstand compression loads perpendicular to the plane of the laminations of not less than 10,000 psi without any sign of failure after the load is removed. Failure is defined as any breakdown of the component materials or laminations. Pre-formed fabric pads shall have a shore A hardness of 90+5.

Pre-formed fabric pads for bridge utility supports will be accepted based on the manufacturer's certificate of compliance that the material furnished conforms to these specifications. The Contractor shall submit the manufacturer's certificate of compliance to the Engineer in accordance with Section 1-06.3.

Steel Pipe Sleeves

The 18-inch, 14-inch, 12-inch and 10-inch diameter steel casings shall be of 5/16-inch thick wall steel pipe. Steel casing material shall conform to AWWA C-200, or ASTM A 53, and coating shall comply with AWWA C-204.

Construction Requirements

The Contractor shall furnish and install the bridge utility supports, and conduit pipe as shown in the Plans.

Storm Drain Lines Installation

This work shall consist of furnishing and installing the pipe hangers for 12-inch diameter storm drain lines and 18-inch steel pipe sleeves in the penetrations at the bridge abutments shown in the Plans, including, but not limited to the concrete inserts, pipe hangers, expansion joints, and vaults.

Any part of work not specifically covered by these specifications shall be in accordance with applicable sections of the Standard Specifications.

Fire Protection Lines and Water Service Lines Installation

This work shall consist of furnishing and installing the pipe hangers for insulated 8-inch fire protection and 1 1/4-inch water service lines and 14-inch steel pipe sleeves in the

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penetrations at the bridge abutments shown in the Plans, including, but not limited to the concrete inserts, pipe hangers, expansion joints, and vaults.

Any part of work not specifically covered by these specifications shall be in accordance with applicable sections of the Standard Specifications.

Sewer Lines Installation

This work shall consist of furnishing and installing 6-inch pipe hangers and 10-inch steel pipe sleeves in the penetrations at the bridge abutments shown in the Plans, including, but not limited to the concrete inserts, pipe hangers, expansion joints, and vaults.

Any part of work not specifically covered by these specifications shall be in accordance with applicable sections of the Standard Specifications.

Utility Conduit Installation on South Approach Span Bridge Deck

This work shall consist of furnishing and installing conduits, conduit hangers and steel pipe sleeve at Abutment 1. The Contractor shall install all materials to construct one line of hangers to support two 4-inch diameter and one 2-inch diameter conduits as shown in the Plans, including the concrete inserts, pipe hangers, and pipe support assemblies.

The Contractor shall furnish and install a 12-inch steel pipe sleeves in the penetrations at the bridge abutment shown in the Plans

Utility Conduit Installation on North Approach Span Bridge Deck

This work shall consist of furnishing and installing conduits, conduit hangers and steel pipe sleeve at Abutment 6. The Contractor shall install all materials to construct one line of hangers to support two 4-inch, two 3-inch, and one 2-inch diameter conduits as shown in the Plans, including the concrete inserts, pipe hangers, and pipe support assemblies.

The contractor shall furnish and install a 14-inch steel pipe sleeves in the penetrations at the bridge abutment shown in the Plans

Measurement

For the purpose of payment, the installation of the pipe hangers, concrete inserts, and steel pipe will not be measured, and the payment for all work necessary to complete the items for an accepted quantity of the supports for utilities on the bridges including furnishing and installing the utility support hangers, inserts and pipe sleeves will be included in "Superstructure-_____Approach Span," lump sum.

The installation of utility supports and steel pipe sleeves on the South Approach Bridge contains the following approximate quantities of materials and work:

Item	Quantity	Unit
Pipe Hanger For 12" Diam. SD Line	70	EA
Pipe Hanger For 8" Diam. Fire Protection Line	54	EA
Pipe Hanger For 6" Diam. Sewer Line	37	EA
Pipe Hanger For 2-4", 2-3", and 1-2" Diam. Conduit Cluster	54	EA
Concrete Inserts	430	EA
18" Diam. Steel Pipe Sleeve	2	EA
14" Diam. Steel Pipe Sleeve	1	EA
12" Diam. Steel Pipe Sleeve	1	EA

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10” Diam. Steel Pipe Sleeve	1	EA

The installation of utility supports and steel pipe sleeves on the North Approach Bridge contains the following approximate quantities of materials and work:

Item	Quantity	Unit
Pipe Hanger for 12” Diam. SD Line	70	EA
Pipe Hanger for 8” Diam. Fire Protection Line	54	EA
Pipe Hanger for 6” Diam. Sewer Line	37	EA
Pipe Hanger for 2-4” Diam. and 1-2” Diam. Conduit Cluster	54	EA
Concrete Inserts	430	EA
18” Diam. Steel Pipe Sleeve	2	EA
14” Diam. Steel Pipe Sleeve	2	EA
10” Diam. Steel Pipe Sleeve	1	EA

The quantities are listed only for the convenience of the Contractor in determining the work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid.

Payment

All work for block outs, penetrations, inserts, and hanger assemblies for utilities and conduit installation within the bridge limits shall be considered incidental to the lump sum contract prices for the related items for “Superstructure- _____ Approach Span,” and no additional compensation will be made.

No additional compensation will be made by reason of any delay or other expense to the Contractor caused by coordination with the utility company or by installing utility company furnished items. Any unavoidable delays to the Contractor caused by coordination with the utility company or resulting from installing utility company furnished items will be addressed in accordance with Section 1-08.8.

6-01.11 NAME PLATES

Section is deleted and replaced with the following:

(*****)

This work shall consist of furnishing and placing a bronze plaque in the bridge as directed by the Engineer.

Bronze shall be the best commercial quality, gold architectural bronze.

Working drawings shall be submitted to the Engineer showing dimensions, details of construction, arrangement, size and spacing of lettering and method of installation. Prior to casting, a full size proof rubbing shall be submitted to the Engineer for final checking and approval.

Border shall be a raised, rectangular pattern approximately 1/2-inch in width. Background shall be oxidized to a tablet dark color. Surfaces of lettering and border and exterior edge of

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border shall be machined smooth and finished to a stain or brushed finish. Letters shall be individually hand chased to obtain a crisp outline.

Mounting shall be with blind studs threaded into the bases on the back side of the plaque. Studs shall be anchored into pre-formed or drilled holes in the concrete by means of quick setting cement. The plaque shall be mounted on the east wall of the Control Tower on Pier 4 as indicated on the Plans and as directed by the Engineer. Mount the plate such that it is centered 54 inches above the walkway and within a concrete border frame with 1/2 inch chamfers that is flush with the brick facing. Provide 3/8 inch clear between the concrete border and the name plate. The rim of the name plate shall be flush with the concrete border frame.

The bronze plaque shall contain the following information:

SOUTH PARK BRIDGE #3179

KING COUNTY

Department of Transportation

Road Services Division

_____, King County Executive

_____, King County Council Member

HNTB Corporation, Designer

(Contractor's Name), Contractor

Date Built: October 2011

Dimensions may vary from 12" x 14" to facilitate the arrangement of the lettering, provided that plaque height does not differ by more than -5% or +25% from 10", and plaque width does not differ by more than -5% or +25% from 8".

Payment: All costs for furnishing and placing the bronze plaque in the bridge shall be considered incidental to and included in the lump sum contract price for "Superstructure – Bascule Pier."

6-02 CONCRETE STRUCTURES

(June 26, 2000)

Compression Seal Expansion Joint System

Compression seal glands shall be selected from the approved products listed in the WSDOT Qualified Products List, latest edition, and sized as appropriate for the compression seal expansion joints shown in the Plans.

(BSP April 7, 2008)

High-Load Elastomeric Bearing Pad Assembly

High-load elastomeric bearing pads shall meet all Level I and Level II acceptance criteria as specified in AASHTO M 251.

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The Contractor shall perform a Long Duration Compression Load test on high-load elastomeric bearing pads randomly selected from each size and material batch of the production bearings. The Contractor shall test one bearing per lot, minimum, where one lot is defined as ten percent of the total number of production bearings in each size and material batch. The Long Duration Compression Load test shall be as specified in Sections 18.2.5.6 and 18.2.5.7 of the AASHTO LRFD Bridge Construction Specifications, current edition and latest interims. The Contractor shall submit the test results to the Engineer for approval.

If one of the test bearings fails, all of the bearings of that lot shall be rejected, unless the Contractor elects to test each bearing of the lot, at no additional expense to the Contracting Agency. In lieu of this procedure, the Engineer may require the Contractor to test all bearings of the lot.

Steel bars, plates, and shapes, shall conform to ASTM A 36.

Silicone grease shall conform to US Navy QPL AS8660-2.

Epoxy gel shall conform to Section 9-26.1, Type I, Grade 3, Class A, B, or C.

Bolts shall conform to Section 9-06.5(3).

(June 26, 2000)

Bridge Supported Utilities

Inserts shall be of the type and model specified in the Plans. Inserts shall be galvanized in accordance with AASHTO M 111.

(April 30, 2001)

Hanger rods, and associated nuts and washers, shall conform to Section 9-06.5(1), and shall be galvanized in accordance with AASHTO M 232.

Steel bars and plates shall conform to ASTM A 36 and shall be galvanized in accordance with AASHTO M 111.

(*****)

Pigmented Sealer

The pigmented sealer shall be a semi-opaque colored toner containing only methyl methacrylate-ethyl acrylate copolymer resins, toning pigments suspended in solution at all times by a chemical suspension agent, and solvent. Toning pigments shall be laminar silicates, titanium dioxide and inorganic oxides only. There shall be no settling or color variation. Use of vegetable or marine oils, paraffin materials, stearates or organic pigments in any part of coating formulation will not be permitted.

The color of pigmented sealers to be applied to shall match that described in the plans.

The pigmented sealer shall be selected from the approved products listed in the WSDOT Qualified Products List, latest edition.

6-02.3 CONSTRUCTION REQUIREMENTS

Section is supplemented with the following:

(June 26, 2000)

Bridge Supported Utilities

The Contractor shall furnish and install inserts for the bridge utility supports as shown in the Plans. The Contractor shall verify that the hanger rods freely hang plumb in their inserts, and shall make adjustments to the inserts as necessary and as approved by the Engineer prior to utility installation.

(June 26, 2000)

The Contractor shall furnish and install the bridge utility supports, and the utility pipe or conduit pipe, as shown in the Plans.

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(June 26, 2000)
The Comcast or Qwest will furnish material for and install communication lines in the 2-inch conduit that is part of the 3-Conduit Duct Bank and the 5-Conduit Duct Bank.
The Contractor shall notify the utility company a sufficient time in advance and shall cooperate with the utility company in order that the utility furnished items may be installed in the structure prior to bridge opening to vehicular traffic.

6-02.3(2) PROPORTIONING MATERIALS

Section is supplemented with the following:

(*****)
Concrete Mixes Incorporating Fly Ash: The incorporation of fly ash into all concrete mixes used in this project shall be considered by the Contractor in accordance with the guidelines set forth in Chapter 10.16080 of the King County Code (KCC).

NOTE: The KCC may be examined at the Map and Information Counter, Department of Transportation, 1st Floor, 201 South Jackson Street, Seattle, Washington 98104-3856.

6-02.3(5)D TEST METHODS

Section is supplemented with the following:

(*****)
The Contractor shall provide sufficient curing boxes to protect all concrete test cylinders made in the field in accordance with the requirements of WSDOT FOP for AASHTO T 23. The cure box may be either a box that is field fabricated by the Contractor or a commercially available ice chest. Field fabricated cure boxes shall have a minimum 2-inch thick styrofoam insulation on all sides with an exterior made from ¾-inch plywood (minimum) or other suitable material to prevent damage to the insulation. The cure box/ice chest shall maintain the temperature of the test specimen(s) between 16°C and 27°C (60°F to 80°F). The cure box/ice chest shall be large enough to hold at least six (6) 6-inch x 12-inch concrete test cylinders. All costs for providing the cure boxes shall be included in the various items in the contract and no additional compensation will be made.

Add the following new Section:

(*****)

6-02.3(6)E MASS CONCRETE

Concrete components of the caissons, columns of Piers 2 and 5 and those portions of the bascule pier walls and caisson cap with a thickness of 3 feet or greater shall be considered Mass Concrete and the following additional requirements shall apply.
Cement complying with AASHTO M85 Type II shall be used, provided that the specified temperature limitations are met. However, the Contractor is allowed the option of using Type II low heat in lieu of Type II. Temperature of concrete at time of placement and measured at the point of discharge is limited to a maximum of 60 °F.
A combination of the mix design, components in the mix, methods of pre cooling and post cooling, if employed, and surface insulation, if used, shall limit the maximum concrete temperature and also the maximum temperature differential between any points in the

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interior of the concrete element and any surface of the concrete element, thereby preventing cracking.

During the period following placing concrete, the temperature differential between interior and surface shall be limited to a maximum of 45 °F; and the concrete peak temperature shall be limited to a maximum of 160 °F.

Mix designs shall achieve the required design strength without the changes in cement type and content.

Pre cooling may be used to prevent excessive heat build-up caused by heat of hydration. Acceptable means include use of chilled water; providing some mixing water in the form of chipped, shaved, or flaked ice; cooling the aggregate; and cooling the mix with liquid nitrogen prior to placing. Ice shall be completely melted in the mix prior to concrete arrival at the job site.

Post cooling is acceptable if feasible within the parameters of the construction schedule. Piping within concrete shall be non metallic and the system shall be submitted for review of the Engineer.

Regardless of methods used, install temperature sensing devices within the concrete in each placement as specified in Construction Methods of this Section. The devices shall operate in the range of 32 °F to 212 °F with an accuracy of ±2 °F. The temperatures shall be recorded automatically by an approved data logger or strip chart recorder furnished by the Contractor. Connect sensing devices with armor sheathed wire. Transmit data to the Engineer daily.

Provide adequate concrete delivery and suitable equipment to accomplish mass concrete placements without segregation and without formation of cold joints.

Submit a Work Plan for Mass Concrete at the same time that mix designs are submitted. Include the following:

1. Mass concrete mix designs, with pertinent data pertaining to each ingredient, shall be submitted to the Engineer for review. Mix designs shall be verified by laboratory testing data. Final approval of the actual mix design shall be required by the Engineer prior to placing any concrete.
2. Temperature of Mass Concrete: The Contractor shall submit to the Engineer along with each mix design an analysis of the anticipated thermal and strength developments in the concrete using his/her proposed placing procedures and materials and a detailed plan indicating how temperature restrictions are to be achieved. State whether low heat cement is to be used. List anticipated temperatures that can be verified at the temperature sensor locations specified in the Construction Methods in this special provision. If cooling pipes are proposed, submit drawings and equipment data.

   Analysis shall include heat of hydration analysis for the cement; concrete strength tests; adiabatic heat signature (AHS) tests on 6 inch by 12 inch concrete cylinders; and simulation studies indicating the rate and extent of concrete temperatures, maturity and strength developed under the anticipated weather conditions, mix design, placing procedures, placing temperatures and curing methods to be used. Software and hardware required for the simulation studies shall be submitted for review by the Engineer.
3. A sketch of the proposed placement limits and volumes.
4. Furnish mass concrete temperature records.

Placement

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Notify the Resident Engineer at least 48 hours prior to placement for each Mass Concrete pour.

Each lift of a placement of mass concrete shall be as indicated in the approved Contractor's submittal. The joints between successive lifts shall be bonded as directed by the Engineer. However curing and protection procedures described below shall be followed on each lift of placement.

Install two independent sets of three temperature sensors (total of six sensors at each location) prior to each placement of mass concrete. Install the sensors at the locations approved by the Engineer and adjusted where necessary to avoid reinforcing steel, cooling pipes (if used), and similar items.

Install each set so that one sensor is located 2 inches below the a surface of the concrete, one sensor is located 2 inches above the opposite surface of the concrete, and the third sensor is located midway between the first and second sensor. All 3 sensors in each set shall be aligned vertically. In elevation view, locate one set at the center of the placement, and the second set 2 feet from the edge of the concrete pour.

Furnish to the Engineer 8½ inch x 11 inch record sketches showing dimensioned temperature sensor locations in plan and section.

Curing and Protection of Concrete

Do not cure mass concrete with cold water that would cause the temperature differential to exceed that identified above. If the weather becomes inclement, protect the placement from excessive water from rain or snow.

Sheet curing materials shall be in accordance with Section 9-23.1. Place insulation blankets on top of the polyethylene sheets. No subsequent application of water is required provided the cover and insulation are kept tightly in place for the curing period.

Acceptance Requirements

In addition to the acceptance requirements of Section 6-02.3(5), provide temperature records documenting that temperatures do not exceed specified limits during mass concrete placement. Record internal and surface temperatures hourly until all of the following conditions are met:

1. Internal concrete temperature has dropped to less than 90 percent of the maximum recorded.
2. It can be confirmed that specified limits are not exceeded and internal concrete temperature remains within 40 degrees F of the surface concrete temp.
3. Cooling trend indicates internal and surface concrete temperatures are converging.

Add the following new Section:

(*****)

6-02.3(6)F <u>CLASS 4000HW CONCRETE (COUNTERWEIGHT CONCRETE)</u>

Class 4000HW concrete shall be placed in the bascule span counterweights as depicted in the Contract Drawings. Class 4000HW Concrete shall consist of Class 4000 concrete matrix and shall contain steel punchings, scrap metal, billet steel, or other approved materials to achieve the average 28-day air dry unit weight specified on the Contract Plans or modified by the Contractor's balance calculations. Supplemental materials used to obtain the desired

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unit weight shall be uniformly distributed throughout the counterweight, shall be clean and free of oil or grease, and shall not be galvanized or coated with other materials.

The Contractor shall prepare calculations showing required dimensions and weight of the counterweight based on center-of-gravity calculations as specified in Section 6-20. The calculations shall be submitted to the Engineer for review. The calculations shall include summarized tabulations showing for each material the total quantity, estimated unit weight, and total weight. These estimates shall be revised based on the shipping weights of the steel. The supplemental summarized tabulations shall be submitted to the Engineer.

Before preparing the balance calculations, the Contractor shall cast five (5) test blocks of the Class 4000HW concrete to be used in the counterweights. The test blocks shall measure 2 feet by 2 feet by 2 feet. The test blocks shall be accurately measured and weighed immediately after casting and again 28 days later to determine the net weight of the concrete test blocks. From these measurements, the Contractor shall accurately calculate the density of the Class 4000HW concrete. Test blocks shall be made and cured as specified for permanent concrete. If test blocks exhibit a tendency to swell, the concrete shall be rejected.

The density of concrete actually placed in the counterweight shall be verified by means of additional test blocks made at intervals during the placement of the concrete for the counterweight. Each block shall be weighed promptly after being made and the weight compared to the original test blocks to estimate the resulting density when cured and seasoned, and the need for adjusting the total volume of concrete to be placed in the counterweight.

Placement

Notify the Engineer at least 48 hours prior to actual placement for each Class 4000HW Concrete pour.

Acceptance Requirements

Acceptance will be based on the requirements of Section 6-02.3(5), supplemented by the requirements of Section 6-02.3(6)E.

Add the following new Section:

(*****)

6-02.3(6)G <u>CONCRETE CLASS 4000LW (LIGHTWEIGHT CONCRETE)</u>

Concrete Class 4000LW shall be used for the bridge deck and sidewalk of the moveable bascule leaves.

The Contractor shall design the concrete mixture and determining the proportions of cement, fine aggregate, coarse aggregate, water and air-entraining admixture which will produce a workable sand-lightweight concrete mix meeting the following criteria:

28 Day Air Dry Unit Weight (max.):	115 pounds per cubic foot, determined in accordance with ASTM C567
28 Day Compressive Strength (min.):	4000 psi
Slump:	2 inch +/- 1 inch (AASHTO T119)
Air Content:	6% +/- 1/2% (ASTM C173)
Cement Content (min.):	650 lbs. per cubic yard

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The sand-lightweight concrete shall be proportioned by weight. It shall be designed and proportioned in accordance with the applicable requirements of ACI publications 211.2, “Standard Practice for Selecting Proportions for Structural Lightweight Concrete" and 213R, "Guide for Structural Lightweight-Aggregate Concrete". Lightweight aggregate shall meet the requirements of ASTM C330

The Class 4000LW concrete mix shall be designed by a testing laboratory, approved by the Department, retained by the Contractor and at the Contractor's expense.

The Contractor shall cast 5 test blocks of the Class 4000LW concrete to be used in the roadway decks. The test blocks shall measure 2 feet by 2 feet by 2 feet. The test blocks shall be accurately measured and weighed immediately after casting and again 28 days later to determine the net weight of the concrete test blocks. From these measurements, the Contractor shall accurately calculate the density of the Class 4000LW concrete. Test blocks shall be made and cured as specified for permanent concrete.

The density of concrete actually placed in the roadway/sidewalk deck shall be verified by means of additional test blocks made at intervals during the placement of the concrete for the roadway/sidewalk decks. Each block shall be weighed promptly after being made and the weight compared to the original test blocks to estimate the resulting density when cured and seasoned, and the need for adjusting the total volume of concrete to be placed in the counterweight and/or balance plates.

The design mix, along with all the test block results shall be submitted to the Engineer for approval of the mix design.

All Class 4000LW concrete shall have good workability and other properties such that proper placement, consolidation, and finishing are obtained. Lightweight aggregates and sand shall be batched by weight.

Class 4000LW concrete shall be placed, finished, cured and protected. It shall be consolidated with vibrators taking care to provide uniform consolidation without over-vibration.

The manufacturer of the Class 4000LW concrete aggregate shall supply a technical representative at the site for the first day of lightweight concrete placement operations. The representative shall be responsible to assist the Contractor and the Engineer in the control of lightweight concrete mixing and placement operations.

A technical report shall be submitted to the Engineer, by the lightweight aggregate manufacturer, regarding any observations or test results relative to the concreting practices at the work site.

No lightweight concrete shall be placed when the temperature of the concrete mixture is 90 °F, or greater. Also, no placement will be allowed if weather forecasts indicate that air temperatures of 100 °F, or greater, will occur within 4 hours of the proposed placement time.

In order to maintain a record of the strength gain of all sand-lightweight concrete placed, the Engineer will make standard size concrete test cylinders for compressive strength and other

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tests of the concrete used during the course of construction. The Contractor shall provide the concrete and molds for the test cylinders, shall be responsible for handling and protection of the cylinders on the job site, and shall arrange for delivery of the cylinders to the laboratory designated by the Engineer.

The cylinders will be made and cured in accordance with the requirements of ASTM C31. In general, one set of cylinders will be made for each 50 cubic yards, or fraction thereof, placed each day and/or as directed by the Engineer. Each set shall consist of six cylinders. Two cylinders of each set will be tested at 3 days for the purpose of determining whether or not the concrete represented by the cylinders has acquired sufficient strength to safely support its own dead weight and any loads that may be imposed thereon; two cylinders of each set will be tested at 7 days and the remaining two at 28 days.

If the results of a seven-day cylinder test indicate that the concrete may not develop the minimum 28-day strength specified, the Engineer reserves the right to order the Contractor to immediately core the portion of the concrete structure represented by that cylinder for testing purposes. The coring shall be made of the size and at locations ordered by the Engineer. If the results of the core tests indicate that strength is not sufficient to produce a satisfactory strength at 28 days, the portion of the concrete structure represented by the core, as delineated by the Engineer, shall be removed, disposed of, and replaced with new construction as directed by the Engineer. If the results of the core tests indicate, in the sole opinion of the Engineer, that satisfactory 28-day strength may yet be realized, possible rejection of the concrete in question will be deferred until the 28-day cylinders are tested. If a 28-day cylinder breaks at a strength below the required value, the Engineer reserves the right to immediately reject the concrete represented by the cylinder, ordering such construction removed and replaced within designated limits, or he/she may permit the Contractor to perform additional coring. If additional coring is permitted, the Engineer will either accept or reject the concrete represented on the basis of the 28-day core tests and all previous tests. The Engineer's decision in these cases shall be final and conclusive. Methods of removal and replacement of the defective concrete shall be of the Contractor's option, subject to the approval of the Engineer.

Core holes in concrete work that is accepted by the Engineer shall be filled with sand-lightweight concrete of the specified mix design. The perimeter surface of the core hole shall be coated with epoxy bonding compound meeting the requirements of Section 9-26 prior to filling with concrete.

Removal and replacement of deficient concrete, as previously outlined, shall be entirely at the Contractor's expenses.

Placement

Notify the Resident Engineer at least 48 hours prior to actual placement for each Class 4000LW Concrete pour.

Acceptance Requirements

Acceptance is based on the requirements of Section 6-02.3(5).

6-02.3(7) CONCRETE EXPOSED TO SEA WATER

Section is supplemented with the following:

(*****)

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Form release agent used for construction of the caissons and piers in the Duwamish Waterway shall be bio-degradable and non-toxic. Submit product information to the Resident Engineer.

6-02.3(13) EXPANSION JOINTS

Section is supplemented with the following:

(June 26, 2000)

6-02.3(13)A EXPANSION JOINT SYSTEM

The expansion joint system between the approach spans and the bascule piers shall be of the type and configuration depicted in the Contract Plans. The expansion joint system shall be installed in accordance with the manufacturer's published recommendations.
The Contractor shall submit working drawings of the expansion joint system to the Engineer for approval in accordance with Section 6-03.3(7). These plans shall include but not be limited to the following:

1. Plan, elevation, and sections of the joint system and all components, with dimensions and tolerances.
2. All material designations.
3. Manufacturer's written installation procedure.
4. Corrosion protection system used on the metal components.
5. Locations of welded shear studs, lifting mechanisms, temperature setting devices, and construction adjustment devices.
6. Method of sealing the system to prevent leakage of water through the joint.

The expansion joint system shall be removable and replaceable. Field welding of expansion joint system will not be allowed.
After the joint system is installed, the joint shall be flooded with water and inspected, from below the joint, for leakage. If leakage is observed, the joint system shall be repaired by the Contractor, as recommended by the manufacturer and approved by the Engineer, at no additional cost to the County.

General

The work shall consist of fabricating, furnishing and installing a bridge deck WABO TRANSFLEX expansion joint sealing system at Piers 3 and 4 in accordance with the details shown on the Contract Plans and the requirements of the Specifications.
Manufacturer shall have a minimum ten (10) years experience specializing in the design and manufacture of expansion control systems.

Quality Control

Manufacturer shall be ISO-9001:2008, RC14001:2008 certified and shall provide written confirmation that a formal Quality Management System and Quality Processes have been adopted in the areas of, (but not limited to) engineering, manufacturing, quality control and customer service for all processes, products and their components. Alternate manufacturers will be considered provided they submit written proof that they are ISO 9001:2008, RC14001:2008 certified prior to the project bid date.

Product

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Provide a watertight joint sealing system that is capable of accommodating the structures movement. The joint sealing system shall consist of elastomeric molded neoprene panels that are reinforced with structural steel angles and imbedded wear plates. The system is cast into the structure by cast in place anchors. The elastomeric panels shall be designed to withstand traffic loads. Provide panel size that satisfies project requirements including movement and water tightness. Install all components utilizing manufacturer's recommended sealants for complete installation.

Component and Materials

The Contractor shall furnish a manufacturer's certification that the materials proposed have been pre-tested and will meet the requirements as set forth in the specification.

1. Elastomeric Molded Panels

The 6'-0" elastomeric molded panels (4'-0" for Model 1300) shall be comprised of a formed steel shape suspended in an elastomeric material. The profile-riding surface shall have imbedded wear plates to ensure skid resistance and shall be capable of accommodating traffic loads. Each elastomeric molded panel shall be supplied with integrated bolt hole cavities and tongue and groove end connections.

The elastomer used to mold the panels shall be manufactured of a neoprene compound exhibiting the physical properties listed in the table below:

Physical Properties	Test Method	Requirement
Tensile Strength	D-412-98A	1800 (12.4)
Elongation at break min%	D-412-98A	400%
Hardness, Type Shore A Durometer	D-2240-02	40-50
Compression Set, 22hrs @158F (70C) max. Method B (modified)	D-395-01	20%
Oil Swell, ASTM #3 Oil, 70hrs @ 212F(100C) Volume Change	D-471-98	120%
Ozone Resistance, 20% Strain 100 pphm in air 70hrs.@104F. (40C) (wipe with toluene to remove surface contamination)	D-1149-99	No Cracks
Low Temperature, brittleness (3min@-40F)	D-746-79(1987)	Not Brittle

2. Steel Angle

The steel angles imbedded in the molded neoprene panels are formed from ASTM A-36 steel.

3. Bolt Cavity Sealant

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Bolt hole cavities shall be filled using a two part polyurethane sealant that meets Federal Specification TT-S-00227E. Contractors to ensure that the anchor blocks are dry from moisture prior to placement of material.

4. Edge Void Sealant

Edge voids shall be filled with a one part polysulfide base synthetic rubber sealant conforming to Federal Specification TT-S-00230C Type II Non-Sag. Contractor shall ensure that the anchor blocks are dry from moisture prior to placement of material.

5 Bedding Compound

Apply edge void sealant as a bedding material to the blockout base prior to placement of the elastomeric gland. Material shall be a one part polysulfide base synthetic rubber sealant conforming to Federal Specification TT-S-00230C Type II Non-Sag.

Construction Requirements

The Contractor shall submit product information and necessary shop drawings after the award of the contract. At the discretion of the Engineer, the manufacturer may be required to furnish a representative sample of material to be supplied in accordance with the project specifications

Then device shall be accurately set and securely supported at the correct grade and elevation and the correct joint opening as shown on the plans and on the shop drawings.

The manufacturer instructions for the proper installation of the joint system shall be entered on the shop drawings. Shop drawings, which lack manufacturer installation instruction, may be returned without approval.

After the joint system is installed, the joint system shall be flooded with water and inspected, from below the joint, for leakage. If leakage is observed, the joint system shall be repaired by the Contractor, as recommended by the manufacturer and approved by the Engineer, at no additional cost to the Contracting Agency.

6-02.3(13)B <u>COMPRESSION SEAL EXPANSION JOINT SYSTEM</u>

The compression seal expansion joint system shall be installed in accordance with the manufacturer's written recommendations. The Contractor shall submit the manufacturer's written installation procedure to the Engineer prior to installing the expansion joint system.

After the joint system is installed, the joint area shall be flooded with water and inspected, from below the joint, for leakage. If leakage is observed, the joint system shall be repaired by the Contractor, as recommended by the manufacturer and approved by the Engineer, at no additional cost to the Contracting Agency.

(June 26, 2000)

Compression Seal Expansion Joint System

The compression seal expansion joint system shall be installed in accordance with the manufacturer's written recommendations. The Contractor shall submit the manufacturer's written installation procedure to the Engineer prior to installing the expansion joint system.

After the joint system is installed, the joint area shall be flooded with water and inspected, from below the joint, for leakage. If leakage is observed, the joint system shall be repaired

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by the Contractor, as recommended by the manufacturer and approved by the Engineer, at no additional cost to the Contracting Agency..

6-02.3(19)A ELASTOMERIC BEARING PADS

Section is supplemented with the following:

(BSP June 26, 2000)

High-Load Elastomeric Bearing Pad Assembly

The Contractor shall install all bearings level, unless otherwise shown in the Plans.

The Contractor shall measure the slope of the top surface of the bearing and the contact surface of the bridge superstructure. If the difference in slope between these surfaces exceeds 0.005 radians, the Contractor shall adjust the surfaces to within this tolerance by shimming, grouting, or other method as approved by the Engineer.

The Contractor shall set the sole plate with epoxy gel just before setting the superstructure in place on the bearing. The Contractor shall spread a thin uniform film of silicone grease on the top surface of the sole plate in contact with the epoxy gel to prevent bonding of the sole place to the epoxy gel. The Contractor shall grease the bolts attaching the sole plate to the superstructure to prevent bonding and allow for future removal. The Contractor shall apply epoxy gel to the bottom surface of the superstructure and immediately bolt the sole plate in place to obtain a level surface at the bottom of the sole plate. The Contractor shall set the superstructure in place on the bearing before the epoxy gel has cured, squeezing out excess epoxy gel. The Contractor shall immediately remove all excess epoxy gel and grease. After the epoxy gel has cured, the Contractor shall tighten the sole plate attachment bolts.

Elastomeric Bearing Pad

Elastomeric bearing pads shall be used in the bearings as shown on the Plans at Piers 3 and 4.

Elastomeric bearing pads shall conform to Section 9-31, except as shown on the plans.

Description

A. Elastomeric bearing pads are used in the bearings at Pier 3 and 4 for the North and South Approach Span Bridges. The bearings at both Pier 3 and 4 are expansion. This work includes all materials for the construction and installation of the bearings as shown in the Plans and as specified.

B. The expansion bearing consists of an upper unit and a lower unit. The upper unit includes an upper sole plate, a lower sole plate, or a top plate, and a stainless steel sheet. The lower unit includes a polytetrafluorethylene (PTFE) sheet, a steel backing plate, an elastomeric pad, or with a stop bar assembly, a masonry plate, and transverse restrainers. The upper and lower units shall be supplied by a single bearing manufacturer.

Materials

A. The elastomeric bearing pads shall conform to Section 9-31, except as shown on the Plans.

The elastomeric bearing pads shall meet all Level I and Level II acceptance criteria as specified in AASHTO M 251. The Contractor shall perform a Long Duration

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Compression Load test on the elastomeric bearing pads randomly selected from each size and material batch of the production bearings. The Contractor shall test one bearing per lot, minimum, where one lot is defined as ten percent of the total number of production bearings in each size and material batch. The Long Duration Compression Load test shall be as specified in Sections 18.7.2.6 and 18.7.4.5.7, Division II Construction, of the AASHTO Standard Specifications for Highway Bridges, Sixteenth Edition and latest interims. The Contractor shall submit the test results to the Engineer for approval.

If one of the test bearings fails, all of the bearings of that lot shall be rejected, unless the Contractor elects to test each bearing of the lot, at no additional expense to the Contracting Agency. In lieu of this procedure, the Engineer may require the Contractor to test all bearings of the lot.

B. The PTFE self-lubricating bearing sheet shall be 1/8 inch thick unless otherwise noted in the Plans. The PTFE sheet shall be composed of 100 percent virgin (unfilled) polytetrafluorethylene polymer except where filled PPTFE is called for in the Plans. The PTFE sheet shall be recessed and bonded to a depth of one half the PTFE sheet thickness into the steel backing plate. The exposed height of the PTFE shall be not less than 3/64 inch. The substrate shall limit the flow (elongation) of the confined PTFE to not more than .009 inch under a load of 2,000 psi for 15 minutes at 78 degrees F for a 2-inch x 3-inch test sample. Dimpled PTFE, if shown in the Plans, shall be unfilled and have a minimum thickness of 3/16 inch. Dimples shall be placed in a 1/2 inch grid and shall have a depth of 1/16 inch. The properties of the (unfilled) PTFE shall be certified to conform to the following requirements:

Requirement	Test Method	Value
Hardness at 78°F	ASTM D 2240	50-65 Durometer D
Tensile Strength, psi	ASTM D 1457	2800 (Min. Avg.)
Elongation %	ASTM D 1457	200 (Min. Avg.)
Specific Gravity	ASTM D 792	2.14 to 2.21

C. The filled PTFE sheet shall be made from virgin PTFE resin uniformly blended with inert filler material (15% glass fiber). The properties of (filled) PTFE shall be certified to conform to the following requirements:

Requirement	Test Method	Value
Tensile Strength	ASTM D 1457	2200 psi (Min. Avg.)
Elongation %	ASTM D 1457	150% (Min. Avg.)
Specific Gravity	ASTM D 792	2.2
Melting Point	ASTM D 1457	327C±10C

D. The stainless steel sheet shall be no less than 14 gage meeting ASTM A 240 Type 304 specifications. Stainless steel in contact with the PTFE shall have a finish of 10 microinches R.M.S. (Root-Mean-Square) or less. The stainless steel sheet

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shall be seal welded all around to the sole plates by the gas tungsten-arc welding process (GTAW) in accordance with applicable AWS recommended practices. The seal weld shall not protrude beyond the surface of the stainless steel. The stainless steel sheet shall be clamped down to have full contact with the sole plate during welding. The surface of the sole plate in contact with the stainless steel sheet shall have a surface roughness of 125 microinches R.M.S.

E. The sole plate, top plate, steel backing plate, bars and masonry plate shall conform to AASHTO M 270 Gr.50, or ASTM A 572 Gr. 50 and the dimensions shall comply with the details as shown in the Plans. The surface of the recess of the steel backing plate shall have a surface roughness of 250 microinches R.M.S. All exposed steel plate surfaces, except stainless steel surfaces, shall be painted in accordance with the Special Provision APPLICATION OF PAINT. The stainless steel sheet to sole plate seal weld shall be painted in accordance with the Special Provision APPLICATION OF PAINT. AASHTO M314 F1554 bolts, ASTM A 449 bolts, nuts, and washers shall be hot-dip galvanized in accordance with AASHTO M 232.

F. The epoxy gel for setting sole plates on precast or steel girders shall conform to the requirements of Section 9-26.1, Type 1, Grade 3, Class A, B, or C. The silicone grease to be used in preventing bond between the epoxy gel and the sole plate shall conform to military specification MIL-S-8660. The Contractor shall submit certification from the manufacturer that certifies the silicone grease and epoxy meets these specifications.

G. The welded shear studs attached to the sole plates embedded in the modified precast girders shall conform to the requirements of Section 9-06.15.

Construction Requirements

A. Before fabrication of any bearing, the Contractor shall submit shop plans to the Engineer for approval in accordance with Section 6-03.3(7). These drawings shall include but not be limited to the following information:

1. Plan and elevation of the bearing showing dimensions and tolerances.
2. Complete details of all components and sections showing all materials incorporated into the bearing.
3. All AASHTO, ASTM or other material designations.
4. Bearing manufacturer's recommendations and procedures for bearing assembly shipment and storage.

B. Prior to the installation of the fabric pad bearings in part or in whole, the Contractor shall submit to the Engineer the following test reports, certifications, and samples for review, testing and approval.

1. Manufacturer's certificate of compliance for the polytetrafluorethylene (PTFE) sheeting, fabric, and elastomer.
2. Certified mill test reports for all steel and stainless steel in the bearing assemblies.

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3. Certified test reports confirming that the eleastomeric pads meet the specified requirements of Section 9-31.

The time to test and review the submitted items will be a minimum of 15 calendar days from the time these items are received at the Engineer's office until the necessary information is returned to the Contractor at the project site. The actual time required for review is dependent upon the completeness and accuracy of the material as submitted. Any deficiencies will require additional time for review. If submittals are returned to the Contractor to correct deficiencies, an additional 15 calendar days may be required for the review process.

Field inspection of a representative number of bearings assemblies will be performed by the Engineer. A clean dry and enclosed area shall be provided by the Contractor. The Engineer will identify the bearing assemblies to be inspected and the Contractor shall do all the necessary work to allow the Engineer to inspect the bearing assemblies.

C. Flatness of bearing surfaces shall be determined by the following method:

1. A precision straightedge, longer than the nominal dimension to be measured shall be placed in contact with the surface to be measured as parallel to it as possible.
2. Select a feeler gauge having an accuracy of ± .001 inch equal to the tolerance allowed and attempt to insert it under the straightedge.
3. Surfaces are acceptable if the feeler gauge does not pass under the straightedge.
4. In determining the flatness, the straightedge may be located in any position on the surface being measured.

D. Flatness tolerances shall be defined as follows:

Class A tolerance = 0.0005 x nominal dimension

Class B tolerance = 0.001 x nominal dimension

Class C tolerance = 0.01 x nominal dimension

(Nominal dimension shall be taken as the actual dimension of the plate or sheet under the straightedge, in inches.)

E. Manufacturing tolerances for the bearings are as follows:

1. PTFE Sheet

Plan dimensions:	Total nominal design area -0, +1/8"
Thickness:	-0", + 1/64"
Flatness:	Class B tolerance, both surfaces

2. Stainless Steel Sheet

Plan dimensions:	-0", +3/16"
Flatness:	Class B tolerance, both surfaces

3. Sole Plate and Top Plate

Plan dimensions:	-0", +3/16"
Thickness:	-1/16", +3/16"

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Flatness:	Class B tolerance, side in contact with the Stainless Steel, Sole Plate, or Top Plate Class C tolerance, side in contact with epoxy gel, grout, or concrete

4. Steel Backing Plate

Plan dimensions:	-0", +3/16"
Thickness:	-0", +3/16"
Width and length of recess:	-0", +1/16", of PTFE sheet size
Flatness:	Class B tolerance, both surfaces

5. Elastomeric Pad Section 9-31 requirements

6. Masonry Plate & Bars

Plan dimension:	-0", +3/16"
Thickness:	-0", +3/16"
Flatness:	Class B Tolerance, side in contact with masonry plate or bars. Class C tolerance, free side or side in contact with grout.

7. Overall Height

Total thickness:	-0, +10 percent

F. The Contractor shall protect the bearing assemblies from all damage, and exposure to the elements, during shipment and storage prior to installation in accordance with the manufacturer's recommendations and procedures listed in the shop plans as approved by the Engineer.

G. The sliding surfaces shall be finished true, lubricated and installed level or installed as shown in the Plans for transverse restrainer bearings.

H. A uniform thin film of silicone grease shall be applied to the entire PTFE sheet before installation.

I. For cast-in-place concrete superstructures the sole plates shall be anchored to the structure as shown in the Plans.

J. For precast concrete superstructures and steel superstructures the sole plates shall be set with epoxy gel just before setting the superstructure in place. The sole plate top surface in contact with the epoxy gel shall receive a thin uniform film of silicone grease, to prevent bonding to the epoxy gel. The anchor bolts and insert threads shall be greased to prevent bonding and allow future removal. Apply epoxy gel by troweling it into the concrete recess or onto the bottom of the steel superstructure and immediately bolting the sole plate in place to obtain a level surface. Before the epoxy gel has cured, the superstructure shall be set in place, squeezing out excess epoxy gel while filling the entire recess. Excess epoxy and grease shall be removed immediately. Special care shall be exercised at all times to ensure protection of the stainless steel and PTFE surfaces from coming in contact with concrete or any other foreign matter. After the epoxy gel has cured, the anchor bolts shall be tightened to snug tight.

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K. The lower contact surface of the PTFE sheet shall be bonded to the steel backing plate with epoxy specified by the PTFE manufacturer. The grout pad and masonry plate shall be installed level. The grout pad shall be pressure installed starting at the middle of the masonry plate.

L. All forms and debris that tend to interfere with the free action of the bearing assemblies shall be removed at the time falsework and forms are removed.

(BSP June 26, 2000)

High-Load Elastomeric Bearing Pad Assembly

Description

Elastomeric bearing pads are used in the bearings at Abut 1 and 6 for the North and South Approach Span Bridges. The bearings at both abutments are expansion. This work includes all materials for the construction and installation of the bearings as shown in the Plans and as specified.

Elastomeric bearing pads shall conform to Section 9-31, except as shown on the plans.

(BSP April 7, 2008)

Materials

High-load elastomeric bearing pads shall meet all Level I and Level II acceptance criteria as specified in AASHTO M 251.

The Contractor shall perform a Long Duration Compression Load test on high-load elastomeric bearing pads randomly selected from each size and material batch of the production bearings. The Contractor shall test one bearing per lot, minimum, where one lot is defined as ten percent of the total number of production bearings in each size and material batch. The Long Duration Compression Load test shall be as specified in Sections 18.2.5.6 and 18.2.5.7 of the AASHTO LRFD Bridge Construction Specifications, current edition and latest interims. The Contractor shall submit the test results to the Engineer for approval.

If one of the test bearings fails, all of the bearings of that lot shall be rejected, unless the Contractor elects to test each bearing of the lot, at no additional expense to the Contracting Agency. In lieu of this procedure, the Engineer may require the Contractor to test all bearings of the lot.

Steel bars, plates, and shapes, shall conform to ASTM A 36.

Silicone grease shall conform to US Navy QPL AS8660-2.

Epoxy gel shall conform to Section 9-26.1, Type I, Grade 3, Class A, B, or C.

Bolts shall conform to Section 9-06.5(3).

Construction Requirements

The Contractor shall install all bearings level, unless otherwise shown in the Plans.

The Contractor shall measure the slope of the top surface of the bearing and the contact surface of the bridge superstructure. If the difference in slope between these surfaces exceeds 0.005 radians, the Contractor shall adjust the surfaces to within this tolerance by shimming, grouting, or other method as approved by the Engineer.

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The Contractor shall set the sole plate with epoxy gel just before setting the superstructure in place on the bearing. The Contractor shall spread a thin uniform film of silicone grease on the top surface of the sole plate in contact with the epoxy gel to prevent bonding of the sole place to the epoxy gel. The Contractor shall grease the bolts attaching the sole plate to the superstructure to prevent bonding and allow for future removal. The Contractor shall apply epoxy gel to the bottom surface of the superstructure and immediately bolt the sole plate in place to obtain a level surface at the bottom of the sole plate. The Contractor shall set the superstructure in place on the bearing before the epoxy gel has cured, squeezing out excess epoxy gel. The Contractor shall immediately remove all excess epoxy gel and grease. After the epoxy gel has cured, the Contractor shall tighten the sole plate attachment bolts.

6-02.3(24) REINFORCEMENT

Section is deleted and replaced with the following:

(*****)

The Contractor shall prepare and submit a schedule of reinforcement bars (bar list) and associated bar bend diagrams for each concrete component of the bridge. The schedules of reinforcement bars shall incorporate the bar marks shown in the Contract Plans such that there is a one-to-one correlation between the Contract Plans and Contractor provided schedules of reinforcement bars.

The schedules of reinforcement bars shall be in WSDOT standard format and include the following information for each reinforcement bar:

Bar mark number
Location in the bridge
Contract Plan sheet number depicting the bar
Bar size
Number of bars required
Bar bend type and associated bend diagrams
Indication if the bar is a tie or stirrup
Indication if the bar is in the substructure quantities
Indication if the bar is to be epoxy coated
Indication if the bar dimensions vary between dimensions shown on two lines
Bar bend dimensions in feet and inches
Bar bend angles of bends in degrees
Total length of bar in feet and inches
Total weight of bar in pounds

Before ordering material, submit all schedules of reinforcement bars according to Section 1-05.3(1) to 1-05.3 for approval. Do not order material until the schedule of reinforcement bars have been approved. The review of order lists and bending diagrams by the Engineer shall in no way relieve the Contractor of responsibility for the correctness of such schedules of reinforcement bars. Revise schedules as required to make them comply with the design drawings at no additional cost to the County.

NOT FOR CONSTRUCTION

Various steel reinforcing bars, including those in crossbeams, may be shown as straight in the bar lists. The Contractor shall bend these bars as required to conform to the configuration of the Structure and as detailed in the Plans.

Schedules of reinforcement bars will not be required to be sealed by a Professional Engineers licensed in the state of Washington.

Provide the Engineer with 5 copies of the final approved schedules of reinforcement bars, unbound, collated and paginated on 11 x 17 sheets.

6-02.3(25)B CASTING

The second paragraph of Section 6-02.3(25)B is revised to read as follows:

(BSP August 4, 2003)

The Contractor shall fabricate all prestressed concrete girders using the Contractor-Provided mix design appropriate for the design strength specified for each girder in accordance with Sections 6-02.3(2)A and 9-19.1 as supplemented in these Special Provisions, and as approved by the Engineer. The temperature of the concrete when placed shall be between 50F and 90F.

6-02.3(25)E CONTRACTORS CONTROL STRENGTH

Section is supplemented with the following:

(BSP August 4, 2003)

For the prestressed girders of "Superstructure - _____ Approach Span" the Contractor may substitute compressive strength testing at 28 days provided that the 28 day compressive strength is equal to or greater than 95 percent of the required 56 day compressive strength.

6-02.3(25)M SHIPPING

The first paragraph of Section 6-02.3(25)M is revised to read as follows:

(BSP August 4, 2003)

After the girder has reached its 28-day design strength, or 95 percent of the 56 day design strength for the girders of "Superstructure - _____ Approach Span", and the fabricator believes it to comply with the specification, the girder and a completed Certification of Compliance, signed by a Precast/Prestressed Concrete Institute Technician or a professional engineer, acceptable to the Contracting Agency, shall be submitted to the Engineer for inspection. If the Engineer finds the certification and the girder to be acceptable, the Engineer will stamp the girder "Approved for Shipment".

The third paragraph of Section 6-02.3(25)M is supplemented with the following:

(BSP August 4, 2003)

The Contractor is advised that, because of the higher compressive design strengths required for the production prestressed concrete girders of "Superstructure - _____ Approach Span", it will take longer than the usual time for these girders to reach sufficient strength for shipping. The Contractor shall take this into account when preparing schedules for this portion of the work.

NOT FOR CONSTRUCTION

Add the following new Section:

(*****)

6-02.3(29) SUPERSTRUCTURE APPROACH SPANS

Contractor shall construct all elements of the bridge approach spans as specified in Section 6-02, unless otherwise shown on the Plans or specified in Section 6-02.3(29).

Prestressed Concrete Girders

Girders shall be WSDOT standard prestressed concrete wide flange I girders, type WF74G, with concrete strengths as specified in the Plans. Girders shall be fabricated, shipped, and erected in accordance with Section 6-02.3(25) and as shown in the Plans.

Roadway Deck Slab

Roadway deck slab shall be cast-in-place and shall be constructed of epoxy-coated steel reinforcing bars and class 4000D concrete in accordance with Section 6-02.3(10) and as shown in the Plans.

Sidewalks

Sidewalks shall be cast-in-place and shall be constructed of epoxy-coated steel reinforcing bars and class 4000 concrete and as shown in the Plans.

Pedestrian Railing Curbs

Pedestrian railing curbs shall be cast-in-place and shall be constructed of epoxy-coated steel reinforcing bars and class 4000 concrete and as shown in the Plans. The works shall include furnishing and installing the pedestrian railing anchorages and curb cuts for the pedestrian rails as shown in the Plans.

Intermediate and End Diaphragms

Diaphragms shall be cast-in-place and shall be constructed of steel reinforcing bars and class 4000 concrete and as shown in the Plans. Blockouts shall be provided in the diaphragms where required to accommodate placement of utilities.

Traffic Gate Platforms

Traffic gate platforms shall be cast-in-place and shall be constructed of epoxy-coated steel reinforcing bars, steel shear studs, and class 4000 concrete and as shown in the Plans.

Traffic Gate Diaphragms

The traffic gate diaphragms shall be provided at the traffic gate platform locations. The traffic gate diaphragm is similar to the intermediate diaphragms along the bridge, except that the end portion of the traffic gate diaphragm is extended beyond the exterior girder and is attached to a steel bracket using steel anchor bolts. The traffic gate diaphragm shall be cast-in-place and shall be constructed of steel reinforcing bars and class 4000 concrete and as shown in the Plans. The steel bracket and connection materials shall be constructed of structural carbon steel and as shown in the Plans.

Traffic Signal Pole Mountings

Traffic signal pole mountings shall be cast-in-place and shall be constructed of steel reinforcing bars and class 4000 concrete and as shown in the Plans. Anchor plates, anchor

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rods, and other connection materials shall be constructed of structural carbon steel and shall be placed as shown in the Plans.

Steel Fascia Trusses

Steel fascia trusses shall be provided along the outside edges of the superstructure along span 2 of the south approach and span 4 of the north approach as shown in the Plans. The fascia trusses, connection materials, bracings, and stiffeners shall all be constructed of structural carbon steel and as shown in the Plans.

Compression Joint Seals

Compression joint seals shall be provided at abutments 1 and 6 and shall be installed in accordance with Section 6-02.3(13) and the manufacturer's written recommendations and as shown in the Plans.

Transflex Expansion Joints

Expansion joints shall be Wabo Transflex Model 650 and shall be provided at piers 3 and 4. Expansion joints shall be installed in accordance with Section 6-02.3(13) and the manufacturer's written recommendations and as shown in the Plans.

Approach Slabs

Approach slabs shall be cast-in-place and shall be constructed of epoxy-coated steel reinforcing bars, steel anchor rods, and class 4000A concrete in accordance with Section 6-02.3(10) and as shown in the Plans.

Bridge Bearing

High-load elastomeric bearing pads shall be provided at abutments 1 and 6 and shall be installed in accordance with Section 6-02.3(19) and as shown in the Plans.

Elastomeric bearing pads shall be provided at piers 3 and 4 and shall be installed in accordance with Section 6-02.3(19) and as shown in the Plans.

Grout Pads

Grout pads shall be provided at all bearing locations and shall be constructed in accordance with Section 6-02.3(19)B and as shown in the Plans.

Utility Supports

Utility supports including concrete inserts, hanger rods, pipe rollers, lateral bracings, clamps, and hardware shall be constructed in accordance with Section 6-02.3.

Embedded Electrical Conduits

Embedded electrical conduits shall be constructed as shown on the Plans and as specified in Section 8-20.3(5).

Drainage Scuppers

Drainage scuppers shall be constructed as shown in Plans.

Girder Stops

Girder stops shall be constructed as shown in Plans.

Stainless Steel Bearing Pins and Gear Mounting Embedded Anchor Rods

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Stainless steel bearing pins, and gear mounting embedded stainless steel anchor rods and hardware shall be installed as depicted on sheets PR20 and PR21 of the Contract Plans.

Pipe insulation on bridge

Pipe insulation on bridge shall be in accordance with Section 9-30.8. Pipe insulation shall be installed along the full length of pipe and around utility supports.

The Work of the bridge approach spans excludes the concrete, reinforcement and miscellaneous metals of the Traffic Barriers depicted on TR sheets of the Contract Plans.

The Work excludes the pedestrian railings depicted on the PR sheets of the Contract Plans except the embedded connection hardware identified above.

The Work excludes the reinforcement bars embedded in the abutments and piers extending into the crossbeams (diaphragms).

6-02.4 MEASUREMENT

Section is supplemented with the following:

(*****)

"Expansion Joint System (WABO TRANSFLEX)" will not be measured.

"Elastomeric Bearing Pad – Superstru" will be measured per each bearing pad assembly furnished and installed in the bridge.

(June 26, 2000)

"Expansion Joint Compression Seal", included in the lump sum item "Superstructure - ___ Approach Span", will be measured per linear foot along its completed line and slope.

(BSP June 26, 2000)

High-load elastomeric bearing pads, included in the lump sum item "Superstructure - ___ Approach Span" will be measured per each for each bearing pad assembly furnished and installed in the bridge.

(BSP December 5, 2005)

Prestressed concrete girder, included in the lump sum item "Superstructure - ___ Approach Span", will be measured by the linear foot of girder specified in the Proposal, including adjustments to the Plan quantity made in accordance with Section 1-04.4.

(*****)

The lump sum Contract price for "Superstructure - North Approach Span" Contains the following approximate quantities of materials and work:

Epoxy-Coated St. Reinf. Bar – Superstr.	166845	LB
St. Reinf. Bar – Superstr.	17100	LB
Concrete Class 4000D For Bridge	663	CY
Concrete Class 4000 For Superstr.	215	CY
Prestressed Conc. Girder WF74G – Superstr.	2741	LF
Elastomeric Bearing Pad – Superstr.	9	EA
Structural Carbon Steel – Superstr.	50862	LB
Expansion Joint System Compression Seal – Superstr.	71	LF
Expansion Joint System Transflex – Superstr.	71	LF

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Pipe Hanger For 12” Diam. SD Line	70	EA
Pipe Hanger For 8” Diam. Fire Protection Line	54	EA
Pipe Hanger For 6” Diam. Sewer Line	37	EA
Pipe Hanger For 2-4”, 2-3”, and 1-2” Diam. Conduit Cluster	54	EA
Concrete Inserts	430	EA
18” Diam. Steel Pipe Sleeve	2	EA
14” Diam. Steel Pipe Sleeve	2	EA
10” Diam. Steel Pipe Sleeve	1	EA

The lump sum Contract price for “Superstructure - South Approach Span” Contains the following approximate quantities of materials and work:

Epoxy-Coated St. Reinf. Bar – Superstr.	164975	LB
St. Reinf. Bar – Superstr.	17084	LB
Concrete Class 4000D For Bridge	659	CY
Concrete Class 4000 For Superstr.	214	CY
Prestressed Conc. Girder WF74G – Superstr.	2723	LF
Elastomeric Bearing Pad – Superstr.	9	EA
Structural Carbon Steel – Superstr.	50862	LB
Expansion Joint System Compression Seal – Superstr.	71	LF
Expansion Joint System Transflex – Superstr.	71	LF
Pipe Hanger For 12” Diam. SD Line	70	EA
Pipe Hanger For 8” Diam. Fire Protection Line	54	EA
Pipe Hanger For 6” Diam. Sewer Line	37	EA
Pipe Hanger For 2-4” Diam. and 1-2” Diam. Conduit Cluster	54	EA
Concrete Inserts	430	EA
18” Diam. Steel Pipe Sleeve	2	EA
14” Diam. Steel Pipe Sleeve	1	EA
12” Diam. Steel Pipe Sleeve	1	EA
10” Diam. Steel Pipe Sleeve	1	EA

The quantities are listed only for the convenience of the Contractor in determining the volume of work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than for approved changes will be made in the lump sum contract price for "Superstructure - South Approach Span" or “Superstructure – North Approach Span” even though the actual quantities required may deviate from those listed.

6-02.5 PAYMENT

Section is supplemented with the following:

(*****)

"Superstructure - _____ Approach Span", lump sum.

The lump sum Contract price for “Superstructure - South Approach Span” and “Superstructure – North Approach Span” shall be full pay for performing the work as specified and depicted in the Contract Plans including shop drawing submittals, fabrication, testing, storage, handling, shipping, erection, furnishing and removing oak block wedges from prestressed concrete girders, furnishing and removing temporary bracing and/or

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falsework, finishing and all costs associated providing the bridge approach spans in their entirety as deemed acceptable by the Engineer including the prestressed concrete girders (WF74G), traffic gate support diaphragms, traffic signal pole blisters, structural bridge deck, sidewalks, pedestrian railing curbs, traffic gate platforms, intermediate and end crossbeams (diaphragms), steel fascia trusses on approach spans 2 and 4 and associated connection devices / hardware / studs / concrete inserts / epoxy grout / elastomeric pads, expansion joint compression seals at the abutments 1 and 6, expansion joint system (WABO TRANSFLEX) at the bascule piers 3 and 4, utility supports including inserts / hangers / rollers / lateral bracings / clamps / hardware, utility penetrations, pipe insulation, embedded electrical conduits, drainage scuppers, grout pads, girder stops, and stainless steel bearing pins, and gear mounting embedded stainless steel anchor rods and hardware depicted on sheets PR20 and PR21 of the Contract Plans.

The lump sum Contract price for “Superstructure - ____ Approach Span” shall include all work associated with the prestressed concrete girders as specified, including shop drawing submittals, fabrication, storage, handling, shipping, erection (including all site preparation and restoration activities necessary for erection equipment access and support), furnishing and removing oak block wedges, furnishing and removing temporary bracing, and furnishing and cutting temporary strands. For deck bulb tee girders and PCPS members, all work related to equalizing girder camber, connecting weld-ties, and grouting keyways, shall also be included. For spliced prestressed concrete girders, all work related to cast-in-place concrete closures and post-tensioning shall be included.

The lump sum Contract price for “Superstructure - ____ Approach Span” shall include all work associated with the High-Load Elastomeric Bearing Pad, including furnishing, testing, and installing the bearing assemblies as specified, including all work required to adjust the bearing assemblies to their correct position following installation.

All costs in connection with placing Bridge Supported Utilities through the "Superstructure - South Approach Span” and “Superstructure – North Approach Span” as shown in the Plans, shall be included in the , lump sum cost for Superstructure - _____ Approach Span. Costs for furnishing, and installing concrete inserts, conduits, hangers, penetrations, and block outs for Fiber Optic Conduit fiberglass electrical conduit shall not be included in the lump sum Contract price for “Superstructure - ____ Approach Span".

"Elastomeric Bearing Pad – Superstru.”, per each.

All costs in connection with furnishing , testing, and installing the bearings as shown in the Plans and as specified shall be included in the Bid items involved.

The unit contract price per each for "Elastomeric Bearing Pad – Superstru.” shall be full pay for furnishing, testing, and installing bearing assemblies as specified, including all work required to adjust the bearing assemblies to their correct position following installation.

(June 26, 2000)

No additional compensation will be made by reason of any delay or other expense to the Contractor caused by coordination with the utility company or by installing utility company furnished items. However, any unavoidable delays to the Contractor caused by coordination with the utility company or resulting from installing utility company furnished items will be adjusted in accordance with Section 1-08.8.

6-03 STEEL STRUCTURES

NOT FOR CONSTRUCTION

6-03.3(7) SHOP PLANS

Section is deleted and replaced with the following:

(*****)

The Contractor shall submit for approval, one set of reproducible shop detail plans and associated executable computer aided drafting (CAD) files required for fabricating the steel, to the Engineer, Department of Transportation, 2nd Floor, 201 South Jackson Street, Seattle, WA 98104-3856. The Contractor may designate in writing to the Project Engineer that shop drawings will be submitted directly from the fabricator.

If any sheets require correction, the Contractor shall correct and resubmit them in reproducible form as required above. No material shall be fabricated until: (1) the Engineer has approved the plans, and (2) the Engineering Services Materials Lab has approved the materials source and the fabricator.

In approving shop plans, the County accepts only the nature and scope of the details without validating any dimensions.

Unless the Engineer permits it in writing, no changes shall be made in any drawing after its approval.

Before physical completion of the project, the Contractor shall furnish the Project Engineer set of reproducible copies of the as-built shop plans and CAD files. The CAD files shall be in AutoCAD 2008 format. The reproducible copies shall be clear, suitable for microfilming, and on permanent sheets that measure no smaller than 11 by 17 inches. Additionally, the shop drawings shall be provided in an Engineer approved electronic CAD format with the approval of the Project Engineer.

6-05 PILING

6-05.5 PAYMENT

The fifth paragraph is deleted and replaced with the following:

(*****)

The unit Contract price per linear foot for "Furnishing (type) Piling (____)" shall be full pay for furnishing the piling specified, including fabricating and installing the steel reinforcing bar cage, and casting and curing the concrete, as required for concrete piling. Unit contract price shall include all costs to comply with section 6-07.3(12) for steel piling used in marine conditions. Such price shall also be full pay, for furnishing timber, precast concrete, or precast prestressed concrete piling length ordered from an Engineer's order sheet but not driven.

6-06 BRIDGE RAILINGS

6-06.1 DESCRIPTION

Section is supplemented with the following:

(*****)

Section also includes providing and building metal traffic barriers upon which metal railing may be installed.

6-06.2 MATERIALS

NOT FOR CONSTRUCTION

Section is supplemented with the following:

(*****)

Metal Traffic Barriers 9-06.19

Add the following new Section:

(*****)

6-06.3(3) METAL TRAFFIC BARRIER

Metal traffic barrier includes XXX members of XXX. Metal traffic barriers shall be made of steel in accordance with Section 9-06.19.

Before fabricating the traffic barriers, the Contractor shall submit 6 copies of the shop plans for the Engineer's approval. The Contractor may substitute other rail connection details for those shown in the Plans if details of these changes show in the shop plans and if the Engineer approves. In approving shop plans, the Engineer indicates only that they are adequate and complete enough. Approval does not indicate a check on dimensions.

Anchor bolts or wedge anchors shall be positioned with a template to ensure that bolts match the hole spacing of the bottom channels or anchorage plates.

Where specified, cover plates shall fit the bottom channel tightly after being snapped into position.

Traffic barriers shall be installed true to line and grade (or camber). The Contractor shall readjust all or part of the traffic barriers, if necessary, to create an overall line and grade pleasing to the eye.

6-06.4 MEASUREMENT

Section is supplemented with the following:

(*****)

Traffic Barrier - Bascule will be measured by the linear foot along the completed line and slope of the barrier.

6-06.5 PAYMENT

Section is supplemented with the following:

(*****)

"Traffic Barrier - Bascule", per linear foot.

The unit Contract price per linear foot for "Traffic Barrier - Bascule" shall be full pay for fabricating , transporting, placing, adjusting, and finishing metal traffic barrier and furnishing and installing steel railing thereon.

6-07 PAINTING

6-07.3(4) PAINTING OR POWDER COATING OF GALVANIZED SURFACES

Section is supplemented with the following:

(April 6, 2009)

The color of the finish coat, when dry, shall match *** TNEMEC Silver Bullet 32MT ***.

6-10 CONCRETE BARRIER

NOT FOR CONSTRUCTION

6-10.1 DESCRIPTION

Section is supplemented with the following:

(*****)

Traffic barrier shall be Traffic Barrier – SEW and Traffic Barrier - Approach types as shown in the Plans.

6-10.3(2) CAST-IN-PLACE CONCRETE BARRIER

Section is supplemented with the following:

(*****)

Steel railing attached to concrete barrier shall be in accordance with Section 6-06.3(2) and the Plans.

6-10.5 PAYMENT

The eleventh Paragraph is supplemented with the following:

(*****)

"Traffic Barrier – SEW", per linear foot.
"Traffic Barrier – Approach", per linear foot.

The unit Contract price for "Traffic Barrier – SEW" and "Traffic Barrier – Approach" shall include furnishing and installing steel railing along the top of the traffic barrier, and shall be full pay for constructing the moment slab.

The unit Contract price per linear foot for "Traffic Barrier – SEW" and "Traffic Barrier – Approach" shall be full pay for constructing the barrier on top of the bridge deck, and associated bridge approach slabs, curtain walls and wingwalls, excluding the steel reinforcing bars that extend from the bridge deck, bridge approach slab, curtain walls, and wingwalls.

6-11 REINFORCED CONCRETE WALLS

6-11.3(6) TRAFFIC BARRIER AND PEDESTRIAN BARRIER

Section is deleted and replaced with the following:

(*****)

When shown in the Plans, traffic barrier and pedestrian barrier shall be constructed in accordance with Sections 6-02.3(11)A and 6-10.3(2), and the details shown in the Plans.

6-13 STRUCTURAL EARTH WALLS

6-13.3 DESCRIPTION

Section is supplemented with the following:

(*****)

Structural Earth Wall shall be two-stage construction as shown on the Plans.

Add the following new Section:

NOT FOR CONSTRUCTION

(*****)

6-13.3(2)A GEOTECHNICAL DESIGN PARAMETERS

The following geotechnical design parameters shall be used for the design of the structural earth wall(s):

Soil Properties	Wall Backfill	Retained Soil	Foundation Soil
Unit Weight (pcf)	125	125	120
Friction Angle (deg)	35	35	32
Cohesion (psf)	0	0	0

	AASHTO Load Group I	AASHTO Load Group VII
Allowable Bearing Capacity (tsf)	1.25	1.75
Acceleration Coefficient (g)	N/A	0.29

6-13.4 MEASUREMENT

Add the following:

(*****)

Traffic Barrier – SEW will be measured as specified in Section 6-10.4 for cast-in-place concrete barrier.

6-13.5 PAYMENT

The eighth Paragraph is supplemented with the following::

(*****)

The unit Contract price for SEW Traffic Barrier shall include furnishing and installing steel railing along the top of the SEW traffic barrier.

"Wall Coping for Pedestrian Railing", per linear foot.

6-20 SUPERSTRUCTURE - BASCULE SPAN

6-20.1 DESCRIPTION

This item includes the movable bascule span leafs, complete, in place and operable as indicated in the

Add the following new Section:

(*****)

6-19 SHAFTS

6-19.1 DESCRIPTION

NOT FOR CONSTRUCTION

This item of work shall consist of furnishing all materials, labor, tools, equipment, services and incidentals necessary to construct the shafts in accordance with the Plans, the Standard Specifications, and the Special Provisions.

6-19.2 MATERIALS

6-19.2(1) CASING

A. All permanent casing shall be of steel base metal conforming to ASTM A36. All permanent casing shall be of ample strength to resist damage and deformation from transportation and handling, installation stresses, and all pressures and forces acting on the casing.

All temporary casing shall be a smooth wall structure of steel base metal, except where corrugated metal pipe is shown in the Plans as an acceptable alternative material. All temporary casing shall be of ample strength to resist damage and deformation from transportation and handling, installation and extraction stresses, and all pressures and forces acting on the casing. The casing shall be capable of being removed without deforming and causing damage to the completed shaft, and without disturbing the surrounding soil.

B. Permanent casing is defined as casing designed as part of the shaft structure and installed to remain in place after construction is complete. Temporary casing is defined as casing installed to facilitate shaft construction only, which is not designed as part of the shaft structure, and which shall be completely removed after shaft construction is complete, unless otherwise shown in the Plans.

C. The casing shall be watertight and clean prior to placement in the excavation.

D. The outside diameter of the casing shall not be less than the specified diameter of the shaft. The inside diameter of the casing shall not be greater than the specified diameter of the shaft plus six inches, except as otherwise noted for shafts 5'-0" or less in diameter, and as otherwise noted in subsection 6-19.3(3)C of this Special Provision for temporary telescoping casing. The inside diameter of casings for shafts 5'-0" or less in diameter shall not be greater than the specified diameter of the shaft plus 1'-0".

E. Where the minimum thickness of the casing is specified in the Plans, it is specified to satisfy structural design requirements only. The Contractor shall increase the casing thickness as necessary to satisfy the requirements of item A of this section.

6-19.2(2) REINFORCING STEEL

A. Reinforcing steel used in the construction of shafts shall conform to Section 9-07.

B. Steel reinforcing bar centralizers shall be steel, conforming to the details shown in the Plans. The Contractor may propose the use of alternative steel reinforcing bar devices as part of item 7 of the shaft installation plan submittal, as specified in subsection 6-19.(2)B of this Special Provision, subject to the Engineer's review and approval of such devices.

6-19.2(3) CONCRETE

A. Concrete used in the construction of shafts shall be Class 4000P conforming to Section 6-02.

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B. When shafts are constructed in water, the concrete used for the casing shoring seal shall be Class 4000W conforming to Section 6-02.

6-19.2(4) SLURRY

Slurry shall conform to one of the following:

A. Mineral Slurry

1. Mineral slurry shall conform to the following requirements:

Property	Test	Requirement
Density (pcf)	Mud Weight (Density) API 13B-1, Section 1	64.3 to 75
Viscosity (seconds/quart)	Marsh Funnel and Cup API 13b-1, Section 2.2	26 to 50
PH	Glass Electrode, pH Meter, or pH Paper	8 to 11
Sand Content (percent)	Sand API 13B-1, Section 5	
-prior to final cleaning		4.0 max.
-immediately prior to placing concrete		4.0 max.

Use of mineral slurry in salt water installations will not be allowed.

Slurry temperature shall be at least 40F when tested.

B. Synthetic Slurries

1. Synthetic slurries shall be used in conformance with the manufacturer's recommendations, the quality control plan specified in subsection 6-19.3(2)B.5 of this Special Provision, and these Special Provisions. The following synthetic slurries are approved as slurry systems, with additives that have been load tested for the California Department of Transportation:

NOT FOR CONSTRUCTION

Product	Manufacturer
Novagel	Geo-Tech Services, LLC 220 North Zapata Highway, Suite 11A Laredo, TX 78043-4464
ShorePac GCV	CETCO 1500 West Shure Drive Arlington Heights IL, 60004
SlurryPro CDP	KB International, LLC Suite 216, 735 Broad Street Chattanooga, TN 37402-1855
Super Mud*	PDS Company 8140 East Rosecrans Ave. Paramount, CA 90723-2754

*Approval as a product applies to the liquid product only.

Other synthetic slurry products may be approved for use provided the product meets the acceptance criteria established by WSDOT, including status as an approved synthetic slurry (with load tested additives) with the California Department of Transportation (Caltrans).

2. The sand content of synthetic slurry prior to final cleaning and immediately prior to placing concrete shall be less than 2.0 percent, in accordance with API 13B-1, Section 5.

C. Water Slurry (with or without site soils)

1. Water with or without site soils may be used as slurry when casing is used for the entire length of the drilled hole. Use of water slurry without full length casing may only be used with the approval of the Engineer.

2. Water slurry shall conform to the following requirements:

Property	Test	Requirement
Density (pcf)	Mud Weight (Density) API 13B-1, Section 1	65 max.
Sand Content (percent)	Sand API 13B-1, Section 5	1.0 max.

Use of water slurry in salt water installations will not be allowed.

Slurry temperature shall be at least 40F when tested.

6-19.2(5) ACCESS TUBES FOR CROSSHOLE SONIC LOG TESTING

A. Access tubes for crosshole sonic log testing shall be steel pipe of 0.145 inches minimum wall thickness and at least 1-1/2 inch inside diameter.

B. The access tubes shall have a round, regular inside diameter free of defects and obstructions, including all pipe joints, in order to permit the free, unobstructed passage of 1.3 inch maximum diameter source and receiver probes used for the crosshole sonic log tests. The access tubes shall be watertight, free from corrosion with clean internal and external faces to ensure good bond between the concrete and

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the access tubes. The access tubes shall be fitted with watertight threaded PVC caps on the bottom and the top.

6-19.2(6) GROUT

A. Grout for filling the access tubes at the completion of the crosshole sonic log tests shall be a neat cement grout with a maximum water/cement ratio of 0.45.

6-19.3 CONSTRUCTION REQUIREMENTS

6-19.3(1) QUALITY ASSURANCE

A. Shaft Construction Tolerances

1. Shafts shall be constructed so that the center at the top of the shaft is within the following horizontal tolerances:

Shaft Diameter	Tolerance
Less than or equal to 2'-0"	3"
Greater than 2'-0" and less than 5'-0"	4"
5'-0" or larger	6"

2. Shafts shall be within 1.5 percent of plumb. For rock excavation, allowable tolerance can be increased to 2 percent max.

3. During drilling or excavation of the shaft, the Contractor shall make frequent checks on the plumbness, alignment, and dimensions of the shaft. Any deviation exceeding the allowable tolerances shall be corrected with a procedure approved by the Engineer.

4. Shaft steel reinforcing bar placement tolerances shall conform to Section 6-02.3(24)C.

B. Nondestructive Testing of Shafts

1. Unless otherwise specified in this Special Provision, the Contracting Agency will perform crosshole sonic log testing of specific shafts, except for those constructed completely in the dry, selected in accordance with subsection 6-19.3(9)A of this Special Provision. The Contractor shall accommodate the crosshole sonic log testing by furnishing and installing access tubes in accordance with subsection 6-19.3(6)A of this Special Provision.

C. Shaft Preconstruction Conference

1. A shaft preconstruction conference shall be held at least five working days prior to the Contractor beginning any shaft construction work at the site to discuss construction procedures, personnel, and equipment to be used, and other elements of the approved shaft installation plan as specified in subsection 6-19.3(2)B of this Special Provision. If synthetic slurry is used to construct the shafts, the frequency of scheduled site visits to the project site by the synthetic slurry manufacturer's representative will be discussed. The list of materials specified in the Record of Materials (ROM) form for this item of work will also be discussed. Those attending shall include:

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a. (representing the Contractor) The superintendent, on site supervisors, and all foremen in charge of excavating the shaft, placing the casing and slurry as applicable, placing the steel reinforcing bars, and placing the concrete. If synthetic slurry is used to construct the shafts, the slurry manufacturer's representative and a Contractor's employee trained in the use of the synthetic slurry, as identified to the Engineer in accordance with subsection 6-19.3(2)C of this Special Provision, shall also attend.

b. (representing the Contracting Agency) The Project Engineer, key inspection personnel, and representatives from KCDOT Construction Management Unit, Engineering Services Section and Materials Laboratory.

2. If the Contractor's key personnel change, or if the Contractor proposes a significant revision of the approved shaft installation plan, an additional conference shall be held before any additional shaft construction operations are performed.

6-19.3(2) SUBMITTALS

A. Construction Experience

1. Prior to the start of drilled shaft construction, the Contractor shall submit four copies of a project reference list to the Engineer for approval verifying the successful completion by the Contractor of at least three separate foundation projects with drilled shafts of diameters, depths, and ground conditions equal to or larger than those shown in the Plans. A brief description of each project and the owner's contact person's name and current phone number shall be included for each project listed.

2. Prior to the start of drilled shaft construction, the Contractor shall submit four copies of a list identifying the on-site supervisors, and drill rig operators assigned to the project to the Engineer for approval. The list shall contain a detailed summary of each individual's experience in shaft excavation operations, and placement of assembled steel reinforcing bar cages and concrete in shafts.

a. On-site supervisors shall have a minimum two years experience in supervising construction of drilled shaft foundations of similar size (diameter and depth) and scope to those shown in the Plans, and similar geotechnical conditions to those described in the geotechnical report and summary of geotechnical conditions. The work experience shall be direct supervisory responsibility for the on-site shaft construction operations. Project management level positions indirectly supervising on-site shaft construction operations is not acceptable for this experience requirement.

b. Drill rig operators shall have a minimum one year experience in construction of drilled shaft foundations.

3. The Engineer will approve or reject the Contractor's qualifications and field personnel within 10 working days after receipt of the submission. Work shall not be started on any drilled shaft until the Contractor's qualifications and field personnel are approved by the Engineer. The Engineer may suspend the drilled shaft construction if the Contractor substitutes unqualified personnel.

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The Contractor shall be fully liable for the additional costs resulting from the suspension of work and no adjustments in contract time resulting from the suspension of work will be allowed.

B. Shaft Installation Plan

The Contractor shall submit four copies of a shaft installation narrative for approval by the Engineer. In preparing the narrative, the Contractor shall reference the available subsurface data provided in the contract test hole boring logs, the Summary of Geotechnical Conditions provided in the Appendix to the Special Provisions, and the geotechnical report(s) prepared for this project. This narrative shall provide at least the following information:

1. An overall construction operation sequence and the sequence of drilled shaft construction.

2. List, description and capacities of proposed equipment, including but not limited to cranes, drills, auger, bailing buckets, final cleaning equipment and drilling unit. The narrative shall describe why the equipment was selected, and describe equipment suitability to the anticipated site and subsurface conditions. The narrative shall include a project history of the drilling equipment demonstrating the successful use of the equipment on shafts of equal or greater size in similar soil/rock conditions.

3. Details of shaft excavation methods, including proposed drilling methods, methods for cleanout of the shafts and a disposal plan for excavated material and drilling slurry (if applicable). This shall include a review of method suitability to the anticipated site and subsurface conditions.

4. Details of the method(s) to be used to ensure shaft stability (i.e., prevention of caving, bottom heave, etc. using temporary casing, slurry, or other means) during excavation (including pauses and stoppages during excavation) and concrete placement. This shall include a review of method suitability to the anticipated site and subsurface conditions. If casings are proposed or required, casing dimensions and detailed procedures for permanent casing installation, temporary casing installation and removal, and methods of advancing temporary and permanent casing with the excavation in accordance with subsection 6-19.3(B) of this Special Provision, shall be provided.

5. Detailed procedures for mixing, using, maintaining, and disposing of the slurry shall be provided. A detailed mix design (including all additives and their specific purpose in the slurry mix), and a discussion of its suitability to the anticipated subsurface conditions, shall also be provided for the proposed slurry.

   The submittal shall include a detailed plan for quality control of the selected slurry, including tests to be performed, test methods to be used, and minimum and/or maximum property requirements which must be met to ensure that the slurry functions as intended, considering the anticipated subsurface conditions and shaft construction methods, in accordance with the slurry manufacturer's recommendations and these Special Provisions. As a minimum, the slurry quality control plan shall include the following tests:

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Property	Test Method
Density	Mud Weight (Density), API 13B-1, Section 1
Viscosity	Marsh Funnel and Cup,
	API 13B-1, Section 2.2
PH	Glass Electrode, pH Meter, or pH Paper
Sand Content	Sand, API 13B-1, Section 5

6. The method used to fill or eliminate all voids below the top of shaft between the plan shaft diameter and excavated shaft diameter, or between the shaft casing and surrounding soil, if permanent casing is specified.

7. Reinforcing steel shop drawings, details of reinforcement placement, including bracing, centering, and lifting methods, and the method to assure the reinforcing cage position is maintained during construction, including use of bar boots and/or rebar cage base plates, and including placement of rock backfill below the bottom of shaft elevation provided the conditions of subsection 6-19.3(5)D of this Special Provision are satisfied.

8. Details of concrete placement, including proposed operational procedures for pumping methods, and a sample uniform yield form to be used by the Contractor for plotting the volume of concrete placed versus the depth of shaft for all shaft concrete placement (except concrete placement in the dry).

9. The method to be used to form an emergency horizontal construction joint during concrete placement.

10. Description of the material used to temporarily backfill a shaft excavation during a stoppage of the excavation operation, as well as the method used to place and remove the material.

11. When shafts are constructed in water, the submittal shall include seal thickness calculations, seal placement procedure, and descriptions of provisions for casing shoring dewatering and flooding.

The Engineer will evaluate the shaft installation plan for conformance with the Plans, Specifications and Special Provisions, within the review time specified in Section 6-01.9. At the option of the Contracting Agency, a Shaft Installation Plan Submittal Meeting may be scheduled following review of the Contractor's initial submittal of the plan. Those attending the Shaft Installation Plan Submittal Meeting, if held, shall include the following:

a. (representing the Contractor) The superintendent, on-site supervisors, and other Contractor personnel involved in the preparation of the shaft installation plan.

b. (representing the Contracting Agency) The Project Engineer and Contracting Agency personnel involved with the structural, geotechnical, and construction review of the shaft installation plan.

C. Slurry Technical Assistance

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1. If slurry other than water slurry is used to construct the shafts, the Contractor shall provide or arrange for technical assistance in the use of the slurry as specified in subsection 6-19.3(4)A.1 of this Special Provision. The Contractor shall submit four copies of the following to the Engineer:

   a. The name and current phone number of the slurry manufacturer's technical representative assigned to the project.

   b. The name(s) of the Contractor's personnel assigned to the project and trained by the slurry manufacturer in the proper use of the slurry. The submittal shall include a signed training certification letter from the slurry manufacturer for each trained Contractor's employee listed, including the date of the training.

D. Work shall not begin until all the required submittals have been approved in writing by the Engineer. All procedural approvals given by the Engineer will be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work.

6-19.3(3) SHAFT EXCAVATION

A. Shafts shall be excavated to the required depth as shown in the Plans. Shaft excavation operations shall conform to this Special Provision and the shaft installation plan as approved by the Engineer, except as otherwise specified by the Engineer. Once the excavation operation has been started, the excavation shall be conducted in a continuous operation until the excavation of the shaft is completed, except for pauses and stops as noted, using approved equipment capable of excavating through the type of material expected. Pauses during this excavation operation, except for casing splicing, tooling changes, slurry maintenance, and removal of obstructions, are not allowed. Contractor shall provide temporary casing at the site in sufficient quantities to meet the needs of the anticipated construction method.

Pauses, defined as momentary interruptions of the excavation operation, will be allowed only for casing splicing, tooling changes, slurry maintenance, and removal of obstructions. Shaft excavation operation interruptions not conforming to this definition shall be considered stops.

If the shaft excavation is not complete at the end of the shift or series of continuous shifts, the shaft excavation operation may be stopped, provided the following conditions are met. The Contractor shall, before the end of the work day, either install casing in the hole to the depth of the excavation and either the Plan diameter of the shaft or the actual excavated diameter of the hole, whichever is greater, or backfill the hole with material approved by the Engineer in accordance with subsection 6-19.3(2)B.10 of this Special Provision. The Contractor shall backfill the hole to the ground surface, is the excavation is not cased, or to a minimum of five feet about the bottom of the casing, if the excavation is cased. Backfilling of shafts with casing fully seated into rock, as determined by the Engineer, will not be required. If slurry is present in the shaft excavation, the Contractor shall conform to the requirements of subsection 6-19.3(4)B of this Special Provision regarding the maintenance of the minimum level of drilling slurry throughout the stoppage of the shaft excavation operation, and shall recondition the slurry to the required slurry

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properties in accordance with subsection 6-19.3(4) of this Special Provision prior to recommencing shaft excavation operations.

B. The Contractor shall furnish and install casings as follows:

Bridge No.	Bridge Pier Number	Casing Type	Elev. Of Bottom of Required Casing (ft)	Casing Type	Elev. Of Bottom of Required Casing (ft)
South Park Bridge #3179	Abut 1	Temp.	-81.00	--	--
	Pier 2	Temp.	-105.00	--	--
	Pier 5	Temp.	-114.50	--	--
	Abut 6	Temp.	-86.00	--	--

All shafts shall be drilled with a full depth temporary casing. Shaft casing shall be equipped with cutting teeth or a cutting shoe to provide positive cut, and installed by either rotating or oscillating the casing. Drilled casing shall be rotary or oscillatory advanced concurrent, or in advance of any drilling operation. Installing the casing by vibratory means will not be allowed.

When installing required temporary or required permanent casings between the upper and lower elevation limits specified above, the casing shall be advanced prior to or concurrently with the elevation. Excavation in advance of the casing tip shall not exceed 5 feet, except that in no case shall shaft excavation and casing placement extend below the bottom of shaft excavation as shown in the Plans.

To maintain stable excavations and to facilitate construction, the Contractor may furnish and install temporary casing in addition to the required casing specified above. The Contractor shall provide temporary casing at the site in sufficient quantities to meet the needs of the anticipated construction method.

C. Where the acceleration coefficient used for seismic design of the structure, as specified in the General Notes of the structure Plans, is less than or equal to 0.16, the Contractor may use temporary telescoping casing for the shafts at any bridge intermediate or interior pier, subject to the following conditions:

1. The Contractor shall submit the request to use temporary telescoping casing to the Engineer for approval. The request shall specify the diameters of the temporary telescoping casing, and shall specify the shafts where use is requested. The Contractor shall not proceed with the use of temporary telescoping casing until receiving the Engineer's approval.

2. The minimum diameter of the shaft shall be as shown in the Plans.

3. The temporary telescoping casing shall conform to subsections 6-19.2(1)A, 6-19.2(1)B, 6-19.2(1)C, and 6-19.2(1)E of this Special Provision.

The Contractor may use temporary telescoping casing for the shafts of any bridge end pier, regardless of the acceleration coefficient used for the seismic design of the structure, subject to conditions 2 and 3 specified above, and the following two additional conditions:

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4. A maximum of two telescoping casing diameter changes will be allowed.

5. The maximum diameter change at each casing diameter transition shall be twelve inches.

D. The Contractor shall conduct casing installation and removal operations and shaft excavation operations such that the adjacent soil outside the casing and shaft excavation for the full height of the shaft is not disturbed. Disturbed soil is defined as soil whose geotechnical properties have been changed from those of the original in-situ soil, and whose altered condition adversely affects the structural integrity of the shaft foundation.

E. Shaft excavations shall not be left open overnight unless cased full depth. An open shaft excavation is defined as a shaft excavation that has not been filled with concrete, or temporarily backfilled with a material approved by the Engineer in accordance with subsection 6-19.3(2)B.10 of this Special Provision.

F. The Contractor shall use appropriate means such as a cleanout bucket or air lift to clean the bottom of the excavation of all shafts. No more than 2 inches of loose or disturbed material shall be present at the bottom of the shaft just prior to placing concrete.

G. The excavated shaft shall be inspected and approved by the Engineer prior to proceeding with construction. The bottom of the excavated shaft shall be sounded with an airlift pipe, a tape with a heavy weight attached to the end of the tape, or other means acceptable to the Engineer to determine that the shaft bottom meets the requirements in the Contract.

H. When obstructions are encountered, the Contractor shall notify the Engineer promptly. An obstruction is defined as a specific object (including, but not limited to, boulders, logs, and man made objects) encountered during the shaft excavation operation which prevents or hinders the advance of the shaft excavation. When efforts to advance past the obstruction to the design shaft tip elevation result in the rate of advance of the shaft drilling equipment being significantly reduced relative to the rate of advance for the portion of the shaft excavation in the geological unit that contains the obstruction, then the Contractor shall remove, break-up, or push aside, the obstruction under the provisions of subsection 6-19.5.B of this Special Provision. The method of dealing with such obstructions, and the continuation of excavation shall be as proposed by the Contractor and approved by the Engineer.

I. When permanent casing is specified, excavation shall conform to the specified outside diameter of the shaft. After the casing has been filled with concrete, all void space occurring between the casing and shaft excavation shall be filled with a material which approximates the geotechnical properties of the in-situ soils, in accordance with the shaft installation plan specified in subsection 6-19.3(2)B.6 of this Special Provision and as approved by the Engineer.

J. Drilling equipment shall not be operated from an existing bridge, except as otherwise noted. If necessary and safe to do so, and if the Contractor submits a written request to the Engineer in accordance with Section 6-01.6, the Engineer may approve the operation of drilling equipment on a bridge.

K. When shafts are constructed in water, the Contractor shall construct a seal between the casing shoring and the upper portion of the permanent casing for the shaft as

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shown in the Plans, in accordance with the shaft installation plan specified in subsection 6-19.3(2)B.13 of this Special Provision, and as approved by the Engineer.

The seal thickness shown in the Plans is designed to resist the hydrostatic uplift force with the corresponding seal weight and adhesion of the seal to the permanent casing and the casing shoring of 20 psi, based on the casing shoring dimension and the seal vent water surface elevation specified in the Plans. If the Contractor uses a casing shoring diameter other than that specified in the Plans, the Contractor shall submit a revised seal design to the Engineer for approval in accordance with subsection 6-19.3(2)B.13 of this Special Provision.

If, in the opinion of the Engineer, water conditions at the time of construction allow the seal vent water surface elevation to be lowered, the Contractor may revise the casing shoring seal by submitting a revised seal design to the Engineer for approval in accordance with subsection 6-19.3(2)B.13 of this Special Provision.

L. The Contractor shall use slurry, in accordance with subsection 6-19.3(4) of this Special Provision, to maintain a stable excavation during excavation and concrete placement operations once water begins to enter the shaft excavation and remain present.

6-19.3(4) SLURRY INSTALLATION REQUIREMENTS

A. Slurry Technical Assistance

1. If slurry other than water slurry is used, the manufacturer's representative, as identified to the Engineer in accordance with subsection 6-19.3(2)C of this Special Provision, shall:

   a. provide technical assistance for the use of the slurry,

   b. shall be at the site prior to introduction of the slurry into a drilled hole, and

   c. shall remain at the site during the construction and completion of a minimum of one shaft to adjust the slurry mix to the specific site conditions.

2. After the manufacturer's representative is no longer present at the site, the Contractor's employee trained in the use of the slurry, as identified to the Engineer in accordance with subsection 6-19.3(2)C of this Special Provision, shall be present at the site throughout the remainder of shaft slurry operations for this project to perform the duties specified in items 1a through 1c above.

B. Minimum Level of Slurry in the Excavation

1. When slurry is used to maintain a stable excavation, the slurry level in the excavation shall be maintained above the groundwater level the greater of the following dimensions, except as otherwise noted in subsection 6-19.3(4)B.3 of this Special Provision:

   a. not less than five feet for mineral slurries,

   b. not less than ten feet for water slurries,

   c. not less than ten feet for synthetic slurries, except when a lesser dimension is specifically recommended by the slurry manufacturer for the site conditions and construction method, and is supported by slurry

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material property, mix, and maintenance requirements submitted as part of item 5 of the shaft installation plan in accordance with subsection 6-19.3(2)B of this Special Provision,

d. one shaft diameter,

e. dimension as required to provide and maintain a stable hole.

The Contractor shall provide casing, or other means, as necessary to meet these requirements.

2. The slurry level shall be maintained above all unstable zones a sufficient distance to prevent bottom heave, caving or sloughing of those zones.

3. Throughout all stops in shaft excavation operations, as specified in subsection 6-19.3(3)A of this Special Provision, the Contractor shall monitor and maintain the slurry level in the excavation the greater of the following elevations:

a. no lower than the water level elevation outside the shaft,

b. elevation as required to provide and maintain a stable hole.

C. Slurry Sampling and Testing

1. Mineral slurry and synthetic slurry shall be mixed and thoroughly hydrated in slurry tanks, ponds, or storage areas. The Contractor shall draw sample sets from the slurry storage facility and test the samples for conformance with the appropriate specified material properties before beginning slurry placement in the drilled hole. Mineral slurry shall conform to the material specifications in subsection 6-19.2(4)A of this Special Provision. Synthetic slurry shall conform to the quality control plan included in the shaft installation plan in accordance with subsection 6-19.3(2)B.5 of this Special Provision and as approved by the Engineer. A sample set shall be composed of samples taken at mid-height and within two feet of the bottom of the storage area.

2. The Contractor shall sample and test all slurry in the presence of the Engineer, unless otherwise directed. The date, time, names of the persons sampling and testing the slurry, and the results of the tests shall be recorded. A copy of the recorded slurry test results shall be submitted to the Engineer at the completion of each shaft, and during construction of each shaft when requested by the Engineer.

3. Sample sets of all slurry, composed of samples taken at mid-height and within two feet of the bottom of the shaft, shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. As a minimum, sample sets of synthetic slurry shall be taken and tested at least once every four hours after beginning its use during each shift. Sample sets of all slurry shall be taken and tested at least once every two hours if the slurry is not recirculated in the drilled hole or if the previous sample set did not have consistent specified properties. All slurry shall be recirculated, or agitated with the drilling equipment, when tests show that the sample sets do not have consistent specified properties.

4. Sample sets of all slurry, as specified, shall be taken and tested prior to final cleaning of the bottom of the hole and again just prior to placing concrete.

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Cleaning of the bottom of the hole and placement of the concrete shall not start until tests show that the samples taken at mid-height and within two feet of the bottom of the hole have consistent specified properties.

D. The Contractor shall clean, recirculate, de-sand, or replace the slurry to maintain the required slurry properties.

E. The Contractor shall demonstrate to the satisfaction of the Engineer that stable conditions are being maintained. If the Engineer determines that stable conditions are not being maintained, the Contractor shall immediately take action to stabilize the shaft. The Contractor shall submit a revised shaft installation plan which addresses the problem and prevents future instability. The Contractor shall not continue with shaft construction until the damage which has already occurred is repaired in accordance with the specifications, and until receiving the Engineer's approval of the revised shaft installation plan.

F. When mineral slurry, conforming to subsection 6-19.2(4)A of this Special Provision, is used to stabilize the unfilled portion of the shaft, the Contractor shall remove the excess slurry buildup inside of the shaft diameter prior to continuing with concrete placement. The Contractor shall use the same methods of shaft excavation and the same diameter of drill tolls to remove the excess slurry buildup as was used to excavate the shaft to its current depth.

G. The Contractor shall dispose of the slurry as specified in the shaft installation plan as approved by the Engineer, and in accordance with the following requirements:

1. Water slurry may be infiltrated to uplands within the confines of the Contracting Agency Right Of Way for the project, provided that the groundline at the disposal site is at least five feet above the current water table, and that disposal operations conform to the temporary erosion and sedimentation control (TESC) requirements established for this project. For the purposes of water slurry disposal, upland is defined as an area that has no chance of discharging directly to waters of the State, including wetlands or conveyances that indirectly lead to wetlands or waters of the State.

2. Synthetic and mineral slurries shall be contained and disposed of at a waste water treatment facility or into a sanitary sewer in accordance with the Contractor's permit requirements.

6-19.3(5) ASSEMBLY AND PLACEMENT OF REINFORCING STEEL

A. The reinforcing cage shall be rigidly braced to retain its configuration during handling and construction. Individual or loose bars will not be permitted. The Contractor shall show bracing and any extra reinforcing steel required for fabrication of the cage on the shop drawings.

B. The reinforcement shall be carefully positioned and securely fastened to provide the minimum clearances listed below, and to ensure that no displacement of the reinforcing steel bars occurs during placement of the concrete. The steel reinforcing bars shall be securely held in position throughout the concrete placement operation. The Contractor shall submit details of the proposed reinforcing cage spacers along

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with the shop drawings. The reinforcing steel spacers at each longitudinal space plane shall be placed at least at the quarter points around the circumference of the steel reinforcing bar cage, and at a maximum longitudinal spacing of either 2.5 times the shaft diameter or 20'-0", whichever is less.

C. Place bars as shown in the contract plans with minimum concrete cover as shown in the table below.

Shaft Diameter	Minimum Concrete Cover
Less than or equal to 3'-0"	3"
Greater than 3'-0" and less than 5'-0"	4"
5'-0" or larger	6"

D. For shafts with temporary casing within 15 feet of the bottom of shaft elevation as specified in the Plans, the Contractor may place quarry spalls or other rock backfill approved by the Engineer into the shaft below the specified bottom of shaft elevation as a means to support the steel reinforcing bar cage, provided that the materials and means to accomplish this have been addressed by the shaft installation plan as approved by the Engineer, as specified in subsection 6-19.3(2)B.7 of this Special Provision. The use of bar boots and/or rebar cage base plates is required when quarry spalls or other rock backfill is placed at the base of the shaft excavation.

E. Shaft excavation shall not be started until the Contractor has received approval from the Engineer for the reinforcing steel spacers required when the casing is to be pulled during concrete placement.

6-19.3(6) ACCESS TUBES FOR CROSSHOLE SONIC LOG TESTING

A. The Contractor shall install access tubes for crosshole sonic log testing in all drilled shafts, except as otherwise noted, to permit access for the crosshole sonic log test probes. If, in the opinion of the Engineer, the condition of the shaft excavations permit shaft construction in the dry, the Engineer may specify that the access tubes be omitted.

B. The Contractor shall securely attach the access tubes to the interior of the reinforcement cage of the shaft. One access tube shall be furnished and installed for each foot of shaft diameter, rounded to the nearest whole number, as shown in the Plans. The number of access tubes for shaft diameters specified as "X feet 6 inches" shall be rounded up to the next higher whole number. The access tubes shall be placed around the shaft, inside the spiral or hoop reinforcement and bundled with the vertical reinforcement.

C. The access tubes shall be installed in straight alignment and as near to parallel to the vertical axis of the reinforcement cage as possible. The access tubes shall extend from the bottom of the reinforcement cage to at least two feet above the top of the shaft. Splice joints in the access tubes, if required to achieve full length access tubes, shall be watertight. The Contractor shall clear the access tubes of all debris and extraneous materials before installing the access tubes. Care shall be taken to

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prevent damaging the access tubes during reinforcement cage installation and concrete placement operations in the shaft excavation.

D. The access tubes shall be filled with potable water as soon as possible after concrete placement (but no later than one day after concrete placement), and the top watertight threaded PVC caps shall be reinstalled.

6-19.3(7) PLACING CONCRETE

A. Concrete placement shall commence immediately after completion of excavation by the Contractor and inspection by the Engineer. Immediately prior to commencing concrete placement, the shaft excavation and the properties of the slurry (if used) shall conform to subsections 6-19.3(3)F and 6-19.3(4), respectively, of this Special Provision. Concrete placement shall continue in one operation to the top of the shaft, or as shown in the Plans. The Contractor shall place concrete between the upper construction joint of the shaft and the top of the shaft in the dry.

B. When placing concrete in the dry, only the top five feet of concrete shall be vibrated. If a temporary casing is used it shall be removed before vibration. This requirement may be waived if a temporary casing is used and removed with a vibratory hammer during the concrete placement operation. Vibration of concrete does not affect the maximum slump allowed for the concrete class specified.

C. If water is not present, the concrete shall be deposited through the center of the reinforcement cage by a method which prevents segregation of aggregates and splashing of concrete on the reinforcement cage. The concrete shall be placed such that the free-fall is vertical down the center of the shaft without hitting the sides, the steel reinforcing bars, or the steel reinforcing bar cage bracing.

D. When placing concrete underwater, including when water in a shaft excavation exceeds three inches in depth with an infiltration rate of 12 inches of depth or more in one hour, the Contractor shall place the concrete by pressure feed using a concrete pump, with a watertight tube having a minimum diameter of 4 inches. The discharge end of the tube on the concrete pump shall include a device to seal out water while the tube is first filled with concrete. Concrete placement by gravity feed is not allowed.

E. Throughout the underwater concrete placement operation, the discharge end of the tube shall remain submerged in the concrete at least 5 feet and the tube shall always contain enough concrete to prevent water from entering. The concrete placement shall be continuous until the work is completed, resulting in a seamless, uniform shaft. If the concrete placement operation is interrupted, the Engineer may require the Contractor to prove by core drilling or other tests that the shaft contains no voids or horizontal joints. If testing reveals voids or joints, the Contractor shall repair them or replace the shaft at no expense to the Contracting Agency. Responsibility for coring costs, and calculation of time extension, shall be in accordance with subsection 6-19.3(9)H of this Special Provision.

F. Before placing any fresh concrete against concrete deposited in water or slurry, the Contractor shall remove all scum, laitance, loose gravel and sediment on the upper surface of the concrete deposited in water or slurry and chip off any high spots on the

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upper surface of the existing concrete that would prevent the steel reinforcing bar cage from being placed in the position required by the Plans.

Prior to performing any of the crosshole sonic log testing operations specified in subsection 6-19.3(9) of this Special Provision, the Contractor shall remove the concrete at the top of the shaft down to sound concrete.

G. The Contractor's construction operation in the vicinity of a drilled shaft excavation with freshly placed concrete and curing concrete shall conform to Section 6-02.3(6)D.

H. Except for shafts where the shaft concrete is placed in the dry, the Contractor shall complete a uniform yield form, consistent with the sample form submitted to the Engineer as part of the shaft installation plan as specified in subsection 6-19.3(2)B.9 of this Special Provision, for each shaft and shall submit the completed form to the Engineer within 24 hours of completing the concrete placement in the shaft.

6-19.3(8) CASING REMOVAL

A. As the temporary casing is withdrawn, a minimum 5 foot head of concrete shall be maintained to balance the foundation material and water pressure at the bottom of the casing.

B. Tops of permanent casings for the shafts shall be removed to the top of the shaft or finished ground line, whichever is lower, unless directed otherwise by the Engineer. For those shafts constructed within a permanent body of water, tops of permanent casings for shafts shall be removed to the low water elevation, unless directed otherwise by the Engineer.

C. The Contractor shall completely remove all temporary casings, except as noted. The Contractor may leave some or all of the temporary casing in place provided all the following conditions are satisfied:

1. The Contractor shall submit the following information in writing to the Engineer:

   a. The Contractor shall completely describe the portion of the temporary casing to remain.

   b. The Contractor shall specify the reason(s) for leaving the portion of the temporary casing in place.

   c. The Contractor shall submit structural calculations, using the design specifications and design criteria specified in the General Notes of the structure Plans, in accordance with Section 6-01.9, indicating that leaving the temporary casing in place is compatible with the structure as designed in the Plans.

2. The Contractor shall have received the Engineer's written approval of the submitted request to leave the temporary casing in place.

6-19.3(9) NONDESTRUCTIVE TESTING OF SHAFTS (CROSSHOLE SONIC LOG TESTING)

A. The Contracting Agency will perform crosshole sonic log testing and analysis on all completed shafts designated for testing by the Engineer. The Contracting Agency will require advance notice from the Contractor to schedule all crosshole sonic log testing. The Contractor shall give at least 48 hours notice to the Engineer of the time

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the concrete in each shaft will be sufficiently cured to allow for crosshole sonic log testing.

The testing will be performed after the shaft concrete has cured at least 96 hours. Additional curing time prior to testing may be required if the shaft concrete contains admixtures, such as set retarding admixture or water reducing admixture, added in accordance with Section 6-02.3(3). The additional curing time prior to testing required under these circumstances shall not be grounds for additional compensation or extension of time to the Contractor in accordance with Section 1-08.8.

Crosshole sonic log testing will be conducted at all shafts in which access tubes for test probe access have been installed (see subsection 6-19.3(6)A of this Special Provision).

B. After placing the shaft concrete and before beginning the crosshole sonic log testing of a shaft, the Contractor shall inspect the access tubes. Each access tube that the test probe cannot pass through shall be replaced, at the Contractor's expense, with a two inch diameter hole cored through the concrete for the entire length of the shaft. Unless directed otherwise by the Engineer, cored holes shall be located approximately six inches inside the reinforcement and shall not damage the shaft reinforcement. Descriptions of inclusions and voids in cored holes shall be logged and a copy of the log shall be submitted to the Engineer. Findings from cored holes shall be preserved, identified as to location, and made available for inspection by the Engineer.

C. The Engineer will determine final acceptance of each shaft, based on the crosshole sonic log test results and analysis for the tested shafts, and will provide a response to the Contractor within three working days after receiving the test results and analysis submittal.

D. Except as otherwise noted, the Contractor shall not commence subsequent shaft excavations until receiving the Engineer's approval and acceptance of the first shaft, based on the results and analysis of the crosshole sonic log testing for the first shaft. The Contractor may commence subsequent shaft excavations prior to receiving the Engineer’s approval and acceptance of the first shaft, provided the following condition is satisfied:

1. The Engineer approves continuing with shaft construction based on the Engineer’s observations of the construction of the first shaft, including, but not limited to, conformance to the shaft installation plan as approved by the Engineer, and the Engineer’s review of Contractor’s daily reports and Inspector’s daily logs concerning excavation, steel reinforcing bar placement, and concrete placement.

E. If the Contractor requests, the Engineer may direct that additional testing be performed at a shaft. If subsequent testing at a shaft indicates the presence of a defect(s) in the shaft, the testing costs and the delay costs resulting from the additional testing shall be borne by the Contractor in accordance with Section 1-05.6. If this additional testing indicates that the shaft has no defect, the testing costs and the delay costs resulting from the additional testing will be paid by the Contracting Agency in accordance with Section 1-05.6, and, if the shaft construction is on the critical path of the Contractor’s schedule, a time extension equal to the delay created by the additional testing will be granted in accordance with Section 1-08.8.

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F. For all shafts determined to be unacceptable, the Contractor shall submit a plan for further investigation or remedial action to the Engineer for approval. All modifications to the dimensions of the shafts, as shown in the Plans, required by the investigation and remedial action plan shall be supported by calculations and working drawings as specified in Section 6-01.9. All investigation and remedial correction procedures and designs shall be submitted to the Engineer for approval. The Contractor shall not begin repair operations until receiving the Engineer's approval of the investigation and remedial action plan.

G. If the Engineer determines that the concrete placed under slurry for a given shaft is structurally inadequate, that shaft will be rejected. The placement of concrete under slurry shall be suspended until the Contractor submits to the Engineer written changes to the methods of shaft construction needed to prevent future structurally inadequate shafts, and receives the Engineer's written approval of the submittal.

H. At the Engineer's request, the Contractor shall drill a corehole in any questionable quality shaft (as determined from crosshole sonic log testing and analysis or by observation of the Engineer) to explore the shaft condition.

Prior to beginning coring, the Contractor shall submit the method and equipment used to drill and remove cores from shaft concrete to the Engineer and receives the Engineer's written approval. The coring method and equipment shall provide for complete core recovery and shall minimize abrasion and erosion of the core.

If a defect is confirmed, the Contractor shall pay for all coring costs in accordance with Section 1-05.6. If no defect is encountered, the Contracting Agency will pay for all coring costs in accordance with Section 1-05.6, and, if the shaft construction is on the critical path of the Contractor's schedule, compensation for the delay will be granted by an appropriate time extension in accordance with Section 1-08.8. Materials and work necessary, including engineering analysis and redesign, to effect corrections for shaft defects shall be furnished to the Engineer's satisfaction at no additional cost to the Contracting Agency.

I. All access tubes and cored holes shall be dewatered and filled with grout after tests are completed. The access tubes and cored holes shall be filled using grout tubes that extend to the bottom of the tube or hole or into the grout already placed.

6.19.4 MEASUREMENT

A. Measurement will be made as follows:

1. Soil excavation for shaft including haul will be measured by the cubic yards of shaft excavated. The cubic yards will be computed using the shaft diameter shown in the Plans, the top of shaft soil excavation, as defined below, and the bottom elevation shown in the Plans, unless adjusted by the Engineer, less all rock excavation measured as specified in item 2.

   Except as otherwise specified, the top of shaft soil excavation shall be defined as the highest existing ground point within the shaft diameter. For shafts where the top of shaft is above the existing ground line and where the Plans show embankment fill placed above the existing ground line to the top of shaft and above, the top of shaft soil excavation shall be defined as the top of shaft.

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Excavation through embankment fill placed above the top of shaft will not be included in the measurement.

2. Rock excavation for shaft including haul will be measured by the cubic yards of shaft excavated. The cubic yards will be computed using the shaft diameter shown in the Plans, the top of the rock line, defined as the highest bedrock point within the shaft diameter, and the bottom elevation shown in the Plans, unless adjusted by the Engineer.

3. Furnishing and placing temporary casing will be measured by the number of linear feet of required temporary casing, as specified in subsection 6-19.3(3)B of this Special Provision, installed within the limits shown in the Plans, plus additional length approved by the Engineer for temporary casing required to address field conditions as encountered.

4. Furnishing permanent casing will be measured by the number of linear feet of required permanent casing, as specified in subsection 6-19.3(3)B of this Special Provision, installed below the cutoff elevation.

5. Placing permanent casing will be measured by the number of permanent casings placed.

6. Casing shoring will be measured by the number of linear feet of casing shoring installed. The linear feet dimension will be computed using either the top of ground line, defined as the highest ground line elevation within the casing shoring, or the specified shaft seal vent elevation as shown in the Plans, whichever is higher, and the bottom elevation as shown in the Plans.

7. Concrete Class 4000P for shaft will be measured by the cubic yards of concrete in place. The cubic yards will be computed using the shaft diameter shown in the Plans, and the top and bottom elevations shown in the Plans, unless adjusted by the Engineer.

8. Steel reinforcing bar for shaft will be measured by the computed weight of all reinforcing steel in place, as shown in the Plans. Bracing for steel reinforcing bar cages shall be considered incidental to this item of work.

9. CSL access tube will be measured by the linear foot of tube furnished and installed.

6.19.5 PAYMENT

A. Payment will be made, in accordance with Section 1-04.1, for the following bid items when they are included in the proposal:

1. "Soil Excavation for _____ Diam. Shaft Incl. Haul", per cubic yard, including all costs in connection with furnishing, mixing, placing, maintaining, containing, collecting, and disposing of all mineral, synthetic, and water slurry.

2. "Rock Excavation for Shaft Including Haul", per cubic yard.

3. "Furnishing & Placing Temp. Casing for _____ Dia. Shaft", per linear foot, including all costs in connection with completely removing the casing after completing shaft construction.

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4. "Furnishing Permanent Casing for Dia. Shaft", per linear foot.

5. "Placing Permanent Casing for Diam. Shaft", per each.

6. “Casing Shoring”, per linear foot, including all costs in connection with placing seals when required.

7. "Shoring Or Extra Excavation Cl. A - _____ lump sum, including all costs in connection with all excavation outside the limits specified for items 1 and 2, all temporary telescoping casings, and all optional temporary casings.

8. "Conc. Class 4000P for _____ Diam. Shaft", per cubic yard.

9. "St. Reinf. Bar For _____ Diam. Shaft", per pound, including all costs in connection with furnishing and installing steel reinforcing bar spacers and centralizers.

10. "CSL Access Tube for _____ Diam. Shaft", per linear foot.

11. "Removing Shaft Obstructions", estimated.

No measurement or payment will be made for slurry. All costs in connection with slurry shall be included in related bid items.

B. Payment for Removing Shaft Obstructions

1. Payment for removing, breaking-up, or pushing aside, shaft obstructions, as defined in subsection 6-19.3(3)H of this Special Provision, will be made for the changes in shaft construction methods necessary to deal with the obstruction. The Contractor and the Engineer shall evaluate the effort made and reach agreement on the equipment and employees utilized, and the number of hours involved for each. Once these cost items and their duration have been agreed upon, the payment amount will be determined using the rate and markup methods specified in Section 1-09.6. For the purpose of providing a common proposal for all bidders, the Contracting Agency has entered an amount for the item "Removing Shaft Obstructions" in the bid proposal to become a part of the total bid by the Contractor.

2. If shaft construction equipment is idled as a result of the work required to deal with the obstruction and cannot be reasonably reassigned within the project, then standby payment for the idled equipment will be added to the payment calculations. If labor is idled as a result of the work required to deal with the obstruction and cannot be reasonably reassigned within the project, than all labor costs resulting from Contractor labor agreements and established Contractor policies will be added to the payment calculations.

3. The Contractor shall perform the amount of obstruction work estimated by the Contracting Agency within the original time of the contract. The Engineer will consider a time adjustment and additional compensation for costs related to the extended duration of the shaft construction operations, provided:

   a. the dollar amount estimated by the Contracting Agency has been exceeded, and

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b. the Contractor shows that the obstruction removal work represents a delay to the completion of the project based on the current progress schedule provided in accordance with Section 1-08.3.

Add the following new Section:

(*****)

6-20 SUPERSTRUCTURE - BASCULE SPAN

6-20.1 DESCRIPTION

This item includes the movable bascule span leafs, complete, in place and operable as indicated in the Contract Documents to the satisfaction of the Engineer. This item includes: shop drawing preparation and submittal, fabrication, testing, storage, handling, transportation, erection, furnishing, and painting (where applicable), of components including, but not limited to, bascule girders, trunnion frames, floorbeams, cantilever brackets, bolted splices, lateral bracing, gusset plates, shear studs, vehicular deck grating, sidewalk deck grating, roadway joints, sidewalk joints, bascule span-supported maintenance walkways, as well as all necessary connections and fasteners; Class 4000LW Concrete (lightweight concrete) for the bascule span roadway and sidewalks; Class 4000HW (heavyweight concrete) for the counterweight; balance blocks and plates; and miscellaneous items related to those described.

This item also includes the fixed spans over the counterweight at Bascule Piers 3 and 4, complete, in place, and serviceable as indicated in the Contract Documents to the satisfaction of the Engineer. This item includes: shop drawing preparation and submittal, fabrication, testing, storage, handling, transportation, erection, furnishing, and painting (where applicable), of components including, but not limited to, floorbeams, overhang brackets, cross frames, diaphragms, roadway deck slab, roadway joint at bascule span, and elastomeric bearing pads with associated hardware, including shear blocks, anchor bolts and nuts.

The traffic barriers and pedestrian railings supported by the bascule leaves will be measured and pay for under pay items separate from “Superstructure – Bascule Span”.

6-20.2 MATERIALS

Materials shall meet the requirements of the following Sections:

Class 4000HW Concrete	6-02.3(6)F
Class 4000LW Concrete	6-02.3(6)G
Sheet Curing Materials	9-23.1
Structural Steel and Related Materials	9-06
Fiber-Reinforced Polymer	9-XX.X

Unless otherwise noted on the Contract Plans, all structural steel shall be Structural Low Alloy Steel. Bascule girder webs, flanges, and stiffeners within the limits shown on the Contract Plans shall be Structural High Strength Steel. Structural Carbon Steel is permissible only where noted on the Contract Plans. All steel components that are not to be painted shall be galvanized in accordance with ASTM A123.

6-20.3 CONSTRUCTION REQUIREMENTS

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Construction of concrete structures shall conform to Section 6-02. Furnishing, fabricating, erecting, cleaing and painting of steel structures shall conform to Section 6-03.

6-20.3(1) PERMANENT STEEL BRIDGE DECK FORMS

Permanent steel bridge deck forms are not permitted on the bascule span or the fixed span over the counterweight.

6-20.3(2) COUNTERWEIGHTS

Each counterweight is a steel box between the bascule girders, as detailed on the Contract Plans, filled with Class 4000HW Concrete (heavyweight concrete). The counterweight with pockets provided therein for balance blocks for securing an initial balance of each bascule leaf and future balance adjustment. For future adjustment of the counterweights, the Contractor shall provide additional balance blocks and/or plates over and above those required for the initial balance as indicated on the Contract Plans. These blocks and/or plates shall be stored at the site at locations designated by the Engineer.

6-20.3(3) BASCULE SPAN CONSTRUCTION

Special attention is called to the necessity for the correct alignment of the forward (toe) and rear (heel) joint details. The bascule girders and floorbeams shall be cambered for dead load as specified on the Contract Plans. Each bascule leaf shall be assembled as a unit in the shop in its cambered position. Proper alignment of machinery bearings or other casings shall be verified.

The setting of all members and other parts, which serve as supports or connections of the movable parts or machinery, shall be set to the tolerances described within the Contract Documents. In no case shall concrete be placed around such parts before they are firmly held in place by proper temporary bracing and before the accuracy of the setting has been checked. Prior to the setting of critical members, the Contractor shall submit an erection procedure to the Engineer for review and approval. This erection procedure shall show estimated displacements and deflections of steel work while portions of the structure are erected and concrete placed.

The Contractor shall monitor the deflection of the bascule girders during placement of concrete on the roadway and sidewalks decks.

6-20.3(4) FABRICATION

The flange plates, which support the trunnion bearings, shall be so accurately welded to the web plates that not less than the designated thickness of metal will remain after finishing. Flange plates shall be square with the web. These plates shall be ordered with extra thickness to allow for finishing and tolerances. The flange plates shall be planed throughout the length as shown on the Contract Plans to provide a true plane for attaching the trunnion bearings.

Special attention is called to the alignment of trunnions. See Division 10 for additional requirements.

Stainless Steel Shims: Wherever shims are required, the nominal, or theoretical, thickness “t” shall be indicated. The actual shim pack furnished shall have a thickness equal to 2 times the nominal thickness indicated and shall be composed of the following material thickness: t, t/2, t/4, t/8, t/16, and etcetera. The thickness of the material furnished shall be such that the total shim pack thickness can be adjusted in increments of 1/32nd inch for

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machinery bases and structural parts that have machined surfaces, or 1/16th inch for structural steel connections for parts not having machined surfaces.

6-20.3(5) BASCULE SPAN ERECTION

The bascule leaves may be erected and constructed in the closed position, one leaf at a time over a period XX calendar days, or both leaves erected simultaneously over a period of YY calendar days.

During periods when the bascule leaves are unbalanced, the Contractor must provide positive, sturdy supports, shoring, and /or falsework to support the unbalanced loads. The Contractor shall secure the services of a Professional Engineer, licensed in the State of Washington, to design these supports to the entire unbalanced loads plus all additional loads resulting from wind forces, temporary erection forces, accumulations of snow, ice or dirt, etcetera. The Contractor shall submit proposed shoring methods, sealed by the Contractor's engineer, to the Engineer for review and approval. It will remain the Contractor's responsibility to ensure that the bascule leaves are adequately shored in a safe manner.

The Contractor shall submit erection procedures of proposed stages of construction, means of control, and motive power to the Engineer for review and approval. The Contractor shall keep ready at a convenient nearby location sufficient counterweight material to balance the bridge leaves during the erection and completion. It will remain the Contractor's responsibility to assure that the bascule leaves are opened and closed in a safe manner.

The Contractor shall verify clearances. The first time the bascule leaf is slowly moved; a check shall be made of all points of minimal clearance or possible interference between the fixed and movable parts of the structure or as otherwise specified on the Contract Plans. Particular care must be taken to ensure that the joints in the roadway deck are adjusted for smooth joints, proper alignments and clearances.

Metal Work Set in Concrete: All metal work set in concrete shall be placed and maintained with care in exact alignment at the proper elevation. Where a grout bed is required, the metal parts shall be adjusted and supported by means of leveling bolts. The grout bed shall be made with an approved self-leveling, high strength, non-shrink and non-staining grout. All metal work shall be adjusted to the satisfaction of the Engineer before being set in concrete or mortar.

6-20.3(6) PLACING SPAN IN OPERATION CONDITION

The span shall be placed in an operating condition, to the satisfaction of the Engineer, upon its final completion. The Span shall be operated sufficiently to enable the Engineer to inspect its operation to their satisfaction. Faulty and defective work shall be repaired or replaced at no additional cost to the County.

Operating Machinery Work: The furnishing, fabricating, installing and/or erecting, painting, adjusting, and the placing in operation of all related items shall be as specified in the Division 10 Operating Machinery.

6-20.3(7) SPAN BALANCING

This work shall consist of the Contractor developing calculations and testing the operation of the bascule span to ensure its balance.

During the shop drawing development, the Contractor shall submit complete and thorough center-of-gravity calculations for the bascule span in a tabulated form showing

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each component's weight, the distance to each component's center of gravity horizontally and vertically (and transversely, where not symmetric with respect to the bridge centerline), the product of each component's weight and distances (moments), the net summation of component weights and moments, and mean center-of-gravity location. This tabulation shall be developed for each bascule leaf in the fully closed and fully open positions, each counterweight in the fully closed and fully open positions, and the complete structure, which is the combination of both.

Calculation Procedures:

Center-of-gravity calculations shall be obtained by using weights from approved shop drawings for the structural steel, pedestrian railing, traffic barrier, roadway deck grating, sidewalk deck grating and all joints, as well as Class 4000LW and Class 4000HW concrete test block results, estimated weight of paint on the structural steel, and incidentals such as navigation lighting, conduits, wiring, span locks, platforms, bird control hardware, etcetera.

Counterweight calculations shall be based on the assumption that half of the balance blocks and plates (approximately 4 percent of counterweight weight) are in place at the counterweight in the fully balanced condition, or as directed by the Engineer.

Weights for structural steel shall be computed on the basis of the net finished parts as shown on the shop drawings deducting for cope, cuts, clips and all open holes. Weights of bolts, nuts, washers and welds shall be included.

The Contractor shall compute the weights in pounds of individual components, reported to two decimal places and summarized to the nearest whole number. Calculations shall be furnished showing the development of these weights

.The center of gravity of each component shall be located horizontally and vertically, with respect to the centerline of trunnion. Where necessary, the center of gravity of each component shall be located transversely with respect to the bridge centerline. All dimensions shall be reported in feet and to two decimal places. Positive (+) distances will be for elements forward and above the centerline of trunnion, while negative (-) distances will be for elements having centers of gravity behind or below the centerline of trunnion. Positive (+) and negative (-) assignment of transverse distances, where necessary, shall be consistent throughout the balance calculations.

These calculations shall be utilized by the Contractor in developing the required information for the counterweight calculations, which are further explained in Section 6-02.3(6)F, Class 4000HW Concrete.

No construction shall proceed on the counterweight until the balance calculations have been reviewed and approved by the Engineer. The balance calculations shall be prepared, signed and sealed by a Professional Engineer licensed to practice in the State of Washington and familiar with movable bridges.

Balance calculations shall be prepared and balance adjustments performed such that, in the calculations, the bascule span is nearly balanced. It is desired to have a slight unbalanced condition, which is specified in subsequent section, for which adjustment shall be made in the field.

Throughout the entire construction, the Contractor shall maintain a copy of the balance tabulation on site and correct the calculations to reflect any adjustments required for field installation of the components.

6-20.3(7)A BALANCING PROCEDURES (PERFORM ON EACH LEAF INDIVIDUALLY)

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After the concrete counterweight, steel grid deck, sidewalks and curbs, railings and barriers are constructed and the counterweight adjusted for the predetermined balance by installing some of the balance blocks and/or plates, the Contractor shall take a preliminary balance reading of the bascule span. This preliminary reading shall be performed by jacking the span using pressure readings from hydraulic jacks placed under the live load shoe. No extraneous loads shall be on the span during the jacking. The Contractor shall place a hydraulic jack under each live load bearing shoe and apply sufficient load to unseat the span from its bearings. Pressure readings at each jack shall be taken to determine the unbalanced moments. The Contractor shall also place hydraulic jacks under each bascule girder at the counterweight and apply sufficient load to close the span. Pressure readings at each jack shall be taken to determine the unbalanced moments. These pressure readings shall also be used to estimate the trunnion friction. An unbalanced moment no greater than 600 kip-ft in the direction towards the channel (span heavy) will be considered suitable. If a greater moment exists, the Contractor shall rebalance and re-jack the span until this moment is attained. At no time will a moment in the direction of the counterweight (tail heavy) be acceptable. The Contractor shall repeat this procedure until the unbalanced moment is acceptable.

Once this initial balancing has been performed, the Contractor shall operate the bascule span utilizing the operating machinery system. The operation of the span shall occur with no extraneous loads on the span and when the weather and wind conditions impose no additional loading on the span.

After the balance blocks have been placed, a second test operation will be run and recorded as previously mentioned. If the operation indicates a need to further refine the balance, the Contractor shall make the adjustments in placement of balance blocks and/or plates. This procedure shall be repeated until the desired span balance is obtained.

The Contractor may submit for review and approval an alternate method of span balance. Rejection of alternate method shall at no time be considered extra cost to the County.

6-20.4 MEASUREMENT

The “Superstructure - Bascule Span” contains the following approximate quantities of material, presented per leaf (two required):

Item	Approximate Quantity per Leaf	
Structural Carbon Steel	XX	LBS.
Structural Low Alloy Steel	XX	LBS.
Structural High Strength Steel	XX	LBS.
Shear Studs	XX	Each
High-Load Elastomeric Bearing Pads	XX	Each
Roadway Deck (Partially Filled Grating)	XX	S.F.
Sidewalk Deck (Filled Grating)	XX	S.F.
Balance Blocks	XX	Each
Balance Plates	XX	Each
Conc. Class 4000LW	XX	C.Y.
Conc. Class 4000HW	XX	C.Y.
Conc. Class 4000D	XX	C.Y.
St. Reinf. Bar	XX	LBS.
Bascule Rear (Heel) Roadway Joint	XX	L.F.
Bascule Rear (Heel) Sidewalk Joint	XX	L.F.

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Bascule Rear (Heel) Longitudinal Joint	XX	L.F.
Bascule Forward (Toe) Roadway Joint	XX	L.F.
Bascule Forward (Toe) Sidewalk Joint	XX	L.F.
FRP Maintenance Walkway	XX	S.F.
Bird Control Hardware	XX	L.F.

The quantities are listed for the convenience of the Contractor in determining the work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than approved changes will be made in the lump sum contract price for the Superstructure – Bascule Span even though the actual quantities required may deviate from those listed.

Item does not include: Machinery required for complete operation of the span, spider plates at trunnion connection to bascule girder, span locks, traffic barrier, pedestrian railing, joint between approach span and counterweight span, navigation lights, conduits, and wiring.

6-20.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for each of the following:

"Superstructure - Bascule Span", per lump sum.

The lump sum Contract price for "Superstructure - Bascule Span" shall be full pay for all costs in completely furnishing and installing items as shown and noted in the Contract Plans as well as outlined in these provisions and the Standard Specifications.

Add the following new Section:

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6-21 FENDER SYSTEM

6-21.1 DESCRIPTION

This Work consists of furnishing 24-inch diameter steel piling, steel pile tips or shoes, structural carbon steel, stainless steel plates and rods, plastic lumber, driving steel piles, and fabricating, and constructing the bridge fender system. Fender system shall be constructed in 2 stages:

Easterly – constructed after the existing bridge is removed
Westerly – construction after new bridge is built

The bridge fender systems serve primarily as navigation aids to vessel traffic by delineating the shipping channel beneath bridges.

6-21.1(1) SUBMITTALS

The manufacturer shall submit to the purchasing authority one (1) copy each of his standard and most recent product brochure, technical data, and owners field guide for the product covered by this specification. Copies of material test reports and performance test data which support compliance with the specification requirements shall be submitted to the purchasing authority as required by the procurement documents.

6-21.1(2) DRAWINGS

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The purchaser is responsible for preparing his own shop drawings. Where tolerances prescribed may cumulatively result in incorrect fits, the contractor shall provide tolerances within those prescribed herein to insure correct fit, assembly, and operations of the items. No deviation from the prescribed dimensions or tolerances is permissible without prior approval of the purchaser.

6-21.2 MATERIALS

Materials shall meet the requirements of the following Sections:

Structural Plastic Lumber	9-36
Steel Pile Tips and Shoes	9-10.4
Steel Piling	9-10.5
Stainless Steel	ASTM A240 TYPE 361

6-21.3 CONSTRUCTION REQUIREMENTS

6-21.3(1) PLASTIC LUMBER INSTALLATION

Installation shall be in accordance with manufacturer's guidelines as noted in the owners field guide. Installation of the plastic lumber is not included as part of manufacturer's responsibility under this purchase order.

Protect materials at all times against exposure to extreme heat or impact. Transport Structural Plastic Lumber in a manner that will minimize scratching or damage to the outer surfaces, stack on dunnage above ground so that it may be easily inspected, and store in a manner that will avoid damage. Handle and lift Structural Plastic Lumber with nylon slings. Do not use sharp instruments in handling the product. Structural Plastic Lumber damaged in shipping or handling will be rejected.

Structural Plastic Lumber sections containing cracks in the reinforcing rods or cracks, partial or full depth, across the section or splits will be rejected.

Cut, bevel, drill, countersink and otherwise install Structural Plastic Lumber in accordance with the manufacturer’s recommendations. Set all material accurately to required levels and lines, with members plumb and true and accurately cut and fitted. Securely attach all materials to substrate by anchoring and fastening as shown on the plans. Perform all cutting and drilling in a manner that allows for the collection of all debris and dispose of properly.

6-21.3(2) PILING AND STEEL STRUCTURE INSTALLATIONS

Install piles in accordance with Section 6-05. After driving, cut off piles to the exact plane of the fender system above them as shown in the Plans by means as approved by the Engineer to provide a smooth level cut.

Furnishing, fabricating, and installing the structural steel components for the fender system as shown in the Plans shall be in compliance with Section and 6-03.

All structural steel pipe piles, rolled steel sections, shapes, channels, and structural steel members shall be galvanized in accordance with ASSHTO M111. All structural bolts, except headed stainless steel rods, shall be AASHTO M164 (ASTM A325) Type 1 high strength bolts only and shall be hot-dip galvanized to AASHTO 232, unless otherwise noted in the Plans.

6-21.4 MEASUREMENT

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Measurement for “Furnishing St. Piling” shall be in accordance with Section 6-05.4.

Measurement for “Driving St. Pile” shall be in accordance with Section 6-05.4.

Measurement for “Furnishing Steel Pile Tip or Shoe (size)” shall be in accordance with Section 6-05.4.

Measurement for “Structural Carbon Steel” shall be in accordance with Section 6-03.4.

“Stainless Steel” shown in the Plans will be measured by the pound or will be paid for on a lump sum basis, whichever is shown on the Proposal.

Measurement for “Structural Plastic Lumber” will be measured by the 1,000-board feet (MBM), using nominal thicknesses and widths. Lengths will be actual lengths of individual pieces in the finished Structure with no deduction for daps, cuts, or splices.

6-21.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for each of the following Bid items that are included in the Proposal:

1. “Furnishing St. Piling” will be made in accordance with Section 6-05.5.
2. “Driving St. Pile” will be made in accordance with Section 6-05.5.
3. “Furnishing Steel Pile Tip or Shoe” will be made in accordance with Section 6-05.5.
4. “Structural Carbon Steel” will be made in accordance with Section 6-03.5.
5. “Stainless Steel” will be made on the same per pound basis as specified for structural carbon steel.
6. “Structural Plastic Lumber” will be made on the same per MBM as specified for timber and lumber.

All costs in connection with completing the work, including furnishing and installing steel piles, steel pile tip or shoe, structural carbon steel, stainless steel, structural plastic lumber, and items as shown and noted in the Plans and as outlined in these specifications and in the Standard Specification shall be included in the unit Contract prices for the pay items involved and shown.

Add the following new Section:

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6-22 BASCULE PIER CAISSONS

6-22.1 GENERAL

Bascule piers 3 and 4 may be constructed on foundations consisting of dredged caissons sunk by open dredging to the depths indicated on the plans or to such other depths as the Engineer may consider necessary as the work progresses.

The term caisson designates a permanent part of the foundation so constructed as to sink gradually into place as material is excavated from within and below the cutting shoe from caisson dredge wells. After caissons have been sunk to required depths and are in approved positions, sealing courses of concrete shall be deposited under water. All dredge wells above such sealing courses of concrete shall be filled with only potable water.

The Contractor shall make his own appraisal of the difficulties of sinking the caissons through any and all materials to the final founding elevation and must determine the means

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and methods of construction required for satisfactory sinking at all stages of construction and shall be prepared to sink the caissons through all soils and obstructions encountered.

6-22.1(1) PREQUALIFICATION OF CONTRACTOR

The person(s) or firm directing the work described in this Special Provision shall be knowledgeable of dredged caisson type foundation installation procedures and shall have installed dredged caissons in conditions similar to those expected at the project site in accordance with the following minimum experience requirements:

1. A dredged caisson contractor shall have a minimum of two years of dredged caisson installation experience prior to the bid date for this project; or,
2. A contractor without prior dredged caisson experience shall employ a superintendent with a minimum of five years of dredged caisson experience prior to the bid date of this project.

A contractor with limited dredged caisson installation experience may use a combination of the company's and its superintendent's experience. Five years of experience of the superintendent may be counted as equivalent to one year experience for the Contractor.

Within 21 calendar day of Notice to Proceed, or Limited Notice to Proceed, which occurs first, the Contractor shall furnish objective evidence of the following requirements:

1. A signed statement from the superintendent responsible for dredged caisson installation that the project site has been visited by persons proposed to be in responsible charge of the caisson constructions, and that all the subsurface information has been inspected. The subsurface information includes soil profiles and boring logs furnished in the plans, available soil samples, and geotechnical reports, all available at the following location:

   Map Counter of the
   Engineering Services Section Road Services Division
   1st Floor, 201 South Jackson Street
   Seattle, Washington, 98104-3856

2. Ability of the Contractor, or firm responsible for installation of caissons, to complete a project of this type. The ability shall be supported by a list containing a detailed description of at least two projects completed on which the Contractor and/or superintendent has installed or supervised installation of dredged caissons in similar conditions to those anticipated at the site, and utilized sinking techniques similar to those anticipated for this project. This list of projects shall contain names and phone numbers of the project owners' representatives who can verify the Contractor's participation on the project, and the names of the superintendents who were in charge of the Contractor's operations.

The Engineer will review the information submitted and notify the Contractor within 21 days of receiving the submittal of acceptance or rejection. The Contractor shall take the necessary steps to satisfactorily meet the requirements and submit acceptable experience.

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Work on the caissons shall not start until the experience requirements are accepted by the Engineer.

6-22.1(3) WORKING DRAWINGS AND COMPUTATIONS

Before beginning construction operations the Contractor shall submit to the Engineer drawings and computations showing complete design and details of the proposal construction and geometry control of the caisson. This submittal shall be in the form of a "Caisson Construction Manual".

The Caisson Construction Manual shall be prepared in accordance with the Contractor-adopted general construction techniques and schedule. The Caisson Construction Manual shall identify proposed construction sequence and methods including, but not limited to: construction equipment, placement and removal of temporary works (including cofferdams, trestles, concrete falsework), methods of excavation, methods of material transportation to and from the caissons, methods of controlling the rate vertical travel of the caissons during sinking operations (including means to increase and decrease vertical rates such as lubricants and water jetting), methods of controlling geometry of the caissons and the cutting shoes (steering the caissons).

The Caisson Construction Manual shall include the detailed step-by-step procedure for the cofferdam construction including material disposal, cutting shoe placement, caisson segment casting, sinking and control of caisson segments, construction of the caisson distribution cap, construction of the first lift of the bascule pier walls, founding of the caisson at the required tip elevation, construction of the submarine cable casing and erection of the trunnion frame. This procedure shall include a table of theoretical elevations and alignment of the caisson geometry control points and cutting shoe during sinking of each caisson segment.

The procedure shall also include the Contractor's proposed methods for measuring, monitoring and recording the elevations and geometry of control points at each stage of caisson construction.

