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Technical Memorandum

HNTB

Date: February 18, 2009

To: Mr. Timothy Lane, PE/Trinh Truong, PE

From: Salima Nagji/Shane Repking

Subject: South Park Bride – Final Design
Agreement No. E00082E07
HNTB Job Number 45647-DS-001
Task 11: Intermediate Design – Design Requirements for Illumination

Enclosed please find the Roadway Illumination Criteria cited from five different sources; WSDOT, King County, Illuminating Engineering Society (IES) RP-8, USDOT and AASHTO. The criterion is based on the roadway classification of a "major" (over 3,500 ADT) with a "medium" pedestrian conflict. The area is mostly commercial and pedestrian traffic is not as high. The foot candle requirements are specified in the attached spreadsheet. The minimum average foot candles (fc) requirement is between 1.2 to 1.3 fc.

However, since bike lanes are not separated from vehicular traffic by a barrier, the pedestrian conflict can be considered "high"; hence, the average foot candle requirement would increase the roadway illumination requirement from 1.3 fc to 1.7 fc per IES RP-8 standards and 1.2 fc to 1.6 fc per WSDOT design criteria. Note that the WSDOT criteria includes bike lane. However, per IES, if the bike lane/pedestrian area is not separated by a barrier, then the walkway area can be considered a high pedestrian traffic which would increase the pedestrian illumination requirement from 0.5 fc to 2.0 fc. There are no specific literatures that discuss the requirement for bascule bridges. Our recommendation is as follows:

Roadway/Bike Lane Illuminance:

Consider the roadway as a "major" with "high" pedestrian conflict to bring the illumination of the roadway to 1.7 fc. This is the highest roadway illuminance requirement per IES RP-8. This will include bike lane which also meets the WSDOT requirements.

Walkway/Sidewalk Illuminance:

Recommend exceeding the 1.0 fc required by IES RP-8 for a barrier separated walkway to 1.5 fc.

Please do not hesitate to call if you have any questions or comments.

Attachment: Illumination Criteria and Sources
IES RP-8 Guideline

cc: Trinh Truong/Amanda Tse – King County
Rich Johnson – HNTB
HNTB File 45647-DS-PM

SOUTH PARK BRIDGE REPLACEMENT PROJECT — **HNTB Corporation**

ILLUMINATION CRITERIA AND SOURCES — **Job #45647-DS-001**

Purpose: Determine Design Criteria for Illumination

Prepared For: King County- Tim Lane, PM

Prepared By: **Shane Repking, HNTB**
Updated By: ***Salima Nagji, HNTB***
Date: **13-Feb-09**

	ROADWAY						PEDESTRIAN	BIKEWAYS
	ILLUMINANCE			LUMINANCE				
	Mininum Average FC	FC Ave/Min	Veiling Luminance Ratio Lvmax/Lavg	Lavg	Lavg/min	Lmax/Lmin	Mininum Average FC	
WSDOT								
Principal Arterials-Medium Pedestrial Conflict-Mainline	1.2	3:01	0.3	n/a	n/a	n/a	*840.07(2)	*840.07(2)
King County	1.2	3:1		n/a	n/a	n/a		
IES RP-8								
Major-Medium	1.3	3	0.3	0.9	3	5	0.5	
Walkway Not Separated by Barrier							0.5	
Walkway Separated by Barrier							1.0	
Major-High**							2.0	
Roadway Lighting Handbook (USDOT)							0.6	Same Standards as Roadways
Major-Urban Intermediate	1.4	4		n/a	n/a	n/a		
Roadway Lighting Design Guide (AASHTO)	1.2	3	0.3	0.9	3	5		

The design area is that portion of the roadway, parking lot, or other facility subjust to the minimum light level, minimum average light level, uniformity ration, and maximum veiling luminance ratio design requirements. This encompasses the area between the edges of the traveled way along the roadway; the outer edges of the stopping points at intersections; and, when presetn, a bike lane adjacent to the traveled way. When the raodway ahs adjacent sidewalks, the design area includes these features; except that the sidewalks adjacent to the traveled way are exempt fro mthe maximum veiling luminance ratio requirements.

