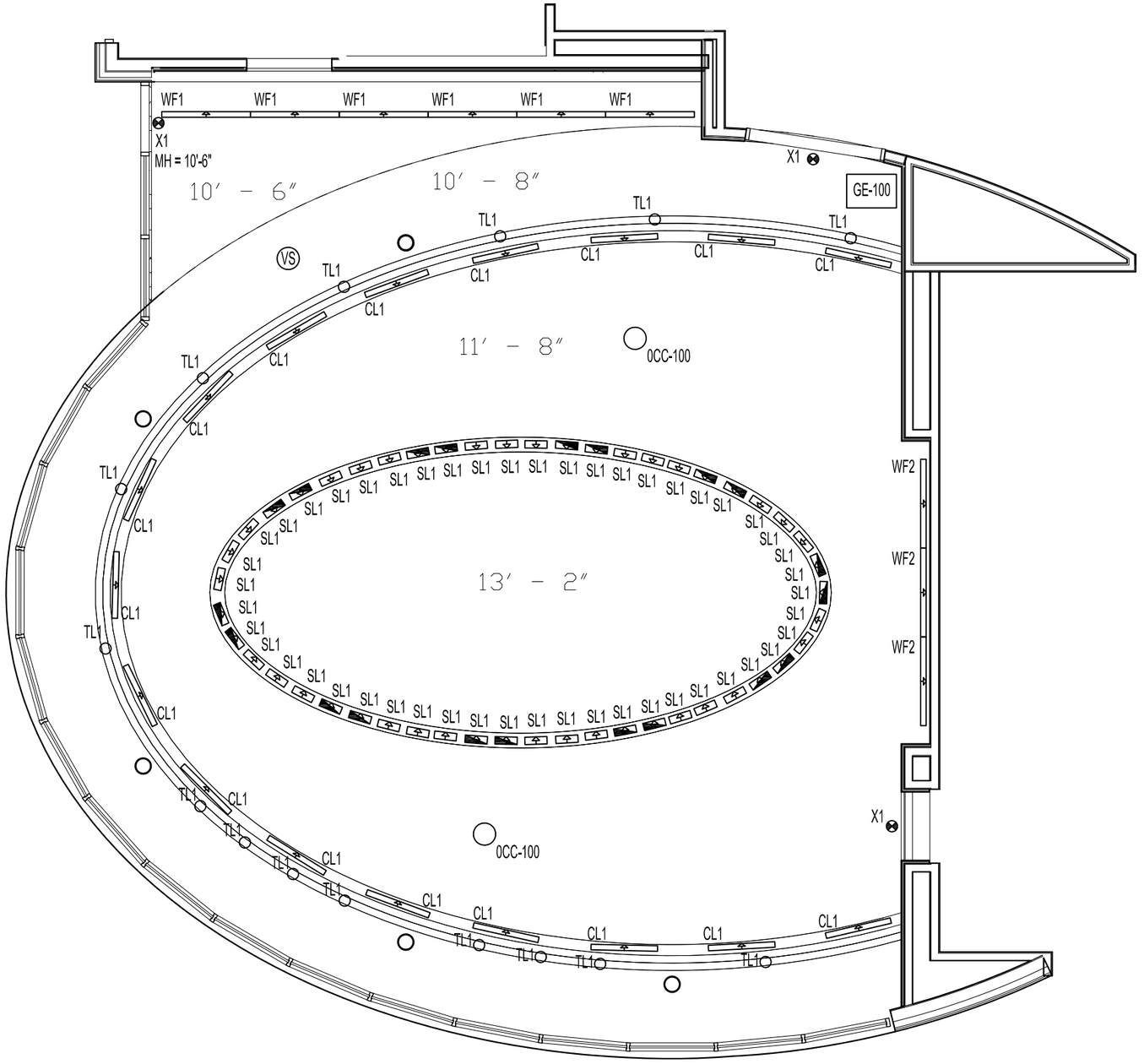
Appendix A | Lighting and Electrical Plans