The Caisson Construction Manual shall provide drawings to show the sequence of operations for construction of the caissons, timing of concrete segment production, dredging, spoil removal, cofferdam removal, placement and removal of Contractor designed falsework, final sinking to plan specified tip elevation, placement of the tremie seal, closure of the caisson distribution cap and placement of the final lift of the caisson distribution cap. The sequence and sinking drawings shall show the caisson displacement under each increment of load, the amount of freeboard on the caisson or bascule pier walls, and the water pressure at critical points for each increment of construction and sinking of the caisson. The plan shall include the proposed method of keeping the cutting edge plumb as it comes in contact with and sinking into and within the Glaciamarine Drift and Estuarine Deposits and proposed methods of steering the caisson through unbalanced lateral earth pressures. Acceptable methods may include water jetting for removal of soil near the cutting show and lubrication of exterior caisson surfaces. The elevation of the Glaciamarine Drift and Estuarine Deposits depicted the plans is approximate and based on the borings shown. The Contractor shall make his own determination as to the actual surface locations and means and methods employed to ensure the caisson remains plumb within two orthogonal vertical planes.

The Contractor shall provide the proposed method of excavation of materials and cleanout of the caisson foundation level at the elevations shown on the plans or to such depth as determined by the Engineer. The Contractor shall provide the proposed method of spoil removal, de-watering and spoil disposal.

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The Caisson Construction Manual shall be prepared under the supervision of and sealed by a Professional Engineer licensed in the State of Washington and shall be submitted not less than 60 calendar days in advance of the time the Contractor intends to start work on the cofferdams. The cost of furnishing design computations and drawings shall be incidental to the contract and no additional compensation will be allowed the Contractor for any delays resulting from compliance with the above requirements.

The Engineer will review the information submitted and notify the Contractor within 30 days of receipt whether the submittal is accepted or additional information is required. Review and comment by the Engineer shall in no way relieve the Contractor of the sole responsibility for the means and methods of construction and to construct the work in accordance with the intent of the plans and these specifications.

Before beginning construction operations the Contractor shall submit to the Engine falsework submittal in accordance with 6-02.3(16) and 6-02.3(17). The submittal shall include the design and details of:

1. Cofferdams including methods of installation and removal,
2. Cantilevered walkways,
3. Caisson distribution cap falsework,
4. Stay-in-place dredge well opening falsework and form work,
5. Bascule pier wall falsework / formwork.

6-22.2 MATERIALS

Concrete and concrete construction for caissons shall conform to Section 6-02 CONCRETE STRUCTURES. Concrete shall be cured a minimum of five days using water curing methods unless otherwise approved by the Engineer. The Contractor shall make his/her own determination as to the need for concrete admixtures to meet schedule and placement requirements.

All concrete in the caissons except the seal shall be Class 4000P. Seal concrete shall be Class 4000W.

Epoxy-coated reinforcing steel and reinforcing steel shall conform to Section 9-07.

Steel and steel fabrication for cutting shoes shall conform to Section 6-03. The cutting shoe shall be fabricated of structural carbon steel in accordance with Section 9-06. Painting or galvanizing of structural steel in cutting edges will not be required.

Caisson backfill material shall be in accordance with Section 9-03.9(2) or an Engineer approved alternate.

6-22.3 CONSTRUCTION REQUIREMENTS

6-22.3(1) CAISSON CONSTRUCTION

Reinforced concrete caissons shall be constructed as shown on the plans. Caissons shall be constructed and handled during positioning and sinking so they maintain correct shape without warping. Methods of constructing caissons and carrying them down to the required tip elevations shall be of the Contractor's selection.

It is anticipated that dredging of the caisson will be performed in various phases of concrete construction. The Contractor shall provide adequate protection for the reinforcing steel exposed in the top of the caisson to prevent damage to the steel. Reinforcing steel damaged due to the Contractor’s dredging operation shall be repaired by using approved couplers or drilled and doweled methods approved by the Engineer.

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Caissons shall be sunk within the following limits of accuracy:

- Transverse to Centerline of Bridge, plus or minus 1.0 foot from plan location.
- Longitudinal, plus or minus 1.0 foot from plan location.
- Rotation about the vertical axis through the intersection of the centerline of bridge and centerline of pier, plus or minus 2.0 degrees from plan location.
- In no case shall the combined values of transverse, longitudinal and rotational errors be such that any corner of the caisson is more than 1.0 foot from planned longitudinal or transverse location.

The limits of accuracy specified above shall apply to any and all levels of the caisson. In the final positional the caisson cutting shoe shall be founded such that the list measured from the bottom of the cutting edge to the top of the subsequent caisson segment does not exceed 1.5 feet.

To assure location of caissons within the limits specified, special care shall be exercised in sinking the caissons. In preparation for sinking, caissons shall be set on exactly correct horizontal position and shall be maintained at true level. Check measurements for the correctness of position of the caissons shall be made at each increment of sinking. If at any time the caisson has shifted from correct position or correct level, adjustment shall be immediately begun as dredging and sinking is resumed. Caissons shall be sunk by incremental excavation and sinking. Excess excavation permitting large drops of caissons shall be avoided as far as practicable. At no time shall the caisson excavation elevation be lower than the cutting shoe tip elevation by more than 4.0 feet unless it can be shown to the Engineer's satisfaction that the additional excavation depth is required to sink the caisson or maintain tolerance limits for location.

The Contractor shall establish satisfactory reference and control marks, telltales, and other checking means; and shall continuous monitor the position, list and cutting edge elevation of each caisson where dredging and sinking operations are in progress. The frequency of making position, list and cutting edge elevation readings shall be as directed by the Engineer and shall be performed by the Contractor. The longitudinal and transverse axes of the caissons and well as a horizontal plane baseline shall be scribed on the steel cutting edge. These control lines shall be projected upward on, and scribed into the interior and exterior faces of the caisson segments, together with elevation points, so that all subsequent caisson construction will have its true geometric relation to the plane of the cutting edge.

The Contractor shall furnish satisfactory sounding equipment and operating personnel to check and record dredging depths, dredged widths of the dredge wells, and elevations of materials under cutting edges, heights of water inside of dredge wells, and similar pertinent information for each caisson during dredging operations. Sounding lines shall be suitably mounted on reels for expeditious handling and shall be accurate to within 0.5 feet. These facilities, equipment, and personnel shall be made available at all times to the Engineer to assist him in making independent checks on the work.

The Contractor shall make all excavations of every nature, in whatever material may be encountered, and do all work necessary to sink or build foundations to required depths, including the removal of all timbers, piling, logs, boulders, rip-rap or other obstacles which may be encountered, regardless if such obstacles are indicated on the boring logs. There will be no direct payment for operations of sinking caissons, nor for the removal of any obstacles encountered, nor for delays on account of unforeseen excavation operations, nor for any unanticipated conditions or materials, but payment therefore shall be covered by the prices paid for the caissons. The Contractor shall have available a competent diver or divers

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to assist in removing any obstructions under the cutting shoes of the caissons. The cost of this work shall be considered incidental to the contract.

Excavated material shall not be deposited against caissons so as to create unbalanced lateral pressures, unless so directed by the Engineer.

Care shall be taken during the sinking operations, especially within the backfill of the cofferdams and Marsh Deposits, to prevent the "blowing in" or inflow of materials under the cutting edges. Such measures may include the maintenance of balanced hydrostatic pressures inside and outside the caisson; care to keep excavation levels above or near the cutting shoe tip elevations, placement intermittent clean timber layers within the cofferdam backfill, placement of intermittent layer of clean load bearing soils within the cofferdam backfill, and restrain from uncontrolled sinking by mechanical means.

No excavation shall be made outside of caissons, and the natural stream bed adjacent to the caisson and/or cofferdam shall not be disturbed without the written permission of the Engineer. If construction operations should cause settlements of the ground outside the caissons, the Contractor shall, when directed by the Engineer, backfill all such excavations or depressions to the original ground surface or stream bed with stone material as specified for riprap.

Upon approval of the depth to which the cutting edge has been driven, the excavation shall be finished to provide uniform and level bearing for placement of the concrete seal against undisturbed soils.

The caissons shall be sunk to the founding elevations as shown on the plans unless otherwise directed by the Engineer. Regardless of the elevation at which the caisson is founded, the bottom and top elevation of the caisson distribution cap shall be as shown on the plans.

In preparation for placement of the seal concrete, the Contractor shall remove all material below the sloping sides of the exterior wall cutting shoes and below the interior dredge well wall cutting shoes to provide the minimum thickness of seal as shown on the plans. The Contractor shall provide spud jets, with right angle arms of sufficient length to reach beyond the center of interior walls and beyond the mid-point of all cross wall intersections, and such other devices as will be needed to remove all the material under the areas inaccessible to the dredge buckets/clamshells.

Prior to placing the seal concrete, all clay, silt, boulders, or foreign materials shall be removed from the founding bearing surface, including beneath the interior walls and interior walls of the dredging chambers. The surfaces to be in contact with the seal concrete shall be carefully washed and cleaned by means of high pressure jets so designed as to reach all parts of the cutting edges and interior surfaces. As a final cleaning operation, after a rest period sufficient to settle all suspended materials, the Contractor shall carefully remove from the dredging chamber all sludge, clay cuttings, and disturbed founding materials. Air lift methods shall used to removing this material. The Contractor shall furnish such labor, diver inspection, sounding equipment, right angle pipe feelers and other equipment including imaging and profiling sonar as required enabling the Engineer to examine the condition of these surfaces and to inspect final cleaning out of the seal concrete chamber. The caissons shall not be sealed until conditions in the caissons are approved by the Engineer.

Final acceptance of the founding surface and seal concrete interface area by the Engineer will be based on the requirement that a minimum of ninety percent of the founding bottom surface and seal concrete interface area shall be clean and void of all loose soil and foreign materials.

6-22.3(2) SEAL CONSTRUCTION

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The concrete seals shall be constructed in accordance with 6-2.3(6)B and the following:

The Contractor shall be responsible for providing competent seals adequate to permit successful foundation of the caisson on the soils. High quality concrete is imperative and the method shall recognize the necessity of placing the concrete so that it will displace the in-situ water. At no time shall the fresh concrete, during and after placement, be permitted to be mixed with the surrounding water.

Any seal concrete additional to that shown on the plans shall be at no additional cost to the County and shall be included in the unit contract price bid for the caissons.

The Contractor shall have available and provide dependable mixing plants of sufficient capacity and sufficient backup system and equipment to ensure the continuous placing of tremie concrete from beginning to completion of concrete placement without interruption.

Concrete shall be deposited by tremie methods. Concrete deposited under water shall be carefully placed in compact mass in its final position in such a manner and by means of a sufficient number of tremies to produce a continuous complete homogeneous concrete monolith of the full foundation area and of the thickness required by the plans. If placement of tremie concrete is interrupted and placement can proceed before initial setting time of the concrete has expired, the tremie shall be removed, resealed, and restarted adjacent to the tremie concrete in place. If the interruption is greater than the initial setting time of the concrete, the point of stopping shall be considered a construction joint. Finished elevation at the top of sound seal concrete shall not be below more than 6 inches from plan grade.

Pumping to dewater the sealed caisson shall not commence until the concrete seal has sufficiently set to withstand the hydrostatic pressure, but in no case shall dewatering begin less than 72 hours after the seal concrete has been placed.

6-22.3(3) USE OF EXPLOSIVES

Explosives may not be used in the loosening of existing materials to be dredged or otherwise removed from within the dredge wells.

6-22.3(4) NOT USED

6-22.3(5) SONAR INSPECTION

The Contractor shall furnish all personnel and equipment necessary to conduct the underwater sonar inspection and shall operate the sonar and supporting equipment, under the direction of the Engineer and in such manner as to obtain optimum results from the equipment, in viewing the bottom surfaces of the excavations for dredged caissons.

6-22.3(5)A TECHNICAL REPRESENTATIVE

A qualified technical representative of the sonar service provider shall be present on the work site at all times to set-up the equipment; operate the sonar, computer and software; provide technical assistance in remedying or repairing any malfunction of the equipment; and to consult with the Engineer and the Contractor. Electronic records of the entire sonar inspection are to be furnished to the Engineer upon completion of the work. The technical representative shall remain at the work site for as long as his or her presence is needed, as determined by the Engineer, but not less than such time as needed to complete the

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inspection of the entire caisson excavation, and shall be available on short notice at any time during caisson work on the project.

6-22.3(5)B EQUIPMENT

A list of the proposed equipment to be furnished by the Contractor for sonar inspection shall be submitted to the Engineer for review and approval. Such gear shall include:

- Digital Scanning Sonar
- Monitor
- Recording Device (CD or DVD)

The Contractor shall develop a method for sonar handling and orientation at the required angles and depths and submit it to the Engineer for approval. Such method shall include provisions to accurately determine the depth and orientation during the under-water sonar inspection as well as later viewing of the files. Other methods and equipment for controlling the sonar will be considered subject to the approval of the Engineer upon achievement of a satisfactory sonar record.

The Contractor shall furnish all necessary supplies, accessories, fuel, barge, etc., necessary for operation of the sonar equipment, including cable, power supply and all incidentals.

6-22.3(5)C DRAWINGS

The Contractor shall submit to the Engineer for approval, layout drawings showing the relative position of all components of the sonar system. The information submitted shall include a written description of the operating procedure in step-by-step sequence and shall state the source of power.

6-22.3(5)D SONAR INSPECTION

Underwater sonar inspection of the excavations will normally be made only after dredging is complete to the plan elevation of the founding material. It is essential that the excavation be cleaned of all loose fragments, sediment and turbidity prior to its inspection.

The sonar shall be lowered slowly to scan the excavation inside the caissons below the sides of the dredge wells. The sonar shall be positioned in each dredge well so that the optimum clarity of detail and complete coverage of the excavation can be obtained. The sonar is to be lowered in all dredge wells. The sonar is to be scanned at sufficient elevation stops per dredge well for complete coverage. The top of the founding surface shall be scanned completely so that all areas of the founding surface can be observed. Unless otherwise directed by the Engineer, all scanning of the excavation shall be recorded on CD or DVD.

6-22.3(5)E RECORD OF INSPECTIONS

Where required by the Engineer, the real-time image shall be displayed on the monitor by the Contractor for study and observation. All sonar scanning is to be recorded with notes of depth and location on CD or DVD and properly labeled as to caisson number along with project and Contractor identification. CD's and/or DVD's shall be furnished to and become the property of the Engineer upon completion of the work.

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6-22.3(6) FINAL DIVER INSPECTION

The Contractor shall furnish competent diver or divers to perform the final inspection of the caisson and the entire founding surface as directed by the Engineer. Subsequent to the final cleaning and sonar inspection, the Contractor shall coordinate and report the results of the divers' observations to the Engineer. Divers shall have communications with the surface and underwater cameras. The entire dive video and voice are to be recorded on DVD. The divers shall cover the entire founding area of the caisson. If remedial measures are necessary after the initial dive inspection, the divers shall reinspect the area at no additional cost to the Owner.

The Contractor shall also furnish all necessary equipment and supplies associated with the final dive inspection.

6-22.4 MEASUREMENT

Special excavation of contaminated materials confined within the cofferdams will be measured in original position by the cubic yards as a 71 square foot area between the neat line elevations as depicted within the plans.

Caisson excavation of non-contaminated materials confined within the cofferdams completed subsequent to completion of Special Excavation, and prior to setting of the cutting shoe, will be measured in original position by the cubic yards as a 71 square foot area from the bottom of the plan specified Special excavation elevation to the bottom of the backfill within the cofferdam.

Caisson excavation completed subsequent to setting of the cutting shoe will be measured in original position by the cubic yards as a 59 square foot area extending from the top of the backfill within the cofferdam to a point 3 feet below the final cutting shoe tip elevation.

Steel reinforcing bar for caisson and epoxy coated Steel reinforcing bar for caisson will be measured as described for reinforcing steel as specified in Section 6-02.4.

Structural carbon steel for cutting shoe will be measured as specified in Section 6-03.4.

Concrete Class 4000P used for the caisson, cutting shoe, and distribution cap will be measured in place by the cubic yard to the neat lines of the Structure as shown in the Plans.

Concrete Class 4000W used in the tremie seal will be measured from the over excavation neat line to the top of seal concrete neat line in final position by the cubic yards.

No other aspect of Work associated with construction if the caissons, in place and acceptable to the Engineer will be measured for payment.

6-22.5 PAYMENT

"Excavation for Caisson", per cubic yard.

The unit Contract price per cubic yard for "Excavation for Caisson" will be full compensation for all costs incurred for excavating, loading, hauling, barging, storing, dewatering and disposing of the material, installing cofferdams, and removing cofferdams as well as all transportation, labor, equipment and materials required, including hydraulic clam shell, crane, required bentonite, cofferdam materials.

"Special Excavation", per cubic yard.

The unit Contract price per cubic yard for "Special Excavation" will be full compensation for all costs incurred for excavating, storing, testing, dewatering, loading, hauling, and disposing of the material, as well as all transportation, labor, equipment, materials, including pumps, storage containers, hoppers and covers.

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"Str. Carbon St. - Caisson Cutting Edge", per pound.

The unit Contract price per pound for "Str. Carbon St. - Caisson Cutting Edge" will be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the manufacture, fabrication, transportation, and installation of the structural carbon steel caisson cutting edge, including the transportation of the caisson cutting edge to the Site, placement, placing blocking on the backfill, and erecting.

"Epoxy Coated St. Reinf. Bar for Caisson", per pound.

The unit Contract price per pound for "Epoxy Coated St. Reinf. Bar for Caisson" will be paid as described for ""Epoxy-Coated St. Reinf. Bar" as specified in Section 6-02.5.

"St. Reinf. Bar for Caisson", per pound.

The unit Contract price per pound for "St. Reinf. Bar for Caisson" will be paid as described for "St. Reinf. Bar" as specified in Section 6-02.5.

"Conc. Class 4000P", per cubic yard.

The unit Contract price per pound for "Conc. Class 4000P" will be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the materials, delivery, placement, cleaning, transportation, and monitoring of the concrete for the caisson, cutting shoe, and distribution cap.

"Conc. Class 4000W", per cubic yard.

The unit Contract price per pound for "Conc. Class 4000W" will be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the materials, delivery, placement, sonar inspection, cleaning, transportation, and monitoring of the concrete tremie seal concrete.

No other aspect of Work for construction of the caissons, in place and acceptable to the Engineer, will be paid for. All other aspects of the Work shall be considered included in the price bid for other pay items.

Add the following new Section:

(*****)

6-23 FRP MAINTENANCE WALKWAYS

6-23.1 DESCRIPTION

This work, "FRP Maintenance Walkway", shall consist of furnishing all labor, materials, equipment and incidentals necessary to join parts, install the fiberglass reinforced polymer (FRP) Maintenance Walkway and access platforms as specified on the Contract Documents and herein. The Contractor is permitted to provide the walkway sections as shown on the plans or to provide an alternate design, provided it is in conformance with these specifications. When a Contractor designed walkway is provided, this item shall also include the complete design of the proposed walkway, which shall be approved by the Engineer.

6-23.2 MATERIALS

With the exception of molded gratings, all FRP products shall be manufactured using a pultrusion process utilizing vinyl ester resin with flame retardant and ultraviolet (UV) inhibitor additives. The flame retardant FRP shapes shall achieve a flame spread of 25 or less in accordance the ASTM test method E-84, Standard Test Method for Surface Burning Characteristics of Building Materials.

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Structural shapes and plates, including rails and posts, shall be made from glass fabrics/fibers and vinyl ester resin with fire retardant additives to meet a flame rating of less than 25 per ASTM E-84 and meet the self extinguishing requirements of ASTM D-635, Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position. All structural shapes shall contain a UV inhibitor. Structural FRP member composition shall consist of a glass fiber and fabric with vinyl ester resin matrix, approximately 50% glass by weight. Glass strand rovings with continuous strand glass mats or stitched reinforcements shall be used for FRP walkway panels.

The FRP grating shall be fabricated from bearing bars and cross rods manufactured by the pultrusion process. The glass fiber/fabric reinforcement for the bearing bars shall be a core of continuous glass strand rovings. Grating shall be shipped from the manufacturer, palletized and banded with exposed edges protected to prevent damage in shipment. Each piece shall be clearly marked showing manufacturer's applicable drawing number. The bearing bars shall be joined into panels by passing continuous length fiberglass pultruded cross rods through the web of each bearing bar. A continuous fiberglass pultruded bar shaped section shall be wedged between the two cross rod spacers mechanically locking the notches in the cross rod spacers to the web of the bearing bars. Continuous chemical bonding shall be achieved between the cross rod spacers and the bearing web and between the bar-shaped wedge and the two cross rod spacers locking the entire panel together to give a panel that resists twist and prevents internal movement of the bearing bars. Cross rod spacing shall not exceed 6 inches. All bearing bars shall be coated with polyurethane coating of a minimum thickness of 1 mil. Fiberglass grating and stair treads shall be made from chemical resistant, fire retardant vinyl ester resin system with antimony trioxide (or equivalent) added to meet the flame rating of 25 or less in accordance with ASTM E-84 testing and meet the self-extinguishing requirements of ASTM D-635. UV inhibitors are added to the resin.

The top surface of all walkways shall be coated with epoxy and sand grit to attain adequate friction.

After fabrication, all cut ends, holes and abrasions of FRP shapes shall be sealed with a compatible resin coating of at least 25 mils in thickness.

Hold down clamps shall be type 316L stainless steel bolted through top of the supporting member. A minimum of 4 each per panel shall be provided and the maximum spacing between hold down clamps shall not exceed 5 feet.

The color of all FRP components shall be gray, and shall match color number 36357 in accordance with Federal Standard 595. A sample piece of grating, railing and supporting member shall be submitted to the engineer for approval prior to fabricating any FRP material. The color of the FRP shall not be a paint or top coating but shall be throughout the thickness of the member.

Splices in supporting members will not be permitted. The supporting beams shall be shipped to the site the full length of the segment as detailed on the Contract Documents.

Polyurethane adhesive materials required shall be specified and applied in accordance with manufacturer's instructions. The minimum ultimate adhesion strength shall be 1000 psi.

Steel Components of the FRP Walkway shall meet the requirements listed in the Contract Plans.

Mechanical properties of all FRP material shall meet or exceed the values listed in Table 1.

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Table 1

MECHANICAL PROPERTIES	ASTM*	UNITS	VALUE
Tensile Stress, LW	D-3039	psi	30,000
Tensile Stress, CW	D-3039	psi	7,000
Tensile Modulus, LW	D-3039	10^6 psi	2.5
Tensile Modulus, CW	D-3039	10^6 psi	0.8
Compressive Stress, LW	D-6641/ D-3410	psi	30.000
Compressive Stress, CW	D-6641/ D-3410	psi	15,000
Compressive Modulus, LW	D-6641/ D-3410	10^6 psi	2.5
Compressive Modulus, CW	D-6641/ D-3410	10^6 psi	1.0
Flexural Stress, LW	D-790	psi	30,000
Flexural Stress, CW	D-790	psi	10,000
Flexural Modulus, LW	D-790	10^6 psi	1.8
Flexural Modulus, CW	D-790	10^6 psi	0.8
Modulus of Elasticity, E	Full Section	10^6 psi	2.5
Shear Modulus	-------	10^6 psi	0.450
Short Beam Shear	D-2344	psi	4,500
Punch Shear	D-732	psi	10,000
Notched Izod Impact, LW	D-256	ft.-lbs/in.	25
Notched Izod Impact, CW	D-256	ft.-lbs./in.	4
Constituent Content (FVF)	D-3171		50%
PHYSICAL PROPERTIES	**ASTM***	**UNITS**	**VALUE**
Barcol Hardness	D-2583	-----	45
24 Hour Water Absorption	D-570	% max.	0.45
Density	D-792	Lbs./in.^{3}	.062-.070
Coefficient of Thermal Expansion, LW	D-696	10^{-6} in./in./ºC	8
ELECTRICAL PROPERTIES	**ASTM***	**UNITS**	**VALUE**
Arc Resistance, LW	D-495	seconds	120
Dielectric Strength, LW	D-149	Kv./in.	35
Dielectric Strength, PF	D-149	Volts/mil.	200
Dielectric Constant PF	D-150	@60hz	5
Fire Retardant Polyester and Fire Retardant Vinylester Structural Profiles:			
FLAMMABILITY PROPERTIES	**ASTM***	**UNITS**	**VALUE**
Tunnel Test	E-84	Flame Spread	25 max.
Flammability	D-635	-----	Nonburning

*There are no AASHTO equivalents for these ASTM designations:

D-149 *Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies*

D-150 *Standard Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation*

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D-256 *Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics*
D-495 *Standard Test Method for High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation*
D-570 *Standard Test Method for Water Absorption of Plastics*
D-635 *Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position*
D-696 *Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement*
D-732 *Standard Test Method for Shear Strength of Plastics by Punch Tool*
D-790 *Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials*
D-2334 *Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates*
D-2583 *Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor*
D-3039 *Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials*
D-3171 *Standard Test Methods for Constituent Content of Composite Materials*
D-3410 *Standard Test Method for Compressive Properties of Polymer Matrix Composite Materials with Unsupported Gage Section by Shear Loading*
D-6641 *Standard Test Method for Determining the Compressive Properties of Polymer Matrix Composite Laminates Using a Combined Loading Compression (CLC) Test Fixture*
E-84 *Standard Test Method for Surface Burning Characteristics of Building Materials.*

6-23.2(1) DESIGN REQUIREMENTS

This section applies to Contractor-designed walkways. The design shall be performed using the allowable stress design method and shall utilize FRP materials with minimum properties as specified herein. Connections utilize steel components. If the intermediate and end walkway supports detailed on the Contract Documents are not utilized, the Contractor is responsible for coordinating with the Steel Fabricator prior to submitting the steel shop drawings. The Contractor design calculations and shop drawings shall be stamped and signed by a Professional Engineer certified in the state of Washington. No fabrication of any FRP material will begin until the Contractor receives approved shop drawings for both the Structural Steel and the FRP maintenance walkway.

6-23.2(2) LOADS

The live loading on the walkway shall be 100 PSF.

Wind Loading applied transversely to the walkway shall be 25 psf applied to the exposed walkway area.

Load Combinations shall be as specified in the AASHTO Standard Specifications for Highway Bridges, 17th Edition. Overstress shall be permitted for load combinations including wind load as specified in the code.

The FRP railing system shall be designed to meet the railing and post loading requirements of the AASHTO LRFD Bridge Design Specifications, Section 13.8. However, the design of the members shall be by the allowable stress method.

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Design live loads of FRP gratings shall not be less than 100 pounds per sq. ft. uniformly distributed. Grating and floor panel deflection at the center of a simple span shall not exceed span length/360.

6-23.2(3) DESIGN

Steel Connections shall be designed by the allowable stress design method in the 17th edition of the AASHTO Standard Specifications for Highway Bridges. The design shall be for the loading specified above.

FRP Material shall be designed using the manufacturer's allowable stress design equations with the following Safety Factors:

Type of Stress	Safety Factor
Bending	3.0
Shear	3.0
FRP Connection Design	10.0

The maximum permissible live load deflection for supporting members = L/360, where L = the span length of the member.

6-23.2(3) DIMENSIONS

The maximum depth of the walkway, not including the railings, shall be 8 inches. Minimum vertical clearance above the walkway shall be as specified on the Contract Plans. The minimum width of walkway, face of rail or post to face of rail or post shall be 3 feet – 0 inches. Railing height shall match those specified on the contract plans. The bottom of walkway shall be no lower than the walkway shown on the Contract Plans.

6-23.3 CONSTRUCTION REQUIREMENTS

Construction, Fabrication and Installation of the FRP maintenance walkway shall be performed in accordance with the manufacturer's instructions. The bottom of walkway shall be no lower than the walkway shown on the Contract Plans. Maximum dimensional tolerances of the FRP Components shall be within tolerances specified in published material provided by the manufacturer. The Contractor shall identify and match-mark all materials, items and fabrications for installation and field assembly.

All material shall be stored before, during, and after shipment in a manner to prevent cracking, twisting bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which, in the opinion of the Engineer, has become damaged as to be unfit for use shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.

The following FRP manufacturers have detailed construction/fabrication requirements that shall be adhered to on this project:

1. Strongwell Corporation, 400 Commonwealth Ave., P.O. Box 580, Bristol, VA 24203-0580; Phone (276) 645-8000
2. Fibergrate Composite Structures Incorporated, 5151 Beltline Road, Suite 700, Dallas, TX 75254; Phone (972) 250-1633
3. Bedford Reinforced Plastics, 264 Reynoldsdale Road, Bedford, PA 15522-7401; Phone (814) 623-8125

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4. Creative Pultrusions, Inc. 214 Industrial Lane, Alum Bank, PA 15521; Phone (814) 839-4186

6-23.6 MEASUREMENT

"FRP Maintenance Walkway" will be measured on a lump sum basis and shall include the complete execution of work described but will be paid for on a lump sum basis as described in Section 6-23.7. The Contractor is responsible for determining the quantity on which the bid is based. The weight of the FRP material shown in the Contract documents is approximate. No increase or decrease in the contract lump sum bid price for the item will be made on the account of a discrepancy.

6-23.7 PAYMENT

The "FRP Maintenance Walkway" shall be included in the lump sum price for "Bascule Bridge Superstructure" pay item which shall be full compensation for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the manufacture, fabrication, transportation, erection, and incidentals necessary to complete the work.

Add the following new Section:

(*****)

6-24 BIRD CONTROL

6-24.1 DESCRIPTION

This work, "Bird Control", shall consist of furnishing all labor, materials, equipment and incidentals for erecting a bird repellant system to prevent bird access to any areas where birds roost, nest or land and to prevent damage caused by droppings or nesting materials as specified on the Contract Documents and herein.

6-24.2 MATERIALS

Bird repellent netting shall have openings no larger than ¾ " x ¾ ", manufactured by Nixalite of America Inc.; Bird-B-Gone Inc., Fly-Bye or an approved equal.

Bird repellent netting shall be attached to the structure using tensioned steel wires in accordance with the manufacturer's recommendations.

Bird coil shall be stainless steel, manufactured by Bird Barrier America, Inc or approved equal.

Bird spikes shall be stainless steel, manufactured by Nixalite of America Inc.; Bird-B-Gone Inc.; Bird-X Inc. or an approved equal.

All stitching and connection hardware shall be stainless steel or other corrosion resistant material as recommended by the manufacturer.

6-24.3 CONSTRUCTION REQUIREMENTS

6-24.3(1) SUBMITTALS

Shop drawings of all fabricated bird control system shall be submitted to the Engineer for approval. Shop Drawings shall give all dimension, colors, materials, location and identification marks and complete schedule of materials. Shop drawings shall contain

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the Bridge Number, State and Federal Project Number, Bridge Name, County, Fabricator and Contractor in the Title Block. Fabrication shall not start until receipt of Engineer's approval marked "Approved" or "No Exception Taken".

Samples of each type of product shall be submitted for approval as specified in Section 6-24.2.

In addition to the above submittals, the Contractor shall supply a complete manufacturer's catalogue to the Engineer in the field and to the Engineer responsible for reviewing the shop drawings.

Fabrication shall not start until receipt of Engineer's approval marked "Approved" or "No Exception Taken".

6-24.4 MEASUREMENT

"Bird Control" will be measured on a lump sum basis and shall include the complete execution of work described but will be paid for on a lump sum basis as described in Section 6-24.5. The Contractor is responsible for determining the quantity on which he bases his bid. The linear foot of the bird spike / bird coil material and bird netting shown on the contract plans is approximate only. No increase or decrease in the contract lump sum bid price for the item will be made on the account of a discrepancy.

6-24.5 PAYMENT

The "Bird Control" shall be included in the lump sum price for "Bascule Bridge Superstructure" pay item which shall be full compensation for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the manufacture, fabrication, transportation, erection, and incidentals necessary to complete the work.

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DIVISION 7
DRAINAGE STRUCTURES, STORM SEWERS, SANITARY SEWERS, WATER MAINS, AND CONDUITS

7-01 DRAINS

7-01.1 DESCRIPTION

Section is supplemented with the following:

*(***COS Specifications 7-01.1***)*
This work also includes work consisting of constructing subsurface drains in accordance with the Contract. This work shall include installation of solid and perforated pipe, filter material, filter fabric (geotextile), sidewalk drains, and gravel drains. Subsurface drains shall be constructed of gravel filter material and may include perforated pipe and filter fabric as detailed on the Drawings.

7-01.2 MATERIALS

Section is supplemented with the following:

*(***COS Specifications 7-01.2**)*
Filter Material per Section 9-03.12(4)
Joints, Rubber Gaskets per Section 9-04.4
Pipe and Tubing per Section 9-05
Geotextiles per WSDOT Section 9-33.2(1) and conforming with COS Section 9-37

Notes: Unless otherwise indicated in the contract (all pipe sizes are inside diameter):

1) Corrugated Polyethylene Drainage Tubing Drain Pipe shall be limited to less than 10 inch.
2) Corrugated Polyethylene Drain Pipe shall be limited to 12 inch minimum to 36 inch maximum.
3) Perforated PVC Subsurface Drain Pipe shall be limited to a maximum 8 inch.

All reference to filter fabric shall be construed to mean a geotextile Material as specified in WSDOT Section 33.2(1) and COS Section 9-37.

7-01.3 CONSTRUCTION REQUIREMENTS

Section is supplemented with the following:

*(***COS Specifications 7-01.3**)*
Trenching is subject to the provisions of COS Section 7-17.3(1). Work in excavations over 4 feet deep are subject to the provisions of COS Section 7-17.3(1)A7a, Trench Safety Systems.
A trench shall be excavated to grade, line, and dimensions indicated on the Drawings. The subsurface drain pipe shall be installed with watertight rubber gasketed joints.
The subsurface drain trench shall be dug to the required alignment grade only as far in advance of pipe installing as the Engineer will approve.
The clear width of trench measured at the springline of the pipe in place shall be 24 inches, or 1 foot greater than the outside diameter of the pipe, whichever is greater. Standard Plan no. 284 trench width is not applicable to drain pipe and subsurface drain pipe.

NOT FOR CONSTRUCTION

There shall be no mixing of filter material with Backfill Material. See Section 2-03.3(10) regarding selected Material.

7-01.3(2) UNDERDRAIN PIPE

Section is supplemented with the following:

*(***COS Specifications 7-01.3(2)**)*

See COS Section 2-12.3(2) for construction requirements for other than subsurface drains.

The filter Material for pipe shall be damp when placed in the trench and shall be deposited uniformly on both sides of the pipe for the full width of the trench and to the springline of the pipe. The Material shall be tamped in 4-inch lifts to provide thorough compaction under and on each side of the pipe. Succeeding lifts of gravel shall be deposited in 8 inch lifts and be thoroughly compacted to the depth shown on the Drawings.

The geotextile (moderate survivability) shall be placed in the manner and at the locations as directed in the Contract. The surface to receive the geotextile, and the trench into which the geotextile is to be placed, shall be free of obstructions and debris.

Should the geotextile be damaged during construction, the torn or punctured section shall be repaired by placing a piece of geotextile of sufficient size to cover the damaged area including a minimum 12 inch overlap with all surrounding geotextile. In places where the trench width is less than 1 foot, the minimum overlap shall be the trench width.

Subsurface drains, as specified in Section 9-05.2(6) [COS 9-05.3], shall be located as shown in the Contract.

Clearances between drains and other utilities shall be maintained per COS Section 1-07.17(2).

When it is necessary to intercept water flowing underneath pavement, the subsurface drain shall be constructed as detailed in the Contract.

All drain pipe shall be installed with the bell or larger end upstream, and shall be open, clean, clear of debris, and free draining.

Add the following new Section:

*(***COS Specifications 7-01.3(3)**)*

7-01.3(3) JOINTS

Polyvinyl Chloride (PVC) drain pipe shall be installed upstream with the bell end upstream. Corrugated polyethylene drain pipe shall be jointed with snap-on, screw-on, or wraparound coupling bands as recommended by the pipe manufacturer.

7-02 CULVERTS

Add the following new Section:

(*****)

7-02.3(6) DEBRIS BARRIER

When shown in the Plans, debris barriers shall be constructed in accordance with the Plans and shall meet the requirements for safety bars as specified in Section 9-05.18.

Add the following new Section:

NOT FOR CONSTRUCTION

(*****)

7-02.3(7) DEBRIS CAGE

When shown in the Plans, Debris Cages shall be constructed in accordance with the Plans, King County Fig. 7-028, and shall meet the requirements of Section 9-05.18.

7-02.4 MEASUREMENT

Section is supplemented with the following:

(*****)

When shown in the Plans, Beveled End Sections will be considered as part of the culvert pipe or storm drain pipe shown in accordance with the Plans and will be measured as culverts or storm drain pipe.

When shown in the Plans, Debri Cages will be considered as part of the culvert pipe, storm drain pipe, or drainage structure shown in accordance with the Plans and will be measured as culverts or storm drain pipe.

When shown in the Plans, Debri Barriers will be considered as part of the culvert pipe, storm drain pipe, or drainage structure shown in accordance with the Plans and will be measured as culverts, storm drain pipe, or drainage structure.

7-02.5 PAYMENT

Section is supplemented with the following:

(*****)

When shown in the Plans (Drawings), all cost for providing materials, labor, and installing Beveled End Sections will be incidental to the unit Contract price per linear foot (L.F.) for culvert pipe or storm drain pipe shown in accordance with the Plans.

When shown in the Plans (Drawings), all cost for providing materials, labor, and installing Debris Barriers will be incidental to the unit Contract price per linear foot (L.F.) for culvert pipe or storm drain pipe shown in accordance with the Plans.

When shown in the Plans (Drawings), all cost for providing materials, labor, and installing Debri Cages shall be incidental to the Unit Contract price per Each for the structure they are installed on.

7-04 STORM SEWERS

7-04.1 DESCRIPTION

Section is supplemented with the following:

(*****)

Where called for in the Plans (Drawings), storm sewer pipe shall be placed in accordance with the size and type designated. Alternates are not acceptable unless they are specified on the structure notes in the Plans.

7-04.2 MATERIALS

NOT FOR CONSTRUCTION

The first Paragraph is supplemented with the following:

(*****)

PIPE, CB CONN., D.I. CL 50, 8 IN.	9-05.13
PIPE, CB CONN., D.I. CL 50, 10 IN.	9-05.13
PIPE, CB CONN., D.I. CL 50, 12 IN.	9-05.13
PIPE, SD, D.I. CL 50, 12 IN.	9-05.13
PIPE, SD, D.I. CL 50, 18 IN.	9-05.13
PIPE, SD, CONC. REINF. C76 CL III, 12 IN.	9-05.1(1)
PIPE, SD, CONC. REINF. C76 CL III, 18 IN.	9-05.1(1)
PIPE, SD, CONC. REINF. C76 CL III, 24 IN.	9-05.1(1)
PIPE, SD, STEEL SCH 40 VICTAULIC, 8 IN.	XXX

7-04.3(1) CLEANING AND TESTING

Section is deleted and replaced with the following:

(*****)

Testing of the Storm Sewer Pipe will be required. Cleaning shall be in accordance with Section 7-04.3(1) and 7-04.3(1), and 7-17.3(2).

7-04.5 PAYMENT

Section is supplemented with the following:

(*****)

Pipe, CB Conn., D.I. CL 50, 8 IN., per linear foot.
Pipe CB Conn., D.I. CL 50, 10 IN., per linear foot
Pipe CB Conn., D.I. CL 50, 12 IN., per linear foot
Pipe SD Conn., D.I. CL 50, 12 IN., per linear foot
Pipe SD Conn., D.I. CL 50, 18 IN., per linear foot
Pipe SD Conc. Reinf. C76 CL III, 12 IN. per linear foot
Pipe SD Conc. Reinf. C76 CL III, 18 IN. per linear foot
Pipe SD Conc. Reinf. C76 CL III, 24 IN. per linear foot
Pipe SD Steel Sch. 40 Victaulic, 8 IN. per linear foot

7-05 MANHOLES, INLETS, CATCH BASINS AND DRYWELLS

7-05.1 DESCRIPTION

Section is deleted and replaced with the following:

(*****)

This Work consists of constructing manholes, inlets, drywells, catch basins and stormwater vaults and connecting to existing Structures of the types and sizes designated in accordance with the Plans, these Specifications, and the Standard Plans, in conformity with the lines and grades staked.

This Section also describes work for rebuilding or rechanneling of existing manholes in accordance with the Contract at locations shown on the Drawings. This work also includes excavation, and backfilling, and compaction as specified in Section 7-17.

Work in trench excavations over 4 feet deep shall comply with COS Section 7-17.3(1)A7a, Trench Safety Systems.

NOT FOR CONSTRUCTION

7-05.2 MATERIALS

Section is supplemented with the following:

(*****)

Manholes Catch Basins, Inlets, Appurtenance, and Related	9-05.50
Stormwater Vault	9-05.50
Mineral Aggregate Type 9	9-03.12(3)A
Gravel Backfill for Drains	9-03.12(4)

Manholes, catch basins, and inlets shall be constructed of pre-cast components in accordance with the following COS Standard Plan Nos.:

Manholes	COS 200a through 207
Catch Basins	COS 240 through 243b
Inlets	COS 250 and 252

Catch Basin Type Special shall be constructed according to COS Standard Plan (Bridge Drain) Numbers 265 and 290.

Manholes, catch basins and inlets in King County shall be constructed of precast components and standard frame, grate, or vaned grate as shown in the Plans in accordance with the following Standard Figures: 7-003, 7-005, 7-006, 7-013, 7-014, 7-016, 7-017, 7-018, 7-022, 7-023, 7-025, 7-026, 7-027, 7-028.

Where shown on the Plans, catch basin or manhole Control Structures, Emergency Outfall Structures, and down-turned elbows shall be installed as shown in the King County Figures (7-025, 7-026, 7-027, and 7-028) with solid locking lids or as indicated on the Plans.

Deviations from Standard Plans, other than Material(s) substitutions allowed in Section 9-05.50, shall require Shop Drawing submitted by Contractor and approval by the Engineer in accordance with Section 1-05.3. Substitution(s) in Materials indicated on the Standard Plans and allowed in Section 9-05.50 shall comply with the requirements in Section 1-06.1. Concrete masonry units or concrete (masonry) rings may be used for adjustment of the casting to final street grade.

Joints between manhole components shall be rubber gasket.

The concrete mix for manhole channel shall be Type 3000 with Class 2 fine aggregate and AASHTO Grading No. 67 coarse aggregate [Class 6 (3/4) (See Section 5-05.3)].

Concrete for manhole, catch basin, and inlet structures shall be class 4000 (see Section 6-02.3).

Precast manhole components shall conform to ASTM C 478 except as modified in Section 7-05.

7-05.3 CONSTRUCTION REQUIREMENTS

Add the following new Sections

(*****)

7-05.3A FOUNDATION PREPARATION

7-05.3A1 DEWATERING

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Dewatering of manhole, catch basin, and vault excavations shall comply with the applicable Sections of 7-08.1 [COS 7-17.3(1)A].

7-05.3A2 FOUNDATION PREPARATION

Adequate foundation support shall be obtained by compacting the existing subgrade to a 95% for a 6 [12] inch depth in accordance with Sections 2-09.3(1)C and 2-09.3(3)C [COS 2-03.3(14)E]. Where unsuitable foundation condition exists, removal of unstable Material and replacement with compacted suitable or imported Material will be required.

7-05.3B BEDDING

7-05.3B1 BEDDING AND FOUNDATION SUPPORT FOR PRECAST BASE SECTION

Manholes, catch basins, and vaults constructed with precast base sections shall be placed to grade upon a 6 inch minimum thickness of Material Aggregate Type 9 per the Special Provisions to Section 9-03.12(3)A [COS 9-03] mixed with 4 sacks of Portland Cement per cubic yard of Mineral Aggregate, with sufficient water add to form a stabilized foundation. The mixed Material shall be placed across the area of the excavation for the base to a minimum distance beyond the face of the manhole as indicated on the COS Standard Plans and shall be graded to provide uniform bearing support with the precast section.

7-05.3B2 BEDDING AND FOUNDATION SUPPORT FOR CAST-IN-PLACE BASE SECTION

All cast-in-place bases for manholes, catch basins, and vaults shall be poured to grade upon a properly prepared foundation as indicated in the COS Standard Plans. Imported Mineral Aggregate, Crushed Surfacing Base Course [COS Type 2], when required in the Contract, shall be placed and compacted to the same limits specified in Section 7-05.3B1. The concrete base shall meet the requirements indicated in the COS Standard Plans.

7-05.3C DIMENSIONS

Manhole, catch basin, and vault types indicated on the drawings shall conform in all aspects to dimensions, and range of dimensions when applicable, as shown on the COS Standard Plans for each type manhole specified.

7-05.3D REINFORCED CONCRETE

7-05.3D1 CONCRETE MIXTURE

Concrete shall meet the requirements of the Special Provisions to Section 9-05.50 [COS 9-12.1].

7-05.3D2 CURING

Upon completion of concrete casting, the precast components shall be protected and cured in a moist atmosphere maintained by injection of steam for the required length of time and at the required temperature to develop the compressive strength required for manhole components.

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Precast components may also be water-cured by any approved method that keeps the components continuously moist during the curing period. Cast-in-place components shall be moist cured for a period not less than 7 Days, except that Type III Portland Cement Concrete shall be cured for not less than 3 Days.

A pigmented membrane curing compound may be applied in lieu of moist curing with prior approval of the Engineer.

7-05.3E BASE

7-05.3E1 GENERAL

Base sections shall conform to the requirements for precast manhole sections in Section 7-05.3F, except that the reinforced base slab shall be made an integral part of the section, and openings for the pipe shall be provided to meet job requirements as indicated on the Plans. The base slab thickness shall not be less than that indicated on the COS Standard Plans, and on COS Type 200 and Type 201 manhole the base slab shall be cast monolithically with the wall section or otherwise constructed in such manner as to achieve a completely watertight structure.

Reinforcement of the base slab shall be in accordance with the COS Standard Plans. The steel shall be placed 1-1/2 inches from the top, and shall extend into the wall of the manhole section and be tied to the longitudinal steel when called for in the COS Standard Plans. The walls of the base section shall be reinforced in accordance with ASTM C 478. Openings to received pipe shall be circular, and shall be held to the minimum size possible to accommodate the pipe to be inserted and to effectively seal the joint. Resilient connectors conforming to ASTM C 923 may be used at the Contractor's option.

7-05.3E2 PRECAST BASE

The base shall be carefully placed on the prepared bedding so as to be fully and uniformly supported in true alignment and ensuring that all entering pipes can be inserted on proper grade.

All lift holes shall be thoroughly wetted and then completely filled with mortar and smoothed both inside and out to ensure watertightness. All joints between precast sections shall be rubber gasketed joints.

Precast sections shall be placed and aligned to provide vertical sides and vertical alignment of the ladder rungs. The completed manhole shall be rigid, true to dimentions, and watertight.

In precast manhole sections where steel loops have been provided in lieu of lift holes, the loops shall be removed flush with the inside wall surface after the manhole has been completed. No sharp cutoff protrusion will be permitted. If concrete spalling occurs as a result of the loop removal, the spalled area shall be restored in a workmanlike manner to a uniform smooth surface with mortar.

All precast manhole bases, catch basins, and vaults shall be manufactured with thin-walled concrete blockouts for pipe connections conforming to pipe size(s) and alignment(s) shown on the Plans. Blockouts shall contain no reinforcing steel. Removal of reinforcing steel or of any concrete beyond the blockouts will not be allowed. Openings for pipe connections in manhole types 200, 201, and 202 shall be no less than the outside diameter of pipe plus 4 inches. Openings for pipe connections to manhole types 200, 201, 202, 203, 204, 205, and 206 shall be no larger than the outside diameter of pipe plus the manhole wall thickness.

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7-05.3E3 CAST IN-PLACE BASE

The first precast section shall be placed on the cast-in-place bottom slab and shall be carefully adjusted to true grade and alignment. The bottom slab shall be constructed in accordance with the modified COS Standard Plans. The Contractor prior to placing the bottom slab of the manhole shall inspect the existing pipe which the manhole is to be built around. If the existing line is in bad condition, the Contractor shall immediately notify the Engineer to replace the pipe. The bottom slab shall not be placed prior to the replacement of the damaged pipe.

The first manhole section shall be uniformly supported by the base concrete, and shall not bear directly on any pipe.

All lift holes and openings around pipes on precast components and cast-in-place bases or Structures shall be thoroughly wetted, completely filled with mortar, and smoothed and pointed both inside and out to ensure watertightness.

Precast sections shall be placed and aligned so as to provide vertical sides and vertical alignment of the ladder rungs. The completed manhole shall be rigid, true to dimension, and watertight.

7-05.3F PRECAST WALL SECTIONS

Reinforcement for standard (riser) sections shall consist of a single caged steel, placed at the approximate center of the wall section. The cage shall be welded at every circumferential wire, or lapped 40 diameters and tied. The welded splice shall develop a tensile strength of 50,000 psi.

Joints between sections shall be tongue and groove, and shall provide 1.2 inch nominal annular space and a minimum 1-1/4 inches lap.

No more than two lift holes shall be cast into each section. Holes shall be so located as to not damage reinforcing or expose it to corrosion. At the manufacturer's option, steel loops may be provided for handling, in lieu of lift holes.

Steps shall be installed in each section so that sections placed together in any combination provide a continuous vertical ladder with rungs equally spaced at 12 inches. The lowest rung shall not be more than 16 inches above the shelf.

Steps shall project uniformly from the inside wall of the manhole per COS Standard Plan No 232, Figure 7-011 and shall be cast or firmly grouted in place to ensure complete watertightness. Where it is intended that manholes be installed without fixed steps, the Contract will so specify.

7-05.3G PRECAST CONES

Standard precast cones shall provide reduction in diameter within range of height from not less than 18 inches to a maximum of 24 inches (see the COS Standard Plans for cone dimensions). Jointing of cone section to the riser sections shall be similar to jointing between riser sections, but the top surface of the cone section shall be flat and at least 5 inches wide, radially, to receive adjustment bricks. Wall thickness shall be 4 inches minimum, and reinforcement shall conform to the requirements specified for standard sections of the larger diameter. Steps shall be provided as specified for standard precast sections, and an additional step or handhold shall be provided in all concrete cones on the side opposite the ladder steps as about midheight of cone section as shown on COS Standard Plan number 208.

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No more than two lift holes shall be cast into each cone, and they shall be located so they do not damage reinforcing or expose it to corrosion. At manufacturer's option, steel loops may be provided for handling in lieu of lift holes.

Handholds (steps) installed in leveling bricks or flat slab shall be modified to allow a minimum clear opening of 21 inches measured at the shortest dimension, but the handhold shall not be less than 3 inches from the inside face of the wall.

7-05.3H FLAT SLAB COVERS

Standard flat slab covers shall be a minimum of 8 inches thick and shall conform to the outer dimension of the standard sections upon which they are to be placed. Details of the opening location and reinforcing shall be as shown on the COS Standard Plans.

7-05.3I FLAT SLAB REDUCTION SECTIONS

Reductions to 24 inch and 48 inch openings can be made by means of a flat slab reducing section as shown on COS Standard Plan numbers 200 through 206, "b" series and Figure 7-011 only. Standard flat slab covers shall be a minimum of 8 inches thick and shall conform to the outer dimension of the standard sections upon which they are to be placed. Details of opening location and reinforcing shall be as shown on the COS Standard Plans.

7-05.3J T-TOP PIPE MANHOLES

T-Top pipe manholes shall conform to the Plans and shall be provided with foundation and bedding.

7-05.3K JOINTS

Joints between precast manhole components shall be rubber gasketed in a manner similar to pipe joints conforming to ASTM C 443. Shop drawings of joint details in COS Standard Plan numbers 200b and 201b, and of end details in COS Standard Plan numbers 202b, 203b, 204b, 205b, and 206b shall be submitted to the Engineer for approval at least 5 Working Days before manufacture. Completed joints shall show no visible leakage and shall conform to the dimensions of ASTM C 478.

7-05.3M MANHOLE CHANNELS

All manholes shall be channeled unless otherwise specified in the Contract.

Manhole channels shall conform to the curvature of the connecting pipes. Manhole channel slopes shall be made to conform accurately to the Sewer grade and shall be brought together smoothly with well rounded junctions. Where pipe connections have differing grades or differing invert elevations or differing inside diameters, a smooth transition in channel grade(s) or side(s) is required. Channel sides for each pipe shall be carried up vertically from the I.D. at the springline to the crown elevation of the pipe. The concrete shelf between channels shall be smoothly finished and warped evenly with slopes to drain.

7-05.3N MANHOLE PIPE CONNECTIONS

All pipes, except CMP, entering or leaving the manhole shall be provided with flexible joints within ½ of a pipe inside diameter or 12 inches, whichever is greater, from the outside face of the manhole structure and shall be placed on firmly compacted bedding, particularly within the area of the manhole excavation which normally is deeper than that of the Sewer trench. Openings surrounding pipes entering the manhole shall be completely filled with a

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non-shrink cement sand grout and shall be finished flush with the remaining manhole concrete wall surfaces to ensure watertightness. PVC pipe connecting to manhole shall be provided with a manhole adapter complete with gasket and approved by the Engineer.

7-05.3O BACKFILL

Backfill around drainage structures, such as manholes. Catch basins, inlets, vaults, and related Structures, shall consist of suitable Material and shall be placed as a backfill in accordance with Section 2-09.3(1)E, Type 1 Compaction [COS 7-17.3(3)].

7-05.3Q LADDER, STEPS AND HANDHOLDS

The Contractor shall submit to the Engineer for approval at least 5 Working Days in advance, the single Material of choice for step , handhold, and ladder from the Section 6-03.1 [COS 9-12.2] Materials available, and shall consistently use this single chosen Material in every drainage Structure. Should the Contractor request a different Material between or among different drainage Structures, then the submittal shall be clear in identifying which Material is for which drainage Structure.

Base sections of precast manholes more than 3 feet in height shall be provided with a ladder as detailed in COS Standard Plan Number 232. Where ladders are required, the bottom step in which the ladder is hung shall be manufactured of the same Material as the ladder.

Steps, handholds, and ladder made of copolymer polypropylene plastic manufactured from Lane International Corp., M. A. Industries, Inc., or approved equal may be substituted for galvanized steel steps, handholds, and ladder.

Where a flat slab is required in the construction of the manhole, the handholds normally required in this area may either be installed in the slab itself, or installed between the slab and leveling bricks, provided that the overall distance to the upper handhold or step, or the distance between the upper handhold or step to the top of frame, is no more than 16 inches. See Sections 7-05.3F and 7-05.3G for additional requirements.

7-05.3R FRAME AND COVER

The casting as shown on COS Standard Plan number 230, Figure 7-022, 7-023 may be used without extension rings for concrete pavement, or rigid pavement base if the top of casting is level with top of finished pavement and the casting flange is below the rigid pavement. Casting with depth less than the thickness of concrete pavement shall have frame extensions (see COS Standard Plan number 231) epoxied to the casting frame by the frame manufacturer to allow the top of the casting to be level with the top of finished pavement, and the casting flange to be below the bottom of rigid pavement.

Where COS Standard Plan number 230 casting is located within the concrete pavement or within the rigid concrete pavement base, reinforcing in the concrete slab shall be installed as specified in Section 5-05.3(9). COS Standard Plan number 230, Figure 7-022 casting located across, or located within 18 inch of a concrete pavement joint as measured from the casting barrel (not the flange), does not require Section 5-05.3(9) pavement reinforcing.

7-05.3(1) ADJUSTING MANHOLES AND CATCH BASINS TO GRADE

Add the following new Section:

*(***COS 7-05.3(1)P***)*

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7-05.3(1)P MANHOLE GRADE ADJUSTMENT (ADJUST MANHOLE)

The Contractor shall be responsible for selecting the appropriate precast concrete manhole components, allowing for a maximum height of 2 foot 2 inch from the top of the cone section or top slab to the finished surface grade for installation of the manhole frame and cover including 8 inches minimum for leveling or adjustment brick, or concrete collar. The surface grade for frame and cover on unimproved roadways shall match the adjacent existing roadway surface. On projects calling for regrading and pavement improvements, the grade sheet furnished by the Engineer will show the approximate top grade for manhole within plus or minus 0.2 feet. The final grade will be set by the Engineer.

Final elevation and slope of the frame and cover shall conform to the restored and adjacent street surface. No warping of grades in lieu of manhole frame adjustment will be allowed. All joints in the brick or ring adjustment shall be filled with mortar, and the casting shall be seated in mortar placed on the top brick course. A 3/8-inch thick mortar lining shall be installed inside and outside the adjustment section to provide a smooth, watertight finish.

7-05.3(2) ABANDON EXISTING MANHOLES

Section X-XX is deleted and replaced with the following:

(*****)

Work shall include abandon catch basin, manhole or inlet as applicable to each structure designated on the plans to be abandon. The Contractor shall remove casting and debri; dewater; break down the structure to a depth of the cone sections or 4 feet below the surface, whichever is greater; plug the oulet pipe as specified in Section 2-02.3(5); and fill the remaining structure and void with Mineral Aggregate or concrete as follows:

The Contractor shall not abandon any existing water service unless the Contract so specifies. When abandonment of an existing water service is required, the Contractor shall first make the notification as specified in Section 1-07.28 item 5.

Valve chambers, catch basins, and manholes shall be filled with Mineral Aggregate Type 9 or Type 17 or crushed concrete compacted to 95% of maximum dry density per Section 2-03.3(14)E. Old Type 164 inlets shall be filled with Class 5 (3/4) concrete (see Section 5-05.3(2)). Inlet grates shall be delivered to the Owner. The upper portion of abandoned structure shall be replaced with Material matching the existing pavement structure unless indicated otherwise in the Contract.

7-05.3(3) CONNECTIONS TO EXISTING MANHOLES

Section is supplemented with the following:

(*****)

Connectiion to Manhole Structure shall be considered the same as Connections to Existing Manholes.

The Contractor shall verify invert elevations prior to construction. Discrepancies in invert elevations shall be immediately brought to the attention of the Engineer. The crown elevation of lateral pipes shall be the same as the crown elevation of the incoming pipe unless otherwise shown per the Plans. The existing base shall be reshaped to provide a channel equivalent to that specified for a rechanneled manhole (see Section 7-05.3(3)A [COS 7-05.3(1)T].

The Contractor shall excavate around the manhole to prevent unbalanced loading. The manhole shall be kept in operation at all times, and the necessary precautions shall be

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taken to prevent debri or other Material from entering the Sewer. This includes building a tight pipeline sewage bypass as required.

The Contractor shall core drill, line drill or wall saw an opening to match the size of pipe to be inserted. Where line drilling is the method used, the method of drilling holes shall prevent overbreakage. All openings shall provide a minimum 1 inch and maximum 2 inches clearance around the outside circumference of the pipe. Upstream pipes, except PVC pipe, penetrating the walls of manholes shall be placed with the bell facing out such that the bell is placed snug against the outside wall of the manhole as the angle of penetration allows. Pipe, except PVC pipe leaving or entering manholes shall be provided with a flexible joint within ½ of a pipe diameter, or 12 inches, whichever is greater from the outside wall of the manhole. After pipes have been placed in their final position, the surface area around the opening in the manhole and the surface of the pipe shall be cleaned of all dirt, dust, grease, oil and other contaminants and then roughened and wetted with water. The opening between pipe and broken out concrete shall be grouted as specified in Section 7-05.3N. PVC connecting to an existing manhole shall be installed according to Section 7-05.3N.

This work shall also include reconfiguring the existing ladder, rungs, steps, handholds, and cover to meet the new connection configuration. This work shall also include work and materials and labor for Rechannel Existing Manhole.

Add the following new Sections:

(*****)

7-05.3(3)A RECHANNEL EXISTING MANHOLE

Rechanneling of an existing manhole shall include all as necessary work, such as excavating shelf and manhole bottom, filling existing channel or channels with concrete, installing the new channel or channels, constructing new pipe opening or openings, and finishing the channel(s) and shelf(ves). It shall also include the work of connecting the pipe to the manhole in accordance with Section 7-05.3(3) Rechanneling shall meet the requirements specified in Section 7-05.3M.

7-05.3(3)B REBUILD EXISTING MANHOLE

Where noted on the Drawings, the Contractor shall rebuild the existing manhole per COS Standard Plans to accommodate a new manhole frame and cover meeting the requirements of the COS Standard Plans. Work required to rebuild an existing manhole includes excavation around the manhole; removal and salvage of the existing manhole frame and cover; removal of leveling or adjustment bricks or rings; and removal of the upper portion of the cone section to a depth yielding an opening of the inside diameter as indicated in the COS Standard Plans. The cone section shall be rebuilt; leveling bricks or rings installed; new manhole steps and handholds installed meeting the requirements of Sections 7-05.3F or 7-05.3G, and a new frame and cover installed in accordance with Section 7-05.3R.

Excavation, backfill with suitable Material, and compaction shall conform to the applicable portions of Section 7-08 [COS 7-17].. Salvage shall be in accordance with Section 2-02.3 [COS 2-02.3(7)].

Add the following new Sections:

(*****)

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7-05.3(5) CATCH BASINS AND INLETS

7-05.3(5)A GENERAL

Construction requirements for catch basins and inlets shall follow all applicable Specifications of Section 7-05.3 for manholes and manhole pipe connections with the exception that no channeling is required. The "joint details by Contractor" in COS Standard Plan number 243a shall be submitted by the Contractor to the Engineer for approval at least 5 Working Days in advance of ordering the catch basin.

Catch basins shall be installed as indicated on COS Standard Plan numbers 260a, 260b, and Figure 7-017 unless the Contract indicates otherwise.

Catch basins shall be installed at an elevation which provides at least 2 feet 8 inches of clearance between the outlet pipe and the bottom of the basin. Connections to the catch basin shall be made only either at pre-drilled holes or at the concrete knockouts provided in the walls of the catch basin except, holes may be cored (avoiding reinforcing) to accept vault sump pump pipes. The Contractor shall determine beforehand the approximate elevation of the proposed inflow and outflow pipes by taking into account the length of inlet connection pipe. All these items have a bearing on the depth of the inlet pipe at the catch basin, and bottom elevation of the catch basin.

Where it is necessary for the Contractor to set the catch basin deeper to accommodate the deeper incoming pipe, the additional depth of the catch basin requires additional rows of leveling or adjustment bricks, up to a maximum of 16 inches, or installation of a 0ne-foot to two-foot high concrete ring section below the top slab or cone section. This added concrete ring section shall be compatible with the Standard Catch Basin Section and shall accommodate rubber gasket joints.

7-05.3(5)B PIPE CONNECTIONS FOR CATCH BASINS AND INLETS

All new catch basins shall be provided with openings or concrete blockouts for insertion of pipe connections and with a trap for the outlet pipe. Traps are required for City of Seattle inlet structures and as indicated in the Plans (Drawings). Traps are not required for King County structures other than those shown in the Plans (Drawings). The Contractor shall furnish and install new outlet traps for relocated and rebuilt catch basins. When connections are to be made to existing catch basins with no available hole or knockout, or where a "knockout" of adequate size is not provided, pipe connections shall be accomplished by core drilling, line drilling, or wall sawing. All openings shall provide a minimum of 1 inch and a maximum of 2 inches clearance around the circumference of the pipe. Where line drilling is the method used, the method of drilling holes shall prevent overbreakage. After pipes have been placed in position, the opening between pipe and wall of catch basin or inlet shall be grouted as specified in Section 7-05.3N. See Sections 7-08.3(4) and 7-08.3(5) for additional pipe connection requirements.

The outlet trap and the frame and grate shall be located as shown on the COS Standard Plans, and shall be vertically aligned to allow reasonable access for removal and replacement of the outlet trap for vactor cleaning maintenance operations.

7-05.3(5)C CATCH BASIN GRADE ADJUSTMENT (ADJUST CATCH BASIN TO GRADE)

Catch basin frame and cover grade adjustment shall be in accordance with Section 7-05.3(1)P.

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7-05.3(5)D INLET GRADE ADJUSTMENT (ADJUST CATCH BASIN TO GRADE)

The inlet frame may be either cast into a concrete collar or set flange down on a minimum of one row of concrete alignment blocks and mortared. It shall not, in any case, be mortared to final grade until the final elevation of the pavement, gutter, ditch or sidewalk in which it is to be placed has been established and permission has been given by the Engineer to mortar the frame in place. Location of the inlet will be staked by the Engineer or personnel appointed by the Engineer. The bottom of the inlet shall be level with the invert of the outlet pipe.

Existing Type 164 inlets shall be adjusted as shown on COS Standard Plan number 268 only for pavement resurfacing projects.

7-05.3(5)E RELOCATE EXISTING CATCH BASIN OR INLET

Work required for relocation of existing catch basin or inlet shall include necessary excavation to remove without damage the existing catch basin or inlet, its frame and grate or cover and transporting and installing at the new location. Backfill shall consist of suitable material and compaction shall be in accordance with Section 2-09.3(1)E, Type 1 Compaction [COS 7-17.3(3)]. Grade adjustment shall be in accordance with Sections 7-05.3(5)C or 7-05.3(5)D.

The Contractor shall furnish and install new outlet traps (see Section 7-05.3(5)B [COS 7-05.3(2)B] for outlet trap location requirements).

Existing Type 164 inlets shall be removed and disposed of when a project requires removal and replacement of pavement coating containing the Type 164 inlet.

7-05.3(5)F REBUILD EXISTING CATCH BASIN

Where noted on the Plans (Drawings), the Contractor shall rebuild the existing catch basin to accommodate a new frame and grate, or cover, as designated in the Contract. Work required to rebuild catch basin includes excavation, the removal of the existing frame and grate or cover, leveling or adjustment bricks, upper portion of catch basin chamber, and installing a new cone section, leveling or adjustment bricks and new frame and grate or cover. Excavation, backfill, and compaction shall conform to the applicable portions of Sections 7-04 and 7-08 [COS 7-17]. Salvage shall be in accordance to Section 2-02.3 [COS 2-02.3(7)]. Grade adjustment shall be in accordance with Sections 7-05.3(5)C.

The Contractor shall furnish and install new outlet traps (see Section 7-05.3(5)B for outlet trap location requirements.

7-05.3(5)G STORMWATER VAULT

Vaults shall be installed at the locations shown on the Plans (Drawings). The Contractor may install, at no expense to the Contracting Agency, such additional boxes as may be desired to facilitate the Work. Vaults shall be installed accordance with the following:

1. Excavation shall be performed in accordance with Section 2-09.
2. Vaults shall be installed on 6-inches of gravel backfill for foundation, per Section 7-05.3A, A1, A2, B, B1, B2, placed on a compacted or undisturbed level foundation.
3. All openings around penetrations shall be sealed and filled with non-shrink grout in accordance with Section 6-02.3(20), to prevent water and debris from entering the vaults.

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4. Pipe, except PVC penetrating the walls shall be provided with a flexible joint within ½ of the pipe inside diameter, or 12 inches whichever is greater from the outside wall of the vault.
5. Backfilling around the Work shall not be allowed until the concrete or mortar has set.
6. The interior bottom shall be formed/sloped to drain according to the plans.
7. Upon acceptance of Work, vaults shall be free of debris.

Where water is encountered in excavating for vaults, it shall be removed during vault placing activities and until vault is sealed and provisions are made to prevent floating of the vault. Excavation water or other deleterious materials shall not be allowed to enter the vault during the construction of the vault. However, see temporary sediment vault/trap and sump in these specifications for temporary use of the water quality wet vault as a temporary sediment trap.

Vault Grates Section 9-05.50(6) shall be aluminized and meet H-25 loading.

Vault Risers per Section 9-05.50(6) shall be constructed with precast collars and non-shrink grout to finished grade.

Vaults with traffic bearing lids shall be raised to final grade using ring risers to raise the cover only. All voids resulting from the adjustment shall be backfilled with materials matching adjacent surfacing material and compacted in accordance with Section 2-09.3(1)E. Damage to the vaults and the associated drainage system from the Contractor's operations, shall be repaired to the Engineer's satisfaction at no additional cost to the Contracting Agency.

New vaults shall be adjusted to be flush with the finished grade (but finished grade over the vault shall be "mounded up to prevent stormwater runoff from surface draining into the vault).

7-05.3(5)H TEMPORARY SEDIMENT VAULT/TRAP AND SUMP

The Stormwater Vault (Section 7-05.3(5)G) may be constructed and used as a temporary sediment trap during construction. The Contractor shall construct the vault with all components including the top sections according to Section 7-05.3(5)G. The vault shall have risers extending to elevation 16.00 minimum and backfilled per plan. At no time shall the Contractor empty the vault completely during high tide, high river elevation, or any other circumstance without providing groundwater monitoring and verification to the Engineer that the groundwater elevation is at or below elevation 3.0. The vault shall be cleaned as necessary to keep sediment at or below one foot deep in the temporary conditions. At no time shall sediment be allowed to resuspend and flush into the river. The vault shall be cleaned (all silt and debri shall be vactored out) and the outlet shall be flushed free of silt, debri, or any other materials at the end of construction after the entire site has been stabilized for permanent sediment control.

This work includes all materials, labor, and equipment to construct temporary sediment traps/sumps and maintain them during construction.

7-05.4 MEASUREMENT

Section is supplemented with the following:

(*****)
Rebuild Existing Manhole will be measured per each.

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Catch Basin Type 2 60 In. Diam. Control Structure will be measured per each.
Catch basin Additional Height Type 2 60 In. Diam. Control Structure will be measured per linear foot for each additional foot over 10-feet. Measurement will be from flow line invert of the outlet pipe to the top of the manhole ring measured to the nearest foot.
Catch Basin Type 2 54 In. Diam. control Structure will be measured per each.
Catch Basin Type 2 48 In. Diam. Emergency Outfall Structure will be measured per each.
Catch Basin Type ___ W/Through Curb Inlet will be measured per each.
Connect to Existing Manhole will be measured per each.
Catch Basin Type Special (____) will be measured per each Stormwater Vault per each.
Temporary Sediment Vault/Trap and Sump per each.

7-05.5 PAYMENT

The second paragraph is deleted and replaced with the following:

(*****)
"Manhole (Type) (X) In. Diam.", per each.
The unit contract price for "Manhole (Type) (X) In. Diam" shall include all costs for the work required to furnish and install the manhole complete to finish grade, including excavation, bedding, mortar, non-shrink grout, brick, block, castings, channeling, ladder, steps, connections to pipelines, and backfill with suitable native Material for a manhole depth up to and including 10 feet.

The third paragraph is deleted and replaced with the following:

(*****)
"Extra Depth, (Type) Manhole", per linear foot.
The unit contract price for "Extra Depth, (Type) Manhole" shall include all costs for the work required to construct the portion of a manhole in excess of 10 vertical feet.

Section is supplemented with the following:

(*****)
Connection to Existing Manhole is considered to include payment for all tools, labor, and materials as necessary to rechannel and/or rebuild existing manhole per each.
The unit contract price for "Rebuild Existing Manhole" shall include all costs for the work required, including the new casting, to completely rebuild the existing item to finished street grade.
"Debris Cage", shall be incidental to the "Catch Basin Type __ (SIZE) In. Diam. Emergency Outfall Structure".
"Debri Barrier" shall be incidental to the Pipe (Class, Type, Diam.).
The unit price per each for "Stormwater Vault", shall be full pay for all work to install the vault, including but not limited to internal components, precast cement concrete footing, sedimentation slab, vault ends, sides, and top sections, access hatch and grates and frames, manhole rings and covers, ladders, backfilling, and compaction.
"Temporary Sediment Vault/Trap and Sump", per each.

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The unit contract price for "Temporary Sediment Vault/Trap and Sump" shall be full pay for all excavation, materials, labor, tools, equipment, and supplies necessary for constructing temporary sumps, sediment traps, and maintaining the Temporary Sediment Vault according to temporary grade conditions, stabilizing slopes draining into the vault, as well as furnishing and installing bedding, backfill, risers, lids, grates, ladders, flow control devices, and any cleaning of sump/trap and vaults as necessary including dewatering for temporary sediment trap use.

"Locking Solid Metal Cover and Frame for Catch Basin, Vaned Grate, non-vaned grate, and frames", shall be incidental to the structure.

No additional payment shall be made should the Contractor require construction of Temporary Sediment Vaults/Traps and sumps in addition to those indicated on the plans, or removed and reconstructed due to construction phasing, or made larger to accommodate additional runoff.

"Locking Solid Metal Cover and Frame for Manhole", shall be incidental to the structure.

Catch Basin Type 2 54 In. Diam. Control Structure per each.
Catch Basin Type 2 60 In. Diam. Control Structure per each.
Catch Basin Additional Height Type 2 60 In. Diam. Control Structure per linear foot.
Catch Basin Type (___) W/Through Curb Inlet per each.
Manhole Type ___ (SIZE) In. Diam. per each

7-06 PIPE ANCHOR, CEMENT CONC. ANCHOR, OUTFALL VALVE, TRENCH DAM

Section 7-06 is deleted and replaced with the following:

(*****)

7-06 PIPE ANCHOR, CEMENT CONC. ANCHOR, TRENCH DAMS, TIDEFLEX VALVES

7-06.1 DESCRIPTION

Section 7-06 describes work consisting of constructing concrete pipe anchors, cement concrete anchor(s), Outfall Trench Dams, and Tide-Flex Valves. Prefabricated pipe anchors on tongue and groove concrete pipe and other pipes as designated in accordance with details indicated in the Contract.

7-06.2 MATERIALS

Material shall meet the requirements of the applicable portion of Sections 6-02 and 6-03.

Backflow prevention outfall valve shall meet ANSI Class 125/150#, and be Tide Flex Viton or other approved equivalent. The flat bottom duckbill valve shall be installed with the flap pointing downstream and not allow river current to force the valve flap open. The valve may be slip on with stainless steel bands (316) and have metallic support material encapsulated within the valve to hold the shape of the valve in position. The valve shall be one piece rubber construction with nylon reinforcement. The valve elastomeric material shall be resistant to halogenated hydrocarbons, oils, greases, sodium hydroxide, ozone, oxygen, methane, and general weathering. The valve shall have a minimum operating temperature

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range between -10 degrees F and +400 degrees F and have a minimum 4 psi backpressure and maximum of 6 psi backpressure rating with a maximum head loss of 1.5 feet..

7-06.3 CONSTRUCTION REQUIREMENTS

The construction shall be in accordance with the Contract and the applicable portions of Sections 6-02.3 and 6-03.3.

7-06.4 MEASUREMENT

Bid Items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1 Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section. No specific unit of measure shall apply to Pipe Anchor(s), Cement Concrete Anchor(s), Outfall Trench Dams, and TideFlex Valves. They shall be considered incidental to other work performed and shall be included in the measurement for the pipe and structure they are associated per linear foot.

7-06.5 PAYMENT

Compensation for costs necessary to complete the work described in Section 7-06 will considered included in the unit bid price for Bid Item Pipe, SD, CONC. REINF. C76 CL III, 24 In. per linear foot.

7-07 CLEANING EXISTING DRAINAGE STRUCTURES

7-07.1 DESCRIPTION

Section is supplemented with the following:

(*****)

Sanitary Sewer pipes, combined Sewer pipes,

7-07.3 CONSTRUCTION REQUIREMENTS

Delete first sentence

"All pipes and drainage Structures that require cleaning are identified in the Plans.

7-08 GENERAL PIPE INSTALLATION REQUIREMENTS

7-08.1 DESCRIPTION

Section is supplemented with the following:

(*****)

This work also consists of excavation, foundation preparation, bedding, backfilling and compacting for the construction of miscellaneous Sewer and drain appurtenances other than those described in COS Sections 7-01, 7-17, and 7-18.

7-08.2 MATERIALS

Section is supplemented with the following:

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(*****)

Materials shall meet the requirements in Sections 9-04, and 9-05.

7-08.3(1) EXCAVATION AND PREPARATION OF TRENCH

Section is supplemented with the following:

(*****)

Excavation, Foundation Preparation, Bedding, and Backfill work in trench excavations over 4 feet deep are subject to Trench Safety Systems, COS Section 7-17.3(1)A7a and trench excavation and backfill shall be as specified in COS Section 7-17.

7-08.3(1)A TRENCHES

The second paragraph is deleted
Section is supplemented with the following:

(*****)

Trench width shall be according to COS Standard Plan Number 284.

7-08.3(1)B SHORING

Section is supplemented with the following:

(*****)
Shoring shall also meet COS Section 7-17.3(1)A.

7-08.3(1)C BEDDING THE PIPE

Section is supplemented with the following:

(*****)

Pipe Zone Bedding (Bedding Class B) shall conform to bedding, jointing, backfilling in COS Section 7-17.

Add the following new Section:

(*****)

7-08.3(1)D CONNECTIONS TO EXISTING SANITARY SEWERS

When making a connection to an existing sanitary Sewer line or manhole, the Contractor shall excavate and expose the existing facility where shown on the Plans. In the event there is no existing tee or wye, refer to COS Section 7-17.3(2)C3 "Cut-In Tee On Existing Pipe". See COS Section 7-05.3(1) for connections to existing manholes.

Add the following new Section:

(*****)

7-08.3(1)E PIPE INSTALLING, JOINTING, AND TESTING

Pipe installing, bedding, jointing, backfilling, and pipe connections shall conform to the applicable requirements of COS Section 7-17. Testing for acceptance as provided in COS Section 7-17.3(4) will not be required.

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Add the following new Section:

(*****)

7-08.3(1)F CATCH BASIN CONNECTIONS

Catch basin connections are pipe lines connecting outlets of catch basins to a Storm Drain or other facility. Both the alignment and the slope shall be straight with the exception of maintaining clearances in accordance with COS Section 1-07.17(2). Ninety degree bends will not be allowed.

No connection shall be made to the catch basin outlet pipe until the excavation around the catch basin has been backfilled and compacted to an elevation which provides for pipe bedding and connection pipe. Bedding for catch basin connection pipe shall be Class B bedding.

Connection pipe may be deflected at the joint to avoid obstacles to within the allowable angular deflection recommended by the pipe manufacturer. Such deflection shall be watertight and allow rodding the pipe in a relatively easy manner. Where pipe joints must be deflected, the Contractor shall submit the manufacturer's pipe joint deflection criteria to the Engineer for approval. Under no circumstances will deflection or change of direction be allowed by cutting or trimming the end of the pipe on a bias or an angle. All pipe ends shall be normal angle.

The Contractor shall furnish and install a new outlet trap to the newoutlet of the existing catch basin.

See COS Section 7-05.3(2)B for outlet trap location and catch basin connection requirements.

Add the following new Section:

(*****)

7-08.3(1)G INLET CONNECTIONS

Inlet connections are pipe connections from drainage inlets to catch basins or other approved outlets. Inlet connections shall be installed upgrade from catch basin openings or other originations in straight alignment. Where a straight alignment or a uniform slope is not pheasible and curves are necessary, the altered alignment shall be made by deflecting each pipe in a smooth curve. Bends with angles greater than 22.5 degrees shall not be used. Each pipe joint deflection shall not exceed that necessary to maintain watertight connection as recommended by the pipe manufacturer. The Contractor shall submit the pipe manufacturer's pipe joint deflection criteria. Inlet connection slopes shall not be less than 5% nor more than 50% for any or all portions of the connection with or without deflection.

Pipe connections to a catch basin or other approved outlet shall not be made until the compaction requirements as specified in Section 7-08.3(1)F have been met and the work has been approved by the Engineer. Bedding for inlet connection pipe shall be Class B bedding.

See COS Section 7-05.3(2)B for inlet pipe connection requirements.

Add the following new Section:

(*****)

7-08.3(1)H DROP CONNECTIONS

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Inside and outside drop connections, used in conjunction with different types of manholes to allow for abrupt drop in elevation of the inflow, shall be constructed as shown on COS Standard Plan numbers 233a and 233b, and at locations indicated on the Plans. The invert elevation of the outside drop connection will be specified on the Plans. The crown elevation of the inside drop connection shall match the crown elevation of the manhole outlet pipe.

Add the following new Section:

(*****)

7-08.3(1)I VERTICAL CONNECTION

When making a connection to an existing sanitary sewer line, the Contractor shall excavate and expose the existing facility where shown on the Plans. Contractor shall verify elevations prior to construction in a manner not to disturb the existing pipe.

Vertical connections shall be constructed as detailed and noted in the Plans. Any damages to the existing pipe shall be immediately repaired by the Contractor at no expense to the Contracting Agency. The vertical connection

Add the following new Section:

(*****)

7-08.3(1)J SANITARY SEWER FLOW METER

Sanitary flow meter shall be installed at the location indicated on the Plans. The flow meter shall conform to the requirements in accordance with Section 9-05.21.

7-08.3(4) PLUGGING EXISTING PIPE

Section is supplemented with the following:

(*****)

Plugging Existing Pipe shall also include work elements for ABANDON AND FILL, AND PLUG PIPE

Add the following new Sections

(*****)

7-08.3(4)A ABANDON AND FILL PIPE

Pipes designated on the Drawings to be abandoned and filled shall be filled with a pumpable, flowable cement slurry completely filling the pipe (See section 9-05.15).

7-08.3(4)B PLUG PIPE

At each end of pipe designated on the Drawings as “abandon and fill” or “plug”, the pipe end shall be completely plugged with Cement Concrete, Class 5 (3/4) (Section 5-05.3(2)) for a minimum length of 12 inches with no voids.

7-08.4 MEASUREMENT

Section is supplemented with the following:

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(*****)

Measurement for "Pipe, CB Conn., (Material), (Class), (Size) will be by the linear foot of pipe installed between the tee or wye in the receiving Sewer and inside center of each catch basin.

Measurement for "Pipe Inlet Conn., (Material), (Class), (Size)" will be by the linear foot of pipe installed between the inside face of inlet, and the inside center of the catch basin.

Measurement for "Drop Connection, Outside, (Size)" will be per each.

Measurement for "Vertical Connection, (Size)" will be per each.

Measurement for "Pipe, CB Conn., (Material), (Class), (Size)" when the pipe is an outlet pipe from a flow control Structure it will be measured from the inside center of the flow control structure.

Measurement for "Pipe, CB Conn., (Material), (Class), (Size)" when the pipe is an outlet pipe from a flow control Structure it will be measured from the inside center of the flow control structure.

Measurement for "Sanitary Sewer Flow Meter" will be per each.

7-08.5 PAYMENT

Section is supplemented with the following:

(*****)

Payment for "Pipe, CB Conn., (Material, (Class), (Size)" will be per linear foot.

Payment for "Pipe Inlet Conn., (Material), (Class), (Size)" will be per linear foot.

The Bid item prices for "Pipe, CB Conn., (Material, (Class), (Size)" and "Pipe Inlet Conn., (Material), (Class), (Size)" shall include all costs for the work required to furnish and install the pipe, including connections to catch basins or inlets, excavation, backfill, and compaction

Payment for "Drop Connection, Outside, (Size)" will be per each.

The Bid item price for "Drop Connection, Outside, (Size)" shall include all costs for the work required to furnish and install the complete outside drop connection as shown on COS Standard Plan numbers 233a. The price paid per drop connection is in addition to the price paid for manholes and for the specified pipe that is replaced with ductile iron pipe.

Payment for "Vertical Connection, (Size)" will be per each.

The Bid item price for "Vertical Connection, (Size)" shall include all costs for the work necessary to furnish and install the vertical connection as detailed in the Drawings including the insert tee, pipe, and pipe bend connecting to the sanitary sewer pipe.

Payment for "Pipe, CB Conn., (Material), (Class), (Size)" when the pipe is an outlet pipe from a flow control Structure it will be measured from the inside center of the flow control structure.

Payment for "Pipe, CB Conn., (Material), (Class), (Size)" when the pipe is an outlet pipe from a flow control Structure it will be measured from the inside center of the flow control structure.

Payment for "Sanitary Sewer Flow Meter" will be per each and shall include all costs for the work required to furnish and install the meter at the locations indicated on the Plans.

Gravel Backfill for Pipe Zone Bedding shall be considered Bedding Class B and shall be paid according to COS Section 7-17.5.

NOT FOR CONSTRUCTION

Add the following new Section:

(*****)

7-13 FIRE PROTECTION WET HYDRANT SYSTEM

7-13.1 DESCRIPTION

General Requirements: This special provision describes the requirements for furnishing, installing, testing and commissioning a fire protection wet hydrant system consisting of buried and exposed fire mains, backflow preventer and precast vault with accessories, valves, dry barrel hydrants for use by the fire department, electric heat trace system including heating cables and controls for freeze protection of exposed wet fire and domestic water mains and all other accessories required for a functional system. Provide an independent wet hydrant system on the north and south sides of the bascule piers and as indicated on the drawings.

Drawings and general provisions of the Contract, General and Special Conditions, apply to this Section.

Drawings indicate size, connections, and dimensional requirements of the various wet hydrant system components and are based on specific manufacturer's products indicated. Other manufacturers' units, listed under Materials, with equal performance characteristics may be considered.

Comply with NFPA 14, "Standard for the Installation of Standpipe and Hose Systems" and NFPA 502, "Standard for Road Tunnels, Bridges and Other Limited Access Highways".

Comply with standards of authorities having jurisdiction pertaining to materials, hose threads, and installation.

Coordinate layout and installation of electric heating cables and system components with piping insulation installer and with power and control wiring provided.

7-13.2 MATERIALS

Submittals: The contractor shall submit to the Engineer for approval, shop drawings, catalog cuts, manufacturer's data and additional data as required by the Engineer to evaluate the materials and equipment for use in the wet hydrant system. Shop drawings shall show all dimensions, details, anchorage details, reinforcement and the manner of installation. No material shall be placed prior to approval of shop drawings. Submit special warranty specified in this Section.

The Contractor's fire main layout shall be furnished together with standard details for review and/or approval. The line layout shall show each standard pipe joint and each special joint or fitting by number and each hanger or support. Standard details shall be furnished in sufficient detail to assure that the detail design of the pipe and specials will comply with the design concept and structural requirements of the project. Full details of reinforcement, concrete, cement, joint dimensions, etc, for the straight pipe, special fittings and the connections, shall be furnished.

Submit length of cable, rated capacities, operating characteristics, furnished specialties, power and control wiring, and accessories for each electric heat trace system provided. Include plans, sections, details and attachments to other work.

Submit product data for pipe insulation. Identify thermal conductivity, thickness, and jackets (both factory and field applied).

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Submit product data for underground vaults, access hatches and hardware. Provide certificates for concrete and steel used in underground precast manholes in conformance with ASTM C 858.

Submit product data for underground vault sump pump, including certified performance curves with operating points plotted on curves, and rated capacities of selected models, furnished specialties, and accessories.

Furnish Operation and Maintenance data for all valves and wiring diagram information for all supervised valves.

Furnish Operation and Maintenance data for heat trace system, and include in project maintenance manuals.

7-13.2(1) BURIED SERVICE FIRE PIPING SYSTEM

Buried pipe from the connection to the SPU detector check vault to the bridge abutment will be ductile iron. Ductile iron pipe shall be centrifugally cast in 18 foot nominal lengths conforming to AWWA C151, shall be seal coated and shall have a double thickness cement mortar lining conforming to AWWA C104. Pipe shall be standard thickness Class 53. Pipe ends shall be suitable for restrained Mechanical joint fittings.

Fittings for Mechanical joint ductile iron pipe shall be ductile iron of Class 250 gray iron conforming to AWWA C110 and C111; fittings shall be seal coated and shall be double thickness cement mortar lined conforming to AWWA C104.

Where shown on the plans and in other locations where there is a change in the direction of the pipe joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which when activated imparts a multiple wedging action against the pipe increasing its resistance as the pressure increases.

Glands shall be of ductile iron conforming to ASTM A536.80 and shall be seal coated equal to that on the connecting pipe.

The mechanical joint restraint device shall have a minimum working pressure of 250 psi. The mechanical joint restraint device shall be "Megalug" or approved equivalent product.

As an alternate to the joint restraint device described above, ductile iron locking segments inserted through slots in the bell face shall provide a positive axial lock between the bell interior surface and a retainer weldment on the spigot end of the pipe. This restraint device shall be “TR Flex” or approved equal.

Flanged joints shall conform to AWWA C115. Restrained and flanged joint fittings shall be compatible with the restrained and flanged joint pipe specified and used.

Pipe Coating System: The exterior surfaces or the pipe shall have the following coating systems per AWWA C210:

1. Surface preparation shall be Solvent Clean (SSPC-SP-1) followed by abrasive blast-cleaning to Near White Metal (SSPC-SP-10) with an anchor profile between 0.0030-inch and 0.0040-inch. The Contractor shall use caution during external blast cleaning of ductile iron pipe and shall conform to the National Association of Pipe Fabricators (NAPF) Standard 500-03 and consult with the pipe manufacturer prior to any blast cleaning of the ductile iron pipe.
2. Two (2) uniform coats of coal tar epoxy conforming to AWWA C210 shall be applied to a total dry film thickness of 0.020-inch to 0.030-inch.
3. The drying time between coats shall be 12 hours minimum and 24 hours maximum at 70-deg F. Intercoat drying time shall be in accordance with manufacturer's recommendations.

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Pipe Coating System (Contractor's Option): polyethylene wrap over the standard asphalted factory coating, applied in accordance with AWWA C 105, can be used for the pipe and fittings specified in these special provisions.

7-13.2(2) NON-BURIED FIRE PIPING SYSTEM BELOW BRIDGE AND AT BASCULE PIERS

Exposed pipe from the bridge abutment and into the bascule piers shall be an IPS grooved piping system. All grooved components shall be of one manufacturer and conform to local code approval and the requirements of ANSI B31.1, UL/FM, IAPMO, and UMC. Grooved end product manufacturer shall be ISO 9001 certified.

Steel Pipe: ASTM A53, Type S, Grade B, plain end or grooved end , Schedule 40. For grooved end, use only factory- or field-formed square cut or rolled-formed grooves per coupling manufacturer's specifications.

Fittings shall be ductile iron grooved end fittings conforming to ASTM A536 and as manufactured by the grooved end coupling manufacturer.

Flanges shall be Class 150 forged steel, ASTM A105, weld neck, raised face or faced to match mating equipment or valves. Gaskets shall be ANSI B16-21, 1/16-inch thick synthetic finish with nitrate builder. Flange Bolts shall be ASTM A307 Grade B bolts with A 563 Grade A heavy nuts.

Mechanical grooved couplings shall be flexible Victaulic Style 77 or rigid Style 07 type as indicated on the drawings, with hot dip galvanized housings from the factory and with Grade "E" EPDM (-30F to +230F) Flush Seal style gaskets. Coupling housings shall be of ductile iron conforming to ASTM A 536. Couplings from 2-inch through 6-inch size shall be rated for a working pressure of at least 700 psi. Coupling gaskets shall be Grade "E" EPDM suitable for temperatures from –30 degrees F to +230 degrees F. For couplings 8-inch size use couplings FM rated for 500 psi. Coupling bolts and nuts shall be heat treated, zinc electroplated to ASTM B-633 track-head style conforming to physical properties of ASTM A-183 minimum tensile strength of 110,000 psi.

All couplings used shall be by the same manufacturer.

All pipe and fitting described above shall be hot dip galvanized in accordance with ASTM A 123. All mechanical grooved fittings, ductile iron or steel, shall be furnished hot dip galvanized from the vendors shop.

7-13.2(3) PRE-INSULATED FIRE PIPING AT PENETRATION INTO BRIDGE ABUTMENT

The exposed pipe and pipe installed in the buried casing pipe at the north and south bridge abutments shall be an IPS grooved piping system, pre-insulated and jacketed at the factory. Pre-insulated piping shall be Ferro-Therm as manufactured by Thermacor Process, L.P., or approved quivalent product by Perma-Pipe, Inc or Insul-Tek Piping Systems, Inc.

Steel Carrier Pipe: ASTM A53, Type S, Grade B, plain end or grooved end. Schedule 40. For grooved end, use only factory- or field-formed square cut or rolled-formed grooves per coupling manufacturer's specifications. Provide pipe in 40-foot lengths.

Insulation shall be polyurethane foam either spray applied or injected with one shot into the annular space between carrier pipe and jacket. Insulation shall be rigid, 90% minimum closed cell polyurethane with a minimum 2.0 lbs per cubic foot density, compressive strength of 30 psi, and coefficient of thermal conductivity (K-Factor) of not higher than 0.15 @ 75°F per ASTM C-518. Insulation shall be nominal 2-inches thick.

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Pre-insulated pipe shall incorporate two longitudinal metal hat channels located 180 degrees apart along the circumference of the pipe for the heat trace cable and RTD temperature sensor and cable.

Jacketing material shall be extruded, black, high density polyethylene (HDPE), having a wall thickness not less than 125 mils.

7-13.2(4) BURIED FORCE MAIN PIPING

The buried force main pipe from the backflow preventer vault to the storm sewer shall be PVC Water-Service Pipe and Fittings complying with ASTM D 1785 for schedule 40 pipe with plain ends for solvent-cemented joints and with ASTM D 2466, Schedule 40, socket-type fittings.

7-13.2(5) HYDRANTS

General: Fire hydrants shall conform to AWWA C502. The name or mark of the manufacturer, size of the valve opening and year made shall be plainly cast in raised letters on the hydrant barrel to be visible after the hydrant is installed. Hydrants shall be one of the following:

1. Pacific States
2. Clow Model 5110 (Iowa)
3. Mueller "Centurion" Model A-423
4. American-Darling Model B-62B
5. Kennedy K81D "Guardian"

6. End Connections: End connection shall be 6 inches, standard flange, Class 125 drilling conforming to ANSI B16.1.

7. Hydrant Dimensions: The dimensions and details of hydrant and nozzles shall be as follows:
8. Hydrant connection pipe size inside diameter: 6 inches.
9. Standpipe, minimum inside diameter: 7 inches.
10. Valve opening, minimum diameter: 5-1/4 inches.
11. Size of auxiliary gate valve: 6 inches.
12. Hose nozzles, number and size: two 2-1/2 inches.
13. Thread (National Board of Fire Underwriters): 7-1/2 per inch.
14. Total length of threaded male nipple: 1 inch.
15. Streamer nozzle, number and size: one 4 inch.
16. Hydrants shall be furnished with one pumper nozzle with size and threads conforming to dimensions as identified on drawings.
17. Drain Valve: Drain valve shall be automatic with outlet tapped with 1/4 to 3/4 inch female iron pipe threads.
18. The threads on the drain valve outlet holes shall be protected with temporary pipe plugs until the hydrant is ready for installation.
19. Breakaway flange (ring) to center of pumper nozzle: 14 inches or more.
20. Face: Pumper port toward the street.
21. All nozzles shall be fitted with cast iron threaded caps with operating nut of the same design and proportions as the hydrant stem nut. Caps shall be threaded to fit the corresponding nozzles and shall be fitted with suitable neoprene gaskets for positive water tightness under test pressures.

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Operating Nuts: The operating nuts on hydrant stem and nozzle caps shall be as follows:

1. Pattern of Nut: Tapered pentagonal
2. Height: 1-1/6 inch
3. Size of pentagon: 1.35 inch at bottom of nut, 1.23 inch at top of nut (measured from point to flat)

The direction of opening shall be clearly marked on the operating nut or hydrant and shall be counterclockwise.

Breakaway Flange: Hydrants shall be provided with a breakaway flange assembly and be equipped with breaking devices at the sidewalk flange which allow the hydrant barrel to separate at this point with a minimum breakage of hydrant parts in case of damage. There shall also be provided at this point, a safety stem coupling on the operating stem that shears at the time of impact. All hydrants shall be equipped with 0-ring stem seals.

Hydrant Shop Painting: All iron parts of the hydrant shall be thoroughly cleaned and painted at the factory. All inside surfaces and the outside surfaces below the ground line shall be coated with asphalt varnish, Federal Specification TT-V-51a or J.A.N.P-450. The hydrant shall be covered with two coats, the first having dried thoroughly before the second is applied.

Hydrant Field Touch-Up Painting: All iron parts of the hydrant shall be thoroughly cleaned and painted at the factory. All inside surfaces and the outside surfaces below the breakaway flanges shall be coated with asphalt varnish, Federal Specification TT-V-51a or J.A.N.P-450. They shall be covered with two coats, the first having dried thoroughly before the second is applied.

The hydrant curb stand section, including all exposed surfaces of the breakaway flange, shall receive two coats of oil based gloss enamel paint (Kelly-Moore Luxlite or approve equal) in Caterpillar yellow. Based on the elevation of the hydrant within the surrounding pressure zone, if the maximum static pressure at the hydrant is less than 60 psi, the engine port cap on the hydrant shall be painted with two coats of oil based gloss enamel paint (Kelly-Moore Luxlite or approve equal) with the final coat being Red.

Hydrant Factory Hydrostatic Test: All hydrants shall be tested by the manufacturer, as required in AWWA C502. The Contractors shall furnish to the Owner an affidavit of compliance from the manufacturer for all tests.

Hydrant Connection Pipe: Pipe connections from the hydrant to the Water Main shall be 6 inch Ductile Iron Pipe, Class 52.

Hydrant Vertical Extensions: Barrel extensions shall have a 7 inch minimum inside diameter and shall be gray cast iron or Ductile Iron and shall conform to the AWWA Standards for such castings. The drillings of the connecting flanges on the extensions shall match the drillings of the flanges on the hydrant.

Hydrant vertical extensions shall also include the necessary hydrant operating stem extension, complete with safety stem couplings.

Extensions with threaded flanges shall be ductile iron and shall conform to AWWA C115. The exterior flange lip overlapping the barrel pipe shall be sealed with a bituminous mastic.

Vertical extensions shorter than 18 inches shall be installed at the bottom of the factory supplied barrel pipe.

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7-13.2(6) GATE VALVES

Gate valves for general shut off and isolation duty shall be iron body resilient seated solid wedge gate valves with a cast iron wedge fully encapsulated with molded rubber, designed to work equally well with pressure on either side of the gate. Valves shall be of the Outside Stem and Yoke (OS & Y) type, complete with UL listed and FM approved supervisory switches.

Gate valves shall have flanged and gasketed ends complying with ANSI B16.1, Class 125. Valves shall be designed for a working pressure of 250 psi.

Bronze for all interior parts of valves shall contain no more than 6 percent zinc.

All interior ferrous surfaces exposed to fluid flow shall be epoxy coated to a minimum dry film thickness of 10 mils. Epoxy coatings shall be factory applied by an electrostatic or thermosetting process in accordance with the manufacturer's printed instructions. The epoxy materials used shall be 100% powder AWWA C550, and shall be certified to ANSI/NSF 61.

Valves shall meet or exceed all applicable requirements of AWWA C509, UL 262 and FM 1120/1130.

7-13.2(7) BALL VALVES

Provide ball valves for drain service size as shown in the plans. Where low point drains are not shown in the plans, provide a minimum 1" size drain and ball valve.

Ball drains shall be standard port, female threaded, brass body ball valves. Forged brass body shall conform to ASTM B-16. Ball and stem shall be chrome plated brass. Seat and stem washer shall be of TFE and O Ring of Fluoroelastomer. Provide with lockable carbon steel zinc plated handle.

Ball valve shall be UL Listed and FM approved and rated for 600 psi (WOG)

7-13.2(8) AUTOMATIC AIR VENTS

Provide where shown in the plans, automatic air release valves of 1-inch size.

Furnish Automatic Air Vents, Claval series 34 or approved equal by APCO or Crispin. For Installation on vertical 1/2-inch threaded outlet connections off the top of the selected high points of the wet standpipe main.

Air vents used in fire protection piping shall be UL listed or FM approved for fire protection service and rated for 400 psi working pressure.

7-13.2(9) GROUT

ASTM C 1107, Grade B, factory-mixed and -packaged non-shrink and nonmetallic grout, suitable for interior and exterior applications. Provide hydraulic-cement grout that is post-hardening, volume-adjusting, dry, non-staining, non-corrosive, and non-gaseous. Grout design mix: 5000-psi (34.5-MPa), 28-day compressive strength.

7-13.2(9) BACKFLOW PREVENTERS

Provide a double check valve assembly for each north and south wet hydrant system. Backflow preventer assemblies shall be of a type included in the Washington State Department of Health current listing of "Approved Double Check Valve Assemblies".

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General: Backflow preventer shall comply with ASSE 1015 and shall be suitable for continuous-pressure operation and designed for horizontal, straight through flow. Pressure loss shall be 6 psig maximum, through middle 1/3 of flow range. Body construction shall be epoxy coated cast iron with bronze seats and flanged ends. Provide outside screw and yoke gate-type with flanged ends on inlet and outlet.

7-13.2(10) UNDERGROUND VAULTS

Underground vaults for the backflow preventers shall consist of furnishing, installing, and testing of precast underground vaults including access hatches ladders, and sumps for sump pumps.

Precast units shall include the following features:

1. ASTM 478, with interlocking mating sections, complete with accessories, hardware, and features as shown on the plans.
2. Design and fabricate manholes according to ASTM C 858.
3. Design manholes according to sizes shown on the plans.
4. Structural design loading: ASTM C 857, Class A-16 and AASHTO H20 traffic loading.
5. Joint sealant: continuous extrusion of asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
6. Provide minimum 14-inch diameter by 18-inch deep cast-in sump.
7. Source quality control: inspect structures according to ASTM C 1037.
8. Pulling eyes in walls: eyebolt with reinforcing-bar fastening insert 51 mm diameter eye and 25 mm x 102 mm bolt.
9. Working load shall be embedded in 6-inch, 3900 psi concrete shall be 13,000 lbs minimum tension.
10. Pulling and lifting irons in floor: 7/8-inch diameter, hot-dip-galvanized, bent steel rod; stress relieved after forming; and fastened to reinforced rod. Exposed opening shall be triangular. Ultimate yield strength shall be 40,000 lbs shear and 60,000 lbs tension.
11. Expansion anchors for installation after concrete is cast: stainless-steel-wedge type with stainless-steel expander clip with ½-inch bolt, 5,300 lb rated pullout strength, and minimum 6,800 lb rated shear strength.
12. Grounding materials: comply with "Grounding and Bonding" of these special provisions.
13. Sleeves shall be steel pipe, ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
14. Mechanical sleeve seals in accordance with these specifications.
15. Cover shall be made of non-skid aluminum and have identification label.

7-13.2(11) SUBMERSIBLE SUMP PUMPS

Provide factory-assembled and -tested, simplex, single-stage, centrifugal, end-suction, submersible, direct-connected sump pumps complying with UL 778 and HI 1.1-1.2 and HI 1.3 for submersible sump pumps.

Pump construction shall be cast iron; with cast-iron inlet strainer, legs that elevate pump to permit flow into impeller, and vertical discharge with companion flange for piping connection. Impeller shall be thermoplastic. Motor shaft shall be steel, with upper sleeve

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and lower heavy duty ball bearing construction. Motor shall be permanently lubricated motor. Include power cord, 10' standard length, heavy duty 16/3 SJTW with 115 volt grounding plug and vertical switch.

Include automatic vertical float switch, with float and float rod.

Discharge piping shall be schedule 40 galvanized steel pipe, ASTM A53, threaded ends.

Isolation valve in discharge piping shall be standard port, female threaded, brass body ball valve. Forged brass body shall conform to ASTM B-16. Ball and stem shall be chrome plated brass. Seat and stem washer shall be of TFE and O Ring of Fluoroelastomer. Provide with lockable carbon steel zinc plated handle.

Check valve in discharge piping shall comply with MSS SP-71 and shall be Class 125, swing check valves with bronze body with nonmetallic disc, bronze seat and threaded ends.

Dielectric Unions shall be factory-fabricated union assembly for 250 psi minimum working pressure. Dielectric fittings shall be combination fitting of copper alloy and ferrous materials with threaded end connections. Insulating material shall be suitable for system fluid, pressure, and temperature.

AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

7-13.2(12) HEAT TRACING SYSTEM

Provide separate heat trace systems for the exposed 8-inch wet fire lines and 1-1/4-inch domestic water lines within the north and south bascule piers and beneath the bridge sections north and south of the bascule piers (4 heat trace systems total). Monitoring and alarm functions for the fire protection lines shall comply with Seattle Fire Department Administrative Rule 9.03.09.

Provide product by one of the following: Chromalox - Wiegurd Industrial Division - Emerson Electric Company, Raychem Corporation, or Thermon Manufacturing Co.

7-13.2(12)A DESCRIPTION

Self-regulating, electric heating cables suitable for freeze protection of metal piping, consisting of pair of parallel No. 14 or No. 16 AWG nickel plated copper bus wires imbedded in radiation cross-linked semi-conductive heating matrix, which varies power output in response to temperature along its length. Cable shall be capable of crossing over itself without overheating. Cable cover shall be fabricated of radiation cross-linked, modified, polyolefin dielectric jacket, tinned-copper braid, and fluoropolymer over jacket.

7-13.2(12)B HEAT OUTPUT

Heating cable output shall be 5 watts per lineal foot at an ambient temperature of 50 deg. F and an applied voltage of 208V - single phase. Output shall vary inversely with ambient temperature.

7-13.2(12)C ACCESSORIES

Cable Installation Accessories: Pipe-mounted non-metallic heat trace power circuit connection box, fiberglass tape, heat-conductive putty, cable ties, silicone end seals and

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splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back. Width for markers on pipes with OD, including insulation, 6-inches or larger shall be 1-1/2 inch minimum and for pipes with OD less than 6-inches shall be 3/4 inch minimum.

Cable installation accessories shall include tapes, cable ties, warning labels, end seals, and installation clips.

7-13.2(12)D HEAT TRACE POWER CONNECTION (HTPC) BOX AND MOUNTING KIT

Includes NEMA 4X junction box, pipe mounted expediter heater cable grommet, stainless steel bands, power connection bolts, ground wire extension lead and lug wire fasteners and RTV adhesive.

7-13.2(12)E HEAT TRACE CONTROLLER (HTC)

Provide product by Environmental Technologies or approved equal. All heater trace circuit controllers must be from one manufacturer. The heater trace circuit controller serving the fire lines shall be an automatic electronic controller with provisions for remote temperature sensor input, internal ground fault protection, and monitoring functions for each heat trace circuit.

1. Control Range: 41 degrees F to 77 degrees F adjustable, with 2 degrees F deadband.
2. Electrical Supply: 208 V, 1 phase, 60 hertz; 2-pole contact suitable for 30 amps maximum load.
3. GFI Protection: 30, 60, 90, or 120 mA selectable with automatic reset.
4. Monitoring Functions: Power-on self-check, heater operation, GFI protection and ground leakage current tested every 24 hours, temperature sensor operation, and contactor operation.
5. Alarm Relay: Single-throw double-pole 1 amp class 2 contact.
6. Indicators: Lights mounted on enclosure for normal power, call for heat, ground fault occurrence, or a failure of the monitored functions.
7. Enclosure: NEMA 3R.

Remote temperature sensor: Resistance Temperature Detector (RTD) supplied for field installation on pipe for direct sensing of pipe-wall temperature at beginning and end of each heat trace circuit.

For extending RTD signal leads, provide silver-plated copper wire with Teflon or PVC insulation and jacket with two or three conductors as required by Heat Trace Circuit Controller manufacturer.

Heat Trace Controllers for Domestic Water Line: Same requirements as above except monitoring functions for power-on self check, heater operation and contactor operation not required.

7-13.2(12)G SPECIAL WARRANTY

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Written warranty, executed by manufacturer agreeing to repair or replace components of electric heating cables that fail in materials or workmanship within two years from date of Substantial Completion.

7-13.3 CONSTRUCTION REQUIREMENTS

7-13.3(1) EXAMINATION

Examine areas, equipment foundations, and conditions, with Installer and Resident Engineer present, for compliance with requirements for installation and other conditions affecting the installation. Examine roughing-in of fire-suppression piping systems.

7-13.3(2) COORDINATION WITH UTILITY COMPANY AND OTHER CONTRACTS

The Contractor shall coordinate work under this contract with the Wheeling Fire Department for witnessing the testing of the completed system. Also coordinate work with the Engineer and with all other Contractors on site.

7-13.3(3) WELDING

The shop and field welders and/or welding operators and welding procedures shall be qualified in accordance with the requirements of ASME Section IX of the Boiler and Pressure Vessel Code.

Major piping assemblies shall be shop fabricated to keep field welds to a minimum.

Field welding, in general, will not be permitted. In specific cases only, the contractor will be allowed to field weld with the approval of the Engineer when sufficient proof is submitted that no other method is feasible.

All welds must have 100 percent penetration and smooth lines of fusion on the exterior and interior. Weld reinforcement shall not exceed 1/16-inch. Minimum thickness of the welded joint shall not be less than 90 percent of the pipe wall thickness.

Welds shall be examined in accordance with the requirements of ANSI B31.1. One hundred percent of the welds that are embedded or buried shall be examined by radiography. A minimum of 10 percent of all remaining circumferential butt welds shall be examined fully by random radiography. A report, interpreting the radiographs shall be submitted to the Engineer without recommendations.

7-13.3(4) SUPPORTS

Provide hot dip galvanized steel hangers and supports as detailed on the Plans and Special Provisions to Section 6-02 Where supports are not specifically shown on the plans, submit shop plan for proposed hangers and supports in accordance with 6-03.3(7).

7-13.3(5) MECHANICAL SLEEVE SEALS

Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve. Sealing elements shall be EPDM interlocking links shaped to fit surface of pipe. Provide type and number of sealing elements required for pipe material and size of pipe. Pressure two stainless steel pressure plates for each sealing element.

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Connecting bolts and nuts shall be stainless steel of length required to secure pressure plates to sealing elements. Provide one connecting bolt and nut for each sealing element.

7-13.3(6) TESTING AND DISINFECTING

Isolate or remove piping equipment which will not safely withstand the test pressure.

Flush all lines prior to testing hydrostatically. Isolate, fill and pressure test the piping system at 200 psi for 2 hours with no loss of pressure. The hydrostatic test pressure shall be measured at the low elevation point of the individual system or section being tested. Should the tested system fail to meet the pressure test successfully as specified, the Contractor shall, at his expense, locate and repair the defects and then retest the system. Upon successful completion of the test, the system shall be drained and the temporary caps and blind flanges required for the test shall be replaced to preclude foreign objects entering the piping or tested system before the next stage of construction or testing.

All systems shall be flushed and disinfected after removal of all temporary testing equipment and installation of all permanent equipment.

Test operation of the dry standpipe/deluge system in accordance with the requirements of NFPA 14.

7-13.3(7) HEATING CABLE INSTALLATION

Examine surfaces and substrates to receive heating cables for compliance with requirements for installation, tolerances, and other conditions affecting performance. Ensure surfaces which will contain the electric heating cables are free of burrs and sharp protrusions, and that the radius of the bends is equal or greater than that shown on the drawings.

Test cables for electrical continuity and for insulation resistance before installing. Proceed with installation only after unsatisfactory conditions have been corrected.

Cut cable to length required. Each circuit shall be of one unbroken length with no splices.

Electrical installation requirements are specified in Division 16 Sections. Drawings indicate general arrangement of wiring, conduit, and specialties. Connect heating cables and other components to wiring systems.

Set field-adjustable thermostat and circuit-breaker trip ranges as indicated.

Protect installed heating cables, including leads, from damage before Substantial Completion.

7-13.3(8)A EQUIPMENT GROUNDING

Ground equipment in accordance with the NEC. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

7-13.3(9) FIELD QUALITY CONTROL

7-13.3(9)A TESTING

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Test cables for electrical continuity and insulation resistance before energizing. Remove cables if measured resistance is less than 10 megohms to ground. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

7-13.4 MEASUREMENT

No specific unit of measurement will apply for the lump sum items of Fire Protection Wet Standpipe System, but measurement will be for the sum total of all items to be furnished and installed.

The following approximate quantities of material are included in Fire Protection Wet Standpipe System:

Item	Approximate Quantity	Unit
ELECTRIC HEATING CABLE	XXXX	LF
XXXXXXXXXXXX	XXXX	EA

The quantities are listed for the convenience of the Contractor in determining the work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting bid.

7-13.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for each of the following bid items that are included in the Proposal:

"Fire Protection Wet Standpipe System", per lump sum.

7-15 SERVICE CONNECTIONS

7-15.1 DESCRIPTION

Section is to be supplemented with the following:

(*****)

This Work consists of installing temporary water line for the construction bypass and future abandonment of the existing water line on the North side of South Park Bridge, near the Boeing facility.

7-15.2 MATERIALS

Section is to be supplemented with the following:

(*****)

Water Line Pipe	9-30.7
Temporary Water Line	9-30.7(8)

7-15.3 CONSTRUCTION REQUIREMENTS

Section is to be supplemented with the following:

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(*****)

The Contractor shall provide the Engineer at least 10 Working Days advance notice when transfer of existing water service is required.

Service transfers may not be done until the new water line has been tested and accepted, and then connected. Unless the Contract specifies otherwise, SPU Water Operations will, at no cost to the Contractor:

1. Mark the exact field locations of service taps and tees on services 2 inch and smaller.
2. Make all excavations for the water service connections, and
3. Furnish and compact backfill including furnishing and placing temporary pavement patch, if necessary.

The Contractor shall not remove or abandon existing pipe until either all existing service connections have been transferred or a new temporary service has been provided, and the Engineer approves.

Actual scheduling of water service connections and related work will be addressed at the Preconstruction Conference to take into account the actual number of connections required, least inconvenience to existing water service customers, sequencing of work, and other operation and construction activity needs.

The tees shall be mechanical joint (MJ) x mechanical joint x flange (FLG). Valves shall be MJ x FLG, and removable plugs shall be MJ for the service connection. The MJ plugs will be returned to the Contractor after SPU Water Operations completes the service connections.

Upon completion of work by SPU Water Operations, the Contractor shall make all final adjustments of valve boxes, water meter boxes, and rings and covers to final surface restorations in accordance with the Contract.

Add the following new Section

(*****)

7-15.3(2) <u>WATER LINE PIPE</u>

All water line pipe installation shall meet the requirements in accordance with Section 9-30.7.

Add the following new Section

(*****)

7-15.3(3) <u>TEMPORARY WATER LINES</u>

All temporary water line pipe, fittings and installation shall be installed per the Contract Plans in such a manner as to provide constant adequate water supply to consumers and to avoid impeding traffic and access to abutting properties. Temporary water line pipe shall be installed concurrently with the storm drain pipe as detailed. If an alternative route is selected for the temporary water line, a plan shall be submitted to the Engineer for approval. Temporary water lines will be disinfected, flushed, and sampled. SPU Water Operations will make all required connections between the existing water main and meter.

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All temporary water line pipe shall conform to the requirements in accordance with Section 9-30.7(6).

Add the following new Section

(*****)

7-15.3(4) AIR RELEASE VALVE ASSEMBLY

Air release valve assembly shall be installed per the Manufacturers recommendations at the locations indicated on the Plans. Valves shall be tested and certified prior to installation.

Air release valve assemblies shall be constructed as shown by COS Standard Plan No. 340a and 340b. A standard meter box shall be installed in non-traffic bearing areas; a Type 361 Frame and Cover shall be used for all other installations subject to vehicular traffic. Care shall be taken in locating the meter box or frame and cover such that it is not in any water course or in any other location subject to drainage or sewerage contamination. Tops shall be set to conform to finished grade.

Drilling and tapping into the water main shall be performed by the SPU Water Operations.

7-13.3(5) PIPE INSULATION APPLICATION

Install 2-inch thick mineral fiber insulation, with factory-applied vapor retarder jacket and outer stainless steel field-applied jacket on pipes, valves and fittings.

7-15.4 MEASUREMENT

Section is to be supplemented with the following:

(*****)

"Pipe, Water Line, (Material), (Class), (Size), including fittings" will be measured per linear foot.

"Bedding, Water Line, (Class), (Size), Pipe" will be measured per linear foot.

The lump sum Contract price for "Temporary Water Line, (Size)" shall be full payment for all costs in furnishing and installing items as shown and noted in the Contract Plans and as outlined in these specifications and in the Standard Specifications.

"Air Release Valve Assembly" will be measured per each.

"Blocking, Cement Concrete" will be measured per cubic yard.

7-15.5 PAYMENT

Section is to be supplemented with the following:

(*****)

"Pipe, Water Line, (Material), (Class), (Size), including fittings", per linear foot.

The Bid item price for "Pipe, Water Line, (Material), (Class), (Size), (Coating), including fittings" shall include all costs for the work required as follows:

(1) Costs required for excavating, installing and joining pipe, backfilling and compacting native material, and disposing of and/or placing excess native material elsewhere;

(2) Cost of Materials, including but not limited to, the pipe, fittings and pipe supports, locating wire, special coatings, and other items called for in the

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Contract. Where required, the costs of sand or foam cushioning between the Water Main and other pipes shall also be included;

(3) Costs for the work required to furnish and install mechanical joint sleeves and pipe supports, including pipe hanger rods with nuts, single pipe rolls, steel angles, reinforcing bars, nuts, bolts, washers, mastic, and galvanizing;

(4) Costs required to perform the "Taste Rating Test Procedures", "Procedures for Hydrostatic Pressure Testing", and "Procedures for Flushing, Disinfection and Bacteriological Sampling of New Water Mains";

(5) Costs necessary for installing pipe on curves as shown on the Drawings, including field changes involving standard lengths of pipe deflected at the joints;

(6) Costs of all Material, labor and equipment associated with making pipe connections unless otherwise specified; and

If the pipe, its lining or its coating is damaged, the Contractor will be required, at the Contractor's sole expense, to repair the damage to an acceptable condition prior to installation.

Payment for safety systems required for trench excavation work will be in accordance with Section 7-17.3(1)A7a.

Defective Material or workmanship discovered as a result of tests will be addressed in accordance with Section 1-05.7.

"Bedding Cl. B, Water Line, (Material), (Size) Pipe", per linear foot.

The Bid item price for "Bedding Cl. B, Water Line, (Material), (Size) Pipe" shall include all costs for the work required to furnish and install bedding to the cross section shown in City of Seattle Standard Plan No. 285.

"Temporary Water Line, (Size)", per lump sum.

The Bid items price for "Temporary Water Line, (Size)" shall include all costs for the work required for excavating, installing and joining pipe, pipe fittings, pipe straps and hangers, backfilling and compacting native material, final pavement and disposing of and/or placing excess native material elsewhere. SPU Water Operations are to make the final service connection at the water meter.

"Air Release Valve Assembly" per each.

The Bid item price for "Air Release Valve Assembly" shall include all costs for the work required as follows:

(1) Costs for furnishing and installing the complete assembly including corporation, fittings, pipes, valve, meter box or ring and cover, and all excavation, backfill with native material and compaction;

(2) Costs to furnish and install the pipe between the corporation and air release assembly including fittings;

(3) Costs for testing the valve to Manufacturer's recommendation and certification for proper valve installation and operation;

(4) If the location of the air release valve assembly differs from that shown on the Plans and requires an increase of more than 10 feet of connection pipe, the excess of pipe over 10 feet will be paid by Contractor.

The Bid item price for "Air Release Valve Assembly" shall include all costs for the work required to furnish and install each valve at the locations indicated on the Drawings. Costs for the work are to include, but not be limited to, furnishing the valve, any and all connection fittings, testing as suggested by Manufacturer, labor for making the connection and providing certification the valve is in proper working order.

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"Blocking, Cement Concrete", per cubic yard.

The Bid item price for "Blocking, Cement Concrete" shall include all costs for the work required as follows:

(1) Costs of placing concrete blocking including: excavation, turnbuckles, shackle rods, steel plates, concrete formwork, finishing, removal and disposal of material not required for backfill; and

(2) Other work that may be necessary for constructing the blocking in place as specified.

Section 7-17 is re-titled to read as follows:

(*****)

7-17 STORM DRAINS AND SANITARY SEWERS

7-17.1 DESCRIPTION

Section is supplemented with the following:

(*****)

This work shall also describe work consisting of trench excavation, protective systems, foundation preparation, bedding, cut-in tees, pipe installing, jointing, backfilling, compacting and testing for the construction of Storm Drain, and sanitary, and combined Sewer.

All reference to "Sewer" in Specification Section 7-17 shall apply equally to construction of sanitary Sewer, combined Sewer, and Storm Drain. Side Sewer is addressed in Section 7-18.

7-17.2 MATERIALS

The second list is supplemented with the following:

(*****)

Temporary Schedule A 12 In. Diam. Storm Sewer Pipe	9-XXX
Pipe, SD, Steel Sch. 40 Victaulic, 8 In.	9-XXX
Coated Steel Casing 18 In. Diam. and 0.25 In. Thick	9-XXX
Coated Steel Casing 16 In. Diam and 0.216 In. Thick	9-XXX

The fifth paragraph is deleted and replaced with the following:

*(*** COS Specifications 7-17.2(1)¶6,7 ***)*

All pipe shall be clearly marked with type, class, date of manufacture, location of manufacturing plant, and thickness. Lettering shall be legible and permanent under normal conditions of handling and storage. Concrete pipe with elliptical reinforcement shall be clearly marked on the inside and outside of the pipe along the minor axis to identify top and bottom.

After installation, pipe shall be tested for leakage in accordance with COS Section 7-17.3(4).

Where steel or aluminum are referenced to in this Section in regard to a kind of storm sewer pipe, it shall be understood that steel is Zinc Coated (galvanized) or aluminum coated

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(aluminized) corrugated iron or steel and aluminum is corrugated aluminum alloy as specified in Sections 9-05.4, and 9-05.5.

It is not necessary that all storm sewer pipe on any project be of the same kind of material. However, all contiguous pipe shall be of the same size, material, thickness, class, and treatment and shall be that required for the maximum height of cover.

Section is supplemented with the following:

(*****)

Pipe Material used for sanitary Sewers, combined Sewers, and Storm Drains will be specified on the Plans and may be one or more of the following:
Flexible Polyvinyl Chloride (PVC), Acrylonitrile Butadiene Styrene (ABS), Corrugated Metal, Spiral Rib, Polyethylene or Rigid pipe Material including all Concrete, Ductile Iron, and Vitrified Clay.

Aluminum or steel corrugated pipe may be used for Storm Drain when specified in the Contract.

Pipe shall have flexible gasketed joints unless otherwise specified in the Contract.

It is not intended that Materials listed be considered equal or generally interchangeable for all applications. The Engineer will determine from the Materials listed, those that are suitable for the project and will specify in the Contract.

Materials shall meet the requirements of the following sections:

Joint Materials and Non-shrink Cement Sand Grout (9-04)
Pipe (9-05)
Controlled Density Fill (CDF) – Pipe Bedding & Trench Backfill (9-01.5)

When Schedule A or B storm sewer is specified in the Plans, the Contractor shall provide the specified schedule and diameter but has the option of furnishing any of the acceptable materials shown in the Storm Sewer Pipe Schedule Table.

Add the following new Section:

(*****)

7-17.2(1) <u>TEMPORARY SCHEDULE A PIPE (SIZE)</u>

When Temporary Schedule A or B storm sewer pipe is specified in the Plans, the Contractor shall provide the specified schedule and diameter, but has the option of furnishing any of the acceptable materials shown in the Storm Sewer Pipe Schedule Tables.

Add the following new Section:

(*****)

7-17.2(2) <u>PROOF TESTS (PREQUALIFICATION)</u>

The intent of this requirement is to pre-qualify a joint system, components of which meet the above requirements, as to the watertightness of that joint system. This proof test shall apply to all pipes which are to be tested for watertightness prior to acceptance. Materials and test equipment for proof testing shall be provided by the manufacturer. When approved by the Engineer, internal hydrostatic pressure may be applied by a suitable joint tester. See test requirements in the following Sections:

Joints (9-04)

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Pipe (9-05)

Add the following new Section:

(*****)

7-17.2(3) MATERIAL CERTIFICATION

The manufacturer or fabricator shall furnish a Manufacturer's Certificate of Compliance, based on Manufacturer's routine quality control tests, that the pipe meets or exceeds the requirements of the pertinent ASTM or ANSI specification.

Add the following new Sections:

(*****)

7-17.2(4) EXCAVATION AND PREPARATION OF TRENCH, PIPE BEDDING, AND CLAY DAM

7-17.2(4)A TRENCH EXCAVATION

7-17.2(4)A1 GENERAL EXCAVATION REQUIREMENTS

All open excavation trenches shall comply with the requirements of WAC Chapter 296-155.

The length of Sewer trench excavation in advance of pipe installation shall be kept to a minimum and in no case shall exceed 150 feet.

Sidewalk, pavement, appurtenance structure, adjacent improvement and underground installation shall not be undermined or disturbed.

The maximum trench width between the bottom of excavation and the top of the pipe shall be in accordance with Standard Plan number 284. If the maximum trench width is exceeded without written authorization of the Engineer, the Contractor as directed by the Engineer shall provide pipe of higher strength classification and shall provide a higher class of bedding.

Trench width above the top of the pipe within the paved roadway, sidewalk, or other improved area and near to structure or underground installation or other improvement, shall not exceed the maximum neatline trench width as indicated on Standard Plan number 284. All requirements for excavating, handling, and disposing of excavated material, and placing and compacting replacement suitable backfill, outside of Standard Plan number 284 neatline trench limits shall be at the Contractor's sole expense.

All ledgerock, boulders, stones, and any other object larger than 3 inch in any dimension shall be removed where within 6 inches in any direction of the pipe. The maximum size of aggregate within 6 inch of the pipe shall not exceed 1 inch per foot of pipe diameter and in no case shall exceed 3 inch.

Prior to installation of bedding and pipe, the trench bottom shall be brought to grade as indicated in the Contract for the type of bedding specified and if the trench bottom is disturbed, compacted to 90% as specified in Section 2-03.3(14)E for a one (1) foot depth to provide a foundation capable of supporting the pipe in its proper position. Bedding and backfill Material shall be placed as indicated on Standard Plan numbers 285 and 284, or Special Trench Section per Plans. Where Class D bedding is specified in the Contract, additional trench bottom preparation shall comply with Section 7-17.3(1)B.

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Excavation for manholes and other Structures connected to the pipelines shall be sufficient to provide a minimum of 12 inches between the side surface of the Structure and the sides of the excavation.

All material excavated from trenches and piled adjacent to the trench shall be piled and maintained so that the toe of the slope is at least 2 feet from the edge of the trench. This material shall be piled to cause a minimum of inconvenience to public travel, and provision shall be made for traffic where necessary. Clear access shall be provided to all fire hydrants, water valves, and water meters. Surface drainage and runoff along gutters to storm drain facilities and along natural watercourses shall not be blocked. See Section 1-07 for other requirements.

The Contractor shall remove any support system or shield system or related system in such a manner as to not disturb bedding and backfill. Where bedding or backfill is disturbed, the Contractor shall reconsolidate these materials to specified requirements.

The Contractor shall be required to provide monitoring during excavation associated with the construction of pipes and trenches adjacent to existing structures. See XXXX of this specification for additional requirements.

7-17.2(4)A2 EXTRA EXCAVATION

When, after excavating to the specified foundation level, if the material remaining in the trench bottom is determined unsuitable by the Engineer, then excavation shall be continued to such additional depth as directed by the Engineer.

All additional excavation directed by the Engineer or indicated in the Contract which is beyond neatline limits indicated on Standard Plan numbers 284 and 285 will be considered “Shoring or Extra Excavation Cl B”.

Where foundation Material is required, it shall consist of Mineral Aggregate Type 2, unless the Contract or Engineer specifies otherwise.

7-17.2(4)A3 DEWATERING

During excavation, installation of pipeline, and placement of bedding and trench backfill, excavations shall be kept free of water. The Contractor shall control surface runoff so as to prevent entry or collection of water in excavations. The static water level within the excavation shall be drawn down a minimum of 1 foot below the bottom of the excavation so as to maintain the undisturbed state of the foundation soils and allow acceptable placement of any bedding or backfill to the required density.

At least 10 Working Days before dewatering is started, The Contractor shall submit to the Engineer, the Method and installation including details of the dewatering system and groundwater recharge system as necessary, indicating number and type of equipment and pipelines including capacity(ies), dewatering pits and locations, water discharge locations, groundwater recharge locations and means or recharging the groundwater table where necessary, groundwater monitoring systems where necessary, an estimate of advance time to dewater the trench prior to work in the trench when necessary, filter systems and locations as necessary, and such other information to verify acceptable control and performance. Open and cased sumps shall not be used as primary dewatering for excavations deeper than 3 feet below the static water table.

The Contractor shall furnish, install and operate all necessary equipment to keep excavations free from water during construction. The control of groundwater shall prevent softening of the bottom of excavations or formations of “quick” or heaving conditions, or “boils”. Dewatering systems shall be designed and operated so as to prevent any removal

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or flowing of native soils. Contaminated water shall be contained and treated prior to discharge. Disposal of water shall not cause injury to public or private property or nuisance to the public. Sufficient pumping and power equipment in good working condition shall be available at all times for all emergencies, including power outage, and competent workmen shall be available at all times for the operation of the dewatering and recharge system.

The dewatering system shall be designed to prevent loss of foundation support to adjacent structure, underground installation, improvement, or the sides of an excavation, and may require recharging the groundwater outside the excavation.

The dewatering system shall be designed to prevent loss of foundation support to adjacent structure, underground installation, improvement, or the sides of an excavation.

The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not drawn down to the extent that would damage or endanger adjacent structure, underground installation, sidewalk, pavement, other improvement, or property.

The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils and supported soils, prevent disturbance of compacted bedding and backfill, and prevent floatation or movement of Structures, pipelines, Sewers, and Storm Drains.

All costs associated with dewatering and treating the trench excavation and controlling groundwater shall be included in the various Bid items and no separate or additional payment will be made therefore, unless the Contract specifies otherwise.

The Contractor is fully responsible for controlling groundwater.

7-17.2(4)A4 UNEXPECTED OBJECTS

Unexpected objects, such as stumps, railroad ties, buried pavements, pile, abandon footings and foundations, abandon utilities, contaminated waste, etc., encountered in the trench excavation shall be removed and disposed of by the Contractor. Removal of unexpected objects will be considered incidental to pipe installation unless one or more of the following conditions are met:

The object(s) cannot be removed by the equipment or excavation method at hand; or

The trench width or depth must be increased.

In the event the Contractor meets condition 1 or condition 2 or both conditions listed immediately above, removal of the object will be paid in accordance with Section 1-04.7.

7-17.2(4)A5 TRENCH EXCAVATION IN SOLID ROCK

Solid Rock Excavation shall cover the removal and disposal of solid rock as defined in Section 2-03.1(2).

Materials removed shall be replaced with suitable excess excavated native Materials from adjacent trenches or roadway excavations, or from imported Mineral Aggregate Type or selected Material as specified by the Engineer.

7-17.2(4)A6 SURPLUS MATERIAL

Surplus Material obtained from trench excavation and determined to be suitable Material for use elsewhere on the Project Site by the Engineer shall be used as selected Material in accordance with Section 2-03.3(10).

Surplus Material obtained from trench excavation and not needed elsewhere on the project, and unsuitable material obtained from the trench excavation shall be disposed of in accordance with Section 1-07.3.

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7-17.2(4)A7 PROTECTIVE SYSTEMS

7-17.2(4)A7A TRENCH SAFETY SYSTEMS

Were trench excavation is deeper than 4 feet, the Contractor shall construct and maintain safety systems that meet the requirements of the Washington Industrial Safety and Health Act (RCW Chapter 49.17) including compliance with WAC Chapter 296-155. Ditches, channels, and similar earth openings over 4 feet in depth may be considered trench excavation over 4 feet deep and may be subject to the requirements of the Washington Industrial Safety and Health Act (RCW Chapter 49.17, including WAC Chapter 296-155). Protective systems for use in excavations more than 20 feet in depth shall be designed by a registered professional engineer (see Section 1-05.3(12)). The Contractor's trench safety system shall be a protective system designed and maintained by a competent person and shall meet accepted engineering requirements or practices. This trench safety system may require the use of a support system in locations not designated in the Contract as requiring a support system.

The trench safety system shall protect the Work, existing property, utilities, underground installation, pavement, improvement, etc., and shall provide safe working conditions in the trench. The Contractor may use a shield system; however, all Work required by the Engineer outside neatline trench width indicated on Standard Plan number 284 including but not limited to:

1) Handling and disposal of excavated material;
2) Additional backfill beyond neatline trench limits;
3) Additional surface restoration beyond limits indicated in the Contract; and/or
4) Repair of damage to adjacent structure, improvement, or underground installation,

Caused by the Contractor's operations shall be at the sole expense of the Contractor and at no additional or separate cost to the Owner.

The Contractor shall control water to protect employees from potential hazards posed by water.

The protective system and shall be removed from the trench, once the work in the excavation is complete, in a manner which provides an acceptable means or reconsolidating the bedding, backfill, or side support Material without disturbance to the pipe.

The use of horizontal strutting below the pipe barrel or the use of the pipe as support for trench bracing will not be permitted.

7-17.2(4)A7B SUPPORT SYSTEM

In addition to worker safety requirements specified in Section 7-17.2(4)A7a, where trench excavations are to be laterally supported, the lateral support shall be a support system as defined in WAC 296-155-650. Support systems may consist of underpinning, bracing, shoring, sheeting, or any other protective system or combination of protective systems which provides support to an adjacent structure, underground installation, and the sides of the excavation. The support system shall also include the control of groundwater as specified in Section 7-17.2(4)A3. The Contractor shall employ methods of installing, maintaining, and removing the system causing the least disturbance. During installation of the system, and when the system is installed, the Contractor shall fill all voids behind the support system as necessary and when necessary to prevent loss of native soils or loss of

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soil support. When removing the support system, the Contractor shall coordinate reconsolidation of bedding as necessary, and with backfilling to minimize disturbance.

All costs for this work will be paid by the Bid item "Shoring or Extra Excavation Cl B".

The Contractor shall submit Shop Drawings (Section 1-05.3) and design calculations (Section 1-03.5(12) of the proposed support system including loading calculations, structural member and system calculations, and sufficient details of installation, maintenance, and removal concurrent with excavation, installation, removal, and backfilling.

7-17.2(4)B PIPE BEDDING

7-17.2(4)B1 GENERAL

Bedding of the class or classes shown on the Drawings, shall be installed in accordance with Standard Plan number 285, and shall include all of the Materials and work within the limits of the bedding zones indicated on Standard Plan number 285.

Unless otherwise specified in the Contract, bedding for rigid and flexible pipe shall be Class B except bedding for ductile iron shall be Class D.

All classes of bedding shall provide uniform support along the entire barrel, without load concentration at joint collars or bells. No blocking of any kind shall be used to adjust the pipe to grade except when used with embedment concrete. Bell holes shall be excavated as required to ensure uniform support along the pipe barrel. Bedding disturbed by pipe movement or by removal of shoring or movement of a trench shield or box shall be reconsolidated prior to backfill. Special care shall be taken to provide adequate bedding support at wye or tee connections and adjacent to manholes or other Structures, so as to avoid bending or shearing stresses at these critical points.

7-17.2(4)B2 BEDDING FOR RIGID PIPE

Bedding shall be Class A, Class B, Class C, and Class D. The requirements and limits for the various classes of bedding are as shown on Standard Plan number 285 and are described as follows:

1) Class A Bedding: Concrete for class A bedding shall be Class 5 (1-1/2) (see Section 5-05.3) and shall be a 4 sack minimum Portland cement concrete mix with 1-1/2 inch macimum size aggregate. When placing the concrete bedding, the pipe shall be prevented from floating. Concrete shall be allowed to cure for a minimum of 12 hours prior to placing the Type 9 Mineral Aggregate bedding Material. Mineral Aggregate bedding shall be placed in lifts of not more than 6 inches to a point 6 inches above the top of the pipe. Compaction of Mineral Aggregate Type 9 shall be to 90% as specified in Section 2-03.3(14)E. Before beginning work on concrete bedding, the Contractor shall submit a mix design for 1-1/2 inch maximum size aggregate concrete with a 28 day strength of 4,000 psi to the Engineer for approval at least 5 working Days in advance. It shall have a sufficient fluid consistency to readily fill all voids around and under the pipe.
2) Class B Bedding: Class B bedding of Type 9 Mineral Aggregate shall be placed in at least 3 lifts. The first lift shall be placed before the pipe is installed and shall be a minimum of 4 to 6 inches in thickness (see dimension "A" on Standard Plan number 285). The Material shall be spread smoothly so that the pipe is uniformly supported along the barrel. Subsequent lifts of not more than 6 inches shall be brought up to a point 6 inches above the top of the pipe. Each lift shall be brought up on both sides of the pipe and shall be carefully worked under the pipe

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haunches by means of slicing with a shovel, vibration or other procedures approved by the Engineer. Compaction of bedding shall be to 90% maximum dry density as determined by methods specified in Section 2-03.3(14)E.

