

Malcolm H. Ray, P.E., Ph.D.
 186 Staples Hill Road
 Canton Maine 04221

19 April 2010

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

RE: Quarterly Progress Report #10
 Update to “A Guide to Standardized Highway Lighting Pole Hardware”

Dear Mr. Fredrick:

This letter is the tenth 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 January 1, 2010 and March 31, 2010. The following paragraphs summarize the progress in the project during this time period.

Task 1: Determination of Standardized Lighting Poles and Hardware

The research team continues to work closely with personnel at HAPCO to organize the on-line website and to ensure proper functionality and accuracy of the guide. As mentioned in previous reports, the FHWA acceptance letters for luminaires generally cover a particular range of luminaire configurations. The FHWA letter generally applies to the breakaway functionality of the base for a specific range of pole dimensions and overall mass properties of the luminaire system. Unfortunately, manufacturers do not organize their catalogs based on FHWA approval of luminaire systems, but rather by specific combinations of base type, shaft type and arm type.

One particular challenge in the development of the Guide has been the conversion of the existing catalogs of luminaire systems into a format that is more consistent with the FHWA acceptance letter process. For example, FHWA letter LS-27 for the HAPCO four-bolt shoe base luminaire encompasses subsets of several different HAPCO luminaire systems. It would be a very difficult task for the research team, without the manufacturer’s help, to ‘sift’ through the thousands of possible luminaire configurations and identify those that correspond to each specific approval letter. Thus, it will be requested that manufactures provide the research team with a list of luminaire systems that correspond to the FHWA acceptance letter with specific information that accurately defines each system. An example is shown below in Table 1. It is noteworthy to mention that, according to HAPCO, more and more states are requesting breakaway luminaires, even for decorative poles.

Table 1: Example of system data that the research team will request from manufacturers.

Per Manufacturers Catalog			Letter No.	Material	Base Type	Crash Test Level	Test Specs	Mounting Height (ft)	Shaft Length (ft)	Maximum Fixture Weight (lb)	Max Wind Speed (mph)	Arm Type	Butt Diameter (in)	Top Diameter (in)	Wall Thickness (in)	Arm Length (ft)
Base Component Name	Pole Component Name	Arm Component Name														
4 Bolt Base (51 Series)	RT	-	LS-27	Aluminum	Shoe	3	Report 350	20	20	100	110	-	7	4.5	0.156	-
4 Bolt Base (51 Series)	RT	M	LS-27	Aluminum	Shoe	3	Report 350	20	17	69	110	Mast	7	4.5	0.156	6
4 Bolt Base (51 Series)	RT	M	LS-27	Aluminum	Shoe	3	Report 350	20	16	37	110	Mast	7	4.5	0.156	8
4 Bolt Base (51 Series)	RT	D	LS-27	Aluminum	Shoe	3	Report 350	20	15	75	110	Davit	7	4.5	0.156	4
4 Bolt Base (51 Series)	Rt	D	LS-27	Aluminum	Shoe	3	Report 350	20	14	75	110	Davit	7	4.5	0.156	6
4 Bolt Base (51 Series)	Rt	D	LS-27	Aluminum	Shoe	3	Report 350	20	13	75	110	Davit	7	4.5	0.156	8

Component and System Drawings

In addition to the data requested in table 1, the manufacturers will also be asked to provide basic drawings of the ‘general systems’, as well as for each primary component of the system (e.g., base, pole, and arm). The drawings will be in TF13 format. A template of the TF13 format can be found at <http://aashtotf13.tamu.edu/Guide/standards.html>.

For proprietary systems, the drawings will be generic in nature but provide sufficient information to describe the component to a potential buyer. Draft drawings were created by the research team for the HAPCO systems corresponding to FHWA Letter LS-27 and are provided in [Attachment A](#). These drawings are currently being revised by HAPCO and should be available for inclusion into the Guide early in the upcoming quarter.

Wind Speed and EPA

An important topic that should be discussed at the upcoming TF13 meeting is achieving consistency in maximum wind speed and Effective Projected Area (EPA) calculations. In general, most luminaire manufacturers have adopted, or are moving to adopt, the current AASHTO specifications for wind speed design based on three-second gust wind speed.¹ Some manufacturers, however, are still using the old AASHTO procedures to compute maximum wind speed based on fastest mile wind, which may lead to confusion for buyers comparing luminaire products from different manufacturers.² The change to the three-second gust wind speeds by AASHTO represented a major change in the specifications. One of the primary reasons for the change was because most national weather service stations currently record and archive *peak gust speeds* and not *fastest-mile wind speeds*. For consistency within the TF13 On-Line Guide, all wind speed data and EPA calculations should conform to the latest AASHTO specifications.