THE PENNSYLVANIA STATE EMPLOYEES CREDIT UNION
CORPORATE HEADQUARTERS

HARRISBURG, PA

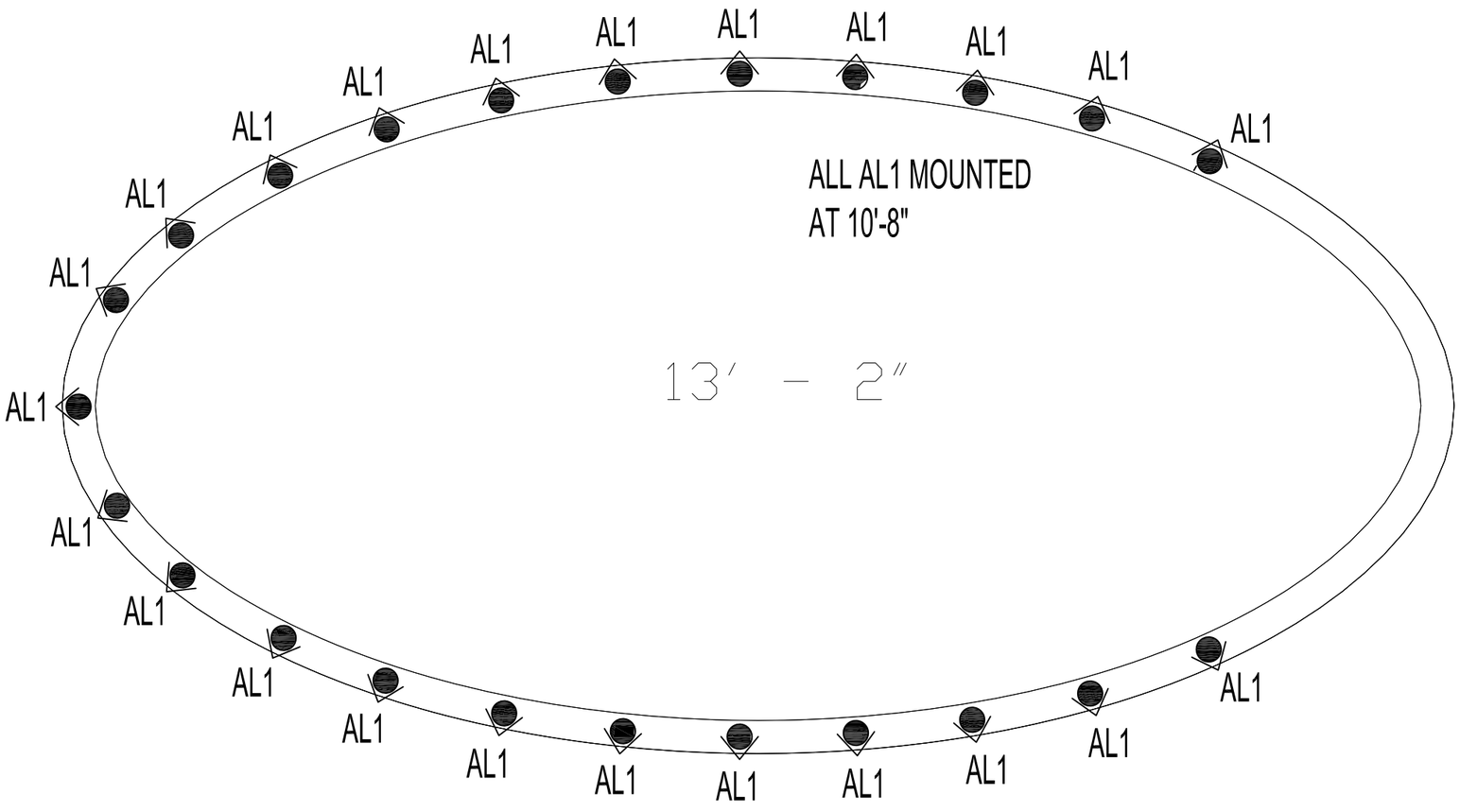
SCALE:
1/16" = 1'

ISSUE DATE:
03/31/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
BOARD ROOM LIGHTING PLAN