3) Class C Bedding: Requirements for Class C bedding shall be the same as for Class B except that the Type 9 Mineral Aggregate shall extend only to the springline of the pipe. Selected native Material shall then be placed in 6 inch lifts to 6 inches above the pipe bedding, using the same methods as those required in Class B bedding. Compaction of Mineral Aggregate Type 9 shall be to 90% maximum dry density as determined by methods specified in Section 2-03.3(14)E. Compaction of native Material shall be as specified in Section 7-17.3(3).

4) Class D Bedding: Class D bedding shall be attained by carefully excavating the trench to proper grade, overexcavating at bell sections, and placing and compacting selected Material around the pipe. Class D bedding and backfill shall be in accordance with Section 7-17.3(3).

5) Class Special Bedding: Bedding Cl Special shall be excavated according to Standard Plan number 284 and details in the Plans. Bedding Cl Special shall include all materials, tools, labor, and hauling to construct the trench with the materials shown in the plans. Overexcavation may be necessary to stabilize the trench and shall be incidental to Bedding Cl Special.

Where authorized excavation has been made below the established grade, the Contractor shall provide, place, and compact suitable bedding Material to the Propper grade and elevation. If the Engineer substitutes imported Mineral Aggregate Type in lieu of the selected native Material shown for Class C and for Class D bedding on Standard Plan number 285, the bedding will be measured and paid for as Bedding, Class B, (Size) Pipe".

7-17.2(4)B3 BEDDING FOR FLEXIBLE PIPE

All references to this Specification Section regarding Water Main trench excavation shall make reference to Standard Plan number 350,unless specified otherwise in the Contract, and Water Main reference to Standard Plan numbers 284 and/or 285 shall be interpreted as reference to Standard Plan number 350 unless the Contract specifies otherwise.

Bedding for flexible pipe shall be Class B bedding with Mineral Aggregate Type 22 placed in several lifts in accordance with Standard Plan number 285. Before installing the pipe, a first bedding lift of 6 inch thickness, depending on pipe size, shall be placed. Then the pipe is installed. The bedding shall be spread smoothly so that pipe is uniformly supported along the barrel. Subsequent lifts of not more than 6 inches thickness shall be installed to the crown of the pipe and individually compacted to 90% density as determined in Section 2-03.3(14)E. A further 6 inch lift of moderately compacted Material shall be placed over the crown of the pipe in a manner not to crush or disturb the pipe.

7-17.2(4)C CLAY DAM

Clay dam shall be CDF material according to Section XXXX . When Trench Dam is used in the Plans or Contract, it shall be interpreted as Clay Dam. The Trench Dam shall be constructed a minimum of 1 foot beyond the width of the standard trench width to cut off the trench excavation.

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Add the following new Sections

(*****)

7-17.2(5) INSTALLING SEWER PIPE

7-17.2(5)A SURVEY LINE AND GRADE

Pipe shall be installed to the true line and grade indicated in the Contract at the invert of the pipe. The limit of variance at the invert shall not exceed plus or minus 0.03 feet from true line and grade at the time of backfill, and in no case shall result in reverse flow or have a sag. Checking the invert of the pipe may be made by calculations from measurements on the top of the pipe.

The Contractor may use any method, such as swede line and batter board", laser beam, etc., which would allow accurate transfer of the control points provided by the Engineer to installing the pipe to the designated alignment and grade.

When using the "swede line and batter board" method, the Contractor shall transfer line and grade into the trench where they shall be carried by means of a taut grade line supported on firmly set batter boards at intervals of not more than 30 feet. Not less than three batter boards shall be used at one time. Grades shall be constantly checked and in the event the batter boards do not line up, the work shall be immediately stopped, the Engineer notified, and the cause remedied before proceeding with the work.

When using a laser beam to set pipe alignment and grade, the Contractor shall constantly check position of laser beam from surface hubs provided by the Engineer to verify laser beam alignment and grade. In the event the laser beam is found out of position, the Contractor shall stop work and make necessary corrections to the laser beam equipment and to pipe installed.

7-17.2(5)B PIPE INSTALLATION AND JOINTING

7-17.2(5)B1 PIPE INSTALLATION

After an accurate grade line has been established, the pipe shall be installed in the properly dewatered trench. Mud, silt, gravel, and other foreign Material shall be kept out of the pipe. Pipe joints shall be kept clean and protected at all times, and shall be lubricated as recommended by the pipe manufacturer before joining.

All pipe installed in the trench shall be kept in longitudinal compression until the bedding has been placed and compacted around and over the pipe.

The Contractor shall exercise care in matching pipe joints for concentricity and compatibility. In no case shall two pipes be joined together with ends exceeding the maximum manufacturer's tolerance.

The pipe shall be installed in the up-grade direction from the point of connection from either the existing pipe or the designated structure as a starting point. The pipe shall be installed with the bell end forward or upgrade.

When pipe installation is not in progress, any open end of the pipe shall be sealed with an approved temporary watertight plug.

7-17.2(5)B2 JOINTS-HAND MORTARED AND ON CURVES

Where pipelines are to be installed on specific curves of sufficiently short radius to deflect the pipe joints in an amount greater than recommended by the pipe manufacturer, the curves shall be achieved with a series of tangents and shop-fabricated bends complying with

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the pipe manufacturer's recommendations as approved by the Engineer. The Contractor shall submit the manufacturer's recommendation for approval at least 5 Working Days in advance. Pipe inverts shall comply with the requirements of Section 7-17.3(2)A.

Hand mortared pipe joints will not be allowed. All joints shall be watertight and meet the applicable test requirement(s) of Section 7-17.3(4).

See Section 7-17.3(2)E for gasketed jointing.

7-17.2(5)C PLUGS AND CONNECTIONS

7-17.2(5)C1 GENERAL

All fittings shall be capped or plugged with an approved Material as the pipe unit; or shall be fitted with an approved mechanical stopper; or shall have an integrally cast knock-out plug. The plug shall be able to withstand all test pressures without leaking, and when later removed, shall permit continuation of piping with jointing similar to joints in the installed line.

Should testing or television inspection indicate installed pipe is damaged or does not pass testing, the Contractor shall remove and replace the failed or damaged section of the pipe. Should the Contractor believe the pipe which is damaged, or which failed the test, can be repaired by other than remove and replace, the Contractor shall submit a repair method for approval by the Engineer at least 5 Working Days in advance (see Section 1-05.7). The replaced, or repaired pipe, shall again be inspected and tested. Repairs using rubber boot type methods, such as FERNCO type coupler repairs, will not be allowed unless approved otherwise by the Engineer. See Section 7-17.3(4).

7-17.2(5)C2 FITTINGS

Unless otherwise specified in the Contract, tee fittings shall be provided in the Sewer and Storm Drains for side Sewers, catch basin connections, and service drains. Tees shall be 8 inches inside diameter, except tees for side Sewers shall be 6 inches inside diameter unless indicated otherwise in the Contract. All fittings shall be of sufficient strength to withstand all handling and load stresses normally encountered. All fittings shall be of the same Material as the pipe, except when core drilling to insert a tee, which shall be per Section 7-17.2(5)C3. Material joining the fittings to the pipe shall be free from cracks and shall adhere tightly to each joining surface. Fittings shall make for a watertight connection meeting the requirement(s) of Section 7-17.3(4).

All tees on new pipe less than 24 inch inside diameter shall be prefabricated.

7-17.2(5)C3 CUT-IN TEE ON EXISTING OR NEW PIPE

Unless the Contract indicates otherwise, the Contractor shall locate and cut a hole in the existing or new pipe centered at 30 to 45 degree angle to the springline. Springline is defined as the widest cross-section of the host pipe measured horizontally. Coring shall be done such that the cored out piece or other materials do not drop into the pipe. The Contractor shall notify the Engineer at least 2 Working Days in advance of cut-in tee operation.

Coring shall be performed in accordance with the following:

1. Concrete Pipe Tess To Concrete Pipe: A concrete tee may be installed on an existing concrete pipe 18 inches in diameter or larger by placing a short length of concrete pipe into the core-drilled hole with its bell end against the outside face of the pipe and the barrel end inserted just to the inside face of the pipe. The end against the outside face of the pipe and the barrel end inserted just to the inside

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face of the pipe. The Contractor shall thoroughly clean the bonding areas between the tee and the pipe so that the surfaces are free of dirt, dust, grease, oil or other contaminants that may reduce the bond between the grout and the pipe surfaces. Both surfaces shall first be coated with a concrete bonding agent submitted for review and accepted by the Engineer. The annular space between the tee and the core-drilled surfaces shall then be tightly packed with non-shrink cement sand grout meeting the requirements of Section 9-04.3(2). The connection shall be neatly finished inside and outside the existing concrete pipe.

2. Ductile Iron Tee to Existing Connection Pipe: The existing concrete pipe shall be core-drilled with a hole large enough to accommodate the barrel of the specified size of ductile iron pipe and provide a 1 inch space between ductile iron pipe and the existing concrete pipe for application of grout. A length of ductile iron pipe shall be cut so that it can be placed in the core-drilled hole with its bell end against the outside face of the existing pipe without the barrel protruding beyond the inside face of the existing pipe. The Contractor shall clean the outside of the ductile iron pipe, removing loose particles (dust, dirt, oil, or film of any sort) that may reduce the bond between the grout and the pipe. After core drilling, the exposed surface of the existing concrete pipe shall be rough and clean. Both surfaces shall be coated with a bonding agent submitted for review and approval by the Engineer. The annular space between the pipe and core drilled surfaces shall be tightly packed with non-shrink cement sand grout meeting the requirements of Section 9-04.3(2). The connection shall be neatly finished inside and outside the existing concrete pipe.
3. Saddle-Type Tee to Existing Ductile Iron Pipe: The ductile iron pipe shall have a full-sized hole cut into it by core drilling or by the arc-weld flame cutting method. The Contractor shall obtain approval of the method from the Engineer at least 2 Working Days in advance. A saddle-type tapping tee, manufactured to fit the receiving pipe, shall be mounted after the contact area between tee and pipe has been cleaned of all dirt, sand, grit, grease, and other foreign matter to ensure continuous contact by the straps.
4. Corrugated Metal Tee To Corrugated Metal Pipe: In corrugated steel and aluminum pipes, a hole shall be sawcut to match a shop fabricated tee as indicated in Standard Plan number 279. The flange plate of the fabricated tee shall be corrugated to match corrugation of the pipe to which it is attached. A neoprene gasket or approved equal shall be inserted between the outside face of the existing pipe and the flange plate of the tee and connected by bolting. Corrosion protection shall be provided if the pipe section of the tee is non-corrugated aluminum pipe. The incoming pipe and tee shall be connected with stainless steel rigid walled flexible coupling. If the pipe section of the tee is aluminum, corrosion protection shall be provided by isolating the aluminum from the steel by extending the gasket 1 inch beyond the edge of the stainless steel coupling.
5. Inserta Tee to Clay Pipe: The Contractor shall submit the method and type tee recommended by the tee manufacturer to the Engineer for approval at least 5 Working Days in advance.
6. Inserta Tee to Concrete Pipe: The Contractor shall core drill a full size hole in one operation to accommodate an Engineer approved PVC tee insert with a coupling fitting.

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All existing pipe, 18 inch and smaller diameter, made of non-reinforced concrete or vitrified caly shall be fully exposed for inspection.

The excavation shall be backfilled and compacted per Section 7-17.3(3).

The Contractor shall notify the Engineer at least 2 Working Days before beginning cut-in operations (Note – The Engineer will notify the SPU Drainage and Wastewater Division @ 206-386-1230 for the South District or 206-684-7506 for the North District). The existing pipe shall be inspected by the Engineer for defects before the drilling or cutting operation starts, again during drilling or cutting operations, and after installation of the tee is completed to make certain that no defective parts or work remain undetected and uncorrected. If the Contractor has requested the Engineer to core drill the hole, the Contractor shall provide a tee made of the same Material and with the same corrugations as the cored pipe.

If the exposed pipe is found cracked or deformed, the Engineer will arrange for either roll in of a new pipe, or repair of the damage at no cost to the Contractor, provided the damage was not caused by the Contractor's operations. If the Engineer rolls in a new pipe with a tee already on it, no fitting will be required.

7-17.2(5)D PIPE MARKINGS

On elliptically reinforced concrete pipe, the markings indicating the minor axis of the reinforcement shall be placed in a vertical plane (top or bottom) when the pipe is installed.

7-17.2(5)E GASKETED JOINTS

Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position, or contaminating it with dirt or other foreign Material. Any gaskets so disturbed shall be removed, cleaned, replaced, and relubricated before joining the sections. Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling, or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since most gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home. Sufficient pressure shall be applied in making the joint to ensure that it is home, as described in the standard installation instructions provided by the pipe manufacturer. Sufficient restraint shall be applied to the line to ensure that joints once home are held so, until fill Material under and alongside the pipe has been sufficiently compacted. At the end of the work Day, the last pipe shall be blocked in an effective way to prevent creep. Where pipe must be deflected to accommodate required horizontal or vertical curvature, it shall first be joined in straight alignment and then deflected as required. See Section 7-17.3(2)B2 for hand mortar joints and joints on curved pipe.

7-17.2(5)F JOINTING – BREAK-OUT AND RECONNECT & MISMATCHED WALL THICKNESS

Where it is necessary to break out or connect to an existing pipe, only new pipe having the same inside diameter shall be used in reconnecting the pipeline. Inverts, grade, and alignments are to match. Where joints must be made between pipes with a mismatched wall thickness, the Contractor shall use a flexible gasketed coupling, adapter or coupling-adapter to make a watertight joint. Couplings shall be those manufactured by "Romac", "Smith-Blair", or approved equal. 7-17.3(2)G

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7-17.2(5) G STORM DRAIN AND SEWER CONNECTIONS

Catch basin, service drain, or side Sewer connections to Sewer and Storm Drain trunks, mains, or laterals, shall be left uncovered until after the Engineer has inspected and approved the work. After approval of the connection, the bedding and trench backfill work shall be completed.

7-17.2(5)H SIDE SEWER CONNECTION – OVERSIZED AND CLEARANCE REQUIREMENTS

Where a side Sewer is as large as or larger than the trunk, main, or lateral Sewer or Storm Drain to which it is to be connected, the connection shall be made only at a manhole unless otherwise provided in the Contract. The capacity of the proposed connection and capacity of existing trunk, main, or lateral Sewer or Storm Drain shall be verified and submitted to the Engineer for approval at least 15 Working Days in advance. Side Sewers shall be installed below Water Main and shall meet the clearance requirements indicated on Standard Plan nos. 286a and 286b, and as specified in Section 1-07.17(2).

7-17.2(5)I PROTECTION OF EXISTING SEWER FACILITIES

All existing live Sewers including septic tanks and drain fields shall be kept in service at all times. Provision shall be made for disposal of sewage flow if any existing Sewer is damaged. Water accumulating during construction shall be removed from the new pipeline but shall not be permitted to enter the existing system. The Contractor shall be responsible for flushing out and cleaning any existing pipeline into which gravel, rocks, or other debris has entered as a result of his/her operations, and shall repair lift stations or other facilities damaged by his/her operations. The physical connection to an existing manhole or pipeline shall not be made until authorized by the Engineer. Such authorization will not be given until all upstream lines have been completely cleaned, all debris removed and, where applicable, a pipe has been temporarily placed in the existing channel and sealed.

7-17.2(5)J UNDERGROUND CONSTRUCTION

Directional drilling shall be in accordance with Section 7-22. Trenchless construction other than directional drilling shall be as specified in the Contract. Where indicated on the Drawings, the Contractor shall install pipe by underground construction methods including jacking, augering, tunneling, microtunneling, or any other trenchless technology method or use of rapid excavation machine other than directional drilling, including installing the pipe in a casing pipe, or by any combination of these methods. When casing pipe is required, and the size and gauge of pipe has not been specified in the Contract, the Contractor shall select the gauge and size of the casing pipe compatible with the underground construction operation and surrounding loading conditions. The Contractor shall take care to prevent caving ahead of the casing which would create voids outside the casing pipe. When the casing is in place, the carrier pipe shall be carefully skidded through the casing pipe and adjusted to the line and grade shown on the Drawing. The annular space between the casing and carrier pipes shall be filled with Material specified in the Contract. Ground support in portal areas, shafts, and pits, whether launch, intermediate, or receiving, shall be designed to support adjacent structure, underground installation, the sides of excavation, and withstand all forces from jacking and other operations.

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At least one designated person shall be on duty above ground whenever any employee is working underground. The Contractor shall have in place communications, hoisting equipment, emergency provisions, air quality monitoring, and ventilation equipment as necessary. For other than directional drilling per Section 7-22, at least 20 Working Days in advance of underground construction activities, the Contractor shall submit 8 sets of Shop Drawings and all necessary calculations describing these activities, including dimensioning of shaft, pit, or portal; method of shaft excavation; method of underground construction; size of underground construction; staging and surface support; waste disposal particular to a specific underground construction; control equipment; qualifications of underground construction Contractor; a complete description of shoring including installation, maintenance, and removal; and a complete des cription of slurry handling and disposal system when applicable; in accordance with the requirements of Section 1-05.3. The submittal shall include the name of the designated person. The material, procedure, and equipment employed by the Contractor shall not relieve the Contractor of responsibilities nor waive or modify any provisions of the Contract.

7-17.2(5)K TEMPORARY SEWER BYPASS

The Contractor shall install a temporary bypass to maintain uninterrupted Sewer service on projects calling for reconstruction of existing Sewer mains or on projects where construction Work will interfere with sewage flow in the existing Sewer. The bypass shall be made by diverting the effluent flow at an upstream access manhole and pumping it through a separate conduit to a downstream reentry point or to an adjacent Sewer system. The pump and bypass conduit shall be of adequate size and capacity to handle the flow. The effluent level in the bypass pumping manhole shall not be allowed to rise more than 1 foot above the crown of the incoming Sewer pipe. Work shall be conducted in such a manner as to comply with the requirements of Section 1-07. A written proposal for bypassing the remaining portion of the Sewer system and the list of all equipment to be used for the Work shall be submitted by the Contractor to the Engineer, allowing at least 10 Working Days for review and return of comments. The Engineer's review shall not relieve the Contractor of its responsibilities or of any public liability for sewage spills under this Contract.

7-17.3(2)A GENERAL

The third paragraph is deleted and replaced with the following:

*(*** COS Specifications 7-17.3(4)¶3 ***)*

All wyes, tees, and stubs shall be plugged using test tees, or acceptable alternate, securely fastened to withstand the internal test pressure. Such test tees shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

Section is supplemented with the following:

*(*** COS Specifications 7-17.3(4)A1¶3 ***)*

Upon final acceptance of the Work, all Sewers, side Sewers and fittings shall be open, clean, and free draining.

7-17.3(2)B EXFILTRATION TEST

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Section is deleted and replaced with the following:

*(*** COS Specifications 7-17.3(4)B ***)*

Prior to making exfiltration leakage tests, the Contractor may fill the pipe with clear water to permit normal absorption into the pipe walls, provided that after filling the pipe the leakage test is completed within twenty-four hours. When under test, the allowable leakage shall be limited according to the provisions that follow. Specified allowances assume pre-wetted pipe.

Leakage shall be no more than 0.28 gallons per hour ("gph") per inch inside diameter ("inch dia") per 100 linear feet ("LF") of pipe, with a hydrostatic head of 6 feet above the crown at the upper end of the test section, or above the natural groundwater table at the time of test, whichever is higher. The length of pipe tested shall be limited so that the pressure at the lower end of the section tested does not exceed 16 feet of head above the invert, and in no case shall the length be greater than 700 linear feet or the distance between manholes when greater than 700 linear feet.

Where the test head is other than 6 feet, the measured leakage shall not exceed 0.28 gph per inch inside diameter per 100 linear feet times the ratio of the square root of the test head to the square root of 6.

Leakage maximum = $0.114 \times \sqrt{H}$, where leakage is in gph/inch dia/100 LF.

When the test is to be made one joint at a time, the leakage per joint shall not exceed the computed allowable leakage per length of pipe.

An allowance of 0.2 gallons per hour per foot of head above invert shall be made for each manhole included in a test section.

All pipe and detention systems in, or near as indicated in the Contract, Environmentally Critical Areas designated geologically hazardous areas, shall require exfiltration testing. Approval will not be given unless the detention system passes this test. The Contractor shall notify the Engineer at least 5 Working Days in advance of proposed testing.

7-17.3(2)C <u>INFILTRATION TEST</u>

Section is deleted and replaced with the following:

*(*** COS Specifications 7-17.3(4)C ***)*

Infiltration test leakage shall not exceed 0.16 gallons per hour (gph) per inch inside diameter (inch dia) per 100 linear feet (LF) of pipe tested, when the natural groundwater head over the pipe is 2 feet or less above the crown of the pipe at the upper end of the test section. The length of pipe tested shall not exceed 700 linear feet or the distance between manholes when greater than 700 linear feet.

Where the natural groundwater head is more than 2 feet, the measured leakage shall not exceed 0.16 gph per inch inside diameter per 100 linear feet times the ratio of the square root of the natural groundwater head to the square root of 2.

Leakage maximum = $0.114 \times \sqrt{H}$, where leakage is in gph/inch dia/100 LF.

When a suitable head of groundwater exists above the crown of the pipe and when the pipe is large enough to perform work inside it, acceptance may be based on there being

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no visible leakage. Where leakage is indicated, the repair methods shall be submitted in writing to the Engineer by the Contractor for approval (see COS Section 7-17.3(4)A1).

Section 7-17.3(2)E is deleted and replaced with the following:

(*****)

7-17.3(2)E AIR PRESSURE TEST FOR SEWERS CONSTRUCTED OF AIR-PERMEABLE MATERIALS

Vitrified clay pipe shall be air tested as specified in Section 9-05.4. For all other pipe Material:

1. Pipelines may be tested with low pressure air by the pressure drop method, in lieu of water infiltration or exfiltration. The pressure drop shall be from 3-1/2 to 2-1/2 psi greater than the average back pressure of groundwater above the springline of the pipe. At the Contractor's option, pipe may be tested without pre-wetting; however, the test allowances herein assume pre-wetted pipe.
2. The allowable rate of air loss shall be .003 cubic feet per minute (cfm) per square foot of internal pipe surface; however, the total air loss shall not exceed 3.50 cfm.
3. The test equipment to be used shall be furnished by the Contractor and shall be inspected and approved by the Engineer prior to use. The Engineer may at any time require a calibration test of gauges, other instrumentation, and equipment that is used for this test.
4. Safety Provisions. Plugs used to close the Sewer pipe for the air test shall be securely braced to prevent the unintentional release or loosening of a plug. Gauges, air piping manifolds, and valves shall be located at the ground surface. No person shall be permitted to enter a manhole where a plugged pipe is pressurized. (Four pounds per square inch gauge (psig) air pressure develops a force against the plug in a 12 inch diameter pipe of approximately 450 pounds, and a plug failure may result in injury.) Air testing apparatus shall be equipped with a pressure release device designed to relieve pressure in the pipe at a pressure recommended by the pipe manufacturer. The Contractor shall submit the pipe manufacturer's recommendations to the Engineer including the safety precautions for pipe testing.
5. Pipe with inside diameter less than 36 inches may be tested from manhole to manhole or on shorter lengths at the Contractor's option. Pipe 36 inches in diameter and over shall have all joints tested individually and in consecutive order along the entire line. The void volume around the joint shall be pressurized to 3.5 psi above that of the average groundwater pressure above the springline of the pipe. The Contractor shall allow the air pressure and temperature to stabilize before shutting off the air supply and start of test timing. Joint or joints will be determined acceptable if a pressure loss not exceeding 1.0 psi occurs over a 30 second test interval. If a pipe joint fails to pass this pressure test or also fails a retest, it shall be repaired in a manner acceptable to the Engineer. If not repairable, the damaged pipe section shall be replaced with a new one and the joints tested as specified above.

Section 7-17.3(2)F is deleted and replaced with the following:

(*****)

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7-17.3(2)F AIR PRESSURE TEST FOR PIPES CONSTRUCTED OF NON AIR-PERMEABLE MATERIALS

Add the following new Sections:

7-17.3(2)F1 GENERAL

Vitrified clay pipe shall be air tested as specified in Section 9-05.4.
For all other material pipe, when non air-permeable pipelines are subjected to the low pressure air test, all of the provisions of Section 7-17.3(4)D shall apply except that the pressure drop shall be from 3.5 to 3.0 psig greater than the average back pressure above the center of the pipe, and the minimum time shall be twice that computed as specified under Section 7-17.3(4)D.

7-17.3(2)F2 RECOMMENDED PROCEDURE FOR CONDUCTING ACCEPTANCE TEST BY PRESSURE DROP METHOD

1. Plug all pipe outlets with suitable test plugs. Brace each plug securely.
2. All gauge pressures in the test should be increased by the amount of groundwater pressure at the center of the pipe.
3. Add air slowly to the portion of the pipe installation under test until the internal air pressure is raised to 4.0 psig.
4. After an internal pressure of 4.0 psig is obtained allow at least 2 minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
5. After the 2 minute period, disconnect air supply.
6. When pressure has decreased to 3.5 psig, start stop watch. Determine the time in seconds that is required for the internal air pressure to reach 2.5 psig. This time interval should then be compared with the time required by Specification computed as follows.
7. List size and length of all portions of pipe under test in table similar to the one that follows. The maximum reach to be tested in one operation shall be the reach between two consecutive manholes.
8. By the use of Nomograph, compute K and C. Use scales d and L, read K and C, and enter these values in the table.
9. Add all values of K and all values of C for pipe under test.
10. If the total of all C values is less than one, enter the total of all K values into the space for “Time Required by Specification”.
11. If the total of all C values is greater than one and less than 1.75, divide the total of all K values by the total of all C values to get tq.
12. If the total of all C values is greater than 1.75, divide the total of all K values by 1.75 to get "Time Required by Specification" tq.

Diameter Inches Length (Feet) K = .0111dL C = .0003918 dL

Total K Total C
Time required by specification (tq)
tq = Time required by specification
d = Diameter of pipe in inches
L = Length of pipe in feet

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NOMOGRAPH for the solution of K = 0.011d2L, C = 0.0003882dL, tq = K ¸ C

7-17.3(2)H TELEVISION INSPECTION

Section is supplemented with the following:

*(*** COS Specifications 7-17.3(4)I ***)*

Where a side Sewer is as large as or larger than the trunk, main, or lateral Sewer or Storm Drain to which it is to be connected, the connection shall be made only at a manhole unless otherwise provided in the Contract. The capacity of the proposed connection and capacity of existing trunk, main, or lateral Sewer or Storm Drain shall be verified and submitted to the Engineer for approval at least 15 Working Days in advance.

Side Sewers shall be installed below Water Main and shall meet the clearance requirements indicated on COS Standard Plan nos. 286a and 286b, and as specified in COS Section 1-07.17(2).

Add the following new Sections

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7-17.3(3) BACKFILLING TRENCHES

7-17.3(3)A GENERAL

In backfilling the trench, the Contractor shall take all necessary precautions to protect the pipe from any damage or shifting. The Contractor shall backfill from the side of the trench to a uniform depth of 2 feet above the crown of the pipe, including the bedding, before starting compaction. See Section 7-17.3(3)B for Compaction Requirements. During all phases of the backfilling operations and testing as outlined herein, the Contractor shall protect the pipe installation, provide for the maintenance of traffic as may be necessary, and provide for the safety of property and person. The Contractor shall use suitable native excavated Material for trench backfill unless notified by the Engineer that the native Material is unsuitable. The Engineer will examine excavated native Material at the time of excavation to determine its suitability for use as backfill. Native Material will be considered suitable for trench backfill if it is:

1. Capable of attaining the degree of compaction specified in Section 7-17.3(3)B;
2. Within reasonable tolerance of optimum moisture content; and
3. Reasonably free of organic material, clay, frozen lumps, rocks or pavement chunks more than 6 inches in maximum dimension, or other deleterious matter. Unsuitable backfill Material shall be removed from the Project Site, disposed of per Section 1-07.3, and replaced with Mineral Aggregate Type 17, selected Material, or such other imported Material as designated by the Engineer. The Contractor shall take any necessary steps to protect the excavated Material from becoming contaminated with excessive moisture.

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Where it is required that a blanket of selected Material or bank run gravel be placed on top of the native backfill, the backfill shall be placed to such elevation as shown on the Drawings, and shall be leveled to provide for a uniform thickness of

the borrow Material. Compaction shall be required. Pipe trenches shall be backfilled as soon as possible after the pipe installation. The Contractor shall not have more than 200 feet of trench open in which the pipeline has been completed, except by permission of the Engineer. Backfilling of trenches in the vicinity of catch basins, manholes, or other appurtenances will not be permitted until the cement in the masonry has become thoroughly hardened. Walking on the pipe shall not be allowed until at least 1 foot of backfill has been placed upon it.

7-17.3(3)B COMPACTION OF TRENCH BACKFILL

Trench backfill shall be spread in lifts and be compacted by mechanical tampers of the impact type approved by the Engineer. The backfill Material shall be placed in successive lifts with the first lift not to exceed 2 feet above the pipe, and the following lifts not exceeding 12 inches in loose thickness, with each lift being compacted to the density specified as follows:

1. Improved areas such as street and sidewalk areas shall be compacted to 95% of maximum dry density; or
2. Unimproved areas or landscape areas shall be compacted to 90% of maximum dry density. Compaction control tests shall be performed as specified in Section 2-03.3(14)E. The procedure and equipment to be used for backfill compaction shall be demonstrated on a test section of pipeline to be located by the Engineer at the beginning of this work. The Contractor shall make these arrangements with the Engineer at least 2 Working Days prior to beginning this work. The Contractor shall excavate test pits in the backfill as directed by the Engineer for the purpose of testing the backfill compaction.

If the required compaction density has not been obtained, the Contractor shall remove the backfill from the trench and recompact using heavier compaction equipment or more passes. This process shall be repeated until the Contractor has established a procedure that provides the required field density. The Contractor will then be permitted to proceed with backfilling and compacting the remainder of the pipeline under the approved compaction procedure. In the event routine field densities taken during the course of construction show the specified compaction of backfill is not being obtained because of changes in soil types which are identified as suitable by the Engineer, the Contractor will be required to reestablish the compaction procedure. In no case will excavation, backfill, and pipe installation operations be allowed to proceed until the specified compaction of backfill is attained. Water settling will not be allowed as a method for compaction of backfill.

Add the following new Sections

(*****)

7-17.3(4) CLEANING AND TESTING

7-17.3(4)A GENERAL

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Pipelines and appurtenances shall be cleaned and tested, after backfilling, by the exfiltration or low pressure air method, at the Contractor's option, or by infiltration test if the ground water table is such that the Engineer may require it. All work involved in cleaning and testing pipelines between manholes or rodding inlets as required herein shall be completed within 15 Working Days after backfilling of pipelines and Structures. Any delay shall be submitted to the Engineer well in advance and requires the written consent of the Engineer. The Contractor shall furnish all labor, Materials, tools, and equipment necessary to make the test, clean the lines, and perform all Work incidental thereto. The Contractor shall perform the tests in the presence of the Engineer. Precautions shall be taken to prevent joints from drawing apart during tests. Any damage resulting from these tests shall be repaired by the Contractor. The manner and time of testing shall be subject to approval by the Engineer.

All wyes, tees, and stubs shall be plugged using test tees, or acceptable alternate, securely fastened to withstand the internal test pressure. Such test tees shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

Testing of side Sewers including runoff and downspout connections shall comply with the requirements of Section 7-18.3(6).

7-17.3(4)A1 PIPE NOT PASSING TESTING

If any pipeline installation fails to meet the requirements of the test method used, or is indicated as defective by television inspection, the Contractor shall determine the source or sources of leakage and shall replace all defective pipe. Where the Contractor believes a repair can be made without removal, the Contractor shall submit to the Engineer for approval at least 5 Working Days in advance, the proposed repair. See Section 7-17.3(2)C1 for damaged connections or failed connections or plugs. The complete pipe installation shall meet the requirements of the test method used before being considered acceptable. Replacement or repair of defective pipe shall not commence until the Contractor has received approval of the method from the Engineer. Retest will be required for acceptance.

All lateral or side Sewer branches included in the test section shall be taken into account in computing allowable leakage.

Upon final acceptance of the Work, all Sewers, side Sewers and fittings shall be open, clean, and free draining.

7-17.3(4)G HYDROSTATIC TEST FOR SANITARY SEWER FORCE MAINS

7-17.3(4)G1 GENERAL

All sanitary force mains and appurtenances shall be subjected to hydrostatic pressure testing as soon as possible after they are installed and backfilled.

The hydrostatic pressure tests shall be conducted in accordance with provisions of sections 7-17.3(4)G2 through 7-17.3(4)G8.

7-17.3(4)G2 EQUIPMENT

The Contractor shall furnish the following equipment for the hydrostatic tests:

Amount Description
2 Approved graduated containers

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2 Pressure gauges
1 Hydraulic force pump approved by the Engineer
Suitable hose and suction pipe as required

Pressure gauges shall be calibrated within 6 months of hydrostatic testing. The Contractor shall provide a Manufacturer's Certificate of Compliance stating the date of calibration of the pressure gauge to be used within 2 Working Days when requested by the Engineer.

7-17.3(4)G3 PROCEDURE

Clean water or approved reclaimed water shall be used as the hydrostatic test fluid. All parts of the piping system shall be subjected to a minimum test pressure of 50 psi plus pressure head required to overcome pumping height.
Where any section of pipe is provided with concrete thrust blocking, do not make the pressure test until at least 5 Days have elapsed after the thrust blocking is installed. If high-early cement is used for thrust blocking, the time may be reduced to no less than 2 days.
The Contractor shall provide all temporary plugs, caps, and thrust blocking and all closure sections and couplings required to test the pipeline in sections at the specified test pressure.

7-17.3(4)G4 DURATION

The duration of each pressure test shall be a minimum of 1 hour. A leakage test of at least 2 hours duration shall immediately follow the pressure test.

7-17.3(4)G5 EXPELLING AIR AND FILLING PIPE

Before applying the specified test pressure, expel all air from the pipe by slowly filling the pipe with water and allow to stand for 48 hours prior to testing.

7-17.3(4)G6 PRESSURE TEST

Test pressures shall be applied by means of a pump connected to the pipe. Apply the test pressure and operate the pump as necessary to maintain the test pressure at its full value for the entire duration of the pressure test. Before applying the specified test pressure, expel all air from the pipe by slowly filling the section of pipe to be tested with water and allow to stand for 48 hours prior to the start of testing under slight pressure. The duration of each pressure test shall be 1 hour. A leakage test of 2 hours duration shall immediately follow the pressure test.

7-17.3(4)G7 LEAKAGE TEST

For the leakage test, the pump suction shall be in a barrel or similar device or metered so that the quantity of water put into the pipeline can be accurately measured. Apply the test pressure and operate the pump as necessary to maintain the pressure in the pipeline at a minimum of 90 percent of the test pressure for the entire duration of the leakage test. At the end of the test period operate the pump until the test pressure is again attained. Leakage shall be defined as the quantity of makeup water required to maintain the pipeline pressure during the test and to restore the test pressure at the end of the test period. No pipe installation will be accepted if the leakage is greater than the number of gallons per hour as determined by the
following formula:
L = ND(P)1/2

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In the above formula: L = Allowable leakage, in gallons per hour

N = Number of joints in the length of pipe tested.

D = Nominal diameter of pipe, in inches.

P = Average test pressure during the leakage test, in pounds per square inch gauge.

Should any test of pipe disclose leakage greater than that allowed, locate and repair the defective joints or pipe until

the leakage from subsequent testing is within the specified allowance. The Contractor shall submit the method of repair to the Engineer for approval at least 3 Working Days in advance.

7-17.3(4)G8 CORRECTION OF EXCESSIVE LEAKAGE

Should any test of pipe disclose leakage greater than that allowed, locate and repair the defective joints or pipe until the leakage from subsequent testing is within the specified allowance. The Contractor shall submit the method of repair to the Engineer for approval at least 3 Working Days in advance.

7-17.3(4)G PLUGGING EXISTING PIPE

Where indicated on the Drawings, existing pipes shall be plugged on the inlet end as specified in Section 2-02.3(5).

7-17.3(4)H DEFLECTION TEST FOR FLEXIBLE PIPE

For pipes nominally 24-inch and larger inside diameter, deflections shall be determined by a method submitted to and approved by the Engineer. If a mandrel is selected, the minimum diameter, length and other requirements shall conform to the dimensions and requirements in this Specification.

All Sewer and Storm Drain constructed of flexible pipe shall be tested for vertical deflection no less than 30 Days after trench backfill and compaction have been completed. No diameter of the installed pipe shall exceed a tolerance of more than 5 % for 12 inch and smaller nominal diameter pipe, and by no more than 3% for all larger than 12 inch nominal diameter pipe and less than or equal to 30 inch nominal diameter pipe. For pipes less than or equal to 30 inches nominal diameter, a mandrel shall be pulled through the pipe by hand to ensure that the maximum allowable deflection has not been exceeded. Prior to use, the mandrel shall be measured, inspected for roundness, and certified as being sound and accurate. A Manufacturer's Certificate of Compliance stating the mandrel to be used meets these Specifications, shall be submitted to the Engineer at least 1 Working Day prior to the test. The use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate the test, and a 2 Working Day advance notification to the Engineer of a retest with a certified mandrel shall be complied with. If the mandrel fails to pass through the pipe, the pipe will be deemed overdeflected and unacceptable.

Testing shall be conducted on a manhole-to-manhole basis after the line has been thoroughly flushed with water. If testing reveals an overdeflected pipe, it shall be uncovered and, if not damaged from overdeflection or from excavation activities, the pipe may be corrected and reinstalled. If the pipe requires repair, the Contractor shall submit the proposed repair to the Engineer for approval at least 3 Working Days before making the repair. The Contractor shall also provide prior to performing the repair, a Manufacturer's Certificate of Compliance stating that the overdeflected pipe as repaired shall acceptably

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perform as required by the Specifications. If no repair is recommended, the Contractor shall state that the pipe requires no repair including the reason why the pipe requires no repair, and shall also provide a Manufacturer's Certificate of Compliance stating that the pipe without repair shall acceptably perform as required by the Specifications. Any pipe damaged beyond reasonable repair, due to overdeflection or from any other cause, shall be uncovered and removed from the Project Site and replaced with a new pipe at no cost to the Owner. Pipe large enough for a person to work inside it may be accepted on the basis of direct measurements rather than using a mandrel. The Contractor shall submit a method for making deflection measurements including the measurement device(s), how the measurement device(s) is verified as providing reasonably repeatable results, how "mark points" will be placed on the pipe for the deflection measurements, and how the measurement data at each test location is presented to demonstrate that any indicated deflection is within the tolerances allowed. The Engineer reserves the right to determine the number of measurements and the orientations of each measurement at each test location. The minimum number of orientations per test location shall be 3 in equal angle projections (3 orientations at 0°, 60°, and 120°). The Engineer also reserves the right to determine the number of test locations. The minimum number of test locations on any single section of pipe shall be no less than 2, and in no case shall there be less than 3 pipe sections tested, and no less than 3 pipe sections tested per any 100 foot length of pipeline. The mandrel shall:

1. Be a rigid, nonadjustable, odd-numbering-leg (9 legs minimum) mandrel having an effective length not less than its nominal diameter;
2. Have a minimum diameter at any point along the full length as follows:

Minimum Mandrel Diameter (inches) Pipe Material Nominal Size (Inches)

5.619 6
7.524 8
9.40 10
11.91 12
13.849
PVC ASTM D 3034
(SDR 35)
15
16.924 18
19.952 21
22.246 24
25.29 26
28.502
PVC ASTM F 679
(T-1 Wall)
30

3. 3. Be fabricated of steel, be fitted with pulling rings at each end, be stamped or engraved on some segment other than a runner indicating the pipe Material, Material specification, nominal pipe size, and mandrel OD (e.g., PVC, ASTM D 3034, 8 inch, 7.524 inch); and be furnished in a suitable carrying case labeled with the same data as stamped or engraved on the mandrel.

7-17.3(4)I <u>TELEVISION INSPECTION WITH AUDIO ASSESSMENT</u>

Once during the final inspection process and after all manholes have been rechanneled, the Contractor in the presence of the Engineer, shall television inspect the

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interior of all mainline Sewer and Storm Drain pipe 6 inches through 48 inches in diameter to determine acceptance of this portion of the Work. Pipe larger than 48 inches in diameter will be inspected visually by the Engineer after cleaning and successful testing by the Contractor. Side Sewer, catch basin and inlet connection pipe, and other non-mainline pipe will not require television inspection.

Personnel Qualifications : Personnel performing television inspection shall have completed the Pipeline Assessment and Certification Program (PACP), and shall have adequate experience and working knowledge of the entire television inspection systems and processes. Contractor shall submit said certification to the Engineer at least 3 Working Days in advance of the first television inspection.

Camera Equipment: The camera shall be a 360-degree radial view color television camera (also known as "pan and tilt") with a mechanical footage counter calibrated to indicate video footage consistent with distance traveled in the pipe.

Footage shall be zeroed at centerline structure (manhole, vault, etc.) where the video begins and footage shall increase as it travels forward, and decrease when backward camera movement is required. Footage shall be displayed on the video recording and be mentioned on the audio portion (see “audio commentary on recording”).

Light Source: The camera shall have a light source providing adequate illumination to clearly identify invert, crown, joints, sides, connections, infiltration/exfiltration, and as may be necessary. Illumination shall be Capable of providing adequate illumination to at least 15 feet in front of the light.

Camera travel in the pipe: The camera shall travel along the invert of the pipe invert to provide the best view of the

crown, invert, connections and sides of the pipe, and shall travel at a speed no faster than 30 feet per minute.

Audio commentary on recording: Commentary shall be objective and shall be based on PACP defined assessment conditions. Audio shall be intelligible and shall be as free from interference and background noise as can reasonably be done.

Subjective comment (such as “the fault of”, “caused by”, and opinion, etc.) shall not be used. Comment shall include the footage location of the comment. At each of connections, the beginning structure, the ending structure, indicated flaws, areas of infiltration/exfiltration, open joints, outfall, and at other features as may be necessary, the footage location shall be mentioned on the audio.

Required Labeling on recording and in audio commentary: Each recording shall have audio accompaniment and shall address a single run of pipe between two (2) structures (manholes, vaults, or ending in an outfall, etc.) on a single recording

Where relatively short runs exist (defined as 100 or fewer feet between centerlines of structures, or to end of outfall), more than one run may be allowed on a single recording when approved by the Engineer at least 3 Working Days in advance. The recording shall contain a legible label that clearly states the following, and the audio commentary shall begin with the following:

a. Date and time of day television inspection performed;
b. Names of television inspection crew members;
c. Project name, vault plan number listed on Drawings, and Drawing sheet number;
d. Location with structure labels (for example – manhole 25, vault 2, outfall, etc.), camera travel direction, size of pipe, pipe material (such as “Broad Street, 5th Ave west to midblock, manholes 24 to 25, going downstream, 24 inch reinforced concrete pipe”); and

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e. a unique identification number, with these numbers being in consecutive sequence on all videotapes of project pipe. If more than one run is on a recording, such information shall clearly be shown on the label and stated on the audio accompaniment.

Recording quality and characteristics : Television inspections shall be on compact discs (CD). If CD not possible or compatible with camera equipment or system, then a Standard Grade, 60-minute VHS tapes taped at SP speed, shall be of a quality that completely and clearly shows that listed in “required extra inspection”.

Recordings not meeting the requirements of this Specification will be determined to be defective work. Upon written notice by the Engineer, the Contractor shall promptly conduct a second television inspection meeting specified requirements, and shall submit a second recording at no additional or separate cost to the Owner.

Required Pre-Notification: The Contractor shall notify the Engineer at least 3 Working Days in advance of the first television inspection.

Pre television inspection preparation: Unless the Contract specifies otherwise, the pipeline system to be inspected shall be successfully pressure tested and then flushed clean prior to beginning inspection. Television inspection shall be performed prior to allowing mainline flow into the pipe from upstream sources. Upstream bypass, when used, shall accommodate television inspection to afford full visibility of pipe inverts (see Section 7-17.3(2)K).

Required Extra Inspection: At all lateral connections, areas of indicated infiltration/exfiltration, open joints, indicated pipe deflection, defects of any kind, and as the Engineer may require, shall require the camera to slow down and fully focus on such areas including having the camera slowly travel backward and forward for multi-directional views. Said areas shall require focused video inspection of not less than 5 seconds. Cameras with telescoping ability shall view the area by telescoping in and out as appropriate for the Engineer to evaluate the condition with certainty.

Reinspection: Should television inspection reveal defective work, the Contractor shall, upon written notice from the Engineer, correct said defects. An additional television inspection (“reinspection”) shall then be taken of the corrected pipe run to verify the corrected pipe meets Specifications. Such reinspection shall be considered in accordance with Section 1-05.7.

Reverse travel runs : The Engineer may require a second television inspection including audio accompaniment run along a pipe by having the camera travel in the direction opposite the previous inspection (“reverse direction”). Such reverse inspection shall be on the same video tape with the footage counter beginning at the upper number and as the camera travels, decreasing in footage count. The audio portion shall include at the beginning of this reverse run, a statement to the effect that “a second view is about to begin of the same length of pipe in the reverse direction”.

Temporary breakdowns : Should an occurrence such as camera breakdown or inability to perform as specified, or other condition arise where no camera or television or audio progress can be made, after the initial 30 seconds of such condition, the operator shall make comment on the audio of such condition and the footage location, then shall shut down the camera and the

audio. Upon fixing such a condition, the video and audio shall be restarted and the audio shall include a comment to the effect “condition fixed and video and audio restarting at footage location”.

Contractor to provide: Compact disc shall be furnished to the Engineer within 10 Working Days of each television inspection, and shall become the property of the Engineer.

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The Engineer may agree to other arrangements. Additional television inspection: Six to eleven months after the Physical Completion Date, the pipes may, at the option of the Engineer, be television inspected again. Videotaping may be done by Owner's forces or, at the Engineer's option, by the Contractor. The Contractor shall schedule such inspection within 10 Working Days after the date of written notice by the Engineer. The audio portion on this recording shall indicate the same information as specified in "Required

Labeling on recording and in audio commentary" also stating "this is an additional television inspection". This additional inspection will then be compared with the prior recording to determine whether or not any change has occurred in the condition of the pipe. Should there be evidence of changed conditions that warrant correction, the Contractor shall, upon written notice of the Engineer, correct those defects pursuant to Section 1-05.10. After the necessary corrections have been made by the

Contractor, the corrections shall be verified in compliance with the Contract at the Contractor's sole expense.

Pipes that are submerged: New pipe that is submerged (for example – Storm Darin that outfalls below the surface of a

body of water), do not require television inspection, unless the Contract specifies otherwise.

7-17.4 MEASUREMENT

Section is deleted and supplemented with the following:

*(*** COS Specifications 7-17.4¶1 ***)*

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities [COS Section 1-09.1], unless otherwise provided for by individual measurement paragraphs herein this Section.

*(*** COS Specifications 7-17.4¶4 ***)*

Measurements for "Pipe, (Use), (Material), (Class), (Size)", for "Steel Casing Pipe, (Class), (Size), (Underground Construction Method)", and for "Pipe, (Material), (Class), (Size), (Underground Construction Method)" for other than directional drilling will be by the linear foot of pipe actually installed and successfully tested, and shall be along the centerline of the pipe through the tees or wyes with the exception of pipe ending at a tee or wye. Measurements will be to the center of new manhole or rechanneled existing manhole; or to the inside face of Structure or existing manhole not rechanneled; or to the end of pipe where it meets a manhole stub; or to a wye, or to a tee whether with stub or cut-in. Measurement will be to the nearest 0.1 foot. See COS Standard Plan no. 010. All incidental to Sewer and Storm Drain pipe measurement will be measured within COS Standard Plan no. 284 neatlines, and for Water Main will be measured within COS Standard Plan no. 350 neatlines.

*(*** COS Specifications 7-17.4¶9 ***)*

Measurement for "TV Inspection" will be for the linear feet of installed 6" - 48" diameter mainline pipe videotaped once during (1) final inspection and (2) such re-videotaping done six to eleven months after the Physical Completion Date. Measurement will be made along the pipe centerline through tees from (1) center to center of new or rechanneled manholes, or (2) to the inside face of Structures or manholes not channeled, or (3) to the end of pipe where it dead ends beyond manholes.

*(*** COS Specifications 7-17.4¶11 ***)*

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Measurement for “Tee, (Material), (Size)” will be per each where “size” applies to the size of the pipe fitting into the tee branching off the mainline pipe as shown on COS Standard Plan no. 010, and “Material” is the Material of the mainline pipe with the branching tee.

Temporary Schedule A (SIZE) In. Diam. Storm Sewer Pipe shall be measured per linear foot for the length installed.

(*****)

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for “Bedding, (Class), (Size) Pipe” and for “Bedding, CDF, (Size) Pipe” for Sewer, Culvert, and Storm Drain as shown on Standard Plan no. 285, and for Water Main as shown on Standard Plan no. 350, will be by the linear foot of pipe actually installed. For Sewer and Storm Drain, measurement will be from center to center of standard manholes or to the inside face of other Structures. For Water Main, measurement will be to inside face of Structure, to end of pipe, or to centerline of connecting tee.

Class D bedding will not be measured. Bedding beyond neatlines shown on the Standard Plans will not be measured.

Measurements for “Pipe, (Use), (Material), (Class), (Size)”, for “Steel Casing Pipe, (Class), (Size), Coated Steel Casing (Size) IN Diam. and (Size) In. Thick (Underground Construction Method)”, and for “Pipe, (Material), (Class), (Size), (Underground Construction Method)” for other than directional drilling will be by the linear foot of pipe actually installed and successfully tested, and shall be along the centerline of the pipe through the tees or wyes with the exception of pipe ending at a tee or wye. Measurements will be to the center of new manhole or rechanneled existing manhole; or to the inside face of Structure or existing manhole not rechanneled; or to the end of pipe where it meets a manhole stub; or to a wye, or to a tee whether with stub or cut-in. Measurement will be to the nearest 0.1 foot. See Standard Plan no. 010. All incidental to Sewer and Storm Drain pipe measurement will be measured within Standard Plan no. 284 neatlines, and for Water Main will be measured within Standard Plan no. 350 neatlines.

No measurement will be made for trench backfill, and selected Material for trench backfill, except for foundation Material, for extra excavation, and for non-native and non select backfill Material including CDF.

Measurement for foundation Material will be by the cubic yard of Mineral Aggregate required to fill the void made by extra excavation and shall be based on neat line width of trench and depth and length as computed by the Engineer.

Measurement for “TV Inspection” will be for the linear feet of installed 6” - 48” diameter mainline pipe videotaped once during (1) final inspection and (2) such re-videotaping done six to eleven months after the Physical Completion Date.

Measurement will be made along the pipe centerline through tees from (1) center to center of new or rechanneled manholes, or (2) to the inside face of Structures or manholes not channeled, or (3) to the end of pipe where it dead ends beyond manholes.

Measurement for “Clay Dam, (Size) Pipe” will be per each.

Measurement for “Tee, (Material), (Size)” will be per each where “size” applies to the size of the pipe fitting into the tee branching off the mainline pipe as shown on Standard Plan no. 010, and “Material” is the Material of the mainline pipe with the branching tee.

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Measurement for “Controlled Density Fill” will be by the cubic yard of material actually placed for pipe bedding or trench backfill.

Measurement for “Dam, Clay Trench” will be per each.

7-17.5 PAYMENT

All paragraphs except the first paragraph are deleted and replaced with the following:

(*****)

“Pipe, (Use), (Material), (Class), (Size)”, per linear foot.

The work of cleaning and testing, except TV inspection, and furnishing caps and plugs for the tests shall be considered as included in the Bid item prices of the pipe Bid items.

Costs for the work required in proof testing the pipe shall be considered included in the Bid item prices for the appropriate pipe Bid items.

Any damage resulting from testing of the Sewers and appurtenances specified in COS Section 7-17.3(4)A shall be made good by the Contractor at the Contractor's sole expense.

All costs of determining the source or sources of leakage and the cost to repair or replace the Sewer found defective as specified in COS Section 7-17.3(4), shall be borne by the Contractor in accordance with Section 1-05.7

"Tee, (Material), (Size)”, per each.

”Television Inspection”, per linear foot.

The cost for the Owner’s labor and equipment for the videotaping during the final acceptance process and the videotaping 6 to 11 months later to recheck the pipe condition will be borne by the Owner unless additional videotape inspection is necessary to verify corrections or replacement of deficient pipe. The cost of additional television inspection, and cleaning in preparation for television inspection, to verify repairs or replaced pipe shall be borne by the Contractor. The Contractor shall also be responsible for all costs incurred in any television inspection performed solely for the benefit of the Contractor.

If the Contractor calls for an initial TV inspection, and the pipe is not clean or has so many deficiencies that the line cannot be fully inspected, the reinspection will be charged to the Contractor, and the cost withheld from money due to the Contractor.

The Contractor shall provide all necessary water for construction and testing purposes (see Section 2-07 [COS 2-07]).

Costs for the work required to excavate, haul, import, place, backfill, and remove and re-backfill for final condition shall be included in the Bid item unit price for Temporary Schedule A (SIZE) In. Diam. Storm Sewer Pipe

Compensation for the cost necessary to complete the work described in Section 7-17 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

Bedding Class Special per linear foot.

Bedding, (Class), (Size) Pipe” and “Bedding, CDF, (Size) Pipe”, per linear foot.

The Bid item price for “Bedding, (Class), (Size) Pipe” and for “Bedding, CDF, (Size) Pipe” shall include all costs for the work required to furnish and install bedding. Cost of Class D bedding shall be included in the Bid item for the pipe Bid item and therefore no separate or additional payment will be made for Class D bedding.

“Pipe, (Use), (Material), (Class), (Size)”, per linear foot.

The Bid item price for “Pipe, (Use), (Material), (Class), (Size)” shall include all costs for the work required to furnish and install the pipe of the type and size specified, and including the following:

a. trench excavation (except “Shoring or Extra Excavation”); haul, stockpile, backfill, and compact suitable native Material backfill,

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b. handling; hauling, storage, removal; off-site disposal of excess suitable and unsuitable excavated native material, or hauling, storage, placement of suitable excess excavated native material or selected Material elsewhere on the project except where designated for embankment construction,

c. dewatering of the trench,

d. required trench excavation, backfill, and compaction,

e. cleaning and testing per Section 7-17.3(4),

f. Class D bedding,

g. pipe coupling, and

h. removal and disposal of existing pipe within trench neatline limits when pipe replacement is called for in the Contract.

All costs in connection with excavating test pits and for standby time during field density tests for compaction shall be considered as included in the Bid item prices for the applicable pipe Bid items. Unauthorized excavation below the established trench grade shall be made good by the Contractor at the sole expense of the Contractor by providing, placing and compacting suitable bedding Material to the proper grade elevation.

The work of cleaning and testing, except TV inspection, and furnishing caps and plugs for the tests shall be considered as included in the Bid item prices of the pipe Bid items. Costs for the work required in proof testing the pipe shall be considered included in the Bid item prices for the appropriate pipe Bid items.

Any damage resulting from testing of the Sewers and appurtenances specified in Section 7-17.3(4)A shall be made good by the Contractor at the Contractor's sole expense.

All costs of determining the source or sources of leakage and the cost to repair or replace the Sewer found defective as specified in Section 7-17.3(4), s hall be borne by the Contractor in accordance with Section 1-05.7

If the pipe fails the deflection test as specified in Section 7-17.3(4)H, all costs to locate and repair the failed sections and retest the pipe shall be borne by the Contractor in accordance with Section 1-05.7.

All costs for the work required to furnish and install joint coupling devices as specified in Section 7-17.3(2)F shall be considered as included in the Bid item prices for the pipe Bid items.

“Casing Pipe, (Material), (Class), (Size), (Underground Construction Method)”, per linear foot.and Coated Steel Casing (Size) and (Size) In. Thick per linear foot.

The Bid item price for “Casing Pipe, (Material), (Class), (Size), (Underground Construction Method) and (Size) In. Thick per linear foot.” for other than directional drilling shall include all costs for the work required to furnish and install casing pipe as specified in Section 7-17.3(2)J, including installation and removal of shoring of the jacking pit. All cost for filling the annular space when required in the Contract shall be incidental to this Bid item and no separate or additional payment will be made therefore.

Payment for directional drilling installation will be as specified in Section 7-22.5.

“Pipe, (Material), (Class), (Size), (Underground Construction Method)”, per linear foot.

The Bid item price for “Pipe, (Material), (Class), (Size), (Underground Construction Method)” for other than directional drilling shall include all costs for the work required to furnis h and install the pipe as specified in Section 7-17.3(2)J.

Payment for directional drilling installation will be as specified in Section 7-22.5.

“Tee, (Material), (Size)”, each.

The Bid item price for “Tee, (Material), (Size)” shall include all costs for the work required to furnish and install the tee including plug when required.

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“Tee, (Size), Cut-In Existing (Material) Pipe”, each.

The Bid item price for “Tee, (Size), Cut-In Existing (Material) Pipe” shall include all costs for the work required to furnish and install the tee as specified in Section 7-17.3(2)C3. If Drainage and Wastewater Utility installs a pipe with a tee, no payment will be made.

Gravel Backfill for Foundation Class B for drainage related catch basins, manholes, and inlets shall be measured per cubic yard within the neatlines of the trench or excavation..

“Temporary Sewer Bypass”, per lump sum.

The Bid item price for “Temporary Sewer Bypass” shall include all the work required to bypass Sewer flow around the construction work.

”Television Inspection”, per linear foot.

The Bid item price for “Television Inspection” shall include all costs for the work required for CCTV inspection of all Sewer and Storm Drain pipe 6” through and including 48” diameter and furnishing an acceptable videotape of a Sewer or Storm Drain pipe to the Engineer. Payment will be for one complete videotaping session made during (1) the final inspection process and (2) one complete re-videotaping, if videotaping is requested by the Engineer, six to eleven months after the Physical Completion Date. Costs for additional videotaping sessions and tapes necessary to verify corrections or replacement of pipe or done solely for the Contractor’s convenience shall be borne by the Contractor.

“Clay Dam, (Size) Pipe”, per each.

The Bid item price for “Clay Dam, (Size) Pipe” shall include all costs for the work necessary to excavate, handle spoils as specified in item 3b this Section, furnish and install the clay dam.

“Backfill, CDF, (Size) Pipe”, per cubic yard.

The Bid item price for “Backfill, CDF, (Size) Pipe” shall include all costs for the work necessary to furnish and place the specified backfill.

“Controlled Density Fill”, per cubic yard.

The Bid item price for “Controlled Density Fill” shall include all costs for the work required to furnish and place the CDF as specified.

“Dam, Clay Trench”, per each.

The Bid item price for “Dam, Clay Trench” shall include all costs for the work required to furnish and install the clay dam as specified.

Payment for imported Material when ordered in lieu of native backfill Material by the Engineer will be paid as "Mineral Aggregate, (Type)", or other imported Material acceptable to the Engineer.

Foundation Material when required will be paid as “Mineral Aggregate, (Type)” per cubic yard, per Section 4-01.5.

Where the Engineer determines that the existing foundation is unsuitable, and foundation Material specified by the Engineer is not in the Contract and no Bid item for “Mineral Aggregate, (Type)” is included in the Bid Form, payment will be made in accordance with Section 1-04.1(2).

The cost for the Owner’s labor and equipment for the videotaping during the final acceptance process and the videotaping 6 to 11 months later to recheck the pipe condition will be borne by the Owner unless additional videotape inspection is necessary to verify corrections or replacement of deficient pipe. The cost of additional television inspection, and cleaning in preparation for television inspection, to verify repairs or replaced pipe shall be borne by the Contractor. The Contractor shall also be responsible for all costs incurred in any television inspection performed solely for the benefit of the Contractor. If the Contractor calls for an initial TV inspection, and the pipe is not clean or has so many deficiencies that

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the line cannot be fully inspected, the reinspection will be charged to the Contractor, and the cost withheld from money due to the Contractor.

The Contractor shall provide all necessary water for construction and testing purposes (see Section 2-07). No separate or additional compensation will be made for submittals, or for Material us ed in the jacking operations or for the cost of the backfilling operations, including compaction.

The Contractor shall, at the Contractor's sole expense, provide pipe of increased strength classification or place a class of bedding of higher load bearing capacity, as required by the Engineer, when the maximum trench width specified in Section 7-17.3(1)A1 is exceeded by the Contractor without prior written approval of the Engineer. The Contractor shall furnish and install any approved imported backfill Material required outside the trench neat line limits.

7-18 SIDE SEWERS

Section is deleted and replaced with the following:

(*****)

7-18.1 DESCRIPTION

Section 7-18 describes work consisting of locating and placing side Sewer, locating tees, and testing of side Sewer. This Section also accommodates private construction in the Right of Way under permit by DPD and SDOT Street Use.

In the Right of Way, a side Sewer, with a capital “S” in “Sewer” as defined in Standard Specification Section 1-01.3, is considered to be that portion of pipe that is constructed between a main Sewer or Storm Drain and the Right of Way margin and shall be constructed in compliance with this Section 7-18 as is reflected by Title 21 of the Seattle Municipal Code. All privately owned and operated drainage control facilities or service drain system, whether or not they discharge to a public drainage control system, Sewer, combined Sewer, or Storm Drain, shall be considered side Sewer where in the Right of Way.

Side Sewer does not include any pipe not in the Right of Way and does not include internal building piping or connecting appurtenances, the installation of which is controlled by Seattle Municipal Code, ordinance or regulation.

In property not within Seattle’s Right of Way, the term “side sewer”, with no capital “s” in “sewer”, shall be interpreted as pipe labeled as “side sewer” or “service drain” or “combined side sewer” as addressed in Title 21 Seattle Municipal Code and applicable Director’s Rules.

7-18.2 MATERIALS

Materials for side Sewer shall meet the requirements of the following Sections:

Pipe 9-05

Side Sewer in Right Of Way shall be not less than 6 inches in side diameter unless otherwise specified in the Contract.

All pipe shall be clearly marked with type, class, date of manufacture, location of manufacturing plant, and/or thickness, as applicable. Marking shall be legible and permanent on the outside surface of the pipe, and shall be able to withstand normal wear due to handling and storage.

NOT FOR CONSTRUCTION

Approved jointing shall be flexible gasketing. Flexible gasketing shall be construed to include rubber, synthetic rubberlike and plastic Materials specially manufactured for the joint, pipe size, and use intended and shall be furnished by the manufacturer of the pipe to be used.

Mortared joints will not be allowed.

Tees, wyes, couplers, and adapters shall conform to the requirements of this Section.

Bends, and transition sections shall be as specified in the Contract.

Couplings for dissimilar pipe shall be flexible gaskets with stainless steel shielding to provide shear control.

Side Sewer that may be exposed to hot sewage, steam, or other extreme exposure shall be of a Material and with joints as specified in the Contract, and shall meet the clearance requirements specified in Section 1-07.17(2).

7-18.3 CONSTRUCTION REQUIREMENTS

7-18.3(1) SIDE SEWER CONSTRUCTION

7-18.3(1)A GENERAL

Trench excavation shall comply with the requirements of Section 7-17.3(1)A and trench excavation over 4 feet in depth shall comply with the trench safety requirements of Section 7-17.3(1)A7a.

Side Sewer work shall be performed by a registered side sewer contractor (RSSC) in accordance with SMC 21.16.060.

The Contractor or Subcontractor performing side Sewer work shall be an RSSC.

Where Section 7-18 does not address specific construction requirements, the construction requirements for Sewer in Section 7-17 of these Standard Specifications shall apply.

Side Sewer location shown on the Drawings shall be subject to relocation in the field after construction starts to accommodate site specific conditions. Regardless of the Drawing location, the Contractor shall place the tee or wye branch in the main Sewer or Storm Drain at the location designated by the Engineer.

When the Work requires, the Engineer will stake and indicate the depth for the invert elevation of side Sewer at the Right-of-Way margin.

Side Sewer shall be installed with existing, or with other project proposed, Water Main and other underground facilities, in accordance with the clearance requirements specified in Section 1-07.17(2) and other code, law, and regulation.

7-18.3(1)B RESERVED

7-18.3(1)C SIDE SEWERS SHOWN ON THE DRAWINGS

7-18.3(1)C1 PROTECTION OF EXISTING SIDE SEWER

See Section 1-07.16.

7-18.3(1)C2 REMOVE AND REPLACE EXISTING SIDE SEWER

When the Drawings call for removal and replacement of existing side Sewer, only new pipe shall be used to replace the removed pipe.

7-18.3(2) EXCAVATION, FOUNDATION PREPARATION, BEDDING, AND BACKFILL

NOT FOR CONSTRUCTION

Excavation, foundation preparation, bedding and backfill for side Sewer shall conform to the requirements of Section 7-17, except that bedding or backfill shall be limited to that required to hold the pipe in true alignment and to grade without covering the pipe. The Contractor shall give the Engineer at least 2 Working Days advance notice for inspection and testing per Section 7-18.3(6) before covering the side Sewer.

7-18.3(3) PIPE INSTALLATION AND JOINTING

7-18.3(3)A GENERAL

Pipe installation and jointing, except as hereinafter provided, shall conform to the requirements of Section 7-17 and Chapter 21.16 of the Seattle Municipal Code.

7-18.3(3)B LINE AND GRADE

Side Sewer shall be installed to a line and grade between the main Sewer or Storm Drain tee branch or wye branch, and the Right of Way margin, so as to best serve the property relative to the following conditions, as approved by the Engineer:

1. Where a vacant property is level with or lower than the street grade, the invert elevation of the proposed side Sewer at the Right of Way margin shall be 1 foot higher than the elevation of the crown of the main Sewer or Storm Drain at the location of its tee or wye branch connection. See Standard Plan no. 283 for additional requirements.
2. Where an occupied property is situated at higher elevation than the street grade and where the slope of the proposed side Sewer is steeper than 50%, the maximum elevation of the side Sewer at the Right of Way margin will be established by the Engineer with due consideration for placing the side Sewer below the invert of any proposed Storm Drain pipe, unless conditions require otherwise. The clearance between the invert of an existing Storm Drain or Sewer and the crown of a side Sewer below it shall be not less than 6 inches. In either of these conditions, the end of the side Sewer at the Right of Way margin shall be placed deep enough to accommodate at least 2-1/2 vertical feet of compacted backfill between the crown of the pipe and finished grade at that point.
3. Where an occupied property is level with or lower than the street grade, side Sewer pipe shall be installed on a grade not less than 2%.

7-18.3(3)C PIPE INSTALLATION

Bell and spigot pipe shall be installed with the bell end facing up grade. All pipe installation shall start and proceed up grade from the point of connection at the Sewer or Storm Drain or other starting point.

Between fittings, pipe shall be installed in a straight line at a uniform grade.

7-18.3(3)D JOINTING – NEW PIPE TO EXISTING PIPE

Where it is necessary to break out an existing side Sewer during construction due to grade conflict with a newly constructed pipeline, only new pipe shall be used in reconnecting the side Sewer. Where joints cannot be made due to dissimilar pipe Material or mismatched wall thickness, the Contractor shall use a flexible gasketed coupling to make a watertight joint. Couplings shall have flexible gaskets and stainless steel shielding.

7-18.3(4) FITTINGS

NOT FOR CONSTRUCTION

All fittings shall be factory-produced and shall be designed for installation on the pipe to be used. The maximum deflection permissible at any one fitting or joint shall not exceed the pipe manufacturer's recommendation, and in no case shall the deflection exceed 2 inches per foot at any joint or fitting. The maximum deflection of any combination of two adjacent fittings or joints shall not exceed 45 degrees (one-eighth bend). Should greater than 45 degree deflection be needed between adjacent joints or fittings, a straight pipe of not less than 2-1/2 feet in length shall be installed between such adjacent fittings or joints, unless either one of such fittings is a wye branch with a cleanout provided on the straight leg or such a wye branch fitting is substituted for a joint.

Side Sewer shall be connected to the tee or wye provided at the main Sewer or Storm Drain where such is available, utilizing approved fittings or adapters. Where no tee or wye is provided or available, connection shall be made by core drilling and installing an approved insert or saddle tee as specified in Section 7-17.3(2)C3. The installation of side sewer to a vertical connection at the main Sewer or Storm Drain shall be as shown on Standard Plan no. 234.

7-18.3(5) CLEANOUTS

Refer to Section 7-19.

7-18.3(6) INSPECTION AND TESTING

7-18.3(6)A INSPECTION

As specified in Section 7-18.3(2) side Sewer covered without Engineer inspection shall be uncovered for inspection.

7-18.3(6)B TESTING

All newly installed side Sewer shall be tested after backfill. Side Sewer that is reconstructed or repaired to a length of 10 feet or more shall be tested for watertightness in accordance with Section 7-17.3(4)B. The only exceptions for no testing required shall be:

1. a new reconstruction of side Sewer consisting of a single length of pipe, and
2. existing side Sewer reconnected to the Sewer or Storm Drain.

Testing shall be performed in the presence of the Engineer in accordance with Section 7-17.3(4).

All side Sewer constructed in conjunction with main Sewer or Storm Drain construction, for purposes of testing as specified in Section 7-17.3(4), shall have a 6-inch tee fitting placed at the point where the side Sewer crosses the Right of Way margin as shown on Standard Plan no. 283. The tee opening shall be positioned perpendicular to the side Sewer slope.

When the new side Sewer is connected to a new main Sewer or Storm Drain installed under the same Contract, and the side Sewer is not tested simultaneously with the test of the main Sewer or Storm Drain, the Contractor shall furnish and place an additional 6-inch tee in the first length of pipe out of the tee on the main Sewer or Storm Drain so that an inflatable rubber ball can be inserted for sealing off the side Sewer and thus permit separate side Sewer and mainline tests.

When the new side Sewer is connected to an existing main Sewer or Storm Drain, the Contractor shall furnish and place 2 test tees as shown on Standard Plan no. 283 and as follows:

a. one immediately adjacent to the main Sewer or Storm Drain, and

NOT FOR CONSTRUCTION

b. a second at the Right of Way margin. The ends of side Sewer and test tee openings shall be plugged watertight with Materials and by method acceptable to the Engineer.

Side Sewer installed with pipe extending beyond the Right of Way margin that includes other connection, such as runoff or downspout, and is associated with private construction under the ins pection of DPD, shall not be part of the Contract, and may require testing of the entire side sewer system including pipe in the Right of Way.

7-18.3(7) MISCELLANEOUS REQUIREMENTS

7-18.3(7)A PIPE AND CONNECTIONS – PRIVATE PROPERTY

Side Sewer in utility easement shall not be less than 6 inch inside diameter. Side Sewer and/or service drain on private property shall be not less than 4 inches inside diameter. No roof drain, area drain, or subsurface drain shall be connected to a side Sewer which is connected to a separate main line sanitary only Sewer.

Private property roof drains or service drains in areas of mainline combined Sewer shall be run in a separate pipe (not combined with sewage) to the property line before connecting into the side Sewer.

7-18.3(7)B PROXIMITY TO OTHER UNDERGROUND FACILITIES

In private property, clearance between side sewer and/or service drain and water supply lines shall comply with WSDOH requirements and other applicable code and regulation. In the Right of Way, side Sewer clearances shall be as specified in Section 1-07.17(2).

7-18.3(7)C PLUGS

In the Right of Way, unused side Sewer openings shall be securely sealed with a watertight plug fastened in place, as approved by the Engineer.

The only exception is private construction under permit from DPD and SDOT Street Use where unused side sewer openings in private property and side Sewer openings in the Right of Way, shall be closed with a watertight plug fastened in place as approved by DPD.

7-18.3(7)D SEPTIC TANKS AND CESSPOOLS – PRIVATE PROPERTY

No side sewer shall be constructed through or adjacent to an existing cesspool or septic tank. If site conditions prohibit any other location, the Contractor shall abate the cesspool or septic tank by such means as the DPD inspector may direct

7-18.3(8) RESTORATION, FINISHING, AND CLEANUP – PRIVATE CONSTRUCTION

Restoration, finishing, and cleanup due to private construction in Seattle's street Right of Way under Street Use permit and DPD permit, shall comply with the Street and Sidewalk Pavement Opening and Restoration Rules.

7-18.3(9) EXTENDING SIDE SEWERSIDE SEWER INTO PRIVATE PROPERTY

Extending side Sewer into private property shall not be part of the Contract and no such work will be allowed.

NOT FOR CONSTRUCTION

Unless authorized by Section 21.16 of the Seattle Municipal Code, private property owners who wish to extend side sewer into the Right of Way or connect with Sewer or Storm Drain, shall do so under permit with DPD and SDOT Street Use.

7-18.3(10) END PIPE MARKER

At the Right of Way margin, a 4 foot long 2-inch x 4-inch stake shall be buried to a 3 foot depth directly over the side Sewer. The exposed 1 foot of stake shall be painted traffic white, and the depth to the invert of the side Sewer from finish grade shall be painted legibly and with black permanent ink or other durable marking agent, on the exposed white portion of stake. The bottom of the stake shall have a 2-inch x 4-inch cleat securely nailed to the stake to prevent withdrawal of the buried stake. In addition, a 12 gauge galvanized wire shall be attached to the tee on the side Sewer, or to the plugged end of the side Sewer if no tee, and shall extend to 6 inches above finished grade at the stake and not attached to the stake.

7-18.4 MEASUREMENT

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for "Pipe, (Use), (Material), (Class), (Size)" will be to the nearest 0.10 foot along the pipe from the tee or wye of the main Sewer or Storm Drain through tees, wyes and other fittings to the Right of Way margin as shown on Standard Plan no. 010, or to the end of pipe when the Contract or Engineer requires.

Measurement for "Tee, Test, (Material), (Size)" shall be per each.

Measurement for trench safety system will be in accordance with Section 7-17.4.

7-18.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 7-18 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

"Pipe, (Use), (Material), (Class), (Size)", per linear foot.

The Bid item price for "Pipe, (Use), (Material), (Class), (Size)", shall include all costs for the work required to furnish all Material and Supplies necessary to install the side Sewer pipe of the type specified, including, but not limited to, the following:

a. trench excavation (except "Extra Excavation"), haul, stockpiling, backfill and compaction of suitable native
b. Material;
c. removal and disposal of excess and/or unsuitable excavated native Material;
d. dewatering of the trench;
e. removal and disposal of existing side Sewer pipe encountered in required trench excavation and backfill;
f. temporary bypass of sewage, including pumping,
g. cleaning and testing;
h. end pipe marker, plug, balloon; and
i. Class D Bedding.

"Tee, Test, (Material), (Size)", per each.

The Bid item price for "Tee, Test, (Material), (Size)" shall include all costs for the work required to furnish, install, and remove as necessary the test tee.

NOT FOR CONSTRUCTION

Other payment information.

Payment for "Safety Systems in Trench Excavation, Min. Bid = $0.80 per Square Foot", for "Extra Excavation", for "Mineral Aggregate (Type)", for "Tee, (Material), (Size)", for "Clay Dam", for "Backfill, CDF, (Size) Pipe", for "Bedding, CDF, (Size) Pipe", and for "Bedding, (Class), (Size) Pipe" will be in accordance with Section 7-17.5.

All cost associated with uncovering a side Sewer without Engineer inspection and all cost associated with reconstructing any portion of completed Work associated with the uncovering shall be at the Contractor's sole expense and no separate or additional payment will be made therefore.

Remove and re-install side Sewer will be paid as "Pipe, (Use), (Material), (Class), (Size)".

No payment will be made for any expense associated with the Contractor installing an additional tee on the side Sewer and requiring separate tests for purposes of testing as specified in Section 7-18.3(6)B.

All costs relating to construction in private property, and to private construction in Seattle's Right of Way under the jurisdiction of DPD and SDOT Street Use, shall not be part of the Contract and no s eparate or additional payment will be made

Section 7-19 is deleted and replaced with the following:

(*****)

7-19 SEWER CLEANOUT

7-19.1 DESCRIPTION

Section 7-19 describes work consisting of the construction of sanitary Sewer cleanouts in accordance with Standard Plan no. 280 and as indicated in the Contract.

7-19.2 MATERIALS

All Materials incorporated into the total cleanout structure shall meet the requirements of the various applicable Sections of these Standard Specifications.

7-19.3 CONSTRUCTION REQUIREMENTS

A cleanout shall be provided for each total change of 90 degrees in grade or alignment. In no case shall the spacing of cleanouts exceed 100 feet. No cleanout will be required at the connection of the side Sewer to a riser on the public Sewer.

A suitably located cleanout in the house piping or plumbing may be considered as a cleanout for the side Sewer. Cleanouts shall consist of a wye branch in the side Sewer. All cleanouts located in the Right Of Way shall be extended to finish grade.

The extension of cleanouts to finish grade on private property is optional with the property owner. When extended to finish grade, cleanouts shall be full side Sewer diameter and shall be extended to a point not less than 6 inches nor more than 12 inches below the finished ground surface with a removable stopper which prevents passage of dirt or water. When specified in the Contract, the Contractor shall install an approved casting to provide ready access to the cleanout stopper. An 1/8-bend shall be used to deflect the side Sewer upward as a cleanout where the terminal end of the side Sewer lies upstream from the last point of connection.

Pipe joints shall be the type specified in Section 7-17.3(2).

NOT FOR CONSTRUCTION

Trench excavation, bedding, and backfill requirements shall comply with the appropriate requirements of Section 7-17. The trench excavation shall be made in such a manner as to provide an undisturbed base upon which the pipe shall be placed. Bedding around the wye and under the pipe connecting to the wye shall be thoroughly compacted. Otherwise, construction shall conform to the requirements shown on Standard Plan no. 280.

7-19.4 MEASUREMENT

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for "Sewer Cleanout, (Size)" will begin at the wye branch and extend through the casting, as shown on Standard Plan no. 280.

7-19.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 7-19 will be made at the Bid item price Bid only for the Bid item listed or referenced as follows:

"Sewer Cleanout, (Size)", per each.

The Bid item price per each for "Sewer Cleanout, (Size)" shall include all costs for the work required for furnishing and installing the wye, Sewer pipe, pipe bands, pipe plug, casting, and concrete collar.

7-20 ADJUSTMENT OF NEW AND EXISTING UTILITY STRUCTURES TO FINISH GRADE

7-20.1 DESCRIPTION

Section 7-20 describes work consisting of adjusting new and existing manholes, catch basins, inlets, valve chambers, water meter boxes, handholes, and similar utility Structures encountered during the Work to a new grade elevation. The work shall include adjustment by removing or installing ring extensions; by removing and installing adjustment brick; by removing or adding a vertical riser section to the utility Structure; by removing and rebuilding a portion of the existing Structure; or by any combination of the preceding methods.

Publicly-owned utility Structures shall be adjusted to finished grade by the Contractor. Privately-owned utilities are generally in the streets and road Rights of Way pursuant to franchises or to rights claimed under the laws of the United States of America, or the State of Washington and, therefore, these utility agencies are responsible for all adjustments and relocations of their own facilities. The Contractor shall schedule the Work so that utility adjustments by others can be accomplished without undue delay.

The requirements of Section 7-20 apply to utility Structures constructed from precast concrete sections, masonry brick or blocks, and cast-in-place concrete.

7-20.2 MATERIALS

Material used in the adjustment of existing utility Structures shall meet the requirements for new construction specified in the Specification Section applicable to the item being adjusted.

Adjustment ring extensions shall meet the requirements of Section 9-12.8 and Standard Plan no. 231.

NOT FOR CONSTRUCTION

Epoxy used to secure manhole castings for ring extensions to existing frames shall be per epoxy manufacturer's recommendations for the material application. The Contractor shall submit at least 3 Working Days in advance, a Manufacturer's Certificate of Compliance and catalog cut stating the proposed epoxy provides acceptable bonding performance for the intended application.

7-20.3 CONSTRUCTION REQUIREMENTS

7-20.3(1) ADJUSTMENT OF MANHOLES, CATCH BASINS, AND SIMILAR STRUCTURES

7-20.3(1)A GENERAL

The Engineer will establish approximate grade elevation for the tops of existing utility Structures requiring adjustment. The final alignment and grade elevation shall be established from adjacent roadway surfaces, forms, or such offset hubs as may be provided by the Engineer. Except where adjustment is to be made by ring extension, the Contractor shall remove the pavement around the casting; remove the casting and install or remove leveling or adjustment brick or block; or shall excavate around the utility structure, remove a portion of it as necessary and rebuild the structure to meet the new grade elevation. Pavement removal shall be kept to the minimum amount required to facilitate the adjustment. Adjustment of drainage Structure to finished grade elevation, by whatever method, shall result in a finished Structure meeting the requirements for new construction as specified in Section 7-05.3(1)P, except inlets which shall comply with Section 7-05.3(2)D. The overall distance between the top of the casting to the bottom of the adjustment brick shall be not more than 26 inches.

Where a Water Main casting adjustment is required and the concrete pavement or concrete rigid pavement base is to be made thicker, the Contract will specify whether or not a new Water Main casting is required. If a new Water Main casting is required, the Contractor shall comply with the requirements in Section 7-20.3(5); otherwise, adjustment of Water Main castings shall be by either brick or concrete block. The adjustment of Water Main castings with ring extensions will not be allowed.

When a ring extension is specified in the Contract, it shall be epoxied securely to the existing frame. All frame and ring extension surfaces to receive the epoxy shall be thoroughly cleaned with a wire brush prior to the application of epoxy.

When adjustment is made by adding or removing leveling bricks, all joints in the bricks shall be filled with mortar and the casting seated in mortar on the top brick course.

After the utility Structure has been adjusted to grade, and the Structure made watertight by plastering with a mortar cement, all voids around the Structure shall be backfilled and compacted with imported Mineral Aggregate Type 17. The casting shall then be secured in place with a tapered layer of concrete or asphalt, as applicable.

The Contractor shall adjust to finish grade, water meter boxes encountered in the planting strip and sidewalk area. Should adjustment to a water meter box necessitate adjustment or relocation of the water meter, the Contractor shall notify the Engineer at least 3 Working Days in advance and the water meter will be adjusted or relocated by SPU Water Operations. The Contractor shall then make final adjustment of the meter box.

7-20.3(1)B UNPAVED STREET GRADING PROJECTS

New manholes, catch basins and similar Structures constructed in conjunction with street grading projects which are to be surfaced with gravel or crushed stone shall be constructed to a point approximately 8 inches below the subgrade and covered with a temporary wood cover. Existing manholes encountered shall be cut off and covered in a

NOT FOR CONSTRUCTION

similar manner. The Contractor shall carefully reference all manholes so that they may be easily found upon completion of the street work.

After placing the gravel or crushed stone surfacing, the utility Structures and utility castings shall be constructed to the finished grade of the roadway surface. Excavation necessary for bringing utility castings to grade shall center about the utility structure and be held to the minimum area necessary. After completion of the utility structure adjustment, and after the structure is made watertight by plastering with mortar cement, the void around the manhole shall be backfilled with imported Mineral Aggregate Type 17 and thoroughly compacted. Where bituminous surface treatment is to be placed, the manhole castings shall be installed from 1/2 inch to 1 inch higher than the rock surfacing so that the top of the casting matches the finished roadway surface.

7-20.3(1)C CEMENT CONCRETE PAVING PROJECTS

Manholes, catch basins and similar Structures shall be constructed or adjusted in the same manner as outlined in Section 7-20.3(1)A except that the final adjustment shall be made and the cast iron frame set after the forms have been placed and checked. In placing the concrete pavement, extreme care shall be taken not to alter the position of the casting in any way.

All Standard Plan nos. 230 and 361 castings (manholes and valve chambers) installed in and requiring new concrete pavement or rigid concrete base pavement, shall comply with the reinforcing requirements of Section 5-05.3(9).

See Section 7-20.3(1)A for Water Main casting adjustment requirements.

See Section 7-20.3(1)D for temporary transition tapers around exposed castings.

7-20.3(1)D ASPHALT CONCRETE PAVING PROJECTS

Utility Structures requiring adjustment of frames to match finish grade shall be adjusted prior to the start of the final paving operation.

The tops of existing utility Structure frames shall be raised or lowered to match the finish grade. Immediately after adjustment of the frame to finish grade in lanes that are to remain open to traffic, the Contractor shall install temporary asphalt or temporary pavement patch transition tapers around the Structure frame to prevent a nuisance to traffic. The Contractor shall maintain the asphalt tapers and shall furnish, install, and maintain warning signs and barricades in accordance with Sections 1-07.23 and 1-10. The Contractor shall remove the asphalt tapers immediately prior to the start of paving operations.

Inside surfaces of adjus ted Structure frame and bricks or rings which are disturbed or damaged by the adjustment, as well as the new adjustment area, shall be mortared to give a smooth, watertight surface.

7-20.3(1)E ASPHALT RESURFACING PROJECTS

Adjustment of manholes, catch basins, and similar Structures on asphalt resurfacing projects shall meet the requirements of Section 7-20.3(1)D.

7-20.3(1)F STORM AND SANITARY SEWER OR WATER PROJECTS

Manholes, catch basins, gate valve Structures and other similar type Structures being constructed in conjunction with Sewer or water projects on improved streets shall be brought to final grade as outlined in these Section 7-20 Specifications.

NOT FOR CONSTRUCTION

7-20.3(1)G ESTABLISHMENT OF GRADE FOR TOP OF MANHOLE

The Engineer will establish the grade for top of manholes, catch basins and similar Structures; however, these grades will be approximate only. The Contractor shall allow adjustment of frame and frame extensions in accordance with the Standard Plans. The Engineer assumes no responsibility in this regard, except when the final grade is set.

7-20.3(2) ADJUSTMENT OF INLETS

The final alignment and grade of frames for new and old inlets to be adjusted to grade shall be established from the forms or from adjacent pavement surfaces. The final adjustment of the inlet frame and frame extension shall be performed in similar manner to that described for manholes. On asphalt concrete paving projects using curbs and gutters, that portion of the frame not embedded in the gutter section shall be solidly embedded in concrete. The concrete shall extend a minimum of 6 inches beyond the edge of the frame and shall be left 1-1/2 inches below the top of the frame so that the wearing course of asphalt concrete pavement butts against the frame. The existing concrete pavement and edge of the casting shall be painted with hot asphalt cement.

Adjustments in the inlet structure frame and frame extension shall be made in the same manner and of the same Material as that required for new inlets. The inside of the inlet frame and frame extension shall be plastered smooth.

7-20.3(3) ADJUSTMENT OF MONUMENTS, AND FRAME AND COVER

Monuments and monument castings shall be adjusted to grade in the same manner as for manholes.

7-20.3(4) ADJUSTMENT OF VALVE BOX CASTINGS

Adjustment of valve box castings and Water Main castings shall be as specified in Sections 7-20.3(1)A and 7-20.3(5).

7-20.3(5) FURNISHING CASTINGS

Where adjustment of existing utility Structures is required and the Drawings indicate that the existing castings be replaced, the Contractor shall furnish new castings of the type specified on the Drawings with the exception of Water Main castings. Water Main castings requiring replacement will be furnished by SPU Water Operations. Casting shall include frame and grate, or ring and cover unless the Contract specifies otherwise. Salvaged castings shall be cleaned and delivered as specified in Section 2-02.3(7).

7-20.3(6) ADJUST BY SHAFTING

Adjustment of existing utility casting and Structure shall be by shafting when the casting remains the same and one of the following conditions exists:

1. The casting is to be raised, resulting in a total depth of the adjustment brick zone greater than the maximum allowable as indicated on the Standard Plans; or
2. The casting is to be lowered more than the depth of the existing adjustment brick or in excess of 16 inches.

Work required shall include excavation, removal of the existing frame and cover, leveling bricks, cone section or flat slab of the utility structure. The Contractor shall add to or

NOT FOR CONSTRUCTION

remove from the utility structure as appropriate, the vertical riser section having the least dimension, unless otherwise indicated on the Drawings, to allow the structure to be adjusted to the new grade elevation. The cone section or flat slab shall be reinstalled, adjustment bricks installed, and the existing frame and cover reset. The surrounding void shall be backfilled and compacted in accordance with Section 7-17.3(3).

7-20.4 MEASUREMENT

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for "Adjust by Shafting" will be by the vertical foot of adjustment, from original grade to finish grade.

7-20.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 7-20 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

"Adjust Existing Manhole, Catch Basin or Valve Chamber", per each.

"Adjust Existing Inlet", per each.

"Adjust Existing Monument Frame and Cover", per each.

"Adjust Existing Valve Box", per each.

"Adjust Existing Handhole", per each.

The Bid item price for "Adjust Existing (Item)" shall include all costs for the work required to adjust the existing utility casting from original grade elevation to finished grade elevation with or without removing or adding adjustment bricks.

"Adjust Existing Manhole, Catch Basin or Valve Chamber With Ring Extension", per each.

"Adjust Existing Inlet With Ring Extension", per each.

8. "Adjust Existing Monument Frame and Cover With Ring Extension", per each.

9. "Adjust Existing Valve Box With Ring Extension", per each.

The Bid item price for "Adjust Existing (Item) with Ring Extension" shall include all cost for the work required to furnish and install the required ring extension.

In the case where the Contractor is required to adjust a casting with ring extension as well as making an adjustment by removing or adding adjustment bricks, the Contractor will be compensated for the work under the Bid items "Adjust Existing (Item)" and "Adjust Existing (Item) with Ring Extension".

"Adjust By Shafting", per vertical foot.

The Bid item price for "Adjust by Shafting" shall include the costs for all work required to modify the existing structure

and complete the adjustment to the grade elevation as specified.

"Utility Casting, (Type)", per each.

The Bid item price for "Utility Casting, (Type)" shall include the costs for all work required to furnish and install new castings of the type specified in the Contract when existing castings are to be replaced.

When a manhole is required to be rebuilt to accommodate a new casting, the cost of the utility casting shall be included in the price Bid for the Bid item "Rebuild (Item)" per Section 7-05.5 where "item" is "manhole".

Other Payment Information.

NOT FOR CONSTRUCTION

Costs for adjustment to finish grade of water meter boxes excluding adjustment of the water meter itself; small castings other than inlet, catch basin, manhole, valve chamber, handhole, monument, and water valve box; hydrant valve

castings; and private and other public utility castings requiring coordination with the private or public casting owner, shall be included in the Bid item prices for the applicable Bid items and no separate payment will be made.

Mineral Aggregate ordered as backfill in lieu of native Material will be paid as "Mineral Aggregate, (Type)".

Restoration of the roadway surface shall be in accordance with the applicable Section covering the work involved.

The costs for asphalt or cement concrete used to secure castings prior to paving shall be considered incidental to the

Work and no separate payment will be made.

All work required to adjust castings of all newly installed or rebuilt utility Structures to finished street grade shall be considered included in the Bid item prices of the Bid items for the appropriate type of utility Structure.

In asphalt resurfacing projects, as specified in Section 7-20.3(1)E, all costs to remove the asphalt concrete and/or concrete base, will be considered included in the Bid item price of the Bid items of work for adjusting the specified Structures.

Add the following new Section:

(*****)

7-21 BASCULE PIER PLUMBING

7-21.1 DESCRIPTION

The work under this Section shall consist of furnishing all labor, equipment and materials and performing all work necessary to install, test and place in correct, satisfactory operating condition a new water supply and sewage systems, including plumbing for the operator house and sump pump systems for both the North and South Piers.

7-21.1(1) CODE

The installation and construction of all plumbing equipment shall conform to the requirements of the 2006 Uniform Plumbing Code

7-21.1(2) SUBMITTALS

The Contractor shall prepare and submit for review working drawings and catalogs for the new piping and miscellaneous components.

Piping configuration and valve locations (including sillcocks and expansion compensators) showing its relation to the structure, control house and other work including structural, electrical, architectural, and other mechanical.

Details showing all steel support for piping and the steel connection to existing structure members.

Manufacturers catalog information and data for piping, fittings, expansion joints, insulation and covers, heat trace, piping supports including installation and maintenance instructions.

Operating and Maintenance Manual - Provide an operating and maintenance manual with the following information.

NOT FOR CONSTRUCTION

1. Product data including electrical requirements and catalog cuts of all equipment specified herein and as shown on the Plans.
2. Product data for each specialty and/or special duty equipment. Include rated capacities of selected models, furnished specialties and accessories, and installation instructions.
3. Shop drawings detailing dimensions, required clearances, for installation.
4. Maintenance data for water heaters, sump pump, grinder pump, and any other specialties for inclusion in operating and maintenance manual.

7-21.2 MATERIALS

All equipment and materials furnished under the items specified herein shall be brand-new. All new equipment, materials and workmanship shall be first class in every particular, and shall be manufactured and installed to the satisfaction of the Engineer.

7-21.2(1) PIPING AND FITTINGS

DWV Piping - Drain, waste and vent piping in the pier and inside the operator's house shall be service weight centrifugal casted cast iron pipe conforming to ASTM designation A 74, bell and spigot with neoprene gaskets. Vent piping shall have no-hub joints. Provide cleanouts where shown on the plans. DWV pipe concealed inside walls may be polyvinyl chloride (PVC) Schedule 40 plastic pipe conforming to ASTM D-2665. Fittings for PVC pipe shall be polyvinyl chloride (PVC) conforming to ASTM D-3034.

Potable Water Supply Piping - All water pipe and fittings shall be NSF approved for potable water service. Water piping in the building and not exposed shall be copper water tube conforming to ASTM designation B 88 type L soft drawn. Connections shall be wrought copper and copper alloy solder joint pressure fittings in accordance with ASME/ANSI B 16.22. Solder shall be alloy grade SN 95 (95/5). Shock absorbing devices shall be installed at each individual fixture. Shock absorbers shall be copper tube, 18" high. Potable water piping in the pier and exposed inside the building shall be black steel galvanized pipe conforming to ASTM A53.

7-21.2(2) WATER VALVES

Ball Valves for copper piping shall be two-piece construction with bronze body conforming to ASTM B-62, having standard porting and solder ends. Valve shall include chrome-plated ball, replaceable Teflon seats and seals, blow proof stem and vinyl covered handle. Valves shall be rated for 600 psi working pressure. Size shall be equal to the size of the pipe on which it is installed.

All sillcocks shall be frost-proof type with vacuum breaker for antisiphon backflow prevention. These sillcocks shall drain when closed to prevent freezing. Outlet connection shall meet ANSI B1.20.7.

Through-Wall Style – body shall be brass with copper pipe and removable thermoplastic handle. Sillcocks shall have a minimum pressure rating of 125 psi and temperature range from 0° to 130° F.

7-21.2(3) UNIONS

NOT FOR CONSTRUCTION

Unions shall be two-piece construction with bronze body conforming to ASTM B-62, having standard porting and solder ends. Union shall be rated for 600 psi working pressure. Size shall be equal to the size of the pipe on which it is installed.

7-21.2(4) EXPANSION COMPENSATOR

Supply water line expansion compensators Metraflex model HPFF or as manufactured by Flexonics, Unaflex or equivalent. Furnish expansion compensator with same diameter as water line and solder joint ends.

7-21.2(5) BACKFLOW PREVENTION DEVICE

A backflow preventer assembly shall be provided and installed on the water supply as shown on the plans. The backflow preventer assembly shall consist of 2 bronze-bodied gate valves and 2 bronze-bodied spring loaded check valves in series. The assembly shall come complete with test cocks. All internal parts of the check valves shall be accessible from the top without removing the check valve body from the line. All valves within the assembly shall be the same size as the line on which they are installed and shall be rated at 150 psi. The backflow preventer assembly shall be approved by the local governing authority and the AWWA for protection of potable water supplies of the type required for this project.

7-21.2(6) INSULATION AND HEAT TRACING

Pipe and fitting insulation shall be jacketed fiberglass pipe insulation. Thickness is as shown on the Plans. Insulation at pipe supports shall be Calcium Silicate.

Insulation shall be covered over pipe and fittings with PVC covers, 20 mils thick. PVC covers shall be secured using stainless steel clamps. A wear shield, galvanized 1/16-in thick and 12" long, shall be placed between each support and the PVC insulation jacket. The wear shield shall be secured to the PVC jacket.

Insulation for expansion compensators shall be removable weatherproof flexible insulation blankets designed to be retrofitted and fasten for easy installation and removal. Fastenings shall include lacing or buckle fastening. Insulation R-value shall not be less than the jacketed fiberglass pipe insulation.

Heat trace cable shall be constructed of 16AWG stranded copper bus wire embedded in parallel self-regulating polymer core that varies its power output to respond to temperature along its length. The heat cable shall be covered by a radiation cross-linked modified polyolefin dielectric jacket. Output shall be 5 watts per foot. The heat trace cable shall be capable of maintaining 40 degree F pipe surface temperature with an outside ambient temperature of 0 degree F. Provide thermostatic control for heat trace to maintain temperature.

7-21.2(7) HOTWATER HEATER

Water Heater - Electric water heater shall be Ruud Model EGSP6 or equivalent, and have an electrical input of 6000 watts maximum, 480 VAC, and a 6 gallon capacity.

The water heater shall be commercial grade and be of low sized construction. The heater shall be glass-lined and insulated. The unit shall come pre-wired with automatic temperature controls and be rated for 150 psi working pressure. The water heater shall carry the following labels:

1. A message for requirement of pressure and temperature relief valve.

NOT FOR CONSTRUCTION

2. Allowable safe working pressure.

The water heater shall be provided with a self-closing pressure and temperature valve set no higher than the manufacturer's rated working pressure and shall also be provided with a high temperature cut-off for 210 Fahrenheit. The relief valve and high limit devises shall bear the AGA or ASME labels and shall be located in accordance with ANSI Z21.22. The labels shall have on them the settings for the devices. Water heater shall be provided with a drain valve and the in-coming cold water line shall be provided with a vacuum relief valve located above the top of the heater. The connection shall have an air gap or no less than 2 inches. The water heater shall be UL listed.

7-21.2(8) SUMP PUMP

The contractor shall furnish and install four sump pumps (two at each pier) and corresponding discharge piping with all accessories. These shall be located and installed as shown on the plans.

Each sump pump assembly shall have the following characteristics:

1. Weil 2558 2 inch Heavy duty submersible wastewater pump or equivalent
2. Bronze impeller, type 300 stainless steel shaft.
3. Capacity: 50 gpm at 60 ft. head (minimum).
4. Air Filled Hermetically Sealed Motor: 5 horsepower, 480 V, 3 phase.3450 RPM
5. Double mechanical seals.
6. Double sealed grease lubricated ball bearings.
7. Cast iron construction.
8. Max sphere 2 inch.
9. Floor-mount.
10. Pump shall be rated at 120 degrees F. continuous, 150 degrees F. intermittent.
11. Three mercury float switches for pump “on”, pump “off” and high water alarm. (Provisions shall be made for “high water remote alarm indication at the enunciator panel in the control house)
12. Float control assembly shall include support pole, clamps and (floor or wall) mounting brackets. All of stainless steel construction.

Pump control Panel shall be located as designated in the plans and shall have the following characteristics:

1. Control Panel in NEMA 4X Wall mount Enclosure
2. Overload Protection
3. Motor Contactor
4. 480/120V control transformer
5. High water horn and light with silencing switch and reset
6. Dry contact for remote high water alarm
7. Padlocking hasp
8. Hour meter
9. UL listed

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All equipment shall be furnished and installed to suit the pump and the electrical system. This shall include all support brackets, piping, check valve, gate valve, float switches, sleeves, anchors, hangers, etc. for a complete and ready to operate installation. All conduits, electrical starters, controls, boxes, wiring, cables and other equipment required to extend the necessary circuits from the control house to the respective components shall be furnished and installed as specified elsewhere in these Special Provisions. The Contractor shall coordinate all requirements for operation under all ambient conditions and for accessing the equipment.

All apparatus for controlling the operation of the sump pump system and specified elsewhere in these Special Provisions

7-21.2(9) PIPE SUPPORTS

Piping Supports - Construct piping supports of ASTM A709 Grade 36 material and hot dip galvanize per ASTM A153.

7-21.2(10) MISCELLANEOUS

Contractor shall provide all required couplings necessary to transition from different type of piping material in sewer system. Couplings shall be sized as required.

7-21.3 CONSTRUCTION REQUIREMENTS

7-21.3(1) WARRANTY AND QUALITY CONTROL

All manufacturers shall warrant all products and associated hardware to be free of defects in material and workmanship for a period of five (5) years from the date of final acceptance. Final Acceptance shall be in accord with the Standard Specifications. Any defect within this period shall be repaired or replaced by the Manufacturer, at total cost to the Manufacturer, including labor, parts, and transportation. The Contractor shall provide letters to the suppliers with copies to the Engineer, identifying the scheduled date of final acceptance of the bridge and therefore the date the warranty shall begin. If the date of final acceptance is extended, it shall be the Contractor's responsibility to extend the commencement of the warranties from the suppliers at no cost to the Department.

7-21.3(2) INSTALLATION

Contractor shall field verify all locations where the water, sewer, and sump pump piping are to be installed to ensure piping will maintain as straight a line as possible.

Contractor shall install water line expansion compensators and supports as required to accommodate the expansion and contraction of the copper water line for a minimum temperature change (rise/drop) of 60 degree F at ambient temperature of 60 degree F during installation. Piping at the compensators must be properly guided and anchored per the recommendations of the Expansion Joint Manufacturers Association.

PVC piping shall be stored prior to installation on racks to provide continuous support to prevent sagging. No sharp edges or heavy objects shall come into contact with the piping or fittings. Piping shall not be subjected to excessive heat prior to or during installation.

PVC piping shall be installed and joined as per the pipe manufacturer's specifications and as specified herein for PVC joints using solvent cement.

Where flanges on PVC pipe are required, the Contractor shall install flanges using solvent cement and shall use full-face flat-type gaskets between flanges.

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Cutting of PVC pipe shall be square cuts at pipe ends, the inside diameter shall be deburred and the outside diameter for the PVC pipe shall be beveled to the manufacturer's requirements.

All horizontal portions of above ground piping shall be supported using reinforced insulation as previously specified so that the weight of the pipe will not crush the insulation at the supports. A wear shield shall be placed between each horizontal support and the PVC insulation jacket. The wear shield shall be secured to the jacket utilizing stainless steel clamps.

All supports for vertical portions of piping shall be directly fastened to the piping prior to the installation of the insulation. The Contractor shall include additional supports as required to accommodate thrust loads at all elbows and turns. Additional extraneous loads on the piping such as cleanouts and valves shall be properly supported.

Prior to the installation of the insulation, the Contractor shall install and secure the two heat trace lines including accessories, as provided elsewhere in these Special Provisions, to the water and sump pump piping. The heat trace shall be loosely wrapped around the pipe expansion joints to ensure free movement of the joints.

The Contractor shall install insulation on all portions of the water and sewer piping except for the vent piping and cleanout extensions that may remain exposed. Insulation shall not be installed over any fittings or joints until that section of piping has been tested and accepted.

7-21.3(3) TESTS AND DISINFECTION

The Contractor shall not enclose, cover or put into operation the water or sewer piping systems until they have been inspected, disinfected (water only), and approved by the Engineer or other duly authorized representative. The Contractor shall give two (2) weeks notice to the Engineer prior to performing any tests.

Testing of the water, waste and vent line shall be in accordance with the procedures of the authority having jurisdiction or, in the absence of a published procedure in accordance to the Plumbing Code.

Disinfection of the water lines shall be in accordance with the Plumbing Code or the Authority having jurisdiction.

The Contractor shall furnish all labor, materials and equipment necessary to perform the above pressure testing and disinfection.

7-21.4 MEASUREMENT

Control Bascule Plumbing contains the following approximate quantities of material:

Item	Approximate Quantity
XXXXXXXXXXXX	XXXX

The quantities are listed for the convenience of the Contractor in determining the work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than approved changes will be made in the lump sum contract price for the Control Bascule Plumbing System even though the actual quantities required may deviate from those listed.

7-21.5 PAYMENT

NOT FOR CONSTRUCTION

See the Payment Paragraph of Section 8-26, for payment of “Control Bascule Plumbing".

Add the following new Section:

(*****)

7-22 SPECIAL SOIL MIX (BIORETENTION SOIL)

7-22.1 DESCRIPTION

Section 7-22 describes work consisting of the installation of Bioretention Soil in swales and raingardens intended to receive surface runoff for infiltration.

7-22.2 MATERIALS

Materials for bioretention soil will be specified in the Contract and consist of one or more of the following:

Special Soil Mix (Landscape Bioretention Soil) 9-14.1(3)B

7-22.3 CONSTRUCTION REQUIREMENTS

7-22.3(1) GENERAL

Bioretention soil shall be protected from all sources of additional moisture at the Supplier’s site, in covered conveyance, and at the Project Site until incorporated into the Work. Soil placement and compaction shall not occur when the ground is frozen or excessively wet (3% above optimum moisture content), or when the weather is too wet as determined by the Engineer.

When the Contract specifies testing by a Contractor provided testing laboratory, the laboratory must be an STA, AASHTO or ASTM or other designated recognized standards organization accredited laboratory with current and maintained certification. The testing laboratory shall be capable of performing all tests to the standards specified, and shall provide test results with an accompanying Manufacturer's Certificate of Compliance.

7-22.3(1)A SUBMITTALS

At least 10 Working Days prior to placement of Bioretention Soil, the Contractor shall submit to the Engineer and the SPU Materials Laboratory, (insert address), for approval:

1. Grain size analysis results of Mineral Aggregate performed in accordance with ASTM D 422, Standard Test Method for Particle Size Analysis of Soils;
2. Quality analysis results for compost performed in accordance with Seal of Testing Assurance (STA) standards, as specified in Section 9-14.4(9);
3. Organic content test results of mixed bioretention soil. Organic content test shall be performed in accordance with Testing Methods for the Examination of Compost and Composting (TMECC) 05.07A, “Loss-On-Ignition Organic Matter Method”;
4. Modified Proctor compaction testing of mixed bioretention soil, performed in accordance with ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort;
5. A description of the equipment and methods to mix the Mineral Aggregate and compost to produce bioretention soil;

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6. Permeability or hydraulic conductivity testing of the bioretention soil, performed in accordance with ASTM D 2434, Standard Test Method for Permeability of Granular Soils. For the landscape bioretention soil assume a relative compaction of 85 percent of modified maximum dry density (ASTM D 1557); and
7. Provide the following information about the testing laboratory(ies):
   a. name of laboratory(ies) including contact person(s),
   b. address(es),
   c. phone contact(s),
   d. e-mail address(es);
   e. qualifications of laboratory and personnel including date of current certification by STA, ASTM, AASHTO, or approved equal.

7-22.3(2) BIORETENTION SOIL CONSTRUCTION

The Contractor shall not start bioretention construction until the Project Site draining to the bioretention area has been stabilized and authorization is given by Engineer.

At the locations shown on the Drawings, excavate, grade, and shape to the contours indicated to accommodate placing of bioretention soil to the thicknesses required. Dispose of excavated soil or reuse elsewhere as the Contract or Engineer will allow. Scarify the subgrade soil a minimum of 2 inches deep where slopes allow, as determined by the Engineer prior to placing bioretention soil.

Mixing or placing bioretention soil shall not be allowed if the area receiving bioretention soil is wet or saturated or has been subjected to more than ½-inch of precipitation within 48-hours prior to mixing or placement. The Engineer will have final authority to determine if wet or saturated conditions exist.

Place landscape bioretention soil loosely. Final grade shall be measured only after the soil has been water compacted, which requires filling the cell with water, without creating any scour or erosion, to at least 1 inches of ponding. If water compaction is not an option, final grade shall be measured at X inches above the grade specified on the plans to allow for settling after the first storm. X shall be calculated by depth of soil x 0.15 and rounded up to the nearest whole number.

7-22.4 MEASUREMENT

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs here in this Section.

Measurement for Special Soil Mix (bioretention soil construction) will be by per cubic yard.

7-22.5 PAYMENT

Compensation for the cost necessary to complete the Work described in Section 7-22 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

"Special Soil Mix (Bioretention Soil Construction)" per cubic yard.

The Bid item price for "Bioretention Soil Construction" shall include all costs for the work necessary to furnish, place, compact, excavate, grade, shape, mix, and dispose of bioretention soil.

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DIVISION 8
MISCELLANEOUS CONSTRUCTION
8-01 EROSION CONTROL AND WATER POLLUTION CONTROL

8-01.1 DESCRIPTION

Section is supplemented with the following:

(*****)

Section 8-01 describes work also consists of furnishing, installing, maintaining, removing, and disposing of temporary erosion and sediment controls to prevent erosion and scour, to treat sediment laden and contaminated water for acceptable discharge, and to prevent the conveyance of sediment into surface waters, drainage systems, and environmentally critical areas.

8-01.3(1) GENERAL

Section is supplemented with the following:

(*****)

Discharge of petroleum products, hydraulic fluid, fresh cement, desiment-laden water, chemicals, or any other toxic or deleterious materials leaching or entering into surface runoff or the river, is prohibited. Any discharge of this kind shall immediately be reported to the Engineer. The Contractor shall have on-site and ready for use a spill prevention plan including, a containment plan. All equipment shall be inspected and maintained in proper working condition within the project site. Any equipment leaking fluids, shall not be allowed near the river and must be repaired immediately and before further use.

There shall be no visible sheen of petroleum products in receiving water as a result of construction activities.

All cement concrete shall be poured in the dry, or within confined waters not being dewatered to surface waters, and shall be allowed to cure a minimum of 7 days before contact with water. The waters of the state shall not come in contact with the concrete structure while concrete is curing. Any dewatering required from a contained area with curing concrete shall be discharged to land or tanks with no possible entry to surface waters. The Contractor shall be responsible for contacting the local agency and obtaining sewer discharge permits for discharge into a public or private sewer system.

The Contractor shall comply with the water quality criteria specified in chapter 173-201A WAC, and RCW90.48 Water Pollution Control. Failure to comply with the State's Water Quality Standards may result in the issuance of civil penalties or other actions, whether administrative or judicial.

For work in or near the water, the Contractor shall meet all State Water Quality Standards.

Adjacent downstream properties shall be protected from sediment deposition from wind or water action. All sediment control devices including sediment ponds, perimeter silt fencing, and other sediment trapping BMPs shall be installed before ground disturbance and grading commences.

All temporary conveyance channels and pipe outlets shall be stabilized to prevent erosion.

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All construction access routes that are subject to water or wind erosion shall be stabilized. Material used to construct road approaches to the site shall be a clean composition and placed in a manner to prevent erosion and tracking out of the material offsite.

All temporary BMPs and accumulated sediments shall be removed or stabilized immediately after final site stabilization and completion of the Contract.

Under no circumstances shall freefall dumping or direct excavation of fill or cut material occur in or next to any water body unless control structures are in place to prevent sediment from directly entering the water body.

All lumber treated with creosote or other protected material shall be completely dry before use in or near the waterway.

In general, Work involving erosion and sedimentation control within The City of Seattle limits shall comply with

Section 1-07.15. Work involving erosion and sedimentation control within Seattle's Rights - of-Way not within The City of Seattle limits shall also comply with the requirements of the local jurisdiction. In general, in doing the Work, the Contractor shall address measures that:

1. Prevent and control erosion and sedimentation processes,
2. Prevent and control scour and scour processes in water bearing channels,
3. Prevent transport of sediment,
4. Protect surface waters and drainage systems from entry of sediment and other construction byproduct,
5. Prevent erosion and sedimentation impacts to areas not designated for Work and
6. Coordinate erosion and sedimentation controls with scheduling of the Work. Such measures may include, but not be limited to, one or more of the following:

    a. Installing temporary ditches, berms, culverts, and other measures to control and redirect surface waters;
    b. Installing temporary dams, settling basins, energy dissipaters, and other measures to detain water, prevent scour, and allow for sediment drop and controlled removal;
    c. Installing measures controlling surfacing groundwater and dewatering discharges;
    d. Installing temporary covers or otherwise protecting slopes, stockpiles, and exposed or disturbed soils from erosion and sediment producing processes;
    e. Installing temporary work area perimeter and sediment transport prevention measures, such as silt fence, wattle, filter, and berm;
    f. Treating sediment laden waters, and removing and disposing of sediment, Installing sediment and debris removal controls for equipment entering and leaving designated Work areas, and
    g. Installing temporary fencing, flagging, and other markings at boundaries of areas identified as not part of the Work.

8-01.3(1)A <u>SUBMITTALS</u>

Section is supplemented with the following:

(*****)

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Fugitive Dust Control Plan: The Contractor shall be responsible for the preparation and implementation of the FDCP to be used for the duration of the project. Six (6) copies of the plan shall be submitted to the Engineer for review and acceptance prior to commencement of any construction activities. The Contractor shall maintain a copy of the accepted plan with any updates, to be made available at the work site upon request.

The FDCP shall outline what measures shall be taken by the Contractor to prevent Fugitive Dust from being released into the air at the work site.

The FDCP shall also address at a minimum, the following project specific information:

1. Introduction
2. Site Information, such as project size, location, topography, and soil type
3. Management Information, such as identification of Contractor personnel responsible for maintaining and implementing the FDCP, and contact person in case of a complaint
4. Identification of all Fugitive Dust sources
5. Fugitive Dust control methods to be used for each Fugitive Dust source
6. Source and availability of materials to be used for controlling Fugitive Dust
   A schedule, rate of application, or calculations identifying how often, how much, and when the control method is to be used

8-01.3(1)B TEMPORARY EROSION AND SEDIMENT CONTROL (TESC) SUBMITTAL

At the preconstruction conference, the Contractor shall be prepared to discuss temporary erosion and sedimentation controls. Following the outcome of these discussions, the Certified On-Site-Erosion Control Lead (ESC Lead) shall prepare and submit a TESC Plan as indicated in the table immediately following, unless the Contract specifies otherwise or unless agreed to otherwise at the preconstruction conference.

In the following Table, NTPD = Notice To Proceed Date.

Contract Time (Working days)	First TESC Plan Submittal	Final TESC Plan Submittal	Comment
30	See Final TESC Plan Submittal	TESC Plan for all Work is due on NTPD	Allow 5 Working Days for Engineer Review
30 and 100	TESC Plan for first 15 Working Days is due within 5 Working Days of NTPD	TESC Plan for all Work is due within 10 Working Days of NTPD	Allow 10 Working Days for Engineer Review
100	TESC Plan for first 30 Working Days is due within 10 Working Days of NTPD	TESC Plan for all Work is due within 30 Calendar Days of NTPD	Allow 15 Working Days for Engineer Review

The TESC Plan shall show, as it relates to the Contractor's critical path schedule, the scheduling of installation, maintenance, phasing, and removal of erosion and sedimentation controls as it relates to the Work. Unless the Contract specifies otherwise, work areas to be addressed in this plan include as applicable:

NOT FOR CONSTRUCTION

1. The Project Site identifying staging, storage, stockpiling, non-Work boundaries, and other constructionrelated areas;
2. Areas beyond the Project Site;
3. Transportation facilities including construction traffic routes and access/exit control areas on and off the Project Site;
4. Environmental Critical Areas, as defined in Ch 25.09 SMC, within or near the Project Site, such as geologic hazard areas, flood prone areas, riparian corridors, wetlands, fish and wildlife habitat conservation areas, and abandoned landfills;
5. Inlets, catch basins, ditches and channels whether dry or water filled, and other surface drainage facilities;
6. Surface waters such as streams, lakes, and other bodies of water; and
7. Identify areas of erodible soil not being worked that may be exposed that may exceed 4,000 square feet, or may be unprotected or uncovered for more than 2 calendar days.

The TESC Plan submittal shall include, but not be limited to, one or more of the following as the Contract may require, as the Work may require, and as the Work is scheduled:

1) Describe with Shop Drawings of sufficient scale and detail showing the Project Site, and the locations and types of temporary erosion and sediment controls. As necessary, show by a series of time sequence Shop Drawings, how TESC controls are to be installed, maintained, removed and coordinated with the Work and the progress schedule;
2) Describe how non-work areas will be identified and protected;
3) Describe the details and continuing maintenance of entrance and exit equipment wash areas;
4) Show locations with cross-sections as applicable and describe control details of existing and proposed ditch,berm, Culvert, pipe, sediment basin, basin outfall, scour control, inlet, catch basin, drain, bypass, subsurface drain and related feature;
5) Describe treatment processes for, controls of, and the disposal of waters resulting from dewatering, surfacing groundwater, and rainfall;
6) Describe protections and covering practices for stockpile, muck, and related deposits;
7) Describe the controls to prevent sediment, debris, and other pollutants from entering surface waters and drainage features;
8) Provide Manufacturer's Certificate of Compliance, certified laboratory test reports, catalog cuts, samples, and other information providing adequate description of Supplies and Material proposed for TESC applications;
9) The name of the Certified On-Site Erosion Control Lead (ESC Lead), qualifications, experience, and certifications directly related to temporary erosion and sediment control, and other information as the Contract and the Work may require, including how to timely contact. If the Work is of such a magnitude that requires additional help, describe the qualifications of additional help, any on-site training that may be necessary, and frequency and type of reporting to the ESC Lead;
10) A schedule of typical inspections ensuring timely maintenance and repair;

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11) Identify and provide timelines for submitting permit required or related documentation;
12) Provide details of seed mix, amendment, mulch, and protections for placing and establishing temporary seeded erosion control areas;
13) In areas where exposed erodible soil exceeds 4000 square feet or that may be unprotected for more than 2 calendar days, describe the controls and the proposed monitoring ensuring erosion and sedimentation shall not become non-compliant; and
14) Provide details of other TESC measures indicated in Section 8-01 as may be used in the Work.

The Contractor shall have at a designated location at the Project Site, and the ESC Lead shall have immediately available, copies of the current TESC Plan.

8-01.3(2)B SEEDING AND FERTILIZING

In reference to this Section, seed and fertilizer shall be placed at the rate, mix and analysis specified herein or as designated by the Engineer.

Section is supplemented with the following:

(*****)
Seeding: The following seed mix shall be furnished at the rate described below:

Erosion Control Seed Mix

Name	Proportion by Weight	Proportion by % Purity	Proportion by % Germination
Chewing Fescue (Banner) *Festuca rubra*	50%	95%	90%
Perennial Rye (Derby or Pennant) *Lolium perenne*	45%	95%	90%
Redtop Bentgrass *Agrostis alba*	5%	95%	90%

A slurry consisting of seed, fertilizer, mulch, and water shall be uniformly applied over all disturbed areas within easements and rights-of-way unless directed otherwise. Seed shall be applied at the rate of 120 pounds per acre.

When seeded by hand, seed shall be applied at the rate of five pounds per 1,000 square feet. The seed shall be evenly distributed over the disturbed area after application of fertilizer. The seed shall be raked into the surface soil to a depth of 0.25 inches and lightly irrigated by hand.

The hydroseeding method of application shall be used for all bioswale seeding. Seed shall be applied at a rate of 100 pounds per acre. For summer applications, “Stay Moist” moisture retention agent, or an approved substitute, shall be added to the seed mix and applied at a rate of 40 pounds per acre, or as directed by the Engineer.

Fertilizing: Fertilizer shall be applied to all areas that are seeded. Fertilizer of the following proportions and formulations shall be used:
Total Available Nitrogen N 10% (of which 50% is derived from 38% slow

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release urea)

Available Phosphorus	P_2O_5	4%
Available Potassium	K_2O	6%

All percentages are by weight

Fertilizer shall be applied at the rate of 200 pounds per acre. Fertilizer shall be incorporated into the seed, mulch and water slurry and shall be applied as specified under "seeding". In the event that additional fertilizer is required to establish a uniform, healthy, thick stand of grass, the Engineer shall determine the method and rate of application.

Where hydroseeding is not practical and approved hand methods are used, fertilizer shall be applied at the rate of 5 pounds per 1000 square feet. It shall be raked into the surface to a depth of one inch.

Add the following new Section:

(*****)

8-01.3(2)D1 STRAW MULCH

Straw mulch used for covering exposed earth as a temporary erosion control measure shall be derived from harvested wheat or alfalfa plant stalk (no hay from grass source). The straw shall be seasoned (an air dried condition) free from noxious weeds, seeds or other undesirable materials prior to loading and delivery to the site. The straw shall be suitable for spreading by mechanical means or by hand methods as a temporary erosion control measure.

The Contractor shall be responsible for providing and placing the straw in areas noted on the Plans and as directed by the Engineer. Straw may be spread mechanically or by hand to provide a uniform coverage of three-inch depth. Straw spread by hand from straw bales shall not cover more than 150 square feet of exposed area. The Contractor shall maintain the temporary three-inch mulch covering throughout the time the straw mulch is in place until the areas are stabilized as determined by the Engineer. All straw placed prior to seeding shall be removed at time of seeding to ensure a good seed to soil contact.

Add the following new Section:

(*****)

8-01.3(9)E TEMPORARY SEDIMENT TRAP

Temporary sediment trap shall be installed in accordance with TESC Plan or manufacturer's recommendations in the areas indicated on the Plans. See Section 7-05.3(5)H. Temporary Sediment Vault/Trap and Sump.

Add the following new Section/Paragraph:

(*****)

8-01.3(17) CHITOSAN ENHANCED SAND FILTRATION

The water pollution and erosion control items shall include the use of a portable stormwater filtration system. The Stormwater Treatment system shall include a Chitosan-Enhanced Sand Filtration (CESF) system furnished to assure water quality meets minimum

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requirements. The CESF system shall have a General Use Level Designation authorized by the Washington State Department of Ecology. The system shall be designed, operated, and maintained in accordance with the conditions applicable to its General Use Level Designation.

Submit a treatment system operations plan to the Engineer including... XXX

Each portable plant shall include pressurized sand filter composed of three or four individual filtration chambers. CESF systems shall be designed and operated at a flow rate not to exceed 15 gpm per square foot of sand bed filtration area and should employ a minimum of 3 sand filter pods to ensure adequate backwashing capacity. Each portable plant shall be able to operate at a minimum treatment capacity of 500 gpm.

The filters shall be equipped with a programmable, electronic, automatic backwash control system activated by differential pressure, time interval, or continuous operation. Backwash piping shall include a spigot or sight glass that allows the system operator to verify that no sand filter media is flushed out during backwash cycles. The CESF system treated water output shall be equipped with an automatic integrated turbidity and pH sensors capable of shutting the system down if output turbidity or pH exceed preset values. An audible alarm and warning light will be installed on the treatment system to alert the operator in the event of a system failure. The Contractor is encouraged to include a computerized controller to automatically adjust chitosan dosage based on turbidity, flow, and pH.

Provide flow and water quality monitoring... XXX

Document operations of Stormwater Treatment System... XXX

Operators shall be trained... XXX

The only filtration media approved is pre-washed 0.6 mm (#30) crushed silica sand with a mean effective sand size of 0.34 mm and a filtration quality mesh of 230-400. Minimum sand bed depth shall be 18-inches underlain with a minimum of 6-inches of 1-inch) crushed rock. An intermediate mesh-size garnet may be added to enhance performance.

The liquid chitosan is most effective in treating stormwater runoff with a pH between 6.5 and 8.5. If pH limits are outside the above limit, neutralization is required prior to the use of liquid chitosan. Dosage is dependent upon introduction time, operational flow rate and turbidity. The dosage range chitosan acetate shall not exceed manufacturer's recommendations or the conditions applicable to its General Use Level Designation. Jar tests will be conducted, as needed, to confirm the dosage level of liquid chitosan.

The liquid-chitosan metering pump, liquid chitosan concentrate, and CESF system instrumentation shall be enclosed in a secure, covered structure maintained at a temperature above 40 degrees Fahrenheit with a locking door. The liquid chitosan concentrate, metering pump, and related tubing shall be kept in secondary containment area. The metering pump pressure tubing shall have an anti-siphon valve. Chitosan injection shall be performed with an LMI-brand C77, high Viscosity pump head, electric metering pump, or equivalent. The metering pump discharge tubing shall have an anti-siphon valve. The liquid chitosan-metering pump shall be capable of maintaining a minimum 12 -gallons per hour gph at 80 psi.

The CESF system shall include a flow-regulating valve on the input to and output of the sand filter. These regulating valves will reduce the maximum output of the pump as required and facilitate proper backwash.

All influent and treated effluent piping shall be provided and sized in accordance with the manufacturer's recommendations.

General Use Level Designations have been issued for systems discharging chitosan acetate treated water from holding ponds to surface water by Natural Site Solutions and by HaloSource for CESF technology utilizing StormKlear™ LiquiFloc™ Chitosan Acetate; by

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Dungeness Development Associates for CESF technology utilizing ChitoVan™ Chitosan Acetate; and by Clear Creek Systems Inc. utilizing FlocClear™ Chitosan Acetate.

The Contractor shall provide one or more generators or other uninterruptible power source as necessary to operate all pumps and other electric components concurrently.

Add the following new Section/Paragraph:

(*****)

8-01.3(18) <u>CONTAMINATED GROUND WATER TREATMENT</u>

Contaminated groundwater shall be removed from the ground XXX way and treated XXX way.

Add the following new Section/Paragraph:

(*****)

8-01.3(19) <u>SPILL PROTECTION NET</u>

Install spill protection net to enclose all in-water work areas that generate turbidity, XXX.

Maintain spill protection net during the duration of Work. Inspect every XXX. Patch or replace damaged sections within 24 hours of discovery.

Remove Spill protection net upon completion of in-water work.

Add to the following Section:

8-01.3(2)D MULCHING

Straw mulch shall be used to cover all exposed soil areas not covered with plastic, or erosion control netting, or soil stabilization materials. This work shall include all tools, materials, labor, and equipment to spread straw mulch over exposed surfaces.

Straw mulch erosion control application shall be with a forced air mulch spreader. In spreading straw mulch, the spreader shall not cut or break the straw stalks into lengths less than 2 inches. Straw mulch coverage shall have a minimum thickness of 2 inches. Where a forced air equipment mulch application is indicated as providing unacceptable results, the Contractor shall employ manual or other application methods such as hand spreading and raking.

Should the straw mulch coverage expose at any time bare ground of more than 50% in any 100 square foot area, then the Contractor shall promptly remulch the exposed area to full coverage of the thickness required.

8-01.3(5) PLACING PLASTIC COVERING

Section is deleted and replaced with the following:

(*****)

Stockpiles, areas with no vegetative growth, areas where vegetative growth is to be inhibited, and areas with disturbed soil may be covered with black plastic covering. Sandbag or similar ballast shall be placed on the cover in a grid with no less than 5 foot spacing in two

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right angle directions. At all ends without overlap, ballast shall be placed within 12 inches of the edge and spaced no more than 5 feet along the perimeter.

Clear plastic covering shall cover areas where the growth of vegetation is not to be inhibited. With the exception of stockpiles, plastic covering sheets shall be installed with the long axis parallel with slope contours. The upper edge of the fabric shall be placed into a 12-inch wide by 6-inch deep anchor trench and backfilled with native soils tamped into place. Upper slope fabric shall overlap downslope fabric in the anchor trench a minimum of 12 inches. Along the same contour, the ends of new fabric shall overlap in-place fabric a minimum of 24 inches.

In general, ballast shall be placed on the cover using sandbags or similar ballast distributed over the cover in a manner to prevent uplift, slippage, and any other movement of the cover. Spacing of ballast shall be not more than a 10-foot grid in line with and against the long axis of the sheet. All overlaps, edges, and corners shall be ballasted. On steep slopes and where slippage of ballast or ballasted fabric is indicated, the ballast shall be secured in-place by rope tied to upslope anchors firmly set in the earth.

Within the dripline of trees, excavation of anchor trenches will not be allowed. Rather, ballast shall be placed on the fabric and on the overlaps secured by rope tied to anchor stakes upslope of the dripline area.

Rips and tears shall be timely repaired by placing additional covering over the defect with a minimum 24 inch overlap in all directions from the defect. The repair shall be ballasted with a spacing in any direction of no more than 5 feet and along all edges and at all corners. Ballast shall be anchored to upslope stakes.

Uplifted areas shall receive additional ballast resulting in reduced ballast spacing. Areas where covering has slipped and the underlying surface becomes exposed shall be timely repaired in the same manner as rips and tears.

Clear plastic covering intended to cover a vegetated surface without long term inhibiting effects shall require frequent monitoring ensuring permanent damage is not occurring. Should vegetative degradation be indicated, the Contractor shall amend the cover practice to a condition not detrimental to the vegetation.

8-01.3(9)A SILT FENCE

Section is supplemented with the following:

(*****)

Silt fences shall act as a filter to both allow the passage of water through the fence and also to prevent the passage of sediment through, under, or over the fence. Silt fences shall be either in-place before the area is disturbed, or shall be coordinated with beginning soil disturbance activity.

Silt fence(s) shall be constructed at locations downstream or downslope of surface runoff areas, and upstream or upslope of surface bodies of waters. Silt fences shall be spaced to account for grade of slope, runoff flowrate and velocity, sheeting and rilling, type and relative density of soil(s), rate of sediment loading, expected maintenance type and frequency, and other factors as the site and Work require. Silt fences shall not be placed across or in streams, channels and ditches.

Silt fences shall be located along contours with the ends turned uphill to capture runoff and prevent flow around the end of the fence. Where the installation requires crossing of contours in areas other than at the ends, gravel check dams shall be placed perpendicular to the uphill face of the fence to minimize concentrated flow and erosion along the fence.

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The gravel check dams shall be approximately 1 foot deep at the fence and shall continue perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface. The gravel check dams shall consist of crushed surfacing base course gravel backfill for walls, or shoulder ballast. The gravel check dams shall be spaced at intervals not exceeding 10 feet along the fence where the fence crosses contours. The slope of the fence line where contours are crossed shall not be steeper than 3H:1V.

The height of the fence fabric, the geotextile, above ground surface shall be 30 inch minimum and 36 inch maximum.

Posts shall be of a length to be installed to a depth and with a spacing to withstand maximum loading for the durations estimated between sediment removals. Unless the Contractor can justify otherwise to the Engineer, posts shall be installed to a minimum 30 inch depth, except as specified below within the dripline of tree, and shall be spaced within a fence line of not greater than six (6) feet. Where required post depth penetration cannot be obtained, the posts shall be adequately secured on the upslope side by bracing or guying to an adequately installed anchor to prevent overturning. Posts shall be either wood or steel. Wood posts shall have minimum dimensions of 1-1/4 inch by 1-1/4 inch and shall be white oak or other hardwood resistant to rot, and with no defects. Steel posts shall consist of U, T, L, or C shape posts with a minimum weight of 1.33 pounds per foot, or other steel posts having equivalent or greater strength and bending resistance than those listed in this paragraph.

The fence fabric and support backing systems shall be attached on the up-slope side of the posts with staples, wire, hog rings, or other connection device as recommended by the manufacturer, in a manner that does not tear or damage the fabric. At the bottom of the fence, the fabric and support backing system shall be buried at least 6 inches below the ground

surface, and then backfilled with native soils compacted by tamping or other appropriate compaction methods. Excavation for installation of silt fence within the dripline of trees, and around other vegetation to be retained, shall be without damage to roots. Roots that are exposed shall not be damaged and shall be promptly covered with earth. Where the bottom of fabric and support backing cannot be installed to a 6 inch depth due to interference with roots, the fabric and backing shall be placed flat on the upside of fence for a minimum 12 inch width and then covered with a minimum 6 inch depth of large size aggregate ballast. In non-trench fabric bottom installations, post penetrations into the earth shall be increased and the height of fence above the top of ballast shall not exceed three (3) feet. Fence support backing system, in the form of wire or plastic mesh with maximum mesh spacing of 2 inch by 4 inch and of adequate strength to withstand maximum loading, shall be attached to posts and fabric as recommended by the Supplier. Plastic mesh shall have the same or greater ultraviolet (UV) resistance as the geotextile fabric. All geotextile fabric shall have backing whether exposed or buried. Fence fabric shall be continuous along any single length of filter fence. Continuous fence is defined as follows:

a. The geotextile fabric may be sewn together at the point of manufacture or by the Supplier to form a single length of geotextile for a continuous fence application. All sewn seams shall be located at a support post.

b. Separate geotextile fabric may installed across posts with a minimum 10 foot overlap where the overlap is supported by no less than three (3) posts with spacing between any posts not greater than 4 feet.

c. Overlapped fabric shall always be secured to support backing.

b. The Contractor may place 2 posts, one on each side of the overlapped fabric and backing, and twist the overlapped fabric at least 2 complete revolutions

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before driving the posts into the earth. The overlaps shall extend a minimum one (1) foot beyond the 2 posts before twisting. Lapped or twisted fabric and backing that slip shall be considered defective and shall be replaced with sewn geotextile. For pre-staked silt fence, laps may be performed in accordance with the manufacturer's written recommendations.

Add the following new Section:

(*****)

8-01.3(20) <u>INTERCEPTOR DITCH</u>

Interceptor ditch shall be constructed as indicated on Plans.

Interceptor ditch bottom and sides shall be lined with quarry spalls and the quantity of Quarry spalls used for the lining shall be considered incidental to the unit bid price for interceptor ditch as in accordance with Section 9-13.6.

Check dams shall be installed along the length of the interceptor ditch as indicated in the plans. Check dams shall be rock in accordance with Section 8-01.3(6)B.

Add the following new Section:

(*****)

8-01.3(21) CHITOSAN TREATMENT SYSTEM

Sediment Best Management Practices and minimum requirements shown in the Plans for preventing discharge of turbid waters and sediments to the waterway shall be implemented during all phases of this project. This work shall include creating and submitting as part of the SWPPP a stormwater treatment system operation plan. The plan shall include maintenance schedule, names, phone numbers, and people responsible for operating the system, checking treatment quality, cleaning the system, delivering materials (chemicals) tracking lot numbers, chemical use, set up, and relocation of the treatment system to accommodate construction phasing. This work item includes providing portable above ground tanks, sediment storage, contaminated groundwater storage tanks, and other containment systems

Add the following new Section:

(*****)

8-01.3(22) DEBRIS CONTAINMENT SYSTEM

A woven geotextile (moderate survivability) for underground drainage on top of a 40 mill construction geotextile for underground drainage shall be constructed under the decking to contain debris on the temporary trestles. The fabric and liner shall be supported, maintained overlapped, and tears shall be patched. The fabric and liner shall and drain back to land and runoff shall be collected for sediment removal. All piping, treatment, hauling, pumping materials, and labor to install and maintain the debris containment system shall be considered part of this bid item. This bid item also includes the fabrication relocation, maintenance of erosion control aprons that shall be used to prevent material from falling into the river while excavation, constructing, backfilling, and draining the coffer dams.