The wind speed map from Figure 3.2 of AASHTO’s *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* (2006) is shown below. This map is based on peak gust data collected at 485 weather stations and from predictions of hurricane speeds on the US Gulf and Atlantic coasts. The map represents the variation of the three-second gust wind speed over open terrain at a height of 10 m (32.8 ft) for a 50-year mean recurrence interval.

Table 2 and Table 3 show the EPA ratings for a HAPCO luminaire system (HAPCO catalog number RTA20B6B4) based on the fastest-mile wind speed and three-second gust, respectively, which clearly illustrates the difference in EPA calculations between the two methods. [Note: the values in Tables 2 and 3 were obtained directly from HAPCO.]

Table 2: EPA calculations for HAPCO pole RTA20B6B4 using fastest-mile wind speed.³

Fastest-Mile Wind Speed	70	80	90	100	110	120	130	140	150
Maximum EPA	9.8	6.7	4.9	3.8	3.0				

Table 3: EPA calculations for HAPCO pole RTA20B6B4 using three-second gust wind speed.³

Max 3-second Wind Gust	70	80	90	100	110	120	130	140	150
Maximum EPA			8.1	6.0	4.7	3.8	3	2.5	2

¹ *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition*, American Association of State and Highway Transportation Officials, 2009

² *Standard Specifications for Structural Supports for Highway Signs, Luminaires & Traffic Signals*, American Association of State and Highway Transportation Officials, 1994

³ The values in Tables 2 and 3 were obtained directly from HAPCO.