SHEET TITLE:
L.01



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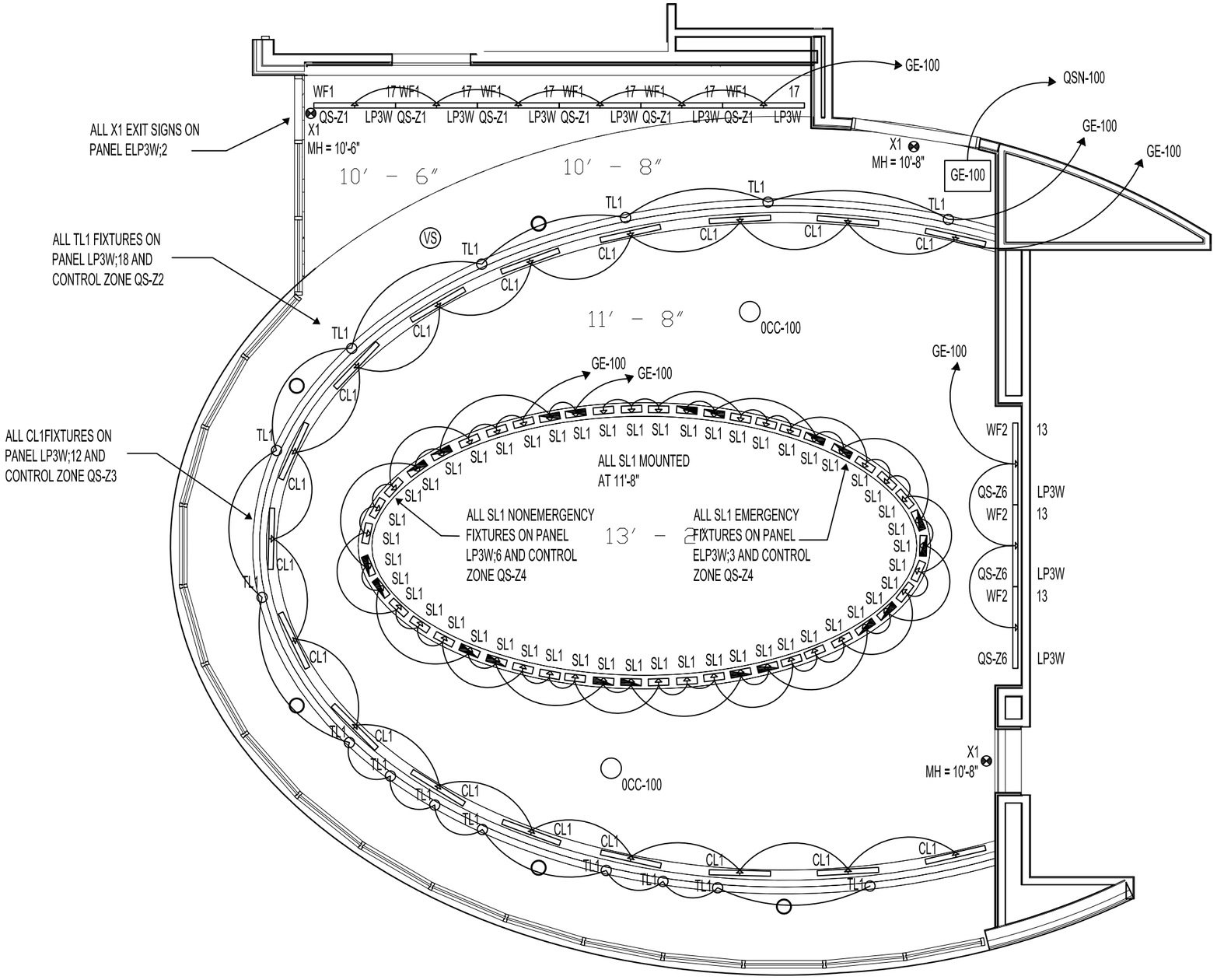
ISSUE DATE:
03/31/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
BOARD ROOM LIGHTING
PLAN CUSTOM FIXTURE