Add the following new Section:

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(*****)

8-01.3(23) TEMPORARY EROSION CONTROL SHEETING

The Contractor shall provide a design and shop drawings that shall be sealed by a Structural Engineer and approved by the Engineer for shoring and preventing river water from entering the work area. The Contractor shall provide all materials, labor, and equipment to install and maintain a leak proof barrier to perform work and prevent sediment from entering the river.

8-01.4 MEASUREMENT

The thirteenth paragraph is deleted and replaced with the following:

(*****)

Seeding, fertilizing, liming, mulching, mowing, and soil binder or tacking agent will be measured in acres by ground slope measurement or through the use of design data. When shown in the proposal as a lump sum item no specific unit of measurement will apply to the item of seeding, fertilizing, and mulching.

Section is supplemented with the following:

(*****)

Chitosan Enhanced Sand Filtration will be measured per lump sum.

Contaminated Ground Water Treatment will be measured per million gallons of groundwater treated.

Spill Protection Net will be measured per square yard.

Interceptor ditch will be measured per linear foot along the ground line of the completed ditch.

Straw Mulch will be measured per square yard by ground slope measurement or through the use of design data

Chitosan Treatment System shall be measured as Lump Sum.

Debri Containment System shall be measured per square yard.

Temporary Erosion Control Sheeting per linear foot.

8-01.5 PAYMENT

Section is supplemented with the following:

(*****)

"Raingarden Seeding", per square foot.

"Seeding, Fertilizing and Mulching", peracre.

"Chitosan Enhanced Sand Filtration", per lump sum.

The lump sum Contract price for "Chitosan Enhanced Sand Filtration" shall be full pay for installing and operating the Chitosan Enhanced Sand Filtration stormwater treatment system during the duration of the Work then removal from the site after it is determined to be no longer needed. This includes configuring the conveyance or transfer system between the plant and storage tank or other BMPs as well as site preparation, connection piping, pre-treatment weir tanks, sand filter backwashing, and operator training, start-up testing, maintenance, equipment rental, and materials necessary to provide a fully functional facility.

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This includes stormwater treatment system operation and monitoring as well as power, chemicals, chitosan, and waste and backwash removal during operation.

"Contaminated Ground Water Treatment", per million gallons (MGAL).

The Unit Contract price for "Contaminated Ground Water Treatment" shall include XX, XX, XX

"Spill Protection Net ", per square yard.

The Unit Contract price for "Spill Protection Net" shall include installation, maintenance, repair, removal and disposal of Spill Protection Net.

"Interceptor Ditch", per linear foot.

The Unit Contract price for "Interceptor Ditch" shall include all costs associated with constructing, maintaining, and removing the interceptor ditch and check dams within the ditch.

"Temporary Sediment Trap", per each.

The Unit Contract price for " Temporary Sediment Trap" shall include all costs associated with constructing, maintaining, and removing temporary sediment trap.

"Straw Mulch", per square yard.

The Unit Contract price for "Straw Mulch" shall include furnishing, installation, maintenance, and reapplication if disturbed during the Work.

"Debris Containment System", per square yard.

"Temporary Erosion Control Sheeting", per linear foot.

8-02 ROADSIDE RESTORATION

8-02.1 DESCRIPTION

Section is supplemented with the following:

(*****)

This work shall consist of removing and disposing of buried man-made or manufactured debris that may be encountered during soil amendment incorporation included in the contract. Such debris shall be removed to a maximum depth of two feet. The excavated debris shall be removed from the project site to an approved disposal facility.

8-02.3(1) RESPONSIBILITY DURING CONSTRUCTION

Section is supplemented with the following:

(NWR June 5, 2000)

For all planting areas, the Contractor shall perform work in a manner that minimizes displacement and compaction of the existing soil. Work will be stopped if, in the opinion of the Engineer, construction method, soil moisture content or other condition will result in displacement of the existing soil horizon (such as ruts over 3 inches deep), or compaction of the soil. The Contractor will not be allowed to resume work until conditions improve or an alternate method of construction is approved by the Engineer.

8-02.3(2)B WEED CONTROL

Section is supplemented with the following:

(NWR January 17, 2006)

Unwanted Vegetation

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In addition to noxious weeds, unwanted vegetation within roadside and mitigation areas throughout the project limits includes Reed Canarygrass (Phalaris arundinacea), Purple loosestrife (Lythrum salicaria), Himalayan blackberry (Rubus discolor or R. procerus) and Evergreen blackberry (Rubus laciniatus), Scotch broom (Cytisus scoparius), Hedge bindweed (Calystegia sepium), Giant hogweed (Heracleum Mantegazzianum), Canadian thistle (Cirsium arvense), Butterfly bush (Buddleia spp.), Common reed (Phragmites australis) and Japanese knotweed (Polygonum cuspidatum).

The Contractor shall identify all target weeds, specific to the site, to be controlled in the Weed Control Plan in accordance with Section 8-02.3(2).

This list of unwanted vegetation is not a complete list of weeds to be controlled within the project limits. The site may also include other invasive and competitive vegetation, as determined by the Engineer, which shall be controlled as ordered by the Engineer.

8-02.3(3) PLANTING AREA WEED CONTROL

Section is supplemented with the following:

(NWR January 6, 2006)

Unwanted vegetation shall be as listed in Section 8-02.3(2)B.

(NWR January 17, 2006)

Prior to planting, unwanted vegetation within planting areas shall be chemically treated with an approved non-selective, non-residual herbicide. After a minimum of two weeks, the Contractor shall remove the dead woody vegetation at the ground level.

(NWR January 17, 2006)

The Contractor is advised that some planting areas may contain unwanted vegetation that is dense and mature. These areas may require additional efforts to accomplish the required planting area weed control and planting area preparation.

(NWR June 5, 2000)

For planting areas to receive soil amendment, grass and unwanted vegetation shall be chemically treated with an approved non-selective, non-residual, herbicide.

After a minimum of two weeks, the Contractor shall remove the dead woody vegetation at the ground level and incorporate the root structure and non-woody top growth into the existing ground surface along with the soil amendment.

No living vegetation shall be incorporated.

(NWR June 5, 2000)

The Contracting Agency has estimated the planting areas to be approximately *** $$32,600 square feet$$ ***.

This quantity is listed only for the convenience of the Contractor in determining the extent of the work involved.

8-02.3(4) TOPSOIL

Section is supplemented with the following:

(NWR January 17, 2006)

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The Contractor shall notify the Engineer a minimum of 10 working days prior to topsoil placement.

The Contractor shall place topsoil to a reasonable even grade without localized low areas which will hold water.

Approval and Acceptance

The Contractor shall submit for approval, 10 working days prior to beginning placement, a preliminary sample of the topsoil and the proposed method of incorporation. Acceptance samples shall be obtained at the point of delivery.

(NWR June 5, 2000)

The Contractor shall submit to the Engineer a manufacturer's certification that the topsoil contains all materials and soil amendments of the type and quantities specified. The Engineer will have 10 working days to respond to submittals. Placement shall not begin until approval has been received in writing.

8-02.3(4)A TOPSOIL TYPE A

Section is supplemented with the following:

(NWR January 17, 2006)

Topsoil Type A shall be placed in two non-compacted lifts.

The first 4-inch lift of topsoil shall be placed over the existing soil and incorporated to a 10-inch depth.

The second lift of topsoil shall then be placed over the existing incorporated soil to the finished grades shown in the Plans.

8-02.3(5) PLANTING AREA PREPARATION

Section is supplemented with the following:

(NWR August 1, 2001)

For planting areas that become compacted due to construction use, such as staging areas and access roads, the Contractor shall loosen and cultivate to a minimum depth of *** $$10”$$ *** prior to planting and seeding operations.

No cultivation shall occur in areas within the drip line of existing vegetation scheduled to remain.

(NWR August 1, 2001)

For the locations designated in the Plans, the Contractor shall loosen the existing soil by ripping to a depth of 18 inches prior to application and incorporation of the Soil Amendment.

8-02.3(6) SOIL AMENDMENTS

Section is supplemented with the following:

(NWR January 17, 2006)

Prior to placement and incorporation of soil amendment, the application and incorporation methods shall be approved by the Engineer.

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After the initial planting area weed control, soil placement, and grading are completed, and prior to the installation of irrigation lines and planting, all designated planting areas shall be covered with soil amendment. Soil amendment shall not be placed when a condition exists, such as frozen or water saturated soil, that may be detrimental to successful application, incorporation, or soil structure.

The Contractor shall notify the Engineer a minimum of five working days prior to the start of soil amendment work.

(NWR August 1, 2001)

Soil amendment shall be uniformly and evenly placed in all designated planting areas to a 3 inch, non-compacted depth and incorporated into the existing soil to a 10 inch depth.

(NWR August 1, 2001)

After the soil preparation work has been completed and approved by the Engineer and prior to plant installation, compost shall be applied to the entire ground surface of designated planting areas. Compost shall be applied at a uniform and even 1 inch non-compacted depth. No incorporation of compost into the existing soil is required.

8-02.3(8) PLANTING

Item 1 in the second sentence of the second paragraph of the Section is revised to read:

(NWR August 1, 2001)

1. Non-irrigated Plant Material
   November 1 to March 1.

Section is supplemented with the following:

(NWR August 1, 2001)

Planting shall occur in the planting period immediately following the second herbicide treatment as specified in the Special Provision CLEARING, GRUBBING AND ROADSIDE CLEANUP.

(NWR January 17, 2006)

The Contractor shall exercise care when installing plant material in creek or stream bank edges to minimize disturbance of the stream bank and prevent sediment or other pollutant discharges from entering the stream.

8-02.3(10) FERTILIZERS

Section is supplemented with the following:

(NWR October 16, 2006)

Plant Fertilizer

The Contractor shall provide and apply plant fertilizer for plants between the months of March and June during plant establishment. Fertilizer shall be placed at the rate of 1/4 cup per plant, spread within a 1-foot radius around each plant.

8-02.3(11) BARK OR WOOD CHIP MULCH

Section is supplemented with the following:

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(*****)

Bark mulch or wood chip mulch shall be placed to a uniform non-compacted depth of *** $$3”$$ *** over all planting areas except seeded and emergent areas, and raingarden planting area.

(NWR July 10, 2006)

Prior to placement, the bark or wood chip mulch application method shall be approved by the Engineer. The Contractor shall notify the Engineer five working days prior to the start of bark or wood chip mulch application. Bark or wood chip mulch shall not be placed in areas of standing water.

8-02.3(13) PLANT ESTABLISHMENT

Section is deleted and replaced with the following:

(*****)

It shall be the Contractor’s responsibility to maintain all the landscaped area of this contract from the time of installation until the project is completed and accepted by the Engineer as complete. The plant establishment period shall begin when the planting and construction has been completed and accepted by the Engineer and shall extend for 365 calendar days.

All plant material shall be watered, pruned, fertilized, sprayed and otherwise maintained and protected throughout the plant establishment period. Rejected plant materials shall be replaced. Plant material for replacement shall be inspected and approved as equal plant material prior to replacement being made. Acquisition of replacements shall be the responsibility of the Contractor with replacements to be made normally during the planting season.

All plant material shall be watered by thorough sprinkling every two weeks during the dry season (May 15th through October 1st) or more often as needed to keep the ground moist, the plants healthy, and to prevent wilting. Groundcover in the plantable paving shall be kept moist for the first six (6) to eight (8) weeks after installation, or until well established as directed by the Engineer.

Pruning shall be performed as directed by the Engineer so as to maintain a neat, healthy appearance, in accordance with good practice for the type of tree or plant. All cuts 0.75-inch in diameter or greater shall be painted with a tree sealer by the Contractor.

The Contractor shall provide the following fertilizer application during the plant establishment period as directed by the Engineer. The inspector must be present during this operation.

Fertilizer:

One (1) part Blue Chip Nitriform (Granular) slow release 38-0-0
Two (2) parts Agro Nursery Supplement #3, 7-8-9

Rate of application shall be three cups per tree and 0.25-cup per groundcover plant.

Trees and groundcover shall be sprayed with the proper insecticides, fungicides and chemical mixtures as necessary to control infestation by harmful insects, pests and plant diseases.

All bark covered areas and seeded areas shall be kept weed free. Frequency of weeding shall be sufficient to keep weeds from going to seed, and shall be done at least once each month. Chemical herbicides shall not be used for a period of 60 calendar days

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after the installation of plant material. When using chemical herbicides, manufacturer's recommended application rates shall be followed. Any plant material damaged by use of herbicides shall be replaced at the Contractor's expense.

All tree stakes, wrappings, guards and fastenings shall be kept intact and effective in maintaining firm support. Where fastenings have become too tight or too short, new and larger fastenings shall be furnished and installed by the Contractor to prevent strangulation or irregular growth of the tree. Stakes shall be removed during the last month of plant establishment. All deciduous tree stakes shall be kept plumb. All deciduous trees shall be sprayed once during the year with an effective preemergent, fungus-inhibiting dormant spray. The inspector must be present during this operation.

Cleanup shall be made immediately after and as part of the work done in the area. The cleanup shall include the entire area under this contract. The contract area shall be cleaned of litter and debris at least once each month. Such cleanup shall include the pickup and removal from the contract area of all clippings, trimmings, leaves, litter, and debris originating from any source whatsoever. Planting areas shall be neatly dressed and finished; walks and paved area shall be hosed off with water as necessary and otherwise kept clean and free from dirt, bark, and litter.

Plantings shall be properly protected against harm from wind, unusual weather, and the public. Special planting techniques, defoliating, wilt proofing, or spray misting may be required for unseasonal planting, prolonged periods of drought, etc. No work shall be performed in, over, or adjacent to planting areas without proper protection and safeguards.

At the end of each month during the plant establishment period, the Contractor shall submit to the Engineer a King County Plant Establishment Monthly Statement of Maintenance form itemizing the maintenance work performed during the month for which payment is requested. The list shall include a detailed account of the type of maintenance work performed, on what date, the materials used, and shall call to the attention of the Engineer any existing condition that may require special consideration or treatment. Failure to follow this procedure at the end of any month during the plant establishment period shall result in forfeiture of the monthly payment for the month involved.

Inspections of the project site will be performed by the Engineer. The Engineer will notify the Contractor in writing of any deficiencies in the maintenance work. The Contractor shall perform whatever additional maintenance work is necessary as directed by the Engineer. Failure by the Contractor to perform any additional work within the time limits specified may result in forfeiture of the monthly payment or a portion thereof.

8-02.5 PAYMENT

The following paragraph is added immediately after the item "Soil Amendment":

(NWR June 5, 2000)

The unit contract price per cubic yard for "Soil Amendment" shall include all costs for ripping the existing soil.

Section is supplemented with the following:

(*****)

"Plant Establishment", lump sum.

The lump sum contract price, at the minimum lump sum price stated in the Proposal or more, for "Plant Establishment" shall be full pay for furnishing all labor, materials, tools, equipment, and any other incidental items necessary to perform the maintenance work specified. Payment will be made at the rate of 25 percent per month of the lump sum contract price for

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the first three months, and the remainder paid following final acceptance of the plant establishment.

Should the Contractor determine that the cost for this work is greater than the minimum price stated in the Proposal, the Contractor may bid a higher lump sum price. Should the Contractor write a lump sum contract price less than the minimum price shown, then the minimum price shown in the Proposal shall govern and become a part of the bid.

8-04 CURBS, GUTTERS AND SPILLWAYS

8-04.3(1) CEMENT CONCRETE CURB ON NEW PAVEMENT

Section is supplemented with the following:

(*****)

Type 410C Curb shall be constructed on new pavement as shown on City of Seattle Standard Plan nos. 410 and 411. The pavement width shall extend to the back of the curb. The pavement where the curb is to be placed shall be roughened or otherwise treated so that a permanent bond can be secured between the curb and the pavement. Curing compound shall not be used on the pavement where curb is to be constructed.

Dowels, as detailed in City of Seattle Standard Plan nos. 410 and 411 shall be placed at 28 inches on center in the fresh concrete pavement. The dowel bars shall be set while the concrete is still plastic enough to not require hammering them into place.

Premolded joint filler shall be as shown on City of Seattle Standard Plan no. 411.

8-04.5 PAYMENT

The first paragraph is supplemented with the following:

(*****)

"Cement Conc. Curb and Gutter," per linear foot.
"Cement Conc. Rolled Curb," per linear foot.

Section shall be supplemented with the following:

(*****)

"Type 410C curb", per linear foot.

The unit contract price for "Type 410C curb" shall include all costs for the work required to furnish and install the complete curb. Payment does not include the pavement slab upon which curb is placed.

Add the following new Section:

(NWR August 1, 2001)

8-05 HABITAT STRUCTURES

8-05.1 DESCRIPTION

This work shall consist of furnishing, installing and constructing various habitat structures as detailed and as shown in the Plans.

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8-05.2 MATERIALS

(NWR June 5, 2000)

Log with Rootwad

Log with rootwad shall be a 10 to 12-foot long trunk of a native coniferous tree species, 18-inch minimum trunk diameter, free of branches, with bark and roots intact. The root spread shall be a minimum of 4 feet. Roots shall be free of rocks and soil.

(NWR June 5, 2000)

Source of Material

The Contractor shall submit the source(s) of materials for habitat structures to the Engineer for approval at least 10 working days prior to use.

8-05.3 CONSTRUCTION REQUIREMENTS

(NWR June 5, 2000)

The Contractor shall exercise care when installing habitat structures to ensure that the method of installation minimizes disturbance of waterways and prevents sediment or pollutant discharge into water.

Placement of the habitat structure shall be according to the following:

(NWR June 5, 2000)

Log with Rootwad

Place the log with rootwad in a stable position on the ground surface.

8-05.4 MEASUREMENT

(NWR June 5, 2000)

Log with rootwad will be measured per each.

8-05.5 PAYMENT

Payment will be made in accordance with Section 1-04.1 for the following:

(NWR June 5, 2000)

"Log With Rootwad", per each.

8-06 CEMENT CONCRETE DRIVEWAY ENTRANCES

8-06.1 DESCRIPTION

Section is supplemented with the following:

(*****)

This Work shall consist of cement concrete driveway and alley constructed at the locations shown on the Drawings and shall be in accordance with COS Standard Plan nos. 430.

8-09 RAISED PAVEMENT MARKERS

Add the following new Section:

(*****)

8-09.3(6) INSTALLATION

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The Type 2 RPMs shall be installed on the roads illustrated in the plans. Normal centerline skip-striping is at 40-foot intervals. Normal intervals for the Type 2 RPMs shall be 40 feet, or between each paint-skip. Where the RPMs are installed in line with skip lines, they shall be installed about midway between the skip lines.

Intervals of RPMs shall be less in channelization areas. Double yellow reverse curves entering left turn lanes shall have RPMs at ten-foot intervals. Double yellow center lines adjacent to left turn lanes shall have RPMs at 40-foot intervals. Solid white holding lines (wide line) shall have RPMs at 20-foot intervals.

Type 2YY RPMs (yellow reflective from two directions) shall be installed on center line. Where the center line is double-yellow, two RPMs shall be installed on each side of the two yellow lines. Where the center line consists of a solid yellow line and a skip yellow line or a skip line only, the RPMs shall be installed in line with the skip line.

Type 2W RPMs (white reflective one-direction) shall be used on lane lines. They shall be installed in line with the white skip lines and placed at the end of each lane line. Where a solid white line is used to separate a special-use lane, the RPMs shall be installed adjacent to the solid line, four inches inside the special-use lane.

Type 1W RPMs shall be used to supplement the white skip lines. Each ten-foot skip line shall be represented by three Type 1W RPMs and one Type 2W RPM.

8-11 BEAM GUARDRAIL

8-11.2 MATERIALS

Section is supplemented with the following:

(*****)

Beam guardrail shall use wood posts and blocks. Steel posts will not be allowed as an alternative.

8-12 CHAIN LINK FENCE AND WIRE FENCE

8-12.1 DESCRIPTION

Section is supplemented with the following:

(*****)

Contractor shall install temporary construction fence where shown on Plans or where designated by the Engineer

Security chain link fence and gates shall be 8-foot high fence, including barbed-wire overhang as detailed on the Plans.

8-12.2 MATERIALS

The first Paragraph is supplemented with the following:

(*****)

Security Chain Link Fence and Gates 9-16.9

Add the following new Section:

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(*****)

8-12.2(1) HIGH VISIBILITY FENCE

The fence shall be brightly collored orange, plastic, open gridded material mounted securely to steel posts. In selected locations, the orange fabric may be hung on temporary construction fencing, or on silt fencing in a manner that will allow the orange to be visible for establisghing construction boundaries. This work shall include maintaining high visibility fencing, and relocating, reconstructing, replacing, and no additional payment will be made.

Add the following new Section:

(*****)

8-12.2(2) TEMPORARY CONSTRUCTION FENCE

Contractor shall install temporary construction fence where shown on Plans or where designated by the Engineer. Relocation of Construction fencing may be required to accommodate Contractor phasing and sequencing. No additional payment will be made for removing, relocating, or replacing, Construction Fence.

8-12.3 <u>CONSTRUCTION REQUIREMENTS</u>

Section is supplemented with the following:

(*****)

The location and alignment of the fence corners and gates are shown on the Plans and as pre-approved by Boeing Security.

The Contractor shall submit shop drawings of fencing, gates and appurtenances. Shop drawings must be approved by the Engineer prior to fabrication or installation.

Upon completion of the fence, the Contractor shall clean the fence of all soiled places and repair marred or abraded areas.

Add the following new Section:

(*****)

8-12.3(3) <u>REMOVING CHAIN LINK FENCE</u>

This work shall consist of removing chain link fence including posts, anchors, braces, and gates. Chain link fencing and posts shall be removed in their entirety. No close cutting of posts will be permitted.

Voids left by post removal, which will not be obliterated by the Contractor's operations, shall be backfilled in 6 inch lifts of granular material with each lift compacted with a minimum of three passes of a mechanical tamper.

All materials removed shall become the property of the Contractor and shall be disposed of outside the project limits.

Add the following new Section:

(*****)

8-12.3(5) <u>SECURITY CHAIN LINK FENCE</u>

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Security chain link fence and gates shall be erected and installed by an organization regularly engaged in the business, employing labor skilled in this type of work to provide a complete security fencing system.

Security double swing gates shall be fabricated to withstand wind and swing loads. They shall have locking bars to seat into keepers that are set in concrete in ground locations which will hold the gate rigidly in position when closed. Hinges shall be provided which will allow the gate to swing the entire arc. Install gates on gate posts only, do not install on buildings.

Fabric shall be fastened to posts, the top rail and the bottom wire with wire ties.

Top rails shall be continuous. The Contractor shall provide for expansion or contraction of the continuous rail. Expansion and contraction sprint couplings shall be installed at intervals of 100 feet maximum.

Posts shall be installed vertically in the concrete with a minimum depth of embedment indicated on the Plans. Spacing of posts shall be as shown on the drawings. In unpaved areas, the concrete shall be struck off two inches above the surrounding grade. In paved areas it shall be struck off flush with the paving. The top of the concrete shall be troweled smooth, with a slight slope away from the posts.

Minor damage to galvanizing of fabric and fence appurtenances shall be repaired by thorough cleaning of the damaged surfaces and the application of "Galvacon," or approved equal, in strict accordance with the manufacturer's recommendations.

Upon completion of the fence, the Contractor shall clean the fence of all soiled places and repair marred or abraded areas.

8-12.4 MEASUREMENT

Section is supplemented with the following:

(*****)

Removing Chain Link Fence will be measured per linear foot measured along the ground line, including removed openings.

Temporary Chain Link Fence will be measured per linear foot measured along the ground line.

Security Chain Link Fence will be measured per linear foot measured along the ground line.

Double Security Swing Gate will be measured per each.

High visibility fence shall be measured by the linear foot of construction fence placed. Relocation, removal, and replacement shall be considered incidental to the bid item high visibility fence.

Temporary Construction Fence shall be measured per linear foot for fence installed. Relocation, removal, and replacement shall be considered incidental to the bid item for temporary construction fence.

8-12.5 PAYMENT

Section is supplemented with the following:

(*****)

"Removing Chain Link Fence", per linear foot.

"Temporary Chain Link Fence", per linear foot.

"Security Chain Link Fence", per linear foot.

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"Security Double Swing Gate" per each.

High visibility fence shall be measured by the linear foot of construction fence placed. Relocation, removal, and replacement shall be considered incidental to the bid item for high visibility fence and no additional payment shall be made.

8-13 MONUMENT CASES

8-13.1 DESCRIPTION

Section is supplemented with the following:

(*****)
Monument, monument cases, and covers shall be installed at the locations shown in the Plans and the KCRS (Fig. 5-019). The Contractor shall furnish and install the monument. Horizontal and vertical locations will be established by the Engineer. The monument case shall match the profile grade of the roadway.

8-13.3 CONSTRUCTION REQUIREMENTS

The last paragraph is deleted.

(*****)

Existing monument cases and covers shall be adjusted in the following way XXX

8-13.5 PAYMENT

Section is supplemented with the following:

(*****)

"Adjust Monument Case and Cover", per each.

8-14 CEMENT CONCRETE SIDEWALKS

8-14.1 DESCRIPTION

Section is supplemented with the following:

(*****)
Cement concrete sidewalks, 3-1/2 inches thick, shall be constructed as shown on the roadway sections in the Plans in accordance with the COS Standard Plan No 420..
At driveways, sidewalks depth shall conform to COS Standard Plan No 430.. The driveway areas will be measured separately from sidewalks.

8-14.3(3) PLACING AND FINISHING CONCRETE

The second paragraph is deleted and replaced with the following:

(*****)

The surface shall be brushed with a fiber hair brush of an approved type in a transverse direction except that at driveway and alley crossings it shall be brushed in a longitudinal direction. The placing and finishing of all sidewalk shall be performed in a manner acceptable to the Engineer, and the tools used shall be acceptable to the Engineer. After

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brush finish, the edges of the sidewalk and all joints shall be lightly edged again with an edging tool to give it a finished appearance.
Sidewalk 120 feet in length or less, shall be scored to match the pattern of existing sidewalk to which new sidewalk joins unless otherwise specified in Contract. All other sidewalk shall be divided into panels by scoring 1/4 inch deep "V grooves" in the manner indicated on COS Standard Plan no. 420.

8-15 RIPRAP

8-15.2 MATERIALS

Section is supplemented with the following:

(*****)

Streambed Cobbles	9-03.11(2)
Streambed Boulders	9-03.11(3)

8-15.3(1) EXCAVATION FOR RIPRAP

The second paragraph is deleted and replaced with the following:

(*****)
All costs for the excavation, including ditch excavation, required for the placement of riprap shall be included in the contract price for the class of riprap to be placed.

Section 8-15.3(5) is deleted and replaced with the following:

(*****)

8-15.3(5) ROCK FACING

Rock facing shall be constructed at the locations and as shown on the sections in the Plans in accordance with the KCRS (Fig. Nos. 5-003, 5-004, 5-005, and/or 5-006). Rock quality shall meet all the test requirements of Section 9-13.

The rock facing shall be constructed of two-man rocks (200 to 700 pounds) each 18 to 28 inches in average dimension, three-man rocks (701 to 2,000 pounds) each 28 to 36 inches in average dimension, and four-man rocks (2,001 to 4,000 pounds) each 36 to 48 inches in average dimension. The rocks shall range uniformly in size for each classification specified. The four-man rocks shall only be used for the bottom courses of rock in all rockeries over six feet in height.

The rock material shall be as nearly rectangular as possible so as to afford the minimum amount of void space between the rocks. No stone shall be used which does not extend through the rockery. The rock material shall be hard, sound, durable, and free from weathered portions, seams, cracks, and other defects. The source of supply and representative samples of the material shall be approved by the Engineer before delivery to the site.

The rock facing shall be started by excavating a trench, one foot in depth below subgrade. Areas on which the rockery is to be placed shall be trimmed and dressed to conform to the elevation or slope indicated.

Rock selection and placement shall be such that there will be no open voids in the exposed face of the rockery over six inches across in any direction. The rocks shall be

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placed and keyed together with a minimum of voids. Particular attention shall be given to the placement and keying together of the final course of all rockeries. The final course shall have a continuous appearance and be placed to minimize erosion of the backfill material. The larger rocks shall be placed at the base of the rockery so that the rockery will be stable and have a stable appearance. The rocks shall be carefully placed by mechanical equipment and in a manner such that the longitudinal axis of the rock shall be at right angles or perpendicular to the rockery face. The rocks shall have all inclining faces sloping to the back of the rockery. Each row of rocks shall be seated as tightly and evenly as possible on the rock below in such a manner that there will be no movement between the two. After setting a course of rock, all voids between the rocks shall be chinked on the back with quarry rock to eliminate any void sufficient to pass a two-inch square probe.

The rockery backfill shall consist of quarry spalls with a maximum size of four inches and a minimum size of two inches. The material shall be placed to a 12-inch minimum thickness between the entire rockery and the cut or fill material. The backfill material shall be placed in lifts to an elevation approximately six inches below the course of rocks placed. The backfill shall be placed after each course of rocks.

A cement concrete cap shall be constructed along the top of the wall at the locations shown in the Plans. The rock facing cap shall be constructed in accordance with the KCRS (Fig. No. 5-005).

Cement concrete for the cap shall be Class 3000 meeting the requirements of Section 6-02.

Add the following new Sections:

(*****)

8-15.3(8) STREAMBED BOULDERS AND COBBLES

Furnish and install streambed boulders and streambed cobbles as indicated on the Plans.

8-15.3(9) ROCKERY

Construct rockery at the locations and as shown on the Plans. The rockery shall be started by excavating a trench and preparing a compacted, level base as shown on the Plans. Larger rocks shall be placed at the base of the rockery for stability. The rocks shall all have inclining faces sloping to the back of the rockery and each row of rock shall be seated as tightly and evenly as possible on the rock below in such a manner that there will be no movement between the two. Rocks shall be placed and keyed together such that there are no open voids in the exposed face of the rockery over three inches across in any direction. The final course shall have a continuous appearance and be placed to minimize erosion of the backfill material. Rock for rockery shall be in accordance with Section 9-03.11 (3). Rockery backfill shall be in accordance with Section 9-13.7 (2) and shall be placed in lifts after each course of rocks is placed.

8-15.4 MEASUREMENT

Section is supplemented with the following:

(*****)

Rock facing will be measured by the square yard of rock face in place, including rockery backfill. Measurement will be to the nearest one-tenth (0.10) square yards, on the

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basis of field measurements taken on 25-foot intervals after construction. The top elevation of the rockery will be field determined upon completion of rock placement. The bottom elevation will be measured to 12 inches below finished grade at the base of the rockery in a cut section and 12 inches below the natural ground line in a fill section.

Rock facing cap will be measured by the linear foot along the top of the wall.

Excavation for the rock facing will be included in the measurement of roadway excavation, and no additional compensation will be made.

Streambed cobbles will be measured by the cubic yard of streambed cobbles actually placed.

Streambed boulders for the planting areas will be measured by each boulder actually placed.

Rockery will be measured by the square yard of rock face installed in place, including gravel backfill and geotextile fabric. Measurement will be to the nearest one-tenth (0.10) square yards, on the basis of field measurements. The top elevation will be measured from the top of rock placement and the bottom elevation will be measured to 6 inches below finished grade at the base of the rockery. Excavation for the rockery will be included in a separate item and no additional compensation will be made.

"Rock Facing", per square yard.

"Rock Facing Cap", per linear foot.

The unit contract prices per cubic yard for "Roadway Excavation Incl. Haul," per linear foot for "Rock Facing Cap" and per square yard for "Rock Facing" shall be full pay for furnishing all labor, materials, tools and equipment necessary or incidental to constructing the rock facing and rock facing cap as specified and as shown in the Plans or as directed by the Engineer, and no additional compensation will be made.

8-15.5 PAYMENT

Section is supplemented with the following:

(*****)

"Streambed Boulder Two-Man", per each.

"Streambed Boulder Four-Man", per each.

"Streambed Boulder Five-Man", per each.

"Streambed Cobbles", per cubic yard.

"Rockery", per square yard.

8-18 MAILBOX SUPPORT

8-18.3 CONSTRUCTION REQUIREMENTS

Section is deleted and replaced with the following:

(*****)

Existing mailboxes shall be remounted where designated as shown on the mailbox mounting details in the Plans in accordance with the KCRS (Fig. No. 5-014 and/or 5-015). Mailbox installations shall be furnished and installed with two- by ten-inch treated timber planks mounted on 1.5-inch diameter galvanized iron pipe or four- by four-inch treated timber posts set in concrete. Timber planks and posts shall be pressure treated with a waterborne wood preservative (ACA, CCA, ACZA) in accordance with the requirements of Section 9-09.3(4) of the Standard Specifications. The pipe shall be galvanized in

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accordance with Section 9-00.7. Concrete shall be Class 3000 in accordance with Section 6-02.

8-19 BRIDGE ELECTRICAL

8-19.1 DESCRIPTION

8-19.1(1) GENERAL

Under this item, furnish, install, test, and place in satisfactory operating condition the complete electrical system for control and operation of the double leaf bascule bridge, including a control desk, Programmable Logic Controller (PLC) equipment, Motor Control Centers, DC Drive Controllers, distribution equipment, closed circuit television system, intercom communication system, lighting, traffic signals, traffic gates, resistance gates, traffic signals, field start up service, spare parts and all required provisions for interlocking complete with all accessories as specified herein and as shown on the plans.

The control system specified herein shall be coordinated as required, with the work of all other sections of the specifications and the plans, so that all installations shall operate as designed. Specific coordination is directed toward mechanical work.

The work also includes removal of the electrical system from the existing South Park Bridge. Carefully remove the existing control console, switchboard cabinets, drive motors, motor brakes, machinery brakes, traffic gates and navigation lights and deliver them to the County at a site provided by the County. Remove and dispose of all existing conduit and wiring.

Any apparatus, device, circuit, appliance, material, or labor not herein specifically mentioned or included, but that may be found necessary to complete or perfect the installation and equipment in a manner acceptable to the engineer, shall be furnished by the contractor as if specifically included in these specifications, and without extra cost to the department.

8-19.1(2) <u>REFERENCE STANDARDS</u>

Portions or all of certain recognized industry or association standards referred to herein as being a requirement of these specifications shall be considered as binding as though reproduced in full herein unless supplemented and/or modified by more stringent requirements in this specification. Unless otherwise stated, the reference standard shall be the standard which is current as of the date of issuance of these specifications. Reference may be made to standards either by full name or, for the sake of brevity, by letter designation as follows:

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute, Inc.
ASME	American Society of Mechanical Engineers
AWG	American Wire Gauge
EPA	Environmental Protection Agency
IES	Illuminating Engineering Society
ICEA	Insulated Cable Engineer's Association
JIC	Joint Industrial Council
NEC	National Electrical Code of NFPA
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association

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OSHA	Occupational Safety and Health Act
UL	Underwriters' Laboratories, Inc.

8-19.1(3) PERMITS AND CODES

The electrical installation shall comply with the National Electrical Code and all applicable laws and ordinances in effect at the construction site and with regulations of the utility companies furnishing power and telephone services to the site.

Obtain approval from the Coast Guard for any temporary construction navigation lighting required.

File with the engineer a certificate of final electrical inspection and acceptance by the Board of Fire Underwriters or an approved inspection agency.

8-19.1(4) DRAWINGS AND SPECIFICATIONS

Omissions from the drawings and specifications, or the mis-description of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the contractor from performing such omissions and details or work, but they shall be performed as if fully and correctly set forth and described in the drawings and specifications. In any case of discrepancy in figures, catalog numbers, or descriptions in the drawings or in the specifications, the matter shall be properly submitted to the engineer who shall promptly make determination in writing. Any adjustment in the plans by the contractor without written approval shall be at the contractor's own risk and expense.

8-19.1(4)A EQUIPMENT LOCATIONS

The layout drawings show, in general, the arrangements and location of all equipment. This shall be considered as illustrative and subject to the approval of the Engineer; the Contractor shall modify it as necessary, for complete and proper construction and operation. The location of the conduits, boxes, and equipment shown on the plan is diagrammatic only, and may be subject to shifting as required or as the engineer may direct in order to conform to local conditions. The design drawings may be utilized in the preparation of the shop or as-built drawings showing the permanent construction as actually made.

8-19.1(4)B CIRCUIT-AND-RACEWAY SCHEDULES

Specification and data sheets for most of the circuits and raceways are included in the drawings. These data sheets fully describe the raceways shown on the plan sheets, and fully describe the circuits enclosed in the scheduled raceways. Raceways and circuits used solely for lighting and general purpose receptacles are shown only on the plans, and are not included in the schedules.

The Raceway Schedule is keyed to the raceway numbers as they appear on the plan sheets. The schedule gives the raceway type (galvanized steel - GRS, PVC coated rigid steel - PVGRS, etc.), fill (total area of enclosed circuits) trade size (nominal inside dimension), and a list of the enclosed circuits.

The Circuit Schedules are keyed to the circuit numbers as they appear in the wiring diagrams. The schedules give the origin and destination of each circuit, the number of cables in the circuit, the description of each cable in the circuit (size in AWG, type per data sheets in this specification, and number of conductors in each cable), area of each cable, and a listing of all the raceways that the circuit is routed through.

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8-19.2 MATERIALS

The Electrical Equipment and its installation shall be in accordance with regulations of the NEC and shall conform to Division II, Group B of the latest revision, for movable bridges of the American Association of State Highway and Transportation Officials except as otherwise provided herein.

All materials and equipment furnished under these specifications shall be new and, to the extent possible, standard products of the various manufacturers. Where more than one of any specific item is required, all shall be of the same type and manufacturer. Items of equipment or material which are not specifically defined herein shall conform to the general standard of quality established herein.

Each piece of electrical equipment and apparatus shall have a permanent type corrosion-resisting metal nameplate on which is stamped the name of the manufacturer, the catalog or model number, and the rating or capacity of the equipment or apparatus.

All electrical devices, printed circuit boards, including their components, and any other electrical or electronic parts, shall be completely identified in such a way as to be easily procured from a supplier of that device. All prints and drawings of same shall show complete circuitry and identify all components as to their specific use and function in the circuit.

Retain the services of a qualified control system integrator who shall have complete system responsibility for the detailed integration of all system components, in order to ensure a complete operating system is furnished and installed in accordance with specified requirements of this project. The control system integrator shall be responsible for ensuring total compatibility of all equipment and devices furnished and installed and shall provide supervisory assistance in the selection, installation and integration of all bridge control system and associated equipment. Components associated with bridge control system include but shall not be limited to control console, switchboard cabinet, relay cabinet, remote control console, programmable controllers, modems, computer and interfacing equipment and other facilities as may be required.

The control system integrator shall be responsible for the review of shop drawings, prior to submission to the engineer, to ensure that all components of the bridge operating system submitted for use are compatible in every respect and that all components meet or exceed the specific requirements and intent of the project. The total bridge operating system shall be subject to the approval of the engineer, based on the specified project requirements.

The control system integrator shall ensure maximum reliability and ease of maintenance for all components of the operating system and shall be responsible for all training of the bridge operator staff and for the supervision of all trial operations. The system integrator must have demonstrable competence in providing electrical control systems for movable bridges of various types, particularly bascule bridge types, but including vertical lift and swing type bridges utilizing programmable controllers and fiber optic communications. Such competence shall be demonstrated by identifying a minimum of (3) three movable bridges for which he has provided complete systems within the past five years.

The control system vendor shall be of a caliber and background similar to that of Link Controls, Inc. of Ronkonkoma, NY, (631) 471-3950, Panatrol Corp, Bedford Park, IL, (708) 496-3080, Anderson Electric Control, Kent, WA, (253) 395-3003 or approved equal.

System integrator shall make available a field service staff with the capability of providing services for field coordination of construction and final adjustments to the control system to the satisfaction of the engineer. Field staff shall be capable of responding, at the site, to an emergency within 24 hours.

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Name and written qualifications of the proposed system vendor shall be included in the bid proposal and shall be subject to approval by the engineer.

All ferrous metal work shall be hot-dip galvanized in accordance with ASTM A123 or ASTM A153, whichever is applicable. If any galvanizing is damaged, the metal work shall be refinished by cleaning and painting, with two coats of approved galvanizing repair paint, or approved zinc chromium paint.

Lock washers shall be provided on all mechanical fastenings.

In order to prevent deterioration due to corrosion, all bolts, nuts, studs, washers, pins, terminals, springs, hangers, cap screws, set screws, tap bolts, brackets, and other hardware fastenings and fittings shall be of an approved corrosion-resisting material such as silicon bronze, or stainless steel. Hot-dip galvanizing, per ASTM Specification A-153, will be considered approved treatment for all non-moving ferrous hardware.

The manufacturer of the resistance gates shall submit calculations, signed by a Licensed Professional Engineer in the State of Washington, showing that the resistance gate arm and its end connections, end lock, side arm lock, housing and anchor bolts are capable of withstanding the design loads . The calculations shall be submitted to the Engineer for review and approval

8-19.2(1) SHOP DRAWINGS

Within 90 days after execution of the contract, submit shop drawings to the engineer. Submit full size drawings for those items requiring construction from such drawings. Provide descriptive leaflets for standard catalog items which are mass produced.

Submit shop drawings for all cabinet enclosures, motors, panel boards, span brakes, transformers, switches, raceways, conductors, wiring devices, lighting fixtures, lamps, service equipment, boxes, control equipment, fasteners and other such equipment, and methods of fastening to structures. No equipment is to be purchased without approval of shop drawings. The control system vendor shall review, coordinate and prepare as necessary all shop drawings pertaining to the bridge operating control system before submitting these drawings to the engineer for his review.

Shop drawings shall include manufacturer's test data, shall be certified by the manufacturer, and shall identify the application for which they are proposed.

Equipment identification shall be the same as shown on the drawings. Standard drawings showing more than one model or size shall be marked to indicate the model or size proposed.

Shop drawings of cabinets containing electrical equipment shall include outside dimensions, areas for conduit penetrations, one-line and three-line diagrams, wiring diagrams, schematic and interconnection diagrams, terminal block arrangements and numbers if such terminal blocks are intended for connection of field wiring, and operating instructions.

Provide layout drawings and geographic wiring diagrams for the control desk and for the programmable controller cabinets.

Submit shop drawings when installation and mounting details of switches, fixtures, and devices are different from or not specifically detailed on the drawings.

If requested by the engineer, submit for inspection samples of the proposed substitute items at no additional cost to the department. Submit all support data in quintuplicate for checking. Neither the department nor the engineer will be liable for any materials purchased or work done or any delay incurred prior to their review. Failure of the engineer to note unsatisfactory materials as received will not relieve the contractor from

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responsibility. Deliver manufacturers' guarantees or warranties on materials to the engineer upon receipt of the materials.

Working drawings shall be made on standard 22 in. x 34 in. sheets. Catalog cuts and manufacturers' standard drawings may be submitted on their respective standard sizes. Submit them to the engineer for review and distribution.

The engineer will not be responsible for errors of working drawings, even though approval has been indicated, or for quantities or bills of material which may be included. Any failure of the engineer to correct errors on working drawings, or implied approval thereof, shall not relieve the contractor of the full responsibility for the safe and adequate execution of the work in accordance with the plans and specifications.

After review of the working drawings by the engineer, no changes shall be made without resubmission for approval by the engineer, and all changes or revisions later made shall be clearly marked and dated.

Before final payment is made, deliver to the department two sets of as-built drawings reflecting all changed or modifications made from the contract drawings having to do with the finished structure. One set of as-built drawings will be given to the city.

As-built drawings shall be suitable for permanent storage, and any reproducible material which is subject to fading when exposed to light will not be acceptable.

8-19.2(2) REFERENCES

Reference to a particular product by manufacturer, trade name, or catalog number establishes the quality standards of material and equipment required for this installation and is not intended to exclude products equal in quality and similar in design. Whenever any article, materials, or equipment is defined by describing a proprietary product, or by using the name of a manufacturer or vendor, the term "or approved equal", if not inserted, shall be implied, except as otherwise noted.

8-19.2(3) SUBSTITUTIONS

Reference to a particular product by manufacturer, trade name, or catalog number establishes the quality standards of material and equipment required for this installation and is not intended to exclude products equal in quality and similar in design.

Equipment for which an acceptable manufacturer is not specifically named, or named equipment for which substitution is proposed, shall be manufactured by a company which has had a minimum of ten years of experience in the manufacture of similar equipment and which, in the engineer's opinion, has demonstrated its proficiency in the manufacture of such equipment. All equipment will be subject to the engineer's approval.

8-19.2(4) STRUCTURAL STEEL

Material for support of limit switches shall conform to the requirements of ASTM A36 structural carbon steel. Bolts used shall conform to the requirements of ASTM A325 Type 1 bolts and hardened steel washers shall be provided as shown in the plans.

8-19.3 CONSTRUCTION REQUIREMENTS

All construction and installation shall be made by workmen skilled in this type of work and under the supervision of an experienced and qualified electrical supervisor. In addition, the approved control system vendor shall provide supervisory assistance to the electrical contractor as specified herein. All work shall be executed in a neat and workmanlike manner and shall present a neat and mechanical appearance when completed. Upon completion of

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the contract, deliver to the engineer a corrected plan showing in detail all changes on construction from the original plans, especially location and sizes of conduits, complete schematic circuit diagrams and the like.

Provide all terminal strips with approved permanent terminal markings for each connected conductor in service. Place the marking on a material which will not be affected by age or moisture and apply two coats of clear lacquer after placing the markings.

8-19.3(1) RACEWAYS

8-19.3(1)A GENERAL

All conduit shall be of the material called for in the plans. All conduits shall be free from blisters, cracks, or injurious defects. Wiring troughs shall be hot dip galvanized after fabrication.

Raceway sizes shall be as shown on the plans, and shall be 3/4" minimum trade size.

8-19.3(1)B GALVANIZED RIGID STEEL CONDUIT

The conduit shall be UL listed and shall comply with the requirements of ANSI Standard C80.1 "Specifications for Rigid Steel Conduit (Zinc-Coated)". Manufacturers shall be Allied, Steel duct, Triangle, Youngstown, or approved equal.

All rigid steel conduit fittings shall be hot-dip galvanized after fabrication in accordance with ASTM-A153. Manufacturer shall be Appleton Electric, Crouse-Hinds, O.Z./Gedney, Pyle-National, Russell & Stroll, Thomas & Betts, or approved equal.

After field threading, re-galvanize all steel conduit with "Zinc Rich", "Zincilate 810", or "Galvanizing Powder M-321". Apply this material in the field, immediately after the conduit is threaded and cleaned.

8-19.3(1)C PVC COATED GALVANIZED RIGID STEEL CONDUIT

The PVC coated galvanized rigid conduit shall be UL listed. The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit and be UL Listed. The PVC coated rigid galvanized steel conduit must be certified and authorized to apply the ETL Verification Mark “ETL Verified to PVC-001”. ETL Verified to :Intertek ETL SEMKO High Temperature H2O PVC Coating Adhesion Test Procedure. Continued compliance to this specification is monitored through production testing, quarterly inspections by Intertek ETL SEMKO at production facility and random sample testing. Ferrous fittings for general service locations must be UL Listed with PVC as the primary corrosion protection. All conduit and fittings must be new, unused material. The PVC coating shall be gray, 40 mils in thickness, and be free of blisters, bubble, or pin holes. Applicable UL standards may include: UL 514B Standard for Safety, Fittings for Conduit and Outlet Boxes. Conduit and fittings shall be evaluated for reliability and performance. Certified test results are the respective test data that have been witnessed and certified to be accurate by an independent, recognized third party. Acceptable conduit and fitting PVC bonds shall be confirmed with a minimum average of 30 days in a heat and humidity test (ASTM D1151 and D2247) with the temperature at 150 degrees F and 95% humidity. Acceptable seal performance shall be confirmed at 15psig (positive) and 25 inches of mercury (vacuum) for 72 hours. Manufacturer shall be Perma-Cote Industries or approved equal by Plasti-Bond or Rob-Roy.

All conduit and fittings shall be hot-dip galvanized inside and out with hot galvanized threads prior to applying plastic coatings. All exterior surfaces shall be coated with a heat

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polymerizing adhesive not to exceed .0005" thick prior to plastic coating. The exterior plastic coating shall be bonded to the metal with a thickness of .040" nominal the full length of the pipe except the threads. Interior coating shall be 2 mil minimum urethane.

Repair any nicks or gouges in the PVC coating after installation with manufacturer's approved touch-up compound to restore corrosion protection.

All fittings, support struts, pipe clamps, etc, shall be PVC coated to meet all requirements of the conduit manufacturer.

8-19.3(1)D LIQUID-TIGHT FLEXIBLE METAL CONDUIT

Liquid-tight flexible steel conduit shall be constructed of a flexible galvanized steel core made from continuous steel metal and an extruded PVC cover. Conduit shall be Anaconda Type UA, Electri-Flex Type LA, Rob-Roy Flex, or approved equal.

Fittings shall have insulated throat and be UL labeled. An "O" ring assembly shall be used on each fitting. Manufacturers shall be Appleton Electric, Ideal Industries, Thomas & Betts, or approved equal.

8-19.3(1)E RIGID NONMETALLIC CONDUIT

The conduit shall be rigid polyvinyl chloride, schedule 80, 90 degree C, of the sizes indicated on the plans and shall conform to the NEMA standards. Conduit shall be UL listed in conformity with Article 347 of the National Electric Code. Conduit, fittings, and cement shall be produced by the same manufacturer who shall have had at least five years experience in manufacturing these products. All joints shall be solvent welded in accordance with the recommendation of the manufacturer.

8-19.3(1)F CABLE TRAYS

Cable trays shall conform to NEMA Standards for cable trays. Trays of the aluminum ladder type when installed within the control tower and electrical equipment room and ventilated trough type when installed in the bascule pier areas and shall be of the size outlined on the plans. Ladder type shall have 9 inch rung spacing, and shall sustain a minimum of 222 pounds per linear foot on a 12 foot span. Trays installed in the bascule pier areas shall be provided with a peaked flanged cover.

Provide trays at the elevation and locations shown on the plans. The interconnections of the sections, fittings and other components shall provide a rigid mechanical assembly with splice plates properly installed to avoid structural weakness. Locate tray splices at the 1\4 points of the span between supports.

Tray shall run parallel or perpendicular to the main structural lines of the building or bridge structure. Drilling or welding of the building steel members will not be permitted. Trays shall be mechanically connected at joints, fittings, and terminations, and shall provide a continuous ground path.

Support cable trays as shown on the drawings, at the midpoint of each horizontal bend and in accordance with manufacturer's recommendations.

8-19.3(1)G INSTALLING RACEWAYS

Connect conduit sections to each other with screw couplings, made up so that the end of both conduits will butt squarely against each other inside of coupling and non-metallic conduit shall be solvent welded in accordance with the manufacturer's recommendations. Install conduits so as to be continuous and watertight between boxes or equipment. Protect

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conduits at all times from the entrance of water and other foreign matter by capping or well plugging overnight and when the work is temporarily suspended.

Install all conduits so that they will drain properly. Provide drainage tees at low points where required.

All field bends shall be long sweep, free from kinks, and of such easy curvatures as to facilitate the drawing in of conductors without injury. Conduit runs shall be made with as few couplings as standard lengths will permit, and the total angle of all bends between any two boxes shall not exceed 360 degrees. Long running threads will not be permitted.

Use pull boxes wherever necessary to facilitate the installation of the conductors. Condulets shall not be used for pulling more than ten conductors or for making such turns in conduit runs or for branching conductors, except for indoor wiring to lighting fixtures and receptacles.

Galvanized rigid steel (GRS) conduit shall be installed only within the control towers and where the areas remain dry. PVC coated rigid steel (PVGRS) shall be installed within the pier areas and in areas where the conduit will be exposed to wet environments. Rigid non metallic (PVC) conduit shall be installed where ever the raceway is to be buried below grade or within concrete.

All conduit fittings shall be of the same type material as the conduit installed.

Where conduits pass through the floors or walls of the control room, galvanized rigid conduit sleeves shall be provided for free passage of the conduits. After the conduits are installed, caulk the opening with an elastic fireproof compound and escutcheon plates provided on the interior walls, ceilings, and floors for airtight fits.

Where cable trays pass through floors or where conductors are required through floors for access to electrical equipment as shown on the plans, fill the openings and caulk with a fire proofing sealant after all conductors are installed. Where conductors pass through floors without the use of a cable tray, provide escutcheon plates. Sealants shall be manufactured by Carborundum, Dow Corning, Nelson Fire Stop Products, or approved equal.

Exposed raceway runs shall be straight and shall be parallel or at right angles to the general structure lines. Attachment to steel or concrete in the pier areas shall be by PVC coated fittings, straps, or hangers held at not less than two points by stainless steel bolts or lag screws. Concrete inserts shall be Unistrut, B-line, Midland Ross, or approved equal, fabricated from stainless steel. Conduits mounted exteriorly on parts of the steel work shall be set not less than 2 inches clear from the supporting structure to prevent accumulation of dirt, and they shall be securely clamped to the steel work to prevent rattling and wear. The clamps, in general, shall consist of U-bolts attached to angle or channel iron supports bolted to the members. The spacing of the clamps shall not exceed 6 feet.

Supports for electrical work which are fabricated from structural plates or shapes bolted to structural members and which are shown or requested to be included on the steel drawings, will be paid for under the items shown on the plans. Additional alterations and supports not shown or requested, but that are found necessary after completion of steel fabrication plans, shall be included for payment and additional compensation will not be considered.

See "Bridge Machinery" for coordination with bridge mechanical system.

At any point where a conduit crosses an expansion joint, or where movement between adjacent sections of conduit can be expected, install bronze or alloy expansion fittings equal to Type AX as made by the O.Z. Electrical Manufacturing Company, Inc., Hope, Spring City, or approved equal.

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Use of flexible conduit is allowed only for the connection of motors, limit switches, and other devices that must be periodically adjusted in position. Connections between the rigid conduit system and all movable motors, and movable limit switches shall be made with flexible conduit with couplings and threaded terminal fittings. The flexible conduit shall be fully interlocked and shall be Type RT-6 as made by the Flexonics Corporation, Type UA-OR as Anaconda's Sealtite, Carflex by Carlon, or approved equal. Flexible conduit extensions shall not exceed 24 inches in length and shall be equipped with bonding jumpers.

All conduits shall be carefully cleaned, both before and after installation. Upon completion of the conduit installation, clear each conduit with a tube cleaner equipped with a mandrel of a diameter not less than 80 percent (80%) of the nominal inside diameter of the conduit, and shall then draw in the conductors.

Provide both ends of each conduit run with a brass tag having a number stamped thereon in accordance with the conduit diagrams. Securely and permanently fasten these tags to the conduit ends with bare copper wire.

8-19.3(2) CONDUCTORS

Furnish insulated conductors and conductor accessories in sufficient quantities for a complete installation. Installation shall be in accordance with the National Electrical Code, and shall include placement, splicing, terminating, identification, testing, and verification of each circuit and conductor.

Conductors at 480 volts (power conductors) potential shall not be routed in the same raceway as conductors at 120 volts potential or less (control conductors).

Cable types, as shown on the plans, shall be as shown on the cable data sheets. The "type" as shown on the circuit schedules in the plans is the "type" referenced to at the top of each cable specification sheet. Unscheduled conductors for lighting circuits shall be Type B.

The "Outside Diameter" is the nominal diameter used to calculate the required conduit size. If actual cables used are of larger diameter, the contractor shall increase the size of the affected conduits, as required by the NEC, at no additional cost to the department.

8-19.3(2)A ACCEPTABLE MANUFACTURERS

Acceptable manufacturers for types B, D, G, and H are American Insulated Wire, Okonite, Southwire or approved equal. Acceptable manufacturers for type E are Okonite, American Insulated Wire, Belden or approved equal. Acceptable manufacturers for type FO are Belden, Alpha, Anixter or approved equal.

Provide a durable marking on the outer surface of all cables or conductors at intervals not exceeding 24 inches. Marking shall include manufacturer's name, insulating material, conductor size, and voltage class.

Each conductor, of power, control and signal wiring, shall be color coded with colored insulation. Color coding of power wiring shall be black for Phase A or 1, red for Phase B or 2, blue for Phase C or 3, white for neutral, and green for equipment ground. Switch legs for local wall switches shall conform to local Code requirements.

8-19.3(2)B CIRCUIT IDENTIFICATION

Each circuit, as shown in the Circuit Schedule on the plans, shall be identified at both ends with an identification tag. Tags shall be of an opaque nylon material arranged to include a marker board, non-releasing holding device, and cable fastening tail. The marking board shall be not less than 3/8 inch wide x 3/4 inch long, and 25 mils thick, roughened on one side

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to hold black nylon marking ink from a permanent marking pen. Identification shall be permanent and waterproof. Once installed, the tie shall not be removable except by cutting it loose from the cable.

8-19.3(2)C INSTALLATION OR PLACEMENT

Draw the wire and cables into conduits without causing injury to the wires or their insulation or covering.

Install all cables as recommended by the manufacturer. Adhere to the manufacturer's recommended maximum pulling tension and minimum bending radius during installation. Use the necessary guides, pulleys, sleeves, and pulling aids to prevent abrasion and damage to the cables during installation. Use lubricants recommended by the cable manufacturer and acceptable to the engineer for the pulling of conductors or cables. Permanently and clearly tag both ends of every single length of conductor with approved tags marked in accordance with the same number and designation shown on the wiring diagrams. Connect all outgoing wires No. 8 AWG or smaller in the control desk, on the switchboards and panels and in terminal cabinets to terminal blocks.

Spare conductors of a multi conductor cable shall be left at their maximum lengths for possible replacement of any other conductors in the cable. Coil each spare conductor and then tape it to the conductors being used.

Twisted shielded pair conductors or instrument conductors shall not be terminated at any point except at point of origin or point of finish. When instrumentation cable are required to cross the channel, a corrugated PVC duct provided within the submarine cables shall be utilized to prevent cutting or splicing of the cables. Where instrument conductors are required be cut and spliced in order to connect to other instrument conductors, the individual conductors and shielding shall be spliced in accordance with the manufacturer’s instructions. The splice connections shall then be taped and wrapped to ensure adequate seal from noise and environment in accordance with the manufacturer’s instructions.

Conductors inside terminal boxes and at the control panels and control desk shall be installed in plastic wire ways or shall be neatly formed into cables and laced with two strands of an approved wax-treated linen cord or plastic tie-wraps, with the individual conductors leaving the cable at their respective terminal points. These conductors shall be looped to allow not less than 3 inches of free conductor when disconnected. These formed cables shall be held securely away from the terminals and from contact with the cabinet by means of approved insulating supports. Wiring duct meeting JIC standards will be acceptable.

All terminal strips shall be provided with approved permanent terminal markings for each connected conductor in service. The marking shall be placed on a material which will not be affected by age or moisture and shall be given two coats of clear lacquer after the markings are placed thereon or as stated elsewhere in these Specifications.

Splicing of conductors will not be permitted except for wiring to service lighting fixtures and receptacles.

All splices, T-taps, and free ends of 600 volt cables shall be insulated. General use cables shall be insulated with type 33 tape. High ambient cable shall be insulated with type 70 tape.

Wherever it becomes necessary to terminate, joint, or branch conductors, terminal blocks in boxes shall be used.

Cable connections for No. 8 and smaller, for making terminations and splices shall be with high pressure indent type pressure connectors. Connectors shall be copper and as manufactured by Buchanan Products, Burndy, Thomas & Betts, or approved equal.

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Cable connections for No. 6 and larger for making terminations, T-taps, and splices shall be with a high compression or bolted type pressure connector. Compression connectors shall be installed as recommended by the manufacturer using the recommended tooling for installation. Bolted connectors shall have a non-rotating pressure cap and as manufactured by Burndy, O.Z. Electric, Buchanan, or approved equal.

8-19.3(2)D TESTS AFTER PLACEMENT

All insulated conductors shall be electrically tested after placement. All circuits, including lighting circuits, shall be tested with the circuit complete except for connections to equipment. All splices shall be complete prior to testing. Any circuit failing to test satisfactorily shall be replaced, or repaired and retested as directed by the engineer. All equipment and labor required for testing shall be provided by the contractor.

All insulated conductors shall be tested for continuity and conductor identification. In addition, all insulated conductors of multi-conductor cable shall be tested for short circuits. Furnish portable, battery powered, ring testers, and other test equipment as required for these tests.

1. Continuity tests shall include all tests necessary to confirm that each conductor is continuous throughout its entire length.
2. Identification tests shall include all tests necessary to confirm that the conductor being investigated originated and terminates at the locations designed in the Circuit List or indicated on the drawings.
3. Short circuit tests shall include all tests necessary to confirm that no conductor of a multi-conductor cable is short circuited to another conductor in that cable.
4. Power and control cable rated below 2,000 V. - All insulated conductors, except instrumentation cable, rated less than 2,000 v. shall be tested with a 1,000 v. megger or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be in excess of 100 Megohms.
5. Instrumentation cable - All insulated conductors of supervisory and communication cable shall be tested with a 500 v. megger or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and the cable shielding tape and between the two conductors in each pair. Minimum acceptable resistance values shall be 50 Megohms divided by the actual cable length in miles.

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TYPE B
600 Volt Single Conductor Flame Resistant Power Cable

DESCRIPTION:

Reference: ICEA S-66-524

Conductor: Class B Stranding, 90 DEG C, Standard Round Uncoated Copper

Insulation: Flame Resistant Cross Linked Polyethylene

Jacket: None

UL Listing: THWN

Tests: Flame Test Requirements per IEEE 383, using a gas burner flame source.

DETAILS:

Size (AWG)	Number of Strands	Insulation Thickness-Inches	Outside Diameter-Inches
12	7	.030	0.16
10	7	.030	0.18
8	7	.045	0.24
6	7	.045	0.28
4	7	.045	0.35
2	7	.045	0.40
1	19	.055	0.46
1/0	19	.055	0.51
2/0	19	.055	0.57
3/0	19	.055	0.60
4/0	19	.055	0.66
250	37	.065	0.73
350	37	.065	0.84
500	37	.065	0.97

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TYPE D
600 Volt Multi-conductor No. 12 AWG
Flame Resistant Control and Power Cable

DESCRIPTION:

Reference: ICEA S-66-524

Conductor: 12 AWG, 7 Strand, Class B Stranding, 90 DEG C, Standard Round Uncoated Copper

Insulation: Flame Resistant Ethylene Propylene (FR-EP), .030 inches thickness

Shield: None

Jacket Cable Assembly: Chlorinated Polyethylene over Polyester-film Tape

UL Listing: Each conductor, XHHW; Assembly shall meet NEC art 340 requirements for tray cable type TC, and shall be sunlight resistant.

Tests: Each conductor and the finished cables shall meet the flame test requirements per IEEE Standard No. 383.

Conductor Identification: ICEA Method 1, Table K2, Colored Compounds with Tracers

DETAILS:

Number of Conductors	Jacket Thickness-Inches	Outside Diameter-Inches	Nominal Area Square Inches
2	.045	0.365	0.105
4	.045	0.422	0.140
7	.060	0.501	0.197
9	.060	0.614	0.296
12	.060	0.689	0.373
60	.080	1.585	1.970

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TYPE E
600 Volt Single Pair Flame Resistant
Shielded Control Cable

DESCRIPTION:

Reference: ICEA S-19-81, ICEA S-68-516 (Interim Standard No. 1)

Conductor: 16AWG, 7 Strand, Class B Stranding, 105 DEG C, Standard Round Coated Copper

Insulation: Ethylene Propylene, 25 mil Thickness

Twisting: Approximately 4 Turns/Foot Staggered

Shield: Each pair, and the composite cable assembly-coated copper 20 AWG drain wire and aluminum/mylar tape over insulated conductors.

Jacket: Conductor and cable assembly - flame resistant chlorosulfonated polyethylene, IPCEA S-19-81, fifth edition, part 4.

Conductor Identification: One black and one white conductor per pair.

Tests: Each conductor and each finished cable shall meet the flame test requirements per IEEE Standard No. 383.

UL Listing: Each cable assembly shall meet NEC art 340 requirements for Type TC, and shall be sunlight resistant.

DETAILS:

Number of Pairs	Jacket Conductor	Cable	Outside Diameter-Inches
1	15 mils	45 mils	0.42
4	19 mils	60 mils	0.81

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TYPE G
Bare Grounding Wire

DESCRIPTION:

Conductor: Standard Round Uncoated Soft-drawn Copper

Stranding: Sizes 8 AWG and smaller, solid; Sizes 6 AWG and larger, 7 strand, class B stranding

Insulation: None

DETAILS:

Size (AWG)	Diameter (inches)
8	0.13
2	0.29
1/0	0.74

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TYPE H
600 Volt Three Conductor With Ground Power Cable

DESCRIPTION:

Reference: ICEA S-66-524, ICEA 5-19-81

Conductor: Standard round, Class B stranding, uncoated copper, 90 degrees C

Insulation: Flame resistant Chlorosulfonated polyethylene

Jacket: Conductor; none. Cable assembly: chlorosulfonated polyethylene
Conductor

Identification: Colored compound or colored coating

Ground: Single or three insulated copper ground conductors.

DETAILS:

Phase Conductor Size (AWG or MCM)	Ground Conductor Size (AWG)	Thickness – Inches Conductor Insulation	Assembly Jacket	Overall Diameter - Inches
12	12	0.045	0.060	0.49
1010	0.045	0.060		0.58
8	10	0.060	0.060	0.75
6	8	0.075	0.080	0.94
4	3x10	0.075	0.080	1.05
2	6	0.075	0.080	1.19
1/0	6	0.100	0.080	1.43
2/0	4	0.100	0.080	1.56
4/0	4	0.100	0.110	1.86
250	3	0.130	0.110	2.07
350	3	0.130	0.110	2.34
500	2	0.130	0.110	2.65

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TYPE F
Multi Mode Fiber Optic

DESCRIPTION:

Fiber type:	62.5/125 microns multimode, outer coating 250 microns
Fiber/Tube count:	6 individual color coded tubes with up to 12 fibers each
Buffer:	Thermoplastic buffer tube
Cable Assembly:	6 tubes and up to 12 fillers per tube cabled around a central E-Glass and Aramid Yarn strength element
Attenuation:	3.50 dB/KM maximum @850 nm, 1.2 dB/KM maximum @1300 nm
Bandwidth:	200 MHz-KM @ 850 nm, 600 MHz @1300 nm
Jacket:	Polyvinyl Chloride (PVC) Nominal wall - 0.060 inches Nominal diameter – 0.265 inches Color - Black

Suitable manufacturer: Belden No. B9B202

Usage:	CCTV Video and Data Communication

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TYPE S
Multi-Conductor Special Purpose
Communication and Data Cable

DESCRIPTION:

Reference:	ICEA S-19-81, UL 2250
Type 22S8	
Conductor:	22AWG, 7 Strand, 4 pair with Individual Shielding, XLP Insulation, PVC Jacket, 300 Volt, 90 degree C
Twisting:	Each pair twisted, approximately 4 turns/foot
Use:	Process Control, Span Position Data
Conductor Identification:	Red/Black, White/Black, Green/Black, Blue/Black

Suitable manufacturer: Belden No. 9330, Alpha Wire No. 6054

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8-19.3(4) BOXES

All exterior surface mounted pull, junction, splice, and terminal boxes shall be 14 gauge stainless steel, NEMA 4X, and shall be provided with hinged, overlapping covers of the same material, with pad-lock provisions and shall be by Hoffman Engineering Company, Hammond Manufacturing or approved equal. Exterior boxes mounted on the bridge steel work shall be primed and painted the same color as the bridge. Wall-mounted boxes installed in the new control house shall be NEMA 12. Junction boxes and terminal cabinets mounted in the machinery rooms shall be NEMA 4X, 14 gauge stainless steel as described above.

Furnish and install junction and pull boxes, reducers, and other fittings as required by these specifications or where required by the NEC or where required to facilitate pulling, whether shown on plans or not.

Provide drain holes in the boxes. Provide all boxes with mounting lugs and securely fasten to the structure with not less than four bronze or monel metal through-bolts. All cast-iron boxes shall be bossed, drilled, and tapped for threaded conduit ends, which shall enter squarely. Sheet metal enclosures shall be drilled to receive the conduit ends, which shall be secured with insulated hub connectors. The conduit ends projecting into all boxes and enclosures shall be equipped with insulated bushings. No box or enclosure shall be drilled for more conduits than actually enter it.

Boxes for surface or exterior mounted wiring devices shall be weatherproof rated, cast-iron, hot-dipped galvanized, Type FS, FD, or approved equal.

Boxes for flush-mounted devices in finished areas shall be stamped galvanized steel.

Fasten device boxes to the mounting surface with not less than two bolts.

Fabricate framework for supporting boxes, switches, and other externally mounted electrical devices from structural steel Type A36 not less than 3/8 inch thick, or if material of thickness less than 3/8 inch is used it shall be hot-dip galvanized.

All mounting bolts, nuts, washers, and other hardware used for fastening boxes, disconnect switches, devices, lighting outlet boxes, conduit clamps, and similar devices shall be brass, monel metal, or stainless steel. Bolt heads and nuts shall be hexagonal, and bolts smaller than 3/8 inch diameter shall not be used except as may be necessary to fit the mounting holes in small devices, outlet boxes, and similar standard equipment.

8-19.3(5) WIRING DEVICES

General use, single pole, or 3-way switches shall be Arrow-Hart 1991 or 1993, Bryant 4901 or 4903, General Electric 5951-1 or 5953-1, Hubbell 1221 or 1223, or approved equal.

General use, duplex receptacles shall be Arrow-Hart 5262, Bryant 5262, General Electric 4065-1, or Hubbell 5262. GFI protection shall be provided by GFI circuit breakers or GFI receptacles where required by the CEC or NEC and as shown on the plans. Devices installed indoors shall be brown color.

Devices installed outdoors shall meet NEC Art. 410-57 and shall be corrosion-resistant, with gray fiberglass weatherproof covers, suitable for wet locations and U.L. listed.

Cover plate for flush installations shall be 0.040 inch thick satin finished Type 302 stainless steel. Cover plates for indoor surface installation shall be cast aluminum or cadmium-plated cast-iron. Covers shall fit Type FS or FD boxes without overlapping edges or corners.

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8-19.3(6) SMOKE DETECTORS

Smoke detectors shall have ionization chambers capable of detecting products of combustion. Power requirements shall be 120VAC with battery backup. Unit shall be capable to function as an individual unit or in an interconnected system. Internal alarms shall be provided. Auxiliary contacts shall be provided for remote annunciation. Units shall be installed where shown on the plans, and they shall be interconnected to sound all units in each control tower if any one unit is activated. Units shall be Kidde model i12040 with Kidde SM120X relay module, or approved.

8-19.3(7) NAMEPLATES

Provide nameplates for all major pieces of equipment named on the drawings, for all devices on the control desk and in panels, and shall be made of laminated micarta or textolite with chamfered edges, and shall be engraved to show BLACK letters on a WHITE background. They shall be mounted with monel or stainless steel screws. Nameplates for devices shall show the device designation used on the schematic wiring diagram. Fuse nameplates shall show the type, ampere, and voltage rating of the fuses.

8-19.3(8) MOTORS

Motors shall be built in accordance with NEMA standards. All exposed metal surfaces shall be protected with a moisture-proof corrosion-resistant polyester paint or coating. Exposed unpainted and uncoated metal surfaces shall be of a heavy-duty corrosion-resistant material. The rotors shall be balanced mechanically and electrically. All windings shall be provided with special insulation to retard decrease in insulation resistance due to excessive moisture. Each motor shall have Class B insulation.

Install the motors with approved sizes and types of wire terminals and splice fittings for the connection of the motors to the circuit wiring. Furnish each motor with a cast-iron frame, bearing brackets with re-lubrication fittings and conduit connection box.

Each motor, unless otherwise specified or indicated on the plans, having a horsepower of 1/3 HP or larger shall be 480 volt, 3-phase, 60-Hertz, totally enclosed, non-ventilated, 30-minute rated, squirrel cage induction motor. Hydraulic brake release motors, main pump and auxiliary pump motors shall be rated for continuous operation.

Motor horsepower shall be as shown on the drawings. Where motors are supplied as an integral part of another item, the motors shall be of a NEMA design and speed compatible with that item.

Where alternate equipment is provided, actual motor horsepower shall be at least 115 percent of the driven load.

Motor mounted solenoid brakes supplied with the traffic gate, resistance gate and span lock assemblies shall be motor-mounted, totally enclosed spring-set, solenoid-release, with hand release lever.

8-19.3(9) PANELBOARDS

Provide and install all wall mounted panelboards where shown on the drawings. Mounting height shall be 6'-6" at the top. Construction shall be as follows:

1. Cabinets. Panel shall be dead front type and enclosed in a code gauge galvanized sheet steel cabinet complete with hinged door, lock and two keys, finished in ANSI 61 Light Gray enamel paint, with circuit directory filled out in

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type and with all exposed metal surfaces prime coated and factory painted. All locks shall be keyed alike.

Cabinets shall be of sufficient size to provide gutter space no less than that required by the Underwriter's Laboratories and in no case less than 4 inches.

2. Mains. Branch circuits shall be changeable without additional machining, drilling or tapping. Branch circuit connections shall provide sequence phasing, with connections permanently identified on the face of the front of the panel interior. Mains shall be equipped with automatic circuit breakers for branch circuit protection and shall have ratings as indicated. All single pole branches shall be rated 20 ampere, unless indicated otherwise.

   Buses shall be rigid copper or copper alloy, installed to provide consecutive phasing. Solid neutral bus shall have solderless connectors, shall be insulated from the cabinet and shall have an ampacity equal to the ampacity of the phase buses. Equipment grounding bus shall be bonded to the cabinet, shall have solderless connectors and a main lug. All copper parts shall be plated to prevent corrosion.

3. Branches. Circuit breakers shall be of the indicating type, providing distinctive "on", "off", and "tripped" positions of the operating handle. All multi-pole breakers shall be so designed that an overload in any one pole automatically causes all poles to open. Multi-pole breakers shall have a single operating handle. Single pole 15 and 20 ampere branch breakers shall be UL listed for switching duty.

   Breakers shall be thermal magnetic type having inverse time delay thermal trip on overloads and instantaneous magnetic trip on short circuit. Circuit breakers shall be quick-break, quick-make on manual, as well as automatic operation. Each circuit breaker shall be independently removable without disturbing adjacent units or other bus connections and shall be fastened to the main bus bars with a bolt-on connection. All copper parts shall be plated to prevent corrosion.

   All 100 ampere frame breakers shall have an interrupting rating of 10,000 amperes A.C. All larger frame size breakers shall have an interrupting rating of 22,000 amperes.

All panelboards shall be factory assembled, UL listed, Type NQOB as manufactured by Cutler-Hammer, Square D, Westinghouse, General Electric, or approved equal.

8-19.3(10) DRY TYPE TRANSFORMERS

Furnish dry type transformers suitable for indoor mounting in the quantity, voltage, phase, KVA rating, and method of mounting as shown on the drawings. Transformers shall be UL 1561 listed and labeled "Suitable for non-sinusoidal current loads" with a K factor not to exceed a rating of K-30.

Transformers shall be Class AA. The temperature rating shall rise above ambient, as listed below. Primary taps shall be as listed below.

	Below Normal	Above Normal	Temp. Below Rise
Single phase less than 25 kva	Two 5 percent	---	115ºC

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Single phase 25 kva and larger	Four 2-1/2 percent	Two 2-1/2 percent	80ºC

Provide transformers with electrostatic shields between the primary and secondary windings as shown on the plans.

Transformers shall have a rated sound level of 45 decibels or below when measured in accordance with NEMA Standards.

Furnish wall hanger brackets especially designed to accommodate the transformers with all wall mounted transformers.

Thoroughly clean transformers, then give them a rust resisting primer coat and two or more finish coats of paint or enamel. Finish transformers with ANSI 61 Light Gray indoor paint.

Submit manufacturer's data on power/distribution transformers, including certification of transformer performance efficiency at indicated loads, percentage regulation at 100% and 80% power factor, no-load and full-load losses in watts, % impedance at 75 degrees C, hot-spot and average temperature rise above 40 degrees C ambient, sound level in decibels, and standard published data.

The transformers shall be as manufactured by General Signal Corporation, International Transformer Corporation, Sorgel Electric Corporation, or approved equal.

8-19.3(11) MOTOR CONTROL CENTERS

The Motor Control Centers (MCC's) shall conform to NEMA Standard "A-C General Purpose Motor Control Centers" Part ICS 2-322, U.L. Standard No. 845, and to the NEC. Exposed metal parts shall be primed and painted with ASA61 light gray.

The vertical sections shall be nominally 90 inches high, 20 inches wide, and 15 inches deep. Each section shall have a horizontal wire trough located at both top and bottom, and shall be connected by a vertical wire trough. Each unit shall have an individual front door for access. Construction details shall be as indicated in the MCC Construction Data.

The new starters shall be 3-pole, 480-volt, full voltage, magnetic combination type, with trip indicating motor circuit protectors. Connection to the bus shall be by stab-type contacts. Quantities shall be as shown on the drawings. Internal connections and accessories shall be as shown on the motor starter wiring diagrams.

Circuit breakers shall be 3-pole, heavy duty, 600 V, quick-make, quick-break, with an AIC of 22,000 amperes symmetrical. Quantities shall be as shown on the drawings.

An incoming line transient voltage surge protector (TVSS) shall be provided and installed in an MCC module within MCC-. The TVSS shall be a rated for industrial distribution systems, less than 1 nanosecond response time, maximum surge current of 160ka per phase, rated at 277/480 volt grounded wye, LED failure indicators, one per phase, high energy parallel design for high energy category C3 applications, EMI/RFI noise filtering and in-line fuses. Unit shall be UL 1449 and 1283 listed and be provided with a 5 year warranty. Unit shall be provided with a disconnecting device to allow servicing without main power shutdown. Unit shall be National Lightning Protection Corp., 1-800-628-2816, TPI 4000 Plus. TVSS unit shall be fully compatable and approved by the supplier of the lightning protection system specified elsewhere in these special provisions.

Incoming line metering accessories shall be added to the metering section in MCC-1, as follows:

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1. Watt Transducer - 1% accuracy, with an output of + or - 1.0 MA DC, and a range of + or - 400 KW, and 3-150/5 ampere CT's shall be provided and connected as shown in the plans. .
2. Phase Reversal Relay - Relay shall be similar to Time-Mark Type C269, and shall have a normally closed contact wired to terminal blocks. This contact shall open upon phase under voltage, loss of phase or reversed incoming phases.

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MCC CONSTRUCTION DATA:

WIRING	SYSTEM	ENCLOSURE
Class 1	480 Volt	X NEMA 1 Gasketed
Type B	3 Phase	___NEMA 3 Weather Resistant
	4 Wire	___Junction Box Required

BUS BRACING	BUS MATERIAL	BUS RATING	
22,000 Amps (SYM) _	Copper __	Mains, Amps	600
42,000 Amps (SYM) X	Aluminum __	Vertical, Amps	300
	Either X	Neutral, Amps	None
		Bare Ground, Amps	300

CONTROL VOLTAGE:

Voltage Level 120	Source:
Secondary Fuses:	Starter Control Transformer X
One X	MCC Control Transformer
Two___	External Control Source

EXTERNAL CONNECTIONS:

Incoming Line Feeders:	Entrance:		
Cable X	Incoming Line:	Top X	Bottom __
Bus Duct__	Load Feeders:	Top X	Bottom __
	Control Cables:	Top X	Bottom __

All internal wire and cable to be rated for 600 volts.
Wiring and connections shall be as shown on the plans.
The motor control centers shall be Square D, Cutler Hammer, Allen Bradley or approved equal.

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8-19.3(12) SERVICE AND DISTRIBUTION

8-19.3(12)A GENERAL

Commercial electric power for operation of the bridge and its auxiliaries will be supplied by dual feeds from at 480 volts nominal, 3-phase, 3-wire, grounded delta, 60-Hertz. Point of contact is.

8-19.3(12)B SERVICE DISCONNECT

Install one 400A fusible disconnect switch within the east pier where shown on the plans. Disconnect enclosure shall be NEMA 4X rated stainless steel. Fuses shall be Class K-5 dual element type and sized as shown on the plans. One 200A fusible disconnect switch shall be installed within the west pier where shown on the plans. Disconnect enclosure shall be NEMA 4X rated stainless steel.

The utility meters will be provided and installed by the power company. The meter packs shall be provided by the contractor.

8-19.3(12)C SERVICE GROUNDING

The 480-volt delta power system shall be solidly grounded to the grounding grid assembly at the transformer or utility service metering equipment and to the grounding grid assembly within each pier.

Terminal lugs and the metal framing and enclosures of all electrical equipment such as control panels, control desk, panelboards, motors, and other apparatus shall be bonded to the grounding grid assembly.

Terminals of grounding system shall be solderless type, secured by means of hexagonal head, copper plated steel machine bolts with lock washers. Grounding system conductors shall be continuous unspliced connections between terminal lugs.

8-19.3(12)D STRUCTURE GROUNDING

Ground cable shall be stranded, soft drawn, insulated copper, conforming to ASTM B3 Class B. Ground cables shall be interconnected or bonded to structural steel or connected ground rods by exothermic welds. Two coats of insulating varnish shall be applied over all exothermic welds and exposed cables.

Thermite welds shall be made with molds, cartridges, and accessories as recommended by the manufacturer of the molds for the items to be welded. Molds and powder shall be furnished by the same manufacturer, and shall be by Cadweld, National Lightning Protection, Approved Lightning Products Co., or approved equal.

Grounding system cable shall be a minimum of 380 pounds/1,000 foot copper unless otherwise indicated. Each strand shall be No. 14 AWG. Stands shall be basket or rope lay, cross sectional area shall be #1/0 AWG minimum. Cable interconnections shall be bolted. Cable terminations shall be on bonding plates, sized 6” x 6” x ¼”.

8-19.3(12)E GROUND RESISTANCE

Ground resistance shall have a value of 5 ohms or less after connection to the service equipment and shall be measured with an approved ground tester.

Ground resistance measurements shall be taken as follows:

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1. The resistance of each individual ground rod shall be measured at the time of installation and before connection to the ground bus. If the resistance is greater than 25 ohms, a second rod shall be driven near the rod being tested.
2. The resistance of the ground bus shall be measured, with all rods connected to the bus prior to connection to the service equipment.
3. The resistance of the ground bus shall be measured with all rods connected to the bus after connection to the service equipment.

Forward a report of the test to the engineer.

It is preferable that all ground rods have approximately like resistances so that when paralleled all rods will carry very nearly the same current. In those instances where a wide variance of resistance is encountered, add additional sectional rods to those already installed that have the high resistance.

8-19.3(12)F LIGHTING PROTECTION

Provide and install a complete lightning protection and ground system as shown on the plans. The system shall consist of a single stainless steel early streamer emission (ESE) lightning protection conductor as manufactured by National Lightning Protection Corp. (NLP). The ESE unit shall be NLP's type US-1213-P4 Prevectron Topset 3.4 mounted on the top of the lighting poles #11 and #12 as shown on the plans. Coordinate with lighting pole supplier as required. The lightning protection system shall be provided with a $10,000,000.00 insurance certificate that provides protection to the bridge electrical system and the components connected to the electrical system in the event of damage as a result of a lightning strike or voltage surge. Attention should be given to the main service Transient Voltage Surge Suppressor specified elsewhere in the specification. In addition to the main service TVSS, surge suppression shall also be provided for the incoming telephone line and CCTV system. The lightning protection system and grounding system shall be installed in accordance with NLP and shall obtain an inspection from an NLP representative or from a nationally recognized testing laboratory such as U.L., Willey Testing Lab or Edison Testing Laboratories (ETL) and provide certification of compliance to the Engineer. The Contractor shall provide to the Engineer at the completion of the installation a Prevectron tester available from NLP.

Lightning protection cable shall be a minimum of 375 pounds/1,000 foot copper unless otherwise indicated. Each strand shall be No. 16 AWG or No. 14 AWG. Stands shall be basket or rope lay, cross sectional area shall be 115 MCM minimum. Cable interconnections shall be bolted. Cable terminations shall be on bonding plates having a minimum of 2 square inches of surface. Bonding plates shall be provided for circumferential welds or bolted connections.

8-19.3(13) EMERGENCY GENERATOR

The engine-generator shall be the product of a manufacturer regularly engaged in the manufacture of generator plants. The set and all controls shall be built and tested by the manufacturer precluding divided responsibility. The generator shall be tested at the manufacturer's facilities. Certified test reports of the complete assembly shall be available from the manufacturer showing the plant's power rating, voltage, and frequency regulation, and other pertinent data. Detailed operation and maintenance manuals with parts lists shall

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be provided. The engine-generator sets shall be sized as indicated elsewhere in these specifications.

8-19.3(13)A RATING

The rated output shall mean the set full continuous derated output under the climatic conditions shown below. The set shall also be capable of carrying the full rated load at rated speed, without undue heating of the engine or alternator.

8-19.3(13)B ASSEMBLY DETAILS

Engine Features

The engine shall be heavy duty, diesel fueled, water cooled unit mounted radiator, multi-cylinder, 4 stroke, designed for cold quick start, capable of delivering full load output at all ambient temperature conditions. Speed shall be 1,800 RPM with a brake horsepower rating of not less than 1.5 brake horsepower per KW of the generator requirements. Provide generator set with a block heater to maintain jacket water temperature at a minimum of 50 degrees F. Provide flexible piping connections at both the engine and radiator.

The engine shall be equipped with the following:

1. Fuel filters.
2. Isochronous Governor capable of 0.25% steady strip frequency regulation.
3. Automatic battery charging alternator with solid state voltage regulation.
4. Replaceable cylinder liners of the wet sleeve type.
5. Replaceable valve seat inserts.

Starting System

The remote-controlled engine starting shall be by means of 24 volt starting motors. Batteries of sufficient capacity for five, 15-second consecutive crank periods shall be furnished. The battery voltage shall be 24 volt DC. Provide two series-connected 12-volt batteries. Provide battery rack with corrosion-resistant battery trays.

Battery Charger

A standby, adjustable, fully automatic, constant voltage, current limited, charging device with rheostat and ammeter shall be furnished by the supplier to maintain the battery in full operation condition at all times.

Cooling System

The cooling system shall insure that the maximum cooling water temperature is safely within the normal working temperature range when the set is operating continuously at full load at maximum ambient air temperature up to 110 degrees F. The engine outlet water temperature under such conditions shall not exceed 225 degrees F. Provide a 50:50 ratio of water and ethylene glycol solution.

The generator set shall be provided with self-contained cooling system of ample capacity comprising unit mounted heavy duty design radiator, multiply V-belt driven radiator fan and gear driven centrifugal pump for water circulation. Radiator fan blades should be of heavy gauge sheet metal well protected against corrosion or of cast anti-corrosion metal. The radiator assembly shall include a core guard and an air duct flange and exhaust air out.

Lubrication System

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A pressure type lubricating system with gear type oil pump and a full flow filter shall be fitted to the engine. The lube oil system shall have full flow filters of sufficient capacity. The lube oil filter elements shall be of the replaceable element type.

Intake and Exhaust System

Air is to be induced to the engine manifold through an air cleaner with reusable elements.

The exhaust system shall include a residential type silencer, a condensation trap and drain cock, a flexible connection near the engine and a rain hood over exhaust pipe end. The exhaust line shall be the size recommended by the engine manufacturer. The exhaust line shall be suspended from the underside of the approach span and extended to the outer edge of the approach span.

The exhaust system shall be provided with all necessary piping, clamps, silencer, wall flashings and other item required for proper installation by others.

Governing System

The engine shall run steadily at any load within its rating at its rated speed, and the changes in speed at a steady load shall not exceed 0.5 percent when all transients have decayed.

The maximum speed variation upon applying a 50 percent 0.8 power factor load change shall not exceed 5 percent.

The governor shall be electronic, and shall have provisions for remote adjustment of speed. The governor shall be of the electronic type and shall be capable of close speed regulation with in ± 0.25 percent.

Safety Switches

The engine shall be equipped with automatic safety switches to stop the engine in the following cases:

1. Water Temperature exceeds a preset safe working limit.
2. Lubricating oil pressure lower than a preset safe working limit.
3. Speeds exceeding 110 percent of rated speed.

Control System

Engine controls shall include complete engine start controls which operate on closing contact, and stop control which operates opening contact. A cranking time delay relay shall be provided to open the starting circuit in approximately 45 to 90 seconds if the plant is not started within that time. The electric plant controls shall include a weekly exerciser timer to permit exercising under load, running time meter, and run-stop-remote selector-switch. High water temperature, overspeed shutdown, and low oil pressure shutdown with signal light and alarm terminals shall be provided. Visual indications only shall be provided for low battery voltage, high battery voltage and generator power on.

The controls shall provide digital readouts for the engine and generator in English and metric units for engine oil pressure, engine oil temperature, engine coolant temperature, engine RPM, battery volts, generator AC volts L-L, L-N and average , generator AC current average and per phase, generator AC frequency, generator kW, generator kVA, generator kVAR, power factor, total kW-hr, %kW, %kVA and %kVAR.

The complete control shall be designed, built, and tested by the manufacturer of the engine. It shall include the necessary relays and component parts together with UL listed

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and tested electrically and mechanically interlocked contactor, and shall provide the transfer functions indicated for the specific units.

Remote annunciator shall be provided to meet NFPA 110, Level 1. The annunciator shall provide remote annunciation of all points listed above and shall communicate via Modbus RTU communications via RS-485 half duplex with a baud rate from 2.4k to 57.6k and shall be capable of being located up to 800 feet from the generator set.

Engine Instrument Panel

An engine mounted instrument panel shall be equipped with gauges for water temperature, oil pressure, oil temperature, battery charge rate ammeter, and intake manifold vacuum.

Sub-Base

The engine generator unit shall be mounted on a full sub-base fabricated of structural steel. Vibration isolators of the type and quality recommended by the manufacturer shall be supplied. Mounting holes for the isolators shall be located in the sub-base by the engine manufacturer to insure equal distribution of weight on the isolators. Maximum vibration transmission shall not exceed 6 percent.

Weather Protective Enclosure

The engine generator unit shall be enclosed in a weatherproof enclosure. Enclosure shall be fabricated from 14 gauge colded rolled steel with lockable gasketed doors. Doors shall be easily removed for service. Enclosure shall provide unrestricted airflow design. Radiator shall be guarded and service access to fill shall be lockable.

Alternator

The alternator shall be salient-pole, reconnectable 12-lead, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed for smooth voltage wave form. The insulation material shall meet the NEMA standard (MGI-22.40 and 16.40) for Class H and be vacuum impregnated with epoxy varnish to be fungus resistant per MIL I-24092. Temperature rise of the rotor and stator shall be limited to NEMA class F. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator with adjustable Volts-per-Hertz operation capable of maintaining voltage within + or - 2% at any constant load from 0 to 100% of rating. The regulator must be sealed from the environment and isolated from the load to prevent tracking when connected to SCR loads.

On application of any load up to the rated load, the instantaneous voltage dip shall not exceed 20% and shall recover to + or - 2% of rated voltage within one second.

The generator shall be capable of sustaining at least 250% of rated current for at least 10 seconds under a 3 phase symmetrical short by inherent design or by the addition of an optional current boost system.

A re-settable line current sensing circuit breaker with inverse time versus current response shall be furnished and shall not automatically reset preventing restoration of voltage if maintenance is being performed. This breaker shall protect the generator from damage due to its own high current capability and shall not trip within the 10 seconds specified above to allow selective tripping of down-stream fuses or circuit breakers under a fault condition.

The alternator instrument panel shall be wired, tested, and shock-mounted on the electric plant by the manufacturer of the alternator. It shall contain manual reset overload

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protection, running time meter, AC voltmeter with phase selector switch, AC ammeter with phase transfer switch, voltage adjusting rheostat, and panel lights.

Fuel System

The unit shall operate on diesel fuel. The fuel system shall include a storage tank, float switch, fuel transfer pump for a lift of 10 feet, automatic shut-off and fuel filters. The fuel storage tank shall be installed above ground where shown on the plans. A fuel line standard with the manufacture of the engine-generator set shall be furnished and installed to meet current codes and requirements and to the satisfaction of the engineer. The storage tank shall be double walled and have a capacity of not less than 500 gallons.

8-19.3(13)C SHOP AND FIELD TESTS

Shop Test

The units of the engine-generator set, with all accessories connected and in place, shall be subjected to full-load test runs at the manufacturer's plant, as hereinafter specified.

The engine shall be run continuously for not less than one hour without stoppage, and shall include at least 30 minutes of operation at 50 to 75 percent, and 15 minutes of operation at 100 percent of rated load. A record shall be kept of the water temperature in the engine head until a stabilized temperature is reached. When the engine is stopped, the temperature of the water shall rise to not more than 225 degrees F.

The tests shall include complete performance tests of the entire generator set to show that the generator voltage regulator and the engine governor perform properly to meet all specified requirements.

The generator and exciter shall be subjected to a full load heat run, and the test results shall be reported on the standard performance specification forms of the National Electrical Manufacturers Association.

Six (6) certified copies of the results of the above tests shall be submitted to the Engineer. Copies of the test reports shall be included with the manuals placed in the O&M Manuals specified in these special provisions. The units of the engine generator set shall not be shipped from the plant of the manufacturer until certified tests therefore have been submitted to the Engineer.

Field Test

The supplier shall arrange for and provide all necessary field tests, as directed by the Engineer, to demonstrate that the entire engine-generator installation is in proper working order and in accordance with the Specifications.

Field testing shall also include complete operating tests to show that the entire engine-generator and all components operate satisfactorily to sustain the loads imposed during operation of the bascule spans.

During the testing period, the supplier shall arrange to have at the site a representative of the manufacturer of the engine-generator. This representative shall be capable of making adjustments to the equipment, of locating faults or defects and correcting them if possible, and of obtaining from the manufacturer without delay new parts or replacements for apparatus which, in the opinion of the Engineer, does not perform satisfactorily.

Should the tests show that any piece of equipment apparatus, in the judgement of the Engineer, is defective or functions improperly, adjustments or replacements shall be made by the supplier to make the installation satisfactory to the Engineer at no extra cost to the owner.

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8-19.3(13)D SUPPLIER

The engine generator set shall be supplied by the manufacturer as a complete factory assembled generator set to include the engine, generator, remote radiator, control panel, and all accessories specified mounted on a single steel grid base. The supplier shall have been regularly engaged in the manufacture of such equipment for the past ten years and who has parts and service facilities locally available so there is one source of supply and responsibility.

All accessories needed for the proper operation of the plant shall be furnished. These shall include a muffler, cooling system piping, exhaust pipe, radio shielding, safety alarms, plant weekly exerciser timer, running time meter, flexible exhaust connection, starting batteries, battery cables, battery rack, fuel filter, solenoid, crankcase heater, thermostat, primary regulator, flexible fuel connections, shut-off valve, and detailed operation and maintenance manuals with parts list.

Each piece of equipment and apparatus shall have a stainless steel, brass or bronze nameplate on which is stamped the name of the manufacturer and the rating or capacity of the equipment or apparatus.

Manufacturers shall be Caterpillar Generac, Onan/Cummins or approved equal.

8-19.3(13)E WARRANTY

The Emergency Generator System shall be warranted by the manufacturer for two years or 1000 hours, whichever occurs first, from the date of site start-up and acceptance.

Instruction Booklets

The supplier shall furnish to the Engineer seven (7) copies of booklet containing instructions covering the operation of the engine-generator unit and its associated equipment, together with an engine parts catalog and maintenance instructions for the unit. The booklet shall contain copies of wiring diagrams showing the connections of all major components, including the engine, generator, control panel, starting panel and starting batteries. One (1) copy of the instruction book shall be furnished for the Engineer's records.

8-19.3(13)F EMERGENCY ENGINE GENERATOR SET

General features shall be as described in 8-19.3(13) above.

This work consists of furnishing, installing, and placing in permanent operating conditions a diesel fueled engine-generator set complete with automatic regulators, automatic start/automatic load transfer switch unit mounted radiator, radiator fan and fan motor, environmental enclosure, exhaust system, water circulating system, engine block heater and an electric starter with battery and battery charger.

The installation of the engine and electric generating system shall include an electric plant rated for standby service at not less than 250 KW, 480/277 volts, three-phase, four-wire, center-tapped, 312.5 KVA, 0.8 pf, 60-Hertz. The system shall be a package of new and current equipment consisting of:

1. A diesel fueled engine-driven electric plant to provide emergency electrical power. .
2. Engine-mounted start-stop control system.
3. Generator set shall provide a minimum Starting KVA (SKVA) of not less that 476 KVA at not more than a 20% voltage dip.

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4. Main Circuit Breaker
5. Mounted accessories as specified.
6. A three (3) pole, Automatic Start/Automatic Transfer Switch rated at 600 AMPS. Each contact pole of the main transfer device shall be double-break design, with solid silver cadmium contacts, capable of handling both non-inductive and inductive loads and allow for inrush currents of 20 times the continuous rating. Contact pressure shall be maintained by a coil spring, not a part of the current-carrying path. The ampere rating of the transfer switch shall be sufficient to handle the capacity of the plant and loads being transferred. The transfer switch enclosure shall be NEMA 4 rated.

The transfer switch shall provide sequential automatic starting and stopping of the generator set and switching of the electric load upon power failure as follows:

Upon commercial supply feeder outage automatically start the generator set, , and when the generator set comes up to voltage, automatically disconnect the power circuit from the main line and transfer it to the generator set output. Upon commercial supply feeder power return and not performing a bridge opening, automatically transfer the load back to the commercial supply feeders. After a 5 minute cool down period, shut down the engine generator set.

The transfer switch shall provide the following functions using solid state logic control:

Time delay on transfer from normal to emergency: Adjustable
Time delay on transfer from emergency to normal: Adjustable
Time delay on engine cool down: Adjustable
Frequency/voltage monitor of emergency source
Four position selector switch (test, auto start, off, and local start)
Relay contacts for normal and emergency power
Frequency meter mounted in enclosure door
Voltmeter, ammeter and selector switch mounted in enclosure door
Plant exerciser with two position selector switch for load/no load

Generator set shall be Caterpillar Model C9 with an LC5034J frame alternator, or equal by Generacl.

8-19.3(14) LIGHTING

8-19.3(14)A LIGHTING FIXTURES

Furnish all fixtures, lighting equipment, and components shown on the plans, listed on the "Fixture Schedule" and all labor and materials to install the specified equipment in the manner indicated. Deliver all fixtures and lighting equipment with accessories, hangers, canopies, hickeys, casings, end plates, sockets, fixture wires, holders, reflectors, globes, glass, guards, ballasts, diffusing louvers, recessing boxes, etc., all wired and assembled as indicated.

Furnish and install all lamps and accessory wiring. Entire fixtures and all component electrical parts shall be listed by UL. The engineer reserves the right to require colors and finish to meet special requirement on the building. Furnish and install the lighting fixtures as required by the following schedule:

Designation	Application	Description
A	Operator's Level	24" x 24", 3 lamp, parabolic fixture with 9-3 inch deep parabolic louvers in a steel housing with mitered

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corners and finished with an iron phosphate pretreatment ensuring good paint adhesion and rust resistance before painting with a polyester enamel. The louver shall be constructed of a pre-anodized aluminum, steel parts die-formed from code-gauge, cold rolled steel. The louver shall be secured by rugged t-hinges and spring loaded cam latches. Thermally protected, resetting, class P, HPF, ballasts, CBM approved and UL listed for three 17W T8 CW/RS fluorescent lamps. Lithonia Mfg. catalog no. 2PM3N GB 317 9LD 120 GEB PAF, Prescolite, Williams Inc., or approved equal.

B	Roadway Level	Stem mounted , 2-32 watt T8 fluorescent lamp fixture, low profile, wraparound, die formed housing, 20 gauge, from cold rolled steel. The housing shall be finished with a five stage iron phosphate pretreatment process ensuring superior paint adhesion and rust resistance. Painted parts shall be finished with a high gloss, electrostatically applied, baked white enamel finish. The ballast shall be class P, HPF, sound rated of A, U.L. listed, thermally protected. Stem shall be 12 inches in length. Ballast shall be DBM approved. High impact acrylic lower diffuser, optically engineered for superior light distribution and tinted to mask lamp image with easy snap-in installation. Fixture to be 120 volt AC rated. Fixture shall be by Lithonia Lighting Co. catalog no. LB232 120 GEB SQ12, Day-Brite Lighting, American Fluorescent Corp., or approved equal.
C	Equipment Level	Stem mounted industrial fluourscent fixture with 2 – 32 watt T8 lamps, housing formed from cold-rolled steel. The housing shall be finished with a five stage iron phosphate pretreatment process ensuring superior paint adhesion and rust resistance. Painted parts shall be finished with a high gloss, electrostatically applied, baked white enamel finish. . Ballast shall be thermally protected, resetting, Class P, HPF, UL listed, rapid start and sound rated. Fixture shall be Lithonia Lighting Co. catalog number EJ 232 120 GEB SQ12, Williams Lighting, Day-Brite or approved equal.
D	Stairway Lighting	Surface mounted, 10 inch square fluorescent fixture with seamless die-cast aluminum housing, epoxy primer and white durable powder top-coat. Polycarbonate translucent lens shall provide uniform illumination. Ballast shall be UL Listed, energy efficient, 120 volt, high power factor sized for a single 38 watt, 2D fluorescent lamp. Fixture shall be Rudd Lighting

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		catalog no. SS0238-ULW, Gotham Lighting, Lithonia Lighting or approved equal.
E	Over Control Console	Low voltage, track type lighting fixture for 50 watt size MR-16 lamps. Fixture to come with an integral 12-volt transformer and be surface mounted using a canopy adaptor, fixture shall be dimmable and shall be round in shape. Rudd Lighting Co. catalog no. TRB2R, Lithonia Lighting Co., or approved equal. Provide all track and fittings as required.
F	Exterior Soffit	Recessed soffit mounted downlight, galvanized steel fraime-in with adjustable integral yoke to retain optical system, galvanized bar hangers up to 24 o.c. inches, galvanized steel junction box with removable access door,, white splay diffuser with tempered lens, 1-32 watt TRT fluorescent lamp, 120 volt, Class P, thermally protected ballast. Lithonia Lighting Co. catalog no. LF6 1/32TRT F6LS73 120 or approved equal.
G	Bathrooms	Similar to Type B but 24 inches long with 2-17W T8 lamps and 6 inch stem. Lithonia Lighting Co. catalog no. LB217 GEB SQ6 or approved equal.
H	Over Entrance Doors	Surface mounted wall pack fixture, 1-50watt metal halide lamp, 12 inch die cast aluminum housing, weather resistant with gasketed ballast compartment and optical chamber, hinged die-cast lens frame, finished with e-coat epoxy primer and bronze powder coat. UL Listed for wet locations. Ruud Lighting Co. catalog no. MGWP0405-M or approved equal.
I	Emergency Lighting	Emergency, battery powered, surface mounted lighting fixture. Units to be provided with two, high output, 25 watt sealed beam lamps, and be equipped with self contained battery inverter power packs. Unit electronics shall be fully automatic in design. The charger shall be of the three stage type with constant current equalizer and float voltage modes. Circuitry will include a 15 minute time delay relay, low voltage battery disconnect and with burnout protection circuits. Custom designed, integrated circuitry shall be self diagnostic in design and constantly monitor charger performance and battery voltage. The unit shall be programmed to exercise the battery and check the emergency operation by automatically perform a five minute discharge/diagnostic check every six months. The unit shall have visual indicators to precisely indicate the area and type of malfunction. A manual

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		test switch shall be provided to allow a 5 minute test at any time. The unit shall be Dual-Lite Spectrum Series I Model No. ML-7E-I or approved equal.
J	Bascule Pier Lighting	Industrial type fluorescent fixture for high Dust/Moisture locations. Provide two 32 watt T8 lamps. Fixture shall be formed from reinforced polyester fiberglass with cold rolled steel enclosed wireway. Diffuser shall be shatter resistant 15% DR acrylic and secured to the housing with captive, corrosion-resistant, cam-action latches, 6 per 4'-0" unit. Fixture to have thermally protected, resetting, class P, HPF, Type 1 ballast with a sound rating of A. CBM approved and UL listed. Ballast shall be cold weather rated for 0 degree starting. Fixture shall be Lithonia Lighting Co. catalog no. DM232 AR 120 CW STSL or approved equal.
K	Maint. Walkways	Stanchion mounted, enclosed and gasketed fixture suitable for wet locations, 30 degree angle base with globe and guard, 1 1'4" hub size with 30 watt compact fluorescent lamp, Crouse-Hinds catalog number VXHA45GP or approved equal.
L	Clearance Gauge	High performance, HID, compact fixture, die cast aluminum housing and doors, anodized specular reflector, stainless steel locking hardware, electronic ballast, textured powder coat finish, black in color, tempered glass lens with half glare shield, 70 watt metal halide lamp, yoke mount, narrow spot distribution. Hydrel Lighting catalog no. 8100 70CMT6 120 NSP YM HGS SF GEB LPI BL or approved equal.

Install lighting fixtures on movable spans or where vibration may be a hazard to lamp life with shock-absorbing lamp receptacles.

Submit catalog cuts of fixtures with complete photometric data, where different from those indicated, to the engineer for approval.

Fluorescent fixtures shall be internally wired with No. 16, Type AF, insulated fixture wire in accordance with the latest requirements in the current edition of the NEC.

Fixtures with incandescent medium-base sockets shall be internally wired with no smaller than No. 16 and mogul sockets no smaller than No. 14 Type AF.

8-19.3(14)B <u>BALLASTS</u>

Furnish and install ballasts as required for all lighting fixtures. Ballasts shall meet the requirements specified herein and shall be designed to meet applicable Certified Ballast Manufacturer's and/or American Standard Association and Underwriter's Laboratories specification. Ballasts furnished must provide lamp watts within 90 percent minimum of lamp manufacturer's published ratings. All ballasts shall be sound rated "A". Replace any ballasts which do not operate quietly. Apply ballasts such that the ballast case temperature will remain below 90 degrees C, for full ballast life. The ballast shall supply an open circuit

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voltage which, at the minimum supply voltage limit, will meet requirements of the lamp manufacturer, and shall be guaranteed to start at least 90 percent of seasoned HID lamps at the minimum supply voltage limit in -20 degree F. ambient. All ballasts shall be equipped with either internal, non-resetting thermal protection devices adjacent to the coils and in the power capacitor or each ballast shall be provided with dual-element, inline, slow blowing external fuse.

All ballasts shall be of the high power factor type, with 120 V primaries.

Provide radio-frequency interference suppressor.

8-19.3(14)C NAVIGATION LIGHTS

Provide navigation lights, reflective markers, and signals during and after construction in accordance with the rules and regulations outlined in DG-208 of the United States Coast Guard, Part II, Number 208 of Volume 33 of the Federal Register. All phases of such work must be completed to the Coast Guard's satisfaction and approval.

All pier and center channel navigation lights, doors and lenses shall be gasketed, and the entire units shall be completely weatherproof. Fittings shall be noncorroding and the sockets shall be of porcelain, mounted on shock absorbers. All lenses shall be of permanent, rigid, heat-resistant glass, 187mm, standard regular marine Fresnel type.

Pier marker lights shall be cast aluminum, gasketed and a 180 degree red Fresnel lens. Locate and mount light fixtures as shown on the plans. Pier marker lights shall be B&B Roadway Manufacturing type PL, or approved equal.

Center channel navigation lights shall have an automatic latch mechanism to hold the light securely in the normal and service positions. The fixture shall be cast aluminum, have two lamp sections with upper section to have a 180 degree red Fresnel lens and the lower section to have a 180 degree green Fresnel lens. The center channel navigation lights shall display green at the fully-open position and red for all other positions as shown in the plans. Center channel navigation lights shall be B&B Roadway Manufacturing type BS, or approved equal.

Lamps for all navigation lights shall be of the four (4) tier LED style, 120 volt, with standard medium base. Lamps shall be rated for 100,000 hour life, color shall match lens color of the fixture.

8-19.3(14)D PHOTOELECTRIC CONTROLLER

The navigation light photoelectric controller shall be furnished and installed as shown on the plans. The photocell shall operate at 120 volts AC with a load rating of 1000 watts and capable of sustaining 130 amps inrush current at 120 volts AC. The photocell shall mount in a 3-pole twist lock 3 inch receptacle made from molded thermoplastic. Housing of photocell shall be of grey polycarbonate with an acrylic window and UVA7 ultraviolet inhibitor, Fisher Pierce model 7760-ES10, or approved equal by Crouse-Hinds, and shall be factory set at 20 foot candles.

8-19.3(16) HORN SIGNAL SYSTEM

Furnish and install a complete self contained air horn signaling system complete with air compressor, dual stainless steel projectors, piping and all hardware required as shown on the Plans.

The projectors shall be capable of producing a tone between 260 and 300 Hz with a decibel rating of 120db intensity at 10 feet. Tone and volume shall be field adjustable. The

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air horn assembly shall be a single unit comprised of compressor, horns and all piping and shall be of weatherproof construction suitable for outdoor mounting.

The compressor shall be a weatherproof, rapid response, direct drive piston type compressor. Piston and cylinder shall be on oil-less, non-lubricated type, with a Teflon compound piston ring. Compressor valve shall be stainless steel. Bearings shall be permanently sealed, pre-lubricated ball type, requiring no maintenance. All components and fasteners shall be corrosion resistant.

The compressor motor shall be standard speed, 1 hp motor, 120 volts AC, 60 Hertz.

Air horn assembly system shall be B&B Roadway Corp. model AHR-2 or approved equal..

8-19.3(17) COMMUNICATIONS

8-19.3(17)A INTER-COMMUNICATIONS

In order to provide means of intercommunication throughout the bridge structure and between the remote site at Water Street, furnish and install a multi-circuit industrial rated communication system. The equipment shall be as manufactured by Gai-Tronics, Reading, PA.

The operator's station shall be installed on the operator's level of the north control tower and mounted on control console as shown on the drawings. Intercom stations shall be located at locations throughout the bridge structure where shown on the drawings. Stations located within the bridge piers shall be provided in NEMA 4 enclosures and be suitable for wet locations. Speakers for all units shall have integral drivers, 30 watt rated and be corrosion resistant. Speakers shall be located within 5 feet of the station hand set. Wall mounted intercom stations shall be located 4'-6" above finished floor as shown on the Plans unless otherwise indicated.

Furnish and install all handset, speakers microphones, environmental enclosures, mounting hardware and brackets as required to provide a complete and operational intercommunications system as described herein and shown on the plans. The inter-communications system shall enable the operator to communicate with individuals in and around the bridge interior spaces and the pedestrian areas near the traffic gates. The operator will need to alert all areas of the bridge when an operation is about to occur. All internal locations of the bridge will be zoned together to enable an "all call" feature. All intercom stations located outdoors or in unheated spaces will need to be able to withstand outdoor environmental conditions. These conditions will include rain, snow, dust, humidity, chemical pollutants, extreme temperatures (-40 F to 140 F), and other environmental hazards.

In order to provide a means of one-way communication with the vehicles, pedestrians and marine vessels, furnish and install a single circuit communication system as a part of the intercommunications system. The system shall consist of an amplifier and weatherproof speaker for each station (2 stations required) and mounted on the bridge traffic signal poles as shown on the drawings.

Furnish all material and coordination to install cable from each extension in the system.. Install the cable from point to point in accordance with the manufacturer's recommendations as per the plans with no intermediate splices.

The operator's station shall be a desk top style, single party line with handset and built-in speaker, Gai-Tronics Model 726 102. Intercom stations located on the Roadway Level and Equipment Level of both control towers shall be Gai-Tronics Model 700-102. Intercom stations located in the bascule pier areas and machinery areas shall be housed in

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weatherproof enclosures, Gai-Tronics Model 730-103. Speakers for all units, except for the desk top unit, shall have integral drivers, 30 watt rated, corrosion resistant, Gai-Tronics Model 13320. Speakers shall be located within 5 feet of the station. Wiring shall be by Gai-Tronics or approved equal. Cross channel wiring to the south bascule pier shall be continuous without splicing and utilize the cross channel duct system shown on the plans.

In order to provide a means of one-way communication with vehicles and pedestrians, a single circuit communication system shall be furnished and installed as shown on the plans. The speakers shall be mounted on the traffic signal poles and located such to direct the audio signal to the traffic gate areas on the north and south approaches.

8-19.3(17)B CLOSED CIRCUIT TELEVISION

Provide and install a complete Internet Protocol (hereafter, "IP") CCTV system including but not limited to six color cameras, four (4) 5 GHz wireless transceiver units, antennas, cable, fiber optic cable, conduit, mounting hardware, software, Ethernet switches, computer workstation, display monitors, display ceiling mounts, network video recorder, CCTV equipment cabinet, fiber optic accessories, all necessary cable terminations, and all necessary hardware to install a complete IP CCTV system as shown on the plans and described herein. The new IP CCTV system shall be networked and controlled from a computer workstation that interfaces with dual-display monitors located within the North Control Tower, Operator's Level. A computer workstation, specified later below, shall be installed with Pelco DS Control Point Client software, which is free downloadable software from Pelco's Internet website (www.pelco.com).

A network video recorder shall be provided, installed, and configured to allow for multi-camera (up to 32 cameras) of recording capabilities using MPEG4 compressed video for a minimum of at least 30 days. The recorder shall be capable of recording at a specified frame rate of at least 5 frames per seconds with a frame size value of 8000 to 25,000 bytes, an activity level of 50%, and a video resolution of 4CIF. Network video recorder shall be supplied with an internal storage drive of 1.5 Terabytes and programmed to provide recording feedback for each of the six video cameras being monitored.

A fully functional, fixed/variable speed, Pan-tilt-zoom (PTZ) keyboard shall be provided and installed for direct interaction with the Pelco cameras using the aforementioned DS Control Point software. Keyboard dip switches #7 and #8 shall be set to "ON" for ASCII mode capabilities. A RS-232/RS-422 converter kit shall be provided to interface the PTZ keyboard with the below supplied computer workstation. Converter kit shall be Pelco Cat. No: PV140. Keyboard shall be configured and setup to provide full pan-tilt-zoom capabilities of each of the cameras. Keyboard shall be manufactured by Pelco, Cat. No: KBD300A with optional KBDKIT provided.

A CCTV equipment cabinet shall be provided that allows for CCTV equipment to be housed and connected. Video and data transmission of all cameras shall communicate over an IP Ethernet based network using CAT5e cable, wireless transmission, and dual-redundant fiber optic cables that extend across the underground duct between the North and South control towers. Refer to plan sheet BE24 for a full detailed description of the complete network layout.

Furnish and install six (6) color cameras at the South Park Bridge. Cameras shall be provided as follows:

Camera #1 shall be located on the West end of the North side pier. This camera shall face a Southeast direction with a field of view including the Southwest corner of the South side pier. The camera will used to verify that a vessel has cleared the bridge before it can be lowered. The camera image will be displayed on the dual-display monitors located within the

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North control tower, operator's level. An external mounted power supply shall be secured to the inner wall of the Control Tower wall that allows both 120V conduit and CAT5e conduit to terminate. Power supply shall provide 24VAC output conductors that will route directly with the CAT5e cable through a sleeve in the concrete wall of the control tower for direct connection into the camera mounting stem of the camera unit. See CCTV camera detail plan sheet BE25 for further detail of the installation.

Camera #2 shall be located on the East end of the South side pier. This camera shall face a Northwest direction with a field of view including the Northeast corner of the North side pier. The camera will be used to verify that a vessel has cleared the bridge before it can be lowered. The camera image will be displayed on the dual-display monitors within the North control tower, operator's level. An external mounted power supply shall be secured to the inner wall of the control tower wall that allows both 120V conduit and CAT5e conduit to terminate. Power supply shall provide 24VAC output conductors that will route directly with the CAT5e cable through a sleeve in the concrete wall of the control tower for direct connection into the camera mounting stem of the camera unit. See CCTV camera detail plan sheet BE25 for further detail of the installation.

Camera #3 shall be mounted on a roadway lighting pole (Pole No. 14) located on the Southeast side of the North control tower as shown on the plans. This camera shall face North with a field of view including both the traffic gate and resistance gateson the North side approach spans with as much detail as possible. The camera will be used to verify that a vehicle is not located under the traffic gate or resistance gate before lowering the traffic gate or resistance gate. It will also be used to verify that the spans are clear of pedestrians before and during operation of the bridge. The camera image will be displayed on dual-display monitors located inside the North control tower, operator's level..

Camera #4 shall be mounted on a roadway lighting pole (Pole No. 11) located on the Northwest side of the South Control Tower as shown on the plans. This camera shall face South with a field of view including both the traffic gate and resistance gateon the South side approach spans with as much detail as possible. The camera will be used to verify that a vehicle is not located under the traffic gate or resistance gate before lowering the traffic gate or resistance gate. It will also be used to verify the spans are clear of pedestrians before and during operation of the bridge. The camera image will be displayed on the dual-display monitors located inside the North control tower, operator's level.

Camera #5 shall be mounted on a roadway lighting pole (Pole No. 23) located on the North end and West side of 16th Ave. S. This camera shall face North for observance of the Intersection of 16th Ave. S. and E. Marginal Way. Camera #5 shall be used to view potential traffic congestion at the intersection during a bridge opening. Camera shall be fed 120V power under the Illumination Roadway Lighting section of the project (see Illumination plans IL05, IL09 and IL10). Power shall be fed from Panel board "N1" circuit #6. Contractor shall be responsible for routing and connecting the 120V Illumination circuit found either within the illumination pull box (at or near the pole), or from pre-pulled conductors within the pole. Contractor shall be properly connect and route the conductors inside the pole to the camera. Camera #5 shall be connected to and supplied with a 5 GHz unlicensed wireless radio unit for communication with the North control tower. Contractor shall be responsible for all installation, including proper alignment and signal strength testing per manufacturer's recommendation.

Camera #6 shall be mounted on a roadway lighting pole (Pole No. 7) located on the South end and West side of 16th Ave. S. This camera shall face South for observance of the Intersection of 14th Ave. and Dallas Ave. Camera #5 shall be used to view potential traffic congestion at the intersection during a bridge opening. Camera shall be fed 120V power

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under the Illumination Roadway Lighting section of the project (see Illumination plans IL02, IL09 and IL10). Power shall be fed from Panel board "S1" circuit #6. Contractor shall be responsible for routing and connecting the 120V Illumination circuit found either within the illumination pull box (at or near the pole), or from pre-pulled conductors within the pole. Contractor shall be properly connect and route the conductors inside the pole to the camera. Camera #6 shall be connected to and supplied with a 5 GHz unlicensed wireless radio unit for communication with the South control tower. Contractor shall be responsible for all installation, including proper alignment and signal strength testing per manufacturer's recommendation.

All video cameras shall be an IP based,High-Resolution Day/Night color-capable unit with NTSC signal format having a 2:1 interlaced scanning system. Image sensor shall be ¼-in EXview "HAD" with a 768 horizontal x 494 vertical pixel format. Camera lens shall be an integrated zoom lens with f/1.4 (focal length, 3.4mm-119mm capabilities. Camera zoom shall be 35X optical and 12X digital with a zoom speed of 3.2/4.6/5.5 seconds. 24VAC/operating power, auto/manual focus, auto/manual integration, low temperature heater, outdoor pressurized environmental housing. Each camera unit be integrally supplied with the internal IP circuitry for direct connection to an Ethernet network. See sheet plan BE24 for full details on the model and camera type/style being used.

Each enclosure shall be provided with camera mounting hardware. The cameras located on the traffic signal poles shall be furnished with all required mounting hardware needed to mount the camera on the roadway lighting pole. The cameras located on the bascule pier shall be mounted to the concrete pier. All required material and hardware shall be furnished as needed to mount the camera.

Each control house shall be provided with a wireless radio transceiver unit for communicating to remote cameras (Cameras 5 & 6). Each wireless unit shall provide a self-contained panel that houses a 5 GHz IP-based radio transceiver unit and internal directional antenna. The unit shall mount directly on a 3" galvanized steel pole or conduit that extends above the rooftop of each control tower. A fabricated support member pole cup and weatherproof roof flashing shall be provided and installed under a separate Control Tower specification within the project. Contractor shall be responsible for mounting the pole, radio units, power conductors and CAT5e cable, conduits, and appropriate mounting hardware to the galvanized steel pole. Contractor shall be responsible for securing the pole within the fabricated support member pole cup using steel bolts, washers, and/or lock nuts. Contractor shall provide a direct ground strap connection between the galvanized steel pole/conduit and the bridge grounding system using a #2/0 bare stranded copper conductor. Contractor shall make provisions for properly routing the ground conductor to the nearest bridge grounding system location. A welded loop style terminal connector shall be used to properly bolt the ground conductor to the bridge grounding system.

An unmanaged fiber and copper Ethernet switch and wall mount kit shall be installed and mounted within the South Tower cross-channel termination panel. Contractor shall be responsible for the installation of the Ethernet switch and power circuit (supplied from Lighting Panel LP-2) within the cross-channel panel. Redundant multi-mode fibers shall be terminated at the Ethernet switch using type SC connectors. Two additional fibers (spares) shall be coiled up within a 12-inch diameter coil and secured with tie-straps inside of the cross-channel termination panel. Unmanaged 10Base-T/100Base-FX Ethernet switch shall be manufactured by Pelco, Cat. No: FX82052MSCR-4, Ethernet switch wall mount kit shall be: Pelco Cat. No: WM5002-3U.

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A workstation class computer shall be provided and provide at a minimum the following requirements:

1. Mini Tower shall provide (1) 3.5” Bay, (2) 5.25” Bays, and capable of mounting (2) Internal Hard drives. Internal connections shall include: A total of (4) SATA connectors, of which, (2) shall be designated for hard drives and (2) designated for optical drives.
2. Intel® Q965 (ICH8) Express Chipset
3. Intel® Core™ 2 Duo 1066MHz FSB Socket T with Dual Core technology XD, EM64T, 2MB and up to 4MB L2 cache, EIST and VT (E6000 series)
4. Microsoft® Windows® XP Professional with Service Pack 3 (installed)
5. Hard drive shall be either Serial ATA or Serial ATA 3.0 with SMART III technology. Hard drive shall have a burst transfer rate of 300 Mbit/s, and support FAT16 AND FAT32 partitioning in a Windows XP environment. Hard drive shall have an available access speed of either 7200RPM SATA 3.0Gb/s: with a minimum of 80GB (or) 10K RPM SATA 1.5Gb/s: 80GB (min.).
6. System board shall provide a (4) 7-pin Serial ATA connectors, (1) 34 pin floppy drive connector, 5 pin connector for internal fan, PCI 2.3 120-pin connector, Front Panel 40-pin connector.
7. Minimum of 2 GB of DDR2 SDRAM system memory. Unbuffered, non-ECC DIMMs only.
8. Network Interface Card that supports 10/100/1000 Ethernet
9. Expansion bus shall be PCI 2.3 (PCI: 33 MHz), PCI Express 1.0a (x1 @ 5 Gbps, x16 @ 80 Gbps), SATA 1.0a and 2.0, and USB 2.0 Ports (supporting 480 Mbps) – two in front, 6 in rear.
10. DC Power Supply: Shall be provided per mfg. recommendation. Minimum requirements shall be 305 W, 76% power efficiency, with a heat dissipation of 1041 BTU/hr. Manual Voltage selection of power shall be capable of 90 to 135 volts at 50/60 Hz, 180 to 265 volts at 50/60 Hz.
11. Internal USB 10 pin connector for optional media bay device.
12. Serial Port (1) rear
13. Parallel Port (25 pin – bidirectional)
14. PCI-Ex1, (1) full height available slot, 36 pin connector size, one bi-directional differential lane pair (2.5 Gbs per lane) 5 Gbs total.
15. PCI, (2) full height available slots, 120 pins connector size, 32 Bit/33 MHz data bus, 3.3V External Operation (1.8 V internal regulation).
16. PCI-Express x16, one full height, 164 pin connector size, 16 bi-directional differential lane pair (2.5 Gbs per lane) 80 Gbs total.
17. High Definition Sound Card, 20-bit analog-to-digital; 20-bit digital-to-analog, with stereo line in, speakers line out, microphone-in, and headphone out
18. Graphics Cards shall be a 256MB ATI Radeon® X1300 PCI-Express X16 with a Max. resolution of 1920x1200 @ 75 Hz & 16.7 million colors. RAMDAC of dual 400MHz, dual VGA (DB15) or DVI optional DMS-59 cables, dual monitor support, dual rotation support.
19. Multimedia USB Keyboard
20. USB 2-button optical premium mouse with scroll, black color.
21. Audio Sound Speakers
22. 16x DVD+/-RW SATA Optical Drive

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Workstation Class Computer shall be a Dell Optiplex 745 Minitower, or approved equal.

Furnish all material and coordination to install the cable from each camera in the system to the appropriate unmanaged Ethernet switch as shown on the plans. Install the cable from point to point as shown on the plans with no intermediate splices.

8-19.3(17)C MARINE BAND RADIO

Provide and install on the top of the CCTV electronic rack a marine band radio which consist of but not limited to a master receiver/transmitter station, 120 volt AC/13.2 volt DCpower supply, stainless steel 3 dB gain marine antenna, coax cable type RG-8U, length and fittings as required and microphone. Receiver/Transmitter unit shall be capable of monitoring U.S., Canadian and International channels, with 25 watt transmit power, with a transmit frequency range of 156.025 to 157.425 MHz and a receiver frequency range of 156.325 to 163.275 MHz, signal to noise ratio greater that 37 dB at 3 kHz. Unit shall be Humminbird model VHF255s or approved equal.

8-19.3(18) PROGRAMMABLE CONTROLLER

All analog and digital logic functions required to control, interlock, and coordinate the bridge remote control system and associated components shall be performed by the programmable controller (PLC) as shown in the schematic diagrams.

The PLC equipment shall be installed in two cabinets. The Main PLC cabinet shall be installed in the north control tower. This Main PLC cabinet shall house the main central processor units (CPU), input-output units (I/O's), and all other associated equipment. The Remote PLC Cabinet shall be installed in the south control tower. This Remote PLC Cabinet shall house the remote I/O units and associated equipment.

The power supply module shall be isolated from the commercial power supply source by a constant voltage transformer/power conditioner to prevent electrical system noise and voltage fluctuations from interfering with the operation of the CPU. Unit shall be rated for 1,000 VA, 120 volts, with a nominal voltage of 115 volts. Unit shall be MGE catalog number T800P-01000 or approved equal.

8-19.3(18)A QUALITY CONTROL

All PLC equipment (CPU, I/O frames, input cards, output cards, multiplexer, cables, etc.) shall undergo a minimum of 100 hours continuous burn-in prior to shipment. Burn-in shall be done while carrying temperature between rated limits of the device and cycling the equipment through a program.

PC equipment, including programming devices, shall be tested so as to ensure their proper operation in the presence of both radio frequency and electrical noise.

8-19.3(18)B REDUNDANT CONTROL PROCESSOR

The programmable logic controller system shall be arranged such that both the main and redundant processors shall be programmed with identical information, operate on the same time base and run in complete synchronization, except that the redundant processor outputs shall be electrically isolated from the main system. In the event that trouble or failure of the main CPU occurs, transfer to the redundant CPU for bridge operations shall be made by manual means and of such ease that non-technically oriented personnel may make the transfer without difficulty. Location of the manual transfer switch shall be on the door of the

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main PLC cabinet and shall utilize a key switch with indicating lights to indicate the CPU in service.

8-19.3(18)C CPU MEMORY

Each central processor shall have a metal oxide semi-conductor memory with a battery backup power system. Batteries shall be able to support the memory for not less than three months without external power.

A key operated selector switch shall disallow changes in the stored program while in the "Operate" position.

The status of the inputs and outputs shall be checked at the time they are called for in the program rung the CPU is operating on.

The outputs shall be available to be turned "ON" or "OFF" as soon as its rung has been scanned.

The CPU shall check the parity of each word at the time it is scanning that word. The CPU shall contain "trouble" lights to indicate memory parity errors or processor malfunctions.

All CPU operating logic shall be contained on plug-in cards for ease of replacement. Chassis wired logic is not acceptable.

The memory unit shall have spare program capacity equal to 20 percent of the memory used.

8-19.3(18)D SYSTEMS INPUT AND OUTPUT (I/O'S)

I/O frames shall be completely pre-wired for a full complement of I/O boards.

Additional I/O frames (up to the maximum PLC capacity) can be added at any time in the field.

I/O modules shall have key slots, which are unique for each card type, so that the wrong card type cannot be inadvertently installed in a slot that was programmed for a different card type.

I/O cards shall be replaceable without removing panel wiring.

I/O cards shall provide at least one common terminal for every two inputs or outputs.

Inputs and outputs shall be provided with reed relay or optical isolation between field circuits and internal circuitry.

Status lights shall be provided for each input or output amplifier indicating a signal is present to turn the input or output "ON".

Outputs shall be fused, and the fuses shall be easily removable without the use of special tools.

Output cards used only for pilot light service shall have a minimum continuous load capacity of 0.25 amperes at 120 VAC.

Output cards used for other loads shall have a minimum continuous load capacity of 1.5 amperes, and shall be capable of operating and withstanding the operating and surge characteristics of a NEMA size 4 starter.

Analog inputs and outputs shall have a range of 4 to 20 milliamperes. Conversions between external analog signals and internal numeric values shall have a resolution of no less than one part in 999.

Timers shall be available through programming of counters utilizing time base inputs to counters. Time bases shall be available in seconds and tenths of seconds.

Arithmetic capability shall include add, subtract, multiply and divide, in integer mode using numbers up to 999. See schematic legend sheet in the Plans for function descriptions.

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8-19.3(18)E DATA LOGGING SYSTEM

Provide a subsystem capable of report generation. System shall output to a multifunction printer/scanner/copier/fax machine. Printer shall be capable of printing up to 32 pages per minute and 1200 dpi print resolution. Printer shall be located on a printer stand next to the main control console in the north control tower operator's level. The fax shall be connected to the phone line provided elsewhere in the special provisions. Connectivity shall be by USB or wireless. Printer shall be Hewlett Packard model 6500 or approved equal. . All necessary hardware and programming is to be included.

This subsystem shall store operational and alarm data and will print a report summary on command. Each printout shall include day-of-year, time-of-day, and the message as they appear in these special provisions and on the plans. Printer output messages shall be as shown on the plans.

A Bridge Activity Movement Report shall be included as part of the data logging system. The report shall contain the following information:
Date, time of opening initiated, time of span off seat position, time span motors stopped and position of the span when stopped, time span motors began to lower, time span motors stopped and span position, and the time the bridge was opened to vehicular traffic.

Each time the span motors are stopped, whether raising or lowering, the Data Logging System shall store the activity report with the time and position of the span regardless of whether the span is fully open or fully closed.

The Activity Report shall be formatted similar to below :

South Park Bridge Activity Report
(Example)

Date:	April 18, 2011	Time Opening Initiated:	10:30:05
North Leaf off Seat:	10:32:28	South Leaf off Seat:	10:32:28
North Leaf Open at:	10:35:13	South Leaf Open at:	10:35:19
North Leaf Position:	74.2 Deg	South Leaf Position:	74.4 Deg
North Leaf Lowered:	10:51:38	South Leaf Position:	10:51:48
North Leaf Seated:	10:54:48	South Leaf Seated:	10:54:48
North Leaf Position:	00.00 Deg	South Leaf Position:	00.00 Deg
Time Opening Completed:	10:58:26		
Total Time of Opening:	00:25:58		

8-19.3(18)F PROGRAMMING

The program shall be entered using an IBM format Compatible Lap Top Personal Computer. Software shall be fully compatible with the PLC equipment. Provide two (2) fully compatible computer system complete with modem hardware and software with a baud rate suitable for the modem equipment provided. Each computer shall be provided with a Pentium 4 processor, 40 Gigabyte hard drive, 512 Megabyte memory, DVD/CDRW combo CD drive with a minimum 14 inch screen. In addition to the software above, each lap top shall have Windows 2007 and Microsoft Office 2007. The lap top computers and all software shall be turned over to the owner at the completion of the project. Storage of one computer shall be within the PLC cabinet on a fold down work table mounted to the PLC cabinet door.

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Each of the following logic symbols shall take no more than one word of CPU memory:

1. coil with address
2. normally closed contact with address
3. normally open contact with address
4. branch open
5. branch close

The CPU shall automatically close gaps in memory when logic statements are removed, thus eliminating NOP's in memory.

It shall be possible, at any time by means of a permissive key interlock, to modify an existing program in memory by inserting one or more ladder diagram rungs between any two existing (previously programmed) rungs. This ability to insert rungs of unspecified word length shall be accomplished by the technique of automatic "gap open", not by the imprecise method of reserving "contingency" blocks of memory for future changes.

It shall be possible to connect programming equipment to the CPU while the CPU is running without interfering with the operation of the CPU.

It shall be possible to record programs stored in the CPU memory on magnetic disk. Disk drive hardware shall be provided with the lap top computer.

It shall be possible to copy programs stored on magnetic disk into the CPU memory.

It shall be possible to verify programs stored on magnetic disk against programs stored in the CPU memory.

It shall be possible to monitor the contents of the various timer and analog registers shown in the drawings. Numerical access pad and display unit shall be provided on the control desk.

It shall be possible to communicate with the CPU at the bridge site and the lap top computer located at a remote location via a internet connection. Communiction shall be secure and password protected. Connection equipment and necessary software shall be provided with the PLC equipment and the lap top computer.

8-19.3(18)G CABINET

Furnish cabinets as described later in this special provision.

8-19.3(18)H SYSTEM HARDWARE

The system shall be complete with all power supplies, racks, interface modules, fault monitors, and any other internal devices required.

8-19.3(18)I DOCUMENTATION

The supplier shall furnish Instruction Manuals described under "Instruction Books" in this special provision. In addition, these manuals shall include operation of the equipment, programming of the equipment, theory of operation, maintenance information, schematics of all cards or units within the system, and point-to-point wiring diagrams.

Provide documentation of the PLC program, which shall include:

1. Ladder diagram printout.
2. Rung address.
3. Contact addresses and English contact description.
4. Cross reference of rungs which control contacts.
5. Cross reference of contact controlled by each rung.

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6. English comments before each series of rungs.
7. Cross reference to relay numbers in plans.

8-19.3(18)J FACTORY TESTS

Pre-test the PC at the factory to ensure that the ramp functions operate in accordance with the plans.

The control console described in these specifications, or a test panel shall be provided to derive the control signals and indicators required to simulate span position.

Notify the engineer 30 days prior to the tests so that he can arrange for a witness to these tests.

The supplier's costs (if any) of debugging the schematics or adapting the program to his hardware, both at the shop and on the project site after installation, shall be included as incidental to the contract.

8-19.3(18)K MANUFACTURERS

To insure compatibility with existing PLC equipment currently in use within the City of Milwaukee, the PLC shall be as manufactured by Allen Bradley or approved equal. The PLC equipment shall be Contrologix series or equal.

8-19.3(19) CONTROL PANELS

The following general requirements apply to all panels and enclosures. Specific requirements are included later in this special provision with the description of each panel.

Furnish the following panels and enclosures:

Control Console
Main PLC Cabinet
Remote PLC Cabinet

Electrical indicating instruments, unless otherwise specified, shall be of the digital type, with 4 digit, 0.56 inch high LED display, shall be designed for semi-flush mounting, and shall be 1.89 inches and 3.89 inches wide. Instrument ranges and scales shall be as shown on the plans. Instruments shall be as manufactured by Simpson, Red Lions, Datel or approved equal.