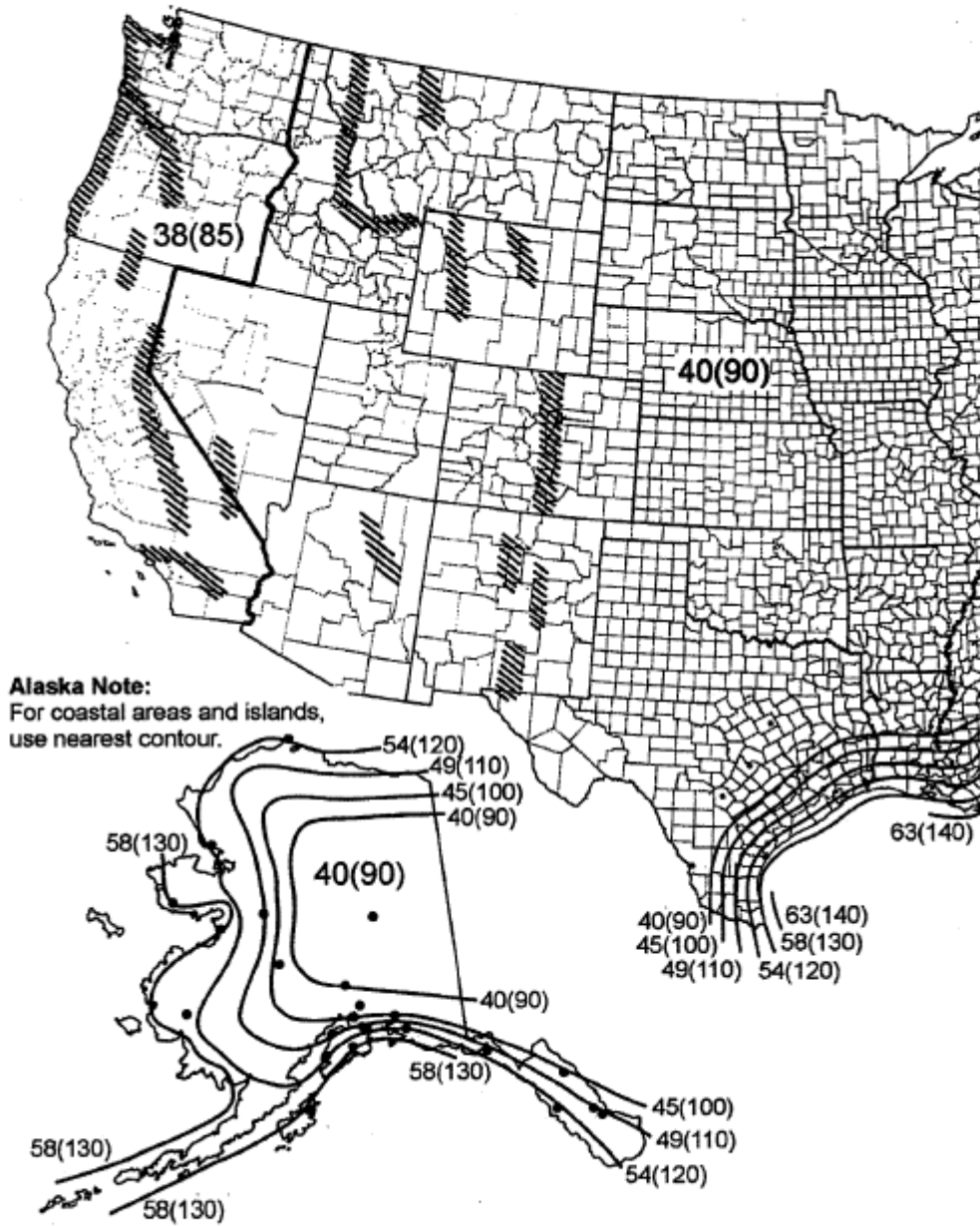
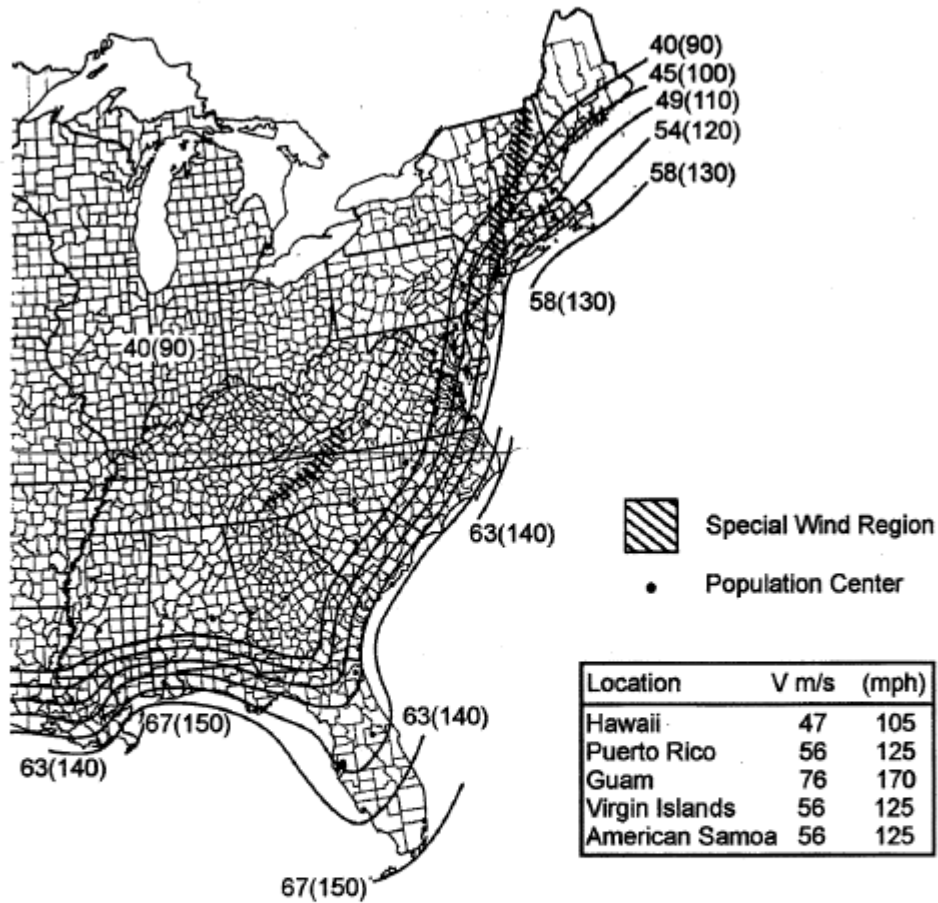


Figure 3-2. Basic Wind Speed, m/s (mph)

⁴ Figure Obtained From: Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition, American Association of State and Highway Transportation Officials, 2009



Notes:

1. Values are 3-second gust speeds in m/s (mph) at 10 m (32.8 ft) above ground for Exposure C category and are associated with an annual probability of 0.02 (50-year mean recurrence interval).
2. Linear interpolation between wind speed contours is permitted.
3. Islands and coastal areas shall use wind speed contour of coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions

Figure 3-2. Basic Wind Speed, m/s (mph) (continued)

5

⁵ Figure Obtained From: Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition, American Association of State and Highway Transportation Officials, 2009

Task 2: Prototype Guide Development

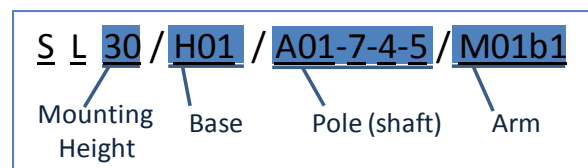
Programming of the Luminaire Guide website was the primary focus of the work this quarter. The Guide is now on-line and is fully functional. Note: The website has been moved to another server and the new web address is: <http://guides.roadsafellc.com/luminaireGuide/index.php>. The following sections provide a description of the Guide contents and how to use it. Some of the information was presented in the previous quarterly report; however, several changes have been made to the Guide during this quarter and those modifications are presented herein.

Nomenclature for naming luminaire systems and components

Figures 1 through 3 provide an annotated description of the suggested nomenclature for naming luminaire components (bases, poles and arms) in the Guide. The nomenclature for the luminaire components was discussed in depth in the previous Quarterly Report (refer to the January 19, 2010 quarterly report).

The luminaire systems in the Guide are defined in two ways: 1) *general systems* and 2) *specific systems*. The nomenclature for the *general systems* includes only five alphanumeric characters, for example SLH01. This naming convention is consistent with all the other TF13 Guides. The first two letters indicate that the nomenclature is defining a **S**ystem that is a **L**uminaire. The next three alphanumeric characters define the **base component**. The *general systems* basically provide a summary of the full *range* of system variables that are encompassed by the FHWA qualification letter, which is based on the physical tests conducted using a particular breakaway base component.

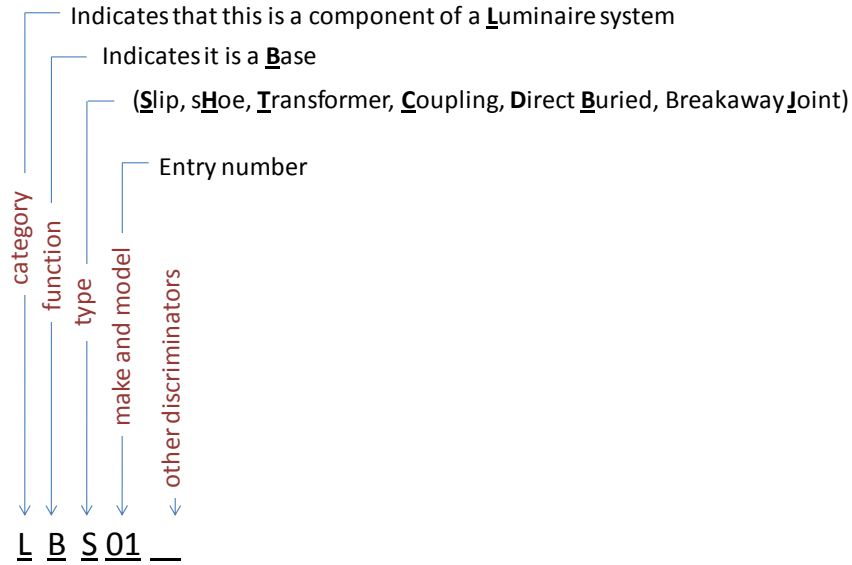
The nomenclature for the *specific systems*, on the other hand, is intended to provide key information that sufficiently and uniquely defines each system. An example of the suggested system nomenclature is illustrated in the figure to the right and in Figure 4. The system nomenclature includes mounting height, base component, pole component with critical dimensions, arm component with arm length and number of arms. The first two letters indicate that the nomenclature is defining a **S**ystem that is a **L**uminaire.



The following two numbers define the **mounting height** of the system. The next three alphanumeric characters define the **base component**. The next three alphanumeric characters define the pole component. The following three numbers define the pole's **base diameter** (width), **top diameter** (width), and **wall thickness**. The next four alphanumeric characters define the **arm component** and **length**, and the last number defines the **number of arms**. Figure 4 provides a more detailed annotation of the system nomenclature.

