

**Goss
Samford**

ATTORNEYS AT LAW | PLLC

Mark David Goss
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(859) 368-7740

February 23, 2018

RECEIVED

FEB 23 2018

PUBLIC SERVICE
COMMISSION

VIA HAND DELIVERY

Gwen R. Pinson, Executive Director
Kentucky Public Service Commission
211 Sower Boulevard
Frankfort, KY 40602

Re: IN THE MATTER OF: APPLICATION OF BIG SANDY RURAL ELECTRIC
COOPERATIVE CORPORATION FOR A GENERAL ADJUSTMENT OF EXISTING
RATES - Case No. 2017-00374

Ms. Pinson:

Please find enclosed and accept for filing on behalf of Big Sandy Rural Electric Cooperative Corporation: (i) an original and ten (10) copies of Big Sandy's Response to Commission Staff's Fourth Request for Information propounded February 15, 2018 (including eleven (11) identical compact discs); and (ii) an original and ten (10) copies of Big Sandy's Third Supplemental Response to Commission Staff's First Request for Information, Item 34, propounded September 27, 2017.

Please return a filed-stamped copy of both the Response and the Supplemental Response to me. I appreciate your assistance with this matter, and please do not hesitate to contact me with any questions or concerns.

Respectfully submitted,



Mark David Goss

Enclosures .

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FEB 23 2018

PUBLIC SERVICE
COMMISSION

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF BIG SANDY RURAL ELECTRIC)
COOPERATIVE CORPORATION FOR A GENERAL) Case No. 2017-00374
ADJUSTMENT OF EXISTING RATES)

**BIG SANDY RURAL ELECTRIC COOPERATIVE CORPORATION'S
RESPONSE TO COMMISSION STAFF'S FOURTH REQUEST FOR INFORMATION**

Filed: February 23, 2018

Big Sandy Rural Electric Cooperative Corporation
Case No. 2017-00374
Commission Staff's Fourth Request for Information

1. Refer to Big Sandy's response to Staff's Second Request for Information, Item 9. Explain why Big Sandy offered and provided the individual lights listed in the Application, Exhibit JW-9, page 7 of 9, given that Big Sandy's current Schedule YL-1 does not set forth those particular lights in its current Commission-approved tariff.

Response:

Big Sandy provided the lights listed in the Application, Exhibit JW-9, page 7 of 9 to its members because the lights listed in the current tariff were unavailable. In 2005, Congress passed a law banning the sale of mercury vapor ("MV") ballasts as of 2008. No new fixtures could be sold, and as existing ballasts failed, they had to be replaced with other lamp types. As a result, manufacturers stopped producing those lights and instead produced other options with similar light-producing capabilities, including the 100 Watt Metal Halide ("MH") option and various Light Emitting Diode ("LED") lighting options, all of which provide a roughly-equivalent amount of lumens as the MV lights specified in the current tariff.

The current tariff specifies the Type of Service as "single-phase, 120 volts, mercury vapor type *or equivalent lighting unit*" (emphasis added). Big Sandy considered the lights listed in Exhibit JW-9 to be "equivalent" for member installations under the current tariff.

In order to further clarify this practice—and to account for the rapidly-emerging changes in lighting technology described in Big Sandy's Response to Commission Staff's Second Request for Information, Item 9—Big Sandy is proposing that additional language be added to the tariff to specify the range of lumens within which lights should be considered "equivalent" for the purpose of establishing monthly lighting charges. No increases to the current charges are proposed.

Big Sandy Rural Electric Cooperative Corporation
Case No. 2017-00374
Commission Staff's Fourth Request for Information

2. Refer to Big Sandy's response to Commission Staff's Third Request for Information, Item 4, page 2 of 2.
 - a. Provide support for the annual energy usage for each light.
 - b. Provide an electronic version of Lighting Cost Support table in Excel spreadsheet format with all formulas intact and unprotected, and with all columns and rows accessible.
 - c. Refer to the footnotes of the exhibit.
 - 1) Refer to Note 1, 2. Provide justification for the Input Watts and Lumen information given by the manufacturer. These can be provided in the form of invoices.
 - 2) Refer to Note 3. Provide a breakout of the cost for installation. Include the cost for each variable as it affects the total cost of installation.
 - 3) Refer to Note 6. Explain how the \$0.1088/kWh rate was determined. Provide support for the calculation.
 - 4) Refer to Note 7. Provide support for the estimates on bulb life, parts, and labor per fixture.

Response:

- a. The annual energy usage for each light was developed in one of several ways, primarily depending on the relevant light type and available data. In some instances, annual energy usage was calculated based on nominal lamp wattage (provided by the manufacturer) at an assumed usage of 4,140 hours per year. This method was primarily used for the LEDs. For some of the non-LED lights, the annual usage was estimated as the nominal lamp wattage plus the estimated ballast load or fixture usage at an assumed usage of 4,140 hours per year. With respect to certain MH and MV lights, historical data from metered lights provided support for the annual energy usage estimate. See the "Cost" tab in the file provided in response to part (b) below.
- b. An electronic version of the Lighting Cost Support table is provided in Excel spreadsheet format on the enclosed compact disc.

c.

- 1) The technical specifications for each light listed in Exhibit JW-9, page 7 of 9, are provided on Page 3 through Page 13 of this Response.
- 2) Big Sandy developed the estimated cost for installation for each light by randomly selecting a small sample of work orders from original lighting installations and averaging these amounts to determine the value of cost for installation provided in the table. For the MV lights, these work orders dated back to 2007-2009, and for the LED lights, the work orders were more recent. A small sample of about three work orders was randomly selected for each type of light (except for the 150 W HPS bulbs used by the City of Prestonsburg for which only one work order was available). The work orders represent the actual costs of the installations, including costs for materials, transportation, labor, and overheads, at the time those jobs were completed. Due to the overall process that was used (*i.e.*, estimating costs from the top down by averaging sample work order costs as opposed to bottom-up cost estimation), specific individual costs for each variable were not used.
- 3) The \$1.088/kWh is the average all-in retail rate of Big Sandy's proposed rates for all rate classes divided by the total test year energy consumption. Specifically, the rate is the total proposed revenue of \$23,465,643 (from Exhibit JW-9, page 1 of 9, Total Proposed Revenue) divided by the total consumption of 215,688,148 kWh (from Exhibit JW-9, page 8 of 9, kWh):

$$\text{\$23,465,643} / \text{215,688,148 kWh} = \text{\$0.1088/kWh}$$

- 4) The estimates on bulb life, parts, and labor per fixture are included on Tab "AnnualMaint" in the file provided in response to part (b) of this Item, along with explanatory comments. Specifically, the data provided for each fixture includes bulb life, parts, part costs, labor for one maintenance visit, maintenance frequency, total cost per one trip, and average annual cost.