Push buttons, indicating lights, and non-illuminated selector switches shall be 30.5mm, heavy duty oil tight by Allen Bradley 800T, Square D type K or Cutler Hammer 10250T.

Multi-light controls shall be a one to four light display with individually controlled lamp and color chip lenses. Lens colors shall be as shown on the plans. Control switches shall measure 2.25 inches square, be of oil tight construction for protection against oil, water, and coolant penetration behind the panel or into the device. Assemblies shall have four swing-out mounting lugs for simple panel mounting, and have heavy duty contact blocks capable of tandem mounting. Units shall have internal 120 VAC transformers and each lamp individually controlled. Lamps shall be LED type. Nameplate engraving shall be as shown on the plans.

Key switches shall be double pole, double throw spring return or maintained contact type, heavy duty oil tight, as shown on the plans, Cutler Hammer type 10250T, Allen Bradley type 800T, Square D type K or approved equal. All key switches shall be keyed alike. Access key for the bypass switch panel cover shall be keyed separately.

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Toggle switches shall be 3 pole, double throw spring return or maintained contact type as indicated on the plans, 10A minimum at 115 VAC, with a red switch guard. Switch guard shall be red high strength plastic configured such that when closed it returns the toggle switch to the normal position.

All load relays (R166, R170, etc.) shall be 10 ampere, 600 volt rated, Allen Bradley Type P, Square D Type X or Cutler Hammer type M-600 with normally open and normally closed power poles as shown in the plans.

All panels and enclosures shall be of the freestanding type. The construction shall be of steel plate of thickness described in the individual panel specifications and shall consist of a frame of suitably sized, formed structural steel members joined by electrical welding to ensure true surfaces and adequate support for the instruments mounted thereon.

All welds on the exposed surfaces shall be ground smooth. Finished surfaces shall be free from waves, bellies or other imperfections. Exterior surfaces shall be sandblasted, ground smooth, filled, primed, sanded and finished.

All instrument cutouts, mounting studs, and support brackets shall be located accurately. Unless specified otherwise, doors shall be hinged and shall have turned-back edges and additional bracing where required to assure rigidity. Hinges shall be of the piano or concealed type. Door latches shall be of the three-point type to assure tight closing.

Before application of paint, all surfaces shall be carefully cleaned of all dirt, moisture, rust, scale, lubricants and other substances. Lubricants shall be removed by suitable solvents. Rust and scale shall be removed by sandblasting, power sanding, power grinding or power wire brushing.

Exterior finish shall consist of application of suitable primers and two or more finish coats of enamel, as required to provide a smooth, hard and durable finish. The finish color for control panels shall be ANSI 61 Light Gray.

Interior surfaces shall be finished with gloss white lacquer applied over suitable primers.

The supplier shall include six 16-ounce containers of touch-up paint in aerosol cans for each color specified above. Touch-up paint shall be of the same type and color as the finish paint used in the factory applied painting. Complete painting instructions shall accompany the touch-up paint.

Paint films shall be free of sags, checks, blisters, teardrops or fat edges. If any such defects appear, they shall be repaired by and at the expense of the supplier.

Provide interconnecting wiring between all electrical devices mounted in the panels and enclosures. If the devices are to be connected to external equipment, they shall be connected to terminal blocks except for specific instrumentation cables as shown on the plans. Conductors for connection of machine tool relays, panelboard circuits and other miscellaneous equipment shall be UL listed type THWN-MTW. Minimum size shall be No. 14 AWG. For internal conductors between the PLC I/O cards and the field wiring terminals shall be of similar type with a minimum size of No. 16 AWG.

Install all interior wiring neatly and carefully. Terminate at suitable terminal blocks. Make all wire terminations with ring tongue nylon self-insulating wire terminals. Install wire terminals using a high compression indenting crimping tool that assures a full crimp by releasing the terminal only when the crimp is complete. All control and instrument wiring used within the panels shall conform to NEC and NEMA standards and shall be installed and tested at the factory.

Wiring to each control switch shall be individually bundled. Install with a "drop loop" of sufficient length to allow its removal from the panel for maintenance without disconnecting the wiring.

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Internal wiring in factory pre-wired electronic system cabinets may be installed according to the manufacturer's standard as to wire size, insulation, and method of termination on internal equipment.

Provide terminal blocks for conductors requiring connection to circuits external to the specified equipment, for internal circuits crossing shipping splits, and where equipment parts replacement and maintenance will be facilitated.

Provide terminal blocks with white marking strips. All terminal blocks shall be rated 600 volts and have pressure plate screw terminals. Standard terminal blocks for 8 AWG and smaller conductors shall be channel mounted in groups of 12, 16 or 20 terminal points as shown on the plans and shall be Square D 9080 GP6, Allen Bradley 1492-CA1, or approved equal. Variations in number of terminal blocks per group shall be as shown in the drawings. Identify individual terminal blocks using the numbering system shown in the plans, using ABB/Enterlec marker-holder catalog number PEBM 0113 084.01 or approved equal.

Provide terminal blocks with corrosion resistant platings on non-ferrous hardware.

Group terminal blocks for easy accessibility unrestricted by interference from structural members and instruments. Provide sufficient space on each side of each terminal block to allow an orderly arrangement of all leads to be terminated on the block.

Permanently label each terminal block, device, fuse block, terminal, and both ends of each conductor, to coincide with the identification indicated on the manufacturer's wiring diagrams. Terminal blocks and devices already numbered on the plans shall be so numbered on the equipment supplied. Identify mounted electronic components by marking with contrasting colored ink beside the component.

Identify individual conductors by permanent marking sleeves using handheld marking tapes or other computer generated software. The marking shall be done on a sleeve not less than 1/2 inch long. The inside diameter of the sleeve shall be such that it will slip snugly over the insulated wire. Mark each sleeve so that the identification shall be permanent and waterproof. Adhesive type labels are not acceptable.

Provide internal illumination in all panels and enclosures using 18" fluorescent strip fixtures. Install a lighting switch activated by the access door of the panels and enclosures. The control desk will not require internal lighting.

Provide a convenience outlet in each panel and enclosure for use with power tools, portable lamps, and other similar equipment. Furnish in each enclosure and the control desk a 120 volt AC circuit to feed the interior lighting, the convenience outlets and the illuminated indicators.

Prepare wiring diagrams on sheets approximately 22 inches by 34 inches. Where interconnecting wiring from different items of equipment or sectional wiring diagrams of the same item of equipment appear on different wiring diagram sheets, all interconnections shall be clearly identified.

Information indicated on the contractor's drawings shall include wiring of the individual panel items as they actually will appear in the panel, contact arrangements of switches, and internal wiring of relays and instruments.

Elementary diagrams shall be cross-referenced to terminal markings on the connection and interconnection diagrams, but need not show complete details of circuits external to the panels. Identify each item of panel mounted equipment indicated on the diagrams by item number and name.

Factory test all control panels for circuit continuity and operation.

Provide laminated phenolic nameplates on the panel faces for all instruments and devices mounted on the panel faces, except where the instruments or devices are

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themselves provided with a service engraving. Attach phenolic nameplates to the panels with double-sided adhesive tape.

All nameplates shall be WHITE with BLACK engraved lettering unless specified otherwise.

8-19.3(19)A CONTROL CONSOLE

Furnish and install the Control Console in the operator's tower where indicated on the plans, for operation of the span and its auxiliaries. All devices necessary for the local electrical control of the bridge shall be mounted on this console.

The control console shall be of neat, substantial construction, arranged as shown on the plans. It shall be fabricated from not less than No. 11 gauge sheet metal properly formed, and suitably reinforced by steel angles to provide adequate strength. The flat top and inclined portions of the console top shall be 10 gauge brushed stainless sheet steel. The top and front slope shall be of non-reflecting finish.

Provide removable doors in the front of each console, secured with 3-way latches. The console shall be neatly fitted up with close joints, and all rough edges or corners shall be ground off smooth and all projecting edges rounded off. All metal hardware shall be of substantial construction, and shall have a satin-chrome plate finish.

The bottom shall be of open type construction. The opening shall be framed with standard size strut, arranged to facilitate the clamping of cables or conduits.

Mount the span control switches and other control devices within the body of each console. Mount the indicating lights for each operation inside or adjacent to the control device governing that operation as indicated.

1. Indicating Lights - Functions to be indicated, and the color of the caps for such indication shall be as shown on the plans. Each indicating light shall be as shown on layout. Each lens shall be provided with an engraved legend, as indicated on the plans, which shall be readily visible when the lamp is energized. Each indicating light shall be similar to type shown and it shall be suitable for mounting on the desk top provided.
2. Span Operated Counter shall be 120VAC, 6-digit, panel mount, key-reset. Unit shall count 1/2 digit on a closed contact and 1/2 digit on an open contact. Counter shall be Veeder-Root catalog number 744386-241 or equal.
3. Provide the control console with a touch-screen display that will provide alarm displays, data logging records, key data registers as shown on the plans and specified in these specifications. Touch Screen display shall be fully compatible with the PLC equipment specified elsewhere in these special provisions Display shall be Allen Bradley Panelview 1000 Plus.

The touch screen display shall be programmed to display the operational conditions of the South Park Bridge both before the operation begins and during the operation of the bridge.

The display screens shall include but not be limited to the following:

Limit switch trip points for the north span and the south span
Status of communication between local and remote PLC Cabinets
Status of alarm conditions at the South Park Bridge
Summary of past alarms for the past 21 calendar days
Speed of the lift span
Position of the lift span

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Display screens shall be easy to read and understand. Submit a concept of each display screen for review and approval by the county and the engineer.

8-19.3(19)B MAIN AND REMOTE PLC CABINETS

Each of the PLC cabinets shall be of neat, substantial construction, arranged similar to the layouts shown on the plans. It shall be fabricated from not less than No. 12 gauge sheet steel metal properly formed, and suitable reinforced by steel angles to provide adequate strength. The door shall be 12 gauge sheet steel. The Main PLC cabinet shall be Hoffman Engineering Co. catalog number A-907220FSD with back panel, Hammond Industries catalog number 1418BY20 with back panel or approved equal. The Remote PLC cabinet shall be Hoffman Engineering C. catalog number A-726018FSD with back panel, Hammond Industries catalog number 1418ZX18 with back panel or approved equal. The general arrangement may be varied to fit specific equipment used. The cabinet dimensions shall not be exceeded. The cabinet shall have a nameplate attached to the left hand door. Nameplates shall be not less than one inch high and shall be attached with screws. Provide a cooling fan with filtered intake and exhaust vents with each cabinet.

Factory test the PLC cabinet for circuit continuity and operation with associated equipment prior to shipment to the job site.

The control panels shall be manufactured by Anderson Electric Controls, Kent WA, (395) 268-3003, Link Controls Inc., Ronkonkoma, NY, (631) 471 3950, Panatrol Corp., Bedford Park, IL, (708) 496-3080 or approved equal.

8-19.3(19)C TESTING

Pre-test the complete electrical control system at the system integrators location. Testing shall include the control console, PLC cabinet and Motor Control Centers.

External field devices such as limit switches, traffic gates etc., shall be simulated using a test panel capable of being switched to indicate different switch positions. Outputs to field devices shall be simulated using light panels.

Notify the engineer at least 30 days prior to the test so that he can arrange to witness the test.

The System Integrator's cost (if any) of debugging the control system shall be included in the contract.

8-19.3(20) SPAN DRIVE MOTORS AND MOTOR CONTROLLERS

Each span drive shall consist of a motor and a drive controller, as follows:

1. Motors - The span drive motor construction shall be as prescribed in the "Motor Construction" specification contained herein, and shall have the following features:

   Motors shall be 75 horsepower, 850 rpm, DC, 500-volt armature, 300 volt field, 60 minute rated, totally enclosed, non-ventilated, frame 409AT frame, with high level thermostat, class F insulation, weatherproof conduit box, 250w/115v space heater, weatherproof enclosure, grease fittings, 40 degree C ambient, 1.0 service factor. Provide capability for field conversion of conduit box for mounting on

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either side of motor. Each motor will operate only when required to lift the bascule span for a duration of 1 minute 30 seconds for dual motor operation and 2 minutes for single motor operation. Normal operational loads are estimated to be around 40% of the full load capability for the majority of operation. External cooling fans are not required.

Double-ended rotor shaft for connection to thruster brakes and tachometer/overspeed switch assembly.

2. Drive Controllers - The span drive controllers shall have NEMA 1 gasketed dust-resistant enclosures mounted on shock and vibration resistant bases, and shall contain the following major components:

Solid State, 3-Phase, SCR Controller
Incoming Line Circuit Disconnect Switch with External Operating Handle
Forward/Reverse Control
Armature Feedback Speed Control
Field Loss Protection
Circuit Checker
Armature Shunt, 50mv, with 4 ½" meter with a transducer, +/- output for a remote meter
Emergency Stop Control by Current Limit
Motor/Controller Failure Light and Relay for Remote Annunciation
"Ready" Light
Motor Run Contact
Field Reduction during periods of non-use
Nameplates: "North Span Drive 1", "North Span Drive 2", "South Span Drive 1" and "SouthSpan Drive 2"
Speed Indicator in RPM
Current Indicator in Amps
Torque Indicator in % of full load
Regenerative Capability in Both Forward and Reverse
Cooling Fans
Current (torque) limit adjustment, set at 150% rated motor current.
Line Reactors
Isolation Transformer

8-19.3(20)A OPERATION

The span drive shall rotate the counter balanced spans of the bridge whenever the operator deems it necessary to allow marine traffic to pass. See "Sequence of Normal and Emergency Operation", for operation details.

8-19.3(20)B INTERLOCKS

See the schematics in the plans for operation of the motors.

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8-19.3(20)C TESTING

Supply the above equipment as a totally pre-engineered coordinated package. The supplier shall test each motor and drive controller as an interconnected system at the factory, and shall provide certified test results, including certified torque-speed curves to the engineer. Speed-torque-current relationships from an overhauling torque or 150 percent of full load to a driving torque of 200 percent of full load shall be shown. See "Instruction Books" for systems tests including this equipment.

The equipment shall also be shown to be operational when connected to the bascule spans at the site.

8-19.3(20)D DRIVE CONTROLLER ENCLOSURE

The drive controller enclosure shall be no larger that 36”w X 24”d X 72”h, NEMA 12 rated, vented and filtered, made from 12 gauge steel and be prime coated on all interior and exterior surfaces. Exterior surfaces shall be given 2 coats of lead-free baked enamel paint. Interior surfaces shall be painted with 2 coats of lead free gloss white enamel. Access door for both the North and South Drive Controller 1 shall be hinged on the left side of the cabinet and access doors for both the North and South Drive Controller 2 shall be hinged on the right side of the cabinet as shown on the plans.

8-19.3(21) AUXILIARY DRIVE MOTOR

The Auxiliary Drive Motor shall be built in accordance with NEMA standards. Protect all exposed metal surfaces with a moisture-proof corrosion resistant polyester paint. The rotors shall be balanced mechanically and electrically. Provide all windings with special insulation to retard a decrease in insulation resistance due to excessive moisture. The motor shall have Class B insulation.

The motor shall be a 50/25hp, 1800/900 RPM, 2 speed, 2 winding, constant torque, continuous duty rated, 405TFrame, 1.0 service factor, class F insulation, 480 volt, 3 phase, 60-hertz, NEMA Design B, totally enclosed fan cooled, squirrel cage induction motor. Motor frame shall be severe duty rated with cast iron enclosure and conduit box, equipped with standard length shaft. The auxiliary drive motor shall be shipped to the machinery manufacturer for installation on the machinery platform and installation in the bascule span machinery rooms. Motor shall be manufactured by Reuland Electric or equal by Reliance Electric or General Electric.

Provide a motor space heater of 100 watt minimum, 120 volt A.C.

8-19.3(22) SPAN MOTOR AND MACHINERY BRAKES

Furnish and install electrically operated thruster brakes in the machinery rooms as shown on the plans. Brakes shall be spring-set, thruster-reversed, shoe-type brakes of open type construction with corrosion-resisting fittings. Each of the machinery brakes shall be factory set at 4500 foot pounds intermittent and shall be Mondel Engineering model number 23MBT/E-ED301/6or approved equal by Link Controls. Delay settings shall be as shown on the drawings. The motor brakes shall be factory set at 600 foot pounds intermittent and shall be Mondel Engineering model number 13MBT/E-ED80/6or approved equal by Link Controls Catalog.

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Brake wheel couplings are to be provided by the mechanical contractor with the bridge machinery. Coordinate motor and machinery brakes are fully compatible with the brake wheel couplings. Refer to machinery drawings for further information.

Provide NEMA 3 type rain tight enclosure with strip heater for all brakes. The enclosure shall have a split cover with plexiglass windows positioned to view the thrustor, limit switches and brake shoes for ease of maintenance and inspection.

Equip each brake with a hand release, which will not change the torque setting, require removal of the brake enclosure or require removable levers or wrenches. Install hand release handles for the machinery brakes on the side of the brake closest to the respective entrance door of the machinery room. Provide each hand release with a lever type limit switch for interlocking purposes. It shall not be possible to release the hand release of the brake without tripping this switch. Furnish two additional lever type limit switches with each brake. One switch shall be activated when the brake is fully set and the other switch shall be activated when the brake is fully released.

The oil used in the thruster operating chambers of the brakes shall be of a grade capable of operating in extreme ambient temperatures ranging from -40 degrees F to 150 degrees F.

The thruster motor shall be totally enclosed with built in adjustable time delays for setting, 460 volt, 3-phase, 60 Hertz, squirrel cage motor.

8-19.3(23) LIMIT SWITCHES

Limit switches shall be rated for not less than 250 volts AC or DC, and 10 amperes continuous AC or 0.4 amperes DC, and shall be of the following type:

Type 1 - Rotary cam, 12 circuit, NEMA 4X stainless steel enclosure, single pole/double throw contacts with straight drive reducer with a ratio 4:1, timing dial and position resolver as specified elsewhere in these special provisions, Gemco type 1980R-412-X-SP-TD1-R-4-L1, Link Controls type 72-610-4X-12-SD28 or approved equal.

Type 2 – Heavy duty lever arm 2-circuit operator, with snap action contact blocks, NEMA 4 enclosure, Namco Type EA780-20000 or approved equal.

Type 4 – Heavy duty, plunger operator, 2-circuit, NEMA 4, cast aluminum, epoxy coated enclosure, B&B Electromatic Model PLS-200 or approved equal.

Provide the limit switches with brass tags as they appear in the plans:

Switch Number	Type	Description
LS-EL 1	12-circuit rotary limit switch monitoring span height above seat position	
LS-EL1N/S	*	Closed Below 2.5 degrees
LS-EL2N/S	*	Closed Above 63.0 degrees
LS-EL3N/S	*	Closed Below 13.0 degrees
LS-EL4N/S	*	Closed Above 74.5 degrees
LS-EL6N/S	*	Closed Above 68.0 degrees
LS-EL7N/S	*	Closed Below 5.0 degrees
LS-EL8N/S	*	Closed Above 7.0 degrees

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LS-HL1N/S	2	Closed Below 11.0 degrees
LS-HL2N/S	2	Closed Above 64.0 degrees
LS-SW/SE10	4	Opens when the south span is fully seated
LS-NW/NE10	4	Opens when the north span is fully seated

*Indicates switch is a portion of rotary limit switch LS-EL

8-19.3(24) POSITION MONITOR SYSTEM

The Position Monitor System shall consist of a span position resolver, a digital decoder/display unit and remote digital display unit. Two systems are required.

Mount the position resolver within the stainless steel rotary limit switch enclosure specified elsewhere in these special provisions. Mount the rotary limit switch where shown on the drawings. Output shall be 3 digit decimal, programmable to correspond to 1,000 counts (0 through 999) for 359 degrees of shaft rotation.

The resolver unit shall be a size 11 transducer as manufactured by Gemco or approved equal. The unit shall be compatible with the programmable logic controller PLC equipment used. The cable between the resolver and the decoder/display unit shall be as recommended by the manufacturer and UL listed as tray cable.

The Digital Decoder/Display unit shall interface with the programmable logic controller to provide span position. Provide PC handshake interface equipment as required. The digital decoder/display unit as manufactured by Gemco shall be Series 2120 or approved equal. Decoder units shall mount on the Main PLC Cabinet and Remote PLC Cabinet doors as shown on the plans.

The Digital Display modules mounted on the main control console shall be 3-digit decimal display and calibrated to function from a 4-20 ma input signal provided from an output from the decoder/display unit above. The display unit shall have a separate power source.

8-19.3(25) TRAFFIC GATES AND RESISTANCE GATES

8-19.3(25)A TRAFFIC GATES

Traffic gates shall be as detailed on the drawings. Each gate arm shall be of the length indicated on the plans, which shall open through an angle of 90 degrees from the horizontal to the vertical. Each gate shall have a welded steel housing, hot dipped galvanized after fabrication, arranged to provide a weather-tight housing for the motor, disconnect switch, gear train, limit switch and fuses for the warning lights. The transmission gearing for each gate shall be enclosed. Provide weather-tight, gasketed doors for access to the operating equipment.

The gate arms shall be a three-section combination aluminum and fiberglass unit. The first section closest to the gate housing shall be aluminum with the remaining sections made of fiberglass. Each assembled gate arm shall be designed for a 75 mph wind load. If recommended by the manufacturer, provide a bumper rod with compression spring near the end of each gate arm to stop the travel at the closed position without undue shock.

All bolts, screws or other fastenings used in the gate arm assembly and for connection to the gate stand shall be of corrosion-resisting metal or shall be hot-dip galvanized.

The number of warning lights on the gate arms shall be as indicated on the plans. Each warning light shall be a weatherproof, two-way, cast aluminum unit with red Fresnel

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lenses front and back. The lights shall be interconnected with three-conductor portable cord using watertight connectors at the fixtures. The lights shall be connected so that adjacent units will flash alternately. The flasher unit shall be mounted within the gate housing. Lamps shall be LED type. Fuses for the warning lights shall be midget cartridge fuses installed in molded rubber connection kits. Provide cannon plug connectors from the gate housing to the gate arm for the warning lights.

Provide an 8-circuit heavy-duty limit switch in each gate, operated by the gate mechanism. Each limit switch shall be a rotary, cam-type, switch and it shall be gear-driven from the transmission. The contacts shall be quick-break with silver alloy buttons. The limit switch shaft shall be stainless steel, and cams shall be secured thereto with setscrews.

The motor for each warning gate shall be furnished as part of the gate by the gate manufacturer. Each motor shall be a totally enclosed, 480 volt, three-phase, 60-cycle ball-bearing induction motor complete with solenoid released brake and shall be capable of withstanding instant reversal when running at full speed. Each motor and gear train shall be capable of raising and lowering the gate in about 11 seconds. A motor-mounted, spring-set, magnetically released disc brake shall be provided for stopping and holding the mechanism. Provide a watertight disconnect switch to permit disconnecting the motor and brake from the incoming power.

All internal wiring for each gate shall be brought to numbered terminal blocks inside the housing for the connection of external circuits.

Each gate arm shall be striped on both faces with alternate red and white reflectorized stripes 16 inches wide measured parallel to the edge of the gate arm. The stripes shall slope downward at an angle of 45 degrees toward the centerline of the roadway. The galvanized gate stands, gate arm channels and supports shall be painted in accordance with the requirements specified herein for painting structural steel.

Each warning gate shall be bolted to its concrete foundation as indicated on the plans. In erecting the gates, carefully attach the aluminum and fiberglass arms to the supporting members so as to make a rigid connection. The arms shall be counterbalanced and the limit switches factory adjusted so that the arms are stopped in a truly vertical or horizontal position.

Make provisions for hand operation, and furnish a hand crank for each gate. Furnish each gate with an adaptor that will enable a hand-held drill to be used for operation.

Traffic gate shall be Roadway Manufacturing model VW-4, B & B Roadway Corp, Russellville, AL or approved equal.

Each gate housing shall come equipped with a 175 watt heater and thermostat as well as a swiched service light and duplex, 15 ampere, 120 volt, GFI specification grade receptacle.

The tops of the two oncoming warning gates, as shown on the plans, shall be modified to accommodate the warning bells specified elsewhere in these special provisions.

The Contractor shall arrange for and provide all necessary field tests, to demonstrate that all traffic signals, traffic gates, resistance gates, and warning bells are in proper working order. Should the tests show that any piece of equipment or apparatus, in the judgment of the Engineer, is defective or functions improperly, such adjustments or replacement shall be made by the Contractor as to make the installation satisfactory to the Engineer, and at no extra cost to the Owner.

8-19.3(25)B RESISTANCE GATES

Resistance gates shall be as detailed on the drawings. Each resistance gate shall be designed for use as a penetration resistance barrier and shall be explicitly designed for

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traffic control on movable bridges. Each resistance gate shall have an arm of the length indicated on the Plans, which shall open through an angle of 90 degrees from the horizontal to the vertical. The gate housing shall be constructed from 3/8" carbon steel, hot dip galvanized after fabrication. Exterior surfaces shall be painted aluminum. All fasteners shall be corrosion resistant. Housing shall be designed to allow ease of maintenance and removal of shaft components. Arm assembly mounted shall be fully gasketed and shaft openings shall incorporate O-ring seals. Housing shall have front and rear access doors mounted on full cross straps. Hinges shall be of the slip-off type and shall have stainless steel pins. Doors shall be secured with two handles using a vise action to compress a neoprene gasket to provide a weatherproof seal and shall be lockable. Traffic Gate handles and Resistance Gate handles shall be keyed alike.

The resistance gate assemblies shall be model VR-6 as manufactured by B & B Roadway Corp., Russellville, AL or approved equal.

The gate arm design shall be of a double rail aluminum tube. Stainless steel truss cables and a damping type bumper rod shall be furnished if recommended by the manufacturer. Front and rear arm surfaces shall be covered with pre-striped alternating red and white diamond grade reflective sheeting. Stripes shall be 6" wide and shall slope at 45 degrees down toward the arm tip. Remaining exposed surfaces shall be painted white.

Energy absorption cables shall be utilized to assist in diffusing the kinetic energy of an impacting vehicle. The resistance gate shall be capable of absorbing the energy of a 5000 pound vehicle traveling up to 50 mph. The double rail aluminum tube resistance arm shall two ½" cables, one in each tube. The energy absorption cables shall be anchored at both ends of the gate arm span while in the closed or lowered position.

All bolts, screws or other fastenings used in the gate arm assembly and for connection to the gate stand shall be of corrosion-resistant metal or shall be hot-dip galvanized.

The number of warning lights on the gate arms shall be as indicated on the Plans. Each warning light shall be a weatherproof, two-way, cast aluminum unit with red Fresnel lenses front and back. The lights shall be interconnected with three-conductor portable cord using watertight connectors at the fixtures. The lights shall be connected so that adjacent units will flash alternately. Lamps shall be LED type. Fuses for the warning lights shall be midget cartridge fuses installed in molded rubber connection kits. Provide cannon plug connectors from the gate housing to the resistance gate arm for the warning lights.

An 8-circuit heavy-duty limit switch shall be provided in each gate, operated by the gate mechanism. Each limit switch shall be a rotary, cam-type switch and it shall be gear-driven from the transmission. The contacts shall be quick-break with silver alloy buttons. The limit switch shaft shall be stainless steel, and cams shall be secured with set screws.

The motor for each resistance gate shall be furnished as part of the gate assembly by the resistance gate manufacturer. Each motor shall be a totally enclosed, 480 volt, three-phase, 60-cycle ball-bearing induction motor complete with solenoid released brake and shall be capable of withstanding instant reversal when running at full speed. Each motor and gear train shall be capable of raising or lowering the gate arm in about 16 seconds. A motor-mounted, spring-set, magnetically released disc brake shall be provided for stopping and holding the mechanism. The brake shall have a manual release lever to permit manual operation of the gate. A watertight disconnect switch shall be provided to permit disconnecting the motor and brake from the incoming power. A hand crank shall be provided with each gate operator to facilitate manual operation of the resistance gate.

Each gate housing shall come equipped with a 175 watt heater and thermostat as well as a swiched service light and duplex, 15 ampere, 120 volt, GFI specification grade

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receptacle.All internal wiring for each gate shall be brought to numbered terminal blocks inside the housing for the connection of external circuits.

Each resistance gate housing shall be bolted to its concrete foundation as indicated on the Plans. Anchor bolts shall be furnished with the resistance gate by the manufacturer. In erecting the resistance gate, the arms shall be carefully attached to the supporting members so as to make a rigid connection. The arms shall be counterbalanced and the limit switches adjusted so that the arms are stopped in a truly vertical or horizontal position.

8-19.3(26) TRAFFIC SIGNALS AND WARNING BELLS

8-19.3(26)A TRAFFIC SIGNALS

Each traffic signal assembly shall consist of a single-face, three-section, red, amber, green signal head assemblies for vertical mounting as indicated on the plans. Light assemblies shall be of a 12" lens made of ultraviolet stabilized polycarbonate, LED circuit board inclusive of all LED's, and required LED circuit components. Each traffic light section shall be a weatherproof unit consisting of a separate polycarbonate housing with hinged lens holder and polycarbonate hood. The lens shall conform to the specifications of the Institute of Transportation Engineers. The housing shall be marked "TOP" to designate the proper orientation of the LED unit in the traffic signal housing. Manufacturer's part numbers and date codes shall be visible from the rear of the assembly. The lens shall be keyed to the housing to insure the proper orientation and to avoid possible rotation during any handling.

The light intensity and distribution of light shall, as a minimum, meet the current ITE standards and measures criteria for vehicular traffic control. To verify the performance of the LED traffic signals in elevated temperature operation, as measured at the 2 ½ degree down and 2 ½ degree left or right position. The light shall maintain a uniform appearance across the lens and shall not exhibit areas of intensity such that it appears to have very bright, shadowed, or less intense points to the motorists.

The LED's shall be connected in series parallel strings. The failure of any one LED, and its associated string of LED's shall not cause the loss of more than 2 percent of the light output of the complete LED signal.

The red traffic signal shall be provided with a strobe light. The strobe shall flash at a rate of approximately once per second. The strobe shall be visible at a distance of at least 1000 feet at normal conditions and conform to the applicable ITE standards.

The intensity of the light shall not vary by more than 30% from the nominal over the allowable voltage range as specified by the manufacture. Transient voltage suppression and fusing shall be provided to minimize the effects and repair cost of an extreme over-voltage situation or other failure mode.

Each traffic light section shall be provided with a tunnel-type, detachable visor. Lenses shall be furnished with a continuous soft rubber gasket completely surrounding the edge of the lens. The traffic signal poles shall consist of a tapered steel 16 flat flute shaft complete with anchor base, anchor bolts, handhole, cast pole top, and a flange plate near the top of the pole for mounting the mast arm. Round tapered support beams shall be complete with a mounting flange plate, hanger clamp and outlet having a 1-inch ID rubber grommet for wiring each signal and a removable cap.

The shaft shall be made of 1 length steel fabricated from a minimum 7 Ga. high strength cold rolled steel and shall conform to the requirements of ASTM A595 Grade A. A 4"x8" handhole complete with cover shall be welded into the shaft 15" above the base. A J-hook wire support shall be welded near the top of the shaft. Furnish an opening near the top of the shaft to provide a cable entrance from the shaft into the bracket mast arm.

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A one-piece cast steel anchor base of adequate strength, shape and size, shall conform to ASTM A27 Grade 65-35 and shall be secured to the lower end of the shaft by two continuous electric arc welds, approximately 2" apart. Provide four holes in the base to receive the anchor bolts, four holes for ventilation in the body of the base and four tapped holes for attaching the covers.

The tapered 16 flat flute support beams shall be made of 7 Ga. steel and conform to ASTM A 595 Grade A. A flange plate shall telescope the large end of the beam and be welded by two continuous electric arc welds. The flange plate shall have four holes for the flange bolts conforming to ASTM A325. Each support beam shall have wire outlet holes on the bottom surface, with rubber grommet, located at each signal position. Poles shall be similar to the roadway lighting poles specified elsewhere in the special provision, Valmont type FLCB16 or approved equal.

8-19.3(26)B TRAFFIC GATE MOUNTED WARNING BELL

Provide and mount warning gongs on the on-coming traffic gates as shown on the plans. The warning gong shall be a twelve-inch motor driven gong type, and operate at 120 VAC. Each warning gong shall be B&B Roadway Manufacturing model G-12 or approved equal.

8-19.3(27) INSTRUCTION BOOKS

Furnish 12 bound copies each of two loose-leaf booklets. The materials shall be bound into each booklet between rigid plastic or cloth binding covers. The instruction booklets shall be approximately 9 inches by 12 inches, and the diagram booklet large enough to contain the drawings without excessive folding so that they may be easily opened. The booklets shall be neatly entitled with a descriptive title, the name of the project, the location, year of installation, owner, supplier and engineer. Copies of drawings shall be in black on white background and shall be easily legible. The arrangements of the booklets, the method of binding, materials to be included, and the composite text shall all be reviewed and approved by the engineer.

Booklets shall include but not limited to operation and maintenance details and manuals for the traffic signals, traffic gates, resistance gates, warning gongs, intercom system, CCTV system and generator set.

8-19.3(27)A FIRST BOOKLET

The first booklet shall contain the following:

1. Table of Contents.
2. Operator's Instructions, which shall cover in full the step-by-step sequence of operation of the bridge and its auxiliaries, and shall note all precautions required for correct operation. Complete instructions for the following shall be included.
   a. Selection of the power supply.
   b. Normal operation of the span on commercial power source.
3. Detailed maintenance instructions for adjusting, lubricating, and operating all of the electrical equipment, including manufacturer's recommended preventative maintenance lubrication schedule.

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4. A set of descriptive leaflets, bulletins, and drawings covering all items of equipment and apparatus made a part of the completed bridge operation and control. The catalog number of each piece, to be used in case it becomes necessary to order replacement parts from the manufacturer. This information shall be furnished for all electrical equipment such as motors, switches, circuit breakers, relays, cables, etc.
5. Copies of all warranties on equipment supplied to the project.

8-19.3(27)B SECOND BOOKLET

The second booklet shall contain legible reduced size photostatic copies of the following drawings, corrected to show the work as constructed:

1. The complete spare parts list.
2. All schematics and wiring diagrams.
3. The control desk and control panel layouts and wiring diagrams for all equipment.
4. The schedule of electrical apparatus.
5. All submitted shop drawings.
6. All conduit layout and installation drawings.

8-19.3(28) TRAINING

Bridge operators shall be fully trained on operation of the bridge both for local control and for remote control.

Maintenance personnel shall be fully trained on the maintenance aspects of the PLC equipment, the system programming panel and the DC drive controllers.

8-19.3(29) FIELD TESTS

8-19.3(29)A PRELIMINARY CHECKOUT PERIOD

Arrange for and provide all the necessary field tests, as indicated herein and as directed by the engineer, to demonstrate that the entire electrical system is in proper working order and is in accordance with the plans and specifications.

The contractor shall be responsible for operation and maintenance, including all costs thereof, for systems or equipment temporarily placed in operation for testing and adjusting purposes or for the convenience or necessity of the contractor, prior to final acceptance by the engineer.

The contractor shall instruct the bridge operating personnel in the operation of equipment during test runs and prior to acceptance. This training session shall be video taped and given to the department and to the city at the completion of the training session.

8-19.3(29)B MANUFACTURER REPRESENTATIVES

Appropriate representatives of the bridge electrical control equipment shall arrange to be on site.

These representatives shall be capable of making adjustments to the equipment, of locating faults or defects and correcting them if possible, and of obtaining from the manufacturers without delay, new parts for replacement of apparatus which, in the opinion of the engineer, do not perform satisfactorily.

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8-19.3(29)C OPERATIONAL TESTING PERIOD

After the span is operating to the satisfaction of the engineer, the contractor and its manufacturers' representatives, an operational test period of not less than one week shall begin, during which time all aspects of the bascule span control system and remote control system will be tested and observed by the engineer. During this period, the contractor shall make any repairs necessary as a result of equipment failure due to faulty equipment or workmanship. Should preliminary checks or operational tests show that any piece of equipment furnished by the contractor, in the judgment of the engineer, is defective or functions improperly, such adjustments and/or replacements shall be made by the contractor as to make the installation completely acceptable to the engineer, and at no extra cost to the department.

8-19.3(30) SEQUENCE OF NORMAL OPERATION

The span shall normally be operated using the commercial electric power source. The span normally will be retained in the seated, closed position. The sequence of normal operation shall be as follows:

Operating Procedure (Local)

A. Preliminary Switch Settings
   1. Check supply voltage. Voltage should always be within 5% of 480V line-to-line.
   2. Verify the “Main Drive Speed Select” control switch in the “Auto” position. Placing the control switch in the “Maintenance” position will operate the span at the maintenance speed of 460 RPM and will not automatically withdraw the span locks upon starting the opening process.

B. To Open Span
   1. Three distinct blasts from vessel signifies that a bridge opening is required.
   2. Turn "Bridge Control" key switch to the "On" position.
   3. Activate the traffic signals by turning "Traffic Signals" control switch to "ON". This will turn on the warning bells and begin flashing the traffic signals.
   4. Signal vessel with the "Horn" pushbutton if the span is to be opened immediately, or with four distinct blasts if a delay is necessary due to a traffic jam, accident, or other causes.
   5. When on-coming traffic has stopped, lower both on-coming gates by turning and holding the NW and SE "Traffic Gate" control switches to the "Lower" position.
   6. When on-coming traffic gates are lowered and it is observed that the Span is clear of Off-Going traffic and pedestrians, then lower both off-going gates by turning and holding the NE and SW "Traffic Gate" control switches to the "Lower" position.

Observe the indicating lights as follows:

Lamps	Color	Indication

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Traffic Signals	Red	Signals set against traffic
Traffic Gates	Red	Traffic Gates Lowered
Resistance Gates	Green	Resistance Gates Raised
Span Locks	Green	Span Locks driven
Span	Green	Spans full seated
Brakes	Green	Brakes applied
Span	Green	Bascule leafs are fully seated

7. When all traffic gates are fully lowered and it is observed that the span is clear of all vehicles and pedestrians, turn both the SE and NW Resistance Gate control switches to the “Lower” position.

<u>Observed the indicating lights as follows:</u>

Lamps	Color	Indication
Traffic Signals	Red	Signals set against traffic
Traffic Gates	Red	Traffic Gates Lowered
Resistance Gates	Red	Resistance Gates Lowered
Span Locks	Green	Span Locks driven
Span	Green	Spans full seated
Brakes	Green	Brakes applied
Span	Green	Bascule leafs are fully seated

8. Observe that no vehicles or pedestrians are near the movable span, then turn the “Auto Raise” switch to begin raising the spans.
The "Auto Raise" light will go on, indicating that the “Auto Raise” circuit is active.
Each of the span lock "Push To Stop" lights will go on, as their motors are started automatically and the “Driven” lights will go off. When each span lock has reached the fully "Drawn" position, their motors will stop, their "Push To Stop" lights will go off and their "Drawn" lights will go on.
The brakes will be released as soon as "Raise" signal to the drive motors is initiated. The brake lights will go from Green to Red as the brakes are released.
Power will be applied to the span drive motors. The "Motor Run" lights for each drive motor will go on and the motor ammeters will show a surge in current as torque is applied to move the span. The speed indicators will show a gradually rising speed as all motors speed up to 850 rpm in 10 seconds. The span position indicator will show span height above the seat.
As the spans leave the seated position, the "Seated" lights will go out, and the "Near Closed" lights will go on, until the span has risen to about 14 degrees. The warning gongs and warning bells will go off as soon as the spans are above the seated position.
Any abnormal event that would interfere with the proper operation of the span will cause the span drives to stop, and will log the event and display it on the Panelview screen located on the control console.
Observe the indicating lights:

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Observe the indicating lights after bridge is moving, as follows as follows:

Lamps	Color	Indication
Traffic Signals	Red	Signals set against traffic
Traffic Gates	Red	Traffic Gates lowered
Resistance Gates	Red	Resistance Gates lowered
Span Locks	Red	Span locks fully drawn
Full Auto	Red	Auto Raise and Push To Stop
Brakes	Red	Brakes are released
Span	None .	Span between "Near Closed" and "Near Open" positions

9. As the span approaches about 63 degrees, as observed on the "Position Indicator" and the amber colored "Near-Open" indicating light, the drive motor control will automatically slow the span speed down from the normal high speed mode to a speed of 460 RPM and will automatically stop the span when the span reaches full open position. Power will be cut from the motor, and the motor and machinery brakes will be applied, holding the span in the full-open position.

Observe the indicating lights, after bridge is stopped, as follows:

Lamps	Color	Indication
Traffic Signals	Red	Signals set against traffic
Traffic Gates	Red	Traffic Gates lowered
Resistance Gates	Red	Resistance Gates lowered
Span Locks	Red	Span locks fully drawn
Full Auto	None	Span Not Moving
Brakes	Green	Brakes are set
Span	Red	Span fully open

C. To Close Span:

1. After confirming that the vessel has cleared the span and no vessels are approaching the span for passage through the opening, sound four short warning blasts, denoting the closing of the spans.

2. Turn the “Auto Lower” control switch to “Lower” which will release the brakes and apply power to the drive motor control. The Motor Run lights will come on and the motor RPM will increase as the spans begin to lower. Observe the indicating lights showing the approximate position of the span and observe each span automatically begins slowing down to 460 RPM at about 13 degrees above the seat position.
When the each span reaches about 1.5 degrees above seat position the spans will slow to 85 RPM, and continue to lower until the each

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span has reached the fully seated position. The warning bells will come on when all spans are fully seated. Power will automatically cut off and the span locks will automatically be driven. When the span locks are fully driven, the automatic lowering sequence will be complete and the "Auto Lower" light will go off.

Observe the indicating lights as follows:

Lamps	Color	Indication
Traffic Signals	Red	Signals set against traffic
Traffic Gates	Red	Traffic Gates lowered
Resistance Gates	Red	Resistance Gates lowered
Span Locks	Green	Span locks driven
Full Auto	None	Spans Not Moving
Brakes	Green	Brakes are set
Span	Green	Spans seated

3. Visually observe that the bridge spans are down and that no pedestrians are near the traffic gates or resistance gates. Raise the resistance gates by turning the SE and NW Resistance Gate control switches to the "Raise" position. Limit switches will automatically stop the resistance gates at the raised position.
4. Raise the traffic gates by turning the NE and SW traffic gate control switches to the "Raise" position, then turn the NW and SE traffic gate control switches to the "Raise" position. Limit switches will automatically stop the gates at the open positions. As an option, the "All Gates Raise" push button can be pushed and all four traffic gates will raise at the same time.
5. When all traffic gates are at the open limits, set the Traffic Signal switch to the "Green" position. The warning bells will go off.

Observe the indicating lights as follows:

Lamps	Color	Indication
Traffic Signals	Green	Signals set to allow traffic
Traffic Gates	Green	Traffic Gates raised
Resistance Gates	Green	Resistance Gates raised
Span Locks	Green	Span locks driven
Brakes	Green	Brakes are set
Span	Green	Span are seated

6. The "Bridge Control" key switch should now be turned "Off". This key operated switch will prevent unauthorized tampering with the operation of the bridge and its auxiliaries.

8-19.3(31) SPARE PARTS

Furnish the following spare parts:

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1. One circuit breaker of each kind and size of branch circuit breaker installed in the panelboards.
2. Three control relays with a minimum of one contact block with 4 contacts installed on the relay.
3. A quantity of 30% (3 minimum) of the total for each size and type of thermal overload relay installed in the motor starters of the Motor Control Center.
4. For the control desk lights:
   12 LED indicating lamps for each type installed
   1 color cap of each color and legend
5. For the programmable controller:
   One each of each type circuit card or module containing solid state devices. If more than ten cards or units of a type are provided, two spares shall be supplied.
6. For the drive controller;
   One complete drive controller assembly
   One each of every type of fuse, relay, transformer or contactor installed.
7. Spare Lamps as Follows:
   1 case of 17 watt, T8 fluorescent lamps
   2 case of 32 watt, T8 fluorescent lamps
   1 case of Compact Fluorescent Lamps (CFL)
   2 70 watt metal halide lamps
8. For the traffic gates
   One complete traffic gate arm complete with warning lights and supporting hardware
   1 case of LED lamps for the warning light assemblies
   3 complete warning light assemblies
9. For the resistance gates
   One complete resistance gate arm complete with warning lights and supporting hardware
   One end lock device and mating plate

Provide spare parts in sealed, uniform-sized cartons, with typed and clearly varnished labels to indicate their contents. Provide a directory of permanent type describing the parts. The directory shall state the name of each part, the manufacturer's number therefore, and the rating of the device for which the part is a spare. The spare parts shall also be marked to correspond with their respective item numbers as indicated on the elementary wiring diagram. Each circuit card requiring adjustments shall be adjusted at the bridge prior to final delivery to the department. A lockable steel cabinet shall be provided for storage of the spare parts and instruction manual, as shown on the plans. Minimum size shall be 48" W x 16" d x 72" h. Cabinet shall be located on the Equipment Level of the north control tower.

8-19.3(32) PAINTING

Exposed metal parts of the electrical equipment installation attached to the steel work of the bridge, such as raceways, boxes, and their accessories, shall be hot-dipped galvanized and shall be painted the same color as the steel work. Interior metal parts shall be primed and painted to match surrounding surfaces.

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8-19.3(33) GUARANTEE

The contractor shall be responsible for the proper performance in part and as a whole of the electrical equipment provided for the operation of the lift spans and related parts for a period of one year after the completion of the operational testing period. During the first year of operation, the contractor shall correct at his own expense any difficulties in the operation which may arise as the result of defects of material, equipment and manufacture. Responsibility for such correction shall include the repair, readjustment and replacement not only of such defective parts, but other parts which may have been damaged thereby. The Owner reserves the right to correct any such defects, and the contractor shall pay the cost thereof. The contractor shall give a written guarantee satisfactory to the Owner to insure the carrying out of the obligations.

8-19.4 MEASUREMENT

The lump sum Contract price for "Bridge Electrical System" Contains the following approximate quantities of materials and completed work:

Motor Control Center 1 - Vert - 20 Inch	5	EA
Surge Protector	1	EA
Metering Compt	1	EA
600 A Main CB	1	EA
100 A Branch CB	5	EA
225 A Branch CB	2	EA
400 A Branch CB	1	EA
Size 1 Non Rev. Starter	5	EA
Size 1 Revering Starter	6	EA
Size 3 2Spd Rev Starter	1	EA
MCC Vert Section (20")	4	EA
400 A Main CB	1	EA
100 A Branch CB	4	EA
225 A Branch CB	2	EA
Size 1 Non Rev Starter	4	EA
Size 1 Reversing Starter	5	EA
Size 3 2spd Rev Starter	1	EA
250kw Dsl W/ Tx Sw	1	EA
600 A Fused Disc NEMA 12	1	EA
600 A Fused Disc NEMA 4	1	EA
30 A Non-Fused Disc NEMA 4 3-Pole	2	EA
200 A Non-Fused Disc NEMA 4 4-Pole	4	EA
100 A Non-Fused Disc NEMA 4 6-Pole	2	EA
Ground System	2	EA
25kva Tx 1ph 480/120, Shielded	1	EA
30kva Tx 1ph 480/120, Shielded	1	EA
PLC Pnl Bd PP-1	1	EA
PLC Pnl Bd PP-2	1	EA
Utility Pnl Bd LP-1	1	EA
Utility Pnl Bd LP-2	1	EA
Control Console	1	EA

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Main PLC Cabinet	1	EA
Remote PLC	1	EA
Span Drives 75hp DC 850rpm	4	EA
Aux Drive,2spd 50/25hp	2	EA
Motor Brake 1/2hp (13")	4	EA
Machinery Brake (23")	4	EA
Rotary Limit Switch W/ Resolver	2	EA
Position Decoder	2	EA
Air Horn W/ Comp (Type AHR By B&B Roadway)	1	EA
Tach Gen/Overspeed Sw	4	EA
Limit Switches - Lever Arm	6	EA
Limit Switches - Plunger	4	EA
Lighting (Lot)	2	EA
Pier Lights	6	EA
J-Box	6	EA
Midspan Lights	4	EA
Retrieving Chain	4	EA
J-Box	4	EA
Wall Outlets And Switches (Lot)	2	EA
Intercom System	1	EA
Warning Signs	2	EA
Traffic Lights W/Pole	2	EA
Traffic Gates	4	EA
Resistance Gates	4	EA
Cable Term Boxes - NEMA 4x	4	EA
Misc J-Boxes - NEMA 4x	8	EA
Cable Tray	415	LF
Lightning Prot. Syst	2	EA
Wiring	41600	LF
Conduit-GRS (Installed)	951	LF
Conduit-PVCRS (Installed)	4240	LF
Start-Up Services	1	EA
Spare Parts	1	EA
Smoke/Heat Detectors	6	EA
Marine Radio	1	EA
Bridge Tender's Training	1	EA
Operation of New Bridge During Construction	1	EA
Control Tower Telephones	XXX	XX
Bascule Pier Telephones	XXX	XX
Commissioning	1	EA

Spare electrical parts are excluded.

The lump sum Contract price for “Emergency Generator Set” Contains the following approximate quantities of materials and completed work:

Emergency Generator Set	1XX	EA.
Automatic Transfer Switch	1XXX	EA.

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Fuel Storage Tank with piping	1	EA

The lump sum Contract price for "Closed Circuit Television System" Contains the following approximate quantities of materials and completed work:

CCTV Cameras	6	EA.
CCTV Control Components	1	EA.
CCTV Monitor	1	EA
CCTV Wireless Components	2	EA

The quantities listed are only for the convenience of the Contractor in determining the volume of work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than for approved changes will be made in the lump sum contract prices for the above items even though the actual quantities required may deviate from those listed.

8-19.5 PAYMENT

"Bridge Electrical System", lump sum.

The lump sum Contract price for "Bridge Electrical System" shall be full pay for removing and disposing the existing electrical system; for furnishing and installing the complete system as specified, ready for operation; for operation and maintenance manuals; and for furnishing all shop drawings, materials, labor, tools, equipment, incidentals and services (including control system vendor services) necessary to achieve a complete and acceptable installation.

At the preconstruction meeting, submit to the engineer for evaluation a full and complete breakdown of all costs under this item. The engineer has full authority to revise the breakdown to suit his/her judgment, and make the various tasks more in conformity with the adjudged true values. The contractor agrees the detailed breakdown will not be effective until it has been approved by the engineer. Progress billing payments will be based upon the approved breakdown.

A minimum of ten-percent of the bid item amount will be retained by the department until final acceptance of the bridge electrical system, the contractor and control system vendor have completed all items on their punchlists, and all aspects of bridge operation, operator and maintenance personnel testing, training, and control are complete. An additional five-percent of the bid item amount will be retained until final approval of the operation and maintenance manuals is granted by the engineer.

"Emergency Generator Set", lump sum.

The lump sum Contract price for "Emergency Generator Set" shall be full pay for furnishing a complete functional emergency generator set as specified.

"Closed Circuit Television System", lump sum.

The lump sum Contract price for "Closed Circuit Television System" shall be full pay for furnishing a complete closed circuit television set as specified.

8-20 ILLUMINATION, TRAFFIC SIGNAL SYSTEMS AND ELECTRICAL

8-20.1 DESCRIPTION

Section is deleted and replaced with the following:

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(*****)
This work shall consist of furnishing, installing and field testing all materials and equipment necessary to complete in place, fully functional system(s) of any or all of the following, types including modifications to an existing system all in accordance with approved methods, the Plans, the Special Provisions and these Specifications:

Illumination System

Unless otherwise noted, the location of signals, controllers, standards, and appurtenances shown in the Plans are approximate; and the exact location will be established by the Engineer in the field.

8-20.1(1) REGULATIONS AND CODE

Section is supplemented with the following:

(*****)
All Contractor designed temporary works, work methods and operations shall conform to the Contract and the following standards: the American Association of State Highway and Transportation Officials, the Occupational Safety and Health Administration OSHA. The requirements outlined in Section 8-20.3(19) shall supplement the Standard Specifications, and in the case of conflicting requirements, the more stringent shall control, as determined by the Engineer.

8-20.3(5) CONDUIT

Section is deleted and replaced with the following:

(*****)

Installation of conduit shall conform to appropriate articles of the Code and these Specifications.

The size of conduit used shall be as shown in the Plans. Conduits smaller than 1-inch electrical trade size shall not be used unless otherwise specified, except that grounding conductors at service points may be enclosed in 1/2 -inch diameter conduit.

It shall be the option of the Contractor, at no expense to the Contracting Agency, to use larger size conduit if desired, and where larger size conduit is used, it shall be for the entire length of the run from outlet to outlet. Reducing couplings will not be permitted.

The ends of all conduits shall be well reamed to remove burrs and rough edges. Field cuts shall be made square and true. Slip joints or running threads will not be permitted for coupling metallic conduit;. When a standard coupling cannot be used, an approved threaded union coupling shall be used. The threads on all metallic conduit shall be rust-free, clean and well painted with a good quality colloidal copper suspended in a petroleum vehicle before couplings are made up. All couplings shall be tightened so that a good electrical connection will be made throughout the entire length of the conduit run. If the conduit has been moved after assembly, it shall be given a final tightening from the ends prior to backfilling. Non-metallic conduit shall be assembled using the solvent cement specified in Section 9-29.1. Where coating on galvanized conduit has been injured in handling or installing, such injured places shall be thoroughly painted with galvanizing repair paint, Formula A-9-73.

Conduit ends shall be capped (do not glue non-metallic caps). Metallic conduit ends shall be threaded and capped with standard threaded conduit caps until wiring is started.

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When conduit caps are removed, the threaded ends shall be provided with approved conduit bushings or end bells (do not glue in place) for nonmetallic conduit.

Conduit stubs from controller cabinet foundations shall extend to the nearest junction box in that system.

Metallic conduit stubs, caps, and exposed threads shall be painted with galvanizing repair paint Formula A-9-73.

Metallic conduit bends, shall have a radius consistent with the requirements of Article 344.24 and other articles of the Code. Where factory bends are not used, conduit shall be bent, using an approved conduit bending tool employing correctly sized dies, without crimping or flattening, using the longest radius practicable.

Nonmetallic conduit bends, where allowed, shall conform to Article 352.24 of the Code.

Conduit shall be laid so that the top of the conduit is a minimum depth of:

1. 24 inches below the subgrade including asphalt or concrete shoulder areas and asphalt or concrete sidewalk areas.
2. 48 inches below the bottom of ties under railroad tracks unless otherwise specified by the Rail Road Company.
3. 18 inches below the finish grade in all other areas.

Galvanized steel conduit shall be installed at the following locations:

1. All railroad crossings.
2. All pole risers, except as otherwise required by owning utilities.
3. All bends with radius less than 3 feet on runs over 180 feet in length. Runs embedded within reinforced concrete structures are exempted.
4. All other locations noted in the contract.
5. All runs externally attached to structures.
6. All runs installed in barrier that is constructed by slip forming.

Galvanized steel conduit or Schedule 80 polyvinyl chloride (PVC) conduit shall be installed at the following locations:

1. All roadbed crossings.
2. All conduit entering foundations.
3. All other locations noted in the contract.

Schedule 40 or Schedule 80 PVC conduit shall be installed at the following locations:

1. All runs installed at traffic signal installations, except road crossings or where externally attached.
2. All other locations noted in the contract.

Non-metallic conduit may be employed as an alternate to metallic conduit at other locations unless specified otherwise in the contract. Nonmetallic conduit installation shall include equipment grounding conductor and shall conform to requirements noted in the WSDOT Standard Plans.

Liquidtight flexible metal conduit is allowed only at locations called for in the Plans.

1. The use of aluminum conduit shall be restricted to above ground locations.
2. Aluminum conduit shall not be placed in concrete.

Metallic conduit shall be placed under existing pavement by approved directional boring, jacking or drilling methods, at locations approved by the Engineer. The pavement shall not be disturbed unless allowed in the Plans, or with the approval of the Engineer in the event that obstructions or impenetrable soils are encountered.

Boring operations shall be conducted to prevent caving ahead of the pipe, which will cause voids outside the pipe. The auger head shall precede no more than 4 inches ahead of the pipe being jacked.

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The Contractor shall install steel casings as specified and shown in the Plans. The Contractor must be prepared to use a method approved by the Engineer to clear any obstructions to boring operations, which may be encountered.

After the casing pipe is in place, the inside shall be cleaned free of rock, dirt and water.

The space between the conduit and the casing shall be plugged with sand bags and a grout seal 12 inch thick at each end of the casing. Casings abandoned due to an encountered obstruction shall be grout sealed in the same manner. Grout shall obtain a minimum of 4000 psi compressive strength at 7 days.

In lieu of sandbags and grout, unopened sacks of prepackaged concrete may be used to seal the casing.

Material shall not be removed from the boring pit by washing or sluicing.

Bore pits shall be backfilled and compacted in accordance with Section 2-09.3(1) E. Directional boring, and jacking or drilling pits shall be kept 2 feet from the edge of any type of pavement wherever possible. Excessive use of water that might undermine the pavement or soften the subgrade will not be permitted.

When approved by the Engineer, small test holes may be cut in the pavement to locate obstructions. When the Contractor encounters obstructions or is unable to install conduit because of soil conditions, as determined by the Engineer, additional work to place the conduit will be paid in accordance with Section 1-04.4.

When open trenching is allowed, trench construction shall conform to the following:

1. The pavement shall be sawcut a minimum of 3 inches deep. The cuts shall be parallel to each other and extend 2 feet beyond the edge of the trench.
2. Pavement shall be removed in an approved manner.
3. Trench depth shall provide 2 feet minimum cover over conduits.
4. Trench width shall be 4 inches or the conduit diameter plus 2 inches, whichever is larger.
5. Trenches located within paved roadway areas shall be backfilled with controlled density fill (CDF) meeting the requirements of Section 2-09.3(1)E. The controlled density fill shall be placed level to, and at the bottom of the existing pavement. The pavement shall be replaced with paving material that matches the existing pavement.

On new construction, conduit shall be placed prior to placement of base course pavement.

Conduit terminating in foundations shall extend a maximum of 2 inches above the foundation vertically including grounded end bushing or end bell.

Conduit entering through the bottom of a junction box shall be located near the end walls to leave the major portion of the box clear. At all outlets, conduit shall enter from the direction of the run, terminating 6 to 8 inches below the junction box lid and within 3 inches of the box wall nearest its entry location.

Galvanized rigid steel conduit entering cable vaults shall extend 2 inches for the installation of grounded end bushing and bonding. PVC conduit entering cable vaults and pull boxes shall terminate flush with the inside walls of the structure. All conduit ends shall be terminated with termination kits.

When conduit or casing is to be placed under pavement it shall be placed prior to the placement of a subbase, base, surfacing, and pavement.

Conduit entering through the bottom of a junction box shall be located near the end walls to leave the major portion of the box clear. At all outlets, conduit shall enter from the

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direction of the run, terminating 6 to 8 inches below the junction box lid and within 3 inches of the box wall nearest its entry location.

Suitable marker stakes shall be set at the ends of conduits, which are buried so that they can be easily located.

Fittings shall be installed at locations as designated by the Engineer so as to provide a conduit channel that will permit freedom for installing the electrical control wires. When conduit fittings are called for in the Plans, or where their installation is required by the Engineer, the Contractor shall also furnish all necessary covers and gaskets.

All covered underground conduit shall be cleaned with an approved sized mandrel and blown out with compressed air prior to pulling wire.

Conduits installed for future use shall be prepared as follows: After final assembly in place, the conduit shall be blown clean with compressed air. Then, in the presence of the Engineer, a cleaning mandrel correctly sized for each size of conduit shall be pulled through to ensure that the conduit has not been deformed. As soon as the mandrel has been pulled through, a pull tape shall be installed and both ends of the conduit shall be sealed with conduit caps. All conduits scheduled for future use shall originate in a foundation or junction box as detailed in the Plans and terminate in a junction box. All equipment grounding conductors, and the bonding conductor for metallic conduits shall be bonded in all junction boxes in accordance with Section 8-20.3(9).

Where surface mounting of conduit is required, supports shall consist of "unistrut" type or equal mounting complete with clamps sized for the conduit. Support spacing shall comply with the Code or shall be as noted in the contract. Approved expansion fittings shall be installed at all expansion joints. Approved deflection fittings shall be installed at the joint between the bridge end and the retaining wall end and the transition point from the bridge attachment to the underground section. In addition to the expansion fittings installed at all expansion joints, when PVC conduit is installed, an additional expansion fitting shall be installed for each 100 feet of conduit. Fasteners shall be as approved by the Engineer.

Existing conduit in place scheduled to receive new conductors shall have any existing conductors removed and a cleaning mandrel sized for the conduit shall be pulled through.

Conduit runs shown in the Plans are for bidding purposes only and may be changed, with approval of the Engineer, to avoid underground obstructions.

A maximum of 1000 feet of continuous open trench will be allowed, unless otherwise approved by the Engineer. All conduit exposed above grade level, or on any elevated structures, or as noted in the Plans shall be galvanized rigid steel innerduct conduit.

8-20.3(6) JUNCTION BOXES, CABLE VAULTS, AND PULL BOXES

Section is deleted and replaced with the following:

(*****)

Standard junction boxes, pull boxes and cable vaults shall be installed at the locations shown in the Plans. The Contractor may install, at no expense to the Contracting Agency, such additional boxes as may be desired to facilitate the work. Junction box installation shall conform to details in the WSDOT Standard Plans.

All junction box lids and frames shall be grounded by means of a minimum No. 8 AWG braided tinned copper bonding jumper bolted to the lid with countersunk stainless steel bolts that will allow the removal of the junction box lid without breaking the ground.

Cable vaults and pull boxes shall be installed in accordance with the following:

1. Excavation shall be performed in accordance with Section 2-09.

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2. Cable vaults and pull boxes shall be installed on 6 inches of crushed surfacing top course, per section 9-03.9(3), placed on a compacted or undisturbed level foundation. If a cable vault or pull box is installed outside a paved area, an asphalt pad shall be constructed surrounding the junction box.
3. All openings around conduits shall be sealed and filled with grout to prevent water and debris from entering the vaults or pull boxes. The grout shall meet the specifications of the cable vault and pull box manufacturers.
4. Backfilling around the work shall not be allowed until the concrete or mortar has set.
5. Pull boxes shall be installed in accordance with Plans and details.
6. Pull boxes shall be configured such that the tensile and bending limitations of the cable are not compromised. Pull boxes shall be configured to mechanically protect the cable against installation force as well as inert forces after cable pulling operations.
7. Upon acceptance of work, cable vaults, and pull boxes shall be free of debris and ready for cable installation. All grounding requirements shall be met prior to cable installation.
8. Where installed near steel casings, the pull boxes and cable vaults shall be offset 3 feet, minimum from the centerline of the casing. Factory bends shall be used to route the conduits to the cable vault or pull box.

Adjustments involving raising or lowering the junction boxes shall require conduit modification if the resultant clearance between the top of the conduit and the junction box lid becomes less than 6 inches or more than 8 inches in accordance with WSDOT Standard Plan J-11a.

Cable vaults and pull boxes shall be adjusted to final grade using risers or rings manufactured by the cable vault and pull box manufacturer. Cable vaults and pull boxes with traffic bearing lids shall be raised to final grade using ring risers to raise the cover only.

All voids resulting from the adjustment shall be backfilled with materials matching adjacent surfacing material and compacted in accordance with Section 2-09.3(1)E.

Damage to the junction boxes, pull boxes, cable vaults and the associated conduit system, or wiring resulting from the Contractor's operations, shall be repaired to the Engineer's satisfaction at no additional cost to the Contracting Agency.

Both existing and new junction boxes, pull boxes, and cable vaults shall be adjusted to be flush with the finished grade as well as with the grade during the various construction stages proposed in the contract.

Where conduit and junction boxes are placed in barrier, the Prime Contractor shall coordinate the work of the Contractor constructing the barrier and the electrical Contractor so that each junction box placed in the barrier is placed in correct alignment with respect to the barrier, with the face of the box flush or uniformly chamfered within ½ inch of the barrier surface. If any point on the surface of the junction box placed in barrier is recessed more than 1/2 inch from the surface of the barrier, the Contractor shall install a box extension meeting the Engineer’s approval and grout around the extension or remove and replace the entire section of barrier.

8-20.3(8) WIRING

The third paragraph is deleted and replaced with the following

(*****)

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All splices in underground illumination circuits, induction loop circuits, and magnetometer circuits shall be installed in junction boxes. The only splice allowed in induction loop circuits and magnetometer circuits shall be the splice connecting the induction loop lead-in conductors or magnetometer lead-in conductors to the exisiting shielded home run cable. Loop wires shall be spliced to lead-in cable at the loop junction box with an approved mastic tape, 3-M 06147 or equal. The mastic pad shall be a minimum of 5 inches long. The mastic splice shall be centered on the wire at the splice point, folded up around the sides, and jointed at the top. The mastic pad ends shall be visible and fully sealed to the conductor insulation. The ends of the lead-in cable shall have the sheathing removed 8 inches and shall be dressed external to the splice. All connections with #10 and smaller wire shall use copper crimped connectors installed with a positive action (ratchet) tool. The non-insulated die shall be an indent type and insulated die shall be of a smooth shape capable of crimping pre-insulated terminals and connectors. The tool shall be compound lever type with a ratchet mechanism to ensure positive closure for full crimping cycle. The tool shall be field adjustable to proper calibration with common tools and materials. All connectors shall be wrapped with two layers of electrical tape. All epoxy splice kits shall be physically separated from other splices and wiring within the junction box to avoid damage from heat during the casting process.

88 9A8 9B8 9C8 9D8

8-20.3(9) BONDING, GROUNDING

The first paragraph is deleted and replaced with the following**:**

(*****)

All metallic appurtenances containing electrical conductors (luminaires, light standards, cabinets, metallic conduit, non-metallic conduit, etc.) shall be made mechanically and electrically secure to form a continuous systems that shall be effectively grounded. Where metallic conduit systems are employed, the conduit system constitutes the equipment grounding conductor. Where non-metallic conduit is installed, the installation shall include an equipment ground conductor, in addition to the conductors noted in the contract. Bonding jumpers and equipment grounding conductors shall be installed in accordance with Section 9-29.3. and sized per NEC 250-122. Where parallel circuits are enclosed in a common conduit, the equipment grounding conductor shall be sized by the largest overcurrent device serving any circuit contained within the conduit.

The following is added at the end of this section:

Where conductors are adjusted in size to compensate for voltage drop, equipment grounding conductors shall be adjusted proportionately according to circular mil area in compliance with NEC 250-122(b).

The grounding electrode system shall consist of a ground ring and shall be 25 ohms or less impedance. The ground ring shall be placed in contact with the earth at a depth of 2.5 feet or more and consist of bare copper conductor not smaller than No. 2. The grounding electrode system shall be tested with a ground rod tester in the presence of the Electrical Inspector prior to activating the service.

8-20.3(10) SERVICES, TRANSFORMER, CABINET

Section is supplemented with the following:

(*****)

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The Contractor shall request the State Department of Labor and Industries (L&I) to perform required inspections for service approval. The request by the Contractor to L&I shall be sent by certified mail with a copy forwarded to the County. The Contractor shall notify the Engineer when the service is approved by L&I and ready for connection.

8-20.3(11) TESTING

The fourth paragraph is deleted and replaced with the following:

(*****)

The Contractor shall conduct functional tests to demonstrate that each part of the, illumination system, or other electrical system functions as specified. These demonstrations shall be conducted in the presence of a Electrical Technician or Supervisor, and the Electrical Inspector.

8-20.3(13)A LIGHT STANDARDS

Section is supplemented with the following:

(*****)

Light standards shall meet the requirements as stated in the latest version of AASHTO and shall be able to withstand winds of 80 mph with a gust factor of 1.3. The radius for the arm shall be between 26 and 30 inches. Hand holes shall be located on the side opposite approaching traffic. Fabrication of pole length shall be within a 6-inch tolerance.

Fixed base installation shall conform to the following:

The base and flange plates shall be ASTM A 283 grade D steel. The anchor bolts shall be 1-1/8 inch x 40 inch x 4 inch ASTM A 307 steel. Longitudinal welds shall be butt-welded by the resistant arc process and circumferential welds shall be welded with a permanent back-up ring. All butt welds shall be ground flush with the base metal.

8-20.3(14)C INDUCTION LOOP VEHICLE DETECTORS

The second sentence of the first paragraph is deleted.
Section is supplemented with the following at the end of item 4:

(*****)

Disconnect existing loops from loop lead in cables at the splice point. Replace loops in the roadway and splice to the existing lead in cables. All loops shall be tested in accordance with Section 8-20.3(14)D and approved by the Engineer prior to placement of the final lift of asphalt.

Section 8-20.3(14)D is deleted and replaced with the following:

(*****)

8-20.3(14)D TEST FOR INDUCTION LOOPS AND LEAD-IN CABLE

All tests shall be performed by the Contractor in the presence of the Electrical Inspector or Traffic Signal Technician for each loop or the tests will be conducted by County personnel at the request of the Contractor. The tests shall be performed at the amplifier location after complete installation of the loop. All costs associated with testing shall be included in the unit contract prices of the respective bid items.

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Test A — The DC resistance between the two lead-in cable wires will be measured by a volt ohm meter. The resistance shall not exceed 5 ohms measured at the loop ends in the junction box.

Test B — A megohm meter test at 500 volts DC shall be made between the lead-in cable shield and grounding, prior to connection to grounding. The resistance shall equal or exceed 200 megohms.

Test C — A megger test shall be made between the loop circuit and grounding. The resistance shall equal or exceed 200 megohms.

Test D — An inductance test to determine the inductance level of each inductance loop. The Contractor shall record the inductance level of each inductance loop installed on the project and shall furnish the findings to the Engineer. An inductance level 90 micro-henries.

If any of the installations fails to pass all tests, the loop installation or lead-in cable shall be repaired and replaced and then retested.

Add the following new Section:

(*****)

8-20.3(14)F VIDEO DETECTION SYSTEM

Prior to commencing work around existing vehicle inductance loops, the Contractor shall provide a fully operational video detection system at the intersections noted in the Plans. The County will operate and the Contractor shall maintain the video detection system throughout construction until new inductance loops are fully operational. The Contractor shall provide adequate cable for each detection camera to allow relocation of cameras as construction conditions (lane shifts, traffic control, etc) change.

The video detection system shall consist of the following:

- Video cameras, including camera enclosure, filter, sunshield and connector kit
- Camera mount assemblies, including extensions as specified in the Plans.
- Video image processors
- 9-inch Video Monitor, including cable
- Programming devices and/or software
- Camera lens(es) and lens adjustment module
- Surge Suppressor
- Coaxial and power cables
- All other equipment necessary for a fully operational video detection system.

Cameras shall be mounted at a sufficient height to prevent occlusion from cross traffic. The Contractor shall provide and install the camera mounts and cable per the Plans. King County will install the cameras and controller cabinet video camera equipment, and program the cameras to provide detection. The Contractor shall notify the Engineer 48 hours in advance of changes that will require King County staff to reprogram cameras.

All video detection system equipment shall remain the property of King County upon completion of the contract work. The Contractor shall be responsible for any damage to the video detection equipment.

8-20.3(16) REINSTALLING SALVAGED MATERIAL

The last paragraph is deleted and replaced with the following:

(*****)

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Metal poles relocated to new permanent locations shall be inspected by the Contractor in the presence of the Electrical Inspector for structural integrity prior to reinstalling. The Contractor shall arrange for a mag particle test, at the Contractor's expense, on all metal poles to be relocated

Add the following new Sections:

(*****)

8-20.3(19) SUBMARINE CONDUIT SYSTEM

This section specifies the requirements for a complete contractor designed submarine conduit system (system) to convey six (6) 4" ID fiberglass reinforced epoxy ducts [duct(s)] between the footing levels of Bascule Span's pier numbers 3 and 4 by way of tunneling under the Duwamish River.

Work of this Section is related to work described in Section 6-19, Superstructure - Bascule Pier, and 8-20.3 (5), Conduit. Submarine conduit system materials are specified in Section 9-29.1, and Section, 9-29.1(9).

Submit the following items in accordance with the Contract Documents 30 contract days prior to the start of Work on the submarine conduit system unless otherwise noted:

1. **General Submittals**
   a. Tunnel construction safety plan to the Engineer for tunnel construction. The safety plan shall bear the seal and signature of a licensed professional engineer, licensed under title 18 RCW, state of Washington, qualified in civil engineering.
   b. Detailed tunneling schedule indicating the sequence of the tunneling and the anticipated drive schedules and installation of ducts and grout in casing, installation of vertically supported duct, installation of duct through pipe sleeve though pier cap and installation of pier face placards. Determine the required tunneling schedule in relation to the soils conditions.
   c. Shop drawings showing general tunneling operation setup, including location of the power and control units, the tunnel spoils disposal system for each of the drive shafts, and the location of any temporary platforms needed to install Vertical and sleeved Ducts.

2. Submarine Casing submittals
   a. Tunneling system design to include method of construction, pipe type of pipe seals and fiber reinforced concrete closure pours. Jacking mechanism design, including maximum thrust capacity, maximum jacking force anticipated for each drive, and jacking force monitoring and recording details. Calculations showing the Shear stress in caissons due to jacking with a 2.0 factor of safety shall be included in submittal. These designs and calculations and shall bear the seal and signature of a licensed professional engineer, licensed under title 18 RCW, state of Washington, qualified in civil engineering.
   b. MTBM manufacturer's literature describing in detail the system proposed. Grade and alignment control system shall be detailed. List of previous projects of a similar size and complexity. Project details shall include pipe size, names, addresses, and telephone numbers of the personnel responsible for the projects cited.

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c. Project plan showing proposed location of drive and receiving shafts and tunneling direction plan.

d. Detailed drawings of the drive shaft layout to include but not be limited to hydraulic jack configuration, thrust reaction backstop design, pipe rail layout, and pipe exit seal detail.

e. Tunnel spoils disposal plan.

f. Streambed disturbance monitoring plan. which provides positive documentation that streambed disturbance is kept below minimum vibration thresholds.

g. Tunneling lubricant specifications and grout mix designs to conform to the contract documents.

3. Vertical Duct Supports submittals

a. Support system design showing the layout of the utility supports securing straight and elbow shaped ducts to the caisson pier faces and supporting the duct elbows while accommodating the movement classifications outlined in this specification. These support system must be suitable for underwater applications These designs and calculations and shall bear the seal and signature of a licensed professional engineer, licensed under title 18 RCW, state of Washington, qualified in civil engineering.

b. Catalog cuts and design manuals for of any proprietary utility support systems deflection and expansion joints used in the design.

4. Caisson Pier Cap Pipe Sleeve submittals

a. Casing design showing the layout of the utility supports securing ducts to the inside or ends of the pipe sleeve, according to duct manufacturers recommendations. These designs and calculations and shall bear the seal and signature of a licensed professional engineer, licensed under title 18 RCW, state of Washington, qualified in civil engineering.

b. Catalog cuts and design manuals for of any proprietary utility support systems deflection and expansion joints used in the design.

5. Fiber Reinforced Epoxy (FRE) Ducts submittals

a. Catalog cuts and design manuals for of any proprietary utility support systems used in the design.

6. Pier face placard submittals

a. Shop drawings showing the Placards, their messages, mounting details placement on the pier face and or fender system that conform to the design requirements outlined in these contract documents.

Submit the following at the Preconstruction conference: List of personnel to be assigned to the project along with a listing of their relative experience in tunneling for projects of similar size and complexity. The tunneling supervisor shall have a minimum of xx months of experience in the operation of the proposed MTBM. This tunneling experience shall specific to submarine applications.

Provide surface drainage during the period of construction to protect the work, to avoid nuisance to adjoining property, and to assure that the surface runoff does not enter the shafts.

During tunnel excavation, monitor and report the following information for each length of pipe installed:

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A. Description of the soil conditions encountered.
B. Excavation velocity.
C. Jacking pressures used.
D. Quantity of lubricant used.
E. Description of any unusual conditions or special actions taken.

8-20.3(19)A SUBMARINE CASING

Submarine casing shall be installed between precast windows in the bascule pier caissons as shown on the Plans.

Casing shall be 16" minimum, 30" maximum inside diameter casing to accommodate six 6 ducts, duct diaphragms and casing grout.

The casing shall conform to Section 9-29.1.

Casing alignment shall be no more than one inch out of deviation in any direction from the design line and grade of tunneled pipe shown on the Plans.

Safety regulations and local noise regulations shall be adhered to at all times, and adequate lighting shall be provided for the safety of the workers.

The preferred method of installing casing is by means of a Micro Tunnel Boring Machine and pipe jacking. Any alternate method must be submitted as a value engineering proposal.

Trenching will not be allowed due to environmental impacts. Extreme low water is -4.00' mean sea elevation.

Prior to starting installation of the carrier pipe, all required labor, materials and equipment shall be on the site.

Protect existing utilities. Prior to beginning construction at any location, protect existing utilities.

Protect the caisson piers during construction. Any concrete or reinforcing bar damaged during the installation of the components of the submarine conduit system shall be repaired and or replaced to its designed condition at no additional cost.

The following information may be available from the City of Seattle for use in designing the micro tunneling component:

1. Existing fender pile survey.
2. Soil samples.

The Contractor shall assume all risk for operations halted by encountering abandoned piles, cobles, and boulders. The Contractor shall be responsible for all damages resulting from ground losses in the tunnel and for refilling of the voids resulting there from. The approval of procedure and equipment by the Engineer shall not relieve the Contractor of responsibility, or waive, or modify any of the provisions of the Contract.

Microtunneling

Soil Survey... XXX.

Precision... XXX.

Equipment and procedures shall be suitable to successfully microtunnel under soil conditions encountered.

Pipe Jacking

Each pipe section shall be jacked forward as the excavation progresses in such a way as to provide complete and adequate ground support at all times. Jacking and boring operations shall be conducted to prevent caving ahead of the pipe that will cause voids outside of the pipe. The auger head shall not proceed more than 4 inches ahead of the pipe

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being jacked. If the material encountered during the Contractor's operations should make boring ahead of the casing impractical, the borer shall be withdrawn into the casing and jacking operation shall precede the boring.

The pipe shall be jacked ahead when stopping work each night to create a plug of sufficient thickness to assure material stability. Contractor shall be responsible for any "freezing" of the pipe string.

Apply lubricant slurry under pressure using a manifold piping system with the tunnel. The lubricant shall be continuously pumped throughout the pipe jacking operation.

After the completion of the jacking operation, displace the lubricant slurry and fill all voids in the space between the excavation and the pipe with flowable backfill. Control the backfilling operation to ensure that the pipe sections remain in place within the specified alignment and grade tolerances, and there is no heaving of the ground surface. Flowable backfilling shall be accomplished as soon as possible after pipe installation has been completed to prevent any surface settlement.

Protect the pipe joints from crushing during the jacking operation at all times. The cushions shall work to evenly distribute the jacking pressure around the pipe circumference and prevent localized stress concentration.

Any pipe damaged during the jacking operation shall be replaced or adequately repaired. Damaged pipes shall be defined as those having cracks that exceed 0.01-inch wide for a length of one foot. All repairs proposed by the Contractor shall be submitted to the Engineer for approval.

Tunnel excavation spoils

Tunnel excavation spoils removal, processing, and disposal shall be per the approved tunnel safety plan procedures submitted by the Contractor prior to commencing the tunneling operation. All tunnel spoil material shall be removed from the site to an approved disposal location. No stockpiling of tunnel spoils on site shall be permitted. Removal of the excavated or bored material from the pits by washing or sluicing will not be permitted.

Pipe Cleaning and Inspection

Prior to demobilizing the pipeline shall be thoroughly cleaned, tested, and inspected to the satisfaction of the Engineer per the requirements of this Section. The inside of the casing pipe shall be thoroughly cleaned free from grease, dirt, rust, or other deleterious contaminants.

The submarine conduit system shall be inspected for workmanship. The Engineer shall review and approve the system if it meets the specifications. The Contractor shall then demobilize the submarine conduit operation.

The Contractor shall repair, replace, or compensate for any damage to permanent facilities due to negligence or lack of adequate protection, Including damage to caissons due to jacking operations.

Seals and Diaphragms

Caisson to casing pipe seals shall be bolted into the casing, accommodate a permanent differential settlement of 3", and conform to section 9-04.4. The Caisson window is shown in the Plans for caisson pier. The closure pour for this window shall be made from fiber reinforces concrete with a minimum 7 day design strengths of 1500 psi and a maximum 28 day design strength of 2500 psi. The caisson design shall accommodate a preferred

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submarine casing alignment and an alternate casing alignment, in case the preferred alignment casing installation fails

Diaphragms shall support the FRE ducts in the casing at a 5'-0" minimum spacing. Grout the casing around the FRE Ducts shall conform to Section 9-29.1(9).

8-20.3(19)B VERTICAL DUCT SUPPORTS

Vertical Duct Supports shall convey FRE ducts vertically between Submarine Casing and caisson pier cap pipe sleeve as shown on the Plans. The support system shall accommodate an elbow radius as shown on the Plans to interface with the submarine casing and shall conform to Section 8-20.3(5) and current industry standards for submarine construction. The Casing to Elbow to Vertical Duct connections shall accommodate a permanent differential settlement of 3".

8-20.3(19)C CAISSON PIER CAP PIPE SLEEVE

Caisson pier cap pipe sleeves shall convey the 6 FRE ducts though the caisson pier concrete caps. The sleeves shall run vertically as indicated on the Plans. The sleeves material shall conform to Section 9-29.1(9). Securing of the ducts inside the sleeve shall conform to Section 8-20.3(5) and current industry standards for submarine construction.

8-20.3(19)D FIBER REINFORCED EPOXY (FRE) DUCTS

FRE Ducts and all associated joints couplers elbows, deflection and expansion fittings shall conform to section 9-29.1(9). Install FRE Ducts... XXXXX

8-20.3(19)E PIER FACE PLACARDS

Mount placards to the exterior of the substructure, to notify utility contractors of the location of this submarine conduit system. The placards shall conform to the common ground alliance best practices version 6.0 guidelines, the 49 Code of Federal Regulations (CFR) Part 192 & 195. Industry Standards, and APWA, "Guidelines for Uniform Temporary Marking of Underground Facilities and any applicable state or local marking standards".

8-20.4 MEASUREMENT

The first paragraph is deleted and replaced with the following:

(*****)

When shown as lump sum in the Plans or in the proposal as illumination, traffic data accumulation and ramp metering, interconnect, or signalization system, or traffic signal modification no specific unit of measurement will apply, but measurement will be for the sum total of all items for a complete system to be furnished and installed.

The following is added at the end of this section:

When shown as lump sum in the Plans or in the proposal as 3-Conduit Duct Bank and 5-Conduit Duct Bank no specific unit of measurement will apply, but measurement will be for the sum total of all items for a complete system to be furnished and installed.

Section is supplemented with the following:

(*****)

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The lump sum Contract price for “Submarine Conduit System” Contains the following approximate quantities of materials and completed work:

XXXXXXXXXXXXXXXX	XXX	LB.
XXXXXXXX	XXX	LB.
XXXXXXXXXXX	XXX	CY

The quantities listed are only for the convenience of the Contractor in determining the volume of work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than for approved changes will be made in the lump sum contract prices for Submarine Conduit System even though the actual quantities required may deviate from those listed.The lump sum Contract price for “3-Conduit Duct Bank” contains the following approximate quantities of materials and completed work:Conduit Pipe 2

In.Diam., Sch 40	XXX	LF
Conduit Pipe 4 In.Diam., Sch 40	XXX	LF
Controlled Density Fill	XXX	CY
HMA	XXX	CY
Structure Excavation Cl. B	XXX	CY
Utility Vault Box 712-LA	XXX	EA
Utility Vault Box 444-LA	XXX	EA

The quantities listed are only for the convenience of the Contractor in determining the volume of work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than for approved changes will be made in the lump sum contract prices for 3-Conduit Duct Bank even though the actual quantities required may deviate from those listed.

The lump sum Contract price for “3-Conduit Duct Bank” contains the following approximate quantities of materials and completed work:

Conduit Pipe 2 In.Diam., Sch 40	XXX	LF
Conduit Pipe 4 In.Diam., Sch 40	XXX	LF
Controlled Density Fill	XXX	CY
HMA	XXX	CY
Structure Excavation Cl. B	XXX	CY
Utility Vault Box 444-LA	XXX	EA

The quantities listed are only for the convenience of the Contractor in determining the volume of work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than for approved changes will be made in the lump sum contract prices for 3-Conduit Duct Bank even though the actual quantities required may deviate from those listed.

8-20.5 PAYMENT

Section is deleted and replaced with the following:

(*****)

Payment will be made in accordance with Section 1-04.1, for each of the following bid items that are included in the proposal:

Not for construction

"Illumination System ____", lump sum.

The lump sum contract price for "Illumination System ____"," shall be full pay for the construction of the complete electrical system, modifying existing systems, or both, as shown in the Plans and herein specified including excavation, backfilling, concrete foundations, conduit, wiring, restoring facilities destroyed or damaged during construction, salvaging existing materials, and for making all required tests. All additional materials and labor, not shown in the Plans or called for herein and which are required to complete the electrical system, shall be included in the lump sum contract price.

"Conduit Pipe ____ In. Diam.", per linear foot.

The unit contract price per linear foot for "Conduit ____ In. Diam." shall be full pay for furnishing all pipe, pipe connections, elbows, bends, caps, reducers, conduits, and unions; for placing the pipe in accordance with the above provisions, including all excavation, directional boring, jacking or drilling required, backfilling of any voids around casing, conduits, pits or the trenches, restoration of native vegetation disturbed by the operation, chipping of pavement, and bedding of the pipe; and all other work necessary for the construction of the conduit, except that when conduit is included on any project as an integral part of an illumination, conduit system and the conduit is not shown as a pay item, it shall be included in the lump sum price for the system shown.

All costs for installing conduit containing illumination wiring shall be included in the contract prices for the illumination system.

All costs for installing junction boxes containing illumination wiring shall be included in the contract prices for the illumination system.

"Casing", per linear foot.

The unit contract price per linear feet for "Casing" shall be full payment for boring, jacking or drilling for installing casing, and backfilling any voids around the casing and pits or back filling of the trenches required to install the casing. This cost will also include any restoration of native vegetation disturbed by the operation.

"Submarine Conduit System", lump sum.

The lump sum Contract price for "Submarine Conduit System" shall be full pay to provide a complete continues submarine conduit system, including, but not limited to furnishing and installing the following:

- Submarine casing pipe bored or jacked, including excavation and backfill of entrance and receiving pits, material removal, machine usage, backfilling of any voids around the casing with flowable fill, installation of diaphragms and grouting around FRE ducts, installation of casing to caisson pipe seals, and backfilling of jacking pits. No payment shall be made for failed attempts and unusable bores;
- Caisson pier cap sleeves; and
- FRE ducts including duct connections, elbows, bends, caps, reducers, unions, and vertical duct supports.

Payment for unforeseen obstructions not defined above will be by the WSDOT force account method.

All costs for installing junction boxes above the caisson caps, and installing illumination and signal wiring shall be included in other bid items.

The lump sum Contract price for "Submarine Conduit System" shall include full payment for furnishing approved microtunneling plans as outlined in the submittals section, microtunnelling access work platform construction maintenance and operations. Jacking for installing casing, backfilling with flowable fill (if applicable), pipe seals and placement of approved fiber reinforced concrete around the pipe seals and to close all casing windows in

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the caisson pier faces, ducts, diaphragms and grout shall all be subsidiary to this item. Payment shall not be made for failed attempts and unusable bores.

The lump sum Contract price for "Submarine Conduit System" shall include furnishing approved vertical duct support plans as outlined in the submittals section, furnishing duct support, installation of vertical duct support system, all deflection and expansion fittings to the end of ducts runs and elbow pieces. duct support system at planned intervals inside of or at ends of pipe sleeve.

The lump sum Contract price for "Submarine Conduit System" shall include furnishing approved vertical duct support plans as outlined in the submittals section, furnishing duct support, casting sleeves into pier caps, and installation of approved duct support system at planned intervals inside of or at ends of pipe sleeve, and all associated appurtenances. Sleeved ducts shall be incidental to this item.

The lump sum Contract price for "Submarine Conduit System" shall include furnishing all duct, duct connections, elbows, bends, caps, reducers, conduits, and unions; deflection/expansion connections for placing the duct in accordance with the above provisions, including all excavation, jacking or drilling required, backfilling of any voids around casing, conduits, pits or the trenches, chipping of pavement, and bedding of the pipe; and all other Work necessary for the construction of the ducts.

The lump sum Contract price for "Submarine Conduit System" shall include placard and placard placement design, fabrication parts and labor, installation per approved plan, and all associated appurtenances.

8-21 PERMANENT SIGNING

8-21.3(9)C <u>TIMBER POSTS</u>

Section is supplemented with the following:

(*****)

All ground mounted sign posts shall use Western Red Cedar wood posts. Posts shall be 90% free of heart center (FOHC) to resist twisting. Post quality shall be standard grade or better and knot size shall not exceed 2 inches. Slope of the grain shall run parallel to the post.

Timber posts shall be buried a minimum of 30 inches below the finished grade line. Post backfill shall be compacted every six (6) inches to minimize settling. Posts shall be 2-way plumb.

Timber posts shall have an aluminum alloy cleat, 6061-T6, which is chemically coated in accordance with ASTM B449-67 Class 2. This cleat shall have a 0.80 gauge thickness and shall be 30 inches long and 3 inches wide with a bottom 2 inch turnout of 90°. The cleat shall be attached to the post with two 8-penny galvanized duplex nails located 1 inch from the top of the cleat and 1 inch from each side. Holes must be punched or drilled in the cleat at these locations with a diameter of 0.156 inches. The cleat turnout shall be positioned away from and even with the bottom of the post. In addition, a marking galvanized duplex nail shall be installed 10 inches above the ground line on the side of the post which contains the cleat.

Section 8-26 is deleted and replaced with the following:

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8-26 HEATING, VENTILATION, AND AIR CONDITIONING WORK

8-26.1 DESCRIPTION

8-26.1(1) GENERAL

The work under this Section shall consist of furnishing all labor, equipment, and materials required for the installation, testing, and balancing of the Control House HVAC system as shown on the Plans and specified herein. HVAC systems shall be installed in two control houses as shown on the plans.

All components of the control house heating, venting and air conditioning system shall be properly sized and selected for service as shown on the Plans and specified herein.

8-26.1(2) CODES

The Contractor shall comply with the requirements of the following codes and standards:

1. International Building Code – Mechanical Section
2. Washington State Energy Code – 2006 Edition
3. Refrigeration system of condensing units shall be constructed in accordance with ASHRAE Standard ASHRAE 15-94 "Safety Code for Mechanical Refrigeration".
4. SMACNA Compliance: Comply with applicable portions of SMACNA-95 "HVAC Duct Construction Standards, Metal and Flexible".
5. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories.
6. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".
7. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
8. AABC: "National Standards for Total System Balance."
9. ASHRAE: ASHRAE Handbook, HVAC APPLICATIONS, Chapter 34, Testing, Adjusting, and Balancing.
10. NEBB: "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

Required Drawings and Product Data

1. Product data, including electrical requirements and catalog cuts of all equipment specified and as shown on the Plans.
2. Product data for each specialty and/or special duty equipment. Include rated capacities of selected models, furnished specialties and accessories, and installation instructions.
3. Shop drawings detailing dimensions, required clearances, for installation.
4. Maintenance data for furnace, condensing unit, and any other gas specialties and special duty valves, for inclusion in operating and maintenance manual.
5. Working Drawings: Working drawings as necessary for the fabrication and installation of control house heating, venting and air conditioning system shall be prepared by the Contractor and shall be submitted to the Engineer for approval. The drawings shall include equipment details, catalog and data sheets of standard components, and a tabulation giving the name of the part,

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description, function, manufacturer, rating, type, model, and catalog and serial number of each component. Each component shall be identified by an item number and complete assembly layout drawings shall be furnished identifying each component by the item number.

8-26.2 MATERIALS

8-26.2(1) AIR HANDLER

Furnish air handlers from the manufacturer and Model number as listed below, including all accessories for a complete installation.

Trane Company Model 4TEH3F36B (2 assemblies required) or approved equal.

Unit shall operate on 240 VAC single phase power.

Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Casing shall be completely insulated with cleanable, foil faced, fire-retardant, permanent, odorless glass fiber material. All insulation edges shall be either captured or sealed. Knockouts shall be provided for unit electrical power and refrigerant piping connections. Captive screws shall be provided on all access panels.

Double inlet, double width, forward curved, centrifugal-type evaporator fan with adjustable belt drive shall be provided. Thermal overload protection shall be provided on motor. Fan and motor bearings shall be permanently lubricated.

Evaporator coil shall be aluminum fin surface mechanically bonded to 3/8" internally enhanced copper tubing and factory pressure and leak tested at 375 psig. Coil shall be provided with a double sloped condensate drain pan. The drain pan shall be removable for cleaning and shall be provided with an external connection on the side of the unit and a drain hose.

An approved 1" throwaway air filter accessible from side access panel shall be provided and installed in the return air system.

An auxiliary electric resistance heating unit specified below shall be supplied with the air handler. Unit shall have a capacity of 5 KW and operate on 240 VAC single phase power.

Trane Company Model BAYHTR1305 (2 assemblies required) or approved equal.

Manufacturer: Manufacturer and Model number are shown above. Subject to compliance with requirements, manufacturers shall be, but are not limited to, one of the following:

1. The Trane Company
2. Lennox Corporation
3. Carrier A/C Group, Carrier Corporation.

8-26.2(2) <u>HEAT PUMP</u>

Heat Pump units shall meet or exceed the minimum EER efficiency levels as prescribed in Washington State Energy Code.

Furnish heat pumps from the manufacturer and Model number as listed below, including all accessories for a complete installation. Factory-assembled and tested air-cooled heat pump units, consisting of compressor, condenser coil, fan, motor, refrigerant reservoir, and operating controls mounted at the operator's level shall be provided. Unit shall provide 36,000 BTUH of total cooling at 2800 cfm. Unit shall be capable of 36,000 BTUH heating. Unit shall operate on 480 VAC 3 phase power. Trane Company Model 4TWA3036A4 (2 assemblies required)

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Unit casing shall be constructed of 18 gauge zinc coated heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Units shall have removable end panels which allow access to all major components and controls, weep holes for water drainage.

The compressor shall be a single hermetically sealed direct drive scroll compressor with centrifugal oil pump providing positive lubrication to all moving parts. The heat pump shall have both a liquid line and suction gas line service valve with gauge port., a refrigeration filter drier, expansion valve and check valves. A crankcase heater, discharge line thermostat, internal temperature and current-sensitive motor overloads shall be included for protection. External high and low pressure cutout devices shall be provided.

The condenser coil shall have copper tubes and aluminum fins, complete with liquid accumulator and liquid subcooler. Aluminum propeller fan shall be direct driven, with permanently lubricated fan motor having current and thermal overload protection. Coils shall come furnished with corrosion resistant coating. Metal grilles with PVC coating for coil protection shall be provided.

8-26.2(3) ACCESSORIES

Low Ambient Head Pressure Control.
Anti-Short-cycle Timer with 5 minute off timing period.
Low-voltage thermostat and sub-base to control condensing unit and evaporator fan.
Timed-off Control.
Precharged and insulated suction and liquid tubing of proper length.
Mounting Base for heat pump.

Manufacturer: Manufacturer and Model number are shown above. Subject to compliance with requirements, manufacturers shall be, but are not limited to, one of the following:

1. The Trane Company
2. Lennox Corporation
3. Carrier A/C Group, Carrier Corporation.

8-26.2(4) VENTILATION FAN

Furnish rest room ventilation fan of Manufacturer and Model number as shown below, including all accessories for a complete installation of ventilation fan. Work shall include providing ventilation fan, duct work, and hole boring through concrete wall to pit. After installation of duct, hole shall be insulated and fire stopped as outlined below. Broan Model L100MG (1 assembly required) or approved equal.

Ventilation fan shall provide 115 CFM at 0.125 inches of water, a noise level of 1.0 sones, and shall have a galvanized steel housing insulated with ½" of acoustic insulation. Housing shall have adjustable mounting brackets to attach housing to ceiling. A backdraft damper shall be located in the duct connector. Vertical fan installation, horizontal duct connector shall be supplied. Blower unit shall be removable from housing and will have a dynamically balanced centrifugal blower. Motor to be permanently lubricated and mounted on resilient anti-vibration mounts. A galvanized bird screen, motor side fan guard, thermostat and all other accessories necessary for installation such as bolts, caulking, firestop material, etc.

Exhaust fan shall come on with the separate bathroom light and shall have a metal grill.

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Manufacturer: Manufacturer and Model number are shown above. Subject to compliance with requirements, manufacturers shall be, but are not limited to, one of the following:

1. Broan
2. Dayton
3. Panasonic, Matsushita Electric Corporation of America

8-26.2(5) LOUVERS

Furnish and install louvers from Manufacturer and Model number as shown in the plans, including all accessories for a complete installation of louvers.

Manufacturer: Manufacturer and Model number are shown above. Subject to compliance with requirements, manufacturers shall be, but are not limited to, one of the following:

1. Ruskin Dampers and Louvers
2. C/S Group
3. Industrial Louvers Incorporated

8-26.2(6) DUCT WORK – SHEET METAL MATERIALS

Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains and discoloration and other imperfections including those which impair painting.

Sheet Metal, General: Provide sheet metal in thickness indicated, packaged and marked as specified in ASTM A700, Standard Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment.

Galvanized Sheet Steel: Lock-forming quality, ASTM A 653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, Coating Designation G 90. Provide mill-phosphatized finish for exposed surfaces of ducts exposed to view.

Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing, installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts provide reinforcing of compatible materials.

Tie Rods: Galvanized steel, ¼-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

8-26.2(7) SEALING MATERIALS

Joint and Seam Sealants, General: The term sealant used here is not limited to materials of adhesive or mastic nature, but also includes tapes and combinations of open weave fabric strips and mastics.

Joint and Seam Tape: 2 inches wide, glass-fiber-fabric reinforced.

Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657, Type I; formulated with a minimum of 75 percent solids.

Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C 920, Standard Specification for Elastomeric Joint Sealants, Type S, Grade NS, Class 25, Use O.

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8-26.2(8) FIRE-STOPPING

Fire-Resistant Sealant: Provide two-part, foamed-in-place, fire-stopping silicone sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops, Underwriters Laboratory Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.

Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
2. "Pensil 851"; General Electric Co.
3. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
4. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
5. "RTV 7403"; General Electric Co.
6. "Fyre Putty"; Standard Oil Engineered Materials Co.

8-26.2(9) DUCT INSULATION

Insulation of ductwork at locations shown on the plans is to be in accordance with Washington State Energy Code. Heating and cooling supply duct insulation shall have an R value of 3.5. Return air duct insulation shall have an R value of 1.9.

8-26.2(10) HANGERS AND SUPPORTS

Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials shall be provided. Do not use powder actuated concrete fasteners for lightweight aggregate concrete or for slabs less than 4 inches thick.

Hangers: Galvanized sheet steel, or round, galvanized steel, threaded rod.

Straps and Rod Sizes: Conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet steel width and gage and steel rod diameters.

Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.

Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.

For stainless steel ducts, provide stainless steel support materials.

For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.

8-26.2(11) RECTANGULAR DUCT FABRICATION

Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including the associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.

Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.

Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discoloration.

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Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:

1. Supply Ducts: 3 inches water gage.
2. Return Ducts: 2 inches water gage, negative pressure.
3. Exhaust Ducts: 2 inches water gage, negative pressure.

8-26.2(12) SPECIAL CONSTRUCTION

All ductwork and fittings are to be constructed of material one gauge lower in number (thicker material) than required by the standards for each duct in this Section. Increased hanger requirements will apply, corresponding to the thicker material as conforming to the required standards.

8-26.2(13) ROUND AND RECTANGULAR DUCT FITTINGS

Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard."

8-26.2(14) REGISTERS AND GRILLES

Furnish manufacturer's floor registers and grilles as shown in the plans; of size, shape, capacity and type indicated herein and on the Plans; constructed of materials and components as indicated, and as required for complete installation.

Heavy duty double deflection supply registers constructed of 20 gauge steel with opposed blade damper shall be provided. Return grilles shall be of similar construction without damper. The finish for all grilles and registers shall be a factory applied white baked enamel.

Manufacturer: Subject to compliance with requirements, provide registers and grilles of one of the following:

1. Titus Products Div.; Philips Industries, Inc.
2. Anemostat Products Div.; Dynamics Corp. of America.
3. Carnes Co.; Div. of Wehr Corp.

8-26.2(15) INSTRUMENTATION

Contractor to provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.

Provide only those instruments, which have the maximum field measuring accuracy and are best suited to the function being measured.

8-26.3 CONSTRUCTION REQUIREMENTS

8-26.3(1) AIR HANDLERS

Install air handlers where shown, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes.

Coordinate with other work, including ductwork, floor construction and piping, as necessary to interface installation of air handler with other work.

Install unit on vibration mounts; comply with manufacturer's indicated installation method, if any.

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Provide access space around unit for service as indicated, but in no case less than that recommended by manufacturer.

Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

Verify that electrical wiring installation is in accordance with manufacturer's submittal. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

8-26.3(2) GROUNDING

Provide positive equipment ground for unit components.

8-26.3(3) HEAT PUMPS

Install Heat Pump units in accordance with manufacturers installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

Connect pre-charged refrigerant tubing to unit's quick-connect fittings. Run tubing so as not to interfere with access to unit.

Install furnished accessories.

8-26.3(4) DUCTWORK

Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.

Install ducts with the fewest possible joints.

Use fabricated fittings for all changes in directions, changes in size and shape, and connections.

Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.

Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.

Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

Coordinate layout with lighting layouts and similar finished work.

Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2 inches.

Seam and Joint Sealing:

1. Seal duct seams and joints as follows:
   a. Supply in Unconditioned Space (more than 2 Inches Water Gauge): All transverse joints, longitudinal seams, and duct penetrations.
   b. Return in Unconditioned Space: All transverse joints and longitudinal seams.

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2. Seal externally insulated ducts prior to insulation installation.

Hanging and Supporting:

1. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards," Tables 4-1 through 4-3 and Figures 4-1 through 4-8.
2. Support horizontal ducts within 2 feet of each elbow and within 4 feet of each branch intersection.
3. Support vertical ducts at a maximum interval of 16 feet and at each floor.
4. Upper attachments to structures shall have an allowable load not exceeding ¼ of the failure (proof test) load but are not limited to the specific methods indicated.
5. Install concrete insert prior to placing concrete.
6. Install powder actuated concrete fasteners after concrete is placed and completely cured.

Connections

1. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards".
2. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards".
3. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards".

Ductwork Accessories:

1. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
2. Install turning vanes in square or rectangular 90 degree elbows in supply and exhaust air systems, and elsewhere as indicated.
3. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

Air Outlet and Inlets:

1. Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
2. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

Locate registers, and grilles as indicated on Plans.

8-26.3(5) PROCEDURES FOR AIR SYSTEM BALANCING

The Contractor shall balance the HVAC system. Prior to operating the system, the Contractor shall submit an Air System Balance Test Procedure including measurements to be recorded, instruments to be used, etc. to the Engineer for approval.

Record and Report Data

NOT FOR CONSTRUCTION

1. Record all data obtained during testing, adjusting, and balancing in accordance with the approved test procedure.
2. The Contractor shall prepare a report detailing the data measured during the Air System Balance Test and submit to the Engineer for approval.

8-26.4 MEASUREMENT

Control Bascule HVAC contains the following approximate quantities of material:

Item	Approximate Quantity
XXXXXXXXXXXX	XXXX

The quantities are listed for the convenience of the Contractor in determining the work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than approved changes will be made in the lump sum contract price for the Control Bascule HVAC System even though the actual quantities required may deviate from those listed.

8-26.5 PAYMENT

Payment for "Control Bascule HVAC" items described in the Measurement Paragraph herein, as well as "Control Bascule Plumbing" items described in the Measurement Paragraph of Section 7-21 the will be made in accordance with Section 1-04.1, for the following:

"Control Bascule Plumbing and HVAC", per lump sum.

The lump sum Contract price for "Control Bascule Plumbing and HVAC" shall be full pay for all costs in furnishing installing items as shown and noted in the Plans and as outlined in these specifications and in the Standard Specifications.

Add the following new Section:

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8-30 PEDESTRIAN RAILING

8-30.1 DESCRIPTION

This work consists of fabricating temporary railing replacement panels, salvaging historic metal railing panels from existing South Park Bridge, installing temporary railing replacement panels on the existing South Park Bridge, transporting salvaged historic railing panels to the fabricator, installing pedestrian railing and gear support anchorages, installing a County-provided pedestrian railing system, installing mockup gears, salvaging gears from existing South Park Bridge, transporting salvaged gears to the fabricator, removing mockup gears from the pedestrian railing system, and installing modified gears.

The pedestrian railing system shall be provided by the County and shall include the pedestrian railing on the outboard edges of the sidewalks and its associated mockup gears, gears and gear support pipes. It also shall include the handrail surrounding the cantilevered observation decks of the control towers. The Contractor shall coordinate delivery of material to and from the County-provided fabricator with the Engineer.

8-30.2 MATERIALS

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The pedestrian railing system and all connection hardware except the anchor bolt assemblies and associated hardware will be provided by others and delivered to the construction site. The pedestrian railing system fabricator will be a third party referred to as the Pedestrian Railing Contractor (PRC). The PRC will be located within 20 miles of the Project Site.

Materials shall meet the requirements of the following sections:

Structural Steel and Related Materials 9-06

Galvanizing of non-stainless steel fasteners shall be in conformance with AASHTO M 232 (ASTM A153). Zinc coating mechanically deposited in accordance with AASHTO M 298 will not be allowed as an alternate.

8-30.3 CONSTRUCTION REQUIREMENTS

Work item includes the following general aspects of construction:

1. Fabricating temporary pedestrian railing replacement panels,
2. Salvaging historic pedestrian railing panels, and installing temporary pedestrian railing panels,
3. Transporting salvaged historic railing panels to the PRC,
4. Installing embedded pedestrian and gear support anchorages in the bridge and approaches,
5. Installing the pedestrian railing system delivered by the PRC,
6. Salvaging existing gears,
7. Transporting salvaged existing gears to the PRC,
8. Removing mockup gears and installing modified gears delivered by the PRC

Include the pedestrian railing system delivery and pedestrian railing system installation in the Baseline Project Schedule and update those activities as the project progresses.

8-30.3(1) HISTORIC RAILING PANELS

The Contractor shall fabricate ninety-six (96) temporary pedestrian railing replacement panels and associated connection hardware including pipe clamps as described in the Contract Plans. Simultaneously remove ninety-six (96) existing historic pedestrian railing panels from the bascule span of the existing bridge and replace them with the temporary pedestrian railing replacement panels one panel at a time. Provide requisite closure of the sidewalk to the public and traffic control during removal and installation of the railing panels.

Salvage four (4) of the nominal 1’-5” historic railing panels and sixty-six (66) of the nominal 3’-3” historic railing panels. The remaining twenty-six (26) historic railing panels shall become the property of the Contractor and removed from the Project Site. Transport salvaged historic railing panels to the PRC. The PRC will be responsible for unloading the salvaged historic railing panels at the PRC shop.

8-30.3(2) INSTALL EMBEDDED ANCHORAGES

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The Contractor shall provide the anchor bolt assemblies defined as the anchor bolts, nuts, washers, beveled washers, couplers, all-thread rods, and anchor plates that are for the purpose of anchoring the railing to concrete. The Contractor shall also install the concrete embedded anchorages, each consisting of multiple anchor bolts or anchor rods, for the pedestrian railing and gear supports. The PRC will provide shop drawings identifying the location of each anchorage by three dimensional coordinate system and station, offset and elevation. Place the anchorages at the required locations within 1/16 inch accuracy such that the pedestrian railing, gear supports and gear can be installed without interference modifications. Anchor bolts shall be positioned with a template to ensure that bolts match the hole spacing of the pedestrian railings and gear support base plates. Accurately position and restrain the anchor bolts during placement and curing of the concrete. Bolts will be perpendicular to the profile grade.

8-30.3(5) INSTALL PEDESTRAIN RAILING, GEAR SUPPORTS AND MOCKUP GEARS

The Contractor shall inform the Engineer in writing 28 calendar days prior to intended start of the pedestrian railing system installation. Coordinate the delivery of the pedestrian railing system with the Engineer such that the railing sections can be unloaded and installed without need for extraneous on-site handling and storage. The PRC will deliver the pedestrian railings system to the site in sections as prescribed by the Contractor to allow unloading the railing sections on the bridge at the approximate location of installation points. The Contractor shall be responsible for offloading, handling, storing, protecting, and installing the pedestrian railing.

Upon delivery of the pedestrian railing to the site, the Contractor shall inspect the pedestrian railing system in the presence of the Engineer. Verbally inform the Engineer of any apparent defects in the finish and/or fit up of railing system during the inspection. Photographically document apparent defects and report them to the Engineer in writing within 24 hours of delivery. Once the Contractor is in possession of the pedestrian railing, the Contractor shall assume responsibility for condition of the pedestrian railing until it is installed and accepted by the Engineer. Damage to the pedestrian railing shall be repaired or replaced at the Contractor's expense at the sole discretion of the Engineer.

Provide erection plan and procedures to the Engineer in accordance with 6-03.3(7). Install the pedestrian railing system in accordance with the approved erection plan and Contract Documents. The Contractor shall not modify the pedestrian railing system without written approval from the Engineer.

The pedestrian railing system shall be installed true to line and grade (or camber). After first setting the railing, the Contractor shall readjust all or part of it, if necessary, to create an overall line and grade pleasing to the eye at the sole discretion of the Engineer.

8-30.3(6) SALVAGE GEARS

The Contractor shall salvage forty-one (41) Plans-specified gears from the existing bridge and transport them to the PRC shop for modification and incorporation into the pedestrian railing system. The PRC will be responsible for unloading the gears at the PRC's shop.

8-30.3(7) INSTALL MODIFIED GEARS

Once the PRC has modified the salvaged gears and attached supports as applicable, the Contractor shall install them.

NOT FOR CONSTRUCTION

The Engineer will inform the Contractor no later than 28 calendar days prior to the intended availability of the modified gears for installation. The Contractor shall install the modified gears within 28 calendar days of the availability of the gears. Coordinate the delivery of the modified gears with the Engineer such that the gears can be unloaded and installed without need for extraneous on-site handling and storage. The PRC will deliver the gears to the site as prescribed by the Contractor to allow unloading the gears on the bridge at the approximate location of installation points. The Contractor shall be responsible for offloading, handling, storing, protecting, and installing the gears.

Upon delivery of the gears to the site, the Contractor shall inspect the gears in the presence of the Engineer. Verbally inform the Engineer of any apparent defects in the finish during the inspection. Photographically document apparent defects and report them to the Engineer in writing within 24 hours of delivery. Once the Contractor is in possession of the gears, the Contractor shall assume responsibility for condition of the gears until they are installed and accepted by the Engineer. Damage to the gears shall be repaired or replaced at the Contractor's expense at the sole discretion of the Engineer.

Provide erection plan and procedures to the Engineer in accordance with 6-03.3(7). Install the gears in accordance with the approved erection plan and Contract Documents. The Contractor shall not modify the gears without written approval from the Engineer.

Simultaneously remove the mockup gears from the bridge and replace them with the modified gears one gear at a time. Provide requisite closure of the sidewalk to the public and traffic control during removal of the mockup gears and installation of the modified gears.

The gears shall be installed true to line and grade (or camber). After first setting the gears, the Contractor shall readjust all or part of the pedestrian railing system, the gear supports or the gears, if necessary, to create an overall line and grade pleasing to the eye at the sole discretion of the Engineer. The Contractor is responsible for the disposal of the mockup gears and any associated supports.

8-30.4 MEASUREMENT

Measurement of "Pedestrian Railing" will not be measured but will be paid for on a lump sum basis as described in 8-30.5. "Pedestrian Railing" contains the following approximate quantities of materials and work:

Item	Quantity	Unit
Fabricate and Install Temporary Railing Replacement Panels	96	Each
Salvage Historic Railing Panels	70	Each
Furnish and Install Railing Anchorages	330	Each
Furnish and Install Gear Support Anchorages	23	Each
Furnish and Install Control Tower Railing Anchorages	24	Each
Install Mockup Gears (with and without Supports)	41	Each
Pedestrian Railing (Bridge) Installation	2,990	LF
Pedestrian Railing (Control Tower) Installation	205	LF
Salvage Existing Gears	41	Each
Install Modified Gears (with and without Supports)	41	Each

The quantities are listed only for the convenience of the Contractor in determining the volume of work involved and are not guaranteed to be accurate. No adjustments other than for approved changes will be made in the lump sum contract price for Installation of Art Elements.

NOT FOR CONSTRUCTION

8-30.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following "Pedestrian Railing", lump sum.

The lump sum Contract price for "Pedestrian Railing" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for salvage, manufacture, fabrication, transportation, coordination, storage, erection, installation, traffic control, and including the providing of items shown on the plans and described herein.

Add the following new section

(*****)

8-31 PLANTABLE PAVING

8-31.1 DESCRIPTION

This work consists of installing plantable paving, including base course, according to the manufacturers written recommendations and these specifications, in the locations shown in the Plans. Topsoil and plants shall be paid for as separate items.

8-31.2 MATERIALS

Materials shall meet the requirements of the following sections:

Gravel Base: 4-2

Plantable Paving Product per the following:

1. Invisible Structures Grass Paving 2; Contact: Invisible Structures, Inc., Golden, CO; 1-800-233-1510; www.invisiblestructures.com.
2. Approved equal.

The Contractor shall be responsible for providing the plantable paving product and base material, and all other materials necessary for the complete installation of the product. The Contractor shall be responsible for ensuring that all materials are protected from damage during offloading, handling, storing, protecting, and installation of the plantable paving product.

8-31.3 CONSTRUCTION REQUIREMENTS

The Contractor shall inform the Engineer in writing 10 calendar days prior to the intended installation of Plantable Paving. Installation of the base course shall be complete and approved prior to the installation of the paving product.

Work items include the following:

1. Install gravel base course ensuring that sub-base is adequate with proper compaction, and soil porosity and gradient will provide adequate subsurface drainage; leave one (1) inch depth below final grade for plantable paving unit and topsoil;
2. Clean surfaces of paving product thoroughly prior to installation;
3. Install paving product by placing rings facing up, using the snap fit system provided along each edge to maintain proper spacing and interlock the units,

NOT FOR CONSTRUCTION

place tops of rings flush or slightly below the surface of adjacent hard-surfaced pavements;

4. Anchor units to the base course, using anchors specified by manufacturer in locations necessary to prevent movement by traffic.

Include the Plantable Paving installation in the Baseline Project Schedule and update those activities as the project progresses.

8-31.4 MEASUREMENT

Measurement of Plantable Paving will be paid for per square foot to include all work items as described in 8-31.3 and 8-31.5.

8-31.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following item:
"Plantable Paving", per square foot.

The unit Contract price for "Plantable Paving" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the base course preparation and installation of paving product, and traffic control, including all other items necessary for the work whether or not such work is shown or specified.

Add the following new Section

(*****)

8-32 GEAR BOX ASSEMBLY

8-32.1 DESCRIPTION

This work consists of removing, salvaging, cleaning and painting one (1) complete gear/shaft/frame set; fabricating and attaching steel tubes for supporting the salvaged gear/shaft/frame set; and construction of concrete walls and footings for displaying the salvaged gear/shaft/frame set in the location shown in the Plans.

8-32.2 MATERIALS

Materials shall meet the requirements of the following sections:

Concrete for walls and footings:	6-02
Steel tubes and plates:	9-06
Paint:	6-07.3(4)

The Contractor shall be responsible for providing forms, reinforcement and concrete for walls and footings; steel tubing, plates and hardware for the support system; paint as specified; and all other materials as required to install one (1) complete Gear Box Assembly as described and specified. The Contractor shall be responsible for ensuring that all materials are protected against damage during offloading, handling, storing, and installation of the Gear Box Assembly.

8-32.3 CONSTRUCTION REQUIREMENTS

The Contractor shall inform the Engineer in writing 10 calendar days prior to the intended installation of the gear/shaft/frame set in place. Concrete work shall be complete and approved prior to the delivery of the prepared gear/shaft/frame set ready for installation;

NOT FOR CONSTRUCTION

delivery shall be coordinated with the Engineer such that the gear/shaft/frame set can be unloaded and installed without need for extraneous on-site handling and storage.

Work items include the following:

1. Field measure one (1) existing gear/shaft/frame set to be salvaged and re-used for purposes of developing shop plans . The Contractor shall conduct field measurements in the presence of the Engineer;
2. Salvage one (1) complete, historic gear/shaft/frame set intact as shown in the Salvage Plans and transport the intact, salvaged set to a secure, approved location;
3. Provide shop plans for installing the gear/shaft/frame set in concrete;
4. Clean the complete, historic gear/shaft/frame set in accordance with Section 6-07.3(10)E
5. Procure supplies for and fabricate the steel tube supports, including steel plates and hardware as shown in the Architectural Site Detail Plans;
6. Prepare fabricated steel for painting in accordance with Section 6-07.3(9)F
7. Paint components in accordance with Section 6-07.3(9) and Section 6-07.3(10)H, as appropriate;
8. Construct concrete walls and footings with steel tube posts for supporting and displaying the historic gear/shaft/frame set intact as shown in the Architectural Site Detail Plans;
9. Transport the intact, components back to the Site for installation.
10. Install one (1) completed Gear Box Assembly in place.

Fabrication of the Gear Box Assembly shall be in accordance with approved Shop Drawings, subject to the Plans and the following:

a. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
b. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Continuously weld joints and seams; grind, fill and dress welds to produce smooth, flush surfaces without distortion or discoloration, and welds invisible after final finishing. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
c. Fabricate steel tube post to length required to allow for embedded depth in concrete footing.

Include the Gear Box Assembly installation in the Baseline Project Schedule and update those activities as the project progresses.

8-32.4 MEASUREMENT

Measurement of Gear Box Assembly will not be measured but will be paid for on a lump sum basis to include all work items as described in 8-32.3 and 8-32.5.

8-32.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following item:
"Gear Box Assembly", per lump sum.

NOT FOR CONSTRUCTION

The lump sum Contract price for "Gear Box Assembly" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the removal, cleaning, transportation, storage, fabrication, installation, traffic control, and painting, including all other items necessary for the work whether or not such work is shown or specified.

Add the following new Section

(*****)

8-33 PEDESTRIAN LANDING

8-33.1 DESCRIPTION

This work consists of removing, salvaging and cleaning existing bascule roadway steel grating; fabricating the grating to the sizes required for constructing four (4) pedestrian landings in the sizes and locations shown in the Plans; installing concrete footings with steel components for support; preparing the base for each landing; and installing concrete fill within the grate material in the locations shown in the Plans.

8-33.2 MATERIALS

Materials shall meet the requirements of the following sections:

Structural Steel	9-06
Concrete for Footings and Steel Grate Fill-in	6-02
Salvaged Steel Grating	

The Contractor shall be responsible for providing base material under the landings; concrete for footings and all steel components for support; salvaged quantities; and all other materials as required to install four (4) Pedestrian Landings as described and specified. The Contractor shall be responsible for ensuring that all materials are protected during removal, handling, storing, protecting, and installing the completed Pedestrian Landings.

8-33.3 CONSTRUCTION REQUIREMENTS

The Contractor shall inform the Engineer in writing 10 calendar days prior to the intended installation of each Pedestrian Landing. Subgrade and footings with support systems shall be complete and approved prior to the delivery of the prepared grating for installation; delivery shall be coordinated with the Engineer such that the grating can be unloaded and installed without need for extraneous on-site handling and storage.

Work items include the following:

1. Field measuring and determining the locations and amount of existing grating needed to be salvaged for constructing the pedestrian landings and for purposes of developing shop drawings. The Contractor shall locate and conduct field measurements in the presence of the Engineer;
2. Salvaging roadway steel grating as shown in the Salvage Plans and transporting the grating to a secure, approved location;
3. Providing shop plans for constructing the four (4) pedestrian landings as shown in the Pedestrian Landing Details;
4. Cleaning grating in accordance with Section 6-07.3(10)E;

NOT FOR CONSTRUCTION

5. Sizing and cutting the grating to sizes necessary to construct the Landings as shown in the Plans;
6. Procuring supplies for and fabricating all steel components shown in the Pedestrian Landing Details;
7. Constructing concrete footings with steel tube posts for supporting the Pedestrian Landings as shown in the Pedestrian Landing Details;
8. Transporting the cleaned and properly sized grating back to the Site for installation.
9. Installing four (4) completed Pedestrian Landings in place.

Fabrication of the steel grating to the sizes as shown on the Plans shall be in accordance with approved Shop Plans and the following:

1. Construct square-cornered grates with closely fitted joints, and that will remain flat under installed conditions.
2. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Clean exposed welded surfaces of welding flux and smooth exposed and contact surfaces.
3. Grind all welds and cuts smooth.

Include the Pedestrian Landings installation in the Baseline Project Schedule and update those activities as the project progresses.

8-33.4 MEASUREMENT

Measurement of Pedestrian Landings will not be measured but will be paid for on a lump sum per each basis to include all work items as described in 8-33.3 and 8-33.5.

8-33.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following items:

"Pedestrian Landing 1", per lump sum.
"Pedestrian Landing 2", per lump sum.
"Pedestrian Landing 3", per lump sum.
"Pedestrian Landing 4", per lump sum.

The lump sum Contract price for "Pedestrian Landing 1", Pedestrian Landing 2", Pedestrian Landing 3", and Pedestrian Landing 4" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the removal, cleaning, transportation, storage, fabrication, installation, and traffic control, including all other items necessary for the work whether or not such work is shown or specified.

Add the following new Section

(*****)

8-34 PEDESTRIAN LANDING RAILING

8-34.1 DESCRIPTION

This work consists of removing, salvaging and cleaning existing bridge trusses; fabricating pedestrian railing using the salvaged trusses; and installing the railing at the four (4) pedestrian landings where shown in the Plans.

NOT FOR CONSTRUCTION

8-34.2 MATERIALS

Materials shall meet the requirements of the following sections:

Paint: 6-07.3(4)

The Contractor shall be responsible for all salvaged material quantities and other materials as required to fabricate and install Pedestrian Landing Railing as described and specified. The Contractor shall be responsible for ensuring that all materials are protected from damage during removal, handling, storage, and installation.

8-34.3 CONSTRUCTION REQUIREMENTS

The Contractor shall inform the Engineer in writing 10 calendar days prior to the intended installation of each Pedestrian Landing Railing.

Work items include the following:

1. Field measuring and determining the locations and amount of existing bridge trusses needed to be salvaged for constructing the pedestrian landing railings and for purposes of developing shop drawings. The Contractor shall locate and conduct field measurements in the presence of the Engineer;
2. Salvaging bridge trusses as shown in the Salvage Plans and transporting the trusses to a secure, approved location;
3. Provide shop plans for fabricating pedestrian landing railing as shown in the Pedestrian Railing Landing Details ;
4. Clean the salvaged trusses in accordance with Section 6-07.3(10)E
5. Fabricating the railing using the steel components and salvaged trusses as shown in the Pedestrian Landing Railing Details;
6. Transporting the fabricated railing back to the Site for installation;
7. Installing Pedestrian Landing Railing in place.

Fabrication of the pedestrian landing railing shall be in accordance with approved ShopPlans, subject to the Plans and the following:

1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
2. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Continuously weld joints and seams; grind, fill and dress welds to produce smooth, flush surfaces without distortion or discoloration, and welds invisible after final finishing. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
3. Conceal fasteners if possible otherwise, locate where they will be the most inconspicuous.
4. Fabricate post to length required to allow for embedded depth in concrete footing and in location where extended post is required for Interpretive Sign Panel installation.

Include the Pedestrian Landing Railing installation in the Baseline Project Schedule and update those activities as the project progresses.

NOT FOR CONSTRUCTION

8-34.4 MEASUREMENT

Measurement of Pedestrian Landing Railing will be paid for per linear foot to include all work items as described in 8-34.3 and 8-34.5.

8-34.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following item:
"Pedestrian Landing Railing", per linear foot.

The linear foot Contract price for "Pedestrian Landing Railing" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the removal, cleaning, transportation, storage, fabrication, installation, and traffic control, including all other items necessary for the work whether or not such work is shown or specified.

Add the following new Section

(*****)

8-35 LIGHT POLE AND BALUSTRADE

8-35.1 DESCRIPTION

This work consists of saw-cutting, removing, salvaging and cleaning sections of existing balustrade with light pole; installing concrete foundation; transporting and installing sections of light pole and balustrade; and installing new light fixture and electrical wiring.

8-35.2 MATERIALS

Materials shall meet the requirements of the following sections:

Concrete for foundation	6-02

The Contractor shall be responsible for providing light fixtures, wiring, and reinforced concrete for the foundation; and all other materials as required to install the Light Pole and Balustrade as described and specified. The Contractor shall be responsible for ensuring that all materials are protected against damage during removal, handling, storing, and installation.

8-35.3 CONSTRUCTION REQUIREMENTS

The Contractor shall inform the Engineer in writing 10 calendar days prior to the intended installation of Light Pole and Balustrade for each of the Light Pole and Balustrade sections. Installation shall be coordinated with the Engineer such that the sections can be unloaded and installed without need for extraneous on-site handling and storage.

Work items include the following:

1. Field measuring the existing light pole and balustrades and determining the locations of sections to be salvaged for purposes of developing shop drawings. The Contractor shall locate and conduct field measurements in the presence of the Engineer;

NOT FOR CONSTRUCTION

2. Salvaging light pole and balustrade sections as shown in the Salvage Plans and transporting the light pole and balustrade sections to a secure, approved location;
3. Provide shop plans for installing new light fixtures and wiring as shown in the Balustrade Light Details;
4. Clean the salvaged light pole and balustrade sections in accordance with Section 6-07.3(10)E;
5. Fabricating concrete base for new light fixture;
6. Installing new light fixtures and wiring;
7. Transporting the completed light pole and balustrade sections back to the Site for installation;
8. Installing Light Pole and Balustrade sections in place.

Fabrication and installation of the concrete base for the new light fixture shall be in accordance with approved ShopPlans, subject to the Plans and the following:

1. XXX
2. XXX

Include the Light Pole and Balustrade installation in the Baseline Project Schedule and update those activities as the project progresses.

8-35.4 MEASUREMENT

Measurement of Light Pole and Balustrade will be paid for per each 9'-6" section to include all work items as described in 8-35.3 and 8-35.5.

8-35.4 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following item:
"Light Pole and Balustrade", per each.

The unit Contract price for "Light Pole and Balustrade" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the removal, cleaning, transportation, storage, fabrication, installation, and traffic control, including all other items necessary for the work whether or not such work is shown or specified.

Add the following new Section

(*****)

8-36 RAIL POST BOLLARDS

8-36.1 DESCRIPTION

This work consists of removal, salvage and cleaning of existing bridge rail posts; and fabrication and installation of Removable and Fixed Rail Post Bollards using the salvaged bridge rail posts.

8-36.2 MATERIALS

The Contractor shall be responsible for providing concrete for footing with tubular steel sleeving, and all other materials necessary for the fabrication and installation of the Rail

NOT FOR CONSTRUCTION

Post Bollards. The Contractor shall be responsible for ensuring that all materials are protected from damage during offloading, handling, storing, protecting, and installation of the bollards.

Concrete for Footing:	6-02
Steel panels, sleeves and other components	9-06
Grout:	6-02.3(20)
Paint:	6-07.3(4)

8-36.3 CONSTRUCTION REQUIREMENTS

The Contractor shall inform the Engineer in writing 10 calendar days prior to the intended installation of Rail Post Bollards. Footings with sleeving and fabrication of the Rail Posts shall be complete and approved prior to the delivery for bollard installation; delivery shall be coordinated with the Engineer such that the bollards can be unloaded and installed without need for extraneous on-site handling and storage.

Work items include the following:

1. Field measuring the existing rail posts and determining the locations of posts to be salvaged for purposes of developing shop drawings. The Contractor shall locate and conduct field measurements in the presence of the Engineer;
2. Salvaging rail posts as shown in the Salvage Plans;
3. Transporting the posts to a secure, approved location;
4. Provide shop plans for fabricating and installing Rail Post Bollards as shown in the Architectural Site Detail Plans;
5. Clean and painting the salvaged rail posts in accordance with Section 6-07.3(9) and Section 6-07.3(10)H, as appropriate;
6. Transporting the fabricated Rail Post Bollards back to the Site for installation;
7. Installing Rail Post Bollards in place.

Fabrication of the bollard is based on Shop Plans, subject to the Architectural Site Detail Plans and the following:

1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Continuously weld joints and seams; grind, fill and dress welds to produce smooth, flush surfaces without distortion or discoloration, and welds invisible after final finishing. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
2. Fabricate bollard from salvaged bridge rail post to length required to allow for embedded depth in footing.

Include the Rail Post Bollard installation in the Baseline Project Schedule and update those activities as the project progresses.

8-36.4 MEASUREMENT

Measurement of Rail Post Bollard will be paid for per each to include all work items as described in 8-36.3 and 8-36.5.

NOT FOR CONSTRUCTION

8-36.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following items:
"Rail Post Bollard Fixed", per each.
"Rail Post Bollard Removable", per each.

The unit Contract price for "Rail Post Bollard Fixed" and "Rail Post Bollard Removable" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the removal, cleaning, painting, transportation, storage, fabrication, installation, and traffic control, including all other items necessary for the work whether or not such work is shown or specified.

Add the following new Section

(*****)

8-37 BRICK PAVING

8-37.1 DESCRIPTION

This work consists of removing, salvaging, cleaning, and storing all of the existing historic brick within the Project Site, and reinstalling clean, salvaged brick for pedestrian and roadway paving.

8-37.2 MATERIALS

The Contractor shall be responsible for providing all base material, salvaged brick and grout filler for installing the brick paving as shown in the Architectural Site Detail Plans. The Contractor shall be responsible for ensuring that all materials are protected from damage during handling, storage and installation of the brick paving.

Crushed Rock shall be Base Course as specified in Section 9-03.9(3).

Concrete Base Material shall be class 3000 in accordance with the requirements of Section 6-02.

Sand Cement Cushion shall be one (1) part Portland cement (as specified in Section 9-01) and five (5) parts clean, dry, course screened sand.

Grout Filler shall be one (1) part Portland cement and one and one half (1-1/2) parts clean, fine sand.

8-37.3 CONSTRUCTION REQUIREMENTS

The Contractor shall inform the Engineer in writing 10 calendar days prior to the intended installation of Brick Paving.

Work items include the following:

1. Field measuring the existing brick paving to be salvaged. The Contractor shall conduct field measurements in the presence of the Engineer;
2. Salvaging existing brick paving as shown in the Salvage Plans;
3. Transporting, if necessary, the bricks to a secure, approved location. The Contractor may store the bricks on site;
4. Thorough cleaning, prior to installation, by pressure washing or other methods to remove all existing mortar;

NOT FOR CONSTRUCTION

5. Transporting the bricks, if necessary, back to the Site for installation. Bricks used for relocation shall be free of defects including cracks, chips and/or breaks;
6. Installing Brick Paving for Walkway and Roadway, including crushed rock, concrete base, sand cement, and grout filler. Sand cement shall be mixed and placed dry, then spread evenly upon the concrete base to a uniform depth of one (1) inch. Bricks shall be placed and watered, and joints filled with grout filler. Expansion joints shall be constructed around or along all concrete castings within brick paved areas.
7. Properly discard and dispose of bricks identified with defects; remaining bricks in good condition shall become the property of King County.

Include the Brick Paving for Walkway and Brick Paving for Roadway installation in the Baseline Project Schedule and update those activities as the project progresses.

8-37.4 MEASUREMENT

Measurement of Brick Paving for Walkway and Brick Paving for Roadway will be paid for per square foot to include all work items as described in 8-37.3 and 8-37.5.

8-37.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following item:
"Brick Paving for Walkway", per square foot.
"Brick Paving for Roadway", per square foot.

The unit Contract price for "Brick Paving for Walkway" and "Brick Paving for Roadway" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the removal, cleaning, transportation, storage, installation, and traffic control, including all other items necessary for the work whether or not such work is shown or specified.

Add the following new Section:

(*****)

8-38 INTERPRETIVE SIGNS

8-38.1 DESCRIPTION

8-38.1(1) INTERPRETIVE SIGN PANEL ON POST

This work consists of fabricating non-illuminated, hollow box-type post and interpretive sign panel, and installing in pavement.

8-38.1(2) INTERPRETIVE SIGN PANEL ON RAILING

This work consists of fabricating non-illuminated interpretive sign panels only, and installing on the pedestrian landing railing. Pedestrian landing railing and railing extension for panel is paid for as a separate item.

8-38.2 MATERIALS

Materials shall meet the requirements of the following:

NOT FOR CONSTRUCTION

Concrete for Footing:	Section 6-02
Grout:	Section 6-02.3(20).
Paint for steel components:	Section 6-07.3(4)
Steel components:	Section 9-06

Sign panel shall be porcelain enamel, fired at temperatures above 1400 degrees Fahrenheit, and in compliance with the porcelain enamel industry specifications.

Steel tubing for post shall be cold-formed steel tubing complying with ASTM A 500, Grade B, size as shown in Plans.

Aluminum Extrusions for Panel Frames shall be ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish specified, and with at least the minimum strength and durability properties of alloy 6063-T5.

Fasteners shall be concealed fasteners fabricated from metals that are non-corrosive to sign material and mounting surface.

Pipe Sleeve shall be Schedule 40 Polyvinylchloride, sized as shown in Plans.

8-38.3 CONSTRUCTION REQUIREMENTS

The Contractor shall inform the Engineer in writing 10 calendar days prior to the intended installation of Interpretive Sign Panels.

Work items include the following:

1. Provide shop plans for approval for fabricating and installing Interpretive Sign Panel on Post and Interpretive Sign Panels on Railing.
2. Fabricate post and sign panels as specified and approved.
3. Painting posts and sign panels in accordance with Section 6-07.
4. Transport all materials to the Site for installation;
5. Prepare hole for concrete footing in firm, compacted soil;
6. Install Class 3000 concrete footing with sleeve while centering, aligning and grouting the post inside the sleeve. Vibrate or tamp concrete for consolidation while protecting the portion of the post above ground from concrete splatter. Check post for alignment and hold in position until concrete has achieved initial set.
7. Submit sign panel with surfaces free from distortion or other defects in appearance, for Engineer's visual inspection and approval.
8. Mount approved sign panel at the angle and height specified in the Plans.
9. At completion of installation, clean soiled surfaces of sign units according to manufacturer's written instructions, and provide such instructions to Engineer.

Include the Interpretive Sign installation in the Baseline Project Schedule and update those activities as the project progresses.

8-38.3(1) PERFORMANCE REQUIREMENTS

Structural Performance

Provide post and panel signs capable of withstanding wind loads based on a uniform pressure of 100 MPH, acting in any direction.

Thermal Movements

NOT FOR CONSTRUCTION

Provide post and panel signs that allow for thermal movements within a maximum range in ambient and surface temperatures of 120 deg F ambient, and 180 deg F material surfaces, without buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

8-38.3(2) FABRICATION

Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.