The *general* and *specific* systems will be discussed in more detail in the Webpage Format section.

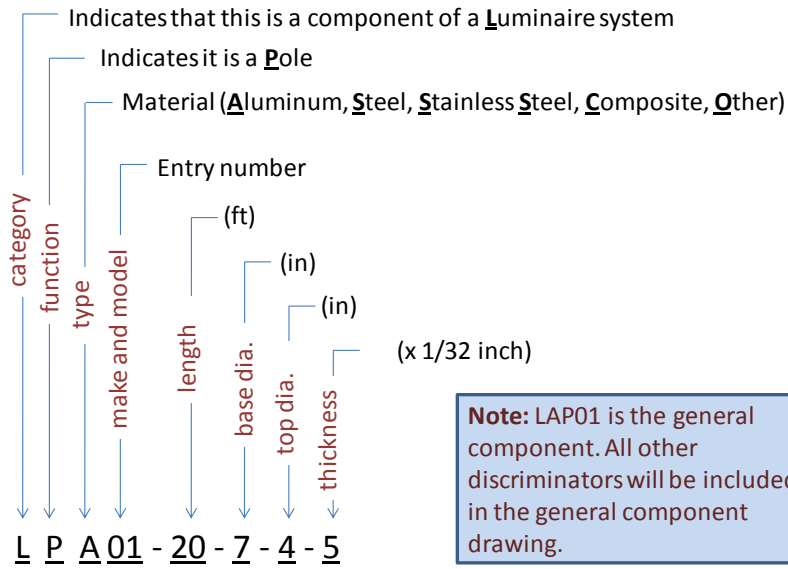
Base Nomenclature



It would be written like this:
LBS01

Figure 1: Naming convention for base components in the Guide

Pole Nomenclature



Note: LAP01 is the general component. All other discriminators will be included in the general component drawing.