TECHNICAL BULLETIN

HIGH PRESSURE SODIUM

Sunlux®
LU150/55

ANSI Code: S55

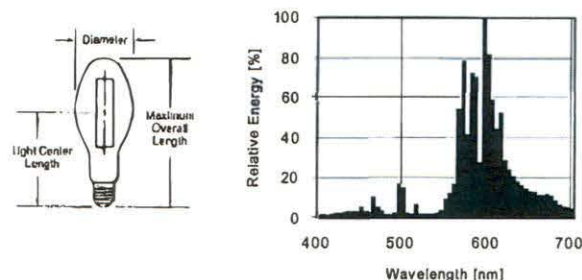
Product Code: 65347

| | |
|------------------|--|
| Features: | <ul style="list-style-type: none"> • Long life • Low cost efficient lighting • Universal burning position • Nickel Plated Base w/ceramic insulator |
|------------------|--|

PERFORMANCE DATA

| | | |
|---|--------------|------|
| Initial lumens at rated watts after 100 hours operation | 16000 | lm |
| Mean lumens at 10' hours/start | 13800 | lm |
| Rated average life | 24000+ | h |
| Warm up time (90% lumens) | 5 | min |
| Correlated color temperature | 1900 | K |
| CIE chromaticity | 0.525, 0.415 | x, y |
| Color rendering index | 22 | |
| Operating Position | Any | |
| Hot Re-strike time | <3 | min |

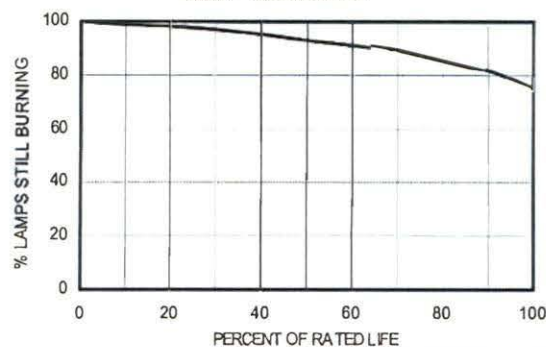
SPECTRAL DISTRIBUTION



ELECTRICAL CHARACTERISTICS

| | | |
|-----------------------------|--------------------------------------|------------------|
| Nominal lamp wattage | 150 | W |
| Nominal lamp voltage | 55 | V |
| Nominal lamp current | 3.2 | A _{rms} |
| Current crest factor (max.) | 1.80 | |
| Max. starting current | 4.8 | A _{rms} |
| Min. starting current | 3.2 | A _{rms} |
| Ballast requirements | Use with ballast rated for S55 lamps | |

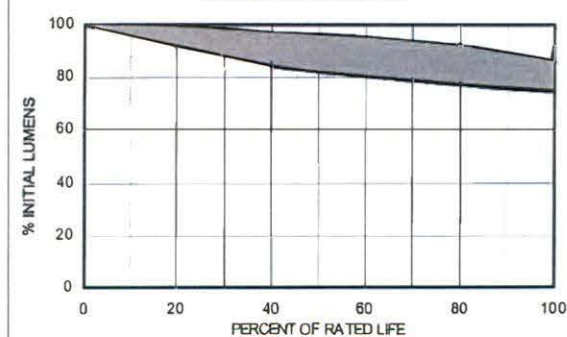
LAMP MORTALITY



PHYSICAL DESCRIPTION

| | | |
|----------------------------------|---------------------------|---------|
| Maximum overall length | 197 (7.75) | mm (in) |
| Light center length | 127 (5.00) | mm (in) |
| Bulb diameter | 74.6 (2.94) | mm (in) |
| Base to bulb eccentricity (max.) | 3 | Degrees |
| Maximum base temperature | 210 (410) | °C (°F) |
| Maximum bulb temperature | 400 (752) | °C (°F) |
| Bulb designation | ED23.5 | |
| Bulb material | Borosilicate (Hard Glass) | |
| Arc tube material | PCA | |
| Arc length | 40 (1.57) | mm (in) |
| Bulb finish | Clear | |
| Base designation | Mogul (E39) | |

LUMEN MAINTENANCE



OSHAS 18001:2007 Certified ISO 17025:2005 Accredited ISO 9001:2008 Certified ISO 14001:2004 Certified



EYE LIGHTING
INTERNATIONAL

Address: 9150 Hendricks Rd., Mentor, OH 44080
Phone: 888-65-LAMPS Fax: 800-811-7395 E-Mail: sales@eyelighting.com
Phone: (440) 350-7000 Fax: (440) 350-7001 www.eyelighting.com



INDEPENDENT TESTING LABORATORIES, INC.
 4066 CAMELOT CIRCLE, LONGMONT, CO 80504 USA

PHONE: (303)442-1255 • FAX: (970)535-3114 • E-MAIL: itl@itlboulder.com • WEBSITE: www.itlboulder.com
 REPORT NUMBER: ITL88130-SPHERE
 DATE: 08/18/16
 PREPARED FOR: EVLUMA
 CATALOG NUMBER: AMAX-70-4K-6-V-D-S3-0

