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15 July 2010

Mr. Greg Fredrick
The Wyoming Department of Transportation
5300 Bishop Blvd.
Cheyenne, WY 82009

RE: Quarterly Progress Report #11
Update to "A Guide to Standardized Highway Lighting Pole Hardware"

Dear Mr. Frederick:

This letter is the eleventh quarterly progress report for the project Update to A Guide to Standardized Highway Lighting Pole Hardware sponsored by the Wyoming Department of Transportation and covering the period between April 1, 2010 and June 30, 2010. The following paragraphs summarize the progress in the project during this time period.

Task 1: Determination of Standardized Lighting Poles and Hardware

This task is complete.

Task 2: Prototype Guide Development

The prototype On-Line Luminaire Support Guide was essentially completed this quarter – minor revisions to the Guide will be made as needed throughout the remainder of the project. The Luminaire Support Guide is now on-line at: http://guides.roadsafellc.com/luminaireGuide/index.php and is fully functional. The Luminaire Guide database currently includes a comprehensive set of information and data for all luminaire systems contained within the FHWA Approval Letters LS-23, LS-27, LS-29, LS-32, LS-64, LS-65 and LS-66. The database includes more than 8,000 different combinations of luminaire bases, poles and arms, where each combination represents an approved system. The database provides specific information for each system including manufacturer, letter number, material type, base type, test specification, crash test level, mounting height, maximum fixture weight, maximum three-second wind speed for each configuration, EPA vs. max three-second gust wind speed, type of arm, arm length, bolt-circle diameter, butt diameter of pole, top diameter of pole, and wall thickness of pole. The systems included in the current version of the database are all HAPCO products. HAPCO has been very helpful throughout this project providing guidance on the organization of the Guide, as well as, providing HAPCO luminaire support data for inclusion in the on-line database.

The interim report was submitted as a Microsoft PowerPoint document to Mr. Frederick on May 24, 2010 and is included with this report as Attachment A. The interim report was also presented to the AASHTO-ARTBA-AGC Task Force 13 Sign and Luminaire Subcommittee on May 20, 2010. This group is composed largely of State and Federal DOT personnel and manufactures of sign and luminaire systems. The research team has been using the twice-yearly Task Force 13 meetings to disseminate and collect information for the project. At that meeting, Dr. Ray and Dr. Plaxico presented the interim report and demonstrated the functionality of the prototype Guide. The group was generally supportive of the Guide's functionality and content; however, several issues were identified that have been addressed in the current version of the Guide by the research team. The most notable issues included:

- The desire to include more of the database information in the search pages,
- The prototype guide did not have capability to search for luminaire support systems based on the design wind speed and EPA of luminaire fixture,

- A table of EPA vs. wind speed should be included for each system.
- A need to deal with the fact that some manufacturers still present EPA vs. wind-speed based on fastest-mile wind ('94 AASHTO standards[1]), while others present EPA vs. wind-speed based on maximum 3-second gust wind speed (latest AASHTO standards[2]).

The following sections discuss how the research team addressed each of these issues. As mentioned previously, the Guide is on-line and fully functional. The accuracy of information that is presented in the Guide and its functionality is currently being evaluated by HAPCO and others. We would also appreciate feedback from the project panel.

The search criteria on the search pages have been expanded considerably. Figure 1 shows the "Search Luminaire Supports" web-page which shows the various search criteria.