It would be written like this:
LPA01-20-7-4-5

Figure 2: Naming convention for pole components in the Guide

Arm Nomenclature

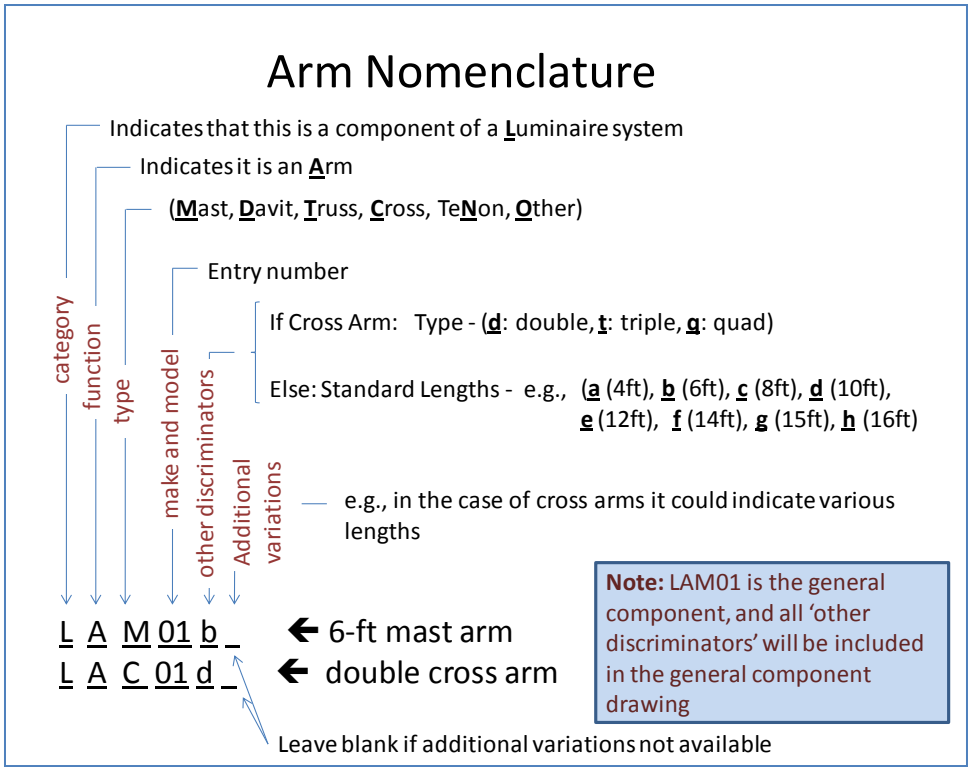


Figure 3: Naming convention for arm components in the Guide

Specific System Nomenclature

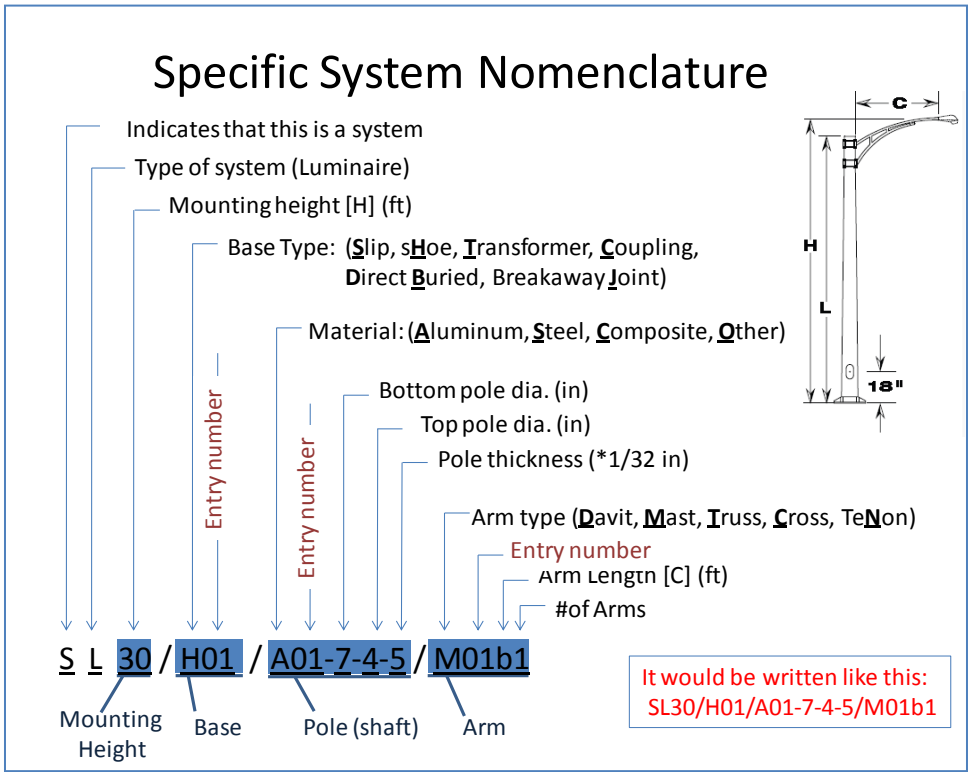


Figure 4: Naming convention for specific systems in the Guide

Webpage Format

There are two ways to search for luminaire systems using the Luminaire Guide: a *Browse Option* and a *Search Option*. When a system is selected using the *Browse* option, the user will be directed to a page with general information about the system, including the general system name, total number of specific system configurations, base component, manufacture, material type and FHWA acceptance letter number (i.e., refer to the example page in Figure 5).

Browse Generalized Luminaires				
<i>Click on a column heading to arrange the list in order of that luminaire characteristic.</i>				
Name	BaseComponent	Manufacturer	Material	FHWAAcceptanceLetter
SLC01 413 configuration(s).	LBC01	HAPCO	Aluminum	LS-23pdf
SLH01 95 configuration(s).	LBH01	HAPCO	Aluminum	LS-27pdf

Figure 5: Example of luminaire system information listed on the *Browse* page.

Browse Option and General System Page

When a system is selected from the Browse Page, the user will be directed to a General System page that lists all the basic options or a *range* of options where appropriate. The General System page provides a summary of the complete *range* of system variables that are encompassed by the FHWA acceptance letter, which is based on the physical test(s) conducted using a specific breakaway base component. For example, Figure 6 shows the General System SLH01. There are 95 different configurations of the SLH01 shoe base system that meet the safety criteria of NCHRP Report 350 according to FHWA letter number LS-27. The General System page also includes the option displaying a photograph of the system, as well as drawings and other associated documents and images.

Another important feature of the General System page is a *search option* that allows the user to search for specific configurations of that general system that meet specific search criteria, including, pole mounting height, maximum fixture weight, number of arms and maximum wind speed. Figure 7 shows an example of a search on the General System SLH01, for those configurations that have a maximum mounting height of 20 ft, maximum fixture weight of 100 lb, two mast arms and a design wind speed of 110 mph (note: database currently uses fastest-mile wind speed, which will be converted to three-second gust speed in next update of the database). In this case, four specific configurations of the general system SLH01 were identified.