70 WATT LED

RESULTS:

| PHOTOMETRIC | |
|---------------------------------|-------------------|
| Total Integrated Flux (lumens) | 7583 * |
| SPECTRORADIOMETRIC | |
| Observer | CIE 1931 2 degree |
| Chromaticity Ordinate x | 0.3864 |
| Chromaticity Ordinate y | 0.3844 |
| Observer | CIE 1976 2 degree |
| Chromaticity Ordinate u' | 0.2259 |
| Chromaticity Ordinate v' | 0.5058 |
| Correlated Color Temp CCT (K) | 3900 |
| ANSI C78.377-2008 Duv | 0.002 |
| Total Radiant Flux (milliWatts) | 22295 * |
| Scotopic / Photopic Lumen Ratio | 1.499 |
| ELECTRICAL | |
| Input Voltage (Volts AC) | 120.0 |
| Input Current (Amps AC) | 0.579 |
| Input Power (Watts) | 69.3 |
| Input Power Factor (%) | 99.7 |
| Input Current THD (%) | 6.6 |
| Input Voltage THD (%) | 0.2 |
| EFFICACY (lumens/Watt) | 109.4 |

| COLOR RENDERING INDICES | CRI |
|---------------------------------|-----|
| Ra (Average 1-8) | 72 |
| R1 Light greyish red | 70 |
| R2 Dark greyish yellow | 76 |
| R3 Strong yellowish green | 83 |
| R4 Moderate yellowish green | 74 |
| R5 Light bluish green | 70 |
| R6 Light blue | 69 |
| R7 Light violet | 79 |
| R8 Light reddish purple | 55 |
| R9 Strong red | -24 |
| R10 Strong yellow | 46 |
| R11 Strong green | 72 |
| R12 Strong blue | 48 |
| R13 Light yellowish pink (skin) | 70 |
| R14 Moderate olive green (leaf) | 90 |

*NOTE: The total lumen output shown on this report was obtained from photometric test ITL88130-GONIOPHOTOMETRY



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29-Mar-2012

American Electric Lighting Launches LED Security Luminaires

Image (1)

Acuity Brands, Inc. is pleased to announce the launch of the LED NEMA Head Series (LNH) luminaire from American Electric Lighting®. The LNH luminaire maintains the familiar NEMA Head aesthetic, but uses LED technology to produce a comfortable and efficient white light that significantly reduces operating costs and extends the fixture life.

Intended for security areas, storage yards, rural areas, area lighting, loading and receiving areas, the LNH luminaire features:

- o More than 65 percent energy cost reduction compared to 175MV HID
- o A 50 percent reduction in maintenance costs compared to HID
- o An estimated 20-year product life

"The new LNH luminaire is the right choice when it comes to sustainable security lighting solutions," said Rob Drago, VP Infrastructure Lighting, Acuity Brands. "Security is a prime concern for many facilities and municipalities, and the LNH luminaire uses efficient white light to improve visibility, ensuring key areas are well lit from dusk to dawn."

Consuming only 60 watts of input power, the LNH luminaire reduces CO2 emissions by .4 metric tons annually. The significant reduction in energy use and lighting maintenance coupled with the extremely long life of the LNH luminaire results in a fixture that provides the lowest total cost of ownership.



[MORE INFO](#)

[DOWNLOAD](#)

American Electric Lighting Launches LED Security Luminaires

[View More Related Media](#)



MEDIA CENTER

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MEDIA CONTACTS

Neil Egan
Acuity Brands
United States
Neil.Egan@acuitybrands.com
770-860-2957

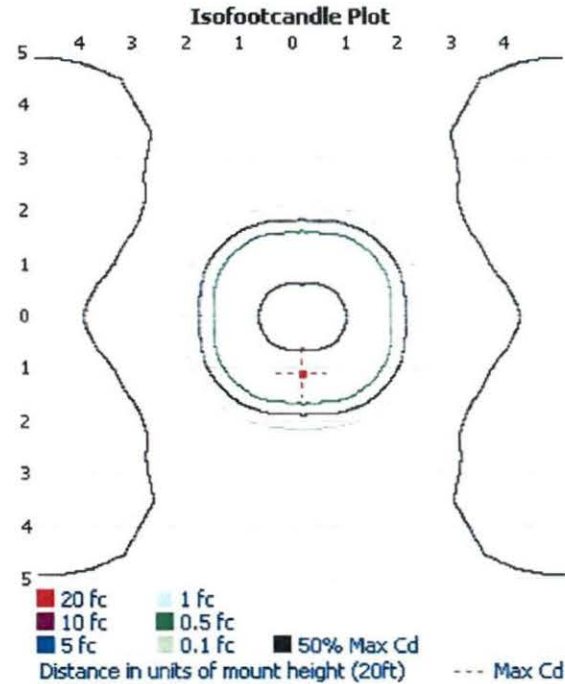
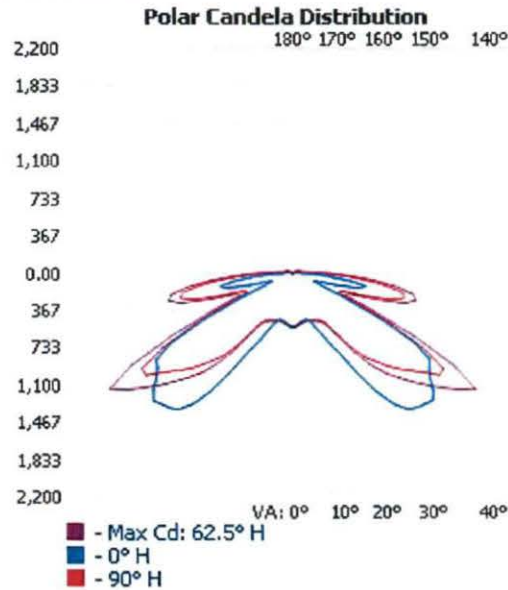
All other inquiries:
info@acuitybrands.com

OUTDOOR PHOTOMETRIC REPORT

CATALOG: LNH2 LU5 XXXXX R5 SA

TEST #: LTL28345P1
 TEST LAB: SCALED PHOTOMETRY
 TEST DATE: 6/11/2015
 CATALOG: LNH2 LU5 XXXXX R5 SA
 DESCRIPTION: LNH2 LED NEMA HEAD 64W LED TYPE 5 OPEN BOTTOM SM. ACRYLIC REFRACTOR
 SERIES: SERIES LNH2
 LAMP: LED
 LAMP OUTPUT: **TOTAL LUMINAIRE LUMENS: 6587.9, ABSOLUTE PHOTOMETRY ***
 BALLAST / DRIVER: LED DRIVER
 INPUT WATTAGE: 64
 LUMINOUS OPENING: VERTICAL CYLINDER (DIA : 9", H: 3")
 MAX CD: 2,109.6 AT HORIZONTAL: 62.5°, VERTICAL: 57.5°
 ROADWAY CLASS: TYPE VS

65 WATT
LED



*TEST BASED ON ABSOLUTE PHOTOMETRY WHERE LAMP LUMENS=LUMENS TOTAL.