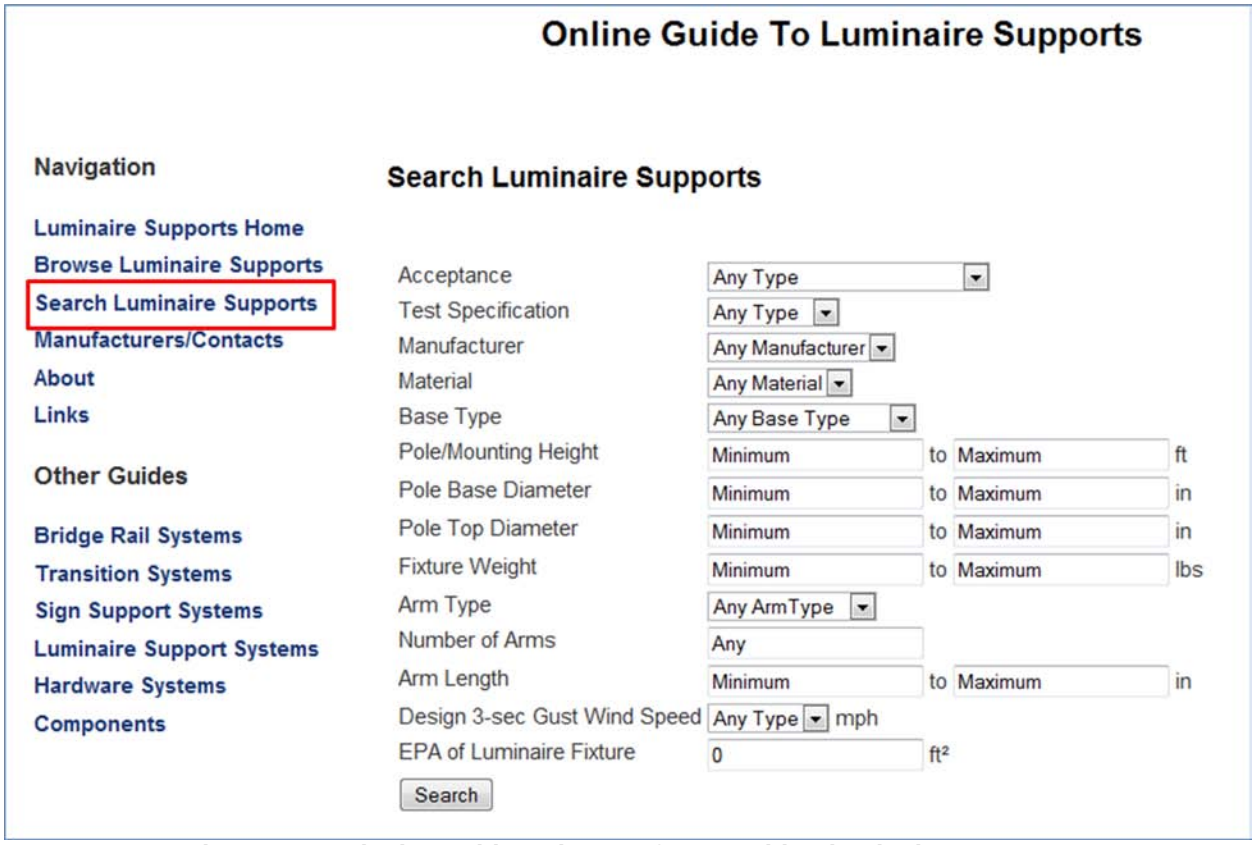

Figure 1. Luminaire Guide web-page for searching luminaire systems

Note: upcoming changes to this page will include:

- Changing "Number of Arms" to "Number of Fixture Tenons" – There was some confusion in the current designation which regards a cross-arm as two arms. Technically, it is a cross-arm with two "fixture tenons". Likewise, a triple-cross arm and a quad-cross arm will have three fixture tenons and four fixture tenons, respectively.
- Adding additional search criteria for "Bolt Circle Diameter" – At the TF13 meeting, a representative from Valmont (a luminaire support manufacture) requested that this option be

[1] *Standard Specifications for Structural Supports for Highway Signs, Luminaires & Traffic Signals*, American Association of State and Highway Transportation Officials, 1994

[2] *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition*, American Association of State and Highway Transportation Officials, 2001- 2009

included. It was noted that contractors often have bolt-circle size limitations/constraints that must be accommodated.

Another important change to the search page was the replacement of "maximum wind-speed" criteria with "Design three-second Gust Wind-Speed." An additional criterion was also added that allows users to search luminaire support structures based on the "EPA of the Fixture." For example, entering search criteria such as:

- **Number of arms – 1**
- **Design 3-sec. Gust Wind-Speed** – 130 mph and
- **EPA of Luminaire Fixture – 4** ft^2

The Guide will return all systems that have a single mast arm and that also meet the criteria of an EPA rating for the fixture **equal to or greater than** 4 ft^2 (i.e., the specified EPA criteria) for a maximum 3-second gust wind speed of 130 mph. Figure 2 shows the list of systems (in the current database) that meet these criteria.