Welded Connections: Comply with AWS standards for recommended practices in shop welding. Continuously weld joints and seams; grind, fill and dress welds to produce smooth, flush surfaces without distortion or discoloration, and welds invisible after final finishing. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.

Construct square-cornered sign panels and frames with closely fitted joints, and that will remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner; increase metal thickness or reinforce with concealed stiffeners or backing materials as needed to produce surfaces without distortion, buckles, warp, or other surface deformations. Panel frame shall have integral, removable top edge to receive sign graphics. Preassemble sign panels in the shop to greatest extent possible.

Conceal fasteners if possible otherwise, locate where they will be the most inconspicuous.

Fabricate post to length required to allow for embedded depth in concrete footing.

8-38.4 MEASUREMENT

Measurement of Interpretive Sign Panel on Post will be paid for per each to include all work items as described in 8-30.3 and 8-30.5.

Measurement of Interpretive Sign Panel on Railing will be paid for per each to include all work items as described for Panels only in 8-30.3, and 8-30.5.

8-38.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following items:

"Interpretive Sign Panel on Post", per each.

"Interpretive Sign Panel on Railing", per each.

The unit Contract price for "Interpretive Sign Panel on Post" and "Interpretive Sign Panel on Railing" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the fabrication, painting, transportation, and installation, including all other items necessary for the work whether or not such work is shown or specified.

Add the following new Section

(*****)

8-39 TREE GRATE

8-39.1 DESCRIPTION

This work consists of furnishing and installing tree grates and frames.

NOT FOR CONSTRUCTION

8-39.2 MATERIALS

The Contractor shall be responsible for furnishing tree grate, frame and all hardware necessary for the complete installation as shown on the Architectural Site Detail Plans and according to the following manufacturer's specifications:

1. Iron Age Grates, Model: Oblio Treegrate 5' Sq. with Type "E" Treegrate Frame, recycled cast iron product, raw finish. Available through Play Creation. Contact: John Mullan at (206) 932-6366, or *info@playcreation.com*.
2. Approved equal

Ensure that components are protected against damage during delivery, storage, and handling, including tree grates, frames and hardware.

8-39.3 CONSTRUCTION REQUIREMENTS

The Contractor shall inform the Engineer in writing 10 calendar days prior to the intended installation of Tree Grates.

Work items include the following:

1. Obtain Tree Grate and Frame, including hardware;
2. Install hardware for Frame in adjacent concrete pavement as shown in the Architectural Site Detail Plans;
3. Install Tree Grate and Frame.

Include the Tree Grate installation in the Baseline Project Schedule and update those activities as the project progresses.

8-39.4 MEASUREMENT

Measurement of Tree Grate will be paid for per each to include treegrate, treegrate frame, and hardware, and all work items as described in 8-39.3 and 8-39.5.

8-39.6 PAYM ENT

Payment will be made in accordance with Section 1-04.1, for the following item:
"Tree Grate", per each.

The unit Contract price for "Tree Grate" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the installation, including traffic control and all other items necessary for the work whether or not such work is shown or specified.

Add the following new Section

(*****)

8-40 SALVAGE CONTROL CONSOLE

8-40.1 DESCRIPTION

NOT FOR CONSTRUCTION

This work consists of removing, salvaging, and delivering one complete, intact Control Console.

8-40.2 MATERIALS

No specific materials are required for this work other than the equipment necessary for the removal and delivery of the salvaged item. The Contractor shall be responsible for handling, removing and delivering the Control Console to King County, ensuring all components are protected against damage during both removal and delivery.

8-40.3 CONSTRUCTION REQUIREMENTS

The Contractor shall inform the Engineer in writing 10 calendar days prior to the intended removal of the Control Console.

Work items include the following:

1. Select, in the presence of the Engineer, one (1) existing Control Console to be salvaged;
2. Provide written description of process and timing for complete removal and delivery of the Control Console;
3. Transport the salvaged Control Console to King County within a twenty (20) mile radius as directed by the Engineer; the Contractor shall be responsible for coordinating the delivery location and timing.

Include the Control Console salvage in the Baseline Project Schedule and update those activities as the project progresses.

8-40.5 MEASUREMENT

Measurement of Salvage Control Console will be paid for per lump sum to include all work items as described in 8-40.3 and 8-40.5.

8-40.6 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following item:
"Salvage Control Console", per lump sum.
The unit Contract price for "Salvage Control Console" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the removal and delivery to King County, including traffic control and all other items necessary for the work whether or not such work is shown or specified.

Add the following new Section

(*****)

8-41 TREE WATERING SYSTEM

8-41.1 DESCRIPTION

This work consists of installing a time release watering tube and insert for trees, according to the manufacturers written recommendations and these specifications, and as shown in the Plans.

NOT FOR CONSTRUCTION

8-41.2 MATERIALS

Materials shall meet the requirements of the following:

3. Dri-WATER tube and insert; as manufactured by DriWater, Inc., Santa Rosa, CA, 1-800-8458; www.driwater.com.
4. Approved equal.

The Contractor shall be responsible for providing the tree watering system and all other essential materials necessary for the complete installation of the product. The Contractor shall be responsible for ensuring that all materials are protected from damage during offloading, handling, storing, and installation of the tree watering system product.

8-41.3 CONSTRUCTION REQUIREMENTS

Work items include the following:

8. Install watering tube and insert as recommended by manufacturer at time of planting and at least one additional replacement at the beginning of the dry season, or as directed by the Engineer.
9. Place watering tubes with the bottom of the tube as close to the root zone as possible. Backfill with soil as specified. Cut off one end of the gel insert and place the open end down inside the tube. Gently squeeze the top of the insert until the content contacts soil. Place the cap on top of the tube and water the tree thoroughly until root ball is saturated.

8-41.4 MEASUREMENT

Measurement of Tree Watering System will be paid for per each to include all work items as described in 8-41.3 and 8-41.5.

8-41.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following item:
"Tree Watering System", per each.

The unit Contract price for "Tree Watering System" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the installation of the product, and traffic control, including all other items necessary for the work whether or not such work is shown or specified.

8-42 ROOT BARRIER

8-42.1 DESCRIPTION

This work consists of installing root barrier in accordance with the manufacturers written recommendations and these specifications, and as shown in the Plans.

8-42.2 MATERIALS

Materials shall meet the requirements of the following:

10. Tree Root Control Barrier, recyclable, high density polypropylene or polyethylene plastic with ultra-violet inhibitors and a mean thickness of 0.08",

NOT FOR CONSTRUCTION

as manufactured by Root Solutions, San Rafael, CA, 1-800-554-0914; www.vesproinc.com.

11. Approved equal.

The Contractor shall be responsible for providing the root barrier and all other materials necessary for the complete installation of the product. The Contractor shall be responsible for ensuring that all materials are protected from damage during offloading, handling, storing, and installation of the root barrier product.

8-42.3 CONSTRUCTION REQUIREMENTS

Work items include the following:

1. Install tree root control barrier as recommended by manufacturer before tree installation.
2. Root barrier shall be installed linearly along the adjacent paving edge, with panels firmly connected, and one-half (1/2) inch above the finish grade.

8-42.4 MEASUREMENT

Measurement of Root Barrier will be paid for per linear foot to include all work items as described in 8-42.3 and 8-42.5.

8-42.5 PAYMENT

Payment will be made in accordance with Section 1-04.1, for the following item:

"Root Barrier", per linear foot.

The unit Contract price for "Root Barrier" shall be full pay for all costs in connection with furnishing all materials, labor, tools, and equipment necessary for the installation of the product, and traffic control, including all other items necessary for the work whether or not such work is shown or specified.

NOT FOR CONSTRUCTION

DIVISION 9
MATERIALS

9-03 AGGREGATES

Section 9-03.2 is deleted and replaced with the following Sections:

(*****)

9-03.2 MINERAL AGGREGATES FOR BIORETENTION SOIL

9-03.2(1) GENERAL

Mineral Aggregate shall be free of wood, waste, coating, or any other deleterious material. All Mineral Aggregate passing the No. 200 sieve size shall be non-plastic.

9-03.2(2) MINERAL AGGREGATE FOR TURF AND LANDSCAPE BIORETENTION SOIL

Mineral Aggregate for turf and landscape bioretention soils shall be analyzed by an accredited lab using the sieve sizes noted below, and shall meet the following gradation:

Sieve Size	Percent Passing
1 inch	100
No. 4	60 - 100
No.10	40 - 100
No. 40	15 - 50
No. 200	2 - 5

Efforts should be made to have the Mineral Aggregate for turf and landscape bioretention soils meet the following gradation coefficients: Coefficient of Uniformity (Cu = D60/D10) equal to or greater than 6; and Coefficient of Curve (Cc = D302/D60D10) greater than or equal to 1 and less than or equal to 3.

9-03.8(2) HMA TEST REQUIREMENTS

Section is supplemented with the following:

(January 5, 2004)

ESAL'S

The number of ESAL's for the design and acceptance of the HMA shall be ***0.4 *** million.

9-03.11(2) STREAMBED COBBLES

Section is supplemented with the following:

(*****)

Streambed cobbles shall be indigenous rock from a regional source. Rock shall be Arctic Blend consisting of an equal mix of gray, brown and black colored rocks. Sizes shall range from 4” - 8” and shall consist of an equal mix of sizes. Total depth of cobbles shall be 12” unless otherwise noted in the Plans.

9-03.11(3) STREAMBED BOULDERS

NOT FOR CONSTRUCTION

Section is supplemented with the following:

(*****)

Boulders shall be indigenous rock from a regional source. Rock shall be a High Cascade Granite. Shape shall be natural occurring and sizes for the boulders placed in the planting areas are as shown in the Plans. Sizes of the boulders for the rockery shall be one-man rocks each 12 to 18 inches in average dimension. Rock for the rockery shall be as nearly rectangular as possible so as to afford the minimum amount of void space between the rocks. The rock material shall be hard, sound, durable, and free from weathered portions, seams, crack, and other defects.

Section 9-03.12(1)B is deleted and replaced with the following:

(*****)

9-03.12(1)B GRAVEL BACKFILL FOR FOUNDATIONS

Gravel backfill for foundations for drainage structures shall be Type 9 Mineral Aggregate With Portland Cement. See Section 7-05.3 Bedding and Foundation Support for Precast Base Section and Bedding and Foundation Support for Cast-in-Place Base Section.

Add the following new Section:

*(***COS* 9-03.12(3)*¶1***)*

9-03.12(3)A GRAVEL AND SAND BACKFILL FOR PIPE BEDDING

The Contract specified class of Sewer and Storm Drain pipe bedding shall comply with both COS Standard plan no. 285 and Section [COS 7-17.3(1)B], and shall be Mineral Aggregate Type 9 and Type 22 as specified below [in this Section and Section 9-03.16].

*(***COS 9-03.16 Line9***)*

Mineral Aggregate Type 9 (3/8" Washed Gravel)

Sieve Size	Percent Passing
3/4" square	100
3/8″ square	80-100
U.S. No. 8	0-10
U.S. No. 200	0-3

*(***COS 9-03.16 Line22***)*

Mineral Aggregate Type 22 (3/4" Crushed Gravel)

Sieve Size	Percent Passing
1/2" square	100
1/4″ square	70-100
U.S. No. 10	40-75
U.S. No. 200	2-12

*(***COS 9-03.16 Line26***)*

Mineral Aggregate Type 26 (3/4" Washed Gravel)

NOT FOR CONSTRUCTION

Sieve Size	Percent Passing
3/4" square	100
1/4″ square	30-60
U.S. No. 8	20-50
U.S. No. 50	3-12
U.S. No. 200	0-1

*(***COS 9-03.12(3)¶3,4***)*

Pea gravel bedding, Mineral Aggregate Type 9, shall consist of screened sand, gravel, or other inert Materials, or combinations thereof, from sources approved by the Engineer, and shall have hard, strong, durable particles free from adherent coatings. The Material shall be washed thoroughly to remove clay, loam, alkali, organic matter, or other deleterious substances. The amount of deleterious substances remaining in the washed pea gravel shall not exceed values specified in Section [COS 9-03.1(2)B].

Crushed gravel bedding, Mineral Aggregate Type 22 shall be manufactured from screened crushed gravel. The finished product shall be clean, uniform in quality, and free from wood, bark, roots, and other deleterious Materials. The crushed screenings shall be substantially free from adherent coatings. The presence of a thin, firmly adhering film of weathered rock shall not be considered as coating unless it exists on more than 50 percent of the surface area of any size between successive laboratory sieves. The portion of Mineral Aggregate Type 22 retained on all sieves with a 1/4 inch opening and larger shall not contain more than 0.1 percent deleterious Materials by weight.

Section 9-03.12(4) is deleted and replaced with the following:

(*****)

9-03.12(4) <u>GRAVEL BACKFILL FOR DRAINS</u>

Gravel backfill for drains shall meet the requirements for Mineral Aggregate Type 26.

9-05 DRAINAGE STRUCTURES, CULVERTS, AND CONDUITS

9-05.10 STEEL STORM SEWER PIPE

Section is supplamented with the following:

(*****)

Pipe, SD, Steel Sch 40 Victaulic, 8 In. shall be Grade B, A53 schedule 40. The pipe shall be galvanized. Connections shall be standard flexible couplings meeting a temperature range -20 degrees F to +180 degrees F. Castings shall be galvanized.

Add the following new section

(*****)

9-05.10A COATED STEEL CASING (SIZE) IN. DIAM. AND (SIZE) IN. THICK

Coated Steel Casing (Size) In. Diam. and (Size) In. Thick shall be high strength steel casing conforming to the requirements of ASTM A139, Grade B A53 and AWWA C200. All field welding shall be done in accordance with ANSI/AWS D 1.1 for full penetration welds.

NOT FOR CONSTRUCTION

Casing pipe shall be placed where indicated on the Contract Drawings, and shall have welded connections. After assembly, defects in the coating shall be repaired. This shall specifically include the lining on the interior of the pipe.

The Contractor shall install the carrier pipe inside the casing pipe without damage to the interior lining of the casing or damage to the exterior coating of the carrier. The Contractor shall submit his proposed procedure to the Engineer for comments. To ensure proper pipe support between the carrier pipe and the casing pipe a lean mix grout shall be placed inside the annular space from the bottom (invert) of the casing to the middle (spring line) of the casing pipe.

Manholes or catch basins shall be installed for terminal casing pipe, as specified and as shown on the Contract Plans.

The coating shall be epoxy coating 25 mil thick min.

9-05.15(1) MANHOLE RING AND COVER

The first, second, and fourth paragraphs are deleted:

Section is supplemented with the following:

*(*** COS Specifications 9-12.8(1) ***)*

Ring and cover casting dimensions shall conform to the Standard. Rings and ring extensions shall be manufactured from cast iron ASTM A 48, Class 30 or ductile iron ASTM A536, Grade 80-55-06. Covers shall be manufactured from ductile iron ASTM A536, Grade 80-55-06. Rings and covers shall be free of defects such as porosity, pittings, shrink cavities, cold shuts, cracks, and other surface defects which would impair serviceability. Repair of defects by welding or by the use of “smooth-on plasticized metals” or similar Material will not be accepted. Manufacturer shall certify that the product conforms to the requirements of these Specifications. In accordance with Section 1-06.1, where source of Material is different from manufacturer, the Contractor shall also provide the name and location of the manufacturer

Castings shall be bare metal. Artificially coated or painted castings will be cause for rejection.

Castings shall be machine finished on the horizontal seating surface and the vertical facing surface common to the ring and cover, so as to assure full bearing (nonrocking) for the entire width and circumference of the bearing surface, and permit interchangeability with other castings of the same design, no matter what the source. The vertical face common to the ring and cover shall be beveled as shown on the Standard Plans. Upon request of the Engineer, the manufacturer shall furnish at the foundry standard ring and covers for use by Inspectors in testing fit and seating.

All covers shall be labeled with the following information:

1. Name or symbol of the manufacturer;
2. Owner’s name (City of Seattle, min. 1/2 inch letters recessed flush with adjacent surface);
3. Material label “DUC” for Ductile Iron;
4. Identification of its use in 3 inch high lettering (Sewer, Drain, etc.); and
5. Country of manufacture/origin. Items 2. and 4. shall be on the exposed face of the cover.

Items 1., 3., and 5. shall be located at the manufacturer’s option. If located on the exposed face of the cover, item 1. and 3. shall be adjacent to each other and shall be set in at least 1/2 inch high recessed letters. Where lock-type castings are called for, a locking device shall permit the cover to be readily released from the ring. Movable parts shall be

NOT FOR CONSTRUCTION

made of non-corrosive metals and be designed to avoid possible binding. Upon request by the Engineer, the manufacturer shall furnish testing apparatus at the foundry Capable of applying uplift pressure on the lid of at least 20 foot head of water which the assembly needs to withstand without failure.

All manhole rings shall be labeled with the name or symbol of the manufacturer and the type of Material.

Where additional depth to a COS Standard Plan no. 230 frame is required, COS Standard Plan no. 231 ring extensions shall be securely bonded to the frame by epoxy at the manufacturer's facility. The Contractor shall provide a Manufacturer's Certificate of Compliance verifying this prior to installing the built up frame at the Project Site.

Add the following new Section:

(*****)

9-05.21 SANITARY SEWER FLOW METER

Sanitary sewer flow meter shall meet the requirements of

Add the following new Section:

(*****)

9-05.22 DEBRIS CAGE

Debris cage shall be XX material in accordance with Section 9-XX.XX. Debris cage shall be shop fabricated in accordance with Section 9-XX. Fabricator shall have XX experience.

9-05.50 PRECAST CONCRETE DRAINAGE STRUCTURES

Section is supplemented with the following:

*(***COS 9-12.1***)*

Reinforced Concrete

General

Reinforced concrete shall consist of Portland cement, fine and coarse aggregates and water, in which steel has been embedded in such manner that the steel and concrete act together.

All cast-in-place concrete placed under these Standard Specifications shall be Class 4000 (see Sections 6-02.3(1) and 6-02.3(2)). Strength determination shall be in accordance with ASTM C 39. Precast components shall conform to the strength requirements of ASTM C 478.

The use of admixtures shall require prior approval of the Engineer. Concrete with air-entraining admixture shall comply with ASTM C 175.

*(***COS 9-12.1(2)***)*

Cement

Portland cement shall conform to the requirements of Section 9-01.

*(***COS 9-12.1(3)***)*

Steel Reinforcement

NOT FOR CONSTRUCTION

Reinforcement shall consist of wire conforming to ASTM A82 or ASTM A496, or wire fabric conforming to ASTM A185 or ASTM A 497, or Grade 60 steel bars conforming to ASTM A615 or Grade 80 steel bars conforming to ASTM A 306.

*(***COS 9-12.1(4)***)*

Aggregates

Aggregates for cast-in-place concrete shall conform to ASTM C 33.

9-05.50(2) MANHOLES

The first paragraph is supplemented with the following:

(*****)

Precast manhole components shall conform to ASTM C 478 except as modified in Section 7-05.

The second paragraph is deleted and replaced with the following:

(*****)

Joints between sections shall be tongue and groove, and shall provide 1/2 inch nominal annular space and a minimum of 1-1/4 inches lap.

Add the following new Section:

(*****)

9-05.50(6) STORMWATER VAULT

Vaults shall be constructed as a concrete box and as a concrete lid. The lid for Vaults shall be as indicate on the Plans. Contractor shall provide shop drawings if their manufacturing process or standard production model includes any deviation Plans. Whenever there is a design change to the Vault, a proof test, as defined in this Specification, shall be performed once in the presence of the Engineer.

Vaults shall be concrete constructed in accordance with Section 7-05.3(5)G, and have a minimum load rating of 22,500 pounds. Concrete for standard vaults shall have a minimum compressive strength of 4000 psi. The frame shall be anchored to the vault by welding the wire fabric to the frame or by welding headed studs ⅜ inch x 3 inches long, as specified in Section 9-06.15, to the frame. The wire fabric shall be attached to the studs and frame with standard tie practices. The vault shall contain studs located near the centerline of the frame and wall. Studs shall be placed one anchor in each corner, one at the middle of each width and two equally spaced on each length of the vault/box. The steel lid support beam shall be painted with a black paint containing rust inhibiters or painted with a shop applied, inorganic zinc primer in accordance with Section 6-07.3 or hot dip galvanized in accordance with ASTM A 111. Material for Vaults shall conform to the following:

Concrete Section 6-02
Reinforcing Steel Section 9-07
Lid Support beam ASTM A36 steel
Anchors (studs) Section 9-06.15
Bolts, Nuts, Washers ASTM F593 or A 193, type 304 or 316

Vault Risers

NOT FOR CONSTRUCTION

Vault risers shall be XX material

Vault Lid Markings

Vault Lids shall be XX material

Vault Grates Markings

Vault Grates shall be XX material

Section 9-06.19 is deleted and replaced with the following:

(*****)

9-06.19 METAL TRAFFIC BARRIERS

Metal traffic barriers shall conform to the type and material Specifications set forth in the Plans and Special Provisions. Steel used for metal railings, when galvanized after fabrication in accordance with AASHTO M 111, shall have a controlled silicon content of either 0.00 to 0.04 percent or 0.15 to 0.25 percent. Mill test certificates verifying the silicon content of the steel shall be submitted to both the galvanizer and the Engineer prior to beginning galvanizing operations.

More XXX

9-13 RIPRAP, QUARRY SPALLS, SLOPE PROTECTION, AND ROCK WALLS

Add the following new Section:

*(***1st Ave Boat Ramp, 2005***)*

9-13.2(3) HABITAT GRAVEL MIX

Habitat Gravel Mix shall consist of rounded rock with the following gradation:

Percent Less Than (By Weight)	Average Diameter
100	2-inch
80 - 95	1½-inch
50 – 80	¾-inch
30 – 50	No. 4 sieve
0 - 8	No. 200 sieve

9-14 EROSION CONTROL AND ROADSIDE PLANTING

9-14.1(1) SOIL

Section is supplemented with the following:

(NWR March 27, 2006)

Topsoil Type A

NOT FOR CONSTRUCTION

Topsoil Type A shall consist of a uniform blend composed by volume of 70-80% aggregate, and 20-30% compost. Ninety five percent of this mixture shall pass through a 1-inch sieve.

Aggregate

Aggregate shall consist of Backfill for Sand Drains, Section 9-03.13 or Fine Aggregate for Portland Cement Concrete, Class 2, Section 9-03.1(2)B. The Contractor shall certify that the material is not detrimental to plant life.

Compost

Compost shall be fine compost and meet the material requirements as specified in Section 9-14.4(8).

Mixing Requirements

The Contractor shall submit in writing, for the Engineers approval, the proposed method of mixing. No mixing shall take place without written approval from the Engineer.

Topsoil Type A shall be thoroughly mixed prior to being placed.

Section 9-14.1(3) is deleted and replaced with the following:

(*****)

9-14.1(3) BIORETENTION SOIL

9-14.1(3)A GENERAL

Bioretention soil shall be a well blended mixture of Mineral Aggregate and compost measured on a volume basis.

9-14.1(3)B LANDSCAPE BIORETENTION SOIL

Landscape bioretention soil shall consist of two parts compost (approximately 35 to 40 percent) by volume meeting the requirements of Section 9-14.4(9) and three parts Mineral Aggregate (approximately 60 to 65 percent), by volume meeting the requirements of Section 9-03.2. The mixture shall be well blended to produce a homogeneous mix. Organic matter content shall be 8 to 10 percent, with the final mix to be determined by the Engineer based on samples and test results submitted.

9-14.4(8) COMPOST

Section is supplemented with the following:

(August 1, 2005)

Acceptance will be based upon a visual examination of the compost.

Section 9-14.4(9) is deleted and replaced with the following:

(*****)

9-14.4(9) COMPOSTED MATERIAL

Compost products shall be the result of the biological degradation and transformation of Type I or III feedstocks under controlled conditions designed to promote aerobic decomposition, per WAC 173-350-220, which is available at

NOT FOR CONSTRUCTION

http://www.ecy.wa.gov/programs/swfa/compost. Compost shall be stable with regard to oxygen consumption and carbon dioxide generation. Compost shall be mature with regard to its suitability for serving as a soil amendment or an erosion control BMP as defined below. The compost shall have a moisture content that has no visible free water or dust produced when handling the material.

Compost production and quality shall comply with Chapter 173-350 WAC, and meet the following physical criteria:

1. Compost material shall be tested in accordance with Testing Methods for the Examination of Compost and Composting (TMECC) Test Method 02.02-B, "Sample Sieving for Aggregate Size Classification".

   Compost shall meet the following:

	Min.	Max.
Percent passing 1"	99%	100%
Percent passing 5/8"	90%	100%
Percent passing 1/4"	40%	90%

2. The pH shall be between 5.5 and 8.0 when tested in accordance with TMECC 04.11-A, "1:5 Slurry pH".
3. Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0 percent by weight as determined by TMECC 03.08-A "percent dry weight basis".
4. Organic matter content should be between 45 and 65 percent dry weight basis as determined by TMECC 05.07A, "Loss-On-Ignition Organic Matter Method".
5. Soluble salt contents shall be less than 6.0 mmhos/cm tested in accordance with TMECC 04.10-A, "1:5 Slurry Method, Mass Basis".
6. Maturity shall be greater than 80% in accordance with TMECC 05.05-A, "Germination and Vigor".
7. Stability shall be 7 or below in accordance with TMECC 05.08-B, Carbon Dioxide Evolution Rate"
8. The compost product must originate a minimum of 65 percent by volume from recycled plant waste as defined in WAC 173-350-100 as "Type 1 Feedstocks." A maximum of 35 percent by volume of other approved organic waste as defined in WAC 173-350-100 as "Type III", including post-consumer food waste, but not including biosolids, may be substituted for recycled plant waste. The supplier shall provide written verification of feedstock sources.
9. Carbon to nitrogen ratio shall be less than 25:1 as determined using TMECC 04.01 "Total Carbon" and TMECC 04.02D "Total Kjeldhal Nitrogen". The Engineer may specify a C:N ratio up to 35:1 for projects where the plants selected are entirely Puget Sound native species.
10. The Engineer may also evaluate compost for maturity using the Solvita Compost Maturity Test at time of delivery. Compost shall score a number 6 or above on the Solvita Compost Maturity Test.

The compost supplier shall test all compost products within 90 Calendar Days prior to application. Samples shall be collected using the Seal of Testing Assurance (STA) sample collection protocol. The sample collection protocol can be obtained from the U.S. Composting Council, 4250 Veterans Memorial Highway, Suite 275, Holbrook, NY 11741

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Phone: 631-737-4931, www.compostingcouncil.org. The sample shall be sent to an independent STA Program approved laboratory. The compost supplier shall pay for the test. A copy of the approved independent STA Program laboratory test report shall be submitted to the Engineer prior to initial application of the compost. Seven days prior to application, the Contractor shall submit a sample of each type of compost to be used on the project to the Engineer.

Compost not conforming to the above requirements or taken from a source other than those tested and accepted shall be immediately removed from the project and replaced at no cost to the Owner.

The Contractor shall submit the following information to the Engineer for approval:

1. A copy of the Solid Waste Handling Permit issued to the supplier by the Jurisdictional Health Department as per WAC 173-350 (Minimum Functional Standards for Solid Waste Handling).
2. The supplier shall verify in writing, and provide lab analyses that the Materials comply with the processes, testing, and standards specified in WAC 173-350 and these Specifications. An independent STA Program certified laboratory shall perform the analysis.
3. A list of the feedstock by percentage present in the final compost product.
4. A copy of the producer's STA certification as issued by the U.S. Composting Council.

Acceptance shall be based upon a satisfactory Test Report from an independent STA program certified laboratory and the sample(s) submitted to the Engineer.

9-14.4 MULCH AND AMENDMENTS

Section is supplemented with the following

(NWR January 17, 2006)

Soil Amendments

Soil amendments shall be coarse compost.

9-14.6(6) SUBSTITUTION OF PLANTS

Section is supplemented with the following:

(NWR June 5, 2000)

The Contractor is advised that a growing contract may be necessary to secure the required quantities, the specified size, variety, and grade of plant material.

Add the following new Section:

(*****)

9-14.5(8) TEMPORARY SEDIMENT TRAP

Temporary sediment trap shall be constructed of XXX Material.

Add the following new Section:

(*****)

9-16.9 SECURITY CHAIN LINK FENCE AND GATES

NOT FOR CONSTRUCTION

9-16.9(1) GENERAL

The fence shall be chain link fabric supported on a steel frame, the posts of which are embedded in concrete foundations. Barbed wire supported on brackets above the fabric portion shall be installed as indicated on the drawings. Materials shall be heavy industrial chain link fencing in accordance with ASTM F1043, with the additional requirements as follows:

Fencing, gates and appurtenances shall be erected and installed by an organization regularly engaged in this business, employing labor skilled in this type of work to provide a complete security fencing system.

9-16.9(1)A SECURITY FENCE TYPES

"Security Chain Link Fence" shall be 8-foot high fence, including barbed-wire overhang as shown on the Plans.

"Security Double Swing Gate" shall be double, 8-foot high gate, barbed wire as shown on the Plans. The gate opening shall be as shown on the Plans.

9-16.9(1)B FABRIC

Vinyl coated steel fabric shall be woven 9-gauge polyvinyl chloride (PVC) coated aluminum-coated steel wire in 2-inch mesh and shall meet the requirements of ASTM F 668, Class 2b. The fabric shall conform to the requirements of ASTM A 491. Vinyl coating shall conform to the requirements of ASTM F 1043, Paragraph 7.3 Optional Supplemental Color Coating. Color shall be non-reflective black.

Fabric shall be fastened to posts, the top rail and the bottom wire with wire ties.

9-16.9(1)C FRAMEWORK

Framework and coating shall be in accordance with ASTM F1083 and F1043.

Framework shall be hot dipped galvanized Schedule-40 pipe conforming to ASTM F1083 or cold rolling and radial frequency welded steel pipe conforming to ASTM A653 or A569 with a minimum yield strength of 50,000 psi. Exterior and interior coatings in accordance with ASTM F1043 Type B outside with a minimum of 0.9 oz. of zinc per sq. ft. after welding, a chromite conversion coating and a clear polymer overcoat; type B inside with a minimum of 0.9 oz. of zinc per sq. ft.

All exterior tubular framework shall be in accordance with ASTM B117 and shall meet the requirements of 1000 hours with a maximum 5% red rust.

Top rail shall be continuous. The Contractor shall provide for expansion or contraction of the continuous rail. Expansion and contraction spring couplings shall be installed at intervals of 100 feet maximum.

Line posts shall be 2.375-inch O.D., 3.65 pounds per foot, or "C" section at 2.70 pounds per foot and shall be installed vertically in the concete.

End, corner, or pull posts shall be 4-inch O.D., at 9.11 pounds per foot.

Swing gate posts shall be 6.625-inch O.D. at 18.97 pounds per foot.

Top rails and post braces shall be 1.66-inch O.D. at 2.27 pounds per foot.

Tension wire shall be No. 7 gauge, coil spring, high tensile strength wire, Marcelled and coated with not less than 0.80 oz. of zinc per square foot of uncoated wire surface.

9-16.9(1)D FITTINGS

All fittings, accessories and hardware for galvanized chain link fence shall conform to the requirements of ASTM F626.

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9-16.9(1)E GATES

Gates shall be constructed with fabric fastened to the end bars of the gate frame by tension bars and fabric bands, and to the top and bottom bars of the gate frames by tie wires in the same manner as specified for the chain link fence fabric.

Gate frames shall be constructed in accordance with ASTM F900. The corners of the gate frame shall be welded and coated with two coats of GALVACON or approved equal, or shall be manufacturer's standard galvanized cast corner connections.

Cross-trussing shall be 3/8-inch galvanized steel adjustable rods.

Each gate shall be provided complete with necessary hinges, latch and drop bar locking device designed for the type of gate, posts and lock used.

Gates shall have positive-type latching devices with provisions for padlocking.

9-16.9(1)F BARBED WIRE

Each barbed wire shall conform to the requirements of ASTM A121 and shall consist of two strands of 12-1/2 gauge galvanized wire, twisted with 4-point, 14 gauge barbs with the barbs spaced an average of five inches apart. Galvanizing shall be Class 3.

9-16.9(1)G CONCRETE

Concrete used in anchorage of posts shall meet the requirements of Section 5-05.

9-16.9(1)H DAMAGES

Minor damage to galvanizing of fabric and fence appurtenances shall be repaired by thorough cleaning of the damaged surfaces and the application of "Galvacon," or approved equal, in strict accordance with the manufacturer's recommendations.

9-19 PRESTRESSED CONCRETE GIRDERS

9-19.1 AGGREGATES AND PROPORTIONING

The second paragraph is deleted and replaced with the following:

(BSP August 4, 2003)

The Contractor shall submit a Contractor-Provided mix design for each design strength of prestressed girder to the Engineer for approval in accordance with Section 6-02.3(2)A, including a Contractor-Provided mix design of high strength concrete for the prestressed girders of "Superstructure - _____ Approach Span".

Approval of the mix design will not preclude any requirements for the concrete placed in the girders.

The Contractor-Provided mix design for high strength concrete shall conform to the following:

Bridge	Minimum Compressive Strength in psi at 56 days in accordance with AASHTO T 22
"Superstructure – _____ Approach Span"	9.7 KSI & 10.0 KSI

The Contractor may substitute testing for minimum compressive strength at 28 days, provided that the 28 day compressive strength is equal to or greater than 95 percent of the specified 56 day compressive strength.

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The Contractor shall test a minimum of three specimens for each of the tests specified. The test specimens for the compressive strength tests shall be four inch by eight inch cylinders cast in molds supplied by the Contractor in accordance with Section 6-02.3(5)D. The Contractor shall include the results of all tests in the high strength concrete mix design submittal to the Engineer.

9-29 ILLUMINATION, SIGNALS, ELECTRICAL

Insert the following new Section:

(*****)

9-29.1(9) SUBMARINE CONDUIT SYSTEM MATERIALS

Submarine Casing

Submarine casing shall be 16" diameter Schedule 40 steel pipe.

Caisson pier cap Pipe Sleeve

Caisson pier cap sleeve shall be a minimum of 16" diameter, and maximum of 24" diameter Schedule 40 steel pipe.

Fiber Reinforced Epoxy (FRE) Ducts

FRE ducts shall be manufactured from E or E-CR glass and specially formulated epoxy resin (no fillers) and shall have a glass content of 68%, plus or minus 3%

9-29.2(1) STANDARD JUNCTION BOX

The first and second paragraphs are deleted and replaced with the following:

(*****)

Install standard junction boxes in locations shown in the Plans. Standard junction boxes shall be concrete junction boxes conforming to details in the Standard Plans, or approved non-concrete junction boxes, except Type 3 junction boxes shall have divided, dual-hinges lids.

Concrete junction boxes shall have a minimum compressive strength of 6000 psi when reinforced with a welded wire hoop and 4000 psi when reinforced with welded wire fabric or fiber reinforcement. The frame shall be anchored to the box by welding the wire fabric to the frame or by welding headed studs 3/8 inch x 3 inches long, as specified in Section 9-06.15, to the frame. The wire fabric shall be attached to the studs and frame with standard tie practices. The box shall contain ten studs located near the centerline of the frame and box wall. The studs shall be placed one anchor in each corner, one at the middle of each width and two equally spaced on each length of the box. The steel frame, lid support, and lid shall be hot dip galvanized in accordance with AASHTO M 111.

9-29.3 CONDUCTORS, CABLE

Item 3 in the second paragraph is deleted and replaced with the following:

(*****)

3. All single conductors shall be Class B or Class C stranded copper. The minimum wire size shall be No. 12 AWG. Insulation shall be as shown in the plans except loop wire.

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9-29.6(5) FOUNDATION HARDWARE

The second paragraph is deleted and replaced with the following:

(*****)

Anchor bolts for Type X, Y and Z signal poles shall meet the requirements of ASTM A 449. Anchor bolts for luminaire poles shall meet the requirements of ASTM A 307. Nuts shall be heavy hex meeting the requirements of AASHTO M 291, Grade C, D, or DH. Washers shall meet the requirements of AASHTO M 293.

9-29.9 BALLAST, TRANSFORMERS

The first paragraph is deleted and replaced with the following:

(*****)

Each ballast shall have a name plate attached permanently to the case listing all electrical data. In addition, the Contractor shall provide warranty cards and warranty information for each ballast prior to approval of illumination system by the Electrical Inspector. The warranty duration for each ballast shall be a minimum of 1-year.

9-29.10 LUMINAIRES

The first sentence of the first paragraph is deleted and replaced with the following:

(*****)

If not listed on the Qualified Products List (QPL) a Certificate of Compliance shall be submitted by the manufacturer with each type of luminaire along with a minimum 1-year warranty on the lamp.

Section is supplemented with the following

(*****)

Roadway luminaire

1. "Universe Collection" by Architectural Area Lighting.
   a. Model Number: UCL-SR-FLR-H2-400HPS-MAL
   b. Manufacturer Information:
      Architectural Area Lighting
      14249 Artesia Boulevard
      La Mirada, CA 90638
      Telephone: (714) 994-2700
      www.aal.net

Sidewalk luminaire

1. "K56 Post Top" by King Luminaire.
   a. Model Number: K56-C-T-SAR-III-150-(MOG)-HPS-120-XX*
      Paint color shall be "Silverbrite" with "flat" finish.
   b. Manufacturer Information:
      14503 Wallick Road
      Atchison, Kansas 66002

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Telephone: 1-800-837-1024
Fax: (913) 255-3124
www.kingluminaire.com

Accent luminaires at rocker locations

1. "Paradox" by Hydrel
   a. Model Numbers:
      1) PDX10 SS 22LED WMW MVOLT MFL FLC
      2) PDX10 SS 22LED WMW MVOLT SP FLC
   b. Manufacturer Information:
      Hydrel Lighting
      20660 Nordhoff St., Suite B
      Chatsworth, CA 91311
      Telephone: (866) 533-9901
      Fax: (866) 533-5291
      www.hydrel.com

9-29.11 CONTROL EQUIPMENT

Section is deleted and replaced with the following:

(*****)
Illumination circuits shall be controlled by a combination of photoelectric controls and lighting contactors as noted in the contract. The photocell shall be mounted on top of the luminaire closest to the electrical service. A 3/C #14 IMSA cable shall be provided from the photocell to the electrical service.

9-29.11(2) PHOTOELECTRIC CONTROLS

The first paragraph is deleted and replaced with the following:

(*****)
The photoelectric control shall be the twistlock type and the light sensitive element shall be a solid state photo diode. The control shall be designed to turn on at 3 foot-candles (32 lux) and turn off at 1.8 foot-candles (20 lux). The lighting control shall not drift by more than 1 percent over a 10-year period. The photoelectric control shall have a minimum 1-year warranty.

9-29.12(1) ILLUMINATION CIRCUIT SPLICES

Section is deleted and replaced with the following:

(*****)
Splices and taps shall be made with solderless crimp connectors on underground circuits to securely join the wires both mechanically and electrically. Aerial splices may employ split bolt connectors. Splices at below grade locations shall employ epoxy resin cast type insulation. Two-way (in-line) splices and three-way (T or wye) splices shall employ clear rigid plastic molds. Clear mylar sheet bonded to butyrate webbing forming a flexible mold shall be used for four-way or more. The material used shall be compatible with the insulation material utilized. Equipment and methods shall be as recommended by the manufacturer of the splicing materials. The component materials of the resin insulation shall

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be packaged form ready for convenient mixing without removing from the package. Only one conductor or one multi conductor cable per wire entrance will be allowed in any rigid mold splice.

9-29.12(2) TRAFFIC SIGNAL SPLICE MATERIAL

Section is deleted.

Add the following new Section:

(*****)

9-29.12(3) TRAFFIC LOOP WIRE ENCAPSULEMENT

The detector loop sealant shall be a flexible traffic loop wire encapsulement. Encapsulement shall be designated to enable vehicular traffic to pass over the properly filled sawcut within five minutes after installation without cracking of material. The encapsulement shall form a surface skin allowing exposure to vehicular traffic within 30 minutes at 75o F. and completely cure to a tough rubber-like consistency within two to seven days after installation. Properly installed and cured encapsulement shall exhibit resistance to defects of weather, vehicle abrasion, motor oil, gasoline, antifreeze solutions, brake fluid, deicing chemicals and salt normally encountered in such a manner that the performance of the vehicle detector loop wire is not adversely affected.
One-quarter inch (1/4”) sawcuts shall be cleared of debris with compressed air before installing three turns of loop wire. All detector loops shall be six feet square or six-foot diameter with diagonal mini-cut corners of not more than one-inch on the diagonal. From the loops to the junction box, the loop wires shall be twisted two turns per foot and labeled at the junction box in accordance with the loop schematics included in the Plans. A three-eighths inch (3/8”) sawcut will be required for the twisted pair. No sawcut will be within three feet of any manhole or utility riser located in the street. Loops and lead-ins will not be installed in broken or fractured pavement. Where such pavement exists it will be replaced in kind with minimum 12-foot square sections. Loops will also be sawed across transverse joints in the road. Loops to be placed in concrete will be located in full panels, a minimum of 18-inches from any expansion joint.

9-29.13(3) EMERGENCY PREEMPTION

Section is deleted and replaced with the following:

(*****)
Immediately after a valid call has been received, the preemption controls shall cause the signals to display the required clearance intervals and subsequent preemption intervals. Preemption shall sequence as noted in the contract. Preemption equipment shall be installed so that internal wiring of the controller, as normally furnished by the manufacturer, is not altered. Termination of the preemption sequence shall place a call on all vehicle and pedestrian phases. Emergency devices shall be 3M Opticom brand, 700-series, as specified in the Plans, or approved equal.

9-29.16(2)B SIGNAL HOUSING

The first paragraph is deleted and replaced with the following:

(*****)

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The signal head housing, or case, shall consist of an assembly of separate sections, expandable type for vertical mounting, substantially secured together in a weather-tight manner to form a unit of pleasing appearance. Each section shall house an individual optical unit. They shall be designed to withstand winds of 80 mph with a gust factor of 0.25 without permanent distortion or failing (torque at attachment of 6,000 pound-feet).

9-29.16(2)E PAINTING SIGNAL HEADS

Section is deleted and replaced with the following:

(*****)

Traffic signal heads shall be finished with two coats of factory Federal Yellow (FHWA) polyester powder coat, oven baked and comprised of resins and pigments. Aluminum end caps shall be painted to match the color of the signal housing.

9-29.17 SIGNAL HEAD MOUNTING BRACKETS AND FITTINGS

The second paragraph is deleted and replaced with the following:

(*****)

Fittings for Type N mounts shall be installed unpainted. All other hardware for other mounts shall be painted with two coats of factory-applied traffic signal Federal Yellow (FHWA) baked enamel.

Add the following new Section:

(*****)

9-29.18(3) VIDEO DETECTION SYSTEM

The video detection system shall be capable of providing presence vehicle detection and shall be expandable without removing or replacing existing units. All materials furnished shall be new, unused, current production models and shall be items currently in distribution. The video detection system shall have a minimum 18-month warranty against manufacturing defects in materials and workmanship from the date of shipment. The Contractor shall supply the warranty and all documentation necessary to maintain and operate the system to the Electrical Inspector prior to approval of the video detection system by the Electrical Inspector.

Minimum physical properties of the video detection system are as follows:

1. The processor shall be modular by design and fit directly into NEMA TS1 and TS2 type racks. It shall be interchangeable between a shelf or rack mount installation without replacing or modifying existing units.
2. The system shall control up to 8 cameras.
3. The system shall operate reliably in adverse environmental conditions in a roadside cabinet and shall meet all NEMA TS1 and TS2 environmental specifications.
4. Ambient operating temperature shall be –37 to +74 degrees Centigrade at 0 to 95% humidity non-condensing.
5. The system shall be powered by 12 to 40 Volts DC and draw less than 2 amperes.
6. The system shall utilize cabinet 24 Volts DC for rack mount installations or external 24 Volts DC for stand-alone shelf installations.

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7. Surge rating shall meet NEMA TS1 and TS2 specifications.
8. Serial communications shall be through an RS232 serial port. This port shall be able to communicate to a modem or a laptop to upload/download detector configurations, count data, and software upgrades.
9. Each processor board shall have 4 opto-isolated open collector outputs. Twenty (20) additional outputs shall be available via the expansion port. The outputs shall be programmed for signaling the presence, the arrival or the departure of vehicles in a minimum of 24 detection zones.
10. Each processor board shall have error detection. An output contact shall be programmable move from open to closed or closed to open if the video signal is bad or the processor board is not functioning properly. A user defined quality level will automatically put the processor into a recall state in cases of severely degraded visibility (i.e. fog, blizzard, etc). Normal detection shall resume when visibility improves above the user defined quality level.
11. A video select button on the front panel shall switch between camera images.
12. The processor board shall have 1 video input (RS-170 NTSC) and one video out.
13. The processor board shall have separate light emitting diodes (LEDs) that indicate the following:

POWER	Red to verify power supply.
OUT1-OUT4	Green if the corresponding detection group is active.

Minimum functional capabilities of the video detection system are as follows:

1. Capable of monitoring all licensed vehicles on the roadway.
2. Provide video detection for all areas outlined in the Plans.
3. Each processor board shall be capable of processing the video signal of one camera and analyze the video signal in real time (30 times per second).
4. The system shall be capable of displaying detectors on the video image with associated outputs. Outputs/Inputs status will be indicated on the screen. Parameters also include the ability to view raw video without any verbiage and/or detectors for surveillance purposes.
5. Each processor board shall detect within the view of the connected camera the presence of vehicles in user-defined zones. Detector zones shall be presence or data. The processor board shall have 20 presence detector zones and 4 data detection zones per camera. Data zones shall collect and store vehicle counts, volume, speed, gap time, headway, occupancy, and 4 types of classification. Data shall be time-stamped (6713 intervals) and stored onboard (non-volatile memory) from 1 to 60 minutes. Presence zones shall have the capability of delay and/or extension with selectable pulse mode.
6. The processor boards shall be programmed without the use of a supervisor computer. A standard CCTV monitor and keypad plugged into the serial port will facilitate detector programming.
7. The processor board shall store a minimum of 3 detector configurations. It shall be possible to switch between detector configurations manually or automatically by time of day or input from the traffic controller.
8. Detector configurations shall be formatted to allow uploading to a laptop computer and stored on a disk.

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9. Detectors shall be able to be linked to 24 outputs and 20 inputs using Boolean Logic features: AND, OR, NOT. It will be possible to generate conditional outputs based on inputs from a controller.
10. Detectors shall be directionally sensitive. Options shall include an omni-directional detector or a detector that only senses movement: from left to right, right to left, up to down or down to up as you look at the monitor.
11. Changes to all detectors and parameters shall be permitted without interruption of detection.
12. Count data shall be able to be downloaded to a PC and exported to a spreadsheet.
13. Software updates to the processors shall be provided at no additional cost.
14. Password protection shall be standard option.
15. Detection system cameras shall be high resolution, 1/3" image format CCD, designed for professional video surveillance systems. The unit shall provide detailed video without lag, image retention, or geometric distortion. Video cameras shall be available commercially. No sole source cameras will be allowed. In addition, the cameras shall meet or exceed the following specifications:

Temperature range:	-20 to 55 degrees C
Humidity:	0% to 95% relative, non-condensing
Dimensions:	50mm x 50mm x 90mm, or smaller
Weight:	Less than 250 grams
Connectors:	BNC for video out
Lens mount:	CS; power in/pressure screw; lens/4-square connector
Housing:	All metal housing
Rated Input Voltage:	12 VDC or 24 VAC +/- 10% @ 60 Hz
Nominal Power:	6 Watts
Imager:	Interline transfer CCD 1/3" format
Imager spectral response:	100% @ 550nm; 30% @ 40nm and 80nm
Sync system:	EIA RS-170
Active Picture:	768H X 494V
Horizontal Resolution:	580 TVL
Sensitivity:	2856 K

	Usable Picture	Full Video
Scene Illumination:	0.012 fc 0.12 lux	0.08 fc 0.8 lux
Imager Illumination :	0.0015 fc 0.015 lux	0.01 fc 0.1 lux

Signal to Noise Ratio:	54 dm Minimum; 58 db Typical
AGC:	18 db
Light Range (AGC on):	1,000,000:1 min. with f/1.4 to 360 auto-iris lens
Video Out:	1.0 Volts peak-to-peak +/- 0.1 volt @ 75 Ohms
Gray Scale:	Minimum of 10 steps

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16. Camera Lens shall be a motorized vari-focal 6.5 –39mm with auto iris and meet or exceed the following specifications:

Image Format:	1.3 inch
Focal Length:	6X zoom (6.5-39mm)
Iris Range:	f 1.0 – Approx. 1200
Back Focus Distance:	10.05mm (0.4in.) in air
Weight:	Approx. 500g
Size:	Approx. 60mm x 70mm x 90mm
Lens Mount:	CS
Focus Control:	Motorized
Zoom:	Motorized

17. Environmental Camera Housing shall be an aluminum enclosure designed for outdoor CCD camera installations and meet or exceed the following specifications:

Camera Mounting:	Removable cradle assembly
Cable Entry:	Three liquid-tight fittings that will accept cable diameters as follows: One fitting – 2 to 7mm; Two fittings – 3 to 10mm
Construction:	Extruded aluminum housing, aluminum rear-end cap; aluminum front cap with glass face plate and aluminum cradle; sunshield
Window:	3mm thick glass that includes a thermostatically-controlled window; heater/defogger strip
Rated input voltage:	115 Volts AC, 60 Hertz
Voltage Range:	108 Volts to 132 Volts AC
Output Voltage:	24 Volts AC, 60 Hertz
Nominal Power:	30 Watts
Enclosure Protection:	Waterproof and dust-tight

18. Surge Protection shall meet or exceed the following specifications:

The suppressor shall provide coaxial cable connection points to an EDCO CX06-BNCY or approved equal transient suppressor for each image sensor.

Peak Surge Current:	(8 X 20 us): 5KA
Technology:	Hybrid, Solid State
Attenuation:	0.1db @ 10Mhz
Response time:	<1 nanosecond
Protection:	Line to Ground
Shield to Ground:	(isolated shield modules)
Clamp Voltage:	6 Volts
Connectors:	BNC
Impedance:	75 Ohms
Temperature:	-40 to +85 degrees C
Humidity:	0% to 95% non-condensing

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Dimensions:	4.5” x 1.5” x 1.25”
UL Listed:	UL497B

19. Mounting Brackets: For mast arm mounting, a six (6) foot maximum length of internally reinforced tubing shall be attached to the mast arm bracket. The camera shall be mounted at the top of the tube with the camera manufacturers recommended bracket. For luminaire arm installations, the camera shall be mounted with the camera/video manufacturers recommended brackets.
    The bracket shall provide adjustments for both vertical and horizontal positioning of the camera. The camera attachments shall be designed to securely fasten the camera to prevent the extension tube from falling into the path of vehicles and/or becoming loose. Miscellaneous hardware shall be stainless steel or galvanized steel. The entire mounting unit shall be designed to withstand a wind load of 90 MPH with a 30-second gust factor.
20. Cable (Coaxial & Power): Coaxial cable shall be suitable for exterior use and in direct sunlight. Power cable shall have a minimum of 5 conductors. The coaxial cable shall be terminated in the surge protector before being connected to the processor boards. Power cable shall be terminated into a fuse panel provided by the manufacturer and connected to 120 Volt AC in the controller cabinet. The remaining three (3) conductors shall be used for zoom/focus for each camera. The three conductors shall be terminated and labeled in the traffic signal cabinet. The outer jacket shall be rated at 600 Volts.

9-29.19 PEDESTRIAN PUSH BUTTONS

The first paragraph is deleted and replaced with the following:

(*****)
Where noted in the contract, pedestrian push buttons of substantially tamper-proof construction shall be furnished and installed. They shall consist of a 2.25-inch nominal diameter mushroom plunger and a momentary contact switch assembled with the push button sign shown in the Plans. The switch may have snap action contacts, or magnetic, or piezoelectric switch, or actuated by a three bladed beryllium copper spring, and shall be rated 10 amperes, 125 volts.

9-29.24 SERVICE CABINETS

Section is deleted and replaced with the following:

(*****)
In addition to the requirements for service cabinets indicated in the contract, the following requirements shall apply:
Overhead electrical service shall be brought to the load center through a conduit riser and a weatherhead on the service pole. The service shall be split into a 120-volt circuit for signals. All circuit breakers shall be clearly marked or labeled.
Underground service shall be brought to the load center in minimum 2-inch conduit. The service shall be split in the load center into a 120-volt circuit for signals. The Contractor shall provide conduit from the electrical service to ten feet up the power pole from which service is provided. Standoff brackets 14-inches long shall be installed on the pole every ten feet. In addition, the Contractor shall provide service conductors from the electrical service to the top

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of the conduit on the power pole with 30 feet of service wire coiled at the top and provide the local electrical utility with 30 feet of 2-inch conduit to make the service connection, unless otherwise directed by the local electrical utility.

9-29.24(2) ELECTRICAL CIRCUIT BREAKERS AND CONTACTORS

The second paragraph is deleted in its entirety.

Add the following new Section:

(*****)

9-30.7 WATER LINE PIPE AND METER BOX ASSEMBLY

9-30.7(0) GENERAL

All Materials for water distribution shall be new. Materials used for temporary water line and for temporary service connection purposes may be either new or previously used materials and shall be subject to Seattle Public Utilities' Water Operation's inspection and approval prior to installation.

Prior to ordering any pipe to be, the Contractor shall submit the Material source as required by Section 1-06 and shall obtain the Engineer's approval.

All direct and indirect drinking water system components which come in contact with potable water shall have National Sanitation Foundation certification.

9-30.7(1) WATER LINE PIPE

All pipe and fittings shall be clearly marked with the manufacturer's name, type, class, and thickness as applicable and shall be marked on the component at the place of manufacture. Marking shall be legible and permanent under normal conditions of handling and storage.

Contractor to coordinate with SPU Water Operations for all connections to the water main.

9-30.7(1)A COPPER TUBING

Copper tubing shall conform to the requirements of ASTM B 88, Type K, annealed. The tubing shall be coupled using compression fittings having a positive external gripping feature to prevent tubing pull-out, conforming to the requirements of AWWA C800, minimum 150 psi working pressure.

9-30.7(1)B MISCELLANEOUS PIPING

Miscellaneous piping and fittings, including but not limited to ductile iron, steel and plastic pipe shall be submitted to the Engineer for approval prior to installation. Pipe and fittings shall have a minimum 150 psi working pressure.

9-30.7(2) SADDLES

Saddles shall be ductile iron, or bronze, double straps with thread standard outlet tapping. Saddles shall be of a size designed by the manufacturer to fit the pipe called for on the Drawings.

9-30.6(3) CORPORATION STOPS

Corporation stops for use with saddle shall be of bronze alloy with inlet M.I.P. (male iron pipe) standard thread and outlet thread compatible with connection piping, with no

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special adapters. Corporation stops for direct tapping shall be bronze alloy with AWWA tapered inlet Outlets on 3/4 inch and 1 inch direct tap corporation stops shall be copper tubing size compression, with an external clamping or anti-pullout feature. Outlets on 1-1/2 inch and 2 inch direct tap corporation stops shall be male iron pipe or tubing to be connected.

9-30.7(4) COMPRESSION COUPLINGS

Compression couplings for use in connecting plain end water line pipes shall be applicable for the type of pipe being coupled. Compression couplings shall have armored gaskets when similar metal pipes are being joined.

9-30.7(5) METER STOPS AND SETTERS

Contractor shall provide and furnish all materials for the installation of meter stops.

SPU Water Operations will install meter stops and setters.

9-30.7(6) METER BOX AND LID

Contractor shall provide and furnish all materials for the installation of the meter box.

Meter Box and Lid shall be in accordance with the current SPU Water Operation Standards. The Meter Box casting shall conform to ASTM A 48, Class 30 for gray cast iron. The Lid casting shall conform to ASTM A536, Grade 80-55-06 for ductile iron. Castings shall be brushed or dipped with a bituminous coating. Meter Box and Lid shall be Olympic Foundry (1984) Inc. SM-29, or approved equal.

SPU Water Operations will install meter box and lid.

9-30.7(7) VALVES

Contractor to provide and furnish all materials for the installation of the valves. All valves shall conform to City of Seattle Specifications 9-30.3.

9-30.7(8) TEMPORARY WATER LINE

All temporary water line shall meet the requirements as outlined in Section 9-30.7(1). PVC Water-Service Pipe and Fittings complying with ASTM D 1785 for schedule 40 pipe with plain ends for solvent-cemented joints and with ASTM D 2466, Schedule 40, socket-type fittings.

9-30.7(9) BEDDING

Pipe zone bedding (Bedding Class B) shall conform to bedding, jointing, backfilling in accordance with 7-08.3(1)C.

9-30.7(10) CEMENT CONCRETE BLOCKING

Concrete thrust blocking, as detailed on COS Standard Plan No. 330a through 331b, shall be placed as indicated on the Drawings. When the plans call for pipe size 4-inch diameter and less, thrust blocks for 4-inch pipe shall be installed as detailed in the COS Standard Plans.

Concrete blocking shall conform to the requirements in Section 7-09.3(21).

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The Contractor shall provide the Engineer at least 1 Working Day advance notice for inspection and approval of all concrete blocking prior to backfilling. Unacceptable concrete blocking shall be replaced at no expense to the Contracting Agency.

Add the following new Section:

(*****)

9-30.8 PIPE INSULATION ON BRIDGE

9-30.8 PIPE INSULATION

General Requirements: This special provision describes the requirements for furnishing, installing and testing pipe insulation for the exposed fire line and domestic water line suspended beneath the bridge and within the bascule piers.

9-30.8(1) MATERIALS

Submittals: The contractor shall submit to the Engineer for approval, shop drawings, catalog cuts and manufacturer's data as required by the Engineer to evaluate the pipe insulation installation. Shop drawings shall:

4. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
5. Detail attachment and covering of heat tracing inside insulation.
6. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
7. Detail removable insulation at piping specialties and equipment connections.
8. Detail application of field-applied jackets.

9-30.8(1)A PIPE INSULATION

Subject to compliance with requirements, provide product by one of the following: Johns Manville, Knauf FiberGlass Gmb H., Owens-Corning Fiberglas Corp.

Preformed pipe insulation complying with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket; Blanket insulation complying with ASTM C 553, Type II, without facing; Fire-resistant adhesive complying with MIL-A-3316C Class 1, Grade A for bonding glass cloth and tape to un-faced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to un-faced glass-fiber insulation; Fire- and water-resistant vapor-retarder mastics for indoor applications complying with MIL-C-19565C, Type II; Expanded or exfoliated vermiculite insulating cements complying with ASTM C 196; and Mineral-fiber, hydraulic-setting insulating and finishing cement complying with ASTM C 449/C 449M.

9-30.8(1)B FIELD-APPLIED JACKETS

Fire line and domestic water line shall be covered with field applied stainless-steel jacket, type 304 or 316 complying with ASTM A 167 or ASTM A 240. Jackets shall be from sheet and roll stock, ready for shop or field sizing, with smooth 2B finish and Z-shaped locking seam, minimum 0.020-inch thick. Moisture barrier shall be 3-mil thick heat-bonded polyethylene and kraft paper. Fitting, flange and valve covers shall be factory fabricated.

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Field fabricated fitting covers allowed only if factory-fabricated fitting covers are not available.

9-30.8(1)C ACCESSORIES AND ATTACHMENTS

Glass cloth and tape complying with MIL-C-20079H, Type I for cloth and Type II for tape; Woven glass-fiber fabrics, plain weave pre-sized a minimum of 8 oz/sq. yd.; 3/4-inch wide aluminum bands; and 0.080-inch nickel-copper alloy wire, or 0.062-inch soft-annealed galvanized steel wire.

9-30.8(1)D PIPE INSULATION FIRE-TEST-RESPONSE CHARACTERISTICS

As determined by testing materials identical to the those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency. Insulation shall have flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

9-30.8(2) CONSTRUCTION REQUIREMENTS

9-30.8(2)A EXAMINATION

Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application. Verify that systems and equipment to be insulated have been tested and are free of defects. Verify that surfaces to be insulated are clean and dry. Proceed with installation only after unsatisfactory conditions have been corrected.

9-30.8(2)B PREPARATION

Clean and dry surfaces that will be insulated. Remove materials that will adversely affect insulation application.

Coordinate insulation installation with the trade installing heat tracing and comply with requirements for heat tracing that apply to insulation.

Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use de-mineralized water.

9-30.8(2)C INSTALLATION

Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties. Install insulation materials, forms, vapor retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified herein or shown on the drawings. Install insulation with longitudinal seams at top and bottom of horizontal runs. Keep insulation materials dry during application and finishing. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer. Install insulation with least number of joints practical. Install insulation continuously through hangers and around anchor attachments. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

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Insulation Installation with Factory-Applied Jackets:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive selfsealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.

Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

Install accessories compatible with insulation materials, suitable for the service and that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

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Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

Repair damaged insulation facings by applying same facing material over damaged areas.

Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints. Install stainless steel metal jackets with a 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

9-30.8(2)D FIELD QUALITY CONTROL

Inspect pipe, fittings, strainers, and valves, randomly selected by Resident Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of coupled fittings, two locations of flanges and one valve location. All insulation applications will be considered defective work if sample inspection reveals noncompliance with requirements.

Add the following new Section:

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9-36 PLASTIC LUMBER

9-36.1 GENERAL REQUIREMENTS

All plastic lumber for use in the construction of marine related structures, including pier protection systems, guide walls, dock fenders, bullrails, chocks, camel systems, and rubbing strips shall be fiberglass-reinforced plastic composite marine timber unless specified otherwise in the Contract.

This work covers structural plastic (SP) components including fiberglass structurally reinforced composite piles (CP), fiberglass structurally reinforced composite lumber (SCL) and smaller dimensional fiberglass fiber reinforced composite lumber (FFRCL).

Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials shall be seamless with a smooth outer skin. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice.

Manufacturers of structural plastic component, lumbers, fiberglass structurally reinforced composite lumbers shall provide independently certified test reports and certification that the material meets the requirements of this section.

9-36.1(1) SUBMITTALS

With each shipment of plastic lumber, the Contractor shall provide a copy of the manufacturer's field guide. This guide shall include information describing the recommended means for handling, placing, installing, cutting, drilling, and repairing the plastic lumber.

9-36.2 MATERIALS

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Use polyethylene made from recycled post consumer or post industrial thermoplastics. Mix the plastic with appropriate colorants, UV inhibitors, hindered amine light stabilizers and antioxidants so that the resulting product meets the material property requirements specified in Tables 1 and 2. Structural Plastic must not corrode, rot, warp, splinter or crack. The outer skin must be smooth and black in color unless otherwise specified in the Contract Documents.

Manufacture Structural Plastic as one continuous piece with no joints or splices to the dimensions and tolerances in accordance with Table 3 and consisting of a dense outer skin surrounding a less dense core. Interior voids shall not exceed 3/4 inch in diameter. Structural Plastic shall be free of twist and curvature.

Reinforce 10”x10” fiberglass structurally reinforced composite lumber for use in heavy duty and medium duty fender systems with a minimum of four 1 1/2 inch reinforcing rods placed in the corners of the section. Reinforce 10”x10” fiberglass structurally reinforced composite lumber for use in light duty fender systems with a minimum of four 1 inch reinforcing rods placed in the corners of the section. Reinforce 16” O.D. Components including fiberglass structurally reinforced composite piles for use in heavy duty fender systems with a minimum of sixteen 1 1/2 inch fiberglass reinforcing rods. Reinforce 16” O.D. Components including fiberglass structurally reinforced composite piles for use in medium duty fender systems with a minimum of sixteen 1 inch fiberglass reinforcing rods.

Reinforcing rods must be continuous and offer a minimum flexural strength of 70.0 ksi when tested in accordance with ASTM D 4476 and a minimum compressive strength of 40.0 ksi when tested in accordance with ASTM D 695. Steel reinforcing rods are not permitted.

Reject any sections of structural plastic containing cracks or splits. Also, inspect the ends of the reinforcing rods and reject any sections containing reinforcing rods with voids or cracks.

Add a minimum of 15% (by weight) chopped fiberglass reinforcement to the polyethylene used for fiberglass structurally reinforced composite lumber, a minimum of 5% (by weight) chopped fiberglass reinforcement for components including fiberglass structurally reinforced composite piles and a minimum of 15% (by weight) chopped fiberglass reinforcement for smaller dimensional fiberglass fiber reinforced composite lumber. The fiberglass reinforcement may be reduced when other means of controlling cracking are specified with test results which show long term cracking is nonexistent.

Fiberglass structurally reinforced composite lumber must meet the minimum structural properties listed in Tables 4A and 4B.

Smaller dimensional fiberglass fiber reinforced composite lumber must meet the minimum physical properties listed in Table 5.

Components including fiberglass structurally reinforced composite piles must meet the structural properties listed in Tables 6A and 6B.

Table 1

Plastic Material Properties- CP and SCL

Density	ASTM D792	Skin	55-63 pcf
Density	ASTM E12	Core	34-48 pcf

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Water Absorption	ASTM D570		
		Skin	2 hrs:<1.0% weight increase 24 hrs:<3.0% weight increase
Brittleness	ASTM D746	Skin	No break at -40°F at 5 ft-lbs/in
Impact Resistance	ASTM D746 Modified	Skin	Greater than 4 ft-lbs/in
Hardness	ASTM D2240	Skin	44-75 (Shore D)
Ultraviolet	ASTM D4329 (B Lamp)	Skin Core	500 hours<10% change in Shore D Durometer Hardness 500 hours<10% change in Shore D Durometer Hardness
Abrasion	ASTM D4060	Skin	Weight Loss: <0.02 oz Wear Index: 2.5 to 3.0 Cycles=10,000 Wheel=CS17 Load-2.2 lb
Chemical Resistance	ASTM D543	Skin/Core Sea Water Gasoline No. 2 Diesel	 <1.5% weight increase <7.5% weight increase <6.0% weight increase
Tensile Properties	ASTM D638	Skin/Core	Minimum 500 psi at break
Compressive Modulus	ASTM D695	Skin/Core	Minimum 40 ksi
Static Coefficient of Friction	ASTM F 489-03		Maximum 0.25, wet
Nail Pull-Out	ASTM D1761	Skin/Core	Minimum 60 lb

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Table 2 Plastic Material Properties FFRCL		
Density	ASTM D6111	50-65 pcf
Brittleness	ASTM D746	No break at -40°F at 5 ft-lbs/n
Impact Resistance	ASTM D746 Modified	Greater than 4 ft-lbs/in

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Table 2 Plastic Material Properties FFRCL		
Hardness	ASTM D2240	44-75 (Shore D)
Ultraviolet	ASTM D4329 (B Lamp)	500 hours <10% change in Shore D Durometer Hardness
Abrasion	ASTM D4060	Weight Loss: <0.02 oz Wear Index: 2.5 to 3.0 Cycles = 10,000 Wheel = CS17 Load -2.2 lb
Chemical Resistance	ASTM D543 Sea Water Gasoline No. 2 Diesel	 <1.5% weight increase <7.5% weight increase <6.0% weight increase
Tensile Properties	ASTM D638	Minimum 3000 psi at break
Static Coeffecient of Friction	ASTM C1028 (Neolite-wet)	Minimum 0.50, wet or dry
Nail Pull-Out	ASTM D 1761	Minimum 250 lb
Screw Withdrawal	ASTM D6117	Minimum 450 lb

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Table 3 Dimensions and Tolerances		
Structural Plastic	Dimension	Tolerance
Length	Per order (80 ft Maximum)	0/+6 inch
Width	See Contract Plans	±1/4 inch
Height	See Contract Plans	±1/4 inch
Corner Radius – SCL Corner Radius – FFRCL	1 3/4 inch 1/4 inch	±1/4 inch ±1/16 inch
Outer Skin Thickness	3/16 inch	±1/8
Distance from outer surface to center rebar elements (SCL)	2 inches	±1/4 inch

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Distance from outer surface to center rebar elements (CP)	1 3/8 inches	±1/4 inch
Straightness (gap, bend or inside while lying on a flat surface)		<1 1/2 inches per 10 feet

Table 4A Structural Properties for Heavy Duty and Medium Duty SCL	
Member Size	10 inches x 10 inches
Modulus of Elasticity as derived below	521 ksi
Stiffness, E.I.	4.05E+08 lb-inch^2
Yield Stress in Bending	5.8 ksi
Weight	30-37 lb/ft

Table 4B Structural Properties for Light Duty SCL	
Member Size	10 inches x 10 inches
Modulus of Elasticity as derived below	307 ksi
Stiffness, E.I.	2.39E+08 lb-inch^2
Yield Stress in Bending	3.4ksi
Weight	28-35 lb/ft

Determine the Modulus of Elasticity of a full size specimen by conducting a three point bend test with a load applied in the center of a simply supported 14-foot span, at a deflection rate of 0.25 inch per minute. The Modulus is to be taken at a strain of 0.01 inch per inch, where strain equals (6) x (depth of cross section) x (deflection) / (span length squared) and where Modulus of Elasticity equals (load) x (span length cubed) / [(48) x (deflection) x (moment of inertia)].

Table 5 Properties for FFRCL	
Modulus of Elasticity ASTM D 6109	306,000 psi
Flexural Strength ASTM D 6109	2,500 psi
Compressive Strength ASTM D 6108	1,960 psi

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Compressive Strength Parallel to gain ASTM D 6112	3,500 psi
Compressive Strength Perpendicular to gain ASTM D 6112	700 psi

Table 6A Structural Properties for Heavy Duty CP	
Member Size	16 inch O.D.
Modulus of Elasticity as derived below	1,146 ksi
Stiffness, E.I.	3.69E+09 lb-inch^2
Yield Stress in Bending	9.1 ksi
Weight	68-83 lb/ft

Table 6B Structural Properties for Medium Duty CP	
Member Size	16 inch O.D.
Modulus of Elasticity as derived below	622 ksi
Stiffness, E.I.	2.0E+09 lb-inch^2
Yield Stress in Bending	4.9 ksi
Weight	61-74 lb/ft

Determine the modulus of elasticity for composite piles using the following test:

Place a 54-foot long plastic composite marine fender piling of manufacturer's standard commercial type horizontally in a clamping device so that 6 feet of the piling will be firmly fixed and unable to move and the other end simply supported. Gradually apply a vertical (downward) load to a point 12 feet from the simply-supported end. Measure the deflection along the length of the piling at the load point, and 3 equidistant locations. Use the load and deflection data to calculate the flexural modulus of elasticity, maximum outer fiber stress, stiffness (EI), and the bending stress. The flexural modulus of elasticity is calculated by dividing EI by the moment of inertia of the cross section of the product.

Calculate the properties in Tables 6A and 6B utilizing standard elastic beam flexure formulas (as found in references such as Machinery's Handbook; and Formulas for Stress and Strain, by Roark and Young). Report the Stiffness (EI) as the average of the stiffness at all measurement locations, between zero load and half the load corresponding to the specification yield stress. The specified minimum yield stress in bending shall be reached before failure of the product. Calculate the stress at the load point, on the tension side of the plastic composite marine piling.

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As stated, conduct the tests on a full-scale product of the specified size. The results of these tests may be extended through engineering calculations, to a product of another size only if the other size has the same or smaller cross section than the tested product. Do not use smaller cross sections to predict the performance of larger cross sections.

Components including fiberglass structurally reinforced composite piles shall exhibit recoverable deflection with not more than a 5% reduction in bending stiffness (EI) when cyclically load tested. Upon request, the manufacturer of the composite piles must provide cyclical, flexural load test results from an independent test laboratory ensuring the tests were conducted under four point load conditions with a minimum 30.5 feet clear span and a minimum 15 feet shear span. They must have also been conducted on a minimum of a 13" O.D. Structural Plastic pile, for a minimum of 200 load cycles with the applied load producing a minimum of 40% of the composite pile's bending moment at yield, as determined by the formula M = f (I / c) where:

M = bending moment at yield (in-lbs)

f = yield stress in bending (lb/in^2)

I = moment of inertia of cross-section (in^4)

c = distance from neutral axis to point where stress is desired (inches)

9-36.3 REINFORCING

The plastic lumber shall be reinforced with fiberglass elements. . Steel reinforcing rods are not permitted. The reinforcing elements shall conform to the characteristics shown below.

FIBERGLASS REINFORCING (TYPICAL PROPERTIES)		
Flexural Strength (ASTM D4476)	Flexural Strength	70,000 psi
Compressive Properties (ASTM D695)	Compressive Strength	40,000 psi

Reject any sections of structural plastic containing cracks or splits. Also, inspect the ends of the reinforcing rods and reject any sections containing reinforcing rods with voids or cracks.

9-36.4 DIMENSIONS

The plastic lumber shall have a square cross section with radiused corners. Both ends shall be cut square. Dimensions shall be as shown below.

MARINE LUMBER DIMENSIONS		
Marine Timber	Dimension	Tolerance
Length	Per order (105 feet maximum)	+/- 12.0 inches
Width	12.0 inches	+/- 0.5 inches
Height	12.0 inches	+/- 0.5 inches

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Corner radius	2.0 inches	+/- 0.375 inches
Outer Skin Thickness	0.1875 inches	+/- 0.125 inches
Rebar Quantity/Diameter	(4) /1.25 inches	+/- 0.125 inches
Distance from outer surface to rebar elements	1.75 inches	+/- 1.0 inch
Straightness (gap, bend or bulge inside while lying on a flat surface)		< 1.5 inches per 10 feet of length

9-36.5 MANUFACTURING PROCESS

Plastic lumber shall be manufactured in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification, but which are a part of manufacturer's standard commercial product, may be included in the plastic lumber being furnished. A standard commercial product is one that has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs or brochures, and represents the latest production model. Manufacturer shall provide documentation that it has manufactured the product for a minimum of 10 years.

The plastic lumber shall be manufactured in a continuous process that will result in it having no joints. The plastic lumber shall have a coextruded outer skin of dense, unblown plastic, an inner core of foamed plastic manufactured prior to the manufacture of the timber, and an annulus of foamed plastic encapsulating the reinforcing elements. The plastic lumber shall conform to the design requirements of the specification.

9-36.5(1) A COLORED OUTER SKIN

The outer skin shall be colored to Engineer's requirements, however it shall be black in color unless otherwise specified in the Contract documents. It shall contain hindered amine light stabilizers to provide sufficient resistance to ultra violet light degradation as to conform to the applicable requirements of Paragraph 9-36.2. The outer skin of the plastic lumber shall be continuous and homogenous throughout the entire length and perimeter of the timber. It shall be formed by co-extruding a plastic material at the same time that the annulus material is extruded. It shall conform to the applicable requirements of Paragraph 9-36.2. The outer skin of the plastic lumber shall be generally smooth but may contain occasional blisters and pockmarks.

9-36.5(2) ANNULUS

The annulus of the timber shall be a continuous foamed structure throughout the entire length of the timber. It shall conform to the applicable requirements of Paragraph 9-36.2 requirements, and shall be black in color. The annulus shall be melt fused to the inner core in such a manner that the joint between the inner core and the annulus develops the full strength of the plastic.

9-36.5(3) INNER CORE

The inner core of the plastic lumber shall be a continuous foamed structure throughout the entire length of the timber. It shall conform to the applicable requirements of

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Paragraph 9-36.2, and shall be black in color. Butt joints as required for manufacturing may be utilized provided the full strength of the plastic is developed in the joint. The foamed inner core should be homogenous and reflect a consistent cell structure when viewed across the grain. The product shall contain no singular interior void in excess of 1" in diameter or greater than 3" in length.

9-36.5(4) REINFORCING

The reinforcing elements shall be arranged in a square pattern, as described in Paragraph 9-36.4. The reinforcing elements shall be those of standard industry make and appearance, and free from kinks and sharp bends within the annulus of the plastic lumber. All plastic lumber shall have a quantity of four (4) fiberglass reinforcing elements, unless specified otherwise, with the diameter listed in Paragraph 9-36.4. Each individual element shall typically run the entire length of the timber, terminating flush with the ends, with the rebar exposed. No plastic, fiberglass or metal elements or supports for the reinforcing element shall be used in the timber.

9-36.5(5) IDENTIFICATION MARKS

All individual plastic lumber shall be clearly marked with the manufacturer's name and distinct serial number near each end of the product.

9-36.5(6) QUALITY ASSURANCE

The Contractor shall verify that the manufacturer has a Quality Assurance Program in place to ensure the plastic lumber is manufactured to the specifications noted.

9-36.6 PERFORMANCE

9-36.6(1) STRUCTURAL CHARACTERISTICS

The plastic lumber shall be designed to provide the structural characteristics as specified in the tables in Paragraph 9-36.2 when using the material properties.

The plastic lumber shall be designed to provide the following structural characteristics when using the material properties other than the members as specified in Paragraph 9-36.2:

Flexural Modulus of Elasticity	319,123 psi
Stiffness (EI)	5.17 x 108 lb.in2
Yield Stress in Bending	3,466 psi
Weight	41-50 lb./ft.

9-36.6(2) INTERCHANGEABILITY

All units of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to insure interchangeability of component parts, assemblies, accessories, and spare parts.

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9-36.6(3) REPAIRABILITY

The outer skin must be repairable if chipped or spalled. The Contractor shall provide to the owner a field guide describing the manufacturer's recommended standard repair procedures.

9-36.3(7) EXAMINATION

Each complete piece of plastic lumber shall be examined by the Contractor for compliance with the appropriate requirements of this specification. This inspection shall encompass all visual examinations and dimensional measurements. Records maintained by the Contractor will be inspected to ensure that the materials used in construction of all contract items conform to the requirements. In particular, it shall be verified that the material requirements of Paragraph 9-36.2 and Paragraph 9-36.3 and manufacturing tolerances found in Paragraph 9-36.4 are met. Noncompliance with any specified requirements or presence of one or more major defects preventing or lessening maximum efficiency shall constitute cause for rejection.

9-36.3(7)A TESTS

The Contractor shall provide manufacturer's documentation showing that the tests described in Paragraph 9-36.2 and Paragraph 9-36.3 have been performed, and that the test results meet the requirements of this specification. The tests shall be conducted entirely by a testing laboratory independent of the manufacturer, under the direction of a testing engineer. The Contractor shall also provide manufacturer's documentation of the test reports that show the results of the physical and mechanical tests listed Paragraph 9-36.2. For these tests, all test specimens shall be extracted from a full-scale product. Test specimens shall not be made by injection or compression molding or calendering, but shall be made from plastic cut from the full-scale product (except those tests that require the entire cross section of the product to be tested).

The product shall be tested in bending to quantitatively determine the flexural modulus of elasticity and the bending yield stress. The product shall be tested full-scale. Scale model tests are not acceptable. The test configuration shall be three point or four point bending (the product shall be simply supported at two locations, with the load applied equidistant from the two supports). The product shall be loaded at least until the specified minimum yield stress is reached, or until failure if so desired. During the test, load and corresponding deflection data shall be recorded.

Load and deflection data acquired during the test shall be used to calculate the stiffness (EI), and the bending stress. The flexural modulus of elasticity is calculated by dividing EI by the moment of inertia of the cross section of the product as described in Paragraph 9-36.2.

.Calculations of the properties in Paragraph 9-36.2 and 9-36.6(1) shall be made utilizing standard elastic beam flexure formulas. The specified minimum yield stress in bending shall be reached before failure of the product.

Test results may be extrapolated from full scale testing of products with similar cross sectional size for different rebar sizes and configurations. Test results may also be extrapolated to a product of another cross sectional size only if the other size has the same or smaller cross section than the tested product. Smaller cross sections shall not be used to predict the performance of larger cross sections.

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9-36.3(8) SHIPPING

Plastic lumber shall be shipped in a manner to minimize any scratching or damage to the outer surface.

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Add the following new Division

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DIVISION 10

OPERATING MACHINERY

10-01 GENERAL REQUIREMENTS

10-01.1 DESCRIPTION

The work Specified in the Sections contained in Division 10 consists of the construction of the operating machinery, trunnion assembly, and span lock complete, as indicated on the Contract Drawings.

10-01.2 MATERIALS

Unless otherwise specified in Division 10, materials shall be in accordance with the Standard Specifications.

10-01.3 CONSTRUCTION REQUIREMENTS

Construction shall be in accordance with the Standard Specifications, as amended by the Special Provision, including Division 10.

10-01.4 MEASUREMENT

No Measurement will be made for the items of work under this Section.

10-01.5 PAYMENT

All work specified in Division 10 Sections will be paid in accordance with Section 1-04.1 under one of the following items:

The Contract lump sum price for "Drive Machinery" shall be full compensation for manufacturing, furnishing, shipping, installing, inspecting, testing, and adjusting all operating machinery including such accessories as auxiliary drive system, shims within machinery parts, and bolts for connecting machinery parts together and to structural supports. The cost shall include painting the operating machinery along with all materials; bolts, shims, keys, and lubricants; labor; equipment; tools, spare parts, drip pans, warranties, and for furnishing all drawings, manuals, charts, guarantee, and other data and services; including adjusting and aligning, required to properly execute and place in complete working order the operating machinery in accordance with the Plans, Specifications and Special Provisions. The cost shall also include installing, adjusting and aligning of related electrical equipment including motors, brakes and limit switches. Payment for furnishing electrical work associated with the “Drive Machinery”, including motors, brakes and limit switches is not part of this item, but is paid for under "Bridge Electrical System".

The Contract lump sum price for "Trunnion Assembly" shall be full compensation for manufacturing, furnishing, shipping, installing, inspecting, testing, and adjusting all trunnion machinery including such accessories as shims within machinery parts, and bolts for connecting machinery parts together and to structural supports. The cost shall include painting the trunnion assembly machinery along with all materials; bolts, shims, keys, and lubricants; labor; equipment; tools and for furnishing all drawings, manuals, charts, guarantee, and other

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data and services; including adjusting and aligning, required to properly execute and place in complete working order the trunnion machinery in accordance with the Plans, Specifications and Special Provisions.

The Contract lump sum price for "Span Lock" shall be full compensation for manufacturing, furnishing, shipping, installing, inspecting, testing, and adjusting all span lock machinery including such accessories as shims within machinery parts, and bolts for connecting machinery parts together and to structural supports. The cost shall include painting the span lock machinery along with all materials; bolts, shims, keys, and lubricants; labor; equipment; tools and for furnishing all drawings, manuals, charts, guarantee, and other data and services; including adjusting and aligning, required to properly execute and place in complete working order the span lock machinery in accordance with the Plans, Specifications and Special Provisions.

Payment for furnishing electrical work associated with the “Span Lock Machinery”, is not part of this item, but is paid for under "Bridge Electrical System".

LOCK 10-02 DRIVE MACHINERY, TRUNNION ASSEMBLY, AND SPAN MACHINERY

10-02.1 DESCRIPTION

The work under this Section shall consist of furnishing all labor, equipment and materials (including spare parts) as shown on the Plans and specified herein. This work includes manufacturing, shop testing, shipping, installing, adjusting, painting, lubricating and field testing to place in correct, satisfactory operating condition the operating machinery and span locks, lock bars, guide sockets, receiving sockets, and supports.

The Contractor shall supply and install new span locks at each pair of aligned bascule girders for the double leaf bascule span as shown on the plans. All materials and equipment required shall be new. The center locks are designed to provide stability at the transition from one movable leaf to the other when traffic passes over the span.

Apparatus for controlling the operation of the span including conduits, boxes, wiring, cables and other equipment required to extend the necessary circuits from the control house to the respective components is specified in Section 8-19, Bridge Electrical.

10-02.1(1) SPECIFICATIONS AND STANDARDS

The design, material requirements, workmanship, and erection of all machinery components shall meet the applicable requirements of AASHTO LRFD Movable Highway Bridge Design Specifications, 2nd Edition, 2007, with 2008 interim Revisions, hereinafter referred to as the AASHTO Specifications, and any other specification or standard as specified herein or as shown on the Plans.

Portions or all of certain recognized industry or association standards or specifications referred to herein as being a requirement of these Specifications shall be considered as binding as though reproduced in full herein unless supplemented and/or modified by more stringent requirements of the Contract Documents. Unless otherwise stated the reference standard or specification is that which is current as of the date of issuance of these Specifications. The following abbreviations will be used herein and on the plans to designate standard specifications for material and workmanship:

American Gear Manufacturers Association	AGMA
American Iron and Steel Institute	AISI
American National Standard Institute	ANSI

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American Society of Mechanical Engineers	ASME
American Society of Testing Materials	ASTM
American Welding Society	AWS
National Electrical Manufacturers Association	NEMA
National Lubricating Grease Institute	NLGI
Occupational Safety and Health Act	OSHA
Society of Automotive Engineers	SAE
Steel Structures Painting Council	SSPC

10-02.1(2) REQUIRED DRAWINGS AND DATA

The Contractor shall furnish data and drawings on the mechanical equipment as specified herein and as required elsewhere in the Plans and specifications. Data and charts shall be submitted, and/or installed on the job, as called for.

Wiring diagrams shall be furnished for all components that include electrical connections.

10-02.1(3) WORKING DRAWINGS

Working drawings as necessary for the fabrication and assembly of the operating machinery shall be prepared by the Contractor and shall be submitted to the Engineer for approval as described in the Special Provisions, and as required herein. The drawings shall include complete details of fabricated machinery parts, catalog and data sheets of standard components, and a tabulation giving the name of the part, description, function, weight, manufacturer, rating, type, model, and catalog and serial number of each component. Each component shall be identified by an item number and complete assembly layout drawings shall be furnished identifying each component by the item number.

The Plans show general details of the machinery, in keeping with the requirements and in accordance with the AASHTO Specifications. These Plans are not intended to be complete in all details. The ratios of teeth between individual pairs of gears, and the layout and arrangement of parts may be varied to permit maximum use of the Contractor's standard patterns and shop procedures, provided the overall ratios and times of operation for normal and auxiliary power as specified, are maintained, the size and strengths of all machinery parts are proportioned to conform to the requirements of the AASHTO Specifications, and that the standard of quality in details as shown in the Plans is maintained.

Structural support for machinery, and exact positions of parts, shall be detailed by the Contractor after the final machinery layout has been determined. Minor parts, which are required but not shown in detail in the Plans, shall be detailed by the Contractor in accordance with best standard practice.

The working drawings shall show finish tolerances and allowances for all fits.

Working drawings shall show all parts completely detailed and dimensioned. The grade and extent of finish machining, with all tolerances and allowances, shall be stated for each part for which a specific fit is required. Finished surfaces shall be as defined by the ANSI B46.1, Surface Texture; and fits shall be as defined by the ANSI B4.1, Preferred Limits and Fits for Cylindrical Parts, unless otherwise stated herein or on the Plans. ANSI B4.1 shall also apply to fits for non-cylindrical parts.

Manufactured components shall be shown in outline on the drawings, with sufficient dimensions and data to determine the clearances required for installation and operation. Manufacturer's certified dimension prints shall state the name of the job; pertinent ratings of the equipment; and shall indicate, where applicable, the provisions for adding, draining, and

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checking the level of lubricant; the method of lubrication and type of fittings; and the location of inspection openings.

The Contractor shall furnish complete data regarding the design and construction of all manufactured items to be furnished under this Contract, including material specifications, cross-sectional assembly drawings, detail drawings of component parts, and the dimensions of principal elements.

Complete shop bills of materials shall be made for all machinery parts. If the bills are not shown on the working drawings, prints of the bills shall be furnished for review in the same manner as specified for the drawings.

Working drawings shall give identifying marks and critical dimensions for locating each part or assembled unit with respect to the bridge or foundation.

The Contractor shall submit to the Engineer for review the required number of prints of all working drawings. In case of correction or rejection, the Contractor shall resubmit the required number of prints of working drawings until drawings are approved and such procedure shall not be considered a cause for delay. The Contractor shall bear all costs for damages, which may result from the ordering of any materials prior to the approval of the working drawings; and no work shall be done until the working drawings have been reviewed and approved by the Engineer. The Contractor shall supply the Engineer with eight (8) sets of prints of the approved drawings.

Contractor shall submit a stress relief heat treatment procedure for all conditions as required and specified herein, to the Engineer for approval. The procedure shall include a description of the part and an explanation of the proposed heat treatment, including the rate of heating, the soaking temperature, the time at the soaking temperature, the rate of cooling, and the temperature at which the part is to be withdrawn from the chamber, and any other information to fully explain procedure.

Approval of the working drawings by the Engineer shall not relieve the Contractor from full responsibility for the satisfactory construction and operation of the machinery.

10-02.1(4) MAINTENANCE AND OPERATION MANUAL

The Contractor shall furnish to the Engineer 12 bound copies of a booklet containing descriptive leaflets and drawings covering all items of the mechanical equipment, with catalog numbers indicated; printed or typewritten statements prepared by the manufacturers of the equipment covering the proper methods of assembly, installation, operation, adjustments, alignment, lubrication, and otherwise maintaining each item; a detailed description of the functions of each item in connection with the various operating steps; charts showing the locations of all lubricating fittings and other points of lubrication; and complete parts lists and replacement parts numbers where applicable.

Manuals shall contain as a minimum the following:

1. Table of Contents in numerical page order.
2. Index, in alphabetical order.
3. Manufacturer's literature describing each piece of equipment and giving complete identification including manufacturer's model numbers and drawing numbers. A set of descriptive leaflets, bulletins and drawings covering all items of equipment. The catalog number of each piece shall be given, to be used in case it becomes necessary to order replacement parts from the original manufacturer.

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4. Operation instructions, including step-by-step description for starting, operating, shutdown, draining and cleaning of all machinery components including manual operation where applicable. Operation instructions shall note all precautions required for correct and safe operation.
5. Maintenance and lubrication instructions for the machinery components as well as reduced size copy of lubrication charts specified herein elsewhere.
6. Local representatives and suppliers' name, addresses and phone numbers.
7. Spare parts data.
8. Reduced size drawings of all approved working drawings that show all as-built corrections.

Manual documents shall be approximately 81/2-inch by 11-inch (or 11-inch by 17-inch, folded) and shall bound in heavy-duty three hole binders which will not be more than 3-inch in thickness. Covers for manuals shall be rigid plastic or other approved material. Reduced size drawings shall be contained in the manuals without excessive folding so that they may be easily opened. Drawings shall be in black on white background and shall be clearly legible

10-02.1(5) GEAR REDUCER CALCULATIONS

The reducer manufacturer shall furnish calculations demonstrating reducers supplied meet requirements as specified by applicable AGMA standards and herein. Calculations shall be submitted to the Engineer for approval. The reducer manufacturer shall also submit a shop testing procedure and arrangement to the Engineer for review and approval.

10-02.1(6) MECHANICAL EQUIPMENT ORDERS

Notification is hereby given that some items listed in the machinery schedule are considered long lead items. Within 30 days after the date of the Notice to Proceed, the Contractor shall furnish evidence to the Engineer that the rack pinion pillow block bearings, the secondary gear reducer, the central gear reducer, and the auxiliary gear reducers have been ordered. Evidence may be in the form of copies of purchase orders or a signed written statement showing date and company from which each item was ordered.

10-02.1(7) MACHINERY ALIGNMENT REPORT

The Contractor shall prepare a letter report that details the final alignment of the machinery. The report shall list the date and temperature conditions at the time of measurement. The report shall contain a table that lists the components, the components allowable misalignment tolerance as specified by the manufacturer, and the measured alignment. The report shall include final reduction in clearance measurements, measured by the use of feeler gauges, for all pillow block bearing adapters. Counterweight rope tension measurements performed with the span in the down position shall also be included in the report. The uphaul operating rope's tension with the span in the down position and down haul operating rope's tension with the span in the up position shall also be contained in the report. The report shall be submitted to the Engineer for final approval and final acceptance of the machinery.

10-02.2 MATERIALS

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The materials shall meet the minimum requirements specified herein or as specified on the Plans, if plan requirements are more stringent. The Plans show equipment schedules listing the minimum design requirements for the new equipment.

All equipment and materials furnished under the items specified herein shall be brand new. All equipment, materials and workmanship shall be first class in every particular, and shall be manufactured and installed to the satisfaction of the Engineer.

All recognized industry or association standards or specifications referred to herein as being a requirement of these Special Provisions shall be considered as binding as though reproduced in full herein unless supplemented and/or modified by more stringent requirements of the Contract Documents. Unless otherwise stated the reference standard or specification which is current as of the date of issuance of these Special Provisions shall be governing. The following abbreviations will be used herein and on the Plans to designate standard specifications for material and workmanship:

American Association of State Highway and Transportation Officials ... AASHTO
American Gear Manufacturers Association ..... AGMA
American Iron and Steel Institute ..... AISI
American National Standards Institute ..... ANSI
American Society of Mechanical Engineers ..... ASME
ASTM International (formerly American Society of Testing Materials)... ASTM
American Welding Society..... AWS
National Electrical Manufacturers Association ..... NEMA
National Lubricating Grease Institute ..... NLGI
Occupational Safety and Health Administration ..... OSHA
Society of Automotive Engineers..... SAE
Steel Structures Painting Council ..... SSPC
American Bearing Manufacturer's Association..... ABMA

10-02.2(1) STEEL CASTINGS

Steel castings shall conform to the material requirements as shown on the Plans and as specified herein.

Patterns for castings specifically cast for this project, shall be substantially constructed and shall be finished to give a neat appearance to the castings. Unfinished edges and inside corners shall have rounded edges and fillets. Draft in patterns shall assure a minimum thickness equal to that shown on the Plans. Ample thickness of material shall be provided so that after finishing, the thickness of metal at every point will not be less than shown on the Plans. The allowance for draft shall be as small as is practicable. After use, patterns shall be shipped to the site and stored at the location as directed by the Engineer.

Each pattern shall have a distinctive mark to correspond with their respective item numbers that will show on the castings.

All steel castings shall be fully annealed per approved heat treatment procedure. Castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blowholes, and other defects in positions affecting their strength and value for the service intended. All castings shall be sandblasted or otherwise effectively cleaned of scale and sand, to present a smooth, clean, and uniform surface. All unfinished edges of castings shall be neatly cast with rounded corners, and all inside angles shall have ample fillets. All surfaces requiring finish shall have adequate material allowance for machining to finish dimensions. All bolted mating surfaces shall be machined and finished to permit proper

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alignment as shown on the Plans. Machined bosses shall be provided on cast steel machinery parts to give proper seats for bolt heads and nuts.

Blowholes appearing upon finished castings shall be so located that a straight line laid in any direction will not cut a total length of cavity greater than one inch in any one foot, nor shall any single blowhole exceed one inch in any dimension or have an area greater than one-half square inch. Blowholes shall not have a depth injuriously affecting the strength of the casting. Minor defects that do not impair the strength may, with the approval of the Engineer, be welded by an approved process and be inspected by magnetic particle examination. The defects shall be removed to solid metal by chipping, drilling, or other satisfactory method, and, after welding, the castings shall be annealed, if required by the Engineer. Castings, which have been welded without the Engineer's permission, will be rejected.

10-02.2(2) STEEL FORGING

All forged shafts, including main drive shafts, shall be reduced to size from a single bloom or ingot until perfect homogeneity is secured. The blooms or ingots, from which shafts are to be made, shall have a cross-sectional area at least three times that required after finishing. No forging shall be done at less than a red heat. Forged rounds for shafts shall be true, straight, and free from all injurious flaws, seams, or cracks. Forging shall provide adequate material allowance for machining to finish dimensions. All forging shall be fully annealed before being machined.

10-02.2(3) OPEN GEARS

All open gears, including the rack and rack pinion, shall conform to the requirements of AASHTO Specifications and the requirements for accuracy of the AGMA Standard 2001-C95, "Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth", except as otherwise provided herein or on the Plans. The open gears shall conform to AGMA Quality No. 7 or higher. The AGMA quality number shall be stated on the applicable shop drawings.

10-02.2(4) SPEED REDUCERS

Speed reducers with minimum requirements as shown on the Plans shall conform to the requirements of AASHTO and shall also conform with AGMA Product Standard 6010-F97, "Standard for Spur, Helical, Herringbone, and Bevel Enclosed Drives", and as specified herein. The nameplate shall carry the AGMA symbol. The reducers shall be furnished by manufacturers who have provided similar equipment for at least ten (10) years.

Gears and shafts shall be heat-treated alloy steel suitable for the intended service. Gearing in enclosed reducers shall conform to AGMA Quality No. 7 or higher. Speed reducer bearings shall be anti-friction type with a B-10 life of 40,000 hours. Bearing seals shall be selected such that no leakage occurs.

AGMA life factors shall be determined assuming 2500 bridge openings and 2500 bridge closings per year for a 100 year life. Bearings shall be designed for a B-10 life of 40,000 hours. Reducer component ratings shall meet or exceed the horsepower specified on the Plans times the service factor at their respective speeds. Minimum service factors shall be as follows:

- 1.5 for durability and 1.5 for strength.

Case hardened gearing will be allowed on spiral bevel gears and spiral bevel pinions. All remaining gearing shall be through-hardened. All gear sets, including bevel gears, shall be straddle mounted unless noted otherwise. Bevel pinion gears need not be straddle mounted.

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Housings shall be of cast steel or welded steel plate construction. An inspection cover shall be provided to permit inspection of the gearing inside the housing. Inspection covers shall be provided with a gasket material that does not require replacement of the gasket when the cover is removed. The inside of the housings shall be sandblasted, cleaned and protected with lubricant prior to assembly to ensure protection from rusting.

Provisions shall be made for filling, draining, and ventilating the housings; and a sight gauge shall be mounted on each unit to read the recommended lubricant level. Ventilation opening shall come equipped with a moisture (hygroscopic) and particle filtration unit. The drain provisions shall include a shut-off valve between a drain pipe cap and the reducer. A hose bibcock or other device suitable for connecting a 1 inch drain hose shall be provided for each reducer. A drain hose shall be provided for use in the pier when oil must be drained from the reducers. The hose shall be a minimum of 50 feet long. The hose shall be provided with a storage reel and shall be permanently mounted in the pier.

Speed reducers shall be provided with continuous oil bath lubrication at varying speeds and direction. RPM shown on the Plans is maximum rated speed, but machinery shall be capable of reduced speed with no adverse affect and supply of proper lubricant to all portions of the reducer. The lubricant level shall be such that all shaft bearings are submerged or to such higher level as recommended by the reducer manufacturer. The reducers shall be provided with effective seals to retain the lubricant such that no visible or measurable lubricant is detectable on input/output shafts.

Speed reducer shaft deflections shall be less than 0.001 inches per inch of gear face width under full load.

The central reducer shall be a parallel shaft, double reduction, selectable differential / non differential, triple input, and double output unit as shown on the Plans. Total ratio and ratio after auxiliary drive input shall be provided as indicated in the Plans. Differential shall be located, such that, when auxiliary drive is operational, the differential will still be utilized. A shaft extension shall be located, as shown on the Plans, for auxiliary drive input. The main input shafts shall be extended to accommodate the flexible brake coupling, and to provide suitable clearance. The output shaft and reducer bearings shall be designed to withstand overhung loads and sized to accommodate coupling hub and key on either side. The efficiency of the unit shall not be less than 94 percent and shall be stated on the applicable shop drawings.

The central reducer manufacturer shall coordinate requirements and limitations associated with the auxiliary drive input shaft with the clutch manufacturer. The central reducer manufacturer shall also design the auxiliary drive input shaft and associated bearings for the overhung load and deflection requirements per clutch manufacturer's requirements to ensure satisfactory clutch operation.

The auxiliary reducer shall be a right angle, single reduction, single input, single output unit as shown on the Plans. Total ratio shall be provided as indicated on the Plans. The auxiliary output shaft reducer bearings shall be designed to withstand overhung loads and extended to accommodate the clutch. The efficiency of the unit shall not be less than 97 percent and shall be stated on the applicable shop drawings.

The secondary reducer shall be a parallel shaft, double reduction, single input, and single output unit as shown on the Plans. Total ratio shall be provided as indicated on the Plans. The output shaft reducer bearings shall be designed to withstand overhung loads.

The Contractor shall furnish complete calculations regarding the design of the reducers including gearing, shafts, seals, bearings, and material specifications.

10-02.2(5) SHAFTS

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Shafts shall be of forged steel of the size and material as shown on the Plans and as specified herein. Forged rounds for shafts shall be true, straight, and free from all injurious flaws, seams, or cracks. Forgings shall provide adequate material allowance for machining to finish dimensions. All forgings shall be thoroughly annealed before being machined.

All shafts shall be accurately finished, round, smooth, and straight; and when turned to different diameters, they shall have rounded fillets at shoulders and chamfers at shaft ends. All journal-bearing areas on shafts and pins shall be accurately turned, ground, and polished with no trace of tool marks or scratches on the journal surface or adjoining shoulder fillets.

The shaft journals for roller bearings shall be sized and finished as required by the manufacturer of the mated equipment at that location.

The journals for mounting sheaves, drums, and couplings shall be finished to provide the interference fits specified. The shafts shall have a shop shrinkage fit which may be made by heating the sheave, drum, or coupling to the required temperature and inserting the shaft or by other approved means.

Hot rolled steel may be used for shafting with a finished diameter of 6 inches or less. Each shaft shall be machine finished for its entire length to obtain a smooth finish concentric with the coupling and bearing centerline. There will be no exceptions or substitutions permitted with regard to concentric machining of the shafts.

All shafts shall have provisions, such that, a hydraulic system for mounting and dismounting spherical roller bearings may be utilized. These provisions shall be coordinated with the bearing manufacturer

10-02.2(6) TRUNNIONS

Trunnions shall conform to the material requirements as shown on the Plans and as specified herein.

Trunnion shafts shall be reduced to size from a single bloom or ingot until perfect homogeneity is secured. The blooms or ingots, from which the trunnions are to be made, shall have a cross-sectional area at least three times that required after finishing. No forging shall be done at less than a red heat. Forged rounds for trunnions shall be true, straight, and free from all injurious flaws, seams, or cracks. Forgings shall provide adequate material allowance for machining to finish dimensions. All forgings shall be fully annealed before being machined.

Trunnions shall be accurately finished, round, smooth, and straight; and when turned to different diameters, they shall have rounded fillets at the shoulders as shown on the plans. All areas on shafts shall be accurately turned, ground, polished with no trace of tool marks or scratches, on the journal surface or adjoining shoulder fillets. Each trunnion shall have crossed centerlines scribed at right angles to each other, on each end of the shaft, to be used as a guide in aligning the trunnions. Trunnions shall be fabricated and in conformance to the limits specified in the AASHTO Specifications.

10-02.2(6)A TRUNNION BEARINGS

10-02.2(6)B TRUNNION SPIDERS

10-02.2(7) AUXILIARY DRIVE CLUTCH

An electric clutch with minimum requirements shown on the Plans shall be furnished as a part of the span drive system. The clutch shall be designed to be normally disengaged and electrically engaged. The driven portion of the clutch shall be connected to the central reducer auxiliary input shaft. The driving portion of the clutch shall be connected to the

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auxiliary reducer output. The clutch hub and shaft fits and finishes shall meet the requirements specified on the plans and AASHTO for hubs on shafts.

The clutch shall be a high torque, low inertia, electromagnetic clutch. The clutch shall be equipped with friction linings, on the driven end only, that can be replaced without disturbing related equipment on either side of the clutch, and a spring lock pin to adjust the air gap. The clutch assembly shall also be furnished with a NEMA Type 3R enclosure and strip heater.

The clutch will be turning at approximately 60-RPM base speed under auxiliary drive operation. Under main drive operation the driven portion of the clutch will be turning at approximately 1470-RPM speed. The clutch shall be dynamically balanced for operation at these speeds

10-02.2(9) COUPLINGS

Couplings shall be of the type and size as shown on the Plans and shall include grid type, gear type, brake wheel type and others as noted.

All couplings and shaft fits and finishes shall meet the requirements specified in the plans and AASHTO for hubs on shafts. Couplings shall, in general, be finish-bored and have keyways cut by the Coupling Manufacturer to dimensions and tolerances established on the working drawings and then shipped to the manufacturers of the various components for shop installation on the shafts.

The couplings shall have provisions for lubricating all contact surfaces and the housings shall be oil-tight under all operating conditions.

All couplings shall be equipped with giant button head lubrication fittings and purge plugs for lubrication of internal parts as recommended by manufacturer and approved by the Engineer.

10-02.2(10) SPHERICAL ROLLER BEARINGS

Bearings shall be anti-friction bearings of the spherical roller type and size as shown on the Plans and as specified herein. All bearing fits and finishes shall be in accordance with ANSI B4.1, Preferred Limits and Fits for Cylindrical Parts and ANSI B46.1, Surface Texture. Bearing loads on rollers shall not exceed loads per linear inch as specified in AASHTO for “Bearing on Rollers”. Anti-friction bearings shall be rated with a B-10 life of 40,000 hours.

Bearings shall be made by a manufacturer of established reputation who has made bearings that are of comparable size and capacity, that have been in service for a period of ten years or more. Standards of the ABMA shall be the basis of manufacture, and shall be the basis of equivalency. Each bearing shall have two separate rows of spherical rollers. Complete details of bearing assemblies shall be submitted to the Engineer for approval.

Bearing housings shall be ASTM A27 cast steel, or shall be fully annealed, ASTM A36 weldments. Two-piece split construction shall be provided for accurate cap and base registration. Cap bolts shall be secured with double hex nuts and base bolts shall be sub-drilled in the shop 0.030-inch under bolt shank diameter to permit reaming.

All bearings shall be equipped with giant head lubrication fittings and purge plugs for lubrication of internal parts as recommended by manufacturer and approved by the Engineer.

Rack pinion bearings shall have hydraulic mount and dismounting system. The hydraulic system shall assist in installation and removal of bearings onto corresponding journals. Bearing manufacturer shall coordinate requirements with shaft manufacturers.

10-02.2(11) SPAN LOCKS

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10-02.2(11)A LOCK BAR OPERATOR

Each system shall include a mechanical bar actuator which drives the rectangular, forged steel lock bar through a bar guide, situated on one leaf tip, into a receiver on the other leaf tip. The gearing shall consist of two reductions using heat-treated, alloy steel helical gears on shafts supported by anti-friction bearings. Linear motion shall be provided by a triple lead ACME threaded stem, pin connected to the lock bar. The lock bar operator shall incorporate a bar guide within the operator housing for the lock bar.

A removable hand crank shall be furnished for manual operation. A removable cover shall be provided over the shaft end. The shaft cover shall have a single pole snap action switch which activates on removal of the hand crank shaft cover. All leads for brake cover switch and motor shall be located in the motor conduit box. The operator shall be foot mounted in either vertical or horizontal positions, as required.

Each operator shall be driven by a high starting torque, induction type, 5 horsepower, 1800 RPM, 3 phase, 60 Hertz, 240/480 volt, D flange mounted, TENV electric motor having a continuous duty rating and equipped with a marine duty disc brake with manual release and safety interlock switch. The motor shall be equipped with ball bearings and designed especially for outdoor applications subjected to adverse weather and corrosion conditions.

Travel of the lock bars in each direction shall be governed by a two pole, snap action limit switch that provides two normally open and two normally closed contacts for each direction of travel. The lock bar shall travel at approximately 1-1/2 inches per second and be capable of delivering a minimum thrust of 8,800 pounds to the lock bar at 50% stall torque of the motor.

Four span lock systems, one in the vicinity of each bascule girder, shall be located at the leaf tips to hold the leaves securely in the closed position and capable of sustaining a maximum shear load transfer of at least 60,000 pounds per girder.

Operator components shall be so designed and detailed such that stalling the motor shall not result in any physical damage to the lock bar operator mechanical components.

10-02.2(11)B GUIDES AND RECIEVERS

Each span lock shall consist of one rear guide, one front guide and one receiver located as shown on the Plans. The lock bar guides and receivers shall be of the zero clearance, energy absorbing type designed for use in bascule bridge service for not less than three years. Each guide and receiver shall have high strength bronze wear shoes supported by a combination of stainless steel springs that permit slight vertical movement of the shoes. When the lockbar is inserted into the guide and/or receiver, it shall cause the shoes to depress the springs slightly resulting in a pre-loaded condition that will provide continuous firm contact between the lockbar and shoes. The selection and design of the system shall be such that the relationship of the minimum and maximum stresses will provide infinite fatigue life of the energy absorbing spring system. Adjustment of the pre-load between the shoes and lock bar shall be possible without disassembly of the guides or receivers.

After installation and alignment of the span lock systems, the lock bar and socket assemblies shall be adjusted to achieve correct clearances as shown on the Plans and/or as per manufacturer's requirements.

10-02.2(11)C LOCK BARS

Forged steel for the lock bars shall conform to the requirements of ASTM Specification A668, Class as specified on the Plans. The lock bars shall be integral with the

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cylindrical stems. The lock bars shall be subjected to ultrasonic examination in accordance with ASTM A388. Any indications (loss of back reflection) using the straight beam method, which can not be readily explained by the geometry of the piece, will be cause for rejection. Any forgings which are rejected shall be replaced at no cost to the Department. A hinged joint shall connect the lock bar to the actuator.

Forgings shall provide adequate material allowance for machining to finish dimensions. All forgings shall be fully annealed before being machined.

10-02.2(12) KEYS AND KEYWAYS

Keys and keyways shall be provided in couplings, clutch hubs, and gears between their respective shafts. Keys and keyways shall conform to the dimensions and tolerances for square and flat keys of ANSI B17.1. All keys shall be effectively held in place, preferably by setting them into closed-end keyways milled into the shaft. The ends of all such keys shall be rounded to a half circle equal in diameter to the width of the key. Subject to the Engineers approval, keys that are not set into the closed-end keyways shall be held by safety set screws, or other effective means; in vertical shafts, collars clamped about the shafts, or similar device shall be provided. Keyways shall not extend into any bearing.

All keys for couplings shall conform to the requirements of ASTM A668 Class G unless otherwise noted

10-02.2(13) SHIMS

Where shown on the Plans and required for leveling and alignment of equipment, machinery shims shall be full width and length neatly trimmed to the dimensions of the assembled parts and drilled for all bolts that pass through the shims. Holes for bolts shall be oversized by 1/16-inch. In general, sufficient thickness shall be furnished to secure 1/64-inch variations of the shim allowance plus one shim equal to the full allowance. Shimming of equipment shall be performed with the least amount of shims needed to fill the space. No more than five (5) shims shall be used unless approved by the Engineer. Shims shall be fabricated of ASTM A709, Grade 50, except that thickness less than ¼-inch shall be stainless steel, corrosion resistant precision thickness shims will be permitted if desired by the Contractor

10-02.2(14) FASTENERS

The following requirements for bolts, nuts, studs, cap screws, lock washers and cotter pins, shall apply, except where otherwise called for herein or on the Plans.

Turned bolts shall be quenched and tempered steel conforming to the requirements of ASTM Specifications A449. Turned bolts shall have the diameter of the shank 1/16-inch larger than the diameter of the threads. Hexagonal heads and nuts shall be in accordance with the heavy series in accordance with ANSI B18.2.1 and shall be finished. Two nuts or one nut and a lock-washer shall be used on turned bolts. Lock washers will only be permitted if approved by the Engineer. Holes for turned bolts shall be carefully reamed to provide for an ANSI B4.1 LC6 fit with the body of the bolt. The surface of the body of turned bolts shall meet the ANSI roughness rating value of 63.

High strength bolts shall be used for connection of machinery components to the machinery bases wherever turned bolts are not required by the plans or Special Provisions. Machinery connection bolts, nuts, and hardened washers shall conform to the requirements of ASTM Specifications A449, A563, and F436, respectively. Holes for machinery connection bolts shall be 1/32 inch larger than the diameter of the bolt.

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High strength structural steel bolts, nuts, and hardened washers shall be used to connect machinery bases to supporting steel. High strength structural steel bolts, nuts, and hardened washers conform to the requirements of ASTM Specifications A325, A563, and F436, respectively. Connections using high-strength bolts shall conform to the "Specification for Structural Joints using ASTM A325 or A490 Bolts," approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

Anchor bolts fastening new machinery supports to concrete shall be threaded rods conforming to the requirements as shown on the Plans. Nuts and hardened washers shall conform to the requirements of ASTM Specification A563, and F436, respectively. Double nuts shall be used on all anchor bolts. All anchor bolts, nuts, and washers shall be galvanized with a Class 50 mechanically deposited zinc coating in accordance with the requirements of ASTM B695.

The dimensions of socket-head cap screws, socket flat-head cap screws, and socket-set screws shall conform to ANSI B18.3; and the screws shall be made of heat-treated alloy steel, cadmium-plated and furnished with a self-locking nylon pellet embedded in the threaded section. Unless otherwise called for on the plans or specified herein, set screws shall be of the headless, safety type; shall have threads of the coarse thread series; and shall have cut points. Set screws shall neither be used to transmit torque nor as the fastening or stop for any equipment that contributes to the stability or operation of the bridges.

All threads for bolts, nuts, and cap screws shall conform to the coarse thread series and shall have a Class 2 tolerance for bolts and nuts or Class 2A tolerance for bolts and Class 2B tolerance for nuts in accordance with the ANSI B1.1, "Unified Screw Threads."

All bolt heads and nuts shall bear on seats square with the axis of the bolt. On castings, except where recessed, the bearing shall be on finished bosses or spot-faced seats. Bolt heads, which are recessed in castings, shall be square. All bolt holes through unfinished surfaces shall be spot-faced for the head and nut, square with the axis of the bolts. Beveled washers shall be used where bearing faces have a slope or more than 1:20 with respect to a plane normal to the bolt axis.

Positive locks shall be furnished for all nuts. If double nuts are used, they shall be of standard thickness. Double nuts shall be used for all connections requiring occasional opening or adjustment. If lock washers are used for securing screws or nuts, they shall be made of tempered steel and shall conform to the SAE regular dimensions. The material shall meet the SAE tests for temper and toughness.

10-02.2(15) MACHINERY SUPPORTS

Structural steel for machinery base supports shall conform to the requirements of ASTM A709, Grade 50. Steel components of manufactured items shall conform to the materials recommended by the manufacturer.

The Plans indicate minimum requirements for machinery base supports for the machinery and all other components. The material thickness shown on the Plans are to be considered the minimum acceptable and should be increased if appropriate for the application.

Welded steel machinery supports shall be given a stress relief heat treatment prior to machining.

Top surfaces of all supports shall be milled after fabrication to provide a uniform surface. All surfaces requiring milling shall have adequate material allowance for milling to the minimum finish dimensions as required by AASHTO or as shown on the Plans.

10-02.2(16) WELDMENTS

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The fabrication of steel weldments shall conform to the requirements of the AASHTO Specifications and as specified herein.

All welding required herein or called for on the Plans shall be done in accordance with the requirements of AWS D1.5. Weldments shall be stress relieved by heat prior to final machining as specified herein. The fitting up and welding procedure shall be such that distortion of the work will be a minimum. If necessary to obtain this result, suitable welding fixtures shall be used. The Contractor shall submit welding procedures, together with the working drawings for the parts to the Engineer for approval.

All fillet welds and partial penetration groove welds shall be tested by the magnetic-particle method in accordance with the requirements of Section 6 of AWS D1.5. Radiographic testing shall be used for examination of complete joint penetration groove welds in butt joints and for complete penetration groove welds in T-joints, and corner joints shall be tested by ultrasonic testing.

All complete joint penetration welds shall be tested in accordance with the requirements of Section 6 of AWS D1.5 for each size and type weld. Inspection and testing of welds and basis of acceptance shall be in accordance with the requirements of Section 6 of AWS D1.5.

All field welds shall be stress relieved by peening unless otherwise indicated within these Special Provisions or within the Plans or unless specific written permission is granted to omit the peening process for each particular weld. The Contractor shall submit his proposed weld procedures for all field welds for review and approval by Engineer. The proposed peening procedures will be required to be included in the weld procedures before approval will be granted. In addition, any existing structural steel being field welded shall be tested to determine its chemical composition. The actual chemistry of the existing steel shall be considered when developing the proposed field welding procedures. The chemistry of each and every existing plate or shape shall be determined. No field welding shall begin until the approved weld procedures are available. All field welding shall be in accordance with requirements of the Standard Specifications.

Welded steel machinery parts shall be given a stress relief heat treatment. The Contractor shall submit a schedule of the proposed stress relief heat treatment to the Engineer for his approval. The schedule shall include a description of the part and an explanation of the proposed heat treatment, including the rate of heating, the soaking temperature, the time at the soaking temperature, the rate of cooling, and the temperature at which the part is to be withdrawn from the chamber. Soaking times less than one hour will not be approved.

Weldments shall be neat and shall have all exposed sharp corners and edges removed. Mounting surfaces shall be straight and flat such that full contact with the equipment being supported or retained is obtained.

10-02.2(17) MACHINERY GUARDS AND SHIELDS

The Contractor shall furnish suitable guards for equipment being installed as required to conform with AASHTO Specifications and OSHA.

All driving mechanisms and power transmission apparatus shall be guarded. Guards and shields must meet the full intent of requirements outlined in OSHA 1910.219. Guards shall be fabricated from galvanized sheet metal (minimum 16 gauge) or expanded steel mesh size 3/4”-9 gage or other suitable materials, as approved by Engineer.

All guards shall be easily removable and replaceable as required for maintenance purposes. Consideration of the use of hinges and quick disconnect pins for this purpose is recommended. Bolt holes shall be oversized such that assembly and disassembly can be accomplished without interference. Guard supports shall be anchored to the machinery floor utilizing stainless steel anchors. Supports and guarding shall be painted, complying with the

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requirements of this specification. All hardware shall be galvanized conforming to the requirements of ASTM A153.

10-02.2(18) LUBRICATION

10-02.2(18)A MANUAL LUBRICATION FITTINGS

Provide all grease lubricated machinery components (not including gear teeth) that are not served by a central, automatic lubrication system with NPS 1/4 Giant Button Head lubrication fittings.

Locate the fittings to conveniently facilitate lubrication. If necessary connect the lubrication ports to central stations using 1/4 inch stainless steel, seamless pipe with stainless steel fittings. Use pipe extensions that are as short as possible and securely supported.

Upon completion of fabrication plug all grease fitting locations until the components are installed and regular lubrication is started. Immediately after erection and prior to operation lubricate all rotating and sliding parts; fill the gear reducers with oil and bearing housings and flexible couplings with lubricants as specified on the approved lubrication charts.

Submit plans and specifications of the proposed systems to the engineer for approval.

10-02.2(18)B CENTRALIZED AUTOMATIC LUBRICATION SYSTEMS

Furnish two automatic lubrication systems one for each pier, a total of two complete systems. Each unit shall be capable of automatically delivering the correct amount of NLGI #2 grease lubricant to the following 28 points on each half leaf:

1. Trunnion Bearings – 4 ports on each bearing of 2 bearings (8 points total)
2. Rack Pinion Shaft Bearings – 1 port on each 2 bearings (2 points total)

The positive displacement pumping unit, approved for grease types up to NLGI #3, shall be driven by a 100 220 V, 60 Hz, single phase electric motor, through gear type speed reductions, and be mounted on a base plate. It shall be approved for operation from 5 degrees to 100 degrees F, and have a reservoir capacity of 20 pounds of grade #2 grease and be equipped with a low and high level switch.

Mount the pumping units in a NEMA 4X enclosure, equipped with a low level and high level alarm for the reservoir. Each outlet shall have a liquid filled pressure gage and high pressure relief valves with electrical indication to signal a blockage in the line.

Furnish a control unit, installed in the NEMA 4X enclosure, to set the pump running and pause time. Separate alarms, displayed on the outside of the enclosure, with different colored lights, for low level conditions inside the grease reservoir, no signal from the piston sensing proximity switch and signal for blockage in case the pressure relief valve opens, shall be supplied by the controller.

Provision shall be made to permit delivery of different volumes of grease to various ports as required. Where divider valves are used, piston sensing proximity switches shall be mounted onto the feeder and electrically connected to the control unit.

Delivery of grease from the pump to the lubrication ports shall be through stainless steel tubing. Where slight motion of the component being lubricated occurs, such as the shoes on the lock bar guides/receivers and the ends of the trunnion shafts, flexible stainless steel, braided hoses shall be used to connect from the tubing to the lubrication ports.

All tubing and flexible hoses shall have excellent wear, cut, weather and chemical resistance. All fittings shall conform to JIC requirements. All grease fittings shall be brass.

10-02.2(18)C LUBRICANTS AND CHARTS

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The Contractor shall furnish sufficient lubricant to provide for the initial lubrication of each component on the structure requiring lubrication and such additional lubricant for normal maintenance requirements for a period of at least two years. Maintenance lubricants shall not be required for synthetic reducer oil having an indefinite service life.

All synthetic oils purchased for use on the bridge shall be provided by a manufacturer that has facilities for annual testing of the oil furnished. The manufacturer shall furnish evidence of this capability by providing testing and analysis of oil taken from the reducers at the time of bridge acceptance, at no charge to the owner. Included in the testing and analysis shall include, but not limited to, viscosity, and presence and quantity of water, wear metals, and other contamination. A standard shall be provided by the testing firm regarding acceptable levels of lubricant quality that should be referenced during future testing

The Contractor shall furnish all equipment necessary for routine maintenance lubrication of the equipment on the bridge. Each grade or class of grease shall be provided with its own separate grease guns or other equipment normally used for application of the lubricant. The Contractor shall coordinate the grease requirements with the various suppliers to attempt to limit the different greases to no more than two. Contractor shall also furnish two grease guns suitable for the furnished lubrication fittings for each bridge. Each grease gun shall be provided with a fitting suitable for the grease fitting installed. If more than one type of grease fitting is used for the same lubricant, grease applicators shall be provided for each type of fitting. Each device shall have a permanently attached nameplate listing the specific lubricant within. Sufficient grease applicators shall be provided to permit storage of all types required in each pier, for each leaf.

Maintenance lubricants shall be stored where specified by the Engineer.

The Contractor shall furnish and install, as directed by the Engineer, charts for the guidance of the operators, outlining sequences for the operation of the span in all modes of operation. A diagram of all machinery and periodic service points shall be furnished and installed in each machinery room. The diagram shall show the location of all lubricating fittings and other points of the mechanical and electrical equipment, which require lubrication of any kind, and shall show the kind of lubricant to be used at each point and the frequency of lubrication. All charts shall be on Mylar framed under glass in a neat wooden frame and shall be prepared and installed as directed by the Engineer.

10-02.2(18)D LUBRICATION **DRIP PANS**

The Contractor shall furnish drip pans constructed of 12 gauge galvanized steel sheet. Edges shall be doubled over so that no sharp edges exist. The edges of the pans shall be 2 inches tall, and of sufficient width and length to completely cover the area beneath the component. Components needing drip pans include: span lock, span lock receiver, span lock guide, rack pinions, pinion shaft bearings, and trunnion bearings. The dip pans shall be attached by 2”x2”x1/8” galvanized steel corner angles welded to the pan and bolted to platforms, or floors with appropriate clips, inserts and fasteners.

10-02.2(19) SPARE PARTS

The Contractor shall furnish the following spare parts for the new span drive.

- 4 Grid for main motor coupling (CP1)
- 2 Grid for auxiliary motor coupling (CP5)
- 2 Complete set of friction discs for auxiliary clutch (CL1)
- 4 Complete set of (2) brake pads for motor brake (BR1)

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4 Complete set of (2) brake pads for machinery brake (BR2)
2 Complete set of seals - rack pinion bearing (B1)
2 Complete set of seals - central reducer (R1)
2 Complete set of seals - secondary reducer (R2)
2 Complete set of seals - auxiliary reducer (R3)
2 Hygroscopic breathers for each reducer type (R1, R2, R3)
2 Complete sets of receiving and guide wear plates including steel springs and shims for the spring-loaded receivers and guides.
2 Lock bar operator motor assembly with integral brake.
2 Lock bars

Spare parts shall be provided in sealed, uniform-sized cartons with typed and clearly varnished labels to indicate their contents, and they shall be stored where directed by the Engineer. The spare parts shall also be marked to correspond with their respective item numbers, as indicated on the elementary wiring diagram

10-02.2(20) TOOLS

A complete set of tools, each set located in a lockable cabinet, shall be furnished at each bascule pier. The Contractor shall provide one set of wrenches suitable for machinery maintenance and to fit all nuts and bolt heads in the machinery installation. The Contractor shall also provide all hydraulic equipment necessary to remove spherical roller bearings at rack pinion shafts. In addition, a full set of flat head and Phillips head screwdrivers shall be furnished which will fit all machinery and electrical components plus an assortment of punches, files, chisels and a ball peen hammer.

The miscellaneous tools, grease, and grease guns shall be stored in a location approved by the Engineer in a cabinet or toolbox made of galvanized steel and having provisions for a padlock

10-02.2(24) WARRANTY AND QUALITY CONTROL

All manufacturers shall warrant all products and associated hardware to be free of defects in material and workmanship for a period of five (5) years from the date of final acceptance of the completed bridge contract. Final Acceptance shall be in accordance to the requirements of the Standard Specifications. Any defect within this period shall be repaired or replaced by the Manufacturer or Vendor, at total cost to the Manufacturer or Vendor, including labor, parts, and transportation. The Contractor shall provide letters to the suppliers with copies to the Engineer, identifying the scheduled date of final acceptance of the bridge and therefore the date the warranty shall begin. If the date of final acceptance gets extended, it shall be the Contractors responsibility to extend the commencement of the warranties from the suppliers at no cost to the Owner.

The Owner reserves the right to receive on demand a test report from an independent laboratory certifying that the equipment furnished meets these specifications, at no cost to the Owner.

The Owner reserves the right to reject an entire shipment of material covered by this specification if an item or items are found to be defective within a 30-day period following receipt of materials

10-02.3 CONSTRUCTION REQUIREMENTS

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The machinery specified and as approved on the shop drawings and related electrical equipment shall be installed according to best millwright practice. Millwrights shall provide information that they have performed installations on heavy machinery of a similar character to that required within this project. The millwright foreman shall have successfully installed movable bridge machinery on a previous project.

In addition to the mechanical equipment included within this Special Provision and as shown on the Plans, electrical equipment including the main drive motors, brakes, and limit switches shall be installed as a part of this Special Provision. The Contractor shall coordinate the work with subcontractors to provide for the necessary shop assembly and field installation of all of the equipment.

Machinery manufacture and installation shall conform to all applicable requirements in AASHTO Specifications and all applicable requirements with special requirements and additions as specified herein or as specified on the Plans.

10-02.3(1) SERVICE ENGINEER

The Contractor shall be required to have a qualified service engineer from the manufacturer of the bearings present on the job at the time that the bearings are installed, aligned and tested. In addition, the service engineer shall be available for consultation as needed until final acceptance of the work. Such consultation shall, if considered necessary by the Engineer, be at the job site.

As part of this item, the Contractor shall be required to have the machinery system supplier present on the site during installation and for training of the bridge personnel.

10-02.3(2) INSPECTION AND TESTING

The Contractor shall give two weeks notice to the Engineer prior to the beginning of work at the foundries, forge, and machine shops so that inspection may be conducted. No materials shall be cast, forged, or machined before the Engineer has been notified where the orders have been placed.

The Contractor shall furnish all facilities for the inspection of material and workmanship in the foundries, forge, and machine shops; and the Engineer shall be allowed free access to necessary parts of the premises. Work done while the Inspector has been refused access will automatically be rejected.

The Inspector shall have the power to reject materials or workmanship, which do not fulfill the requirements of these Specifications.

Inspection at the foundries, forge and machine shops is intended as a means of facilitating the work and avoiding errors; and it is expressly understood that it will not relieve the Contractor from any responsibility in regard to imperfect material or workmanship and the necessity for replacing the defective materials or workmanship.

The Contractor shall furnish the Engineer with as many copies of orders covering work as the Engineer may direct.

Unless otherwise provided, the Contractor shall furnish test specimens, as specified herein, and all labor, testing machines, tools, and equipment necessary to prepare the specimens and to make the physical tests and chemical analyses. Copies of all test reports and chemical analyses shall be furnished to the Engineer.

The acceptance of any material or finished parts by the Engineer shall not bar their subsequent rejection if found defective. Rejected material and workmanship shall be replaced or corrected by the Contractor in a manner satisfactory to the Engineer at no additional cost to the Owner.

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10-02.3(3) REDUCER TESTING

The reducer manufacturer shall shop test each reducer by running it at the normal operating speed at no load for at least four hours and at 150% full-load torque of the main motor for 1 hour in the presence of the Engineer or his duly appointed representative. These tests shall be run with the reducers filled to the required mark and with new oil of the viscosity the manufacturer recommends on his lubrication chart for normal operation. Half of the run shall be one direction and the other half in the opposite direction. Immediately before the start of the test, and at half-hour intervals for no-load and ten (10) minute intervals for 150% full-load motor torque thereafter, the following measurements shall be made and recorded and the records shall be submitted with the Certificate of Compliance:

1. Temperature of ambient air
2. Temperature of oil near bottom of crankcase (not to exceed 135°F)
3. Surface temperature of each shaft extension adjacent to shaft seal
4. Sound level at point above and 60 inches distant from center of unit

During testing, each reducer shall be checked for unusual noise (thumping or any non-uniformity), excessive bearing clearance, oil leakage, and any other unusual operating characteristics. The units shall operate smoothly, and without excessive vibration or temperature rise. All malfunctions shall be recorded and corrected, and the units retested, if necessary, before release from the manufacturer's shop. After the unit has passed the test, a Certificate of Compliance shall be submitted by the Contractor to the Engineer.

In addition to the test specified above, the proper distribution of load on the gear teeth shall be demonstrated by the wear of blue machinists die applied to each gear. Load distribution shall meet AGMA requirements for all gears.

10-02.3(4) PAINT AND PROTECTION FOR MACHINERY

All surfaces of the new operating machinery shall be painted using a three-coat system.

All unfinished machinery surfaces shall be made free of all chips, dirt, rust, scale, sand, grease, and other foreign matter by sandblasting, wire brushing, or other approved means as stated elsewhere.

After proper surface preparation, all unfinished machinery surfaces, except for those inside reducer housing, shall be given one shop coat of primer.

Cleaning of surfaces preparatory to shop painting shall not be by sand blast as specified for structural metal, but shall be by means of wire brushes, scrapers and other suitable hand tools and solvents.

All finished contact surfaces which are not finally assembled in the shop shall be coated with waterproof National Lubricating Grease Institute No. 3 Multipurpose grease as soon as possible after being accepted and before removal from the shop, and shall be adequately protected during shipment by wrapping with burlap or canvas held by wooden bats securely wired together. During erection these surfaces shall be thoroughly cleaned and a field coat of this grease applied. All machinery surfaces shall be protected against any damage by contamination at all times and no sand blasting shall be permitted within the machinery area unless approved by the Engineer.

All grease holes shall be adequately plugged for painting and shipment. Careful attention shall be given to the protection of all machinery parts during shipment and while stored before erection.

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After installation is complete, all machinery surfaces remaining exposed, except rubbing surfaces, shall be thoroughly cleaned and given two field coats of paint prepared as specified elsewhere for intermediate and finish coat. The color of paint for machinery components shall be as approved by the Engineer and/or Owner.

Nameplates on all manufacturers' components shall be readable, clean and free of all paint before acceptance of the machinery.

After completion of the operating tests and acceptance of the machinery, all accumulated oil, grease, dirt, and other foreign matter shall be solvent cleaned in accordance with SSPC-SP1 from exposed machinery surfaces, except rubbing surfaces.

10-02.3(5) PROTECTION FOR SHIPMENT

All finished metal surfaces and unpainted metal surfaces that might be damaged by corrosion shall be coated as soon as practicable after disassembly or finishing with a corrosive-preventative compound. This coating shall be removed from all surfaces prior to assembly and painting after installation.

All machinery parts shall be completely protected from weather, dirt and all other injurious conditions during disassembly, manufacture, shipment and while awaiting erection.

All shaft journals that are shipped disassembled from their bearings shall be protected during shipment and before erection by a packing of oil-soaked fabric secured in place by burlap and covered with heavy metal thimbles or heavy timber lagging securely attached. Every precaution shall be taken to ensure that the bearing surfaces will not be damaged and that all parts shall arrive at their destination in satisfactory condition.

Assembled units shall be mounted on skids or otherwise crated for protection during handling and shipment.

10-02.3(6) INSTALLATION AND FIELD TESTING

Prior to any work being performed on the machinery, the Contractor shall submit to the Engineer for approval a detailed mechanical work procedure. This procedure shall give in detail methods for providing measurements for gear teeth, bearing; detailed explanation for match marking, and installation and testing of machinery. Procedures shall include duration of time involved with the work and shall show coordination with structural, electrical and architectural contractors, which will be coinciding with the mechanical work.

After lining up and bolting in place the trunnion assembly it shall be tested to see that the trunnion turns freely in the bearings. If the trunnion does not turn freely, the alignment of bearings must be corrected as may be necessary to accomplish this. Before the trunnions are put in service, bearings shall be checked for proper lubrication by the Contractor and bearing manufacturer, subject to approval by the Engineer.

Each trunnion shaft and bearing shall be carefully aligned and installed to proper elevation. Each end of each trunnion shaft shall be within 0.020 inches from a common transverse centerline on each bascule pier in both the horizontal and vertical directions. The trunnion alignment shall take into consideration the expected deflection of the supporting structural steel once full dead load is applied.

All parts of the machinery shall be installed in accordance with installation marks and match marks. Before final drilling or reaming, all parts shall be adjusted to exact alignment by means of shims furnished for each part. After final alignment and bolting, all parts shall operate smoothly.

All shafts, gears, pinions, racks, bearings, and other parts supported by machinery frames shall be assembled and adjusted in the field in their several frames and tested by

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operation in place. Each assembly shall be operated continuously for a period of not less than four hours in the shop before shipment. The speed of operation shall be not less than that of the assembly under normal bridge operation. Field-testing shall be done with the bridge supported on its live load shoes under full dead load.

Bolt holes in structural steel for connecting machinery shall, in general, be drilled from the solid after final alignment of the machinery. Sufficient installation holes, sub-drilled ¼-inch undersize for undersize temporary bolts, may be used for installation and alignment of the machinery. After the machinery has been aligned in its final position, full-size holes for the remaining bolts shall be drilled or sub-drilled and reamed, the full-size bolts installed, and the temporary bolts removed. The undersize holes used for temporary bolts shall then be reamed full-size and full-size bolts installed.

The machinery shall be installed and adjusted by competent millwrights skilled in the type of work involved, with qualifications as specified herein. Millwrights provide all necessary measuring and leveling instruments, as may be required including but not limited to dial indicators and laser alignment equipment. Contractor shall provide all necessary equipment and methods to the Engineer to verify proper alignment of all machinery.

The drive machinery shall be installed with the utmost care in the field. Ropes, slings or other equipment used for installation shall be carefully placed to prevent scratches, abrasions or other damage.

Prior to the installation of the reducer, the Contractor shall install and align the new rack pinion assembly to the new rack. The contractor shall verify the contact between the rack and rack pinion by opening the span one complete cycle and applying tooth contact tape. Backlash measurements shall also be obtained on each side of the gears, and shall meet the requirements of the working drawings and standards as specified herein.

Once the Engineer has approved the rack and rack pinion alignment, the Contractor may continue with the installation of the reducer and remaining mechanical equipment.

The main drive motors, brakes, and auxiliary drive machinery shall be precisely aligned with the respective input shaft of the main reducer as shown on the Plans.

The alignment of all components shall be checked by the use of laser alignment tools, dial indicators and/or feeler gages both before and after final bolting up of the machinery in the presence of the Engineer. Installation tolerances furnished by the coupling manufacturer shall be considered to be a maximum value and the installation shall be such that the installed tolerances are no more than one-half those recommended unless otherwise approved by the Engineer. Any re-adjustment after final bolting required by the Engineer in order to conform to this requirement shall be made by the Contractor at no additional cost to the Owner.