InductionLightingFixtures.com
FACTORY DIRECT WAREHOUSE

1.855.ILF.BULB
info@inductionlightingfixtures.com

LAMP

INDUCTION

ILRLB80 • ILRLB100 • ILRLB120 • ILRLB150

DESCRIPTION

The ILRLB round-loop induction lamp is a low frequency electrode less discharge (LFED) unit.

FEATURES

- Lamp envelope is constructed of a high-temperature silicon glass, and solid amalgam channel in a sealed unit
- Dual external inductors at fixed point surrounding envelope
- UL\C-UL listed to US and Canadian safety standards for ambient operation from -40°F to 122°F (-40°C to 50°C)

PRODUCT INFORMATION

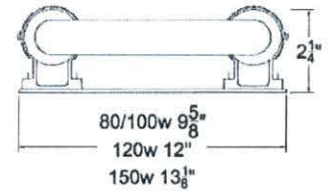
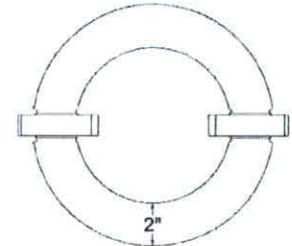
| MODEL | LAMP STYLE | WATTS | VOLTAGE | FLUX |
|----------|------------|-------|-----------|----------|
| ILRLB80 | ROUND | 80 | 120v-277v | 6,500Lm |
| ILRLB100 | ROUND | 100 | 120v-277v | 8,100Lm |
| ILRLB120 | ROUND | 120 | 120v-277v | 9,600Lm |
| ILRLB150 | ROUND | 150 | 120v-277v | 12,000Lm |

LAMP

A long lifetime rating of 100,000 hours or about 23 years operating hours 12 hours per 7 days per week.

WARRANTY

Lamp & Ballast guaranteed for 5 years against manufacturing defects.



Lamp Dimensions



TECHNICAL BULLETIN METAL HALIDE

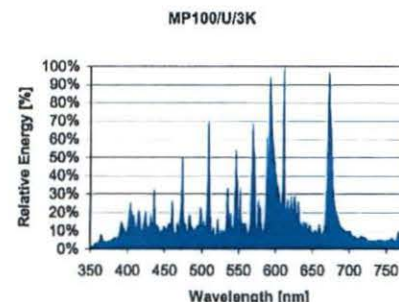
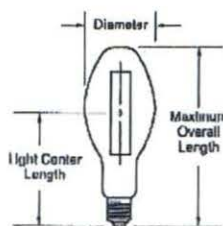
**EYE Multi Metal™
MP100/U/3K**

ANSI Code: M90/O

Product Code: 56650

| | | |
|------------------|---|------------------------------|
| Features: | ▪ Open Fixture Rated | ▪ Universal burning position |
| | ▪ Superior lamp to lamp color consistency | |
| | ▪ High initial and maintained lumens | |

| PERFORMANCE DATA | | |
|---|----------------------|------|
| Initial lumens at rated watts after 100 hours operation | 8500 | lm |
| Mean lumens at 10 hours/start | 5600 | lm |
| Rated average life | 15,000 V 10,000 H | h |
| Warm up time, maximum | 4 | min |
| Correlated color temperature | 3000 | K |
| CIE chromaticity | 0.426, 0.382 | X, Y |
| Color rendering index (Ra) | 75 | |
| Operating Position | Universal | |
| Time to hot re-start, typical | 15-20 | min |

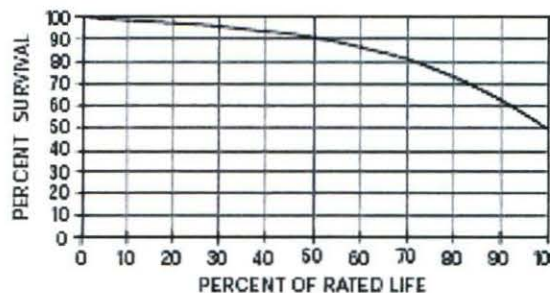


| ELECTRICAL CHARACTERISTICS | | |
|---|--|-------------------|
| Nominal lamp wattage | 100 | W |
| Nominal lamp voltage | 100 | V |
| Nominal lamp current | 1.1 | A _{rms} |
| Maximum current crest factor | 1.8 | - |
| Maximum starting current | 1.5 | A _{rms} |
| Minimum starting current | 1.1 | A _{rms} |
| Ballast requirements | Use with ballast rated for ANSI M90/O lamp | |
| Open circuit voltage (CWA) -30°C (-22°F) | 235 | V _{rms} |
| | 332 | V _{peak} |
| Pulse requirements | 3kV -4kV max. | |
| Lampholder voltage rating | 4 | kV |

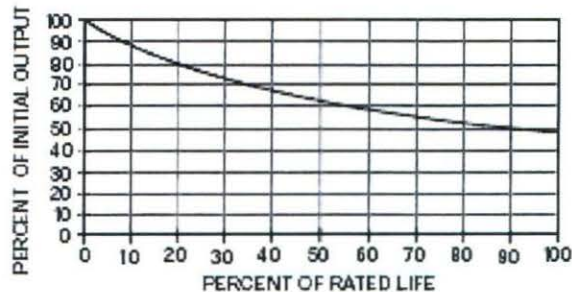
| PHYSICAL DESCRIPTION | | |
|-------------------------------|---------------------------|---------|
| Maximum overall length | 138 (5.43) | mm (in) |
| Light center length | 86 (3.39) | mm (in) |
| Bulb diameter | 54 (2.125) | mm (in) |
| Max. base - bulb eccentricity | 3 | Degrees |
| Maximum base temperature | 210 (410) | °C (°F) |
| Maximum bulb temperature | 400 (752) | °C (°F) |
| Bulb designation | E17 | |
| Bulb material | Borosilicate (Hard Glass) | |
| Arc tube material | Quartz | |
| Effective arc length | 14 (0.55) | mm (in) |
| Bulb finish | Clear | |
| Base designation | E26 Medium | |

| FIXTURE REQUIREMENT |
|------------------------------------|
| O Rated – Open Fixture Permissible |