Another important change to the Guide is that "fastest-mile wind speed" is no longer presented anywhere in the Guide. The current AASHTO standard uses only maximum three-second gust to define wind speed, so a decision was made by the research team to conform to the AASHTO standard. Some manufactures, however, still use "fastest-mile wind speed" in their catalogs. In order to accommodate data from those manufacturers, the project team developed a script that converts fastest-mile wind speed vs. EPA to maximum three-second gust wind speed vs. EPA. This script was then included in the Excel worksheet which generates the Luminaire Guide Database. The conversion results have been verified by HAPCO to be very close to the values that they calculated. When the EPA values in the On-Line Guide are obtained from this conversion process, a footnote is included on the page just under the wind-speed vs. EPA table that states, "EPA is estimated using conversion from 'fastest-mile' wind speed data. Please contact manufacturer for exact EPA values".

Figure 3 shows an example of the on-line data that is presented for each luminaire support system. There are a couple of modifications that will be made to these pages in the coming quarter, including:

1. The "wall thickness of pole" data will be displayed with values rounded to three decimal places
2. The EPA data will be displayed with values rounded to one decimal place.

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Acceptance	Any Type			
Test Specification	Any Type			
Manufacturer	Any Manufacturer			
Material	Any Material			
Base Type	Any Base Type			
Pole/Mounting Height	Minimum	to	Maximum	ft
Pole Base Diameter	Minimum	to	Maximum	in
Pole Top Diameter	Minimum	to	Maximum	in
Fixture Weight	Minimum	to	Maximum	lbs
Arm Type	Mast (M)			
Number of Arms	1			
Arm Length	Minimum	to	Maximum	in
Design 3-sec Gust Wind Speed	130 mph			
EPA of Luminaire Fixture	4			ft²

Search

Click on a column heading to arrange the list in order of that luminaire support characteristic.

Name/Designator	Pole Component	Arm Component	Base Component	Acceptance Letter	Manufacturer
SL20/C01/A01-7-4-5/M01a1 Precisionform/HAPCO Aluminum 4-bolt-coupler Base with 20 ft Mtg. Ht. and 1 Mast Arm	LPA01-x-7-4-5	LAM01a	LBC01	LS-23.pdf	HAPCO
SL25/C01/A01-7-4-5/M01a1 Precisionform/HAPCO Aluminum 4-bolt-coupler Base with 25 ft Mtg. Ht. and 1 Mast Arm	LPA01-x-7-4-5	LAM01a	LBC01	LS-23.pdf	HAPCO
SL25/C01/A01-7-4-6/M01a1 Precisionform/HAPCO Aluminum 4-bolt-coupler Base with 25 ft Mtg. Ht. and 1 Mast Arm	LPA01-x-7-4-6	LAM01a	LBC01	LS-23.pdf	HAPCO
SL25/H01/A01-7-4-6/M01a1 HAPCO Aluminum Shoe Base with 25 ft Mtg. Ht. and 1 Mast Arm	LPA01-x-7-4-6	LAM01a	LBH01	LS-27.pdf	HAPCO
SL30/S01/A01-8-4-6/M01a1 HAPCO Aluminum Slip Base with 30 ft Mtg. Ht. and 1 Mast Arm	LPA01-x-8-4-6	LAM01a	LBS01	LS-29.pdf	HAPCO
SL35/S01/A01-8-4-8/M01a1 HAPCO Aluminum Slip Base with 35 ft Mtg. Ht. and 1 Mast Arm	LPA01-x-8-4-8	LAM01a	LBS01	LS-29.pdf	HAPCO
SL20/J01/A01-6-4-5/M01a1 HAPCO Aluminum Breakaway Joint 12591 Base with 20 ft Mtg. Ht. and 1 Mast Arm	LPA01-x-6-4-5	LAM01a	LBJ01	LS-65.pdf	HAPCO
SL25/J01/A01-7-4-5/M01a1 HAPCO Aluminum Breakaway Joint 12591 Base with 25 ft Mtg. Ht. and 1 Mast Arm	LPA01-x-7-4-5	LAM01a	LBJ01	LS-65.pdf	HAPCO
SL30/J01/A01-8-4-5/M01a1 HAPCO Aluminum Breakaway Joint 12591 Base with 30 ft Mtg. Ht. and 1 Mast Arm	LPA01-x-8-4-5	LAM01a	LBJ01	LS-65.pdf	HAPCO