SHEET TITLE:
L.01.2



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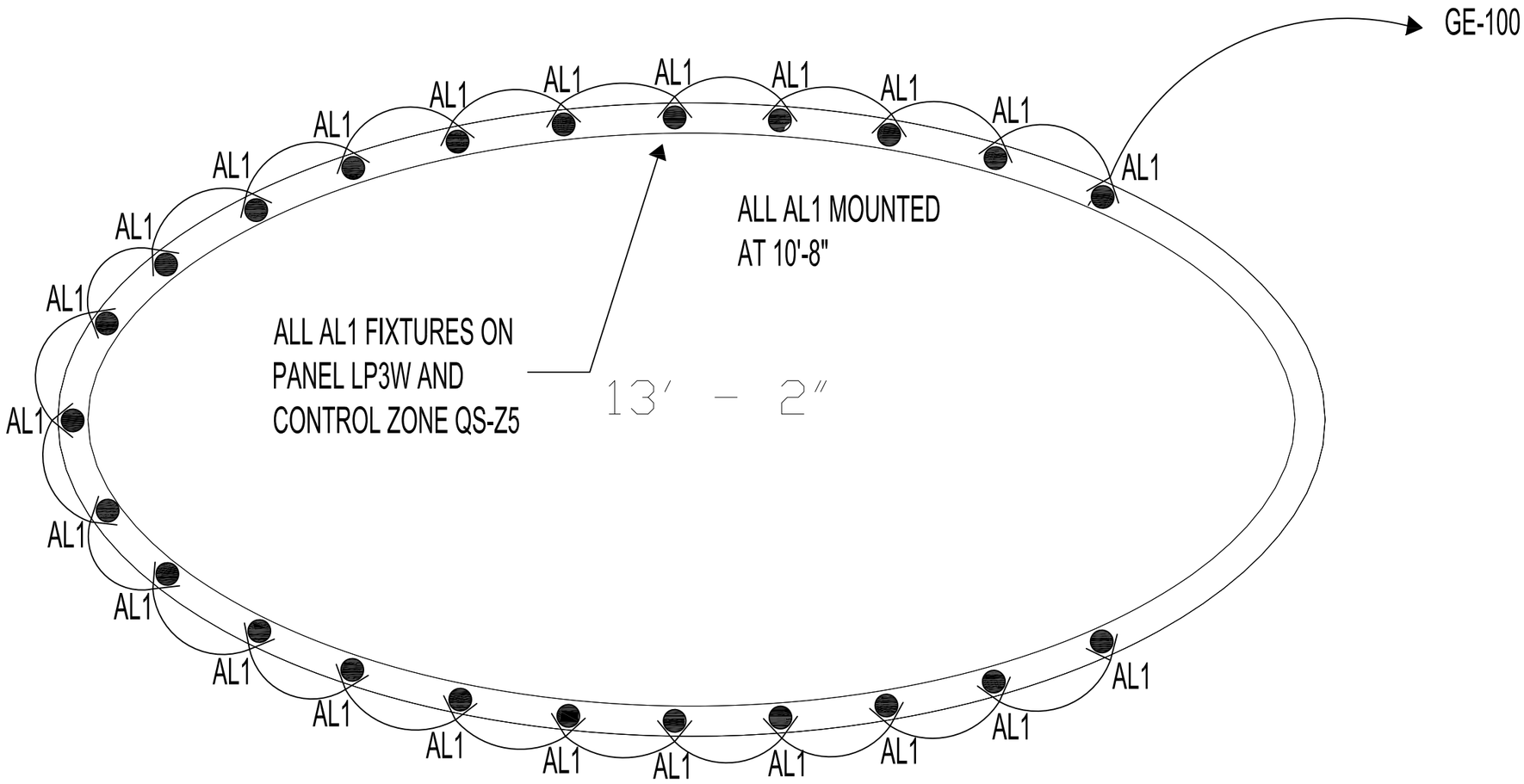
03/31/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
BOARD ROOM CIRCUITING DIAGRAM