Typical Mortality Curve



Typical Lumen Depreciation



ISO 9001:2008 Certified ISO 14001:2004 Certified

OSHAS 18001:2007 Certified ISO 17025:2005 Accredited



**EYE LIGHTING INTERNATIONAL
OF NORTH AMERICA, INC.**
A SUBSIDIARY OF IWASAKI ELECTRIC CO., LTD.

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TECHNICAL BULLETIN

MERCURY VAPOR LAMP

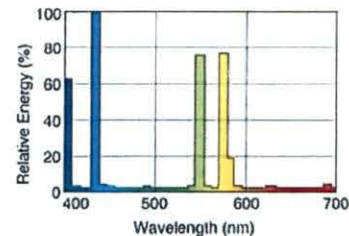
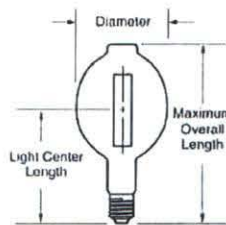
Mercury Vapor H175

ANSI Code: H39

Product Code: 69770

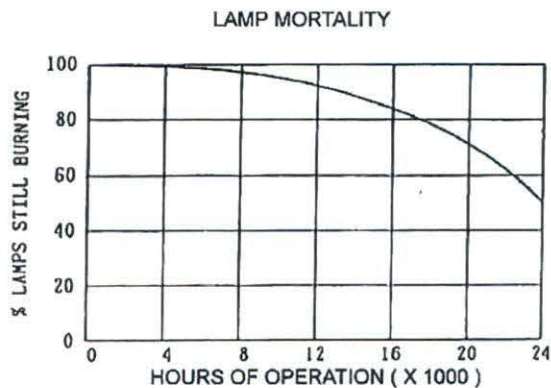
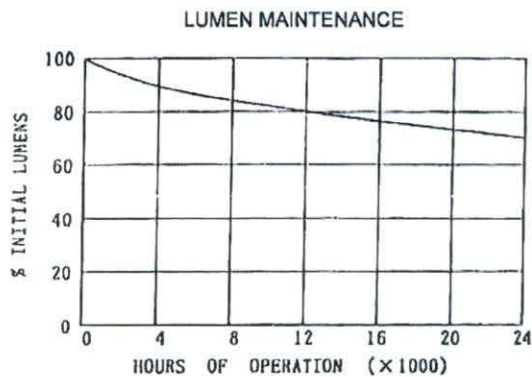
| | | |
|------------------|--|---|
| Features: | <ul style="list-style-type: none"> Long life Nickel-plated base Rugged construction | <ul style="list-style-type: none"> Applications: Roadway, Landscape Factory, Sports, Parking, Security |
| | | |

| PERFORMANCE DATA | | |
|---|--------------|------|
| Initial lumens at rated watts after 100 hours operation | 7800 | lm |
| Mean lumens at 10 hours/start | 6365 | lm |
| Rated average life | 24000 | h |
| Warm up time (90% lumens) | 4 | min |
| Correlated color temperature | 5700 | K |
| CIE chromaticity | 0.327, 0.381 | x, y |
| Color rendering index | 20 | |
| Operating Position | Universal | |
| Time to hot re-start (max) | 10 | min |



| ELECTRICAL CHARACTERISTICS | | |
|-----------------------------|------|-------------------|
| Nominal lamp wattage | 175 | W |
| Nominal lamp voltage | 130 | V |
| Nominal lamp current | 1.5 | A _{rms} |
| Current crest factor (max) | 2 | |
| Ballast requirements | | |
| Open circuit voltage | 225 | V _{rms} |
| -30°C (-22°F) | 318 | V _{peak} |
| Min. starting current | 1.5 | A _{rms} |
| Max. starting current | 3.25 | A _{rms} |

| PHYSICAL DESCRIPTION | | |
|---------------------------------|--|---------|
| Effective arc length | 42 (1.65) | mm (in) |
| Maximum overall length | 211 (8.31) | mm (in) |
| Light center length | 127 (5) | mm (in) |
| Bulb diameter | 90 (3.54) | mm (in) |
| Base to bulb eccentricity (max) | 3 | deg |
| Maximum base temperature | 210 (410) | °C (°F) |
| Maximum bulb temperature | 400 (752) | °C (°F) |
| Bulb designation | BT28 | |
| Bulb material | Borosilicate glass (Hard Glass Lead Free) | |
| Arc tube / Shroud material | Quartz / None | |
| Bulb shape | BT28 | |
| Bulb finish | Clear | |
| Base designation | E39 Mogul | |
| Base Solder (one side only) | Sn (tin) 5% and Pb (lead) 95% | |



ISO 9001:2008 Certified ISO 14001:2004 Certified OHSAS 18001:2007 Certified ISO 17025:2005 Accredited