Online Guide To Luminaires

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SLH01: General System

This page provides only general information about this system. To view the specific configurations of this system, use the search criteria at the bottom of this page. To search through specific configurations of all systems, please use the [Search Luminaires](#) page.

Specific Configurations:	95 specific systems
Acceptance:	TF13 Approved
FHWA Acceptance Letters:	LS-27.pdf
Test Specification:	Report 350
Manufacturer:	HAPCO
Base Type:	Shoebase (H)
Base Component:	LBH01
Arm Type:	Tenon (N) Davit (D) Cross (C) Mast (M) Truss (T)
Num. of Arms:	1, 2, 3, 4 (arms)
Mounting Height:	20, 25, 30 (feet)
Fixture Weight:	25 to 100 (lbs)
Maximum Wind Speed:	70 to 110 (mph)
Contact:	Mr. Joe Bowman (Click for details)

No photograph available.

Drawings	Other Documents	Images
• No files found.	• No files found.	• Thumbnail Gallery

Search Specific Configurations of SLH01

Pole/Mounting Height to ft

Fixture Weight to lbs

Number of Arms

Arm Type

Wind Speed to mph

Figure 6: Example of information provided for luminaire systems selected from the Browse Page.

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SLH01: General System

This page provides only general information about this system. To view the specific configurations of this system, use the search criteria at the bottom of this page. To search through specific configurations of all systems, please use the [Search Luminaires](#) page.

Specific Configurations:	95 specific systems
Acceptance:	TF13 Approved
FHWA Acceptance Letters:	L 3-27.pdf
Test Specification:	Report 350
Manufacturer:	HAPCO
Base Type:	Shoebase (H)
Base Component:	LBH01
Arm Type:	Tenon (N) Davit (D) Cross (C) Mast (M) Truss (T)
Num. of Arms:	1, 2, 3, 4 (arms)
Mounting Height:	20, 25, 30 (feet)
Fixture Weight:	25 to 100 (lbs)
Maximum Wind Speed:	70 to 110 (mph)
Contact:	Mr. Joe Bowman (Click for details)

No photograph available.

Drawings	Other Documents	Images
• No files found.	• No files found.	• Thumbnail Gallery

Search Specific Configurations of SLH01

Pole/Mounting Height to ft
 Fixture Weight to lbs
 Number of Arms
 Arm Type
 Wind Speed to mph

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

Name/Designator	Pole Component	Arm Component	Base Component	# of Arms	Fixture Weight (lbs)	Max. Wind Speed (mph)
HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA01-20-7-4-5	LAM01b	LBH01	2	69	110
HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA01-20-7-4-5	LAM01c	LBH01	2	37	110
HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA01-20-7-4-6	LAM01b	LBH01	2	69	110
HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA01-20-7-4-6	LAM01c	LBH01	2	37	110

Figure 7: Example of information provided on the General System page using the general systems Search Criteria.

Search Option and Specific System Page

Whereas, the search option on the General System page only searches through the configuration options of a single ‘general system’, the *Search Luminaires Option* located on the left hand side of the webpage in the Navigation List allows the user to search through the entire database for all luminaire systems that meet desired search criteria. In this case the search criteria is expanded to include manufacture, test specification, material type, base type, pole mounting height, maximum fixture weight, number of arms and maximum wind speed. If a search is made using the *Search Luminaires Option* from the Navigation List to search through the database for systems that exactly match

the search criteria used in the example in Figure 7, the Guide will return a list of all the specific luminaire configurations that meet those criteria, which would include the subset of SLH01 systems that were identified in Figure 7.

For example, a search for all HAPCO Aluminum Shoe Base systems, with an unapproved TF13 status, that meets NCHRP Report 350, has a 20-ft mounting height, can carry a maximum fixture weight of 100 lbs, on two mast arms, and is designed for a maximum 90 mph fastest-mile wind velocity, yields the results shown in Figure 8. The search provides a list of systems and identifies the specific base, pole and arm components that make up each system, as well as providing direct links to those components. The list also includes the manufacture of the system and the FHWA acceptance letter number. In this example, the search found ten specific luminaire systems that met the search criteria. The list also shows that these ten specific systems are subsets of two general shoe base systems: namely, SLH01 and SLH03.