*840.07(2)

**"High Pedestrian Conflict" - Pedestrians and vehicles are not separated.

WSDOT - Washington Department of Transportation
IES - Illuminating Engineering Society
USDOT - United States Department of Transportation
AASHTO - American Assocation of State Highway and Transportation Officials

City of Seattle - Refers to IES Guidelines

SOURCE: IES

lighting levels. Consensus opinion is currently to delete such a differential on the basis that adequate research to justify the lower levels has not been conducted.

High mast lighting typically consists of clusters of three to six or more luminaires mounted on rings, which can be mechanically lowered to near ground levels for servicing.

Designs for high mast lighting can utilize the illuminance method. Unique high mast luminaires and both symmetrical and asymmetrical distributions have been used. Cutoff luminaires are desirable to avoid excessive glare. Large lamps consuming up to 1000 watts are sometimes employed.

Because high mast lighting is a tool for illuminating areas rather than specific sections of roadway, the poles are customarily placed well back from adjacent roadways. Installation cost comparisons between high mast and conventional lighting systems vary widely, depending on the application. High mast lighting for interchanges is frequently less expensive to install than conventional lighting, due to the reduced complexity of conduit and conductor and the smaller number of luminaires and poles required. Other than at interchange locations, conventional lighting usually requires a smaller initial cost.

Maintenance costs for the two types of systems differ greatly. Conventional lighting requires the use of a bucket truck and frequently requires extensive traffic control, such as signs, cones, and lane closures. When poles are mounted on concrete traffic barriers (CTB's), the adjacent traffic lane usually has to be closed, resulting in significant traffic disruptions. One or two persons, without special lift equipment, can usually perform maintenance on a high mast lighting system equipped with a lowering device. High mast lighting may also eliminate the risks involved with having personnel working near high speed traffic.

3.5 Pedestrian and Bikeway Design Criteria

The lighting of streets with pedestrian sidewalks and/or bikeways included as part of the right of way, particularly in urban and suburban areas, differs from that of limited access high speed roadways. The driver's tasks include seeing objects in the roadway as well as pedestrians, parked cars, and other elements. The purpose

Table 2: Illuminance Method - Recommended Values

Road and Pedestrian Conflict Area		Pavement Classification (Minimum Manintained Average Values)			Uniformity Ratio	Veiling Luminance Ratio
Road	Pedestrian Conflict Area	R1 lux/fc	R2 & R3 lux/fc	R4 lux/fc	E_{avg}/E_{min}	L_{vmax}/L_{avg}
Freeway Class A		6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Freeway Class B		4.0/0.4	6.0/0.6	5.0/0.5	3.0	0.3
Expressway	High	10.0/1.0	14.0/1.4	13.0/1.3	3.0	0.3
	Medium	8.0/0.8	12.0/1.2	10.0/1.0	3.0	0.3
	Low	6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Major	High	12.0/1.2	17.0/1.7	15.0/1.5	3.0	0.3
	Medium	9.0/0.9	13.0/1.3	11.0/1.1	3.0	0.3
	Low	6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Collector	High	8.0/0.8	12.0/1.2	10.0/1.0	4.0	0.4
	Medium	6.0/0.6	9.0/0.9	8.0/0.8	4.0	0.4
	Low	4.0/0.4	6.0/0.6	5.0/0.5	4.0	0.4
Local	High	6.0/0.6	9.0/0.9	8.0/0.8	6.0	0.4
	Medium	5.0/0.5	7.0/0.7	6.0/0.6	6.0	0.4
	Low	3.0/0.3	4.0/0.4	4.0/0.4	6.0	0.4

(*Refer to **Section 3.6** for Intersection Lighting*)