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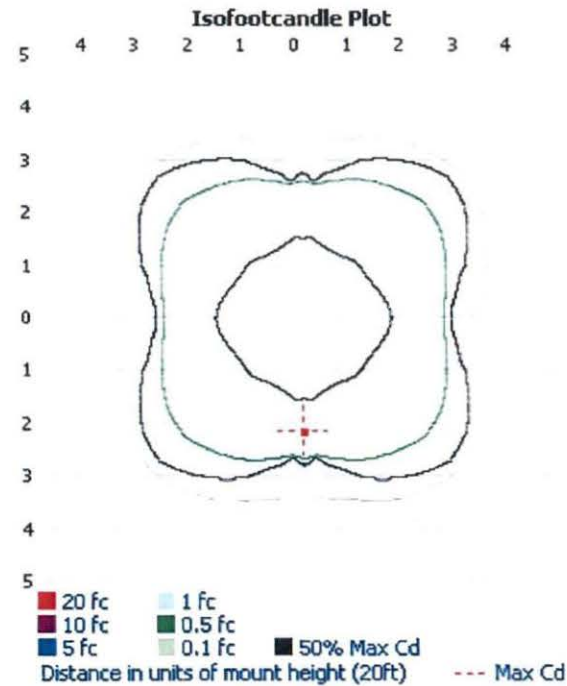
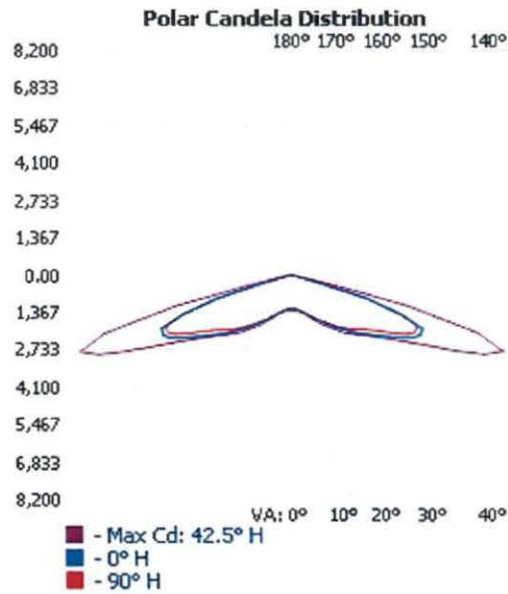
OUTDOOR PHOTOMETRIC REPORT

CATALOG: ATB2 40BLEDE10 XXXXX R5 4K/5K

TEST #: ISF 34901P28
 TEST LAB: SCALED PHOTOMETRY
 TEST DATE: 5/24/2017
 CATALOG: ATB2 40BLEDE10 XXXXX R5 4K/5K
 DESCRIPTION: ATB2 SERIES LED 1000MA TYPE 5
 4000K/5000K CCT
 SERIES: AUTOBAHN ATB2
 LAMP CATALOG: LED
 LAMP: LED ARRAY
 LAMP OUTPUT: **TOTAL LUMINAIRE LUMENS: 17499, ABSOLUTE
 PHOTOMETRY ***
 BALLAST / DRIVER: LED DRIVER, LED DRIVER
 INPUT WATTAGE: 133
 LUMINOUS OPENING: RECTANGLE W/LUMINOUS SIDES (L: 5.4", W:
 9.6", H: 0.36")
 MAX CD: 8,176.0 AT HORIZONTAL: 42.5°, VERTICAL:
 70°
 ROADWAY CLASS: TYPE VS



140 WATT
LED



*TEST BASED ON ABSOLUTE PHOTOMETRY WHERE LAMP LUMENS=LUMENS TOTAL.



TECHNICAL BULLETIN

HIGH PRESSURE SODIUM

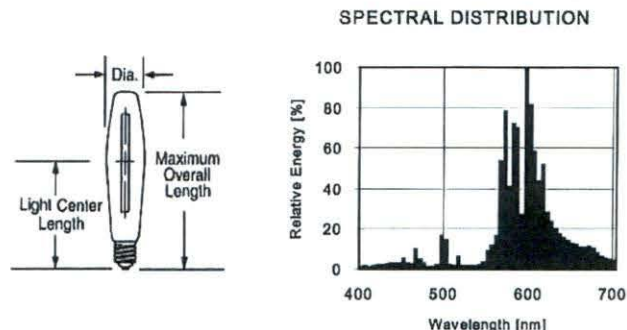
Sunlux®
LU250

ANSI Code: S50

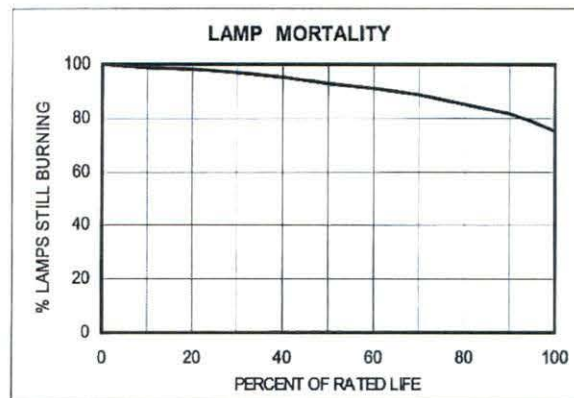
Product Code: 65576

| | | |
|------------------|-------------------------------|--|
| Features: | • Long life | • Universal burning position |
| | • Low cost efficient lighting | • Nickel Plated Base w/ceramic insulator |

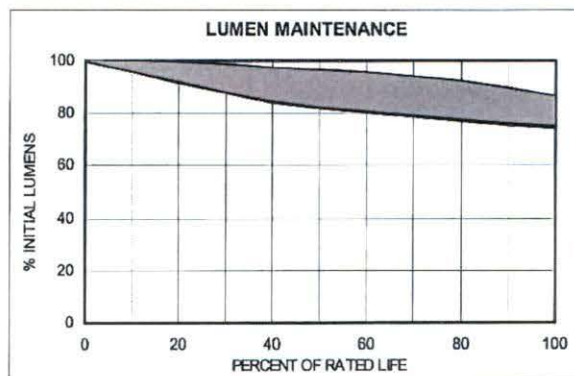
| PERFORMANCE DATA | | |
|---|--------------|------|
| Initial lumens at rated watts after 100 hours operation | 28000 | lm |
| Mean lumens at 10 hours/start | 26100 | lm |
| Rated average life | 24000+ | h |
| Warm up time (90% lumens) | 5 | min |
| Correlated color temperature | 1900 | K |
| CIE chromaticity | 0.525, 0.415 | X, Y |
| Color rendering index | 22 | |
| Operating Position | Any | |
| Hot Re-strike time | <3 | min |