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Search Luminaires

Acceptance: TF13 Approved

Test Specification: Report 350

Manufacturer: Any Manufacturer

Material: Aluminum

Base Type: Shoebase (H)

Pole/Mounting Height: 0 to 20 ft

Fixture Weight: Minimum to 100 lbs

Number of Arms: 2

Arm Type: Mast (M)

Wind Speed: 90 to Maximum mph

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

Name/Designator	Pole Component	Arm Component	Base Component	Acceptance Letter	Manufacturer
SLH01 HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA01-20-7-4-5	LAM01b	LBH01	LS-27.pdf	HAPCO
SLH01 HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA01-20-7-4-5	LAM01c	LBH01	LS-27.pdf	HAPCO
SLH01 HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA01-20-7-4-6	LAM01b	LBH01	LS-27.pdf	HAPCO
SLH01 HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA01-20-7-4-6	LAM01c	LBH01	LS-27.pdf	HAPCO
SLH03 HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA12-20-6-4-5	LAM01a	LBH03	LS-32.pdf	HAPCO
SLH03 HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA12-20-6-4-5	LAM01b	LBH03	LS-32.pdf	HAPCO
SLH03 HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA12-20-6-4-5	LAM01c	LBH03	LS-32.pdf	HAPCO
SLH03 HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA12-20-6-4-6	LAM01a	LBH03	LS-32.pdf	HAPCO
SLH03 HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA12-20-6-4-6	LAM01b	LBH03	LS-32.pdf	HAPCO
SLH03 HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms	LPA12-20-6-4-6	LAM01c	LBH03	LS-32.pdf	HAPCO

Subset of systems identified in Figure 7 from the General Page search

Figure 8: Example of possible results from using the Search Luminaires Option from the Navigation List

Selecting a system from the search results page will direct the user to a page that provides a detailed description of the system; this page will also echo the search criteria. Figure 9 shows an illustrative example of how the information is presented on the website.

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HAPCO Aluminum Shoe Base with 20ft Pole and 2 Mast Arms (SLH01)

		Search criteria:
Acceptance:	TF13 Approved	TF13 Approved
FHWA Acceptance Letters:	Letter LS-27	
Test Specification:	Report 350	Report 350
Manufacturer:	HAPCO	HAPCO
Base Type:	Shoebase (H)	Shoebase (H)
Arm Type:	Mast (M)	Mast (M)
Num. of Arms:	2 (arms)	2
Mounting Height:	20 (feet)	0 < x < 20
Fixture Weight:	37 (lbs)	
Maximum Wind Speed:	110 (mph)	
Contact:	Mr. Joe Bowman	
Last Updated:	March 23, 2010	

Arm Component:	LAM01c
Pole Component:	LPA01-20-7-4-5
Base Component:	LBH01

No photograph available.

Drawings	Other Documents	Images
<ul style="list-style-type: none"> • No files found. 	<ul style="list-style-type: none"> • No files found. 	<ul style="list-style-type: none"> • Thumbnail Gallery

Existing Comments

[Click here to post a new comment.](#)

There are no comments for this system yet.

Figure 9: Illustrative example of how the information will be presented on the website

Note: For cases where a system includes components from multiple manufacturers, such as luminaire system SLC01 which uses HAPCO pole and arms with a PrecisionForm four-bolt coupling base, the General and Specific System pages will only list the manufacturer that markets the complete system – in this case, HAPCO. The General and Specific System pages, however, will include the names of each of the system’s components with a link to the associated Component pages. The Component page will include all pertinent information related to the component, including manufacture of that particular component.

Task 3: Final Guide Development

This task has not been initiated as yet.

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 personnel from HAPCO to complete the data entry for the systems currently in the database (e.g., component drawings, system drawings, other documentation, and photos). The research team will also attend the Spring meeting of TF13 and present the status of the project to the Luminaire subcommittee members.

Contractual

The total expenditure for the work performed during this reporting period was \$19,924.67. The total expenditure to-date for the project is \$87,891.18. This quarterly report and all previous quarterly reports are posted on the Internet at <http://guides.roadsafellc.com/QPR> .

Sincerely,

A handwritten signature in black ink, appearing to read "M. Ray", with a long horizontal flourish extending to the right.

Malcolm H. Ray, P.E., Ph.D.