After the machinery installation is complete, the Contractor shall make a thorough inspection to insure that all components are clean and free of obstruction, that all parts are aligned and adjusted as closely as practicable without actual operation, and that all bolts are properly tightened. All gear housings shall be filled with lubricant to the proper level, and all rotating and sliding parts shall be supplied with lubricants recommended by the suppliers of the units. Typical lubricants for the various locations are as follows:

Spherical Roller Bearings:	As recommended by manufacturer
Open Gears:	NGLI Grade #3
Gear Reducers:	Petroleum Based Rust and Oxidation Inhibited Gear-oil, AGMA Viscosity Grade 4
Gear Couplings:	NGLI #0 Grease
Grid Couplings:	NGLI #2 Grease

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The lubricants listed on the lubrication charts shall conform to the recommendations of the manufacturers of the units and shall be coordinated with the products normally stocked by King County. Information required from the Maintenance Department shall be obtained through the Engineer.

10-02.3(7) SPAN LOCK INSTALLATION AND FIELD TESTING

Prior to placing any of the new span locks in operation, the Contractor shall require the system supplier representative to inspect the installation of the new span lock machinery at the site to ensure it is installed to the supplier's requirements and tolerances. System supplier representative shall furnish a letter to the Engineer after the inspection certifying that the installation is acceptable and in conformance to the requirements of the span lock machinery supplier.

The span lock machinery shall be installed with the utmost care in the field. Ropes, slings or other equipment used for installation shall be carefully placed to prevent scratches, abrasions or other damage.

The alignment of all components shall be checked by the use of laser alignment tools, dial indicators and/or feeler gages both before and after final bolting up of the machinery. To install the span lock machinery, the Contractor shall first vertically align the bascule leaves at the centerline of the bascule span by adjusting the front live load shoes.

The support frames for the span lock bar operators shall then be installed and the operators, with lock bars, temporarily attached with undersized bolts. Holes for these bolts in the operator shall be sub-drilled in the field after the operators have been roughly aligned. The receiving and guide sockets shall likewise be attached with undersized bolts. Holes for these bolts in the sockets shall be sub-drilled in the field after the sockets have been roughly aligned. If necessary, angular alignment of the sockets shall be adjusted with beveled shims placed between the sockets and the supporting structural steel. The lock bars shall then be operated through several cycles by manual cranking and adjustments made to the location of the sockets and lock bar operators as required to align all elements of the span locks. Holes shall then be reamed for turned bolts to permanently fasten the lock bar operators and sockets. Any re-adjustment after final bolting required by the Engineer and/or system supplier representative in order to conform to this requirement shall be made by the Contractor at no additional cost to the Owner.

The millwrights responsible for the installation of the lock bar mechanism shall be responsible for proper installation of the guide and receiver sockets. Any additional requirements necessary to provide assurance that the receiver will be installed to the degree of accuracy necessary for proper functioning of the guide and receiver shall be made at no additional cost to the Owner. Any re-adjustment and/or re-machining of the receiver necessary to eliminate any cross bearing between the wear plates and the lock bar shall be at no additional cost to the Owner.

The lock bar operator shall be precisely aligned with the lock bar after final installation of the lock bar guide and receiving sockets. The centerline of the operator shall be collinear to the lock bar. The operator shall be shimmed vertically as shown on the Plans at the location of the operator.

All adjusting, aligning and testing of the new span lock machinery shall be done with no extraneous loads upon the bascule spans.

After installation is complete, the Contractor shall make a thorough inspection to ensure that all components are clean and free of obstruction, that all parts are aligned and adjusted as closely as practicable without actual operation, and that all bolts are properly

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tightened. All gear housings shall be filled with lubricant to the proper level, and all rotating and sliding parts shall be supplied with lubricants recommended by the suppliers of the units.

The lubricants listed on the lubrication charts shall conform to the recommendations of the manufacturer of the units and shall be coordinated with the other components on this project to minimize the amount of lubricants to be furnished.

After completion of electrical and mechanical work for span lock installation, and after greasing all lock machinery components as described above, the Contractor shall demonstrate satisfactory operation of the center lock machinery by having them driven and pulled in the presence of the Engineer. The span locks shall be operated electrically and by the hand crank with which each unit is equipped. The leaves shall be raised between each cycle to simulate a regular opening of the bridge. The number of such operating cycles for demonstration purposes shall not be less than five cycles. Additional cycles shall be performed as requested by the Engineer and shall be sufficient to verify proper adjustment and functioning of the span lock system.

During the foregoing test runs, all parts shall be inspected to detect overheating, misalignment, or incorrect adjustment. All such defects shall be corrected at no cost to the Owner before final acceptance.

10-02.3(8) INSTALLATION OF ELECTRICAL ITEMS

The Contractor shall coordinate the work of the subcontractors supplying and installing components under electrical and machinery as well as structural items of the contract. The Contractor will be held fully responsible for supplying all work necessary to provide a complete installation, properly fitted together, adjusted and satisfactorily operating as one unit.

10-02.3(8)A MOTOR COUPLINGS

The flexible couplings at the main drive motors shall be furnished under "Operating Machinery". The coupling half at the motors shall be shipped to the supplier of the motors and shall be fitted and installed on the motor shafts under "Electrical Work".

10-02.3(9) TESTS AND PRELIMINARY OPERATION

The bascule span is an operating machine. The Contractor shall construct, erect and adjust every part so that the machine will function and operate satisfactorily. The Contractor shall make all necessary tests of the completed structure and all trial operations so that the completed structure, ready for acceptance, shall be in perfect operating condition and in accordance with design. During testing and adjustment of the span, representatives of the manufacturer of mechanical and electrical components shall be present at the bridge site and available for consultation as may be required.

When the equipment is ready for testing, the operating machinery shall be operated through not less than five complete cycles.

During the foregoing test runs, all parts shall be inspected to detect overheating, misalignment, or incorrect adjustment. All such defects shall be corrected at no cost to the Owner before final acceptance.

The Contractor shall supply without charge all grease, oil, fuel, maintenance, and other incidentals necessary for testing, adjustments, and preliminary operation. Until final acceptance, the Contractor shall operate the span as required for marine and vehicular traffic.

10-02.3(10) TRAINING

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10-03.3(10)A MAINTENANCE TRAINING

The Contractor shall provide a minimum of two (3) – eight (8) hours sessions of classroom and field operation, maintenance and trouble shooting instruction. The number of attendees shall be determined by King County. However, for the purpose of bidding, a minimum of eight (8) attendees per training session shall be assumed. Provide each attendee the Operation and Maintenance Manuals for the course. The final approved manuals shall be furnished to the attendees no later than two (2) weeks prior to the training session so that they may become familiar with the system.

The Contractor shall obtain a conference room located in the vicinity of the bridge (not to exceed five miles away) for the purpose of holding the training sessions.

One (1) of the eight (8) hour sessions shall cover the mechanical portion of the bridge and the course shall consist of the following; plus any additional subjects required:

1. Mechanical Drive Basics
2. Mechanical System Configuration specific to the project
3. Mechanical Component Layout and Location
4. Preventive Maintenance Procedures
5. Trouble Shooting, Minor Repairs and Emergency Operations
6. Mechanical Operation of the Bridge
7. Sump pump assemblies, water system, and sewer system
8. HVAC.
9. Reducers and operating machinery, span locks,
10. Automatic Lubrication System

Contractor shall provide a qualified engineer as a representative to train the Department's personnel on the components that are being furnished.

One (1) of the eight (8) hour sessions will be for onsite instruction for topics covered in the classroom. Faults will be introduced into the systems, which the students will diagnose and correct. These faults will include the most common failures, which are likely to be encountered in the operations of the bridge.

The Contractor shall submit to the Engineer for approval the qualifications of the system supplier's representatives who will be doing the training. These qualifications shall include the representatives' name, company they work for and a breakdown of the representative's specific experience to the portion of the project they will be covering.

10-02.4 MEASUREMENT

Measurement for items of work in this Section is described in Section 10-01.4

10-02.5 PAYMENT

Payment for all items of work in this Section is described in Section 10-01.5.

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Add the following new Division:

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DIVISION 11

SUPERSTRUCTURE - BASCULE PIER

11-01 GENERAL REQUIREMENTS FOR BASCULE PIER SUPERSTRUCTURE

11-01.1 DESCRIPTION

This item includes fixed portion of the bascule piers and control towers above the top of the caissons (final elevation of -7.0), but excluding the "Superstructure – Bascule Span", complete, in place and serviceable as indicated in the Contract Documents to the satisfaction of the Engineer.

This item includes bascule pier related: shop drawing preparation and submittals, furnishing, fabrication, testing, storage, handling, transportation, erection, construction, painting (where applicable), of components including, but not limited to: the caisson distribution cap including the sump well and drain troughs, temporary, structural and finish slabs, the bascule pier walls, stairwells, stairs, stair landings, stair handrails, interior floor slabs, Roadway Level concrete decks, pedestrian railing curb, pedestrian railing embedded anchorages, resistance gate foundations, Roadway Level access doors, bascule pier windows, bascule pier doors, fire extinguishers, work benches, a tool set, and bird screening.

This item also includes control tower related: shop drawing preparation and submittals, furnishing, fabrication, testing, storage, handling, transportation, erection, painting (where applicable), of components including, but not limited to: concrete support brackets, concrete walls and floors, cast-in-place concrete with integral thin brick, structural steel framing, standing seam roofs, roof drainage systems (gutters), Operator Level cantilevered observation decks, cantilevered deck access hatches, windows, exterior and interior doors, brick veneer, insulation, interior finish walls, flooring, and exterior clocks.

This item also includes control tower furnishings related: fabrication, testing, storage, handling, transportation, painting (where applicable), of items including, but not limited to: lockers, desks, chairs, tables, cabinets, sinks, countertops, mirrors, refrigerators, microwave ovens, handrails, window coverings, shelving, hardware, towel bars, and sink mounted garbage disposals.

Electrical work including interior and exterior lighting of the control towers, convenience outlets, emergency lighting, exit signs, and *lightning protection* are described under *Item 24 for Means and* Methods but are to be included under this item for pricing.

1. Applicable portions of this Special Provision also apply to the plazas.
2. Furniture not specified under this section is covered under Item 52 as an allowance.
3. Prior to beginning this item of work, the contractor shall submit to the Engineer a schedule of values allocated to the various portions of this item of work, and the percentage each portion represents of the entire item. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy to the satisfaction of the Engineer. This schedule shall be used only as a basis for the contractor's applications for payment. The schedule of values shall be prepared in such a manner that each single item of construction is shown as a single line item matching those items listed in the Table of Contents for this item.

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11-01.2 MATERIALS

Unless otherwise specified in Division 11, materials shall be in accordance with the Standard Specifications.

11-01.3 CONSTRUCTION REQUIREMENTS

Construction shall be in accordance with the Standard Specifications, as amended by the Special Provision, including Division 11.

11-01.4 **MEASUREMENT**

All work specified in Division 11 Sections will be paid in accordance with Section 1-04.1 for the following item:

"Superstructure - Bascule Pier" contains the following approximate quantities of material:

Item	Approximate Quantity	Unit
Concrete Class 4000	XXX	C.Y.
Concrete Class 4000D	XX	C.Y.
Concrete Class 4000 – Base Wall	XX	C.Y.
Concrete Class 4000 – Wall	XX	C.Y.
Epoxy-Coated St. Reinf. Bar	XX	LB.
St. Reinf. Bar	XX	LB.
Metal Stairs and Handrails	XX	S.F.
Metal Stair Landings	XX	S.F.
Bascule Pier Windows	XX	Each
Bascule Pier Exterior Doors	XX	Each
Roadway Level Access Hatch	XX	Each
Fire Extinguishers	XX	Each
Work Bench	XX	Each
Tool Set	XX	Each
Structural Carbon Steel	XX	LB.
Structural Low Allow Steel	XX	LB.
Standing Seam Roof	XX	S.F.
Roof Drainage Collection (Gutters)	XX	L.F.
Operator Cantilevered Deck	XX	S.F.'
Cantilevered Deck Access Hatches	XX	Each
Control Tower Windows	XX	Each
Control Tower Exterior Doors	XX	Each
Control Tower Interior Doors	XX	Each
Brick Veneer	XX	S.F.
Flooring	XX	S.F.
Exterior Clocks	XX	Each
Lockers	XX	Each
Desks	XX	Each
Tables	XX	Each
Chairs	XX	Each
Base Cabinets	XX	L.F.
Wall Cabinets	XX	L.F.
Countertops	XX	S.F.

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Countertop Sinks	XX	Each
Wall Mounted Sinks	XX	Each
Mirrors (3 ft.x 3 ft.)	XX	Each
Microwave Ovens	XX	Each
Wall Mounted Handrails	XX	L.F.
Window Coverings	XX	S.F.
Towel Bars	XX	Each

The quantities are listed for the convenience of the Contractor in determining the work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than approved changes will be made in the lump sum contract price for the Superstructure - Bascule Pier even though the actual quantities required may deviate from those listed.
Item does not include: “Superstructure - Bascule Span”, “Superstructure - Approach Span”, trunnion frame supports, bascule pier, operators level cantilevered deck railing, or control tower electrical.

11-01.5 PAYMENT

All work specified in Division 11 Sections will be paid in accordance with Section 1-04.1 under the The Contract lump sum price for "Superstructure - Bascule Pier", which price shall be payment in full for furnishing and fabricating all materials necessary for the construction of the bascule pier superstructur and control towers in accordance with the Plans and the Specifications; and for furnishing all labor, tools, equipment and incidentals necessary to complete the work in accordance with the Contract.

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11-02 CAST-IN-PLACE CONCRETE

11-02.1 GENERAL

11-02.1(1) DESCRIPTION

Work under this item consists of cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes supplemental to the Washington Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction, dated 2008.

11-02.1(2) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of manufactured material and product indicated.
Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Indicate amounts of mix water to be withheld for later addition at Project site.
Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Cementitious materials and aggregates.
2. Form materials and form-release agents.
3. Steel reinforcement and reinforcement accessories.
4. Fiber reinforcement.
5. Admixtures.
6. Waterstops.
7. Floor and slab treatments.
8. Bonding agents, if required.
9. Adhesives, if required.
10. Joint-filler strips.
11. Floor and slab treatments.
12. Repair materials, if required.

Minutes of preinstallation conference.

11-02.1(3) QUALITY ASSURANCE

Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

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Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.

Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

Preinstallation Conference: Conduct conference at Project site. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

1. Contractor's superintendent.
2. Independent testing agency responsible for concrete design mixes.
3. Ready-mix concrete producer.
4. Concrete subcontractor.

11-02.1(4) DELIVERY, STORAGE AND HANDLING

Deliver, store, and handle steel reinforcement to prevent bending and damage.

11-02.2 PRODUCTS

11-02.2(1) STEEL REINFORCEMENT

All reinforcing steel, tie wires, mechanical connections and supports shall be furnished in accordance with Section 6-02.3(24)

Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

1. Steel Reinforcement: ASTM A 615/A 615M, *Grade 60*, deformed.
2. Steel Reinforcement: ASTM A 706/A 706M , deformed.
3. Zinc Coating: Class I.
4. Zinc Coating: Class II.

Plain-Steel Wire: ASTM A 82, as drawn.

Plain-Steel Wire: ASTM A 82, galvanized.

Deformed-Steel Wire: ASTM A 496.

Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

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Galvanized Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from galvanized steel wire into flat sheets.
Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

11-02.2(2) FIBER REINFORCEMENT

Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 3/4 inches long.

11-02.2(3) CONCRETE MATERIALS

Furnish all materials, including Portland cement, aggregate, air entraining admixture, and chemical admixtures in accordance with Section 6-02.

11-02.2(4) FLOOR AND SLAB TREATMENTS

Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces; matt finish.

Penetrating Liquid Floor Treatment:

1. Titan Hard; Burke Group, LLC (The).
2. Chemisil Plus; ChemMasters.
3. Day-Chem Sure Hard; Dayton Superior Corporation.
4. Euco Diamond Hard; Euclid Chemical Co.
5. Retroplate 99; Advanced Floor Products
6. Seal Hard; L&M Construction Chemicals, Inc.

11-02.2(5) CURING MATERIALS

Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately *9 oz./sq. yd.* dry.
Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
Water: Potable.

11-02.2(6) RELATED MATERIALS

Joint-Filler Strips: Provide joint filler conforming Section 6-11.3(4)
Joint Seals: Use preformed elastomeric compression joint seals conforming to ASTM D 2628.
Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

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11-02.2(7) REPAIR MATERIALS

Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from *1/8 inch* and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, *1/8 to 1/4 inch* or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than *4100 psi* at 28 days when tested according to ASTM C 109/C 109M.

Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from *1/4 inch*.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C 109/C 109M.

11-02.2(8) CONCRETE MIXES

Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

Proportion concrete mix per structural General Notes.

Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.

Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixes where indicated.

11-02.2(9) FABRICATING REINFORCEMENT

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Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

11-02.2(10) CONCRETE MIXING

Measure, batch, mix, and deliver concrete according to Section 6-02.

11-02.3 CONSTRUCTION REQUIREMENTS

11-02.3(1) FORMWORK

Design, erect, shore, brace, and maintain formwork, according to Sections 6-02.3(16) and 6-02.3(17), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

11-02.3(2) EMBEDDED ITEMS

Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
Install anchor bolts, accurately located, to elevations required.

11-02.3(3) REMOVING AND REUSING FORMS

General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than *50 deg F* for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:

1. 28-day design compressive strength.
2. At least 70 percent of 28-day design compressive strength.
3. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.
4. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

11-02.3(4) STEEL REINFORCEMENT

General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack

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weld crossing reinforcing bars. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

11-02.3(5) JOINTS

General: Construct joints true to line with faces perpendicular to surface plane of concrete.
Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least *1-1/2 inches* into concrete.
3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

11-02.3(6) CONCRETE PLACEMENT

Place concrete per Section 6-02.3(6).
Cold-Weather Placement: Comply with Section 6-02.3(6)A.

11-02.3(7) FINISHING FORMED SURFACES

Reference Section 6-02.3(14).
Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding *1/8 inch* in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
2. Do not apply rubbed finish to smooth-formed finish.

11-02.3(8) FINISHING SLABS

Reference Section 5-05.3(11).
General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

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Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
   A. Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15.
   B. Specified overall values of flatness, F(F) 35; and levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and levelness, F(L) 17; for slabs-on-grade.
   C. Specified overall values of flatness, F(F) 30; and levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and levelness, F(L) 15; for suspended slabs.
   D. Specified overall values of flatness, F(F) 45; and levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and levelness, F(L) 24.
3. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding *10-foot-* long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed *1/4 inch*.

Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

11-02.3(9) MISCELLANEOUS CONCRETE ITEMS

Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

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11-02.3(10) CONCRETE PROTECTION AND CURING

Concrete shall be protected and cured per Section 6-02.3(11)H (wet curing), for all cast-in-place concrete work.
For cold weather placement, concrete shall be protected and cured Section 6-02.3(6)A.

11-02.3(11) LIQUID FLOOR TREATMENTS

Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

11-02.3(12) JOINT FILLING

Prepare, clean, and install joint filler according to manufacturer's written instructions.
Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.
Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
Install semirigid epoxy joint filler full depth in saw-cut joints and at least *2 inches* deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

11-02.3(13) CONCRETE SURFACE REPAIRS

Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a *No. 16* sieve, using only enough water for handling and placing.
Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than *1/2 inch* in any dimension in solid concrete but not less than *1 inch* in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to

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verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of *0.01 inch* wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of *1/4 inch* to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes *1 inch* or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least *3/4 inch* clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes *1 inch* or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
8.

Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

Repair materials and installation not specified above may be used, subject to Engineer's approval.

11-02.3(14) FIELD QUALITY CONTROL

Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

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Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each *100 cu. yd.* or fraction thereof of each concrete mix placed each day. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is *40 deg F* and below and when *80 deg F* and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample. Cast and field cure one set of four standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days. Test two field-cured specimens at 7 days and two at 28 days. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than *500 psi*.

Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer.

NOT FOR CONSTRUCTION

11-03 PLANT-PRECAST STRUCTURAL CONCRETE

11-03.1 GENERAL

11-03.1(1) DESCRIPTION

This Section includes plant-precast structural solid flat slab concrete units

11-03.1(2) PERFORMANCE REQUIREMENTS

Structural Performance: Provide precast structural concrete units and connections capable of withstanding design loads within limits and under conditions indicated in drawings and general notes, as well as the self-weight of the units themselves.

11-03.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable..
Product Data: For each type of product indicated.
Design Mixes: For each concrete mix.
Shop Drawings: Detail fabrication and installation of precast structural concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, openings, and types of reinforcement, including special reinforcement.

1. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories.
2. Indicate locations and details of anchorage devices to be embedded in other construction.
3. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation.

Samples: For each type of finish indicated on exposed surfaces of precast structural concrete units, in sets of 3, illustrating quality of finishes, colors, and textures; approximately *12 by 12 by 2 inches*. Deliver samples to the site. Notify Engineer seven days in advance of dates and times when samples can be reviewed on site. Obtain Engineer's approval of samples before starting fabrication.
Samples of bearing pads.
Welding Certificates: Copies of certificates for welding procedures and personnel.
Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Concrete materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.

11-03.1(4) QUALITY ASSURANCE

Installer Qualifications: An experienced installer who has completed precast structural concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

NOT FOR CONSTRUCTION

Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast structural concrete units similar to those indicated for this Project and with a record of successful in-service performance.

1. Assumes responsibility for engineering precast structural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
2. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of precast structural concrete that are similar to those indicated for this Project in material, design, and extent.
3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group C, Category C2.
4. Has sufficient production capacity to produce required units without delaying the Work.

Design Standards: Comply with *ACI 318* and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."
Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and camber and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products."
Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.4, "Structural Welding Code--Reinforcing Steel."
Preinstallation Conference: Conduct conference at Project site

11-03.1(5) DELIVERY, STORAGE, AND HANDLING

Deliver precast structural concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.
Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

11-03.1(6) SEQUENCING

Furnish anchorage items to be embedded in other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

11-03.2 PRODUCTS

11-03.2(1) MOLD MATERIALS

Molds: Provide molds and, where required, form-facing materials of metal, plastic, wood, or another material that is nonreactive with concrete and dimensionally stable to produce continuous and true precast concrete surfaces within fabrication tolerances and suitable for required finishes.

11-03.2(2) REINFORCING MATERIALS

NOT FOR CONSTRUCTION

Reinforcing Bars: ASTM A 615/A 615M, *Grade 60*, deformed.
Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M. Steel Reinforcement: ASTM A 615/A 615M, *Grade 60*, deformed.
Steel Bar Mats: ASTM A 184/A 184M, assembled with clips. Steel Reinforcement: ASTM A 615/A 615M, *Grade 60,* deformed bars.
Plain-Steel Wire: ASTM A 82, as drawn.
Deformed-Steel Wire: ASTM A 496.
Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, plain.
Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
Epoxy-Coated-Steel Welded Wire Fabric: ASTM A 884/A 884M, Class A coated, plain.
Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manual of Standard Practice," PCI MNL 116. For all reinforcement, use all-plastic bar supports

11-03.2(3) PRESTRESSING TENDONS

Prestressing Strand: ASTM A 416/A 416M, *Grade 250 or 270*, uncoated, 7-wire, low-relaxation strand.

11-03.2(4) CONCRETE MATERIALS

Portland Cement: ASTM C 150, Type I or Type III, of same type, brand, and source.
Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 5S.
Lightweight Aggregates: ASTM C 330.
Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
Water-Reducing Admixture: ASTM C 494, Type A.
Retarding Admixture: ASTM C 494, Type B.
Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
Plasticizing Admixture: ASTM C 1017.
Fly Ash Admixture: ASTM C 618, Class C or F.
Metakaolin Admixture: ASTM C 618, Class N.
Silica Fume Admixture: ASTM C 1240.

11-03.2(5) STEEL CONNECTION MATERIALS

Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.
Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.
Carbon-Steel Bolts and Studs: *ASTM A 307, Grade A*; carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.

NOT FOR CONSTRUCTION

Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M, after fabrication, and ASTM A 153/A 153M, as applicable. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.
Welding Electrodes: Comply with AWS standards.
Accessories: Provide clips, hangers, plastic shims, and other accessories required to install precast structural concrete units.

11-03.2(6) STAINLESS-STEEL CONNECTION MATERIALS

Stainless-Steel Plate: ASTM A 666, Type 304, of grade suitable for application.
Stainless-Steel Bolts and Studs: ASTM F 593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.
Stainless-Steel Headed Studs: ASTM A 276.

11-03.2(7) BEARING PADS

Provide bearing pads for precast structural concrete units as follows:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer, minimum tensile strength *2250 psi* per ASTM D 412.
2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer.
3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer.
4. Frictionless Pads: Tetrafluoroethylene, glass-fiber reinforced, bonded to mild-steel plate, of type required for in-service stress.
5. Hardboard: AHA A135.4, Class 1, tempered hardboard strips, smooth on both sides.
6. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

11-03.2(8) GROUT MATERIALS

Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application.
Epoxy Grout: ASTM C 881, 2-component epoxy resin, of type, grade, and class to suit requirements.

11-03.2(9) CONCRETE MIXES

Prepare design mixes for each type of concrete required.
Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.

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Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by *ACI 318*.

Normal-Weight Concrete: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): Per general notes.
2. Maximum Water-Cementitious Materials Ratio: 0.40.
3. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows, with a tolerance of plus or minus 1-1/2 percent: Air Content: 6 percent for *3/4-inch-* nominal maximum aggregate size.

Other Admixtures: Use water-reducing, high-range water-reducing, water-reducing and accelerating, or water-reducing and retarding admixtures according to manufacturer's written instructions.

Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

11-03.2(10) FABRICATION

Formwork: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for pretensioning and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances.

1. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial-formula, form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's written instructions.
2. Unless forms for precast, prestressed concrete units are stripped before detensioning, design forms so stresses are not induced in precast concrete units because of deformation or movement of concrete during detensioning.

Built-in Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect position of main reinforcement or concrete placement. Do not relocate bearing plates in units unless approved by Engineer.

Cast-in openings larger than *10 inches* in diameter or *10 inches* square according to Shop Drawings. Smaller holes may be field cut by trades requiring them, as approved by Engineer.

Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete-placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
3. Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold

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reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

Prestress tendons for precast structural concrete units by either pretensioning or posttensioning methods. Comply with PCI MNL 116.

1. Delay detensioning until concrete has reached at least 70 percent of its compressive strength as established by test cylinders cured under the same conditions as concrete.
2. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
3. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.

Mix concrete according to PCI MNL 116 and requirements in this Section. After concrete batching, no additional water may be added.

Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 116 for measuring, mixing, transporting, and placing concrete.

Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 116.

Comply with ACI 306.1 procedures for cold-weather concrete placement.

Comply with ACI 305R recommendations for hot-weather concrete placement.

Identify pickup points of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint casting date on each precast concrete unit on a surface that will not show in finished structure.

Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

Product Tolerances: Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product tolerances.

Apply scratch finish to precast concrete units that will receive concrete topping after installation. After initial strikeoff, transversely scarify surface to provide ridges approximately *1/4 inch* deep.

Recess prestressing tendons a minimum of *1/2 inch*, fill recesses with grout, and apply a sack finish to vertical ends of precast concrete units.

11-03.2(11) SOLID FLAT SLAB UNITS

Furnish units free of voids and honeycombs.

Standard Finish: Normal plant-run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls will be tolerated. Major or unsightly imperfections, honeycombs, or structural defects are not permitted.

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Reinforce units to resist transportation and erection stresses.
Include cast-in weld plates where required.
Coordinate with other trades for installation of cast-in items.

11-03.2(12) SOURCE QUALITY CONTROL

Owner will employ an independent testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.

Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements.

Strength of precast concrete units will be considered deficient if units fail to comply with PCI MNL 116 requirements, including the following:

1. Units fail to comply with compressive-strength test requirements.
2. Reinforcement and prestressed tendons of units do not comply with fabrication requirements.
3. Concrete curing and protection of units against extremes in temperature fail to comply with requirements.
4. Units are damaged during handling and erecting.

Testing: If there is evidence that the strength of precast concrete units may be deficient or may not comply with PCI MNL 116 requirements, Owner will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.

1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Engineer.
2. Cores will be tested, after immersion in water, in a wet condition per ACI 301 if units will be wet under service conditions.
3. Cores will be tested in an air-dry condition per ACI 301 if units will be dry under service conditions.
4. Strength of concrete for each series of 3 cores will be considered satisfactory if the average compressive strength is equal to at least 85 percent of the 28-day design compressive strength and no single core is less than 75 percent of the 28-day design compressive strength.
5. Test results will be made in writing on the same day that tests are performed, with copies to Engineer, Contractor, and precast concrete fabricator. Test reports will include the following:
   A. Project identification name and number.
   B. Date when tests were performed.
   C. Name of precast concrete fabricator.
   D. Name of concrete testing agency.
   E. Identification letter, name, and type of precast concrete unit or units represented by core tests; design compressive strength; type of break; compressive strength at break, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

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Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mix that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

Dimensional Tolerances: Units with dimensions smaller or larger than required and not complying with tolerance limits may be subject to additional testing. Precast concrete units with dimensions larger than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to comply with construction conditions.

Defective Work: Precast concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

11-03.3 CONSTRUCTION REQUIREMENTS

Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

Install bearing pads as precast concrete units are being erected. Set pads on true, level, and uniform bearing surfaces and maintain in correct position until precast concrete units are placed.

Install precast structural concrete. Shore and brace precast concrete units to maintain location, stability, and alignment until permanent connections are installed.

Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders. Protect precast concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required. Repair damaged metal surfaces by cleaning and applying a coat of galvanized repair paint to galvanized surfaces.

Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units unless approved by Engineer.

Erection Tolerances: Install precast concrete units level, plumb, square, and true, without exceeding the recommended erection tolerances in PCI MNL 127, "Recommended Practice for Erection of Precast Concrete."

Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at keyways, connections, and joints as follows: Provide forms or other approved method to retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.

Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

Field welds and connections using high-strength bolts will be subject to tests and inspections.

Testing agency will report test results promptly and in writing to Contractor and Engineer.

Remove and replace work that does not comply with specified requirements.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.

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Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

NOT FOR CONSTRUCTION

11-04 PLANT-PRECAST ARCHITECTURAL CONCRETE

11-04.1 GENERAL

11-04.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-04.1(2) SUMMARY

This Section includes precast architectural concrete units.

11-04.1(3) PERFORMANCE REQUIREMENTS

Structural Performance: Provide precast architectural concrete units and connections capable of withstanding design loads within limits and under conditions indicated in the general notes of the drawings.

11-04.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of product indicated.
Design Mixes: For each concrete mix.
Shop Drawings: Detail fabrication and installation of precast architectural concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, limits of each finish, and types of reinforcement, including special reinforcement.

1. Indicate separate face and backup mix locations and thicknesses.
2. Indicate locations and extent and treatment of dry joints if two-stage casting is proposed.
3. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories.
4. Indicate locations and details of anchorage devices to be embedded in other construction.
5. Indicate locations and details of thin brick units and joint treatment.
6. Indicate locations and details of stone facings, anchors, and treatment of joints.
7. Comprehensive engineering analysis signed and sealed by the qualified professional engineer in the State of Washington responsible for its preparation.

Samples: For each type of finish indicated on exposed surfaces of precast architectural concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately *12 by 12 by 2 inches*.
Welding Certificates: Copies of certificates for welding procedures and personnel.
Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:

NOT FOR CONSTRUCTION

Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Concrete materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.
5. Water-absorption test reports.

11-04.1(5) QUALITY ASSURANCE

Installer Qualifications: An experienced installer who has completed precast architectural concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast architectural concrete units similar to those indicated for this Project and with a record of successful in-service performance.

1. Assumes responsibility for engineering precast architectural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
2. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of precast architectural concrete that are similar to those indicated for this Project in material, design, and extent.
3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group A, Category A1--Architectural Cladding and Load Bearing Units.
4. Has sufficient production capacity to produce required units without delaying the Work.
5. Is registered with and approved by authorities having jurisdiction.

Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

Design Standards: Comply with *ACI 318* and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."

Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

Product Options: Drawings indicate size, profiles, and dimensional requirements of precast concrete units and are based on the specific types of units indicated

Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.4, "Structural Welding Code--Reinforcing Steel."

Sample Panels: Before fabricating precast architectural concrete units, produce sample panels to establish the approved range of selections made under sample Submittals. Produce a minimum of 3 sets of full-scale sample panels, approximately *48 inches* long by *48 inches* high, to demonstrate the expected range of finish, color, and texture variations.

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1. Locate panels where indicated or, if not indicated, as directed by Engineer.
2. In presence of Engineer, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of surface blemishes to match adjacent undamaged surfaces.
3. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed.

Mockup: Before installing precast architectural concrete units, build mockup to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockup in the location and of the size indicated or, if not indicated, as directed by Engineer.
2. Notify Engineer seven days in advance of dates and times when mockup will be constructed.
3. Obtain Engineer's approval of mockup before starting fabrication.
4. In presence of Engineer, damage part of an exposed face for each finish, color, and texture, and demonstrate materials and techniques proposed for repairs to match adjacent undamaged surfaces.
5. Maintain mockup during construction in an undisturbed condition as a standard for judging the completed Work.
6. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

Preinstallation Conference: Conduct conference at Project site

11-04.1(6) DELIVERY, STORAGE, AND HANDLING

Deliver precast architectural concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.
Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

11-04.1(7) SEQUENCING

Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

11-04.2 PRODUCTS

11-04.2(1) MOLD MATERIALS

Molds: Provide molds and, where required, form-facing materials of metal, plastic, wood, or another material that is nonreactive with concrete and dimensionally stable to produce continuous and true precast concrete surfaces within fabrication tolerances and suitable for required finishes

11-04.2(2) REINFORCING MATERIALS

NOT FOR CONSTRUCTION

Reinforcing Bars: ASTM A 615/A 615M, *Grade 60*, deformed.
Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M, as follows:
Steel Reinforcement: ASTM A 615/A 615M, *Grade 60*, deformed.
Steel Bar Mats: ASTM A 184/A 184M, assembled with clips, as follows:
Steel Reinforcement: ASTM A 615/A 615M, *Grade 60*, deformed bars.
Plain-Steel Wire: ASTM A 82, as drawn.
Deformed-Steel Wire: ASTM A 496.
Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, plain.
Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
Epoxy-Coated-Steel Welded Wire Fabric: ASTM A 884/A 884M, Class A coated, plain.
Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manual of Standard Practice," PCI MNL 117, and as follows:

1. For uncoated reinforcement, use all-plastic bar supports.
2. For epoxy-coated reinforcement, use all-plastic bar supports.
3.

11-04.2(3) PRESTRESSING TENDONS

Prestressing Strand: ASTM A 416/A 416M, *Grade 250 or 270*, uncoated, 7-wire, low-relaxation strand.

11-04.2(4) CONCRETE MATERIALS

Portland Cement: ASTM C 150, Type I or Type III, white, of same type, brand, and source. Standard gray portland cement may be used for nonexposed backup concrete or in concealed areas.
Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S.

1. Face-Mix Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining. Color to match design reference sample. Gradation: To match design reference sample.
2. Face-Mix Fine Aggregates: Selected, natural or manufactured sand of the same material as coarse aggregate, unless otherwise approved by Engineer.

Lightweight Aggregates: ASTM C 330.
Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.
Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.
Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
Water-Reducing Admixture: ASTM C 494, Type A.
Retarding Admixture: ASTM C 494, Type B.
Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
Plasticizing Admixture: ASTM C 1017.

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11-04.2(5) STEEL CONNECTION MATERIALS

Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.
Carbon-Steel Plate: ASTM A 283/A 283M.
Malleable Steel Castings: *ASTM A 47*.
Carbon-Steel Castings: ASTM A 27/A 27M, *Grade 60-30*.
High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
Wrought Carbon-Steel Bars: ASTM A 675/A 675M, *Grade 65*.
Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.
Carbon-Steel Bolts and Studs: *ASTM A 307, Grade A*; carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.
Welding Electrodes: Comply with AWS standards.
Accessories: Provide clips, hangers, plastic shims, and other accessories required to install precast architectural concrete units.

11-04.2(6) STAINLESS-STEEL CONNECTION MATERIALS

Stainless-Steel Plate: ASTM A 666, Type 304, of grade suitable for application.
Stainless-Steel Bolts and Studs: ASTM F 593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.
Stainless-Steel Headed Studs: ASTM A 276.

11-04.2(7) BEARING PADS

Provide bearing pads for precast architectural concrete units as follows:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer, minimum tensile strength *2250 psi* per ASTM D 412.
2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer.
3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer.
4. Frictionless Pads: Tetrafluoroethylene, glass-fiber reinforced, bonded to mild-steel plate, of type required for in-service stress.
5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

11-04.2(8) GROUT MATERIALS

Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application.

11-04.2(9) CONCRETE MIXES

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Prepare design mixes for each type of concrete required.
Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast architectural concrete fabricator's option.
Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by *ACI 318*.
Normal-Weight Concrete Face and Backup Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): *5500 psi*.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3.

Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.
Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.
When included in design mixes, add other admixtures to concrete mixes according to manufacturer's written instructions.

11-04.2(10) MOLD FABRICATION

Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing operations.
Maintain molds to provide completed precast architectural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
Edge and Corner Treatment: Uniformly chamfered.

11-04.2(11) FABRICATION

Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast architectural concrete units to supporting and adjacent construction.
Cast-in reglets, slots, holes, and other accessories in precast architectural concrete units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.
Cast-in openings larger than *10 inches* in any dimension.
Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 117 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcement to maintain at least *3/4-inch* minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement

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in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

5.

Reinforce precast architectural concrete units to resist handling, transportation, and erection stresses.

Mix concrete according to PCI MNL 117 and requirements in this Section. After concrete batching, no additional water may be added.

Place face mix to a minimum thickness after consolidation of the greater of *1 inch* or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover.

Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 117 for measuring, mixing, transporting, and placing concrete.

Place backup concrete to ensure bond with face mix concrete.

Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 117.

Comply with ACI 306.1 procedures for cold-weather concrete placement.

Comply with ACI 305R recommendations for hot-weather concrete placement.

Identify pickup points of precast architectural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast architectural concrete unit on a surface that will not show in finished structure.

Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

Discard precast architectural concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Engineer.

11-04.2(12) FABRICATION TOLERANCES

Fabricate precast architectural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

Fabricate precast architectural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with the following product tolerances:

1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:
   - A. *10 feet* or under, plus or minus *1/8 inch*.
   - B. *10 to 20 feet*, plus *1/8 inch*, minus *3/16 inch*.
   - C. *20 to 40 feet*, plus or minus *1/4 inch*.
   - D. Each additional *10 feet*, plus or minus *1/16 inch*.

2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:
   - A. *10 feet* or under, plus or minus *1/4 inch*.
   - B. *10 to 20 feet*, plus *1/4 inch*, minus *3/8 inch*.

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C. *20 to 40 feet*, plus or minus *3/8 inch*.
D. Each additional *10 feet*, plus or minus *1/8 inch*.

3. Total Thickness or Flange Thickness: Plus *1/4 inch*, minus *1/8 inch*.
4. Rib Thickness: Plus or minus *1/8 inch*.
5. Rib to Edge of Flange: Plus or minus *1/8 inch*.
6. Distance between Ribs: Plus or minus *1/8 inch*.
7. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches or 1/2 inch total, whichever is greater.
8. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/4 inch.
9. Location and Dimension of Block-outs Hidden from View and Used for HVAC and Utility Penetrations: Plus or minus 3/4 inch.
10. Dimensions of Haunches: Plus or minus 1/4 inch.
11. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch.
12. Difference in Relative Position of Adjacent Haunch Bearing Surfaces from Specified Relative Position: Plus or minus 1/4 inch.
13. Bowing: Plus or minus L/360, maximum 1 inch.
14. Local Smoothness: 1/4 inch per 10 feet.
15. Variation between Adjacent Thin-Brick-Facing Products: 1/16 inch.
16. Warping: 1/16 inch per 12 inches of distance from the nearest adjacent corner.
17. Tipping and Flushness of Plates: Plus or minus 1/4 inch.
18. Dimensions of Architectural Features and Rustications: Plus or minus 1/8 inch.

Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.

1. Weld Plates: Plus or minus 1 inch.
2. Inserts: Plus or minus 1/2 inch.
3. Handling Devices: Plus or minus 3 inches.
4. Reinforcing Steel and Welded Wire Fabric: Plus or minus 1/4 inch where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch.
5. Reinforcing Steel Extending out of Member: Plus or minus 1/2 inch of plan dimensions.
6. Tendons: Plus or minus 1/4 inch, vertical; plus or minus 1 inch, horizontal.
7. Location of Rustication Joints: Plus or minus 1/8 inch.
8. Location of Opening within Panel: Plus or minus 1/4 inch.
9. Flashing Reglets: Plus or minus 1/4 inch.
10. Flashing Reglets at Edge of Panel: Plus or minus 1/8 inch.
11. Reglets for Glazing Gaskets: Plus or minus 1/8 inch.
12. Electrical Outlets, Hose Bibs: Plus or minus 1/2 inch.
13. Haunches: Plus or minus 1/4 inch.
14. Allowable Rotation of Plate, Channel Inserts, Electrical Boxes: 2-degree rotation or 1/4 inch maximum over the full dimension of the unit.

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11-04.2(13) FINISHES

Finish exposed-face surfaces of precast architectural concrete units to match approved design reference sample and as follows:

1. Design Reference Sample: Cast-in-place concrete from original control house structures.
2. Retarded Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
3. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
4. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.

Finish exposed top surfaces of precast architectural concrete units to match face-surface finish.

Finish unexposed surfaces of precast architectural concrete units by float finish.

11-04.2(14) SOURCE QUALITY CONTROL

Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements.

Strength of precast concrete units will be considered deficient if units fail to comply with *ACI 318* requirements.

Testing: If there is evidence that the strength of precast concrete units may be deficient or may not comply with *ACI 318* requirements, Owner will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.

1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Engineer.
2. Cores will be tested in an air-dry condition.
3. Strength of concrete for each series of 3 cores will be considered satisfactory if the average compressive strength is equal to at least 85 percent of the 28-day design compressive strength and no single core is less than 75 percent of the 28-day design compressive strength.
4. Test results will be made in writing on the same day that tests are performed, with copies to Engineer, Contractor, and precast concrete fabricator. Test reports will include the following:
   - A. Project identification name and number.
   - B. Date when tests were performed.
   - C. Name of precast concrete fabricator.
   - D. Name of concrete testing agency.
   - E. Identification letter, name, and type of precast concrete unit or units represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

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Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mix that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
Defective Work: Precast architectural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

11-04.3 CONSTRUCTION REQUIREMENTS

11-04.3(1) EXAMINATION

Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
Do not install precast concrete units until supporting concrete has attained minimum design compressive strength.

11-04.3(2) INSTALLATION

Install clips, hangers, and other accessories required for connecting precast architectural concrete units to supporting members and backup materials.
Install precast architectural concrete. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

1. Install bearing pads as precast concrete units are being erected.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting hoisting devices and use sand-cement grout to fill voids within recessed hoisting devices flush with surface of concrete.

Anchor precast architectural concrete units in position by bolting, welding, grouting, or as otherwise indicated. Remove temporary shims, wedges, and spacers as soon as possible after anchoring and grouting are completed.
Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.

1. Protect precast architectural concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
2. Repair damaged steel surfaces by cleaning and applying a coat of galvanizing repair paint to galvanized surfaces.
3. Repair damaged steel surfaces by cleaning and repriming damaged painted surfaces.

At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.
Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

11-04.3(3) ERECTION TOLERANCES

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Install precast architectural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

Install precast architectural concrete units level, plumb, square, and true, without exceeding the following noncumulative erection tolerances.

1. Plan Location from Building Grid Datum: Plus or minus *1/2 inch*.
2. Plan Location from Centerline of Steel: Plus or minus *1/2 inch*.
3. Top Elevation from Nominal Top Elevation: As follows:
   A. Exposed Individual Panel: Plus or minus *1/4 inch*.
   B. Nonexposed Individual Panel: Plus or minus *1/2 inch*.
   C. Exposed Panel Relative to Adjacent Panel: *1/4 inch*.
   D. Nonexposed Panel Relative to Adjacent Panel: *1/2 inch*.
4. Support Elevation from Nominal Support Elevation: As follows:
   A. Maximum Low: 1/2 inch.
   B. Maximum High: 1/4 inch.
5. Maximum Plumb Variation over the Lesser of Height of Structure or *100 Feet*: *1 inch*.
6. Plumb in Any *10 Feet* of Element Height: *1/4 inch*.
7. Maximum Jog in Alignment of Matching Edges: *1/4 inch*.
8. Joint Width (Governs over Joint Taper): Plus or minus *1/4 inch*.
9. Maximum Joint Taper: *3/8 inch*.
10. Joint Taper in *10 Feet*: *1/4 inch*.
11. Maximum Jog in Alignment of Matching Faces: *1/4 inch*.
12. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: *1/4 inch*.

11-04.3(4) FIELD QUALITY CONTROL

Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

Field welds and connections using high-strength bolts will be subject to tests and inspections.

Testing agency will report test results promptly and in writing to Contractor and Engineer.

Remove and replace work that does not comply with specified requirements.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

11-04.3(5) REPAIRS

Repair exposed exterior surfaces of precast architectural concrete units to match color, texture, and uniformity of surrounding precast architectural concrete if permitted by Engineer. Remove and replace damaged precast architectural concrete units if repairs do not comply with requirements.

11-04.3(6) CLEANING

Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.

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Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

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11-05 GLASS REINFORCED CONCRETE

11-05.1 GENERAL

11-05.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-05.1(2) SUMMARY

This Section includes glass fiber reinforced concrete (GRC) panels consisting of GRC, panel frames, anchors, and connection hardware. GRC panels include fascia units and soffits.

1. Related Sections include the following:
2. Section 11-02 "Cast-in-Place Concrete" for placing connection anchors in concrete.
3. Section 11-03 "Plant-Precast Architectural Concrete."
4. Section 11-09 for connection attachment to structural steel framing.
5. Section 11-31, Joint Sealants for elastomeric joint sealants and sealant backings.

11-05.1(3) PERFORMANCE REQUIREMENTS

Structural Performance: Provide GRC panels, including panel frames, anchors, and connections, capable of withstanding the following design loads as well as the effects of thermal- and moisture-induced volume changes, according to load factors and combinations established in PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panels."

1. Design Loads: 30 psf.
2. Thermal Movements: Provide for thermal movements resulting from annual ambient temperature changes of *100 deg F*.
3. Design panel frames and connections to accommodate deflections and other building movements.

11-05.1(4) SUBMITTALS

Product Data: For each type of product indicated. Include GRC design mixes.

Shop Drawings: Show fabrication and installation details for GRC panels, including the following:

1. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Panel elevations, sections, and dimensions.
3. Thickness of facing mix, GRC backing, and bonding pads for typical panels.
4. Finishes.
5. Joint and connection details.
6. Erection details.
7. Panel frame details for typical panels, including sizes, spacings, thickness, and yield strength of various members.
8. Location and details of connection hardware attached to structure.

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9. Size, location, and details of flex, gravity, and seismic anchors for typical panels.
10. Other items sprayed into panels.
11. Erection sequence for special conditions.
12. Relationship to adjacent materials.
13. Description of loose, cast-in, and field hardware.

Samples: Representative of finished exposed face of GRC showing the full range of colors and textures expected, *16 by 16 inches* and of actual thickness.
Qualification Data: For GRC manufacturer, including proof of current PCI Plant Certification.
Source Quality-Control Program: For GRC manufacturer.
Source Quality-Control Test Reports: For GRC, inserts, and anchors.
Research/Evaluation Reports: PCI's ICBO Evaluation Report #4359 for GRC.

11-05.1(5) QUALITY ASSURANCE

Manufacturer Qualifications: A qualified manufacturer who participates in PCI's Plant Certification Program and is designated a PCI-Certified Plant for Group G - Glass Fiber Reinforced Concrete.

1. Manufacturer's responsibility includes fabricating and installing GRC panels and providing professional engineering services needed to assume engineering responsibility for GRC panels.
2. Engineering responsibility includes preparation of Shop Drawings and comprehensive engineering analysis, based on GRC production test values, by a qualified professional engineer experienced in GRC design.

Source Limitations: Obtain GRC panels through one source from a single manufacturer.
PCI Manuals: Comply with requirements and recommendations in the following PCI manuals unless more stringent requirements are indicated:

1. PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panels."
2. PCI MNL 130, "Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products."

AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members."
Preinstallation Conference: Conduct conference at Project site.

11-05.1(6) DELIVERY, STORAGE, AND HANDLING

Handle and transport GRC panels to avoid damage.

3. Place nonstaining resilient spacers between panels.
4. Support panels during shipment on nonstaining material.
5. Protect panels from dirt and damage during handling and transport.

Store GRC panels to protect from contact with soil, staining, and physical damage.

1. Store panels with nonstaining resilient supports in same positions as when transported.
2. Store panels on firm, level, and smooth surfaces.
3. Place stored panels so identification marks are clearly visible.

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11-05.2 PRODUCTS

11-05.2(1) MOLD MATERIALS

Molds: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide continuous and true GRC surfaces; nonreactive with GRC and capable of producing required finish surfaces. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain, or adversely affect GRC surfaces and will not impair subsequent surface or joint treatments of GRC.
Surface Retarder: Chemical liquid set retarder capable of temporarily delaying hardening of newly placed GRC face mix to depth of reveal specified.

11-05.2(2) GRC MATERIALS

Portland Cement: ASTM C 150, Type I, II, or III.

1. For surfaces exposed to view in finished structure, use buff of same type, brand, and source throughout GRC production.
2. Metakaolin: ASTM C 618, Class N.

Glass Fibers: Alkali resistant, with a minimum zirconia content of 16 percent, *1 to 2 inches* long, specifically produced for use in GRC, and complying with PCI MNL 130.
Sand: Washed and dried silica, complying with composition requirements of ASTM C 144; passing *No. 20* sieve with a maximum of 2 percent passing *No. 100* sieve.
Facing Aggregate: ASTM C 33, except for gradation, and PCI MNL 130, *1/4-inch* maximum size. Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match existing original cast-in-place concrete.
Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant as required to match existing original cast-in-place concrete.
Water: Potable; free from deleterious material that may affect color stability, setting, or strength of GRC and complying with chemical limits of PCI MNL 130.
Polymer-Curing Admixture: Acrylic thermoplastic copolymer dispersion complying with PCI MNL 130. Do not use for face mix.
Air-Entraining Admixture: ASTM C 260, containing not more than 0.1 percent chloride ions.
Chemical Admixtures: ASTM C 494/C 494M, containing not more than 0.1 percent chloride ions.

11-05.2(3) ANCHORS, CONNECTORS, AND MISCELLANEOUS MATERIALS

All anchors to be stainless steel A316.

11-05.2(4) PANEL FRAME MATERIALS

Cold-Formed Steel Framing: Manufacturer's standard C-shaped steel studs, complying with AISI's "Specification for the Design of Cold-Formed Steel Structural Members," minimum uncoated steel thickness of *0.0538 inch*, with stiffened flanges, U-shaped steel track, and of the following steel sheet:

1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, structural-steel sheet, *G90* zinc coating, of grade required by structural performance of framing.
2. Steel Channels and Angles: Stainless steel 316.

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11-05.2(5) GRC MIXES

Backing Mix: Proportion backing mix of portland cement, glass fibers, sand, and admixtures to comply with design requirements. Provide nominal glass-fiber content of not less than 5 percent by weight of total mix.

Face Mix: Proportion face mix of portland cement, sand, facing aggregates, and admixtures to comply with design requirements.

Polymer-Curing Admixture: 6 to 7 percent by weight of polymer-curing admixture solids to dry portland cement.

Air Content: 8 to 10 percent; ASTM C 185.

Coloring Admixture: Not to exceed 10 percent of cement weight.

11-05.2(6) PANEL FRAME FABRICATION

Fabricate panel frames and accessories plumb, square, true to line, and with components securely fastened, according to Shop Drawings and requirements in this Section.

1. Fabricate panel frames using jigs or templates.
2. Cut cold-formed metal framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Fasten framing members of hollow structural sections, steel channels, or steel angles by welding. Comply with AWS D1.1 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
5. Weld flex, gravity, and seismic anchors to panel frames.

Reinforce, stiffen, and brace framing assemblies, if necessary, to withstand handling, delivery, and erection stresses. Lift fabricated assemblies in a manner that prevents damage or significant distortion.

Galvanizing Repair: Touch up accessible damaged galvanized surfaces according to ASTM A 780.

11-05.2(7) MOLD FABRICATION

Construct molds that will result in finished GRC complying with profiles, dimensions, and tolerances indicated, without damaging GRC during stripping. Construct molds to prevent water leakage and loss of cement paste. Coat contact surfaces of molds with surface retarder.

11-05.2(8) GRC FABRICATION

Proportioning and Mixing: For backing mix, meter sand/cement slurry and glass fibers to spray head at rates to achieve design mix proportions and glass-fiber content according to PCI MNL 130 procedures.

Spray Application: Comply with general procedures as follows:

1. Spray or place face mix in thickness indicated on Shop Drawings.
2. Proceed with spraying backing mix before face mix has set, using procedures that produce a uniform thickness and even distribution of glass fibers and matrix.

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3. Consolidate backing mix by rolling or other technique to achieve complete encapsulation of glass fibers and compaction.
4. Measure thickness with a pin gage or other acceptable method at least once for each *5 sq. ft.* of panel surface. Take not less than six measurements per panel.

Hand form and consolidate intricate details, incorporate formers or infill materials, and over spray before material reaches initial set to ensure complete bonding.
Attach panel frame to GRC before initial set of GRC backing, maintaining a minimum clearance of *1/2 inch* from GRC backing, and without anchors protruding into GRC backing.
Build up homogeneous GRC bonding pads over anchor feet, maintaining a minimum thickness of *1/2 inch* over tops of anchor feet, before initial set of GRC backing.
Inserts and Embedments: Build up homogeneous GRC bosses or bonding pads over inserts and embedments to provide sufficient anchorage and embedment to comply with design requirements.
Curing: Employ initial curing method that will ensure sufficient strength for removing units from mold.

1. After initial curing, remove panel from mold and place in a controlled curing environment.
2. Keep GRC panels continuously moist for a minimum of seven days unless polymer-curing admixture was used. Maintain temperature between *60 and 120 deg F* during this period.

Panel Identification: Mark each GRC panel to correspond with identification mark on Shop Drawings. Mark each panel with its casting date.

11-05.2(9) FABRICATION TOLERANCES

Manufacturing Tolerances: Manufacture GRC panels so each finished unit complies with PCI MNL 130 for dimension, position, and tolerances.

11-05.2(10) SOURCE QUALITY CONTROL

Quality-Control Testing: Establish and maintain a quality-control program for manufacturing GRC panels according to PCI MNL 130.

1. Test materials and inspect production techniques.
2. Quality-control program shall monitor glass-fiber content, spray rate, unit weight, product physical properties, anchor pull-off and shear strength, and curing period and conditions.
3. Prepare test specimens and test according to ASTM C 1228, PCI MNL 130, and PCI MNL 128 procedures.
4. Test GRC inserts and anchors according to ASTM C 1230 to validate design values.
5. Produce test boards at a rate not less than one per work shift per operator for each spray machine and for each mix design. For each test board, determine glass-fiber content according to ASTM C 1229, and flexural yield and ultimate strength according to ASTM C 947.

11-05.3 CONSTRUCTION REQUIREMENTS

11-05.3(1) EXAMINATION

NOT FOR CONSTRUCTION

Examine structure and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

11-05.3(2) ERECTION

Install clips, hangers, and other accessories required for connecting GRC panels to supporting members and backup materials.

Lift GRC panels and install without damage.

Install GRC panels level, plumb, square, and in alignment. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.

1. Maintain horizontal and vertical joint alignment and uniform joint width.
2. Remove projecting hoisting devices.

Connect GRC panels in position by bolting or welding, or both, as indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as possible after connecting is completed.

Welding: Comply with applicable AWS D1.1 and AWS D1.3 requirements for welding, appearance, quality of welds, and methods used in correcting welding work. Protect GRC panels from damage by field welding or cutting operations, and provide noncombustible shields as required.

At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.

11-05.3(3) <u>ERECTION TOLERANCES</u>

Erect GRC panels to comply with the following noncumulative tolerances:

1. Plan Location from Building Grid Datum: Plus or minus *1/2 inch*.
2. Top Elevation from Nominal Top Elevation: As follows:
   A. Exposed Panel Relative to Adjacent Panel: *1/4 inch*.
3. Support Elevation from Nominal Elevation: As follows:
   A. Maximum Low: 1/2 inch.
   B. Maximum High: 1/4 inch.
4. Maximum Jog in Alignment of Matching Edges: *1/4 inch*.
5. Maximum Jog in Alignment of Matching Faces: *1/4 inch*.
6. Face Width of Joint: As follows (governs over joint taper):
   A. Panel Dimension 20 Feet or Less: Plus or minus 1/4 inch.
7. Maximum Joint Taper: *3/8 inch*.
8. Joint Taper in *10 Feet*: *1/4 inch*.
9. Differential Bowing, as Erected, between Adjacent Members of Same Design: *1/4 inch*.

11-05.3(4) <u>REPAIRS</u>

Repairs will be permitted provided structural adequacy of GRC panel and appearance are not impaired, as approved by Engineer.

Mix patching materials and repair GRC so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces.

Prepare and repair accessible damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

NOT FOR CONSTRUCTION

Remove and replace damaged GRC panels when repairs do not comply with requirements.

11-05.3(5) CLEANING AND PROTECTION

Perform cleaning procedures, if necessary, according to GRC manufacturer's written instructions. Clean soiled GRC surfaces with detergent and water, using soft fiber brushes and sponges, and rinse with clean water. Prevent damage to GRC surfaces and staining of adjacent materials.

NOT FOR CONSTRUCTION

11-07 BRICK EMBEDDED CONCRETE PANELS

11-07.1 GENERAL

11-07.1(RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-07.1(2) SUMMARY

This Section includes products, methods and installation for thin brick inlay system for site-cast concrete, formliners for the setting of the brick, as scheduled and drawn. Thin brick is specified in Section 11-08 “Brick Masonry”

Related Sections include the following:

1. Section 11-02 "Cast-in-Place Concrete."
2. Section 11-08 “Brick Masonry”.
3. Section 11-40 “Gypsum Board Assemblies” for stud wall and glass-mat, water-resistant backing board.

11-07.1(3) REFERENCES

ASTM C 1088 - TBX Select Specification for Thin Veneer Brick Units Made From Shale or Clay.

ASTM D 2240 - Standard "A Scale" Test Method for Rubber Property -Durometer Hardness (Shore A).

11-07.1(4) SUBMITTALS

Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

Shop Drawings: Provide locations of brick panels in project and submit elevation drawings that indicate:

1. Panel sizes.
2. Panel joint locations and dimensions.
3. Horizontal and vertical brick coursing.
4. Alignment of brick coursing to adjacent construction.
5. Special conditions.

Selection Samples: For each finish product specified, two complete sets of samples, representative of full range of color and finish for each brick type.

1. For each finish product specified, two complete sets of samples, representative of full range of color and finish for each brick type.
2. Form Liner Samples representing all brick gasket form liners which will be used.
3. Bond breaker sample on brick chip representing bond breaker which will be used.

NOT FOR CONSTRUCTION

Verification Samples: For each finish product specified, two samples, representative of selected color range and finish of each brick type.
Qualification Data: For installers, to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

11-07.1(5) QUALITY ASSURANCE

Installer Qualifications: In addition to other requirements in Division 1 Section "Quality Requirements," retain installers that employ workers trained and approved by manufacturer to apply concrete patching and rebuilding materials and epoxy crack injection materials.
Manufacturer Qualifications: In addition to other requirements in Division 1 Section "Quality Requirements," manufacturers shall have factory-trained representatives who are available for consultation and Project site inspection at no additional cost.
Mock-Up: Provide mock-ups for evaluation of surface preparation techniques and application workmanship.

1. Mock-up panels for areas as shown on drawings of specified brick type. Mock-up one shall include brick template application utilized in concrete application. Mock-up two shall include brick application utilized in metal stud and cement board framing above concrete walls.
2. Do not proceed with remaining work until workmanship, color, and detail are approved by Engineer.
3. Modify mock-up area as required to produce acceptable work.

11-07.1(6) DELIVERY, STORAGE, AND HANDLING

Deliver materials to Project site in manufacturer's original and unopened containers, labeled with type and name of products and manufacturers.
Store products in manufacturer's unopened packaging in dry storage area, with ambient temperature between 30 degrees F (-1 degree C) and 120 degrees F (41 degree C), until installation.
Do not use damaged products. Do not install products not bearing product trade name and manufacturer's name.
Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
Note compliance with TCLP Test for Throw-away status.

11-07.1(7) PROJECT CONDITIONS

Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

11-07.2 PRODUCTS

11-07.2(1) MANUFACTURERS

Products: Subject to compliance with requirements, provide one of the following:

1. Thin Brick, Scott System, Inc.,
2. Brickmaster, Fitzgerald Formliners

11-07.2(2) MATERIALS

NOT FOR CONSTRUCTION

Complete thin brick assembled in single-use brick embed system.

1. Brick template system: Single-use template system for brick embedded concrete application. Modular templates formed of recyclable styrene plastic to surround single brick units, having factory-applied face wax.
2. Brick inlay system: Multi-use template for vertically poured walls and corner returns. Modular templates formed styrene plastic and polyurethane rim to surround single brick units, having factory-applied bond breaker.
3. Brick gasket form liner system: Elastomeric gasket form liner for integrally casting brick into precast concrete.
4. Maximum variation from indicated nominal dimensions of brick cavities:
   A. Length: Plus or minus 1/32 inch (0.8 mm).
   B. Height: Plus or minus 1/32 inch (0.8 mm).
   C. Depth: Plus or minus 1/32 inch (0.8 mm).
5. Maximum variation from square, measured diagonally across non-adjacent comers: Plus or minus 1/16 inch (1.6 mm).

Brick: Brick is specified in Section “Brick Masonry”.
Brick Coating: Wax or other brick coating will be applied to each brick face to facilitate the cleaning of the cast brick surface. Retarder papers may be substitute.
Brick Gasket: Single Use Formliner: Brick faces will be coated with wax or approved bond breaker to prevent grout staining.

11-07.2(3) FABRICATION

Inlay Installation Tolerances:

1. Variation in alignment of horizontal or vertical mortar joints maximum 1/4 inch (6 mm) in 10 feet (3 m), non-cumulative.
   A. Maximum offset in plane of adjacent form liner units: 1/16 inch (1.6 mm).
   B. Maximum misalignment between adjacent form liner units: 3/64 inch (1.2 mm).

Install brick in accordance with manufacturer's printed installation instructions.

1. Clean brick pockets free of foreign material.
2. Install in accordance with manufacturer's printed installation instructions.

Form, cast, strip and cure concrete per requirements of sections referenced.

11-07.3 CONSTRUCTION REQUIREMENTS

11-07.3(1) EXAMINATION

Do not begin installation until supporting structures have been properly prepared.
If support structure is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

11-07.3(2) INSTALLATION

Field erect panels in accordance with manufacturer's instructions and Project requirements. Refer to related specification sections for field installation requirements.

NOT FOR CONSTRUCTION

11-07.3(3) PROTECTION

Protect installed products until completion of project. Touch-up, repair or replace damaged products before Substantial Completion.

NOT FOR CONSTRUCTION

11-08 BRICK MASONRY

11-08.1 GENERAL

11-08.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

11-08.1(2) SUMMARY

Section Includes:

1. Products, methods and installation for thin brick system for application to metal stud and cement board framing above concrete walls as scheduled and drawn.
2. Concrete facing thin brick. Thin brick with required custom brick shapes.
3. Stone trim units.
4. Latex portland cement mortar.
5. Colored grout.
6. Miscellaneous masonry accessories.

Related Sections:

1. Section 11-07 "Brick Embedded Concrete Panels" for installation and mockups of thin brick facing on concrete.
2. Section 11-40 "Gypsum Board Assemblies" for stud wall and glass-mat, water-resistant backing board.

11-08.1(3) SUBMITTALS

Product Data: For each type of product indicated.

Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

Samples for Initial Selection:

1. Concrete facing brick, in the form of small-scale units.
2. Stone trim.
3. Colored grout.

Samples for Verification: For each type and color of the following:

1. Concrete facing brick.
2. Special brick shapes.
3. Stone trim.
4. Colored grout. Make Samples using same sand and mortar ingredients to be used on Project.
5. Accessories embedded in masonry.

NOT FOR CONSTRUCTION

List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Engineer and approved in writing.

Material Certificates: For each type and size of the following:

1. Masonry units.
   - A. Include data on material properties.
   - B. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
   - C. For exposed brick, include test report for efflorescence according to ASTM C 67.
   - D. For surface-coated brick, include test report for durability of surface appearance after 50-cycles of freezing and thawing per ASTM C 67.
   - E.
2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, portland cement mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Anchors, ties, and metal accessories.

11-08.1(4) QUALITY ASSURANCE

Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 32 inches (900 mm) long by 24inches (600 mm).
2. Clean one-half of exposed faces of panels with masonry cleaner indicated.
3. Protect approved sample panels from the elements with weather-resistant membrane.
4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Engineer in writing. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Engineer in writing.

Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

NOT FOR CONSTRUCTION

1. Build mockup of typical wall area as shown on Drawings.
   A. Include lower corner of window opening with stone sill at upper corner of exterior wall mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.
   B. Include metal studs, sheathing, and air barrier in mockup.

2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
   A. Approval of mockups is also for other material and construction qualities specifically approved by Engineer in writing.
   B. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Engineer in writing.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

11-08.1(5) DELIVERY, STORAGE, AND HANDLING

Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

11-08.1(6) PROJECT CONDITIONS

Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.

Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

NOT FOR CONSTRUCTION

2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

11-08.2 PRODUCTS

11-08.2(1) MASONRY UNITS, GENERAL

Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

11-08.2(2) BRICK

General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

Brick: Exterior grade conforming to ASTM C 1088, fabricated to TBX tolerance.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
2. Thin brick shall be “METROBRICK® as manufactured by Ironrock Capital, Canton, Ohio, 44711." Customer Service: 1-888-325-3945
3. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67.
4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
5. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m.)

NOT FOR CONSTRUCTION

6. Sheer Bond Strength to Portland Cement: Provide brick that has been tested according to ASTM C 482 and is rated greater than 150psi.
7. Application: Use where brick is exposed unless otherwise indicated.
   A. Installation for thin brick inlay system for site-cast concrete.
   B. Installation for thin field applied with thin set method.
   C.
8. Color and Texture: Metro Brick, mixture of bricks described as; X35 – Main Street, Flashed Iron Spot, Velour Texture. Match sample palette provided by Engineer

11-08.2(3) STONE TRIM

Limestone: ASTM C 568, Classification III High Density. Variety and Sources: Indiana oolitic limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana. Grade and Color: Select, buff, according to grade and color classification established by ILI.
Finish: Machine tooled, 8 bats per 1 inch (25 mm). Finish for Tops of Sills: Sand rubbed.
Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

11-08.2(4) WATERPROOF MEMBRANE

General: Manufacturer's standard product selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.
Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following]:

1. Boiardi Products; a QEP company; Elastiment 323 Cement Based Waterproofing, Anti-Fracture/Crack Suppression Membrane.
2. C-Cure; UltraCure 971.
3. MAPEI Corporation; Mapelastic (PRP 315).
4. TEC; a subsidiary of H. B. Fuller Company; Triple Flex Waterproofing, Crack Isolation Membrane & Mortar.

11-08.2(5) MORTAR MATERIALS

Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Laticrete International, Inc. or comparable product by one of the following:
   A. Boiardi Products; a QEP company.
   B. Bostik, Inc.
   C. C-Cure.
   D. Custom Building Products.
   E. MAPEI Corporation.
   F. TEC; a subsidiary of H. B. Fuller Company.

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site.

NOT FOR CONSTRUCTION

4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

11-08.2(6) GROUT MATERIALS

Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated. Color shall match concrete joints at brick on cast-in-place concrete.

11-08.2(7) MASONRY CLEANERS

Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Diedrich Technologies, Inc.
2. EaCo Chem, Inc.
3. ProSoCo, Inc.

11-08.3 CONSTRUCTION REQUIREMENTS

11-08.3(1) GENERAL

See Section 11-07 "Brick Embedded Concrete Panels" for installation and mockups of thin brick facing on concrete.

11-08.3(2) EXAMINATION

Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

11-08.3(3) INSTALLATION, GENERAL

Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

11-08.3(4) TOLERANCES

NOT FOR CONSTRUCTION

Dimensions and Locations of Elements: Match dimensions and locations of elements in Section 11-07 "Brick Embedded Concrete Panels".
Lines and Levels: Match line and levels in Section 11-07 "Brick Embedded Concrete Panels".
Joints: Match joint height and width in Section 11-07 "Brick Embedded Concrete Panels".

11-08.3(5) LAYING MASONRY WALLS

Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

11-08.3(6) INSTALLATION

Comply with Tile Council of North America; TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108.5 Series "Specifications for Installation of Ceramic Tile with Latex Portland Cement Mortar" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.
4.

Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

11-08.3(7) TILE BACKING PANEL INSTALLATION

Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

11-08.3(8) WATERPROOFING INSTALLATION

Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

11-08.3(9) REPAIRING, POINTING, AND CLEANING

Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

NOT FOR CONSTRUCTION

Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

NOT FOR CONSTRUCTION

11-09 STRUCTURAL STEEL

11-09.1 GENERAL

11-09.1(1) DESCRIPTION

This Section includes structural steel and grout.
Related Sections in the Special Provisions include the following:

1. Section 11-11 "Metal Fabrications" for steel lintels or shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other metal items not defined as structural steel.
2. Section 11-45 “Painting” for surface preparation and priming requirements.

11-09.1(2) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of product indicated.
Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.

Welding certificates.
Qualification Data: For Installer and Fabricator
Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Nonshrink grout.

Source quality-control test reports.

11-09.1(3) QUALITY ASSURANCE

Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd.
Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design"
3. AISC's "Specification for the Design of Steel Hollow Structural Sections."
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

NOT FOR CONSTRUCTION

11-09.1(4) DELIVERY, STORAGE, AND HANDLING

Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

11-09.1(5) COORDINATION

Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

11-09.2 PRODUCTS

11-09.2(1) STRUCTURAL-STEEL MATERIALS

W-Shapes: ASTM A 992 or ASTM A 572, Grade *50*.
Channels, Angles: ASTM A 36.
Plate and Bar: ASTM A 36.
Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
Steel Pipe: ASTM A 53, Type E or S, Grade B.
Welding Electrodes: Comply with AWS requirements.

11-09.2(2) BOLTS, CONNECTORS, AND ANCHORS

High-Strength Bolts, Nuts, and Washers: *ASTM A 325*, Type 1, heavy hex steel structural bolts; *ASTM A 563* heavy hex carbon-steel nuts; and *ASTM F 436* hardened carbon-steel washers. Finish: Plain or Hot-dip zinc coating, ASTM A 153, Class C, as indicated on drawings.

Headed Anchor Rods: *ASTM A 307, Grade A*.

1. Configuration: Straight.
2. Nuts: *ASTM A 563* heavy hex carbon steel.
3. Plate Washers: ASTM A 36 carbon steel.
4. Washers: *ASTM F 436* hardened carbon steel.
5. Finish: Plain or Hot-dip zinc coating, ASTM A 153, Class C, as indicated on drawings.

Threaded Rods: ASTM A 36.

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Washers: ASTM F 436 hardened carbon steel.
3. Finish: Plain or Hot-dip zinc coating, ASTM A 153, Class C, as indicated on drawings.

11-09.2(3) PRIMER

Coordinate required primer withSection 11-45 "Painting".

NOT FOR CONSTRUCTION

Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

11-09.2(4) GROUT

Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

11-09.2(5) FABRICATION

Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
5.

Thermal Cutting: Perform thermal cutting by machine to greatest extent possible. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning"
Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

11-09.2(6) SHOP CONNECTIONS

High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
Joint Type: Snug tightened.
Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

11-09.2(7) SHOP PRIMING

Shop prime steel surfaces per Section11-45 “Painting”.

11-09.2(8) GALVANIZING

NOT FOR CONSTRUCTION

Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M for galvanized members indicated on the drawings.
Fill vent holes and grind smooth after galvanizing.

11-09.2(9) SOURCE QUALITY CONTROL

Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

11-09.3 CONSTRUCTION REQUIREMENTS

11-09.3(1) EXAMINATION

Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
Proceed with installation only after unsatisfactory conditions have been corrected.

11-09.3(2) PREPARATION

Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

11-09.3(3) ERECTION

Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.

NOT FOR CONSTRUCTION

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

Splice members only where indicated.
Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
Do not use thermal cutting during erection.
Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

11-09.3(4) FIELD CONNECTIONS

High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for snug tightened bolts
Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

11-09.3(5) FIELD QUALITY CONTROL

Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
Welded Connections: Field welds will be visually inspected according to AWS D1.1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

NOT FOR CONSTRUCTION

Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

11-09.3(6) REPAIRS AND PROTECTION

Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

Touchup Painting: Cleaning and touchup painting are specified in Section 11-45 "Painting".

NOT FOR CONSTRUCTION

11-10 STEEL DECK

11-10.1 GENERAL

11-10.1(1) DESCRIPTION

This Section includes the following roof deck and composite floor deck

11-10.1(2) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of deck, accessory, and product indicated.
Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.
Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.
Welding Certificates: Copies of certificates for welding procedures and personnel.
Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

11-10.1(3) QUALITY ASSURANCE

Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

11-10.1(4) DELIVERY, STORAGE, AND HANDLING

Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

11-10.2 PRODUCTS

11-10.2(1) ROOF DECK

Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade *33*, *G60* zinc coating.
2. Deck Profile: Type WR, wide rib.
3. Profile Depth: *1-1/2 inch*
4. Design Uncoated-Steel Thickness: 20 gauge
5. Span Condition: Simple or double span.

NOT FOR CONSTRUCTION

6. Side Laps: Overlapped or interlocking seam at Contractor's option.

11-10.2(2) COMPOSITE FLOOR DECK

Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade *33*, *G60* zinc coating.
2. Profile Depth: *2 inches*.
3. Design Uncoated-Steel Thickness: 20 gauge
4. Span Condition: As indicated on drawings.

11-10.2(3 ACCESSORIES

General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, *No. 10* minimum diameter.

Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of *33,000 psi*, not less than *0.0359-inch* design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of *33,000 psi*, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 29 for overhang and slab depth, unless indicated otherwise.

Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless indicated otherwise.

Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

Flat Sump Plate: Single-piece steel sheet, *0.0747 inch* thick, of same material and finish as deck. For drains, cut holes in the field.

Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

11-10.3 CONSTRUCTION REQUIREMENTS

11-10.3(1 EXAMINATION

Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

11-10.3(2 INSTALLATION, GENERAL

Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.

Install temporary shoring before placing deck panels, if required to meet deflection limitations.

NOT FOR CONSTRUCTION

Locate decking bundles to prevent overloading of supporting members.
Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
Place deck panels flat and square and fasten to supporting frame without warp or deflection.
Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

11-10.3(3) ROOF DECK INSTALLATION

Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than *1-1/2 inches* long, and as follows:

1. Weld Diameter: *5/8 inch*, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units spaced as indicated on the drawings, with a minimum of two welds per deck unit at each support.

Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals indicated on the drawings, mechanically fastened with self-drilling *No. 10* diameter or larger carbon-steel screws.
End Bearing: Install deck ends over supporting frame with a minimum end bearing of *1-1/2 inches*, with end joints lapped *2 inches* minimum.
Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than *12 inches* apart with at least 1 weld at each corner.
Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

11-10.3(4) FLOOR DECK INSTALLATION

Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: *5/8 inch*, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units spaced as indicated on the drawings, with a minimum of two welds per deck unit at each support.

Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals indicated on the drawings, mechanically fastened with self-drilling *No. 10* diameter or larger carbon-steel screws.
End Bearing: Install deck ends over supporting frame with a minimum end bearing of *1-1/2 inches* with lapped end joints.

NOT FOR CONSTRUCTION

Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.
Install piercing hanger tabs not more than *14 inches* apart in both directions, within *9 inches* of walls at ends, and not more than *12 inches* from walls at sides, unless otherwise indicated.

11-10.3(5) FIELD QUALITY CONTROL

Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.
Field welds will be subject to inspection.
Testing agency will report test results promptly and in writing to Contractor and Engineer.
Remove and replace work that does not comply with specified requirements.
Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

11-10.3(6) REPAIRS AND PROTECTION

Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
Repair Painting: Wire brushing, cleaning and repair painting of rust spots, welds, and abraded areas of exposed deck surfaces are included in the Section 11-45 "Painting".
Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

NOT FOR CONSTRUCTION

11-11 METAL FABRICATIONS

11-11.1 GENERAL

11-11.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-11.1(2) SUMMARY

This Section includes the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Structural-steel door frames.
4. Metal ladders.

Products furnished, but not installed, under this Section include the following: Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

Related Sections include the following:

1. Section 11-02 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Section 11-09 "Structural Steel."
3. Section 11-12 "Metal Stairs."
4. Section 11-13 "Pipe and Tube Railings."

11-11.1(3) PERFORMANCE REQUIREMENTS

Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

11-11.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.

Product Data: For the following:

1. Paint products.
2. Grout.

Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

NOT FOR CONSTRUCTION

Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
Welding certificates.
Qualification Data: For professional engineer.

11-11.1(5) QUALITY ASSURANCE

Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."
3. AWS D1.6, "Structural Welding Code--Stainless Steel."

11-11.1(6) PROJECT CONDITIONS

Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

11-11.1(7) COORDINATION

Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

11-11.2 PRODUCTS

11-11.2(1) MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

11-11.2(2) METALS, GENERAL

Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

11-11.2(3) FERROUS METALS

Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.
Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
Rolled-Stainless-Steel Floor Plate: ASTM A 793.
Steel Tubing: ASTM A 500, cold-formed steel tubing.

NOT FOR CONSTRUCTION

Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.

1. Size of Channels: *1-5/8 by 1-5/8 inches*.
2. Material: Galvanized steel complying with ASTM A 653/A 653M, commercial steel, Type B, with *G90* coating; *0.108-inch* nominal thickness.

11-11.2(4) FASTENERS

General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

Steel Bolts and Nuts: Regular hexagon-head bolts, *ASTM A 307, Grade A*; with hex nuts, *ASTM A 563*; and, where indicated, flat washers.

Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; *ASTM F 593* for bolts and *ASTM F 594* for nuts, Alloy Group *2*.

Anchor Bolts: ASTM F 1554, Grade 36. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

Eyebolts: ASTM A 489.

Machine Screws: *ASME B18.6.3*.

Lag Bolts: *ASME B18.2.1*.

Wood Screws: Flat head, ASME B18.6.1.

Plain Washers: Round, *ASME B18.22.1*.

Lock Washers: Helical, spring type, *ASME B18.21.1*.

Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group *2* stainless-steel bolts complying with *ASTM F 593* and nuts complying with *ASTM F 594*.

11-11.2(5) MISCELLANEOUS MATERIALS

Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

Shop Primers: Provide primers that comply with Section 11-45 "Painting".

Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

NOT FOR CONSTRUCTION

2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products:
   A. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
   B. Carboline Company; Carbozinc 621.
   C. ICI Devoe Coatings; Catha-Coat 313.
   D. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
   E. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
   F. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
   G. Tnemec Company, Inc.; Tneme-Zinc 90-97.

Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

11-11.2(6) FABRICATION, GENERAL

Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately *1/32 inch*, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

Form exposed work true to line and level with accurate angles and surfaces and straight edges.

Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

NOT FOR CONSTRUCTION

Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, *1/8 by 1-1/2 inches*, with a minimum *6-inch* embedment and *2-inch* hook, not less than *8 inches* from ends and corners of units and *24 inches* o.c., unless otherwise indicated.

11-11.2(7) MISCELLANEOUS FRAMING AND SUPPORTS

General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts if units are installed after concrete is placed.

Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

Galvanize miscellaneous framing and supports where indicated.

Prime miscellaneous framing and supports with zinc-rich primer where indicated.

11-11.2(8) LOOSE BEARING AND LEVELING PLATES

Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

Galvanize plates after fabrication.

11-11.2(9) STEEL WELD PLATES AND ANGLES

Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

11-11.2(10) STRUCTURAL-STEEL DOOR FRAMES

Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with *5/8-by-1-1/2-inch* steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than *10 inches* o.c. Reinforce frames and drill and tap as necessary to accept finish hardware. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.

Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

Prime exterior steel frames with zinc-rich primer.

11-11.2(11) MISCELLANEOUS STEEL TRIM

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Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
Galvanize exterior miscellaneous steel trim.
Prime interior miscellaneous steel trim, where indicated with zinc-rich primer.

11-11.2(12) METAL LADDERS

General:

1. Comply with ANSI A14.3, unless otherwise indicated.
2. Space siderails *18 inches* apart, unless otherwise indicated.
3. Support each ladder at top and bottom and not more than *60 inches* o.c. with welded or bolted brackets, made from same metal as ladder.

Aluminum Ladders:

1. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
2. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
3. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.

11-11.2(13) METAL DOWNSPOUT BOOTS

Provide lambstongue downspout boots made from finish painted cast gray iron in heights indicated with inlets of size and shape to suit downspouts. Outlet: At 35 degrees from horizontal, to discharge onto splash block or pavement.

11-11.2(14) FINISHES, GENERAL

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.

11-11.2(15) STEEL AND IRON FINISHES

Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or

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masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Stripe paint corners, crevices, bolts, welds, and sharp edges.

11-11.2(16) STAINLESS-STEEL FINISHES

Remove tool and die marks and stretch lines or blend into finish.
Dull Satin Finish: No. 6.
When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

11-11.3 CONSTRUCTION REQUIREMENTS

11-11.3(1) INSTALLATION, GENERAL

Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

11-11.3(2) INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
Anchor supports for operable partitions securely to and rigidly brace from building structure.
Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

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Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
Grout baseplates of columns supporting steel girders after girders are installed and leveled.

11-11.3(3) INSTALLING BEARING AND LEVELING PLATES

Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

11-11.3(4) ADJUSTING AND CLEANING

Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces. Apply by brush or spray to provide a minimum *2.0-mil* dry film thickness.
Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 11-45 "Painting".
Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

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11-12 METAL STAIRS

11-12.1 GENERAL

11-12.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-12.1(2) SUMMARY

This Section includes the following:

1. Preassembled steel stairs with concrete-filled treads.
2. Industrial-type stairs with steel grating treads.
3. Steel tube handrails attached to walls adjacent to metal stairs.
4. Preassembled alternating tread metal stairs.

Related Sections include the following:

1. Section 11-02 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
2. Section 11-13 "Pipe and Tube Railings" for pipe and tube railings not attached to walls adjacent to metal stairs.
3. Section 11-15 "Miscellaneous Carpentry" for wood blocking for anchoring railings.
4. Section 11-40 "Gypsum Board Assemblies" for metal backing for anchoring railings.
5. Section 11-45 “Painting” for finish painting of exposed, shop primed metal components.

11-12.1(3) PERFORMANCE REQUIREMENTS

Structural Performance of Stairs: Provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch, whichever is less.

Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:
   A. Uniform load of 50 lbf/ ft. applied in any direction.
   B. Concentrated load of 200 lbf applied in any direction.
   C. Uniform and concentrated loads need not be assumed to act concurrently.

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2. Top Rails of Guards:
   A. Uniform load of 50 lbf/ ft. applied in any direction.
   B. Concentrated load of 200 lbf applied in any direction.
   C. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:
   A. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
   B. Infill load and other loads need not be assumed to act concurrently.
   C.

Seismic Performance: Provide metal stairs capable of withstanding the effects of earthquake motions determined according to the International Building Code (IBC 2006).

11-12.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.

Product Data: For metal stairs and the following:

1. Nonslip aggregates and nonslip-aggregate finishes.
2. Steel grating treads.
3. Paint products.
4. Grout.

Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Provide templates for anchors and bolts specified for installation under other Sections.
2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

Samples for Verification: For the following products, in manufacturer's standard sizes:

1. Stair treads with nonslip-aggregate surface finish.
2. Grating treads.

Welding certificates.

Qualification Data: For professional engineer.

11-12.1(5) QUALITY ASSURANCE

Installer Qualifications: Fabricator of products.

NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Preassembled Stairs: Service class.
2. Industrial-Type Stairs: Industrial class.

Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

11-12.1(6) COORDINATION

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Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

11-12.2 PRODUCTS

11-12.2(1) MANUFACTURERS

In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

11-12.2(2) METALS, GENERAL

Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

11-12.2(3) FERROUS METALS

Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
Grating Treads: 12 GA. pre-galvanized steel with serrated surface, 4 diamond depth with abrasive nosing. Products: Grip Strut or approved equal.
Steel Bars for Grating Treads: ASTM A 36/A 36M.
Wire Rod for Grating Crossbars: ASTM A 510.
Iron Castings: Either gray or malleable iron, unless otherwise indicated.

1. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
2. Malleable Iron: ASTM A 47/A 47M.

Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30, unless another grade is required by design loads.

11-12.2(4) FASTENERS

General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

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11-12.2(5) MISCELLANEOUS MATERIALS

Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products:
   - A. ICI Devoe Coatings; Catha-Coat 313.
   - B. Moore, Benjamin, & Co.; Epoxy Zinc-Rich Primer CM18/19.
   - C. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
   - D. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
   - E. Tnemec Company, Inc.; Tneme-Zinc 90-97.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
2. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
3. Concrete Materials and Properties: Comply with requirements in Section 11-02 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
4. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.
5. Welded Wire Fabric: ASTM A 185, 6 by 6 inches--W1.4 by W1.4, unless otherwise indicated.

11-12.2(6) FABRICATION, GENERAL

Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

Form exposed work true to line and level with accurate angles and surfaces and straight edges.

Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

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4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

11-12.2(7) STEEL-FRAMED STAIRS

Stair Framing:

1. Fabricate stringers of steel channels. Provide closures for exposed ends of channel stringers.
2. Construct platforms of steel tube headers and miscellaneous framing members as needed to comply with performance requirements.
3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.

Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.0677 inch.

1. Steel Sheet: Uncoated hot-rolled steel sheet.
2. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
3. Shape metal pans to include nosing integral with riser.
4. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
5. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing. Smooth Soffit Construction: Construct subplatforms with smooth soffits.

Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."

1. Fabricate treads and platforms from welded steel grating with 1-1/4-by-3/16-inch bearing bars at 15/16 inch o.c. and crossbars at 4 inches o.c., NAAMM designation: W-15-4 (1-1/4 x 3/16) STEEL.
2. Fabricate treads and platforms from pressure-locked steel grating with 1-by-3/16-inch bearing bars at 11/16 inch o.c. and crossbars at 4 inches o.c., NAAMM designation: P-11-4 (1 x 3/16) STEEL.
3. Surface: Serrated.
4. Finish: Galvanized.
5. Fabricate grating treads with rolled-steel floor plate nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
6. Fabricate grating platforms with nosing matching that on grating treads. Provide toeplates at open-sided edges of grating platforms. Weld grating to platform framing.

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11-12.2(8) STEEL TUBE RAILINGS

General: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

Form changes in direction of railings as follows:

1. As detailed.
2. By bending or by inserting prefabricated elbow fittings.

Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

Close exposed ends of railing members with prefabricated end fittings.

Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

1. Connect posts to stair framing by direct welding, unless otherwise indicated.
2. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
3. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

11-12.2(9) FILLERS

Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

11-12.2(10) PREASSEMBLED ALTERNATING TREAD METAL STAIRS

Provide pre-engineered alternating tread metal stairs as manufactured by Lapeyre Stair, Inc., Harahan, LA; 1-800-535-7631.

Provide preassembled, 68 degree from horizontal, alternating tread stair with center stringer, handrails and platform.

1. Material: Carbon steel; powder coated.
2. Structural steel components:
   - A. Treads: 13 gage HRPO
   - B. Stair Landings and Foot Stampings: 11 gage.
   - C. Stringers: 3 inch by 1-3/4 inch by 11 gage.
   - D. Platforms: CS, 3/16 inch thick diamond safety plate.

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Fabricate components to comply with performance and design requirements specified and in accordance with approved shop drawings. Fabricate to minimize field assembly. Fabricate by welding.
Install handrails to stair unit using bolts supplied by manufacturer.
Position stairs with top tread at same elevation as finished floor.
Do not field cut or alter shop-fabricated members.
After installation, touch-up using matching paint supplied by manufacturer.

FINISHES

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
Finish metal stairs after assembly.
Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
3. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products: Interior Stairs (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Stripe paint corners, crevices, bolts, welds, and sharp edges.

11-12.3 CONSTRUCTION REQUIREMENTS

11-12.3(1) INSTALLATION, GENERAL

Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

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2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

Place and finish concrete fill for treads and platforms to comply with Section 11-02 "Cast-in-Place Concrete."

11-12.3(2) INSTALLING STEEL TUBE RAILINGS

Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

1. Anchor posts to steel by welding directly to steel supporting members.
2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
3. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.

11-12.3(3) ADJUSTING AND CLEANING

Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

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11-13 PIPE AND TUBE RAILINGS

11-13.1 GENERAL

11-13.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-13.1(2) SUMMARY

This Section includes steel pipe railings.
Related Sections include the following:

1. Section 11-12 "Metal Stairs" for steel tube railings associated with metal stairs.
2. Section 11-45 “Painting” for finish painting of exposed, shop primed metal components.

11-13.1(3) PERFORMANCE REQUIREMENTS

Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:
   A. Uniform load of *50 lbf/ ft.* applied in any direction.
   B. Concentrated load of *200 lbf* applied in any direction.
   C. Uniform and concentrated loads need not be assumed to act concurrently.

2. Top Rails of Guards:
   A. Uniform load of 50 lbf/ ft. applied horizontally and concurrently with 100 lbf/ ft. applied vertically downward.
   B. Concentrated load of 200 lbf applied in any direction.
   C. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:
   A. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
   B. Uniform load of 25 lbf/ ft. applied horizontally.
   C. Infill load and other loads need not be assumed to act concurrently.

Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Temperature Change (Range): *120 deg F*, ambient; *180 deg F*, material surfaces.
Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials. Galvanize all ferrous metal exposed to weather, min G60.

11-13.1(4) SUBMITTALS

NOT FOR CONSTRUCTION

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For the following:

1. Manufacturer's product lines of welded railings.
2. Grout, anchoring cement, and paint products.

Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.

Welding certificates.
Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

11-13.1(5) QUALITY ASSURANCE

Source Limitations: Obtain each type of railing through one source from a single manufacturer.
Welding: Qualify procedures and personnel according to the following: AWS D1.1, "Structural Welding Code--Steel."

11-13.1(6) PROJECT CONDITIONS

Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

11-13.1(7) COORDINATION AND SCHEDULING

Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

11-13.2 PRODUCTS

11-13.2(1) METALS, GENERAL

Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

11-13.2(2) STEEL AND IRON

Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads. Provide galvanized finish for exterior installations and where indicated.
Plates, Shapes, and Bars: ASTM A 36/A 36M.

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Castings: Either gray or malleable iron, unless otherwise indicated.

1. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
2. Malleable Iron: ASTM A 47/A 47M.

11-13.2(3) FASTENERS

General: Provide the following: Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide Manufacturer's standard flat-head machine screws for exposed fasteners, unless otherwise indicated.

Anchors: Provide torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

11-13.2(4) MISCELLANEOUS MATERIALS

Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

11-13.2(5) FABRICATION

General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately *1/32 inch*, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

Form work true to line and level with accurate angles and surfaces.

Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

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Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

Connections: Fabricate railings with either welded or nonwelded connections, unless otherwise indicated.

Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

Form changes in direction as follows: By bending or by inserting prefabricated elbow fittings.

Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

Close exposed ends of railing members with prefabricated end fittings.

Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is *1/4 inch* or less.

Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

For railing posts set in concrete, provide steel sleeves not less than *6 inches* long with inside dimensions not less than *1/2 inch* greater than outside dimensions of post, with steel plate forming bottom closure.

Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

11-13.2(6) FINISHES, GENERAL

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

11-13.2(7) STEEL AND IRON FINISHES

Galvanized Railings:

1. Hot-dip galvanize steel and iron railings, including hardware, after fabrication.

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2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.

Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.
Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

11-13.3 CONSTRUCTION REQUIREMENTS

11-13.3(1) INSTALLATION, GENERAL

Fit exposed connections together to form tight, hairline joints.
Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of *1/16 inch in 3 feet*.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed *1/4 inch in 12 feet*.

Adjust railings before anchoring to ensure matching alignment at abutting joints.
Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

11-13.3(2) RAILING CONNECTIONS

Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.
Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending *2 inches* beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within *6 inches* of post.

11-13.3(3) ANCHORING POSTS

Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink,

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nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

Form or core-drill holes not less than *5 inches* deep and *3/4 inch* larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

Leave anchorage joint exposed; wipe off surplus anchoring material; and leave *1/8-inch* buildup, sloped away from post.

Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

11-13.3(4) ADJUSTING AND CLEANING

Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

11-13.3(5) PROTECTION

Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

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11-15 MISCELLANEOUS CARPENTRY

11-15.1 GENERAL

11-15.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-15.1(2) SUMMARY

This Section includes the following:

1. Wood blocking, cants, and nailers.
2. Interior wood trim.
3. Plywood backing panels.

11-15.1(3) DEFINITIONS

Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

11-15.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.

Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

Research/Evaluation Reports: For the following, showing compliance with Building Codes of King County in effect for Project:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.

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3. Power-driven fasteners.
4. Expansion anchors.

11-15.1(5) DELIVERY, STORAGE, AND HANDLING

Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

11-15.2 PRODUCTS

11-15.2(1) WOOD PRODUCTS, GENERAL

Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

Wood Structural Panels:

1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Factory mark panels according to indicated standard.

11-15.2(2) WOOD-PRESERVATIVE-TREATED MATERIALS

Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
   a. Ammoniacal, or amine, copper quat (ACQ).
   b. Copper bis (dimethyldithiocarbamate) (CDDC).
   c. Ammoniacal copper citrate (CC).
   d. Copper azole, Type A (CBA-A).
   e. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent.

Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches above grade.

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11-15.2(3) MISCELLANEOUS LUMBER

General: Provide lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Cants.
3. Nailers.

For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content and any of the following species:

1. Mixed southern pine; SPIB.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

11-15.2(4) INTERIOR WOOD TRIM

Lumber Trim for Opaque Finish (Painted): Finished lumber (S4S), either finger-jointed or solid lumber, of the following species and grades: Grade A Finish alder, aspen, basswood, cottonwood, gum, magnolia, soft maple, sycamore, tupelo, or yellow poplar; NHLA.

11-15.2(5) PANEL PRODUCTS

Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch.
Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

11-15.2(6) FASTENERS

General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
Nails, Wire, Brads, and Staples: FS FF-N-105.
Power-Driven Fasteners: CABO NER-272.
Wood Screws: ASME B18.6.1.
Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
Lag Bolts: ASME B18.2.1.
Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

11-15.1 EXECUTION

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11-15.3(1) INSTALLATION, GENERAL

Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

Securely attach carpentry work as indicated and according to applicable codes and recognized standards.

Countersink fastener heads on exposed carpentry work and fill holes with wood filler.

Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

11-15.3(2) WOOD BLOCKING AND NAILER INSTALLATION

Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

11-15.3(3) PANEL PRODUCT INSTALLATION

Wood Structural Panels: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

11-15.3(4) WOOD TRIM INSTALLATION

Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.

1. Match color and grain pattern across joints.
2. Install trim after gypsum board joint-finishing operations are completed.
3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads and fill holes.
4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.

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11-16 INTERIOR ARCHITECTURAL WOODWORK

11-16.1 GENERAL

11-16.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-16.1(2) SUMMARY

This Section includes the following:

1. Manufactured wood cabinets as shown on the drawings.
2. Wood window sill stools.

11-16.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.

Product Data: Submit product data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices, louvers/grilles, connections to grounding system, and other components. Obtain field dimensions prior to and include in preparing shop drawings.

Samples: Submit samples for selection of colors and styles: Swatches of plastic laminate showing color, pattern, and surface finish, with separate samples of unfaced panel product used for core.

Certification of Grade: Submit certificates on graded but unmarked lumber or plywood (unmarked for reasons of appearance) attesting that these materials meet the grade requirements herein specified.

11-16.1(4) QUALITY ASSURANCE

Manufacturer's Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work.

AWI Quality Standard: Comply with applicable requirements of AWI except as otherwise indicated.

Take field measurements and ensure proper fit in-place of all woodwork.

Any items not given a specific quality grade shall be "Custom" grade, as defined in the latest edition of AWI Quality Standards.

Grademarking:

1. Lumber: Each piece or each bundle (include millwork and wood trim) shall be identified by the grade mark of a recognized association or independent inspection agency that specializes in the particular species used. Such association or independent inspection agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used.
2. Plywood: Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing

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control over the quality of the plywood. The mark for softwood plywood shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with the U.S. Department of Commerce PS 1.

Sizes and Patterns of Wood Products: Yard and board lumber sizes shall conform to U.S. Department of Commerce PS 20. Except as indicated or specified otherwise, sizes are nominal. Provide shaped lumber and millwork in the patterns indicated and which conform to standard patterns of the association recognized as covering the species used. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

11-16.1(5) DELIVERY, STORAGE, AND HANDLING

Sizes and Patterns of Wood Products: Yard and board lumber sizes shall conform to U.S. Department of Commerce PS 20. Except as indicated or specified otherwise, sizes are nominal. Provide shaped lumber and millwork in the patterns indicated and which conform to standard patterns of the association recognized as covering the species used. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.
Do not deliver architectural woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate architectural woodwork have been completed in installation areas. If architectural woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in project conditions Article.

11-16.2 PRODUCTS

11-16.2(1) MATERIALS

General: Provide materials that comply with recommendations of the AWI woodworking standard for type and quality grade indicated.

1. Plywood, veneer core, premium grade, conforming with U.S. Product Standard PS-1, exterior exposure durability classification.
2. Particle board for interior use, premium grade, conforming with Commercial Standard CS-236.
3. High Pressure Laminate:
   a. High Pressure Decorative Laminate for countertops and exposed cabinet surfaces. NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard. Colors as indicated in the drawings.
   b. High Pressure Decorative Laminate for countertops and exposed cabinet surfaces. NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard. Colors as indicated in the drawings.

11-16.2(2) FABRICATION, GENERAL

Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

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Fabricate architectural woodwork to dimensions, profiles, and details indicated. Round corners of sills as noted. Ease edges of running and standing trim.
Complete fabrication, including, but not limited to, assembly, finishing, and hardware application, before shipment to the Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
Complete fabrication, including, but not limited to, assembly, finishing, and hardware application, before shipment to the Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

11-16.2(2) CABINET HARDWARE AND ACCESSORY MATERIALS

General: Provide cabinet hardware and accessory materials associated with manufactured architectural cabinets
Cabinet Hardware Schedule: As a minimum comply with the following hardware style and quality:

1. Hinges: Concealed, three (3) way adjustable, self-close.
2. Pulls: Satin chrome wire pulls.
3. Drawer suspension: Epoxy coated with 100 pounds load capacity, drawer slide.
4. Door catch: Self aligning magnetic catch.
5. Shelving support: Heavy duty shelf clips inserted in predrilled holes or aluminum side pilasters with supports.

11-16.2(3) ARCHITECTURAL CABINET TOPS

Quality Standard: Comply with AWI Section 400 and its Division 400C.
Type of Top: Provide high pressure decorative laminate complying with the following:

1. Grade: Premium.
2. Laminate Cladding for Horizontal Surface: High pressure decorative laminate as follows:
   a. Colors, Patterns, Texture and Finishes as scheduled on drawings.
   b. Grade: GP-50 (0.050 inch nominal thickness).

3. Grade: GP-50 (0.050 inch nominal thickness).
   a. Plastic laminate with postformed edge for countertops and sills.

11-16.2(4) FASTENERS AND ANCHORS

Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.
Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent architectural woodwork anchorage.

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11-16.3 EXECUTION

11-16.3(1) EXAMINATION

Examine areas and conditions under which the work is to be installed, and notify the Ower in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

11-16.3(2) PREPARATION

Condition architectural woodwork to average prevailing humidity conditions in installation areas before installing.

11-16.3(3) INSTALLATION

Quality Standard: Install architectural woodwork to comply with AWI Section 1700 for same grade specified in Products of this section for type of architectural woodwork involved.
Install architectural woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8 feet.
Scribe and cut architectural woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
Anchor architectural woodwork to blocking built in or directly attached to substrates. Secure to grounds, stripping, and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.
Install cabinets without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
Install cabinets without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

11-16.3(4) ADJUSTING AND CLEANING

Repair damaged and defective architectural woodwork where possible to eliminate defects functionally and visually. Where not possible to repair, replace architectural woodwork. Adjust joinery for uniform appearance.
Clean, lubricate, and adjust hardware.
Clean architectural woodwork on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

11-16.3(5) WOOD TRIM INSTALLATION

Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.

1. Match color and grain pattern across joints.
2. Install trim after gypsum board joint-finishing operations are completed.
3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads and fill holes.

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4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.

11-16.3(6) ADJUSTING AND CLEANING

Repair damaged and defective architectural woodwork where possible to eliminate defects functionally and visually. Where not possible to repair, replace architectural woodwork. Adjust joinery for uniform appearance.

Clean, lubricate, and adjust hardware.

Clean architectural woodwork on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

11-16.3(7) PROTECTION

Provide final protection and maintain conditions, in a manner acceptable to the manufacturer that shall ensure that architectural woodwork shall be without damage or deterioration at time of Substantial Completion.\

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11-20 HOT FLUID-APPLIED WATERPROOFING

11-20.1 GENERAL

11-20.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-20.1(2) SUMMARY

This Section includes the following: Reinforced waterproofing membrane.
Related Sections include the following:

1. Section 11-02 “Cast-In-Place Concrete” for concrete topping slab.
2. Section 11-31 "Joint Sealants" for joint-sealant materials and installation.

11-20.1(3) PERFORMANCE REQUIREMENTS

Provide waterproofing that prevents the passage of water and complies with physical requirements in CAN/CGSB-37.50, "Hot Applied, Rubberized Asphalt for Roofing and Waterproofing."

11-20.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.
Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.
Samples: For the following products:

1. *12-by-12-inch* square of flashing sheet.
2. *4-by-4-inch* square of drainage panel.

Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.
Sample Warranty: Copy of special waterproofing manufacturer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

11-20.1(5) QUALITY ASSURANCE

Installer Qualifications: A qualified installer who is authorized, approved, or licensed to install waterproofing manufacturer's products; and who is eligible to receive waterproofing warranty specified.
Source Limitations: Obtain waterproofing materials, sheet flashings, protection course, insulation, and drainage panels through one source from a single manufacturer.
Preinstallation Conference: Conduct conference at Project site. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special

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details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

11-20.1(6) DELIVERY, STORAGE, AND HANDLING

Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
Remove and replace liquid materials that cannot be applied within their stated shelf life.
Protect stored materials from direct sunlight.

11-20.1(7) PROJECT CONDITIONS

Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below *0 deg F*. Do not apply waterproofing in snow, rain, fog, or mist.
Maintain adequate ventilation during application and curing of waterproofing materials.

11-20.1(8) WARRANTY

Special Manufacturer's Warranty: Written NDL (no dollar limit) warranty, signed by waterproofing manufacturer agreeing to repair or replace waterproofing and sheet flashings that do not comply with requirements or that do not remain watertight within specified warranty period.

1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate that exceed *1/8 inch* in width.
2. Warranty Period: Fifteen years after date of Substantial Completion.

11-20.2 PRODUCTS

11-20.2(1) MANUFACTURERS

Products: Subject to compliance with requirements, provide one of the following products or approved equal:

1. American Hydrotech, Inc.; Monolithic Membrane 6125.
2. Tremco; Tremproof 150.

11-20.2(2) MEMBRANE

Single-component; 100 percent solids; hot fluid-applied, rubberized asphalt with the following properties measured per applicable test methods in CAN/CGSB-37.50:

1. Flash Point: Not less than 260 deg C or not less than 25 deg C above manufacturer's maximum recommended application temperature.
2. Cone Penetration: 110 maximum at 25 deg C, and 200 maximum at 50 deg C.
3. Flow: 3 mm maximum at 60 deg C.
4. Toughness: Not less than 5.5 J
5. Ratio of Toughness to Peak Load: Not less than 0.040.
6. Adhesion Rating: Pass.

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7. Water-Vapor Permeance: 1.7 ng/Pa x s x sq. m.
8. Water Absorption: 0.35-g maximum mass gain, or 0.18-g maximum mass loss.
9. Pinholing: Not more than one pinhole.
10. Low-Temperature Flexibility: No cracking.
11. Crack Bridging Capability: No cracking, splitting, or loss of adhesion.
12. Heat Stability: Comply with requirements for penetration, flow, low-temperature flexibility, and viscosity when heated for five hours at manufacturer's recommended application temperature.
13. Viscosity Test: 2 to 15 seconds.

11-20.2(3) AUXILIARY MATERIALS

Primer: ASTM D 41, asphaltic primer.

Elastomeric Flashing Sheet: *50-mil*-minimum, nonstaining, uncured sheet neoprene with manufacturer's recommended contact adhesives and predrilled metal termination bars and anchors, with the following physical properties as measured per standard test methods referenced:

1. Tensile Strength: *1400 psi* minimum; ASTM D 412, Die C.
2. Elongation: 300 percent minimum; ASTM D 412.
3. Tear Resistance: *125 psi* minimum; ASTM D 624, Die C.
4. Brittleness: Does not break at minus *30 deg F*; ASTM D 2137.

Sealants and Accessories: Waterproofing manufacturer's recommended sealants and accessories.

Reinforcing Fabric: Manufacturer's recommended spun-bonded polyester fabric.

Separator Sheet: ASTM D 4397, polyethylene sheet, minimum *4 mils* thick.

Protection Course: Semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: *1/8 inch*, nominal.
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

11-20.2(4) MOLDED-SHEET DRAINAGE PANELS

Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding *No. 70* sieve laminated to 1 side and a polymeric film bonded to the other side of a 3-dimensional, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of *9 to 15 gpm per ft.*

1. Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M 288:
   a. Survivability: Class 2.
   b. Apparent Opening Size: *No. 40* sieve, maximum.
   c. Permittivity: 0.5 per second, minimum.
2. Film Backing: Polymeric film bonded to drainage core surface.

11-20.3 EXECUTION

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11-20.3(1) EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

11-20.3(2) PREPARATION

Clean and prepare substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.

Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

11-20.3(3) JOINTS, CRACKS, AND TERMINATIONS

Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to CAN/CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing," and waterproofing system manufacturer's written instructions.

1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.
2. Embed reinforcing fabric into a layer of hot, rubberized asphalt. Extend reinforcing fabric a minimum of *6 inches (150 mm)* on each side of joints and cracks and beyond deck drains, corners, and penetrations.

At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric flashing sheet extended a minimum of *6 inches* on each side of joints and adhere to substrates in a layer of hot, rubberized asphalt.

11-20.3(4) FLASHING INSTALLATION

Install flashing sheets at terminations of waterproofing membrane according to CAN/CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing," and waterproofing system manufacturer's written instructions.

Prime substrate with asphalt primer.

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Install elastomeric flashing sheet and adhere to deck and wall substrates in a layer of hot, rubberized asphalt.
Extend flashing sheet up walls or parapets a minimum of *8 inches* above plaza deck pavers and *6 inches* onto deck to be waterproofed.
Install termination bars and mechanically fasten to top of flashing sheet at terminations and perimeter of roofing.

11-20.3(5) MEMBRANE APPLICATION

Apply rubberized asphalt according to CAN/CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing," and manufacturer's written instructions.
Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized-asphalt waterproofing.
Start application with manufacturer's technical representative present.
Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.
Reinforced Membrane: Apply waterproofing to substrates and adjoining surfaces indicated. Spread hot fluid-applied, rubberized asphalt to a thickness of *90 mils (2.3 mm)*; embed reinforcing fabric, overlapping sheets *2 inches (50 mm)*; and spread another *125-mil-* thick layer to provide a uniform, reinforced, seamless membrane *215 mils* thick.
Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.
Cover waterproofing with separator sheet with overlapped joints while rubberized asphalt is still hot and before membrane is subject to traffic. Install protection course with overlapped joints over separator sheet.

11-20.3(6) MOLDED-SHEET DRAINAGE PANEL INSTALLATION

Place and secure molded-sheet drainage panels to substrate according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction. For vertical applications, install board insulation used as a protection course before installing drainage panels.

11-20.3(7) FIELD QUALITY CONTROL

Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

1. Flood to an average depth of *2-1/2 inches* with a minimum depth of *1 inch* and not exceeding a depth of *4 inches*. Maintain *2 inches* of clearance from top of sheet flashings.
2. Flood each area for 48 hours.
3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

Owner will engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

11-20.3(8) CURING, PROTECTING, AND CLEANING

NOT FOR CONSTRUCTION

Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing. Do not permit foot or vehicular traffic on unprotected membrane.

Protect waterproofing from damage and wear during remainder of construction period.

Protect installed board insulation from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction

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11-21 BUILDING INSULATION

11-21.1 GENERAL

11-21.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-21.1(2) SUMMARY

This Section includes the following: Concealed building insulation.
Related Sections include the following:

1. Section 11-30 "Sheet Metal Roofing" for insulation specified as part of roofing construction.
2. Section 11-40 "Gypsum Board Assemblies" for installation in metal-framed assemblies of insulation specified by reference to this Section.
3. Section 11-40 "Gypsum Board Assemblies" for installation in metal-framed assemblies of vapor retarder.

11-21.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of product indicated.
Research/Evaluation Reports: For foam-plastic insulation.

11-21.1(4) QUALITY ASSURANCE

Source Limitations: Obtain each type of building insulation through one source.
Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

11-21.1(5) DELIVERY, STORAGE, AND HANDLING

Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

11-21.2 PRODUCTS

11-21.2(1 MANUFACTURERS

NOT FOR CONSTRUCTION

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Extruded-Polystyrene Board Insulation:
   a. DiversiFoam Products.
   b. Dow Chemical Company.
   c. Owens Corning.
   d. Tenneco Building Products.

2. Glass-Fiber Insulation:
   a. CertainTeed Corporation.
   b. Johns Manville Corporation.
   c. Knauf Fiber Glass.
   d. Owens Corning.

11-21.2(2) INSULATING MATERIALS

General: Provide insulating materials that comply with requirements and with referenced standards. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively: Type IV, 1.60 lb/cu. ft., unless otherwise indicated.

Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

11-21.2(3) SPRAY-APPLIED CELLULOSIC INSULATION

Self-Supported, Spray-Applied Thermal, Cellulosic Insulation: ASTM C 1149, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications chemically treated for flame-resistance, processing, and handling characteristics. R value os finish installation shall be R-19.

1. Manufacturer must subscribe to independent laboratory follow-up inspection services of Underwriters Laboratories and Factory Mutual. Each bag shall be labeled accordingly.
2. R-Value shall be 3.8 per inch per ASTM C 518.
3. Bond strength shall be greater than 100 psf per ASTM E 736.
4. Product shall be Class 1 Class A per ASTM E 84/ UL 723.
5. Bond Deflection per ASTM E 759: 6” Deflection in 10’ Span – No Spalling or Delamination.
6. Cannot contain any Urea-Formaldehyde Resins.
7. Finish color shall be light grey.

11-21.2(4) VAPOR RETARDERS

Fire-Retardant, Reinforced-Polyethylene Vapor Retarders: is the work of Section 11-40 "Gypsum Board Assemblies".

11-21.2(5) AUXILIARY INSULATING MATERIALS

Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

NOT FOR CONSTRUCTION

11-21.3 EXECUTION

11-21.3(1) EXAMINATION

Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

Proceed with installation only after unsatisfactory conditions have been corrected.

11-21.3(2) PREPARATION

Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

11-21.3(3) INSTALLATION, GENERAL

Comply with insulation manufacturer's written instructions applicable to products and application indicated.

Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

11-21.3(4) INSTALLATION OF GENERAL BUILDING INSULATION

Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:

1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

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3. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

11-21.3(5) INSTALLATION OF VAPOR RETARDERS

General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (400 mm) o.c.

Before installing vapor retarder, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.

Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

11-21.3(6) INSTALLATION OF SPRAY-APPLIED CELLULOSIC INSULATION

Install spray applied insulation according to manufacturer’s recommendations.

Verify surfaces to receive spray insulation to determine if priming/sealing is required to insure bonding and/or to prevent discoloration caused by migratory stains.

Provide masking, drop cloths or other satisfactory coverings for materials/surfaces that are not to receive insulation to protect from over-spray.

Prime surfaces as required by manufacturer’s instructions or as determined by examination.

Cure insulation with continuous natural or mechanical ventilation.

11-21.3(7) PROTECTION

Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

NOT FOR CONSTRUCTION

11-22 FLUID-APPLIED MEMBRANE AIR BARRIERS

11-22.1 GENERAL

11-22.1(1) SUMMARY

This Section includes the following: Fluid-applied membrane air barrier, vapor retarding.
Related Sections include the following:

1. Section "Sheet Metal Flashing" for sheet metal flashings.
2. Section 11-31 Joint Sealants for joint-sealant materials and installation.
3. Section 11-40 "Gypsum Board Assemblies" for wall sheathings, wall sheathing joint-and-penetration treatments.

11-22.1(2) DEFINITIONS

ABAA: Air Barrier Association of America.
Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

11-22.1(3) PERFORMANCE REQUIREMENTS

General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
Air Barrier Assembly Air Leakage: Not to exceed 0.01 cfm x sq. ft. of surface area at 1.57 lbf/sq. ft. ASTM E 283 and ASTM E 783.

11-22.1(4) SUBMITTALS

Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.
Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1. Include details of interfaces with other materials that form part of air barrier.
2. Include details of mockups.

Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.
Qualification Data: For Applicator.
Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

11-22.1(5) QUALITY ASSURANCE

NOT FOR CONSTRUCTION

Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance and that is an ABAA-licensed contractor, employs certified and registered installers, and complies with ABAA's Quality Assurance Program.

Preinstallation Conference: Conduct conference at Project site.

1. Include installers of other construction connecting to air barrier, including composite metal wall panels.
2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

11-22.1(6) DELIVERY, STORAGE, AND HANDLING

Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

Remove and replace liquid materials that cannot be applied within their stated shelf life.

Store rolls according to manufacturer's written instructions.

Protect stored materials from direct sunlight.

11-22.1(7) PROJECT CONDITIONS

Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

11-22.2 PRODUCTS

11-22.2(1) FLUID-APPLIED MEMBRANE AIR BARRIER

Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
   a. Synthetic Polymer Membrane:
      i. Grace, W. R. & Co.; Perm-A-Barrier Liquid.
      ii. Henry Company; Air-Bloc 21 or 21S.
      iii. Rubber Polymer Corporation; Rub-R-Wall Airtight.
3. Physical and Performance Properties:
   a. Membrane Air Permeance: Not to exceed 0.004 cfm x sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Membrane Vapor Permeance: Not to exceed 0.1 perm; ASTM E 96.

11-22.2(2) AUXILIARY MATERIALS

NOT FOR CONSTRUCTION

General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.

Counterflashing Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, crosslaminated polyethylene film with release liner backing.

Butyl Strip: Vapor-retarding, 30- to 40-mil- thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.

Modified Bituminous Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.

Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250 inch thick, and Series 300 stainless-steel fasteners.

Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance of 37 perms.

Elastomeric Flashing Sheet: ASTM D 2000, 2BC415 to 3BC620, minimum 50- to 65-mil-thick, cured sheet neoprene with manufacturer's recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.

Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 11-31, Joint Sealants.

11-22.3 EXECUTION

11-22.3(1) EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

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4. Verify that masonry joints are flush and completely filled with mortar.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

11-22.3(2) SURFACE PREPARATION

Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.
Remove excess mortar from masonry ties, shelf angles, and other obstructions.
At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

11-22.3(3) JOINT TREATMENT

Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces. Prime substrate and apply a single thickness of preparation coat strip extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of air barrier membrane and embed a joint reinforcing strip in preparation coat.
Glass-Mat Gypsum Board Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

11-22.3(4) TRANSITION STRIP INSTALLATION

Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install butyl or modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over both substrates.

Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and

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window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials as indicated.

At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply compatible modified bituminous transition strip, adhesive-coated transition strip, elastomeric flashing sheet, or preformed silicone-sealant extrusion so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Modified Bituminous or Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.
2. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
3. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and membrane.

Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, modified bituminous counterflashing strip.

Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

11-22.3(5) AIR BARRIER MEMBRANE INSTALLATION

Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

Apply air barrier membrane within manufacturer's recommended application temperature ranges.

Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties. Vapor-Retarding Membrane Air Barrier: 120-mil dry film thickness.

Apply strip and transition strip a minimum of 1 inch onto cured air membrane or strip and transition strip over cured air membrane overlapping 3 inches onto each surface according to air barrier manufacturer's written instructions.

Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

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Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

11-22.3(6) FIELD QUALITY CONTROL

Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction or mastic has been applied on exposed edges, with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

11-22.3(7) CLEANING AND PROTECTION

Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 30 days.
2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.

Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction. Remove masking materials after installation.

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11-23 COMPOSITE WALL PANELS

11-23.1 PRODUCTS

11-23.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-23.1(2) SUMMARY

Section includes metal-faced composite soffit and wall panels in a “rain-screen” assembly system.

Related Sections:

1. Section 11-22 “Fluid-Applied Membrane Air-Barrier” for the waterproofing of the rain-screen wall system.
2. Section 11-40 "Gypsum Board Assemblies" for metal framing and glass-mat gypsum wall sheathing supporting metal-faced composite wall panels.

11-23.1(2) DEFINITION

Metal-Faced Composite Wall Panel Assembly: Metal-faced composite wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete “rain-screen” wall system.

Rain-Screen Wall System: The rainscreen principle is the management of water and air-infiltration in a building envelope system for eliminating the air-pressure differential across wall openings that allows the creep of water into the building interior.

11-23.1(3) PERFORMANCE REQUIREMENTS

General Performance: Metal-faced composite wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

Delegated Design: Design metal-faced composite wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

Structural Performance: Provide metal-faced composite wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330: Wind Loads: Determine loads based on the following minimum design wind pressures: Uniform pressure of 30 lbs/sq. ft., acting inward or outward.

Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at the following test-pressure difference: Test-Pressure Difference: 1.57 lbf/sq. ft.

Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference: Test-Pressure Difference: 6.24 lbf/sq. ft.

Water Penetration under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft.

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1. Water Leakage: As defined according to AAMA 501.1. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
2. Deflection Limits: Metal-faced composite wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/175 of the span at the perimeter and 1/60 of the span anywhere in the panel.

Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Temperature Change (Range): 120 deg F, ambient; 180 deg , material surfaces.
Base design on the Rainscreen Principle. Proper joinery and spacing to allow effective back ventilation and pressure equalization. No exposed sealants, gaskets, tapes or battens unless specifically detailed in Architectural drawings.

11-23.1(5) SUBMITTALS

Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal-faced composite wall panel and accessory.
Shop Drawings: Show fabrication and installation layouts of metal-faced composite wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
   a. Flashing and trim.
   b. Anchorage systems.

2. Include similar Samples of trim and accessories involving color selection.
3. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.

Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal-Faced Composite Wall Panels: Minimum 12 x 12 inches. Include fasteners, closures, and other metal-faced composite wall panel accessories. Composite Panels: Include four-way joint.
2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch- long Samples for each type of accessory.
4. Exposed Gaskets: 12 inches long.
5. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of metal-faced composite wall panels adjacent to joint sealants.

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Delegated-Design Submittal: For metal-faced composite wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer in the State of Washington responsible for their preparation.
Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Soffit and wall panels and attachments.
2. Girts and stud framing.

Qualification Data: For professional engineer and testing agency.
Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
Field quality-control reports.
Maintenance Data: For metal wall panels to include in maintenance manuals.
Warranties: Samples of special warranties.

11-23.1(6) QUALITY ASSURANCE

Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
Source Limitations: Obtain each type of metal-faced composite wall panel from single source from single manufacturer.
Fire-Resistance Ratings: Where indicated, provide metal-faced composite wall panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Engineer, metal-faced composite wall panel Installer, metal-faced composite wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal-faced composite wall panels including installers of window.
2. Review methods and procedures related to metal-faced composite wall panel installation, including manufacturer's written instructions.
3. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
4. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal-faced composite wall panels.

11-23.1(7) DELIVERY, STORAGE, AND HANDLING

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Deliver components, sheets, metal-faced composite wall panels, and other manufactured items so as not to be damaged or deformed. Package metal-faced composite wall panels for protection during transportation and handling.

Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending, warping, twisting, and surface damage.

Store metal-faced composite wall panels vertically, covered with suitable weathertight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 deg F.

Retain strippable protective covering on metal-faced composite wall panel for period of panel installation.

11-23.1(8) PROJECT CONDITIONS

Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal-faced composite wall panels to be performed according to manufacturer's written instructions and warranty requirements.

Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal-faced composite wall panel fabrication and indicate measurements on Shop Drawings.

11-23.1(9) COORDINATION

Coordinate metal-faced composite wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

11-23.1(10) WARRANTY

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal-faced composite wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures, including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal-faced composite wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

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11-23.2 PRODUCTS

11-23.2(1) PANEL MATERIALS

Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Surface: Smooth, flat finish.
2. Exposed Coil-Coated Finishes: FEVE Fluoropolymer: AAMA 620. 3-coat fluoropolymer finish containing 100 percent FEVE resin in color coat and a clear-coat finish. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Panel Sealants: Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal-faced composite wall panels and remain weathertight; and as recommended in writing by panel manufacturer.

11-23.2(2) MISCELLANEOUS MATERIALS

Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated.

Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal-faced composite wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

11-23.2(3) METAL-FACED COMPOSITE WALL PANELS

General: Provide factory-formed and -assembled, metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.

1. Fire-Retardant Core: Noncombustible, with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

2. Products: Subject to compliance with requirements, provide one of the following:
   a. Alcan Composites USA Inc.;Alucobond ACM.
   b. Alcoa Inc.; Reynobond FR.
   c. ALPOLIC, Division of Mitsubishi Chemical America, Inc.; ALPOLIC ACM.
   d. Or Approved Equal.

Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- thick, anodized aluminum sheet facings.

1. Panel Thickness: 0.236 inch.
2. Core: Fire retardant.
3. Exterior Finish: fluoropolymer. Color: Custom color to match Engineer's samples.

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Attachment System Components: Formed from extruded aluminum. Adjust components in subparagraph below to suit Project and to coordinate with installation method specified in Part 3. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips and anchor channels.

11-23.2(4) ACCESSORIES

Wall Panel Accessories: Provide components required for a complete metal-faced composite wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal-faced composite wall panels unless otherwise indicated.

Flashing and Trim: Formed from 0.018-inch- minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.

11-23.2(5) FABRICATION

General: Fabricate and finish metal-faced composite wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

Fabricate metal-faced composite wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

Metal-Faced Composite Wall Panels: Factory form panels in a batch process by laminating each sheet using glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
3. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
4. Dimensional Tolerances:
   a. Panel Bow: 0.8 percent maximum of panel length or width.
   b. Squareness: 0.25 inch maximum.

Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

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3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal-faced composite wall panel manufacturer. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal-faced composite wall panel manufacturer for application, but not less than thickness of metal being secured.

11-23.2(6) GENERAL FINISH REQUIREMENTS

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

11-23.3 CONSTRUCTION REQUIREMENTS

11-23.3(1) EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal-faced composite wall panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal-faced composite wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal-faced composite wall panel manufacturer.
3. Verify that weather-resistant sheathing paper has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

Examine roughing-in for components and systems penetrating metal-faced composite wall panels to verify actual locations of penetrations relative to seam locations of panels before panel installation.
For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
Proceed with installation only after unsatisfactory conditions have been corrected.

11-23.3(2) PREPARATION

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Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal-faced composite wall panel manufacturer's written instructions.

11-23.3(3) METAL-FACED COMPOSITE WALL PANEL INSTALLATION

General: Install metal-faced composite wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal-faced composite wall panels.
2. Flash and seal metal-faced composite wall panels at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
3. Install flashing and trim as metal-faced composite wall panel work proceeds.
4. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.

Fasteners: Aluminum Soffit and Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal-faced composite wall panel manufacturer.

Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal-faced composite wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer. Prepare joints and apply sealants to comply with requirements in Section 11-31, Joint Sealants.

Attachment System Installation, General: Install attachment system required to support metal-faced composite wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.

Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system with vertical channel that provides support and complete secondary drainage system, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach wall panels by engaging horizontal support pins into notches in vertical channels and into flanges of wall panels. Leave horizontal and vertical joints with open reveal.

1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.

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2. Do not apply sealants to joints unless otherwise indicated on Drawings.

11-23.3(4) ACCESSORY INSTALLATION

General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components. Install components required for a complete metal-faced composite wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

11-23.3(5) ERECTION TOLERANCES

Installation Tolerances: Shim and align metal-faced composite wall panel units within installed tolerance of 1/4 inch in 20 feet, nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

11-23.3(6) FIELD QUALITY CONTROL

Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by SEI/ASCE 7, but not less than 6.24 lbf/sq. ft.

Water-Spray Test: After completing the installation of 75-foot- by-2-story minimum area of metal-faced composite wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Engineer.

Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust completed metal-faced composite wall panel installation, including accessories.

Metal-faced composite wall panels will be considered defective if they do not pass tests and inspections.

Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

Prepare test and inspection reports.

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11-23.3(7) CLEANING

Remove temporary protective coverings and strippable films, if any, as metal-faced composite wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal-faced composite wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.

After metal-faced composite wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

Replace metal-faced composite wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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11-24 TRAFFIC COATING

11-24.1 GENERAL

11-24.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-24.1(2) SUMMARY

Scope: This section includes, but shall not be limited to, the following:

1. Fluid-applied membrane traffic coating for application on concrete Control Level exterior walkway.
2. Flashing and miscellaneous accessories.

11-24.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.

Product Data: Submit product data for type of application specified in this section and special requirements for conditions under which this product will perform, including precautions onflammability and toxicity. Submit for:

1. Fluid-applied membrane components and primers.
2. Cleaner, activating solvent.
3. Moisture meter.

11-24.1(4) DELIVERY, STORAGE, AND HANDLING

Deliver manufacturer's traffic coating materials in manufacturer's original, unopened containers, with labels intact and legible. Containers of materials covered by a referenced specification number, type, and class of the contents must be visibly indicated.

Deliver materials in sufficient quantity to continue work without interruption.

Store and protect materials in accordance with the manufacturer's instructions and use within their indicated shelf live.

When hazardous materials are involved, adhere to the special precautions of the manufacturer, unless they conflict with local, state, and federal regulations. Promptly remove from the site materials or incomplete work adversely affected by exposure to moisture or freezing. Use pallets and waterproof tarpaulins to cover stored materials top to bottom.

11-24.1(5) PROJECT CONDITIONS

Apply materials when air temperature has been above 40 degrees F. for a period of 24 hours prior to the application and when there is no ice, frost, surface moisture, or visible dampness on the substrate surface. Ensure the air temperature of the substrate is maintained at a minimum 40 degrees F for 24 hours during the application and cure period recommended by the manufacturer.

11-24.2 PRODUCTS

11-24.2(1) TRAFFIC COATING

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Urethane based traffic coating, 2-component or 3-component liquid membrane waterproofing material, self-bonding to concrete substrate, and compounded specifically for application and slope of substrate. Provide membrane with not less than 90 percent solids, minimum 6 month shelf life in uncured state (1-component type) and tested by the manufacturer to comply with requirements of ASTM C957.

11-24.2(2) MISCELLANEOUS MATERIALS

Joint Sealant: Multi-component urethane sealant complying with ASTM C920 as recommended by the manufacturer for the substrate, and compatible with the traffic coating specified, Type M, Class 25, Grade NS for sloping and vertical application, Grade P for deck application.

Aggregate: Uniformly graded washed silica sand of practical sizes and shape as recommended by the traffic coating manufacturer, with minimum hardness of 6 on the Moh Scale.

Sheet Flashing: 50 mils minimum non-staining uncured sheet neoprene.

Adhesive: Manufacturer's recommended contact adhesive.

11-24.3 EXECUTION

11-24.3(1) PREPARATION

Coordinate the work with that of trades to assure components to be incorporated into the traffic coating system are available when needed.Proceed with installation only after unsatisfactory conditions have been corrected.

Inspect and approve surfaces immediately before the application of the traffic coating materials. Free concrete surfaces of laitance, loose aggregate, sharp projections, grease, oil, dirt, curing compounds, and other contaminants which could adversely affect the complete bonding of the fluid-applied membrane to the concrete surface.

Do not begin application until penetrations through or attachments to the structural slab are in place.

1. Flash penetrations and projections, if any, through the structural slab with neoprene sheet adhered to the concrete slab or wall and the penetration. Leave the neoprene sheet un-adhered for one inch over the joint between the penetration and the concrete slab or wall. The neoprene sheet shall be adhered a minimum of 4 inches onto the horizontal deck. Cover this portion of the neoprene sheet with fluid-applied traffic coating during application.
2. Flash wall intersections which are not of monolithic pour or constructed with reinforced concrete joints with neoprene sheet adhered to both the vertical wall surface and the concrete slab. Intersections which are of monolithic pour or constructed with reinforced concrete joints with a neoprene sheet adhered to both vertical wall surface and the concrete slab can be flashed with a vertical grade of fluid-applied traffic coating membrane. Leave the sheet un-adhered for a distance of one inch from the corner on both the vertical and horizontal surfaces. Cover the neoprene sheet with fluid-applied traffic coating during application.
3. Prepare visible cracks and joints in the substrate to receive application of the traffic coating membrane per manufacturer's recommendations.
4. Prime surfaces to receive the fluid-applied traffic coating membrane. Apply the Primer as required by the membrane manufacturer's printed instructions.

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11-24.3(2) SPECIAL PRECAUTIONS

Protect components during transport and application of waterproofing materials. Do not dilute primers and other materials, unless specifically recommended by the materials manufacturer. Keep containers closed except when removing the contents. Do not allow contact of various materials through mixing of remains and the dual use of application equipment for mixing and transporting materials. Do not permit equipment on the project site that has residue of materials used on previous projects.

11-24.3(3) APPLICATION

Over the primed surfaces, provide a uniform, wet, monolithic coating of fluid-applied membrane by following the manufacturer's printed instructions.

Apply material by trowel, squeegee, roller, brush, spray apparatus, or other method acceptable to the membrane manufacturer.

Check wet thickness as specified under Field Test and adjust application rate as necessary to provide a uniform coating of the thickness specified. Where possible, mark off surface to be coated in even units to facilitate proper coverage.

At control joints, prepare cracks and terminations; carry the membrane over the preformed Elastomeric sheet in a uniform 40 mils thick, plus or minus 5 mils, wet thickness to provide a monolithic coating.

When work has stopped long enough for the membrane to cure, begin the next application by wiping the previously applied material with a solvent so that accumulated dirt and dust, which could inhibit adhesion of the overlapping membrane coat, is removed. Use solvent recommended by the membrane manufacturer, as approved.

Work sequence: Move material storage areas as work progresses to prevent abuse of the membrane and overloading the structural deck. Flashing shall be completed prior to the application of fluid-applied membrane.

11-24.3(4) FIELD TESTING

Moisture test: Prior to application of the fluid-applied traffic coating, check moisture content of substrate with a moisture meter. Only meters which are suitable for the purpose and manufacturer approved may be used. Do not begin application until the meter reading indicates "dry" range or similar reading indicating that substrate is suitably dry in the presence of the Engineer.

Film thickness: Check wet film thickness during application by placing flat metal plates on the substrate or using a mil-thickness gauge especially manufactured for the purpose.

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11-30 SHEET METAL ROOFING

11-30.1 GENERAL

11-30.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and

11-30.1(2) SUMMARY

This Section includes the following custom-fabricated sheet metal roofing: Standing-seam metal roofing.

Related Sections include the following: Section 11-15 "Miscellaneous Carpentry" for wood roof deck supporting sheet metal roofing, blocking, underlayment, and nailers installed as part of the roofing system.

11-30.1(3) DEFINITIONS

Sheet Metal Roofing Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

11-30.1(4) PERFORMANCE REQUIREMENTS

General: Provide complete sheet metal roofing system, including, but not limited to, custom-fabricated metal roof pans, cleats, clips, anchors and fasteners, sheet metal flashing and drainage components related to sheet metal roofing, fascia panels, trim, underlayment, and accessories as indicated and as required for a weathertight installation.

Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 1680 at the following test-pressure difference: Test-Pressure Difference: Positive and negative 1.57 lbf/sq. ft.

Water Penetration: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:

1. Test-Pressure Difference: [20 percent of positive design wind pressure, but not less than 6.24 lbf/sq. ft. (300 Pa) and not more than 12.0 lbf/sq. ft. (575 Pa)] <Insert pressure>.
2. Positive Preload Test-Pressure Difference: [Greater than or equal to 15.0 lbf/sq. ft. (720 Pa) and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference] <Insert pressure>.
3. Negative Preload Test-Pressure Difference: [50 percent of design wind-uplift-pressure difference] <Insert pressure>.

FMG Listing: Provide metal roof panels and component materials that comply with requirements in FMG 4471 as part of a panel roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings. Fire/Windstorm Classification: [Class 1A-60] [Class 1A-75] [Class 1A-90] [Class 1A-105] [Class 1A-120] <Insert number>.

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Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:

1. Uniform pressure of [20 lbf/sq. ft. (957 Pa)] [30 lbf/sq. ft. (1436 Pa)] <Insert design wind pressure>, acting inward or outward.
2. Uniform pressure as indicated on Drawings.

Thermal Movements: Provide sheet metal roofing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal roofing thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

11-30.1(5) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.

Product Data: For each product indicated. Include details of construction relative to materials, dimensions of individual components and profiles, and finishes.

Shop Drawings: Show fabrication and installation layouts of sheet metal roofing, including plans, elevations, and keyed references to termination points. Distinguish between shop- and field-assembled work. Include the following:

1. Details for forming sheet metal roofing, including seams and dimensions.
2. Details for joining and securing sheet metal roofing, including layout of fasteners, clips, and other attachments.
3. Details of termination points and assemblies, including fixed points.
4. Details of roof penetrations.
5. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings.
6. Details of special conditions.
7. Details of connections to adjoining work.

Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items. Show the following:

1. Sheet metal roofing and attachments.
2. Purlins and rafters.
3. Roof-mounted items including pipe supports and penetration.

Qualification Data: For fabricator.

Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sheet metal roofing portable roll-forming equipment. Include reports for structural performance.

Warranties: Special warranties specified in this Section.

11-30.1(6) QUALITY ASSURANCE

Installer Qualifications: Fabricator of sheet metal roofing.

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Custom-Fabricated Sheet Metal Roofing Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate sheet metal roofing similar to that required for this Project and whose products have a record of successful in-service performance.

Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockup of typical roof eave, including fascia, and gutter as shown on Drawings; approximately 48 inches square by full thickness, including attachments, underlayment, and accessories.
2. Approval of mockups is for other material and construction qualities specifically approved by Engineer in writing.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Engineer in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to sheet metal roofing including, but not limited to, the following:

1. Meet with Engineer, sheet metal roofing Installer, wood deck Installer, and installers whose work interfaces with or affects sheet metal roofing including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to sheet metal roofing installation.
4. Examine wood deck conditions for compliance with requirements, including flatness and attachment to structural members.
5. Review structural loading limitations of wood deck during and after roofing.
6. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal roofing.
7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
8. Review temporary protection requirements for sheet metal roofing during and after installation.
9. Review roof observation and repair procedures after sheet metal roofing installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

11-30.1(7) DELIVERY, STORAGE, AND HANDLING

Deliver sheet metal roofing pans, components, and other sheet metal roofing materials so as not to be damaged or deformed. Package sheet metal roofing materials for protection during transportation and handling.

Unload, store, and erect sheet metal roofing materials in a manner to prevent bending, warping, twisting, and surface damage.

Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Storesheet metal roofing materials to ensure dryness. Do not store sheet metal

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roofing materials in contact with other materials that might cause staining, denting, or other surface damage.
Store metal roofing materials away from uncured concrete and masonry.
Protect strippable protective covering on sheet metal roofing from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal roofing installation.

11-30.1(8) COORDINATION

Coordinate sheet metal roofing with rain drainage work, flashing, trim, and construction of metal decks, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

11-30.1(9) WARRANTY

Special Installer's Warranty: Roofing Installer's warranty, on warranty form at end of this Section, signed by Roofing Installer, in which Roofing Installer agrees to repair or replace components of custom-fabricated sheet metal roofing that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Structural failures.
    b. Loose parts.
    c. Wrinkling or buckling.
    d. Failure to remain weathertight, including uncontrolled water leakage.
    e. Deterioration of metals, metal finishes, and other materials beyond normal weathering, including nonuniformity of color or finish.
    f. Galvanic action between sheet metal roofing and dissimilar materials.
2. Warranty Period: Ten years from date of Substantial Completion.

Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: Twenty years from date of Substantial Completion.

11-30.2 PRODUCTS

11-30.2(1) PANEL MATERIALS

Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
3. Surface: Embossed finish.

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4. Exposed Coil-Coated Finish: 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
5. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Surface: Embossed finish.
2. Exposed Coil-Coated Finish: 2-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

11-30.2(2) FIELD-INSTALLED THERMAL INSULATION

Polyethylene Vapor Retarders: ASTM D 4397, 6 mils (0.15 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1 aluminum foil, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, based on tests performed on unfaced core.

11-30.2(3) UNDERLAYMENT MATERIALS

Self-Adhering, High-Temperature Sheet: 30 to 40 mils (0.76 to 1.0 mm) thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.; CCW WIP 300HT.
   b. Grace Construction Products; a unit of Grace, W. R. & Co.; Ultra.
   c. Henry Company; Blueskin PE200 HT.

11-30.2(4) SUBSTRATE BOARDS

Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.

1. Type and Thickness: Regular, 1/4 inch.
2. Product: Subject to compliance with requirements, provide Dens-Dek by Georgia-Pacific Corporation.

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Substrate-Board Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FMG 4470, designed for fastening substrate board to substrate.

11-30.2(5) MISCELLANEOUS METAL FRAMING

Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G40 (Z120) hot-dip galvanizedor coating with equivalent corrosion resistance unless otherwise indicated.

Hat-Shaped, Rigid Furring Channels: Nominal Thickness: As required to meet performance requirements.

Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), and depth required to fit insulation thickness indicated. Nominal Thickness: As required to meet performance requirements.

Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

11-30.2(6) STANDING-SEAM METAL ROOF PANELS

General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.

Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and snapping panels together.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide AEP Design Span HP or comparable product by one of the following:
    a. AEP-Span.
    b. Architectural Building Components.
    c. CENTRIA Architectural Systems.
    d. Petersen Aluminum Corporation.
3. Material: Zinc-coated (galvanized) steel sheet, 0.028-inch (0.71-mm) nominal thickness.
    a. Exterior Finish: 2-coat fluoropolymer.
    b. Color: Custom color as scheduled.
4. Material: Aluminum-zinc alloy-coated steel sheet, 0.028-inch (0.71-mm) nominal thickness.

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a. Exterior Finish: 2-coat fluoropolymer.
b. Color: Custom color as scheduled.

5. Material: Aluminum sheet, 0.032 inch (0.81 mm) thick.
   a. Exterior Finish: 2-coat fluoropolymer.
   b. Color: Custom color as scheduled.

6. Clips: Floating to accommodate thermal movement.
   a. Material: 0.028-inch- (0.71-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
   b. Material: 0.025-inch- (0.64-mm-) thick, stainless-steel sheet.

7. Panel Coverage: 12 inches (305 mm).
8. Panel Height: 1.75 inches (44 mm).

11-30.2(7) ACCESSORIES

Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum 0.018 inch (0.45 mm) thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

Gutters: Formed from same material roof panels. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (900 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Finish downspouts to match gutters.

11-30.2(8) FABRICATION

Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill

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indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. End Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. End Seams for Other Than Aluminum: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured

11-30.2(9) FINISHES

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

11-30.3 EXECUTION

11-30.3(1) EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, sheet metal roofing supports, and other conditions affecting performance of work.

1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored, and that provision has been made for flashings, and penetrations through sheet metal roofing.
3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

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Examine roughing-in for components and systems penetrating sheet metal roofing to verify actual locations of penetrations relative to seam locations of sheet metal roofing before sheet metal roofing installation.
Proceed with installation only after unsatisfactory conditions have been corrected.

11-30.3(2) THERMAL INSULATION INSTALLATION

Polyethylene Vapor Retarder: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Repair tears or punctures immediately before concealment by other work.
Board Insulation: Extend insulation in thickness indicated to cover entire roof. Erect insulation and hold in place with Z-shaped furring members spaced 24 inches (610 mm) o.c. Securely attach narrow flanges of furring members to roof deck with screws at spacing to meet uplift criteria.
Substrate: Extend glass-mat gypsum sheathing board in thickness indicated to cover entire roof. Fasten glass-mat gypsum sheathing board to Z-shaped furring members with screws at spacing to meet uplift criteria.

11-30.3(3) UNDERLAYMENT INSTALLATION

Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof substrate under sheet metal roofing. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply at locations indicated below, in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days. Extend underlayment indicated to cover entire roof.
Apply slip sheet over underlayment before installing sheet metal roofing.

11-30.3(4) INSTALLATION, GENERAL

General: Install sheet metal roofing perpendicular to purlins or supports. Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement. Install fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.

1. Field cutting of sheet metal roofing by torch is not permitted.
2. Rigidly fasten eave end of sheet metal roofing and allow ridge end free movement due to thermal expansion and contraction. Predrill roofing.
3. Provide metal closures at each side of ridge and hip caps.
4. Flash and seal sheet metal roofing with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
5. Locate and space fastenings in uniform vertical and horizontal alignment.
6. Install ridge and hip caps as sheet metal roofing work proceeds.
7. Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid a four-panel lap splice condition.
8. Lap metal flashing over sheet metal roofing to allow moisture to run over and off the material.

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Fasteners: Use fasteners of sizes that will not penetrate completely through substrate.
Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by fabricator of sheet metal roofing or manufacturers of dissimilar metals.
Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
Fascia: Align bottom of sheet metal roofing and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal sheet metal roofing with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

11-30.3(5) SHEET METAL ROOFING INSTALLATION

Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.

Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.Gutters: Fabricate gutter from same material as roof. Install gutter with continuous support.

1. Install self-adhering sheet underlayment and slip sheet between continuous wood blocking and copper.
2. All joints are to be riveted and soldered.
3. Provide expansion control as recommended by SMACNA.

11-30.3(6) ACCESSORY INSTALLATION

General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components. Install components required for a complete sheet metal roofing assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather

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resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3. Form flashing around pipe penetration and sheet metal roofing. Fasten and seal to sheet metal roofing as recommended by manufacturer.

11-30.3(7) ERECTION TOLERANCES

Installation Tolerances: Shim and align sheet metal roofing within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

11-30.3(8) CLEANING AND PROTECTION

Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

Clean and neutralize flux materials. Clean off excess solder and sealants.

Remove temporary protective coverings and strippable films, if any, as sheet metal roofing is installed. On completion of sheet metal roofing installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

Replace panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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11-31 JOINT SEALANTS

11-31.1 GENERAL

11-31.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-31.1(2) SUMMARY

This Section includes joint sealants for the following applications and as indicated in the Joint-Sealant Schedule at the end of Part 3.

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   a. Joints between plant-precast architectural concrete units.
   b. Joints between metal panels.
   c. Joints between different materials listed above.
   d. Perimeter joints between materials listed above and frames of doors, windows and louvers.
   e. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:
   a. Joints in precast and cast-in-place slabs.
   b. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   a. Perimeter joints of exterior openings where indicated.
   b. Joints on underside of plant-precast structural concrete beams and planks.
   c. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   d. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:
   a. Isolation joints in cast-in-place concrete slabs.
   b. Other joints as indicated.

Related Sections include the following: Section 11-38 “Glazing” for sealing glass lites in door and window assemblies.

11-31.1(3) PERFORMANCE REQUIREMENTS

Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

11-31.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each joint-sealant product indicated.

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Color Selection: Sealant color is to match adjacent substrate.
Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
Qualification Data: For Installer.
Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
Warranties: Special warranties specified in this Section.

11-31.1(5) QUALITY ASSURANCE

Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than four pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.

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2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Engineer.
2. Conduct field tests for each application indicated below:
   a. Each type of elastomeric sealant and joint substrate indicated.

Notify Engineer seven days in advance of dates and times when test joints will be erected.
Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

11-31.1(6) PROJECT CONDITIONS

Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

11-31.1(7) WARRANTY

General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period. Warranty Period: Two years from date of Substantial Completion.
Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
Warranty Period: Twenty years from date of Substantial Completion.

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Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

11-31.2 PRODUCTS

11-31.2(1) MANUFACTURERS

Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

11-31.2(2) MATERIALS, GENERAL

Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

Colors of Exposed Joint Sealants: As selected by the Engineer from manufacturer's standard colors.

11-31.2(3) ELASTOMERIC JOINT SEALANTS

Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

Single-Component Mildew-Resistant Acid-Curing Silicone Sealant ES-1:

1. Available Products:
   a. Dow Corning Corporation; 786 Mildew Resistant.
   b. GE Silicones; Sanitary SCS1700.
   c. Tremco; Tremsil 200 White.
   d. Type and Grade: S (single component) and NS (nonsag).
2. Class: 25.
3. Use Related to Exposure: NT (nontraffic).
4. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O. Use O Joint Substrates: Porcelain, tile, and painted gypsum board.

Single-Component Nonsag Urethane Sealant ES-2:

1. Available Products:

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a. Sika Corporation, Inc.; Sikaflex - 1a.
b. Sonneborn, Division of ChemRex Inc.; NP 1.
c. Tremco; Vulkem 116.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O. Use O Joint Substrates: Precast concrete, galvanized steel, hollow metal door frames, and steel window frames.

Single-Component Pourable Urethane Sealant ES-3:

1. Available Products:
   a. Sika Corporation, Inc.; Sikaflex - 1CSL.
   b. Sonneborn, Division of ChemRex Inc.; SL 1.
   c. Tremco; Vulkem Nova 300 SSL.

2. Type and Grade: S (single component) and P (pourable).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O. Use O Joint Substrates: Precast and cast-in-place concrete.

Single-Component Neutral-Curing Silicone Sealant ES-4:

1. Available Products:
   a. Dow Corning Corporation; 795
   b. GE Silicones; SilPruf NB SCS9000.
   c. Pecora Corporation; 895.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O. Use O Joint Substrates: Aluminum coated with a high performance coating.
6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.

11-31.2(4) LATEX JOINT SEALANTS

Latex Sealant LS-1: Comply with ASTM C 834, Type P, Grade NF.
Available Products:

Pecora Corporation; AC-20+.
Sonneborn, Division of ChemRex Inc.; Sonolac.
Tremco; Tremflex 834.

11-31.2(5) JOINT-SEALANT BACKING

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General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) O (open-cell material) B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

11-31.2(6) MISCELLANEOUS MATERIALS

Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

11-31.3 EXECUTION

11-31.3(1) EXAMINATION

Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

Proceed with installation only after unsatisfactory conditions have been corrected.

11-31.3(2) PREPARATION

Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.

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Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following: Concrete.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

11-31.3(3) INSTALLATION OF JOINT SEALANTS

General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

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1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193. Show on drawings. Use masking tape to protect surfaces adjacent to recessed tooled joints.

Installation of Preformed Tapes: Install according to manufacturer's written instructions.

11-31.3(4) CLEANING

Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

11-31.3(5) PROTECTION

Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

11-31.3(6) JOINT-SEALANT SCHEDULE

Joint-Sealant Application JS-1: Exterior horizontal traffic isolation and contraction joints in cast-in-place concrete slabs.

1. Joint Sealant: Single-component pourable urethane sealant ES-3.
2. Joint-Sealant Color: As selected by Engineer from manufacturer's full range.

Joint-Sealant Application JS-2: Exterior vertical and horizontal nontraffic joints between plant-precast architectural concrete and plank units.

1. Joint Sealant: Single-component nonsag urethane sealant ES-2.
2. Joint-Sealant Color: To match substrate and as approved by Engineer.

Joint-Sealant Application JS-3: Exterior butt joints between metal panels.

1. Joint Sealant: Single-component neutral-curing silicone sealant ES-4.
2. Joint-Sealant Color: To match substrate and as approved by Engineer.

Joint-Sealant Application JS-4: Exterior vertical joints between different materials listed above.

1. Joint Sealant: Single-component nonsag urethane sealant ES-2.
2. Joint-Sealant Color: To match substrate and as approved by Engineer.

Joint-Sealant Application JS-#5: Exterior perimeter joints between pre-cast concrete and frames of doors windows.

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1. Joint Sealant: Single-component nonsag urethane sealant ES-2.
2. Joint-Sealant Color: To match substrate and as approved by Engineer.

Joint-Sealant Application JS-6: Interior perimeter joints of exterior openings.

1. Joint Sealant: Single-component nonsag urethane sealant ES-2.
2. Joint-Sealant Color: White.

Joint-Sealant Application JS-7: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.

1. Joint Sealant: Single-component mildew-resistant acid-curing silicone sealant ES-1.
2. Joint-Sealant Color: White.

Joint-Sealant Application JS-8: Perimeter joints between interior wall surfaces and frames of interior doors and windows.

1. Joint Sealant: Latex sealant.
2. Joint-Sealant Color: White.

Joint-Sealant Application JS-9: Interior control, expansion, and isolation joints in horizontal traffic surfaces of retroplated cast-in-place concrete.

1. Joint Sealant: Single-component pourable urethane sealant ES-3.
2. Joint-Sealant Color: As selected by Engineer from manufacturer's full range.

NOT FOR CONSTRUCTION

11-32 STEEL DOORS AND FRAMES

11-32.1 GENERAL

11-32.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-32.1(2) SUMMARY

This Section includes the following:
Steel doors.
Steel door frames.
Related Sections include the following:
Section 11-33 "Stainless Steel Doors and Frames" for stainless steel doors.
Section 11-37 "Door Hardware" for door hardware and weather stripping.
Section 11-38 "Glazing" for glass in glazed openings in doors.
Section 11-40 "Gypsum Board Assemblies" for spot-grouting frames installed in steel-framed gypsum board partitions.
Section 11-45 "Painting" for field painting factory-primed doors and frames.

11-32.1(3) DEFINITIONS

Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

11-32.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

11-32.1(5) QUALITY ASSURANCE

Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

11-32.1(6) DELIVERY, STORAGE, AND HANDLING

Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Engineer. Remove and replace damaged items that cannot be repaired as directed.

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Store doors and frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

11-32.2 PRODUCTS

11-32.2(1) MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Steel Doors and Frames:

Ceco Door Products; a United Dominion Company.

Curries Company.

Steelcraft; a division of Ingersoll-Rand.

11-32.2(2) MATERIALS

Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

11-32.2(3) DOORS

General: Provide doors of sizes, thicknesses, and designs indicated.

Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:

Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

Level 4 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush).

Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

Louvers: At doors indicated, provide louvers fabricated of same material as the door with insect screen. Louvers are unpowered and shall have fixed blades. The factory-assembled louver section shall be designed to withstand wind loadings of 20 pounds per square foot (90-mph equivalent) and provide a minimum free area of 75%. Provide complete assembly to doors.

11-32.2(4) FRAMES

General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.

Frames of 14 gauge steel sheet for:

Level 3 steel doors.

Level 4 steel doors.

Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.

Plaster Guards: Provide 0.016-inch- thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

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Supports and Anchors: Fabricated from not less than 0.042-inch- thick, electrolytic zinc-coated or metallic-coated steel sheet.
Wall Anchors in Masonry Construction: 0.177-inch- diameter, steel wire complying with ASTM A 510 may be used in place of steel sheet.
Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

11-32.2(5) FABRICATION

General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.
Interior Door Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from the following material:
Cold-rolled steel sheet.
Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.
Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between pairs of doors. Not more than 3/4 inch at bottom.
Single-Acting, Door-Edge Profile: Square edge.
Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
Unless otherwise indicated, provide thermal-rated assemblies with U-value of 0.24 Btu/sq. ft. x h x deg F or better.
Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
Frame Construction: Fabricate frames to shape shown.
For exterior applications, fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
For interior applications, fabricate knock-down frames with mitered or coped corners, for field assembly.
Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
Glazing Stops: Manufacturer's standard, formed from 0.032-inch- thick steel sheet.

NOT FOR CONSTRUCTION

Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

11-32.2(6) FINISHES

Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

11-32.3 EXECUTION

11-32.3(1) INSTALLATION

General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
Install fire-rated frames according to NFPA 80.
Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.

11-32.3(2) ADJUSTING AND CLEANING

Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.
Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

NOT FOR CONSTRUCTION

11-33 STAINLESS STEEL DOORS AND FRAMES

11-33.1 GENERAL

11-33.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-33.1(2) SUMMARY

This Section includes the following:
Stainless steel doors.
Stainless steel door frames.
Related Sections include the following:
Section 11-32 "Steel Doors and Frames" for steel doors.
Section 11-37 "Door Hardware" for door hardware and weather stripping.
Section 11-45 "Painting" for field painting factory-primed doors and frames.

11-33.1(3) DEFINITIONS

Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

11-33.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

11-33.1(5) QUALITY ASSURANCE

Steel Door and Frame Standard: Comply with NAAMM / HMMA Technical Manual, unless more stringent requirements are indicated.

11-33.1(6) DELIVERY, STORAGE, AND HANDLING

Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Engineer. Remove and replace damaged items that cannot be repaired as directed.
Store doors and frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

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11-33.2 PRODUCTS

11-33.2(1) MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Steel Doors and Frames:
Krieger Specialty Products.
Ambico Limited.
Stainless Doors Incorporated.

11-33.2(2) MATERIALS

Stainless Steel: Level, cold rolled sheet steel conforming to ASTM A 240, commercial quality.
Type: 304.
Finish: No. 2D Paint Grade.
Reinforcing Material, Sleeves, Jamb Anchors, Dust Cover Boxes: Stainless Steel.

11-33.2(3) DOORS

General: Provide doors of sizes, thicknesses, and designs indicated.
Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
Level 4 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush).
Construction: Full flush seamless construction all sides.
Hinge and Lock Edges: 12 gage stainless steel channels fastened to both sheets full height of doors.
Stiffen doors with foamed-in-place polystyrene, cured and chemically bonded to interior surfaces.
Factory-prepare fully for all template hardware.
Provide reinforcing in doors scheduled for surface-mounted hardware.

11-33.2(4) FRAMES

General: Provide steel frames for doors that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
Frames of 14 gauge steel sheet for:
Level 4 steel doors.
Reinforce with 18 gage galvanized or stainless steel liners for hardware and anchor attachment.
Form liners to a tight fit, slide into stainless steel formed sections, and TIG weld on returns to support the total frame and lintel.
Reinforcing:
Hinge and Lock Tabs: 7 gage.
Surface Reinforcing: 14 gage.
Construction, General:
Smooth surfaces, true planes, free of warp and buckle.
Miters true, aligned, continuously TIG welded.
Metal edges straight, true, with sharp edges of metal sheets uniformly dulled.
Exposed welded joints ground smooth and flush, matching specified finish.

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Sub-frames continuously welded and tacked to skins.
Factory-prepared for all template mortised hardware; reinforced for surface mounted and non-templated mortised hardware.
Butt Joined Corner Construction.
Jamb Anchors: 16 gage minimum, every 16 inches (400 mm) provided for the type of wall construction.
Dust Cover Boxes (Mortar Guards): 22 gage minimum.
Cutoff Stops: Terminate jamb stops above floor, fill with weld plate, grind and polish. Terminate at 90 degrees.
Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.

11-33.2(5) FABRICATION

General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
Unless otherwise indicated, provide thermal-rated assemblies with U-value of 0.24 Btu/sq. ft. x h x deg F or better.
Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.

11-33.2(6) FINISHES

Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

11-33.3 EXECUTION

11-33.3(1) INSTALLATION

General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
Placing Frames: Comply with provisions in NAAMM-HMMA 840, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.

11-33.3(2) ADJUSTING AND CLEANING

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Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

NOT FOR CONSTRUCTION

11-34 ACCESS DOORS AND FRAMES

11-34.1 GENERAL

11-34.1(1) RELATED DOCUMENTS

Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-34.1(2) SUMMARY

This Section includes the following:
Wall access doors and frames.
Floor doors and frames.
Related Sections include the following:
Section 11-02 "Cast-in-Place Concrete" for blocking out openings for access doors and frames in concrete.
Section 11-41 "Acoustical Panel Ceilings" for access tile in suspended acoustical panel ceilings.

11-34.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
Shop Drawings: Show fabrication and installation details of customized doors and frames. Include plans, elevations, sections, details, and attachments to other Work.
Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.

11-34.1(4) QUALITY ASSURANCE

Source Limitations: Obtain doors and frames through one source from a single manufacturer.
Size Variations: Obtain Engineer's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

11-34.1(5(COORDINATION

Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article.

11-34.2 PRODUCTS

11-34.2(1) MANUFACTURERS

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
Access Doors:
J. L. Industries, Inc.

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Larsen's Manufacturing Company.
Milcor Limited Partnership.
Floor Doors:
Babcock-Davis Hatchways, Inc.
Bilco Company (The).
Nystrom Building Products Co.

11-34.2(2) MATERIALS

Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M.
Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator's option.
Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.
Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316; with minimum sheet thickness indicated representing specified thickness according to ASTM A 480/A 480M.
Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

11-34.2(3) PAINT

Shop Primers: Provide primers that comply with Section 11-45 "Painting."
Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.
Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

11-34.2(4) ACCESS DOORS AND FRAMES

Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
Locations: Gypsum board wall surfaces.
Door: Minimum 0.060-inch- thick sheet metal, set flush with exposed face flange of frame.
Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
Hinges: Continuous piano hinge.
Latch: Knurled-knob-operated cam latch.

11-34.2(5) FLOOR DOORS

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Floor Doors, General: Equip each door with adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with red vinyl grip that allows for one-handed closure, and recessed lift handle.
Watertight Steel Floor Door: Galvanized structural -steel channel frame forming gutter with NPS 1-1/2 drainage coupling and 3/16-inch- thick, diamond-pattern, galvanized structural -steel tread plate door; watertight; loading capacity to support 300-lbf/sq. ft. pedestrian live load.
Options: If available from specified manufacturers, include the following options:
Hinges: Heavy-duty, stainless-steel butt hinges with stainless-steel pins.
Latch: Stainless-steel slam latch.
Hardware Material: Stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and all brackets, hinges, pins, and fasteners.
Safety Accessories: Safety chains.

11-34.2(6) FABRICATION

General: Provide access door assemblies manufactured as integral units ready for installation.
Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
Provide mounting holes in frames to attach frames to metal or wood framing in plaster and drywall construction and to attach masonry anchors in masonry construction.
Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

11-34.2(7) FINISHES, GENERAL

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
Finish metal fabrications after assembly.

11-34.2(8) METALLIC-COATED STEEL FINISHES

Galvanizing of Steel Shapes and Plates: Hot-dip galvanize items indicated to comply with applicable standard listed below:
ASTM A 123/A 123M, for galvanizing steel and iron products.
Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. For galvanized surfaces, apply, after cleaning, a conversion coating suited to the organic coating to be applied over it. For metallic-coated surfaces, clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
Factory Priming for Field-Painted Finish: Apply shop primer immediately after cleaning and pretreating.

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11-34.2(9) STEEL FINISHES

Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

11-34.3 EXECUTION

11-34.3(1) PREPARATION

Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

11-34.3(2) INSTALLATION

Comply with manufacturer's written instructions for installing access doors and frames and floor doors and frames.
Install floor doors flush with adjacent finish surfaces.

11-34.3(3) ADJUSTING AND CLEANING

Adjust doors and hardware after installation for proper operation.
Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

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11-35 ALUMINUM ENTRANCES AND STOREFRONTS

11-35.1 GENERAL

11-35.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-35.1(2) SUMMARY

This Section includes the following:
Aluminum thermal glazed fixed type storefront and window system. Storefront system optionally factory glazed.
Aluminum entrance doors.
Related Sections include the following:
Section 11-31 "Joint Sealants" for sealing perimeter joints between windows and adjacent materials.
Section 11-38 “Glazing” for glass in entrance doors.

11-35.1(3) PERFORMANCE REQUIREMENTS

Structural Performance: Provide steel windows capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated:
Wind Loads: Determine loads based on the following minimum uniform design wind pressures as determined from testing windows representative of those indicated for Project according to ASTM E 330:
Uniform pressure of 50 lbf/sq. ft., acting inward or outward.
Provide window framing that limits lateral deflection of glass edges at uniform design pressures as noted below.
Performance Requirements:
Storefront units to conform to the following performance requirements:
Air Infiltration: Air infiltration rate shall not exceed 0.06 cfm/ft^2 at a static air pressure differential of 6.24 psf when tested in accordance with ASTM E283.
Water Resistance: Test in accordance with referenced ASTM E331. No water penetration at a test pressure difference of 8 PSF as defined in AAMA 501.
Uniform Load: Static air design loads noted as windload and indicated on the drawings under window schedule shall be applied in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
Thermal Performance: AAMA 1503 - U (Thermal Transmittance) shall not be more than: 0.46 (low-e) or 0.63 (clear) BTU/hr/ft^2/°F.
Entrances to conform to following performance requirements:
Air Infiltration: For single acting offset pivot or butt hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 6.24 psf for single doors and 1.567 psf for pairs of doors. A single 3'0" x 7'0" entrance door and frame shall not exceed 0.50 cfm per square foot. A pair of 6'0" x 7'0" entrance doors and frame shall not exceed 1.0 cfm per square foot.

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Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

Pre-Installation Conference: The Engineer will call a pre-installation conference at the site with the Contractor and aluminum storefront installer to review and discuss conditions of preparation, installation, and coordination with related work.

11-35.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.

Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum entrances and storefronts.

Shop Drawings: Include plans, elevations, sections, details, attachments to other work, and the following:

Layout and installation details, including anchors.

Elevations of continuous work at 1/4 inch = 1 foot scale and typical window unit elevations at 3/4 inch = 1 foot scale.

Full-size section details of typical composite members, including reinforcement.

Hardware, including operators.

Accessories.

Glazing details.

Samples for Initial Selection: For units with factory-applied color finish.

Include Samples of window hardware and accessories involving color selection.

Samples for Verification: For each type of aluminum entrances and storefronts required, prepared on Samples of size indicated below.

Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum entrances and storefronts manufacturer's standard products to determine compliance with performance requirements.

Maintenance Data: For operable window sash to include in maintenance manuals.

Warranties: Special warranty specified in this Section.

11-35.1(5) QUALITY ASSURANCE

Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

11-35.1(6) PROJECT CONDITIONS

Field Measurements: Verify aluminum entrances and storefronts openings by field measurements before fabrication and indicate measurements on Shop Drawings.

Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating steel windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

11-35.1(7) WARRANTY

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Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of steel windows that fail in materials or workmanship within specified warranty period.
Failures include, but are not limited to, the following:
Failure to meet performance requirements.
Structural failures including excessive deflection.
Water leakage or air infiltration.
Faulty operation of operable sash and hardware.
Deterioration of metals, metal finishes, and other materials beyond normal weathering.
Insulating-glass failure.
Warranty Period: One year(s) from date of Substantial Completion.
Warranty Period for Metal Finishes: Ten (10) years from date of Substantial Completion.
Warranty Period for Glass: Ten (10) years from date of Substantial Completion.

11-35.2 PRODUCTS

11-35.2(1) MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Storefronts:
Manufacturers
Kawneer
EFCO
US Aluminum
Vistawall
Provide following types:
Trifab VG 450, 4 ½ inch, center glazed.
Framing Member Profile: 1-3/4-inch x 4 1/2-inch nominal dimensions, thermally improved, front glazed, screw splined fabrication.
Aluminum Entrance Doors:
Manufacturers
Kawneer or other approved manufacturers.
Provide following types:
Kawneer's "350 Heavy Wall Door" entrance doors are specified for type, quality, and construction required.
Doors shall be 2-inches thick and stile and rail face dimensions of:
Vertical Stile: 3-1/2-inches.
Rail: 3-17/32-inch.
Bottom Rail: 10-1/4-inches.

11-35.2(2) MATERIALS

Glass: See Section 11-38 "Glazing" for glazing.
Storefront Materials:
Extrusions: 6063-T5 alloy and temper (ASTM B221).
Member Wall Thickness: Each framing member shall provide structural strength to meed specified performance requirements.
Fasteners: Where exposed, shall be stainless steel.
Glazing gaskets shall be EPDM elastomeric extrusions and be type that locks securely into the glazing reglet to prevent glazing gaskets from disengaging.

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Perimeter anchors of aluminum or steel, isolate dissimilar metals to prevent galvanic corrosion.
Finish: Finish storefront assemblies with Kynar fluoropolymer coating meeting AAMA 2604-05, similar to Kawneer Permadize Hardcoat finishes, color as scheduled on the drawings.
Aluminum Entrance Doors:
Materials: 6063-T6 alloy and temper extruded aluminum (ASTM B221).
Glazing gaskets for doors and frames shall be EPDM extrusions.
Screws and miscellaneous fasteners shall be aluminum, stainless steel or zinc plated steel.
Finish: Finish entrance door assemblies with Kynar fluoropolymer coating meeting AAMA 2604-05, similar to Kawneer Permadize Hardcoat finishes, color as scheduled on the drawings.
Hardware: See Section 11-37 “Door Hardware”.
Provide weatherstripping, moldings and miscellaneous items for a complete assembly.

11-35.2(3) FABRICATION

Manufacturer's standard methods.
Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
Prepare components to receive anchor devices. Fabricate anchors.
Arrange fasteners and attachments to conceal from view.
Storefront and Window System: Provide for flush glazing appearance, with no projecting stops. Vertical and horizontal members to have nominal dimensions as detailed on the drawings.
Aluminum Entrance Doors: Manufacturer's standard methods. Fabricate components with minimum clearances and shim spacing around perimeter of assembly. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof. Prepare components to receive anchor devices. Fabricate anchors. Arrange fasteners and attachments to conceal from view.

11-35.2(4) STEEL FINISHES

General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

11-35.3 EXECUTION

11-35.3(1) EXAMINATION

Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances, rough opening dimensions, levelness of sill plate, coordination with wall flashings and vapor retarders, and other conditions affecting performance of work.
Proceed with installation only after unsatisfactory conditions have been corrected.

11-35.3(2) INSTALLATION

Install in accordance with "Quality Assurance" provisions, "References", Specifications, and Manufacturer's directions. Where these may be in conflict, the more stringent requirements govern.

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Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

Provide alignment attachments and shims to permanently fasten system to building structure.

Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Install perimeter sealant. Comply with Section 11-31 "Joint Sealants".

Install entrances plumb and true and in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturer's written instructions.

Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:

Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.

Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

11-35.3(3) CLEANING

Clean aluminum and glazing both sides at completion of work. Leave premises clean and free of residue of work of this Section. Advise Contractor of protective treatment and other precautions required through remainder of construction period, to ensure entrances and storefronts will be without damage or deterioration at time of acceptance.

11-35.3(4) PROTECTION

Provide final protection and maintain conditions for the duration of the project, in a manner acceptable to manufacturer and installer that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion. Scratches, marks and blemishes will not be acceptable and will be cause for rejection. Remedial work will be at no cost to the Owner.

NOT FOR CONSTRUCTION

11-36 ALUMINUM WINDOWS

11-36.1 GENERAL

11-36.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-36.1(2) SUMMARY

This Section includes the following:
Heavy commercial architectural aluminum thermal glazed projecting-in window system. System is factory glazed.
Related Sections include the following:
Section 11-31 "Joint Sealants" for sealing perimeter joints between windows and adjacent materials.
Section 11-38 “Glazing” for glass for aluminum windows.

11-36.1(3) PERFORMANCE REQUIREMENTS

Structural Performance: Provide steel windows capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated:
Wind Loads: Determine loads based on the following minimum uniform design wind pressures as determined from testing windows representative of those indicated for Project according to ASTM E 330:
Uniform pressure of 50 lbf/sq. ft., acting inward or outward.
Provide window framing that limits lateral deflection of glass edges at uniform design pressures as noted below.
Performance Requirements:
Aluminum window units to conform to the following performance requirements:
Aluminum Windows shall meet requirements of AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS) North American Fenestration Standard for Windows, Doors and Skylights Specifications for a Class and Grade of P-HC90 / P-AW90.
Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283 at a minimum window size of 60" x 36". The air infiltration rate shall not exceed 0.10 cfm/ft at a static air pressure differential of 6.24 psf.
Water Resistance: The test specimen shall be tested in accordance with ASTM E 547 and ASTM E 331 at a minimum window size of 60" x 36". There shall be no leakage as defined in the test method at a static air pressure differential of 12 psf.
Uniform Load Deflection: A minimum static air pressure difference of 90 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member.
Uniform Load Structural Test: A minimum static air pressure difference of 135 psf shall be applied in the positive and negative direction in accordance with ASTM E330. The unit shall be evaluated after each load.
Component Testing: Window components shall be tested in accordance with procedures described in ANSI AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).
Condensation Resistance Test (CRF): When tested in accordance with AAMA 1503, the condensation resistance factor (CRF) shall not be less than:

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Project-In: (CRF_f) not less than 52.
Thermal Transmittance Test (U-Factor): When tested in accordance with AAMA 1503, the conductive thermal transmittance (U-Factor) shall not be more than:
Project-In: U-Value not more than .57 BTU/hr/sf/°F.
Forced Entry Resistance: All windows shall conform to ASTM F588, Grade 10.
Sound Performance: When tested in accordance with ASTM E 90 and E 413, the sound transmission loss (STL) shall not be less than 39.
Thermal Barrier Tests: Testing shall be in general accordance with AAMA 505 Dry Shrinkage and Composite Thermal Cycling test procedure, AAMA TIR-A8, Structural Performance of Composite Thermal Barrier systems.
Test units:
All test unit sizes and configurations shall conform to the minimum size in accordance with ANSI AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS) and AAMA 910.
Units submitted for laboratory testing shall be units of the manufacturer's standard construction, glazed and assembled in accordance with the manufacturer's specifications and ANSI/AAMA 101.
Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.
Pre-Installation Conference: The Engineer will call a pre-installation conference at the site with the Contractor and aluminum storefront installer to review and discuss conditions of preparation, installation, and coordination with related work.

11-36.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum entrances and storefronts.
Shop Drawings: Include plans, elevations, sections, details, attachments to other work, and the following:
Layout and installation details, including anchors.
Elevations of continuous work at 1/4 inch = 1 foot scale and typical window unit elevations at 3/4 inch = 1 foot scale.
Full-size section details of typical composite members, including reinforcement.
Hardware, including operators.
Accessories.
Glazing details.
Samples for Initial Selection: For units with factory-applied color finish.
Include Samples of window hardware and accessories involving color selection.
Samples for Verification: For each type of aluminum entrances and storefronts required, prepared on Samples of size indicated below.
Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum entrances and storefronts manufacturer's standard products to determine compliance with performance requirements.
Maintenance Data: For operable window sash to include in maintenance manuals.
Warranties: Special warranty specified in this Section.

11-36.1(5) QUALITY ASSURANCE

NOT FOR CONSTRUCTION

Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

11-36.1(6) PROJECT CONDITIONS

Field Measurements: Verify aluminum entrances and storefronts openings by field measurements before fabrication and indicate measurements on Shop Drawings.
Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating steel windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

11-36.1(7) WARRANTY

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of steel windows that fail in materials or workmanship within specified warranty period.
Failures include, but are not limited to, the following:
Failure to meet performance requirements.
Structural failures including excessive deflection.
Water leakage or air infiltration.
Faulty operation of operable sash and hardware.
Deterioration of metals, metal finishes, and other materials beyond normal weathering.
Insulating-glass failure.
Warranty Period: One year(s) from date of Substantial Completion.
Warranty Period for Metal Finishes: Ten (10) years from date of Substantial Completion.
Warranty Period for Glass: Ten (10) years from date of Substantial Completion.

11-36.2 PRODUCTS

11-36.2(1) MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Aluminum Windows:
Manufacturers
Kawneer
EFCO
US Aluminum
Vistawall
Provide following types:
Series: 8225TL ISOLOCK®, Thermally Broken, 0.125 Wall Thickness, Project-Out or Project-In Window.
Framing Member Profile: 1-3/4-inch x 4 1/2-inch nominal dimensions, thermally improved, front glazed, screw splined fabrication.

11-36.2(2) MATERIALS

Glass: See Section 11-38 ”Glazing” for glazing.
Storefront Materials:
Extrusions: 6063-T5 alloy and temper (ASTM B221).

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Member Wall Thickness: Each framing member shall provide structural strength to meed specified performance requirements.
Steel Reinforcement: Complying with ASTM A 36/ A 36M for structural shapes, plates and bars; ASTM A 611 for cold-rolled sheet and strip or ASTM A 570/ A 570M for hot-rolled sheet and strip.
Fasteners: Where exposed, shall be stainless steel.
Weather-stripping: Ventilators shall be double weather-stripped with a resilient foam core clad with UV-resistant elastomer.
Glazing Gaskets: Standard glazing gaskets shall be a dry glazed elastomer in accordance with ASTM C509-91.
Glazing Sealant: Glazing material shall be a 100 percent silicone, neutral-cure sealant in accordance with AAMA 805.2-94, Group A.
Thermal Barrier: The thermal barrier shall be Kawneer ISOLOCK® with a minimum 3/8" separation consisting of a two-part, chemically curing high density polyurethane which is mechanically and adhesively bonded to the aluminum.
Perimeter anchors of aluminum or steel, isolate dissimilar metals to prevent galvanic corrosion.
Finish: Finish storefront assemblies with Kynar fluoropolymer coating meeting AAMA 2604-05, similar to Kawneer Permadize Hardcoat finishes, color as shown on the drawings.

11-36.2(3) HARDWARE

Typical Hardware:
Locking:
Cast White Bronze Cam Lockswith pole ring
Sash pole with hanger for pole.
Hinging: 4-Bar Hinge

11-36.2(4) ACCESSORIES

Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
Sealants and joint fillers for joints at perimeter of window system as specified in Section 11-31 "Joint Sealants."
Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
Optional Muntin Grids: Extruded aluminum profiles, 6063-T6 alloy and temper and as follows:
Applied muntins.
Glazing: Factory glazing as specified in Section 11-38 “Glazing”.
Optional Exterior Panning and Interior Trims: Extruded aluminum, 6063-T6 alloy and temper, extruded to profiles and details indicated. Seal exterior joints with manufacturer’s standard sealant to assure water-tight joints.
Mullions and Cover Plates: Shall be extruded aluminum of 6063-T6 alloy and temper of profile and dimensions indicated on drawings. Mullions shall provide structural properties to resist wind pressure required by performance criteria and standards.

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11-36.2(5) COMPONENTS

The frame depth shall be not less than 1-3/4".
All frame members shall have minimum wall thickness of 0.125" and shall provide the structural strength sufficient to meet the specified performance requirements.
Glazing beads shall be extruded aluminum and shall be a minimum thickness of 0.060".
Reference to tolerances for wall thickness and other cross-sectional dimensions of window members are nominal and in compliance with AA Aluminum Standards and Data.
All references to dimensions for wall thicknesses and other cross-sectional dimensions of window members are nominal and in compliance with ANSI H35.2-1990.

11-36.2(6) FABRICATION

General: Fabricate components per manufacturer's installation instructions. When assembled, components will have accurately fitted joints to produce hairline joints.

11-36.2(7) STEEL FINISHES

General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

11-36.3 EXECUTION

11-36.3(1) EXAMINATION

Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances, rough opening dimensions, levelness of sill plate, coordination with wall flashings and vapor retarders, and other conditions affecting performance of work.
Proceed with installation only after unsatisfactory conditions have been corrected.

11-36.3(2) INSTALLATION

Install in accordance with "Quality Assurance" provisions, "References", Specifications, and Manufacturer's directions. Where these may be in conflict, the more stringent requirements govern.
Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
Provide alignment attachments and shims to permanently fasten system to building structure.
Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Install perimeter sealant. Comply with Section 11-31 "Joint Sealants".

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Install entrances plumb and true and in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturer's written instructions.
Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:
Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.
Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

11-36.3(3) ADJUSTING

Adjust operating window components to provide a tight fit at contact points and at weather-stripping for smooth operation and a weather tight closure.

11-36.3(4) CLEANING

Clean daily in accordance with the following: Clean aluminum and glazing both sides at completion of work. Leave premises clean and free of residue of work of this Section. Advise Contractor of protective treatment and other precautions required through remainder of construction period, to ensure entrances and storefronts will be without damage or deterioration at time of acceptance.

11-36.3(5) PROTECTION

Provide final protection and maintain conditions for the duration of the project, in a manner acceptable to manufacturer and installer that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion. Scratches, marks and blemishes will not be acceptable and will be cause for rejection. Remedial work will be at not cost to the Owner.

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11-37 DOOR HARDWARE

11-37.1 GENERAL

11-37.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-37.1(2) SUMMARY

This Section includes the following:
Commercial door hardware for the following:
Swinging doors.
Related Sections include the following:
Section 11-34 "Access Doors and Frames" for access door hardware, except cylinders.
Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

11-37.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of door hardware indicated.
Samples: For exposed door hardware of each type indicated below, in specified finish, full size. Tag with full description for coordination with the Door Hardware Schedule. Submit samples before, or concurrent with, submission of the final Door Hardware Schedule.
Door Hardware: As follows:
Hinges.
Locks and latches.
Cylinders and keys.
Thresholds.
Miscellaneous items.
Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
Content: Include the following information:
Type, style, function, size, label, hand, and finish of each door hardware item.
Manufacturer of each item.

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Fastenings and other pertinent information.
Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
Explanation of abbreviations, symbols, and codes contained in schedule.
Mounting locations for door hardware.
Door and frame sizes and materials.
Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
Keying Schedule: Prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
Qualification Data: For firms and persons specified in "Quality Assurance" Article.
Include lists of completed projects with project names and addresses of architects and owners, and other information specified.
Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current products comply with requirements.
Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
Warranties: Special warranties specified in this Section.

11-37.1(4) QUALITY ASSURANCE

Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Engineer, and Owner about door hardware and keying.
Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
Regulatory Requirements: Comply with provisions of the following:
NFPA 101: Comply with the following for means of egress doors:
Latches and Locks: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
Thresholds: Not more than 1/2 inch high.

11-37.1(5) DELIVERY, STORAGE, AND HANDLING

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Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
Deliver keys to manufacturer of key control system.

11-37.1(6) COORDINATION

Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

11-37.1(7) WARRANTY

General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
Structural failures including excessive deflection, cracking, or breakage.
Faulty operation of operators and door hardware.
Deterioration of metals, metal finishes, and other materials beyond normal weathering.
Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
Warranty Period for Manual Closers: 10 years from date of Substantial Completion.

11-37.1(8) MAINTENANCE SERVICE

Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

11-37.2 PRODUCTS

11-37.2(1) SCHEDULED DOOR HARDWARE

General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets indicated in door and frame schedule, and the Door Hardware Schedule at the end of Part 3.
Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products.
Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

11-37.2(2) MANUFACTURERS AND ACCEPTABLE SUBSTITUTES

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Item:	Manufacturer:	Acceptable Substitute:
Hinges/Butts:	Ives (IVE)	Hager, McKinney,Stanley, Baldwin
Continuous Hinges:	Ives (IVE)	Pemko, Markar
Locks/Latches:	Schlage (SCH)	Best 35H
Cylinders:	Schlage Everest Primus (SCH)	Kaba, Medeco
Surface Closers:	LCN (LCN)	Norton 7500
Stops/Catches:	Ives (IVE)	Trimco
Overhead Stops:	Glynn Johnson (GLY)	Rixson
Kickplates:	Ives (IVE)	Trimco, Tice
Weatherstripping/ Gasketing:	Pemko (PEM)	Reese, Steelcraft
Door Bottoms:	Pemko (PEM)	Reese
Thresholds:	Pemko (PEM)	Reese
Silencers:	Ives (IVE)	Trimco

11-37.2(3) HINGES

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Hinges:

Ives (IVE)

Baldwin Hardware Corporation (BH).

Hager Companies (HAG).

McKinney Companies (MCK).

Standards: Comply with the following:

Butts and Hinges: BHMA A156.1.

Template Hinge Dimensions: BHMA A156.7.

Self-Closing Hinges: BHMA A156.17.

Quantity: Provide the following, unless otherwise indicated:

Two Hinges: For doors with heights up to 60 inches.

Three Hinges: For doors with heights 61 to 90 inches.

Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches) Standard Weight	Heavy Weight
32 by 84 by 1-3/8	3-1/	0.123	-
36 by 84 by 1-3/8	4	0.130	-
36 by 84 by 1-3/4	4-1/2	0.134	0.180
42 by 90 by 1-3/4	4-1/2	0.134	0.180
48 by 120 by 1-3/4	5	0.146	0.190

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Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
Hinge Weight: Unless otherwise indicated, provide the following:
Entrance Doors: Heavy-weight hinges.
Doors with Closers: Antifriction-bearing hinges.
Interior Doors: Standard-weight hinges.
Hinge Base Metal: Unless otherwise indicated, provide the following:
Exterior Hinges: Stainless steel, with stainless-steel pin.
Interior Hinges: Brass, with stainless-steel pin body and brass protruding heads.
Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:
Corners: Square.
Fasteners: Comply with the following:
Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
Wood Screws: For wood doors and frames.

11-37.2(3) LOCKS AND LATCHES

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Mechanical Locks and Latches:
Best Lock Corporation (BLC).
Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR).
Medeco High Security Locks, Inc. (MED).
Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
Schlage (SCH)
Standards: Comply with the following:
Mortised Locks and Latches: BHMA A156.13.
Bored Locks: BHMA Grade 1, unless Grade 2 is indicated; Series 1000.
Certified Products: Provide door hardware listed in the following BHMA directories:
Mechanical Locks and Latches: BHMA's "Directory of Certified Locks & Latches."
Lock Trim: Comply with the following:
Knob: Wrought, forged, or cast.
Escutcheon (Rose): Wrought, forged, or cast.
Lockset Designs: Provide the lockset design designated below or, if sets are provided by another manufacturer, provide designs that match those designated:
Mortised Locks: Schlage “L” Series and 42 (knob, “D Orbit”) series.

Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
Mortised Locks: BHMA A156.13.
Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
Mortiseded Locks: Minimum 3/4-inch latchbolt throw.
Backset: 2-3/4 inches unless otherwise indicated.

11-37.2(4) CYLINDERS AND KEYING

Manufacturers:
Cylinders:

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Schlage 'Everest Primus'
Medeco High Security Locks, Inc. (MED) - KeyMark cylinder.
Construction Keying: Comply with the following:
Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
Replace construction cores with permanent cores, as directed by Owner.
Furnish permanent cores to Owner for installation.
Keying System: Unless otherwise indicated, provide a factory-registered keying system complying with the following requirements:
Existing System: Master key or grand master key locks to Owner's existing system.
Keys: Provide nickel-silver keys complying with the following:
Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
Notation: Information to be furnished by Owner.
Quantity: In addition to one extra blank key for each lock, provide the following:
Master Keys: Five.

11-37.2(5) CLOSERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Surface-Mounted Closers:
Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR).
DORMA Door Controls Inc.; Member of The DORMA Group (DC).
LCN Closers; an Ingersoll-Rand Company (LCN).
Norton Door Controls; Div. of Yale Security Inc. (NDC).
Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
Yale Security Inc.; Div. of Williams Holdings (YAL).
Standards: Comply with the following:
Closers: BHMA A156.4.
Closer Holder Release Devices: BHMA A156.15.
Surface Closers: BHMA Grade 1, unless Grade 2 is indicated.
Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."
Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

11-37.2(6) STOPS AND HOLDERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Architectural Builders Hardware Mfg., Inc. (ABH).
Baldwin Hardware Corporation (BH).
DORMA Door Controls Inc.; Member of The DORMA Group (DC).
Hager Companies (HAG).
Hiawatha, Inc. (HIA).
Ives: H. B. Ives (IVS).
LCN Closers; an Ingersoll-Rand Company (LCN).

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Rockwood Manufacturing Company (RM).
Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
Schlage
Triangle Brass Manufacturing Company, Inc. (TBM).
Yale Security Inc.; Div. of Williams Holdings (YAL).
Standards: Comply with the following:
Stops and Bumpers: BHMA A156.16.
Door Silencers: BHMA A156.16.
Stops and Bumpers: BHMA Grade 1.

Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.
Where floor or wall stops are not appropriate, provide overhead holders.
Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch ; fabricated for drilled-in application to frame.

11-37.2(7) DOOR GASKETING

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Door Gasketing:
Hager Companies (HAG).
National Guard Products, Inc. (NGP).
Pemko Manufacturing Co., Inc. (PEM).
Zero International, Inc. (ZRO).
Door Bottoms:
Hager Companies (HAG).
National Guard Products, Inc. (NGP).
Pemko Manufacturing Co., Inc. (PEM).
Zero International, Inc. (ZRO).
Standard: Comply with BHMA A156.22.
General: Provide continuous weather-strip gasketing on exterior. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.

11-37.2(8) THRESHOLDS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Hager Companies (HAG).
National Guard Products, Inc. (NGP).
Pemko Manufacturing Co., Inc. (PEM).
Zero International, Inc. (ZRO).
Standard: Comply with BHMA A156.21.

NOT FOR CONSTRUCTION

11-37.2(9) FABRICATION

Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:

Surface hinges to doors.

Closers to doors and frames.

Surface-mounted exit devices.

Spacers or Sex Bolts: For through bolting of hollow metal doors.

Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

11-37.2(10) FINISHES

Standard: Comply with BHMA A156.18.

Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

BHMA Designations: Comply with base material and finish requirements indicated by the following:

BHMA 613: Oil rubber brnze on bronze base metal.

BHMA 630: Satin stainless steel, over stainless-steel base metal.

11-37.3 EXECUTION

11-37.3(1) EXAMINATION

Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

Proceed with installation only after unsatisfactory conditions have been corrected.

NOT FOR CONSTRUCTION

11-37.3(2) PREPARATION

Steel Doors and Frames: Comply with DHI A115 series.
Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

11-37.3(3) INSTALLATION

Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Section 11-45 "Painting). Do not install surface-mounted items until finishes have been completed on substrates involved.
Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 11-31 "Joint Sealants."

11-37.3(4) ADJUSTING

Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
Consult with and instruct Owner's personnel on recommended maintenance procedures.
Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

11-37.3(5) CLEANING AND PROTECTION

Clean adjacent surfaces soiled by door hardware installation.
Clean operating items as necessary to restore proper function and finish.
Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

11-37.3(6) DOOR HARDWARE SCHEDULE

NOT FOR CONSTRUCTION

HW SET:
DOOR NUMBER:

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	112HD	313	IVE
1	EA	CLASSROOMSECURITY HOLDBACK LOCK	L9477R 07A	613	SCH
1	EA	EVEREST CORE	PRIMUS20-740	606	SCH
2	EA	BULLET STAND-OFF	912016	613	FOR
1	EA	CONCEALED CLOSER	5011	695	LCN
1	EA	OVERHEAD STOP	100S	695	GLY
1	SET	WEATHERSTRIP	PROVIDED BY DOOR MANUFACTURER	DKB	
1	EA	DOOR SWEEP	3452DNB	DKB	PEM
1	EA	THRESHOLD	255D	DKB	PEM

DOOR CLOSER REQUIRES 4" TALL HEADER ON DOOR FRAME.

HW SET:
DOOR NUMBER:

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	613	IVE
1	EA	CLASSROOMSECURITY HOLDBACK LOCK	L9477R 07A	613	SCH
2	EA	EVEREST CORE	PRIMUS20-740	606	SCH
1	EA	SURFACE CLOSER	4011EDA	695	LCN
1	SET	WEATHERSTRIP	S88D (HEAD & JAMBS)	DKB	PEM
1	EA	DOOR SWEEP	3452DNB	DKB	PEM
1	EA	RAIN DRIP	346D	DKB	PEM
1	EA	THRESHOLD	255D	DKB	PEM

HW SET:
DOOR NUMBER:

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	641	IVE
1	EA	STOREROOM LOCK	L9080R 07A	613	SCH
1	EA	EVEREST CORE	PRIMUS20-740	606	SCH
1	EA	SURFACE CLOSER	4011	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	WALL STOP	WS407CCV	613	IVE

NOT FOR CONSTRUCTION

1	SET	GASKETING	S88D (HEAD, JAMBS & ASTRAGAL)	DKB	PEM

HW SET: 56

DOOR NUMBER:

EACH TO HAVE:

3	EA	HINGE	5PB1 4.5 X 4.5	641	IVE
1	EA	EVEREST PRIMUS CORE	20-740	606	SCH
1	EA	PRIVACY W/INDICATOR	L9496R 07A L583-363	613	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	WALL STOP	WS407CCV	613	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS)	DKB	PEM

HW SET: 08

DOOR NUMBER:

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	641	IVE
1	EA	PASSAGE SET	L9010 07A	613	SCH
1	EA	SURFACE CLOSER	4111	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	WALL STOP	WS407CCV	613	IVE
1	SET	GASKETING	S88D (HEAD, JAMBS & ASTRAGAL)	DKB	PEM

HW SET: 54

DOOR NUMBER:

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	DOUBLE CYLINDER DEADLOCK WITH PULL	L9462Xxl 11-886 17A	630	SCH
2	EA	EVEREST PRIMUS CORE	20-740		SCH
1	EA	SURFACE CLOSER	4011 EDA		LCN
1	SET	WEATHERSTRIP	S88D (HEAD & JAMBS)	DKB	PEM
1	EA	DOOR SWEEP	3452DNB	DKB	PEM
1	EA	RAIN DRIP	346D	DKB	PEM
1	EA	THRESHOLD	255D	DKB	PEM

NOT FOR CONSTRUCTION

11-38 GLAZING

11-38.1(GENERAL

11-38.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-38.1(2) SUMMARY

This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

Windows.

Doors.

11-38.1(3) DEFINITIONS

Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

11-38.1(4) PERFORMANCE REQUIREMENTS

General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

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Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
Specified Design Wind Loads: As indicated, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
For laminated-glass lites, properties are based on products of construction indicated.
For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal 1/2-inch- wide interspace.
Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
Solar Heat Gain Coefficient: NFRC 200.
Solar Optical Properties: NFRC 300.

11-38.1(5) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each glass product and glazing material indicated.
Samples: For the following products, in the form of 12-inch- square Samples for glass and of 12-inch- long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
Insulating glass for each designation indicated.
For each color (except black) of exposed glazing sealant indicated.
Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
Qualification Data: For installers.
Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
Product Test Reports: For each of the following types of glazing products:
Insulating glass.
Glazing sealants.
Warranties: Special warranties specified in this Section.

11-38.1(6) QUALITY ASSURANCE

Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in

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glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.

Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

Submit not fewer than four pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.

Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."

IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

Insulating Glass Certification Council.

11-38.1(7) DELIVERY, STORAGE, AND HANDLING

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Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

11-38.1(8) PROJECT CONDITIONS

Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

11-38.1(9) WARRANTY

Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
Warranty Period: 10 years from date of Substantial Completion.
Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
Warranty Period: Five years from date of Substantial Completion.
Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
Warranty Period: 10 years from date of Substantial Completion.

11-38.2 PRODUCTS

11-38.2(1) MANUFACTURERS

In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
Products: Subject to compliance with requirements, provide one of the products specified.
Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

11-38.2(2) GLASS PRODUCTS

Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

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Ultra-Clear (Low-Iron) Float Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.
Products:
AFG Industries Inc.; Krystal Klear.
Pilkington Building Products North America; Optiwhite.
PPG Industries, Inc.; Starphire.
Schott Corporation; Amiran.
Pyrolytic-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide coating applied by pyrolytic deposition process during initial manufacture, and complying with other requirements specified.
Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:
Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.
Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.
Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

Sealing System: Dual seal, with primary and secondary sealants as follows:
Manufacturer's standard sealants.
Spacer Specifications: Manufacturer's standard spacer material and construction.

11-38.2(3) GLAZING SEALANTS

General: Provide products of type indicated, complying with the following requirements:
Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
Colors of Exposed Glazing Sealants: Match Engineer's samples.
Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
Single-Component Neutral-Curing Silicone Glazing Sealants GS-1:
Available Products: Provide one of the following or approved equal:
Dow Corning Corporation; 790.
GE Silicones; SilPruf LM SCS2700.
Type and Grade: S (single component) and NS (nonsag).
Class: 100/50.

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Use Related to Exposure: NT (nontraffic).
Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
Use O Glazing Substrates: Coated glass and galvanized and painted steel.
Applications: Door and window glazing.

11-38.2(4) GLAZING GASKETS

Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
EPDM, ASTM C 864.
Silicone, ASTM C 1115.
Thermoplastic polyolefin rubber, ASTM C 1115.
Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
EPDM.
Silicone.
Thermoplastic polyolefin rubber.

11-38.2(5) MISCELLANEOUS GLAZING MATERIALS

General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

11-38.2(6) FABRICATION OF GLAZING UNITS

Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

11-38.2(7) MONOLITHIC FLOAT-GLASS UNITS

Uncoated Clear Float-Glass Units MG-#1: Class 1 (clear) annealed glass.
Thickness: 6.0 mm.
Coated Clear Float-Glass Units MG-1: Class 1 (clear) annealed glass.
Available Products:
PPG Industries; Starphire.
Thickness: 6.0 mm.
Visible Light Transmittance: 91 percent minimum.
Winter Nighttime U-Factor: 1.09 maximum.

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Summer Daytime U-Factor: 1.00 maximum.
Solar Heat Gain Coefficient: 0.9 maximum.
Outdoor Visible Reflectance: 8 percent maximum.

11-38.2(8) LAMINATED-GLASS UNITS

Laminated-Glass Units LG-#1:
Basis-of-Design Product: Pilkington Optilam or a comparable product by one of the following:
PPG Industries.
Oldcastle Glass.
Viracon
Kind LA, consisting of two lites of annealed float glass.
Outer Lite: Class 1 (clear) float glass.
Thickness: 3.0 mm.
Plastic Interlayer:
Thickness: 0.030 inch.
Interlayer Color: Clear.
Inner Lite: Class 1 (clear) float glass.
Thickness: 3.0 mm.
Laminated-Glass Units LG-#2:
Basis-of-Design Product: Pilkington Optilam or a comparable product by one of the following:
PPG Industries.
Oldcastle Glass.
Viracon
Kind LA, consisting of two lites of annealed float glass.
Outer Lite: Class 1 Coated Spandrel Float Glass : Coated spandrel float glass comprised of 1/4 inch outer lite with Ceramic frit coating to simulate sandblast finish on number 2 surface, Kind FT (fully tempered). The basis of design product for the lite with the ceramic frit coating is Viracon V1086 (simulated acid-etch).
Thickness: 3.0 mm.
Plastic Interlayer:
Thickness: 0.030 inch.
Interlayer Color: Clear.
Inner Lite: Class 1 (clear) float glass.
Thickness: 3.0 mm.

11-38.2(9) INSULATING-GLASS UNITS

Passive Solar Low-E Insulating-Glass Units IG-#1:
Basis-of-Design Product: PPG Industries, Sungate 500 (3)
Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
Interspace Content: Air.
Outdoor Lite: Class 1 (clear) float glass.
Laminated (LG-#1).
Indoor Lite: Class 1 (clear) float glass.
Annealed.
Low-E Coating or Film: Pyrolytic on third surface.
Visible Light Transmittance: 74 percent minimum.
Winter Nighttime U-Factor: 0.35 maximum.

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Summer Daytime U-Factor: 0.38 maximum.
Solar Heat Gain Coefficient: 0.60 maximum.
Outdoor Visible Reflectance: 16 percent maximum.
Passive Solar Low-E Insulating-Glass Units IG-#2:
Basis-of-Design Product: PPG Industries, Sungate 500 (3)
Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
Interspace Content: Air.
Outdoor Lite: Class 1 Coated Spandrel Float Glass.
Laminated (LG-#2).
Indoor Lite: Class 1 (clear) float glass.
Annealed.
Low-E Coating or Film: Pyrolytic on third surface.
Visible Light Transmittance: 75 percent minimum.
Winter Nighttime U-Factor: 1.02 maximum.
Summer Daytime U-Factor: 0.93 maximum.
Solar Heat Gain Coefficient: 0.74 maximum.
Outdoor Visible Reflectance: 10 percent maximum.

11-38.3 EXECUTION

11-38.3(1) EXAMINATION

Examine framing glazing, with Installer present, for compliance with the following:
Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
Presence and functioning of weep system.
Minimum required face or edge clearances.
Effective sealing between joints of glass-framing members.
Proceed with installation only after unsatisfactory conditions have been corrected.

11-38.3(2) PREPARATION

Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

11-38.3(3) GLAZING, GENERAL

Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

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Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width.
With glazing tape, use thickness slightly less than final compressed thickness of tape.
Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

11-38.3(4) GASKET GLAZING (DRY)

Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
Install gaskets so they protrude past face of glazing stops.

11-38.3(5) CLEANING AND PROTECTION

Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

NOT FOR CONSTRUCTION

11-40 GYPSUM BOARD ASSEMBLIES

11-40.1 GENERAL

11-40.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-40.1(2) SUMMARY

This Section includes the following:
Interior gypsum wallboard.
Non-load-bearing steel framing.
Related Sections include the following:
Section 11-21 "Building Insulation" for insulation installed in gypsum board assemblies.

11-40.1(3) DEFINITIONS

Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

11-40.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of product indicated.
Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

11-40.1(5) DELIVERY, STORAGE, AND HANDLING

Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

11-40.1(6) PROJECT CONDITIONS

Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

11-40.2 PRODUCTS

11-40.2(1) MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Steel Framing and Furring:
Dietrich Industries, Inc.
National Gypsum Company.
Scafco Corporation.

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Unimast, Inc.
Gypsum Board and Related Products:
American Gypsum Co.
G-P Gypsum Corp.
National Gypsum Company.
United States Gypsum Co.

11-40.2(2) STEEL PARTITION AND SOFFIT FRAMING

Components, General: As follows:
Comply with ASTM C 754 for conditions indicated.
Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with manufacturer's standard corrosion-resistant zinc coating.
Steel Studs and Runners: ASTM C 645.
Minimum Base Metal Thickness: 0.027 inch.
Depth: As indicated.
Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- deep flanges.
Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum 1/2-inch-wide flange.
Depth: 1-1/2 inches.
Clip Angle: 1-1/2 by 1-1/2 inch, 0.068-inch- thick, galvanized steel.
Cold-Rolled Furring Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch-wide flange.
Depth: 1-1/2".
Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch.
Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.
Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

11-40.2(3) INTERIOR GYPSUM WALLBOARD

Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
Gypsum Wallboard: ASTM C 36.
Type X:
Thickness: 5/8 inch.
Long Edges: Tapered.
Location: Vertical surfaces, unless otherwise indicated.
Sag-Resistant Gypsum Wallboard: ASTM C 36, manufactured to have more sag resistance than regular-type gypsum board.
Thickness: 1/2 inch.
Long Edges: Tapered.
Location: Ceiling surfaces.

11-40.2(4) WATER-RESISTANT PANELS

Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M.

NOT FOR CONSTRUCTION

Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, "Dens-Shield Tile Backer" manufactured by G-P Gypsum Corp.

11-40.2(5) EXTERIOR GYPSUM SHEATHING

Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
Gypsum Wall Sheathing:
5/8 inch “USG” Fiberock® Brand Sheathing.
Nominal Size: Standard width and length to suit conditions of construction.
Composition: Gypsum sheathing board core in conformance with referenced ASTM C79, C1177, and C1278 with glass mats both sides and along edges.
Flame spread 5, smoke developed 0 per reference ASTM E84.

11-40.2(6) TRIM ACCESSORIES

Interior Trim: ASTM C 1047.
Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
Shapes:
Cornerbead: Use at outside corners.

11-40.2(7) JOINT TREATMENT MATERIALS

General: Comply with ASTM C 475.
Joint Tape:
Interior Gypsum Wallboard: Paper.
Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
Use setting-type compound for installing paper-faced metal trim accessories.
Fill Coat: For second coat, use setting-type, sandable topping compound.
Finish Coat: For third coat, use drying-type, all-purpose compound.
Joint Compound for Water-Resistant Panels:
Glass-Mat, Water-Resistant Backing Panel: As recommended by manufacturer.

11-40.2(8) AUXILIARY MATERIALS

General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
Isolation Strip at Exterior Walls:
Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

NOT FOR CONSTRUCTION

Thermal Insulation: As specified in Section 11-21 "Building Insulation."
Vapor Retarder: Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
Reinforced-Polyethylene Vapor Retarders:
Raven Industries, Inc.; DURA-SKRI
Reef Industries, Inc.; Griffolyn T-65.

11-40.3 EXECUTION

11-40.3(1) EXAMINATION

Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

11-40.3(2) INSTALLING STEEL FRAMING, GENERAL

Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."
Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
Use deep-leg deflection track where indicated.

11-40.3(3) INSTALLING STEEL PARTITION AND SOFFIT FRAMING

Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
Where studs are installed directly against exterior walls, install asphalt-felt or foam-gasket isolation strip between studs and wall.
Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
Install steel studs and furring at the following spacings:
Single-Layer Construction: 16 inches o.c., unless otherwise indicated.
Multilayer Construction: 16 inches o.c., unless otherwise indicated.
Cementitious Backer Units: 16 inches o.c., unless otherwise indicated.
Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.
Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

NOT FOR CONSTRUCTION

Install two studs at each jamb, unless otherwise indicated.
Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

11-40.3(4) APPLYING AND FINISHING PANELS, GENERAL

Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
Attach gypsum panels to framing provided at openings and cutouts.
Form control and expansion joints with space between edges of adjoining gypsum panels.
Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
Fit gypsum panels around ducts, pipes, and conduits.
Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
Space screws a maximum of 12 inches o.c. for vertical applications.

11-40.3(5) PANEL APPLICATION METHODS

Single-Layer Application:
On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
Stagger abutting end joints not less than one framing member in alternate courses of board.
At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
Multilayer Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.
Glass-Mat, Water-Resistant Backing Panel:
These panels are applied to metal stud wall framing for the application of thin brick veneer. Comply with manufacturer's written installation instructions and install at exterior wall areas where indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.

NOT FOR CONSTRUCTION

Gypsum Wall Sheathing:
These panels are applied to metal stud soffit and wall framing for the application of composite metal panels. Comply with manufacturer's written installation instructions and install at exterior soffit and wall areas where indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.

11-40.3(6) INSTALLING TRIM ACCESSORIES

General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

11-40.3(7) FINISHING GYPSUM BOARD ASSEMBLIES

General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
Prefill open joints and damaged surface areas.
Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

NOT FOR CONSTRUCTION

11-41 ACOUSTICAL PANEL CEILINGS

11-41.1 GENERAL

11-41.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-41.1(2) SUMMARY

This Section includes acoustical panels and exposed suspension systems for ceilings.

11-41.1(3) DEFINITIONS

AC: Articulation Class.
CAC: Ceiling Attenuation Class.
LR: Light Reflectance coefficient.
NRC: Noise Reduction Coefficient.

11-41.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of product indicated.
Coordinate Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
Ceiling suspension members.
Method of attaching hangers to building structure.
Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
Minimum Drawing Scale: 1/4 inch = 1 foot.
Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.
Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
Research/Evaluation Reports: For each acoustical panel ceiling and components.
Maintenance Data: For finishes to include in maintenance manuals.

11-41.1(5) QUALITY ASSURANCE

Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:

NOT FOR CONSTRUCTION

Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."
CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 & 4."
UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."

11-41.1(6) DELIVERY, STORAGE, AND HANDLING

Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

11-41.1(7) PROJECT CONDITIONS

Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

11-41.1(8) COORDINATION

Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

11-41.1(9) EXTRA MATERIALS

Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed, minimum 1 carton.
Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
Hold-Down Clips: Equal to 2.0 percent of amount installed.

11-41.2 PRODUCTS

11-41.2(1) MANUFACTURERS

Armstrong World Industries was used as the basis of design. Products by other manufacturers complying with requirements below may be incorporated into the Work upon approval by the Engineer.

11-41.2(2) ACOUSTICAL PANELS, GENERAL

NOT FOR CONSTRUCTION

Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Engineer from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

11-41.2(3) MINERAL-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

Product:
Armstrong, Ultima RH90
Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
Type and Form: Type IV, Form 2
Pattern: E (lightly textured)
Color: White.
LR: Not less than 0.80.
NRC: Not less than 0.70
CAC: Not less than 35.
Edge Detail: Beveled tegular.
Thickness: ¾ inch.
Size: 24 by 24 inches.

11-41.2(4) METAL SUSPENSION SYSTEMS, GENERAL

Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

11-41.2(5) METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

NOT FOR CONSTRUCTION

Products:
Armstrong World Industries, Prelude.
Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, G60 coating designation, with prefinished, cold-rolled, 15/16-inch-wide, aluminum caps on flanges.
Structural Classification: Intermediate-duty system.
Face Design: Flat, flush.
Face Finish: Painted to match color of acoustical unit

11-41.2(6) METAL EDGE MOLDINGS AND TRIM

Manufacturers:
Armstrong World Industries, Inc.
Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

11-41.3 EXECUTION

11-41.3(1) EXAMINATION

Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
Proceed with installation only after unsatisfactory conditions have been corrected.

11-41.3(2) PREPARATION

Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

11-41.3(3) INSTALLATION, GENERAL

General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
Suspend ceiling hangers from building's structural members and as follows:
Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

NOT FOR CONSTRUCTION

Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

Do not attach hangers to steel roof deck. Attach hangers to structural members.

Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

Do not use exposed fasteners, including pop rivets, on moldings and trim.

Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

11-41.3(4) CLEANING

Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

NOT FOR CONSTRUCTION

11-42 RESILIENT FLOOR TILE

11-42.1 GENERAL

11-42.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-42.1(2) SUMMARY

This Section includes the following:
Solid vinyl floor tile.
Resilient wall base and accessories.
Stair tread.

11-42.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of product indicated.
Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.
Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.
Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.
Stair Tread: Full-size units of each color and pattern of stair tread required.
Maintenance Data: For resilient products to include in maintenance manuals.

11-42.1(4) QUALITY ASSURANCE

Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

11-42.1(5) DELIVERY, STORAGE, AND HANDLING

Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

11-42.1(6) PROJECT CONDITIONS

Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
48 hours before installation.
During installation.
48 hours after installation.
After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
Close spaces to traffic during floor covering installation.
Close spaces to traffic for 48 hours after floor covering installation.

NOT FOR CONSTRUCTION

Install resilient products after other finishing operations, including painting, have been completed.

11-42.1(7) EXTRA MATERIALS

Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
Floor Tile: Furnish 1 box of each type, color, and pattern of floor tile installed.
Resilient Wall Base and Accessories: Furnish not less than 20 linear feet, of each type, color, pattern, and size of resilient product installed.
Stair Tread: Furnish 5% of total installed but not less than two full-size units.

11-42.2 PRODUCTS

11-42.2(1) MANUFACTURERS

Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products listed in other Part 2 articles.

11-42.2(2) COLORS AND PATTERNS

Colors and Patterns: As indicated by manufacturer's designations.

11-42.2(3) SOLID VINYL FLOOR TILE – FL1.

Solid Vinyl Floor Tile: ASTM F 1700.
Armstrong World Industries, Inc.;Perspectives; 34300-Antiqued Metal.
Lonseal; Lonfloor Galvanized; No. 246-Gold.
Parterre; Vinyl Stone Tile; Tuscany; 22129-Chianti.

11-42.2(4) RESILIENT WALL BASE - WB-1.

Wall Base: ASTM F 1861.
Johnsonite; 63-Burnt Umber; or approved equal.
Style: Cove (with top-set toe).
Minimum Thickness: 0.125 inch.
Height: 4 inches.
Lengths: Coils in manufacturer's standard length.
Outside Corners: Premolded.
Inside Corners: Premolded.
Surface: Smooth.

11-42.2(5) RESILIENT STAIR ACCESSORIES

Treads: FS RR-T-650.
Johnsonite; 2” hinged nosing; service weight (ST-Sq.); 63-Burnt Umber; or approved equal.

11-42.2(6) RESILIENT MOLDING ACCESSORY -RM-1.

Description: Reducer strip for resilient floor covering.
Johnsonite; 63-Burnt Umber; or approved equal.
Material: Vinyl.

11-42.2(7) INSTALLATION MATERIALS

NOT FOR CONSTRUCTION

Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

11-42.3 EXECUTION

11-42.3(1) EXAMINATION

Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
Proceed with installation only after unsatisfactory conditions have been corrected.

11-42.3(2) PREPARATION

Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
Concrete Substrates: Prepare according to ASTM F 710.
Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
Moisture Testing:
Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
Do not install resilient products until they are same temperature as space where they are to be installed.
Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

11-42.3(3) TILE INSTALLATION

Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
Lay tiles square with room axis.

NOT FOR CONSTRUCTION

Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
Lay tiles with grain running in one direction.
Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
Extend tiles into toe spaces, door reveals, closets, and similar openings.
Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

11-42.3(4) RESILIENT WALL BASE INSTALLATION

Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
Do not stretch wall base during installation.
Premolded Corners: Install premolded corners before installing straight pieces.

11-42.3(5) RESILIENT ACCESSORY INSTALLATION

Resilient Stair Accessories:
Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
Tightly adhere to substrates throughout length of each piece.
Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

11-42.3(6) CLEANING AND PROTECTION

Perform the following operations immediately after completing resilient product installation:
Remove adhesive and other blemishes from exposed surfaces.
Sweep and vacuum surfaces thoroughly.
Damp-mop surfaces to remove marks and soil.
Do not wash surfaces until after time period recommended by manufacturer.
Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

NOT FOR CONSTRUCTION

11-45 PAINTING

11-45.1 GENERAL

11-45.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

11-45.1(2) SUMMARY

This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color or finish is not indicated, Engineer will select from standard colors and finishes available.

Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

Painting includes field painting of exposed structural steel including pan stair systems.

Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

Prefinished items include the following factory-finished components:

Insulated aluminum panels

Finished mechanical and electrical equipment.

Light fixtures.

Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

Furred areas.

Ceiling plenums.

Utility tunnels.

Pipe spaces.

Duct shafts.

Finished metal surfaces include the following:

Anodized aluminum.

Stainless steel.

Copper.

Operating parts include moving parts of operating equipment and the following:

Valve and damper operators.

Linkages.

Sensing devices.

Motor and fan shafts.

Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

Related Sections include the following:

Section 11-09 "Structural Steel" for shop priming structural steel.

Section 11-11 "Metal Fabrications" for shop priming ferrous metal.

NOT FOR CONSTRUCTION

Section 11-32 "Steel Doors and Frames" for factory priming steel doors and frames.
Section 11-40 "Gypsum Board Assemblies" for surface preparation of gypsum board.

11-45.1(3) DEFINITIONS

General: Standard coating terms defined in ASTM D 16 apply to this Section.
Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

11-45.1(4) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each paint system indicated. Include block fillers and primers.
Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
After color selection, Engineer will furnish color chips for surfaces to be coated.
Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
Submit Five (5) Samples on the following substrates for Engineer's review of color and texture only:
Concrete: 4-by-8-inch Samples for each color and finish.
Painted Wood: 4-by-8-inch Samples for each color and material on hardboard.
Ferrous Metal: 4-by-8-inch Samples of flat metal and 8-inch long Samples of solid metal for each color and finish.
Qualification Data: For Applicator.

11-45.1(5) QUALITY ASSURANCE

Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

NOT FOR CONSTRUCTION

Engineer will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
Wall Surfaces: Provide samples on at least 100 sq. ft.
Small Areas and Items: Engineer will designate items or areas required.
Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
After finishes are accepted, Engineer will use the room or surface to evaluate coating systems of a similar nature.
Final approval of colors will be from benchmark samples.

11-45.1(6) DELIVERY, STORAGE, AND HANDLING

Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
Product name or title of material.
Product description (generic classification or binder type).
Manufacturer's stock number and date of manufacture.
Contents by volume, for pigment and vehicle constituents.
Thinning instructions.
Application instructions.
Color name and number.
VOC content.
Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

11-45.1(7) PROJECT CONDITIONS

Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

11-45.1(8) EXTRA MATERIALS

Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
Quantity: Furnish Owner with an additional 5 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

11-45.2 PRODUCTS

11-45.2(1) MANUFACTURERS

NOT FOR CONSTRUCTION

Products: Subject to compliance with requirements, provide one of the products listed in the Part 3 section Interior Finish Schedule.
Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in the Part 3 section Interior Finish Schedule:
Benjamin Moore & Co. (Benjamin Moore).
Tnemec Company Inc. (Tnemec)
Pratt & Lambert (P&L)
Sherwin Williams Co (SW)

11-45.2(2) PAINT MATERIALS, GENERAL

Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
Colors: Match Project Engineer's samples.

11-45.3 EXECUTION

11-45.3(1) EXAMINATION

Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
Notify Engineer about anticipated problems when using the materials specified over substrates primed by others.

11-45.3(2) PREPARATION

General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

NOT FOR CONSTRUCTION

Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

Provide barrier coats over incompatible primers or remove and reprime.

Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.

Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.

Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.

Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

Use only thinners approved by paint manufacturer and only within recommended limits.

Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat

11-45.3(3) APPLICATION

General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

Paint colors, surface treatments, and finishes are indicated in the paint schedules.

Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

Provide finish coats that are compatible with primers used.

The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.

NOT FOR CONSTRUCTION

Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

Sand lightly between each succeeding enamel or varnish coat.

Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

Omit primer over metal surfaces that have been shop primed and touchup painted.

If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.

Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.

Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in occupied spaces.

Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

11-45.3(4) CLEANING

Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

NOT FOR CONSTRUCTION

After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

11-45.3(5) PROTECTION

Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Engineer.

Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

11-45.3(6) EXTERIOR PAINT SCHEDULE

Substrate	1st Coat	2nd Coat	3rd Coat	Notes
Ferrous Metal	Tnemec Series 88 HS Azeron H.S. Primer	Tnemec Series 23 Enduratone	Tnemec Series 23 Enduratone	
Carbon Steel framing and all other structural steel members exposed to view.	Tnemec Series 90-97 at 2.0-3.0 mils	Tnemec Series 1075 Endura-Shield II at 3.0-5.0 mils		Mil thickness are dry film for all Tnemec systems
Zinc-Coated (Galvanized) Steel (except railing not indicated to receive paint finish)	Galvanized Iron, Primer, Tnemec Series 27 F.C. Typoxy	Tnemec Series 1075 Endura-Shield II		

11-45.3(7) INTERIOR PAINT SCHEDULE

Substrate	1st Coat	2nd Coat	3rd Coat	Notes
Concrete		Tnemec Series 84 Ceramlon ENV	Tnemec Series 84 Ceramlon ENV	Use for exposed concrete walls at machine room and pit levels for Pier 3 Forward Right and Pier 4 Rear Left
Galvanized Deck	Tnemec Series 115 Tneme-Deck			Use for exposed deck at ceilings.
Gypsum Drywall System	SW Pro-Mar 400 Latex Wall	SW Pro-Mar 400 Latex Flat	SW Pro-Mar 400 Latex Flat	Use for drywall soffit

NOT FOR CONSTRUCTION

	Primer, B28	Wall Primer, B30	Wall Primer, B30	
Gypsum Drywall System	SW Pro-Mar 400 Latex Wall Primer, B28	SW Pro-Mar 200 Interior Alkyd Egg-Shell Enamel, B33	SW Pro-Mar 200 Interior Alkyd Egg-Shell	Use for vertical wall/partition surfaces except at wet areas.
Gypsum Drywall System	SW Pro-Mar 400 Latex Wall Primer, B28	SW Tile-Clad High Solids Epoxy B62	SW Tile-Clad High Solids Epoxy B62	Use for vertical wall surfaces in wet areas.
Ferrous Metal	SW Kem-Kromik Universal Metal Primer, B50NZ6/B50WZI	SW Pro-Mar 200 Alkyd Semi-Gloss B34	SW Pro-Mar 200 Alkyd Semi-Gloss B34	Use for metal fabrications, structural steel, sheet metal, hollow metal frames and doors, and other ferrous metal items. 1st coat may be omitted if item has properly applied factory prime coat.

NOT FOR CONSTRUCTION

11-50 IDENTIFYING DEVICES

11-50.1 GENERAL

11-50.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-50.1(2) SUMMARY

This Section includes the following:
Standard Interior Modular Sign System.

11-50.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.
Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include; elevations, and large scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
Provide message list for each sign required, including large scale details of wording and layout of lettering. Include full size details of special graphics.
Samples: Provide samples of each sign component for initial selection of color, pattern, and surface texture, and for verification of compliance with requirements indicated.
Submit samples for initial selection of color, pattern, and texture, as follows:
Cast Acrylic Sheet: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.
Submit samples for verification of color, pattern, and texture selected, and compliance with requirements indicated, as follows:
Cast Acrylic Sheet: Provide a sample panel not less than 8-1/2”x 11” for each material indicated. Include a panel for each color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

11-50.1(4) QUALITY ASSURANCE

Installer's Qualifications: Engage an experienced Installer who is an authorized representative of the sign manufacturer and has completed installation of signs similar in material, design, and extent to those indicated for this Project and that has resulted in construction with a record of successful in-service performance.
Single Source Responsibility: For each separate type of sign required, obtain signs from a single source from a single manufacturer.

11-50.1(5) DELIVERY, STORAGE, AND HANDLING

Proved protective covering or crating as recommended by the manufacturer to protect sign components and surfaces against damage during transportation and delivery.
Handle signs carefully to prevent breakage, surface abrasion, denting, soiling, and other defects. Comply with the manufacturer's handling instructions for unloadincomponents subject to damage.

NOT FOR CONSTRUCTION

Inspect sign components for damage upon delivery. Do not install damaged sign components. Repair minor damage to signs, provided the finished repair is equal in all respects to the original work and is acceptable to the eNGINEER, otherwise remove and replace damaged sign components.

11-50.1(6) MAINTENANCE

Maintenance Instructions: Furnish maintenance manual to instruct the Owner's personnel in procedures to be followed in operating, cleaning, and maintaining the work. Provide manufacturer's brochures describing the actual materials used in the work, including, but not limited to, metal alloys, finishes, and other major components.

11-50.2 PRODUCTS

11-50.2(1) MATERIALS

Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, a minimum allowable continuous service temperature of 176 °F and of the following general types:
Opaque Sheet: Where sheet material is indicated as opaque, provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.
Vinyl Film: Provide opaque nonreflective vinyl film, 0.0035 inch minimum thickness, with pressure sensitive adhesive backing, suitable for exterior as well as interior applications.
Sealants and Joint Fillers: Refer to Section 11-31 Joint Sealants.

11-50.2(2) STANDARD INTERIOR WALL PLAQUE:

All plaques to be fabricated in accordance with Fed Spec. P 387, Type NDP 1/8 inch thick.
Size: Signage used primarily for room identification and information, and standardized at 4 3/8” x 7 3/4” or as indicated on the drawings, each with a 1/2 inch border.
Graphics: Typically, character shall be 5/8 inch tall letter forms unless indicated otherwise on the drawings. Type to be Transbold. Characters shall be raised 1/32 inch minimum, upper and lower case.
Character Proportion: Letters and numbers on signs shall have a width-to-height ratio between 3:5 and 1:1 and a stroke width-to-height ratio between 1:5 and 1:10.
Construction: Signs to be constructed of 1/8 inch plastic with raised characters and symbols. The character and background of signs shall be eggshell, matte, or other non-glare finish. All signs shall have white letters. Colors of signs indicated by reference to manufacturer's name and designations are for color identification only, and are not intended to limit selection of other manufactuer's products with similar colors.
Mounting: Signs should be positioned eye level, 60 inches from floor to the centerline of the sign, on the latch side of the door or at Owner's direction. Double faced foam tape adhered to the back of the sign shall be the mounting method for interior signs.
Message: applicable signs are all room identifications and informational sign, as noted or shown in the Room Finish Schedules in the Tower.
Message: applicable signs are all room identifications and informational sign, as noted or shown in the Room Finish Schedules in the Tower.

11-50.2(3) FINISHES

NOT FOR CONSTRUCTION

Colors and Surface Textures: For exposed sign material that require selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated on Color and Material Schedule.

11-50.3 EXECUTION

11-50.3(1) EXAMINATION

Examine areas and conditions under which the work is to be installed, and notify the Owner in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

11-50.3(2) INSTALLATION

Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
Vinyl Tape Mounting: Use double-sided foam tape, of thickness indicated, to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
Silicone Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cure

11-50.3(3) CLEANING

At completion of the installation, clean soiled surfaces of sign units in accordance with the manufacturer's instructions.

11-50.3(4) PROTECTION

Protect installed sign units from damage until acceptance by the Owner.

11-50.3(5) SIGN SCHEDULE

Graphic	Location	
	Floor	Detailed Location
Control Room	Ground Floor	Wall Adjacent to Door DS3
Equipment Room	Ground Floor	Wall Adjacent to Door DS5
Toilet	Ground Floor	Wall Adjacent to Door DS4

NOT FOR CONSTRUCTION

11-51 FIRE EXTINGUISHER CABINETS AND ACCESSORIES

11-51.1 GENERAL

11-51.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
Related Sections: The following sections contain requirements that relate to this section:
Section 11-40 "Gypsum Board Assemblies."

11-51.1(2) SUMMARY

This Section includes the following:
Fire extinguisher cabinets.
Fire Extinguishers.
Fire extinguisher mounting brackets.

11-51.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: Submit product data for fire extinguisher cabinets including, but not limited to, rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
Samples: Submit samples of manufacturer's standard colors and texture for selection by the Engineer.

11-51.1(4) QUALITY ASSURANCE

Coordination: Verify that extinguisher cabinets are sized to accommodate type and capacity of extinguishers indicated.
Single Source Responsibility: Obtain products in this section from one manufacturer.
Provide new portable fire extinguishers which are UL listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.
Provide new portable fire extinguishers which are approved by Factory Mutual Research Corp. for type, rating, and classification of extinguisher indicated and carry appropriate FM marking.

11-51.2 PRODUCTS

11-51.2(1) MOUNTING BRACKETS

Brackets: Provide brackets designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.
Provide brackets for extinguishers not located in cabinets and for those located in cabinets.

11-51.2(2) FIRE EXTINGUISHERS

Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes which comply with requirements of governing authorities.

NOT FOR CONSTRUCTION

Abbreviations indicated below to identify extinguisher types related to UL classification and ratings system and not necessarily to type and amount of extinguishing material contained in extinguisher.
Multi-purpose Dry Chemical Type: UL rated 4A:60B:C, 10 lbs. nominal capacity, in enameled steel container, for Class A, Class B, and Class C.
Carbon Dioxide Type: UL rated 10B:C, 15 lbs. capacity, in enameled steel container, for Class B and Class C. Provide wall brackets for mounting extinguishers.

11-51.2(3) FIRE EXTINGUISHER CABINETS

General: Provide fire extinguisher cabinets of suitable size for housing multipurpose dry-chemical type fire extinguishers of capacities indicated above.
Construction: Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
Fire-Rated Cabinets: Listed and labeled to meet requirements of ASTM E 814 for fire-resistance rating of wall where it is installed.
Construct fire-rated cabinets with double walls fabricated from 0.0478-inch thick, cold-rolled steel sheet lined with minimum 5/8-inch thick, fire-barrier material.
Provide factory-drilled mounting holes.
Cabinet Type: Cabinet box (tub) semi recessed or surface mounted on walls of sufficient depth to suit style of trim indicated.
Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.
Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
Trim: Square-edge trim with 1/4 inch to 5/16 inch backbend depth.
Trim Metal: Of same metal and finish as door.
Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
Material: Manufacturer's standard flush, hollow aluminum door construction.
Door Glazing: Clear float glass, 1/8 inch thick, complying with ASTM C1036, Type I, Class 1, Quality q3.
Identification:
Identify bracket-mounted extinguishers with "FIRE EXTINGUISHER" in red letter decals applied to wall surface. Use letter size, style, and location as selected by the Engineer.
Door Style: Provide manufacturer's standard “Vertical Duo-Panel” design.
Door Hardware: Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam action latch, or door pull, exposed or concealed, and friction latch. Provide concealed or continuous type hinge permitting door to open 180 degrees.

11-51.2(4) FINISHES

General: Comply with NAAMM MFM for recommendations relative to applying and designating finishes. Protect finishes on exposed surfaces from damage by applying strippable, temporary protective covering prior to shipping, in accordance with manufacturer's recommendations.
Aluminum Finishes:
Finish Designation: Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

NOT FOR CONSTRUCTION

Class I Clear Anodized Finish: AA-M12C22A41 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class I Architectural, clear film thicker than 0.7 mil complying with AAMA 607.1.

Steel Finishes:

Surface Preparation: Solvent clean surfaces complying with SSPC SP-1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel complying with SSPC SP-5 or SSPC SP-8.

Baked Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard two-coat baked enamel finish consisting of prime coat and thermosetting topcoat, a minimum dry film thickness of 2.0 mils.

Color and Gloss: Manufacturer's standard color and gloss designations. Paint the interior of cabinet.

11-51.3 EXECUTION

11-51.3(1) EXAMINATION

Examine areas and conditions under which the work is to be installed, and notify the Owner in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

11-51.3(2) INSTALLATION

Follow manufacturer's printed instructions for installation.

Follow manufacturer's printed instructions for installation.

Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and wall type to comply with manufacturer's instructions.

Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and wall type to comply with manufacturer's instructions.

11-51.3(3) ADJUSTING AND CLEANING

Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

Remove temporary labels and protective coatings.

Clean and polish exposed surfaces according to manufacturer's written recommendations.

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11-55 METAL LOCKERS

11-55.1 GENERAL

11-55.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-55.1(2) SUMMARY

This Section includes standard metal lockers.
Related Sections include the following:
Section 11-15 "Miscellaneous Carpentry" for wood blocking and grounds for mounting lockers and accessories.

11-55.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: Product data and installation instructions for metal locker units.
Three color samples on squares of same metal to be used for fabrication of lockers.
Shop drawings that show metal lockers in dimensioned relation to adjacent surfaces. Show lockers in detail, method of installation, fillers, trim, base, and accessories. Include locker numbering sequence information.
Manufacturers Certificates of Conformance: Attesting that materials meet the requirements specified herein.

11-55.1(4) DELIVERY, STORAGE, AND HANDLING

Deliver shades in factory packages, marked with manufacturer and product name, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

11-55.1(5) PROJECT CONDITIONS

Do not deliver metal lockers until building is enclosed and ready for locker installation. Protect from damage during delivery, handling, storage, and installation.
Field Measurements: Where metal lockersare indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings.

11-55.2 PRODUCTS

11-55.2(1) MATERIALS:

Sheet Steel: Mild cold-rolled and leveled furniture steel, free from buckle, scale, and surface imperfections.
Fasteners: Cadmium, zinc, or nickel-plated steel; exposed bolt heads, slotless type; self-locking nuts or lock washers for nuts on moving parts.
Equipment: Hooks and hang rods of cadmium-plated or zinc-plated steel.
Body: Fabricate back and sides of minimum 24-gage steel, with double-flanged connections extending full height. Form top and bottom of not less than 24-gage steel, with flanged

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edges. Provide 24-gage steel sheet hat shelf. Form exposed ends of non-recessed lockers of minimum 16-gage steel.
Door: One-piece, minimum 18-gage sheet steel, flanged at all edges, constructed to prevent springing when opening or closing. Fabricate to swing 180 degrees. Provide not fewer than 6 stamped, louvered vent openings in full-height locker face top and bottom.
Hinges: Steel, full-loop, 5-knuckle, tight pin. Weld to inside of frame and secure to door with not less than 2 factory-installed fasteners that are completely concealed and tamperproof when door is closed. Provide at least 3 hinges for each door.
Projecting Handle and Latch: Positive automatic, prelocking, pry-resistant latch and pull with rubber silencers; chromium-plated, heavy-duty, vandal-proof lift-up handle, containing strike and eye for padlock. (Padlock N.I.C.)

11-55.2(2) FABRICATION:

Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch. Weld frame members together to form rigid, one-piece structure. Weld, bolt, or rivet other joints and connections. Grind exposed welds flush. Do not expose bolts or rivet heads on fronts of locker doors or frames. Locker configuration and dimensions to be as shown on the Drawings.
Locker style to be single tier 12 inch wide x 15 inch deep x 72 inch high. Provide one shelf, hanging coat storage rod and 3 single prong hooks. The door pull shall serve as padlock hasps (padlocks not included). Each compartment will have space for a number place above the louver openings.
Frames: Fabricate of 16-gage channels or 12-gage angles, minimum, with continuous stop/strike formed on vertical members.
Finishing: Chemically pre-treat metal with degreasing and phosphatizing process. Apply baked-on enamel finish to all surfaces, exposed and concealed, except plates and nonferrous metal.
Color: Concealed parts may be manufacturer's standard color. Visible color shall be as scheduleded on the Drawings.
Uniformity: Provide metal lockers that are standard products of single manufacturer, with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.
ACCESSORIES: Furnish each locker with the following items:
One shelf 9 inches from the top.
Coat rod.
Not less than 3 single-prong hooks.
Number Plates: Manufacturer's standard etched, embossed, or stamped, nonferrous metal number plates with numerals not less than 3/8 inch high. Number lockers in sequence as directed by Owner. Attach plates to each locker door, near top, centered, with at least 2 fasteners of same finish as number plate.
Continuous Metal Base: Minimum 12-gage cold-rolled steel, fabricated in lengths as long as practicable to enclose base of lockers without additional fastening devices. Base to be 4" high recessed "Z" style base. Factory-finish metal base to match lockers.
Continuous Sloping Tops: Not less than 20-gage sheet steel, approximately 25 degrees pitch, in lengths as long as practicable but not less than 4 lockers. Provide closures at ends. Finish to match lockers. Locate as indicated on the Drawings.
Filler and End Panels: Provide filler panels where indicated, and end panels at end locations, of not less than 18-gage steel sheet, factory fabricated and finished to match locker units.

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11-55.3 EXECUTION

11-55.3(1) INSTALLATION:

Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid, and flush installation.

Space fastenings about 48 inches o.c., unless otherwise recommended by manufacturer, and apply through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners. Any attachment to acoustically treated partitions to have resilient grommet.

Install trim, metal base, sloping top units, and metal filler panels and end panels, using concealed fasteners. Provide flush, hairline joints against adjacent surfaces.

11-55.3(2) ADJUST AND CLEAN:

Adjust doors and latches to operate easily without binding.

Touch up marred finishes, but replace units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

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11-60 TOILET AND BATH ACCESSORIES

11-60.1 GENERAL

11-60.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-60.1(2) SUMMARY

This Section includes the following:
Toilet accessories.
Underlavatory guards.

11-60.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

11-60.1(4) QUALITY ASSURANCE

Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Engineer, may be provided.
Do not modify aesthetic effects, as judged solely by Engineer, except with Engineer's approval. Where modifications are proposed, submit comprehensive explanatory data to Engineer for review.

11-60.1(5) COORDINATION

Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

11-60.2 PRODUCTS

11-60.2(1) MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:
Toilet Accessories:

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A & J Washroom Accessories, Inc.
American Specialties, Inc.
Bobrick Washroom Equipment, Inc.
Bradley Corporation.
General Accessory Manufacturing Co. (GAMCO).
McKinney/Parker Washroom Accessories Corp.
Underlavatory Guards:
Brocar Products, Inc.
Truebro, Inc.
Approved equal.

11-60.2(2) MATERIALS

Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.

Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

11-60.2(3) FABRICATION

General: One, maximum 1-1/2-inch- diameter, unobtrusive stamped manufacturer logo, as approved by Engineer, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

11-60.3 EXECUTION

11-60.3(1) INSTALLATION

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Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

11-60.3(2) ADJUSTING AND CLEANING

Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
Remove temporary labels and protective coatings.
Clean and polish exposed surfaces according to manufacturer's written recommendations.

11-60.3(3) TOILET AND BATH ACCESSORY SCHEDULE

Toilet Tissue Dispenser TBA-1: Where this designation is indicated, provide toilet tissue dispenser complying with the following:
Products: Available products include the following:
ASI Model No. 7305-S.
Bobrick No. B-7685.
Type: Single-roll dispenser.
Mounting: Surface mounted with concealed anchorage.
Material: Stainless steel.
Operation: Noncontrol delivery with mfr's standard spindle.
Capacity: Designed for 4-1/2- or 5-inch- diameter-core tissue rolls.
Waste Receptacle TBA-2: Where this designation is indicated, provide stainless-steel waste receptacle complying with the following:
Products: Available products include the following:
ASI No. 0810.
Freestanding Type: With swing top and minimum 13-gal. capacity, reusable, vinyl liner.
Multipurpose Unit TBA-3: Where this designation is indicated, provide stainless-steel combination unit complying with the following:
Products: Available products include the following:
ASI Model No. 0430.
General: Provide multipurpose unit with seamless wall-flange; mirrored door with continuous hinge and tumbler lockset; paper towel dispenser; minimum 80-oz. capacity soap dispenser; sight gage and tumbler lockset for servicing; shelf above soap dispenser; and the following features:
Soap Valve: For dispensing soap in liquid form.
Towel Dispenser: Designed to dispense minimum of 600 C-fold or 800 multifold paper towels without special adapters.
Mounting: Recessed, designed for nominal 4-inch wall depth.
Robe Hook TBA-4: Where this designation is indicated, provide robe hook complying with the following:

Products: Available products include the following:
ASI No. 8425.

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Bobrick B-2333.
Single-prong Unit: Stainless-steel, single-prong robe hook with rectangular wall bracket and backplate for concealed mounting.
Underlavatory Guard TBA-5: Where this designation is indicated, provide underlavatory guard complying with the following:
Products: Available products include the following:
Lav-Guard as manufactured by Trubro, Inc.

Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.

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11-65 RESIDENTIAL APPLIANCES

11-65.1 GENERAL

11-65.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-65.1(2) SUMMARY

This Section includes undercounter refridgerator and microwave oven.
Appliances as specified and shown on drawings, including all required miscellaneous parts and accessory items for complete installations.

11-65.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: Submit copies of Manufacturer's product data, installation, and maintenance instructions for each appliance. Transmit extra copies of installation instructions to installer.
Provide templates, instructions, and directions required to insure accurate location of utility rough-in and anchorage devices.
Operation and Maintenance Data: Submit Manufacturer's printed directions.

11-65.1(4) QUALITY ASSURANCE

Conform to the requirements of the National Electric Code (NEC) for installation of powered equipment and Uniform Plumbing Code (UPC) for all plumbed equipment. All fixtures and connections must be UL labeled.
Energy Ratings: Comply with Federal Trade Commission regulations.

11-65.1(5) DELIVERY, STORAGE, AND HANDLING

Carefully crate and insulate against marring, and other damage in transit.

11-65.1(6) SERVICE AND WARRANTY

Fully guarantee each unit against defects in function and appearance (not caused by abuse) for a period of two years minimum from Date of Substantial Completion.

11-65.2 PRODUCTS

11-65.2(1) MANUFACTURERS

Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
General Electric or other reviewed and approved manufacturers.

11-65.2(2) EQUIPMENT LISTS

Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
CPFilms, Inc, polyester film shade impregnated with ultra-violet absorbers, non-reflective construction.

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Refrigerator: GE Compact Refrigerators, Model GMR04HASCS, CleanSteel™ Exterior.
3 Wire Cabinet Shelves.
1 Mini Ice 'N Easy Tray.
3 Fresh Food Door Shelves.
Can Rack.
Recessed handles.
Microwave: GE Profile Spacemaker II® Microwave Oven, Model PEM31DMWW.
1.0 cu. ft. capacity, 800 watts.
Sensor cooking controls.
Auto and Time Defrost.

11-65.2(3) EXAMINATION

Inspection:
Prior to all work of this Section, carefully inspect work of all other trades and verify conditions as complete and satisfactory for appliance installations.
Verify that equipment may be installed in accordance with original design and Manufacturer's recommendations.

11-65.2(4) INSTALLATION/POSITION

Contractor shall verify all rough-in locations, electrical and mechanical connections and ascertain that sufficient clearances are provided for proper operation of all appliances provided under this contract.
Install in accordance with all referenced regulation requirements, and Manufacturer's directions.
Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
Check operation. Appliances are to be in perfect operating service.

11-65.2(5) ADJUSTING AND CLEANING

Adjust units as required for proper operation.
Leave installations clean; premises free from residue of work of this Section.

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11-70 ROLLER SHADES

11-70.1 GENERAL

11-70.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-70.1(2) SUMMARY

This Section includes roller shades.
Related Sections include the following:
Section 11-15 "Miscellaneous Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

11-70.1(3) SUBMITTALS

Provide submittals as outlined in Section 1-05.3, as applicable.
Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.
Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
Ceiling suspension system members and attachment to building structure.
Shade mounting assembly and attachment.
Size and location of access to shade operator and adjustable components.
Minimum Drawing Scale: 1/4 inch = 1 foot.
Samples for Initial Selection: For each colored component of each type of roller shade indicated.
Include similar Samples of accessories involving color selection.
Samples for Verification:
Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
For the following products:
Shade Material: Not less than 12-inch- square section of film.
Window Treatment Schedule: Include roller shades in schedule using same room designations indicated on Drawings.
Product Certificates: For each type of roller shade product, signed by product manufacturer.
Product Test Reports: For each type of roller shade product.
Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
Methods for maintaining roller shades and finishes.
Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
Operating hardware.

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11-70.1(4) QUALITY ASSURANCE

Source Limitations: Obtain roller shades through one source from a single manufacturer.

11-70.1(5) DELIVERY, STORAGE, AND HANDLING

Deliver shades in factory packages, marked with manufacturer and product name, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

11-70.1(6) PROJECT CONDITIONS

Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Engineer of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

11-70.1(7) EXTRA MATERIALS

Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Rollers Shades: Before installation begins, for each size, color, texture, and pattern indicated, full-size units equal to 5 percent of amount installed, but not fewer than 2 units.

11-70.2 PRODUCTS

11-70.2(1) MANUFACTURERS

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

CPFilms, Inc., (818) 882-5744.

Plastic-View (800) 468-6301.

SeeSawUSA, (800) 561-9250.

11-70.2(2) ROLLER SHADES [RS-1]

Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

CPFilms, Inc, polyester film shade impregnated with ultra-violet absorbers, non-reflective construction.

Shade Band Material: Tinted film.

Material Width: 60 inches.

Bottom Hem: Straight.

Shading Coefficient: 0.42.

Solar Transmittance: 19.86 percent.

Ultraviolet Transmittance: 0.27percent.

Material Color: Smoke.

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Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide capacity for one roller shade band per roller, unless otherwise indicated on Drawings.
Direction of Roll: Regular, from back of roller.
Mounting Brackets: Galvanized or zinc-plated steel.
Pocket-Style Headbox: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.
Bottom Bar: Steel or extruded aluminum,. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
Shade Operation: Manual; with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.
Position of Clutch Operator: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.
Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
Lift Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
Loop Length: Length required to make operation convenient from floor level.
Bead Chain: Stainless steel.
Cord Tensioner Mounting: Wall.
Operating Function: Stop and hold shade at any position in ascending or descending travel.
Mounting: Inside mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
Hold-Down Brackets and Hooks or Pins: Manufacturer's standard for anchoring roller shade bottom in place and keeping shade band material taut.

11-70.2(3) ROLLER SHADE FABRICATION

Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
Lifting Mechanism: With permanently lubricated moving parts.
Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/2 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting headbox, roller, and operating hardware and for hardware position and shade mounting method indicated.
Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

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Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

Colors of Metal and Plastic Components Exposed to View: As selected by Engineer from manufacturer's full range, unless otherwise indicated.

11-70.3 EXECUTION

11-70.3(1) EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

11-70.3(2) ROLLER SHADE INSTALLATION

Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

11-70.3(3) ADJUSTING

Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

11-70.3(4) CLEANING AND PROTECTION

Clean roller shade surfaces after installation, according to manufacturer's written instructions.

Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

Replace damaged roller shades that cannot be repaired, in a manner approved by Engineer, before time of Substantial Completion.

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11-75 SKELETON CLOCK SYSTEM

11-75.1 GENERAL

11-75.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

SUMMARY

This Section includes the following:

Outdoor skeleton clocks and interior pilot clocks including clock control system.

11-75.1(2) SUBMITTALS

Provide submittals as outlined in *Item 29 "PLANS AND WORKING DRAWINGS", ODOT CMS 513.06 or 501.04*, as applicable.

Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of clock required.

Shop Drawings: Product data to include overall physical clock dimensions, clock mechanism, dial style, hand style, installation detail and electrical wiring detail. Include; elevations, and large scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

11-75.1(3) QUALITY ASSURANCE

Installer's Qualifications: Engage an experienced Installer who is an authorized representative of the clock manufacturer and has completed installation of clocks similar in material, design, and extent to those indicated for this Project and that has resulted in construction with a record of successful in service performance.

11-75.1(4) DELIVERY, STORAGE, AND HANDLING

Proved protective covering or crating as recommended by the manufacturer to protect clock components and surfaces against damage during transportation and delivery.

Handle clocks carefully to prevent breakage, surface abrasion, denting, soiling, and other defects. Comply with the manufacturer's handling instructions for unloading components subject to damage.

Inspect clock components for damage upon delivery. Do not install damaged clock components. Repair minor damage to clocks, provided the finished repair is equal in all respects to the original work and is acceptable to the Engineer, otherwise remove and replace damaged clock components.

11-75.1(5) MAINTENANCE

Maintenance Instructions: Furnish maintenance manual to instruct the Owner's personnel in procedures to be followed in operating, cleaning, and maintaining the work. Provide manufacturer's brochures describing the actual materials used in the work, including, but not limited to, metal alloys, finishes, and other major components.

11-75.1(6) REGULATORY REQUIREMENTS

Conform to requirements of the current recognized National Electric Code.

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11-75.2 PRODUCTS

11-75.2(1) MANUFACTURER

Basis-of-Design Product: Subject to compliance with requirements, provide National Time & Signal Corporation products as described below or comparable equal products of other manufacturers. Product numbers listed are those of National Time & Signal Corporation.

11-75.2(2) MASTER CLOCK UNIT

Provide surface mounted National Time & Signal Corporation, model MC3 microprocessor based master clock controller with a 10 year lithium battery standby.
Provide automatic daylight saving time correction.
In the event of power loss. Provide automatic correction of clock upon restoration of power.
Provide individual control of clocks in multi clock systems.
Provide perpetual leap year calendar.
The master clock shall be powered from 120 VAC 60 Hz with user selected time base of power line frequency, crystal oscillator, optional GPS or LAN interface utilizing the time based on the NIST atomic clock.
Provide (*Select: GPS or LAN*) interface equipment as required. In the event of signal loss or fault, the MC100 shall automatically switch to its internal crystal oscillator for time keeping until the fault is cleared.

11-75.2(3) CLOCK COMPONENTS

Type KMR-xx(hand length center to tip)-EXxx(extension) clock mechanism with xx" shaft extension for wall penetration.
Style "A" dial markers shall be constructed of .250" aluminum plate with wall stand-offs and studs for masonry mounting. Markers shall be clear anodized with Teflon coating. Provide marker mounting template.
Type M02 hands shall be clear anodized with Teflon coating.
Furnish 115V 60HZ heavy duty, synchronous motor driven clock mechanism. The clock mechanism shall employ worm/worm gear drive technology to protect the mechanism from wind shear and provide smooth positive drive of the hands. Clock shall be constructed of precision machined, heavy wall, cast aluminum gear housings with permanent lubricating oil reservoir. Clock mechanisms utilizing stamped plate and pillar construction do not meet the quality standards for clocks of this size.

11-75.2(4) PILOT CLOCK

Provide manufacturer's standard enclosed face pilot clock with 10 inch diameter.
Colors and Surface Textures: For exposed sign material that require selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated on Color and Material Schedule.

11-75.3 EXECUTION

11-75.3(1) EXAMINATION

Examine areas and conditions under which the work is to be installed, and notify the Engineer in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

NOT FOR CONSTRUCTION

11-75.3(2) INSTALLATION

Provide labor to install markers per manufacturer instructions.
Wiring by Electrical Contractor per manufacturer instructions. Three 14AWG conductors for each unit between reset control panel or master clock. All wiring shall be in approved metal raceway.

11-75.3(3) CLEANING

At completion of the installation, clean soiled surfaces of clock units in accordance with the manufacturer's instructions.

11-75.3(4) PROTECTION

Protect installed clock units from damage until acceptance by the Engineer.

NOT FOR CONSTRUCTION

11-85 FURNISHINGS

11-85.1 GENERAL

11-85.1(1) RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

11-85.1(2) SUMMARY

This Section includes the following:
Desk task chairs.
Side chairs.
Desks.
Mobile pedestals.
File cabinets
Side tables.

11-85.1(3) SUBMITTALS

Provide submittals as outlined in *Item 29 "PLANS AND WORKING DRAWINGS", ODOT CMS 513.06 or 501.04,* as applicable.
Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of furnishing required.
Product Certificates: For each type of flame-retardant treatment of fabric, from manufacturer.

11-85.1(4) QUALITY ASSURANCE

Source Limitations: Obtain each type of seating required, including accessories and mounting components, from single source from single manufacturer.
Upholstery Fabric: Obtain fabric of a single dye lot for each color and pattern of fabric required.

11-85.1(5) DELIVERY, STORAGE, AND HANDLING

Proved protective covering or crating as recommended by the manufacturer to protect furnishing components and surfaces against damage during transportation and delivery.
Handle furnishings carefully to prevent breakage, surface abrasion, denting, soiling, and other defects. Comply with the manufacturer's handling instructions for unloading components subject to damage.

11-85.1(6) MAINTENANCE

Maintenance Instructions: Furnish maintenance manual to instruct the Owner's personnel in procedures to be followed in operating, cleaning, and maintaining the work. Provide manufacturer's brochures describing the actual materials used in the work, including, but not limited to, metal alloys, finishes, and other major components.

11-85.2 PRODUCTS

11-85.2(1) MANUFACTURER

NOT FOR CONSTRUCTION

Basis-of-Design Product: Subject to compliance with requirements, provide Haworth products as described below or comparable equal products of other manufacturers. Product numbers listed are those of Haworth.

11-85.2(2) DESK TASK CHAIR

Manufacturer: Basis-of-Design Product: Subject to compliance with requirements, provide Haworth – Zody Task Chair. Alternative manufacturer's product include Steelcase "Think" and Teknion "T3 with mesh back".

Description: Task chair with height adjustable arms (4 inch), adjustable foam seat (3 inch), balanced 3-point tilt mechanism with 24 degrees back recline, hard dual wheel casters, passive torsional flex for upper back support, PAL Back System, including a patent pending asymmetrical lumbar adjustment and passive pelvic support for low-back support, pneumatic seat height adjustment, easy to reach/activate tilt tension adjustment, 6-position back-stop and forward-tilt adjustment that allows the user to control their positions throughout the day, and aluminum five-star base.

Finishes:

Upholstered seat pad: COM

Designtex

Bliss 2770-701, Canyon Sunset, 54 inch wide

100% Zeftron nylon, nanotex resists spills finish, 90,000 wyzenbeek.

Trim: Base and arm color – metallic gunmetal.

Mesh back: Haworth, support 001, black

Plastic seat shell, arm pad and base: Black

11-85.2(3) SIDE CHAIR

Manufacturer: Basis-of-Design Product: Subject to compliance with requirements, provide Haworth – x99 Guest Chair. Alternative manufacturer's product include Knoll "Open Up side sled base and mesh back with arm caps" and Steelcase " Protégé, sled base fully upholstered back with arm caps".

Description: Guest chair with solid base tube metal frame, hard arm caps and upholstered seat and back.

Finishes:

Upholstered seat pad: COM

Maharam

Tai 463790, 001 Glowt, 54 inch wide

47% Acrylic, 18% Nylon, 15% Cotton, 12% Polyester, 8% Rayon, Teflon/Acrylic backing.

Trim: COM seat and back – metallic gunmetal.

11-85.2(4) DESK

Manufacturer: Basis-of-Design Product: Subject to compliance with requirements, provide Knoll "Propeller Training Table.. Alternative manufacturer's product include Fixtures Syllabus "C-fixed leg except with height adjustment manual pin option to32 inch height" and Haworth "Tactic C-legs adjustable height table..

Description: Rectangular training room table with C-legs and adjustable height. Equity worksurfce cable basket. Top: 1 3/16 inch thick, 3-ply, solid core construction. Plastic laminate top and and baker sheet on bottom. Threaded inserts are die-cast zinc. Edges: all table edges are finished. 3mm flat PVC edgeband. Legs: All heght adjustable legs feature the Propeller C leg design allowing enhanced leg space and incorporating a vertica channel

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for wire management. Locking casters are black nylon. Manual crank mechanism: Propeller hand crank adjustable height tables include an intuitive manual mechanism that allows one person to raise and lower the table top from a height of 28 to 41 inches. A discreet hand crank is located under the work surface for easy access and operation. ADA compliant. .
Size 60 inch wide x 30 inch deep x adjustable height 28 to 41 inches.
Finishes:
Laminate top
Wilsonart 4622-60 Grey Nebula.
Flat edgeband: 3mm black.

11-85.2(5) MOBILE PEDESTAL

Manufacturer: Basis-of-Design Product: Subject to compliance with requirements, provide Haworth "X-series mobile pedestal". Alternative manufacturer's product include Steelcase "900 series" and Herman Miller "Tu lateral file".
Description: Three drawer, freestanding mobile pedestal with black nylon lockable casters. Painted metal.
Dimensions 15 inch wide x 23inch deep.
Finishes:
Painted metal
Silver.
Drawer interiors: Black finish color.
Drawer eclipse pull: Satin finish

11-85.2(6) FILE CABINET

Manufacturer: Basis-of-Design Product: Subject to compliance with requirements, provide Haworth "X-series lateral file". Alternative manufacturer's product include Steelcase "900 series" and Herman Miller "Tu lateral file".
Description: Two-high lateral file, freestanding. Painted metal.
Dimensions 42 inch wide x 18 ¾ inch deep.
Finishes:
Painted metal
Silver.
Drawer interiors: Black finish color.
Drawer eclipse pull: Satin finish

11-85.2(7) SIDE TABLE

Manufacturer: Basis-of-Design Product: Subject to compliance with requirements, provide Haworth "Planes, small cart".
Description: One drawer with storage below, freestanding mobile small cart with laminate top , side panels, drawer and cabinet door faces. Black nylon lockable casters. Painted metal.
Dimensions 15 inch wide x 23inch deep.
Finishes:
Painted metal
Gunmetal.
Laminate: Platinum H-3P.
Drawer eclipse pull: Satin finish

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11-85.3 EXECUTION

11-85.3(1) EXAMINATION

Examine areas and conditions under which the work is to be installed, and notify the Engineer in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

11-85.3(2) INSTALLATION

Deliver furnishings to spaces identified on plans.

11-85.3(3) ADJUSTING

Adjust chair backs so that they are aligned with each other in [straight] [uniformly curved] rows.
Adjust self-rising seat mechanisms so seats in each row are aligned when in upright position.
Verify that all components and devices are operating properly.
Verify that seating returns to correct at-rest position.
Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.
Replace upholstery fabric damaged during installation.

11-85.3(4) CLEANING

At completion of the installation, clean soiled surfaces of furnishings in accordance with the manufacturer's instructions.

11-85.3(5) PROTECTION

Protect installed furnishings from damage until acceptance by the Engineer.

APPENDICES
(July 12, 1999)

The following appendices are attached and made a part of this contract:

*** $$1$$ ***

[Fill-in is the name, title, and if necessary the page numbers of the appendices, formatted as shown in the following sample:]

APPENDIX A:
Log of Test Borings, Page __ through Page __.

APPENDIX B:
Summary of Geotechnical Conditions, Page __ through Page __.

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STANDARD PLANS
August 3, 2009

The State of Washington Standard Plans for Road, Bridge and Municipal Construction M21-01 transmitted under Publications Transmittal No. PT 09-013, effective August 3, 2009 is made a part of this contract.

The Standard Plans are revised as follows:

All Standard Plans
All references in the Standard Plans to "Asphalt Concrete Pavement" shall be revised to read "Hot Mix Asphalt".

All references in the Standard Plans to the abbreviation "ACP" shall be revised to read "HMA".

B-10.20 and B10.40
Substitute “step” in lieu of “handhold” on plan

C-1a
In the TYPE 10 WOOD POST ASSEMBLY, delete callout – NESTED THRIE BEAM
In the TYPE 11 WOOD POST ASSEMBLY, THE 18” button head bolt is revised to 25”

C-1b
In the ANCHOR POST ASSEMBLY, the above ground 7 1/2” long bolt connecting the Wood Breakaway Post to the Foundation Tube is revised to 10” long.

C-3, C-3B, C-3C
Note 1 is revised as follows: replace reference F-2b with F-10.42

C-5
In the A CONNECTION, “Type 3 transition pay limit” is revised to “transition pay limit”.

C-10 (sheet 2 of 2)
COVER PLATE DETAIL, dimension of the 1” dia. holes, changes from 8” to 3”

F-10.20
GENERAL NOTE
Revise as follows:
Replace reference to F-3 with F-30.10

F-40.12 through F-40.18
The following note is added to these five plans:

Note 7. To the maximum extent feasible, the ramp cross slope shall not exceed 2%.

G-24.40
Existing callout - CORNER BOLT (TYP.)
New callout - CORNER BOLT OR SHOULDER BOLT (TYP.)

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J-28.40
Add to the end of Note 4.
DO NOT OVERTIGHTEN. After State Inspection, Burr threads to prevent nut rotation.

J-40.10, Section A
replace 3" MIN. with 3" MAX.

K-80.30
In the NARROW BASE, END view, the reference to Std. Plan C-8e is revised to Std. Plan K-80.35

L-20.10, Sheet 1
Delete all references to tension cable and substitute tension wire.
Add knuckled selvage is required on the top edge of the fence fabric.

L-20.10, Sheet 2
Delete all references to tension cable and substitute tension wire.
All rope thimbles, wire rope clips and seizing are not required.

L-30.10, Sheet 1
Delete all references to tension cable and substitute tension wire.

L-30.10, Sheet 2
Delete all references to tension cable and substitute tension wire.
All rope thimbles, wire rope clips and seizing are not required.

M-1.60
COLLECTOR DISTRIBUTOR ROAD OFF- CONNECTION, taper dimensions of 225' MIN. is changed to 300' MIN.

M-20.30
LEFT EDGE OF LANE PLACEMENT DETAIL
Dimension 4" replaced with 1"

The following are the Standard Plan numbers applicable at the time this project was advertised. The date shown with each plan number is the publication approval date shown in the lower right-hand corner of that plan. Standard Plans showing different dates shall not be used in this contract.

A-10.10-00.....8/07/07	A-30.30-00.....11/08/07	A-50.20-00…..11/17/08
A-10.20-00.....10/05/07	A-30.35-00.....10/12/07	A-50.30-00…..11/17/08
A-10.30-00.....10/05/07	A-40.10-00.....10/05/07	A-50.40-00…..11/17/08
A-20.10-00.....8/31/07	A-40.20-00.....9/20/07	A-60.10-00.....10/05/07
A-30.10-00.....11/08/07	A-40.50-00.....11/08/07	A-60.20-00.....10/05/07
A-30.15-00.....11/08/07	A-50.10-00…..11/17/08	A-60.30-00.....11/08/07
		A-60.40-00.....8/31/07

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B-5.20-00.....6/01/06
B-5.40-00.....6/01/06
B-5.60-00.....6/01/06
B-10.20-00.....6/01/06
B-10.40-00.....6/01/06
B-10.60-00.....6/08/06
B-15.20-00.....6/01/06
B-15.40-00.....6/01/06
B-15.60-00.....6/01/06
B-20.20-01.....11/21/06
B-20.40-02.....6/10/08
B-20.60-02.....6/10/08
B-25.20-00.....6/08/06
B-25.60-00.....6/01/06
B-30.10-00.....6/08/06
B-30.20-01.....11/21/06
B-30.30-00.....6/01/06
B-30.40-00.....6/01/06
B-30.50-00.....6/01/06
B-30.70-01.....8/31/07
B-30.80-00.....6/08/06
B-30.90-01.....9/20/07
B-35.20-00.....6/08/06
B-35.40-00.....6/08/06
B-40.20-00.....6/01/06
B-40.40-00.....6/01/06
B-45.20-00.....6/01/06
B-45.40-00.....6/01/06
B-50.20-00.....6/01/06
B-55.20-00.....6/01/06
B-60.20-00.....6/08/06
B-60.40-00.....6/01/06
B-65.20-00.....6/01/06
B-65.40-00.....6/01/06
B-70.20-00.....6/01/06
B-70.60-00.....6/01/06
B-75.20-01.....6/10/08
B-75.50-01.....6/10/08
B-75.60-00.....6/08/06
B-80.20-00.....6/08/06
B-80.40-00.....6/01/06
B-82.20-00.....6/01/06
B-85.10-01.....6/10/08
B-85.20-00.....6/01/06
B-85.30-00.....6/01/06
B-85.40-00.....6/08/06
B-85.50-01.....6/10/08
B-90.10-00.....6/08/06
B-90.20-00.....6/08/06
B-90.30-00.....6/08/06
B-90.40-00.....6/08/06
B-90.50-00.....6/08/06
B-95.20-01.....2/03/09
B-95.40-00.....6/08/06

1

C-1.....2/10/09
C-1a.....2/10/09
C-1b.....10/31/03
C-1c.....5/30/97
C-1d.....10/31/03
C-2.....1/06/00
C-2a.....6/21/06
C-2b.....6/21/06
C-2c.....6/21/06
C-2d.....6/21/06
C-2e.....6/21/06
C-2f.....3/14/97
C-2g.....7/27/01
C-2h.....3/28/97
C-2i.....3/28/97
C-2j.....6/12/98
C-2k.....7/27/01
C-2n.....7/27/01
C-2o.....7/13/01
C-2p.....10/31/03
C-3.....10/04/05
C-3a.....10/04/05
C-3b.....10/04/05
C-3c.....6/21/06
C-4.....2/21/07
C-4b.....6/08/06
C-4e.....2/20/03
C-4f.....6/30/04
C-5.....10/31/03
C-6.....5/30/97
C-6a.....3/14/97
C-6c.....1/06/00
C-6d.....5/30/97
C-6f.....7/25/97
C-7.....10/31/03
C-7a.....10/31/03
C-8.....2/10/09
C-8a.....7/25/97
C-8b.....2/10/09
C-8e.....2/21/07
C-8f.....6/30/04
C-10.....7/31/98
C-13.....7/3/08
C-13a.....7/3/08
C-13b.....7/3/08
C-13c.....7/3/08
C-14a.....7/3/08
C-14b.....7/26/02
C-14c.....7/3/08
C-14d.....7/3/08
C-14e.....7/3/08
C-14h.....2/10/09
C-14i.....2/10/09
C-14j.....12/02/03
C-14k.....2/10/09
C-15a.....7/3/08
C-15b.....7/3/08
C-16a.....11/08/05
C-16b.....11/08/05
C-20.14-00.....2/06/07
C-20.40-00.....2/06/07
C-20.42-00.....2/03/09
C-22.14-00.....2/03/09
C-22.16-00.....2/03/09
C-22.40-01.....10/05/07
C-23.60-00.....2/06/07
C-25.18-01.....9/20/07
C-25.20-03.....2/03/09
C-25.22-02.....2/03/09
C-25.26-00.....2/03/09
C-25.80-01.....7/3/08
C-28.40-00.....2/06/07
C-40.14-00.....2/03/09
C-40.16-00.....2/03/09
C-40.18.00.....2/03/09
C-90.10-00.....7/3/08

2

D-2.02-00.....11/10/05
D-2.04-00.....11/10/05
D-2.06-01.....1/06/09
D-2.44-00.....11/10/05
D-2.46-00.....11/10/05
D-2.48-00.....11/10/05
D-3b 6/30/04
D-3c 6/30/04
D-4.....12/11/98

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D-2.08-00.....11/10/05
D-2.10-00.....11/10/05
D-2.12-00.....11/10/05
D-2.14-00.....11/10/05
D-2.16-00.....11/10/05
D-2.18-00.....11/10/05
D-2.20-00.....11/10/05
D-2.30-00.....11/10/05
D-2.32-00.....11/10/05
D-2.34-01.....1/06/09
D-2.36-02.....1/06/09
D-2.38-00.....11/10/05
D-2.40-00.....11/10/05
D-2.42-00.....11/10/05
D-2.60-00.....11/10/05
D-2.62-00.....11/10/05
D-2.64-01.....1/06/09
D-2.66-00.....11/10/05
D-2.68-00.....11/10/05
D-2.78-00.....11/10/05
D-2.80-00.....11/10/05
D-2.82-00.....11/10/05
D-2.84-00.....11/10/05
D-2.86-00.....11/10/05
D-2.88-00.....11/10/05
D-2.92-00.....11/10/05
D-3.....7/13/05
D3a.....12/02/08
D-6.....6/19/98
D-10.10-01.....12/02/08
D-10.15-01.....12/02/08
D-10.20-00.....7/8/08
D-10.25-00.....7/8/08
D-10.30-00.....7/8/08
D-10.35-00.....7/8/08
D-10.40-01.....12/02/08
D-10.45-01.....12/02/08
D-15.10-01.....12/02/08
D-15.20-01.....1/06/09
D-15.30-01.....12/02/08

1

E-1.....2/21/07
E-2.....5/29/98
E-4.....8/27/03
E-4a.....8/27/03

2

F-10.12-00.....12/20/06
F-10.16-00.....12/20/06
F-10.40-01.....7/3/08
F-10.42-00.....1/23/07
F-10.62-01.....9/05/07
F-10.64-02.....7/3/08
F-30.10-00.....1/23/07
F-40.10-01.....10/05/07
F-40.12-00.....2/07/07
F-40.14-00.....2/07/07
F-40.15-00.....2/07/07
F-40.16-00.....2/07/07
F-40.18-00.....2/07/07
F-40.20-00.....10/05/07
F-42.10-00.....10/05/07
F-80.10-00.....1/23/07

3

G-10.10-00.....9/20/07
G-20.10-00.....9/20/07
G-22.10-01.....7/3/08
G-24.10-00.....11/08/07
G-24.20-00.....11/08/07
G-24.30-00.....11/08/07
G-24.40-01.....12/02/08
G-24.50-00.....11/08/07
G-24.60-00.....11/08/07
G-25.10-01.....1/06/09
G-30.10-00.....11/08/07
G-50.10-00.....11/08/07
G-60.10-00.....8/31/07
G-60.20-00.....8/31/07
G-60.30-00.....8/31/07
G-70.10-00.....10/5/07
G-70.20-00.....10/5/07
G-70.30-00.....10/5/07
G-90.10-00…..1/06/09
G-90.20-00…..1/06/09
G-90.30-00…..1/06/09
G-90.40-00…...1/06/09
G-95.10-00.....11/08/07
G-95.20-01.....7/10/08
G-95.30-01.....7/10/08

4

H-10.10-00.....7/3/08
H-10.15-00.....7/3/08
H-30.10-00.....10/12/07
H-32.10-00.....9/20/07
H-60.10-01.....7/3/08
H-60.20-01.....7/3/08
H-70.10-00.....9/05/07
H-70.20-00.....9/05/07
H-70.30-01.....11/17/08

5

I-10.10-00.....8/31/07
I-30.10-00.....9/20/07
I-30.20-00.....9/20/07
I-30.30-00.....9/20/07
I-30.40-00.....10/12/07
I-30.50-00.....11/14/07
I-40.10-00.....9/20/07
I-40.20-00.....9/20/07
I-50.10-00.....9/20/07
I-50.20-00.....8/31/07
I-60.10-00.....8/31/07
I-60.20-00.....8/31/07
I-80.10-00.....8/31/07

6

J-1f.....6/23/00
J-3.....8/01/97
J-3b.....3/04/05
J-3c.....6/24/02
J-9a.....4/24/98
J-10.....7/18/97
J-11b.....9/02/05
J-12.....2/10/09
J-28.30-00.....8/07/07
J-28.40-00.....8/07/07
J-28.42-00.....8/07/07
J-28.45-00.....8/07/07

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J-3d.....11/05/03	J-16a.....3/04/05	J-28.50-00.....8/07/07
J-5.....8/01/97	J-16b.....2/10/09	J-28.60-00.....8/07/07
J-6c.....4/24/98	J-16c.....2/10/09	J-28.70-00.....11/08/07
J-7a.....9/12/01	J-18.....2/10/09	J-40.10-00…....1/06/09
J-7c.....6/19/98	J-19.....2/10/09	J-40.30-00……1/06/09
J-7d.....4/24/98	J-20.....9/02/05	J-75.10-00……2/10/09
J-8a.....5/20/04	J-28.10-00.....8/07/07	J-75.20-00……2/10/09
J-8b.....5/20/04	J-28.22-00.....8/07/07	J-75.30-00…….2/10/09
J-8c.....5/20/04	J-28.24-00.....8/07/07	J-90.10-00…….2/10/09
J-8d.....5/20/04	J-28.26-01.....12/02/08	J-90.20-00…….2/10/09

K-10.20-01.....10/12/07	K-26.40-01.....10/12/07	K-40.60-00.....2/15/07
K-10.40-00.....2/15/07	K-30.20-00.....2/15/07	K-40.80-00.....2/15/07
K-20.20-01.....10/12/07	K-30.40-01.....10/12/07	K-55.20-00.....2/15/07
K-20.40-00.....2/15/07	K-32.20-00.....2/15/07	K-60.20-02.....7/3/08
K-20.60-00.....2/15/07	K-32.40-00.....2/15/07	K-60.40-00.....2/15/07
K-22.20-01.....10/12/07	K-32.60-00.....2/15/07	K-70.20-00.....2/15/07
K-24.20-00.....2/15/07	K-32.80-00.....2/15/07	K-80.10-00.....2/21/07
K-24.40-01.....10/12/07	K-34.20-00.....2/15/07	K-80.20-00.....12/20/06
K-24.60-00.....2/15/07	K-36.20-00.....2/15/07	K-80.30-00.....2/21/07
K-24.80-01.....10/12/07	K-40.20-00.....2/15/07	K-80.35-00.....2/21/07
K-26.20-00.....2/15/07	K-40.40-00.....2/15/07	K-80.37-00.....2/21/07

L-10.10-00.....2/21/07	L-40.10-00.....2/21/07	L-70.10-01.....5/21/08
L-20.10-00.....2/07/07	L-40.15-00.....2/21/07	L-70.20-01.....5/21/08
L-30.10-00.....2/07/07	L-40.20-00.....2/21/07	

M-1.20-01.....1/30/07	M-7.50-01.....1/30/07	M-24.60-02.....2/06/07
M-1.40-01.....1/30/07	M-9.50-01.....1/30/07	M-40.10-00.....9/20/07
M-1.60-01.....1/30/07	M-9.60-00…….2/10/09	M-40.20-00...10/12/07
M-1.80-02.....8/31/07	M-11.10-01.....1/30/07	M-40.30-00.....9/20/07
M-2.20-01.....1/30/07	M-15.10-01.....2/06/07	M-40.40-00.....9/20/07
M-2.40-01.....1/30/07	M-17.10-02.....7/3/08	M-40.50-00.....9/20/07
M-2.60-01.....1/30/07	M-20.10-01.....1/30/07	M-40.60-00.....9/20/07
M-3.10-02.....2/10/09	M-20.20-01.....1/30/07	M-60.10-00.....9/05/07
M-3.20-01.....1/30/07	M-20.30-01.....1/30/07	M-60.20-01.....2/03/09
M-3.30-02.....2/10/09	M-20.40-01.....1/30/07	M-65.10-01.....5/21/08
M-3.40-02.....2/10/09	M-20.50-01.....1/30/07	M-80.10-00.....6/10/08
M-3.50-01.....1/30/07	M-24.20-01.....5/31/06	M-80.20-00.....6/10/08
M-5.10-01.....1/30/07	M-24.40-01.....5/31/06	M-80.30-00.....6/10/08

The following City of Seattle (COS) 2008 Standard Plans for Municipal Construction numbers are applicable at the time this project was advertised. Unless specifically stated otherwise in the Plans or Specifications, WSDOT Standard Plans shall be used whenever items of work are shown in the WSDOT Standard Specifications and COS Standard Specifications

NOT FOR CONSTRUCTION

1		001											
2		002	50	203b	98	286a	146	440a	194	601a			
3		003a	51	204a	99	286b	147	440b	195	601b			
4		003b	52	204b	100	290	148	441	196	601c			
5		003c	53	205a	101	300a	149	442	197	610			
6		003d	54	205b	102	300b	150	443a	198	612			
7		003e	55	206a	103	300c	151	443b	199	613			
8		003f	56	206b	104	310a	152	450a	200	615			
9		003g	57	207	105	310b	153	450b	201	616			
10		003h	58	208	106	311a	154	450c	202	620			
11		003i	59	230	107	311b	155	456	203	621a			
12		003j	60	231	108	312	156	460	204	621b			
13		003k	61	232	109	313	157	463	205	622			
14		003l	62	233a	110	314	158	500a	206	623			
15		003	63	233b	111	315a	159	500b	207	624			
16	m		64	234	112	315b	160	502	208	625			
17		003n	65	240	113	330a	161	505a	209	626			
18		003o	66	241a	114	330b	162	505b	210	627			
19		010	67	241b	115	331a	163	510a	211	628			
20		020	68	242	116	331b	164	510b	212	629			
21		030	69	243a	117	340a	165	511	213	630			
22		100a	70	243b	118	340b	166	520	214	700			
23		100b	71	250	119	350	167	521	215	710			
24		101	72	252	120	360	168	522	216	711			
25		110	73	260a	121	361	169	523	217	712			
26		111	74	260b	122	362	170	524a	218	713			
27		112	75	261	123	363	171	524b	219	720a			
28		113	76	262	124	400	172	530a	220	720b			
29		121	77	263	125	401	173	530b	221	721			
30		122	78	264	126	402	174	541a	222	722			
31		123	79	265	127	403	175	541b	223	723			
32		124	80	267a	128	404a	176	542a	224	724			
33		125	81	267b	129	404b	177	542b	225	800			
34		126	82	268	130	405	178	543	226	801			
35		127	83	270	131	410	179	550a	227				
36		128	84	271a	132	411	180	550b					
37		129	85	271b	133	412	181	560					
38		132	86	271c	134	413a	182	562a					
39		133	87	272a	135	413b	183	562b					
40		134	88	272b	136	414	184	563a					
41		140	89	277	137	415	185	563b					
42		141	90	278	138	420	186	566a					
43		200a	91	279	139	421	187	566b					
44		200b	92	280	140	422a	188	567a					
45		201a	93	282a	141	422b	189	567b					
46		201b	94	282b	142	423	190	569					
47		202a	95	283	143	424	191	572					
48		202b	96	284	144	430	192	580					
49		203a	97	285	145	431	193	600					

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