| ELECTRICAL CHARACTERISTICS | | |
|-----------------------------|--------------------------------------|------------------|
| Nominal lamp wattage | 250 | W |
| Nominal lamp voltage | 100 | V |
| Nominal lamp current | 3.0 | A _{rms} |
| Current crest factor (max.) | 1.80 | |
| Max. starting current | 4.5 | A _{rms} |
| Min. starting current | 3.0 | A _{rms} |
| Ballast requirements | Use with ballast rated for S50 lamps | |



| PHYSICAL DESCRIPTION | | |
|----------------------------------|---------------------------|---------|
| Maximum overall length | 248 (9.76) | mm (in) |
| Light center length | 146 (5.75) | mm (in) |
| Bulb diameter | 57 (2.20) | mm (in) |
| Base to bulb eccentricity (max.) | 3 | Degrees |
| Maximum base temperature | 210 (410) | °C (°F) |
| Maximum bulb temperature | 400 (752) | °C (°F) |
| Bulb designation | ED18 | |
| Bulb material | Borosilicate (Hard Glass) | |
| Arc tube material | PCA | |
| Arc length | 67 (2.64) | mm (in) |
| Bulb finish | Clear | |
| Base designation | Mogul (E39) | |



OSHAS 18001:2007 Certified ISO 17025:2005 Accredited ISO 9001:2008 Certified ISO 14001:2004 Certified



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TECHNICAL BULLETIN

METAL HALIDE

EYE Pulse Start

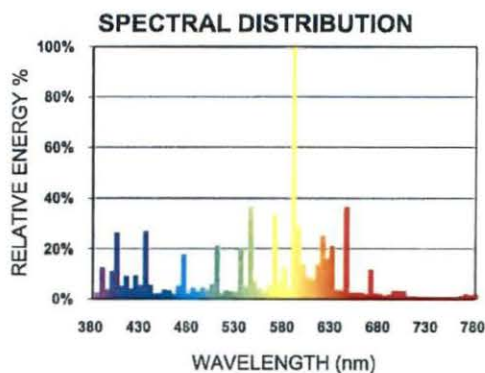
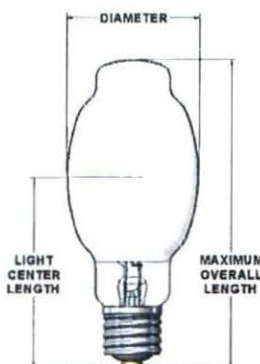
MF250X/U/PS

ANSI CODE M138/E, M153/E

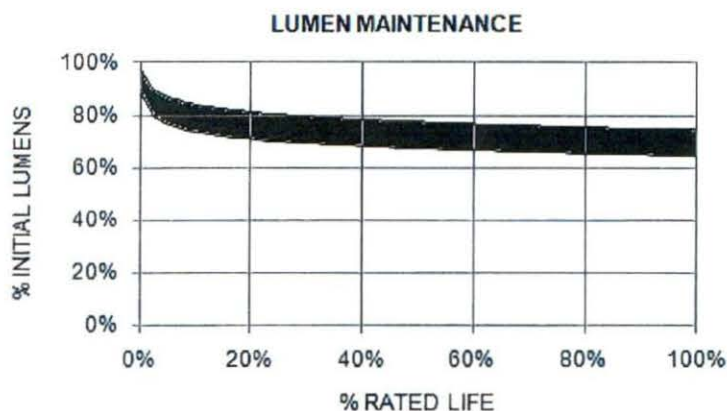
Product Code: 52464

- FEATURES:**
- High Output, Universal Metal Halide
 - High initial and maintained lumens
 - Superior lamp to lamp color consistency
 - Pulse Start Performance
 - Nickel Plated Base

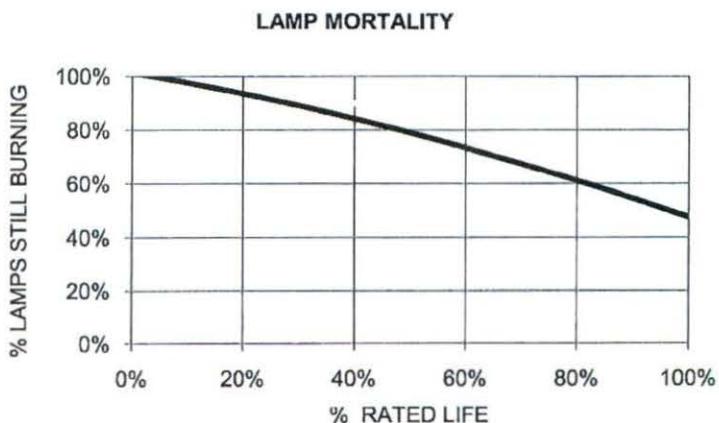
| PERFORMANCE DATA | | |
|-------------------------------|-----------|-----|
| Initial lumens | 19600(V) | lm |
| | 16500(H) | |
| Mean lumens at 11 hours/start | 15700(V) | lm |
| | 13200(H) | |
| Rated average life | 15000(V) | hr |
| | 12000(H) | |
| Correlated color temperature | 3400(V) | °K |
| | 3800(H) | |
| Color rendering index [Ra] | 60-55 | |
| Operating position | Universal | |
| Warm-up time (90%lumens) | <6 | min |
| Time to re-start (max) | 10 | min |



| ELECTRICAL CHARACTERISTICS | | |
|--------------------------------------|-----|-------------------|
| Nominal lamp wattage | 250 | W |
| Nominal lamp voltage | 133 | V |
| Nominal lamp current | 2.1 | A _{RMS} |
| Current crest factor | 1.8 | |
| Ballast requirements | | |
| Open Circuit Voltage -30°C(-22°F) | 254 | V _{RMS} |
| | 359 | V _{PEAK} |
| Min starting current | 2.1 | A _{RMS} |
| Max starting current | 3.2 | A _{RMS} |



| PHYSICAL DESCRIPTION | | |
|---------------------------|---------------------------|---------|
| Effective arc length | 33(1.7) | mm (in) |
| Maximum overall length | 211(8.312) | mm (in) |
| Light center length | 127(5.0) | mm (in) |
| Bulb diameter | 89 (3.5) | mm (in) |
| Base to bulb eccentricity | 3° | max |
| Maximum base temperature | 210 (410) | °C (°F) |
| Maximum bulb temperature | 400 (752) | °C (°F) |
| Bulb designation | BT28 | |
| Bulb material | Borosilicate (hard glass) | |
| Arc tube material | Quartz | |
| Bulb finish | Phosphor Coated | |
| Base designation | E39 | |