Figure 2. List of systems found by the search page for a particular set of criteria.

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SL30/S01/A01-8-4-6/M01a1 (SLS01)

HAPCO Aluminum Slip Base with 30 ft Mtg. Ht. and 1 Mast Arm

		Search criteria:
Acceptance:	Submitted	
Test Specification:	Report 350	
Manufacturer:	HAPCO	
Base Type:	Slip Base (S)	
Arm Type:	Mast (M)	Mast (M)
Arm Length:	N/A	
Num. of Arms:	1 (arms)	1
Mounting Height:	30 (feet)	
Pole Length:	N/A	*Not searchable.*
Pole Base Diameter:	8.00 (inches)	
Pole Top Diameter:	4.50 (inches)	
Wall Thickness of Pole:	0.190 (inches)	*Not searchable.*
Max. Fixture Weight:	80 (lbs)	
Max. 3-Second Gust:	130 (mph)	
Contact:	Mr. Joe Bowman	*Not searchable.*
Last Updated:	July 2, 2010	*Not searchable.*
FHWA Acceptance Letters:	Letter LS-29	*Not searchable.*

Arm Component:	LAM01a
Pole Component:	LPA01-x-8-4-6
Base Component:	LBS01
General System:	SLS01

Max 3-Sec Gust Wind Speed (mph):	90	100	110	120	130	140	150
Max. EPA of Fixture (ft²)*	8	7	6	5	4	0	0

*EPA is estimated using conversion from 'fastest-mile' wind speed data. Please contact manufacturer for exac EPA values

Drawings	Other Documents
• SLS01.pdf	• ls-29.pdf • 3-Second Gust Wind Map.pdf

Figure 3. Example of on-line data presented for each luminaire support system

Task 3: Final Guide Development

The project team has begun the process of assembling new materials into the database. Some of the material is being solicited from manufacturers, some may be solicited from State DOTs and some will likely be produced by the research team itself. For example, the research team has had several phone and e-mail communications with Carl Macchietto of Valmont (a luminaire support manufacturer). Mr. Macchietto and his associates are currently reviewing the information that the research team is soliciting from manufacturers. The research team expects to start receiving data from Valmont in the early part of next quarter.

In general, the research team attempts to obtain as much material as possible from a variety of sources and only create new materials when they are not otherwise available. This allows the research team to stretch the resources of the project as far as possible to include as much new material as possible.

Task 4: Final Report

This task has not been initiated as yet.

Planned Activities for April-June 2010

The research team will continue to communicate with various luminaire pole manufacturer and State DOTs to gather data for the on-line guide and to identify areas for improvement in the Guide.

The research team will start on the development of a draft tutorial for the On-Line Guide. The tutorial will include information on:

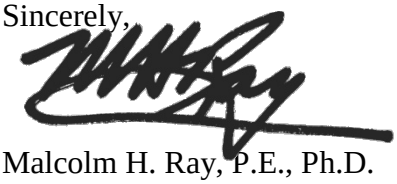
- How to use the Guide,
- How to submit data for inclusion into the Guide, and
- How to report errors and comments to the research team.

The tutorial may be developed in one or more formats including html, pdf , Microsoft Word, or Microsoft PowerPoint.

Contractual

The total expenditure for the work performed during this reporting period was $23,057.53. The total expenditure to-date for the project is $119,948.71. As usual, this quarterly progress report and all previous reports are available on-line at http://guides.roadsafellc.com/QPR.

Sincerely,



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Attachment A: Interim Report Presentation.