ISO 9001:2008 Certified ISO 14001:2004 Certified OSHAS 18001:2007 Certified ISO 17025:2005 Accredited



EYE LIGHTING INTERNATIONAL

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TECHNICAL BULLETIN

MERCURY VAPOR LAMP

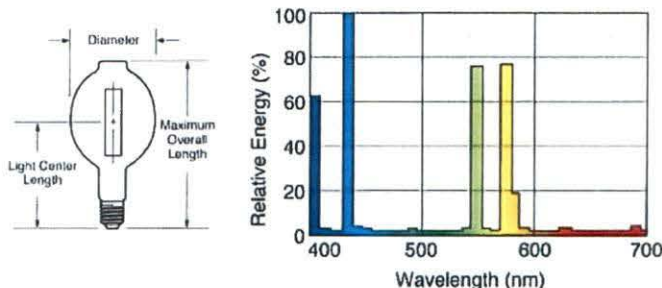
Mercury Vapor H400

ANSI Code: H33

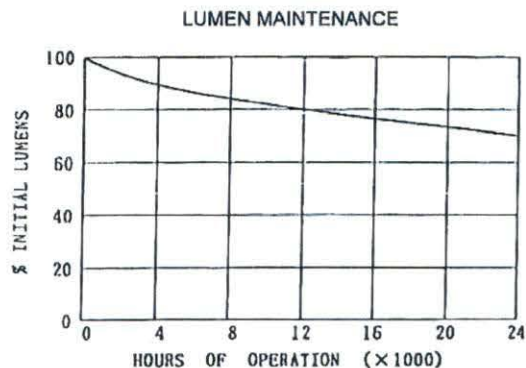
Product Code: 69868

| | | |
|------------------|----------------------|--|
| Features: | • Long life | • Rugged construction |
| | • Nickel-plated base | • Applications: Roadway, Landscape, Factory, Sports, Parking, Security |

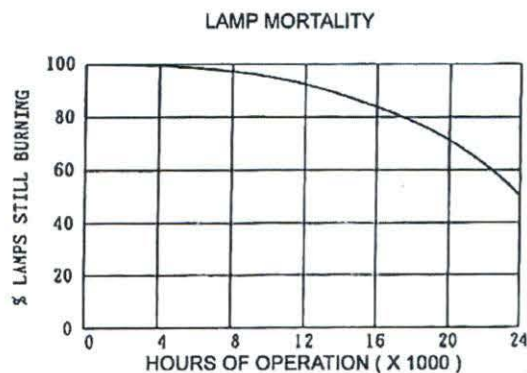
| PERFORMANCE DATA | | |
|---|--------------|------|
| Initial lumens at rated watts after 100 hours operation | 21000 | lm |
| Mean lumens at 10 hours/start | 17136 | lm |
| Rated average life | 24000 | h |
| Warm up time (90% lumens) | 4 | min |
| Correlated color temperature | 5700 | K |
| CIE chromaticity | 0.327, 0.381 | x, y |
| Color rendering index | 20 | |
| Operating Position | Universal | |
| Time to hot re-start | 10 max. | min |



| ELECTRICAL CHARACTERISTICS | | |
|-----------------------------|-----|-------|
| Nominal lamp wattage | 400 | W |
| Nominal lamp voltage | 135 | V |
| Nominal lamp current | 3.2 | Arms |
| Current crest factor (max) | 2 | |
| Ballast requirements | | |
| Open circuit voltage | 225 | Vrms |
| -30°C (-22°F) | 318 | Vpeak |
| Min. starting current | 3.1 | Arms |
| Max. starting current | 7.5 | Arms |



| PHYSICAL DESCRIPTION | | |
|---------------------------------|---|---------|
| Effective arc length | 70 (2.76) | mm (in) |
| Maximum overall length | 291 (11.5) | mm (in) |
| Light center length | 185 (7.3) | mm (in) |
| Bulb diameter | 116 (4.6) | mm (in) |
| Base to bulb eccentricity (max) | 4 | deg |
| Maximum base temperature | 210 (410) | °C (°F) |
| Maximum bulb temperature | 400 (752) | °C (°F) |
| Bulb designation | BT37 | |
| Bulb material | Borosilicate Glass (Hard Glass Lead Free) | |
| Arc tube material | Quartz | |
| Bulb finish | Clear | |
| Base designation | E39 Mogul | |
| Base Solder (one side only) | Sn (tin) 5% and Pb (lead) 95% | |



ISO 9001:2008 Certified ISO 14001:2004 Certified OHSAS 18001:2007 Certified ISO 17025:2005 Accredited



EYE LIGHTING INTERNATIONAL
OF NORTH AMERICA, INC.
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COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF BIG SANDY RURAL ELECTRIC)
COOPERATIVE CORPORATION FOR A GENERAL) Case No. 2017-00374
ADJUSTMENT OF EXISTING RATES)

VERIFICATION OF JOHN WOLFRAM

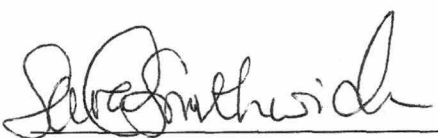
COMMONWEALTH OF KENTUCKY)
COUNTY OF Jefferson)

John Wolfram, being duly sworn, states that he has supervised the preparation of certain of the responses of Big Sandy Rural Electric Cooperative Corporation to Commission Staff's Fourth Request for Information in the above-referenced case and that the matters and things set forth in his responses are true and accurate to the best of his knowledge, information and belief, formed after reasonable inquiry.




John Wolfram

The foregoing Verification was signed, acknowledged and sworn to before me this ____ day of February, 2018, by John Wolfram.



Commission expiration: _____


SARA CATHERINE SOUTHWICK
Notary Public
State at Large
Kentucky
My Commission Expires April 20, 2021