SHEET TITLE:
E.01



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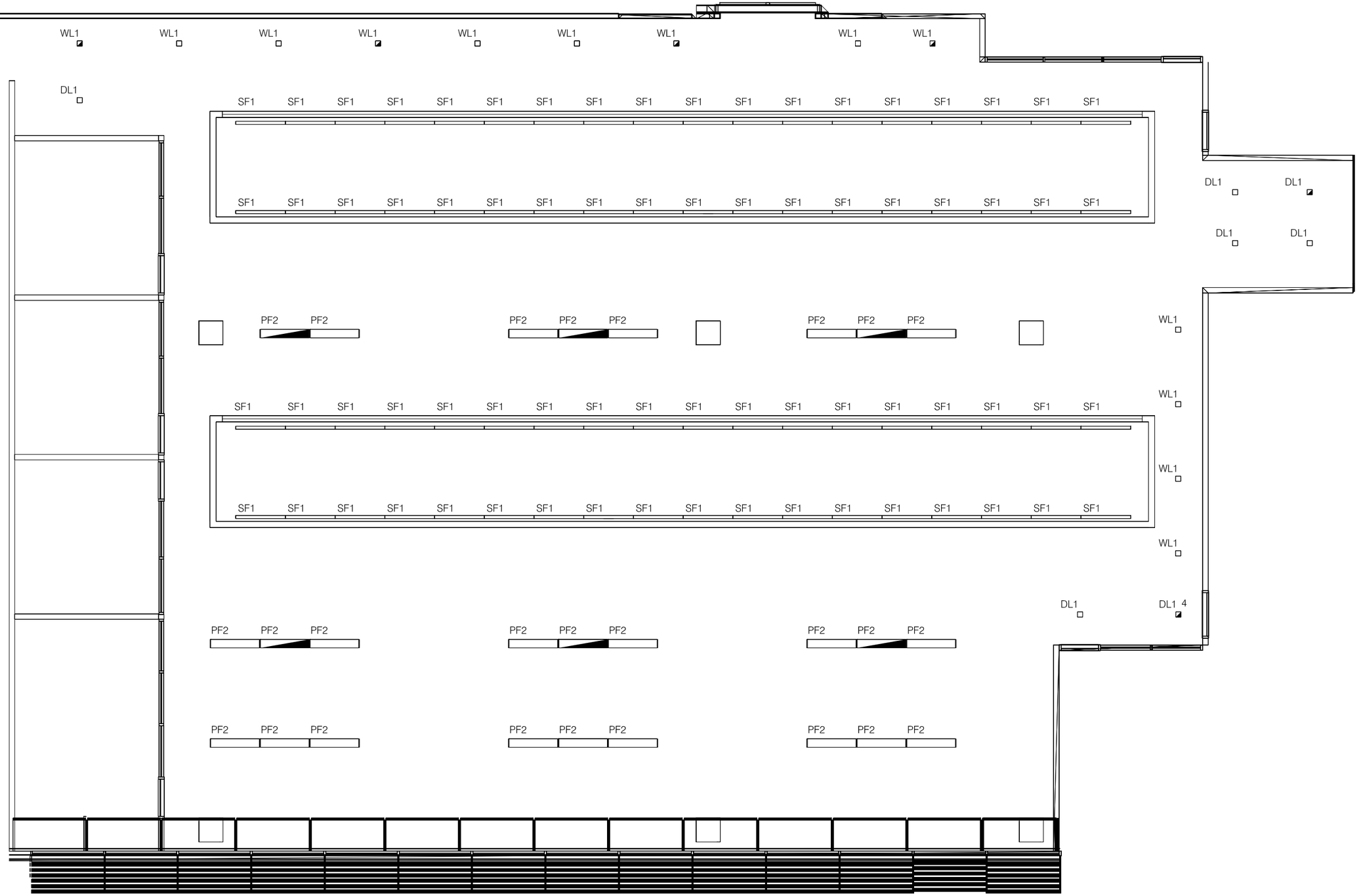
TITLE:
BOARD ROOM CIRCUITING DIAGRAM FOR CUSTOM FIXTURE

SHEET TITLE:
E.01.2



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DRAWN BY:
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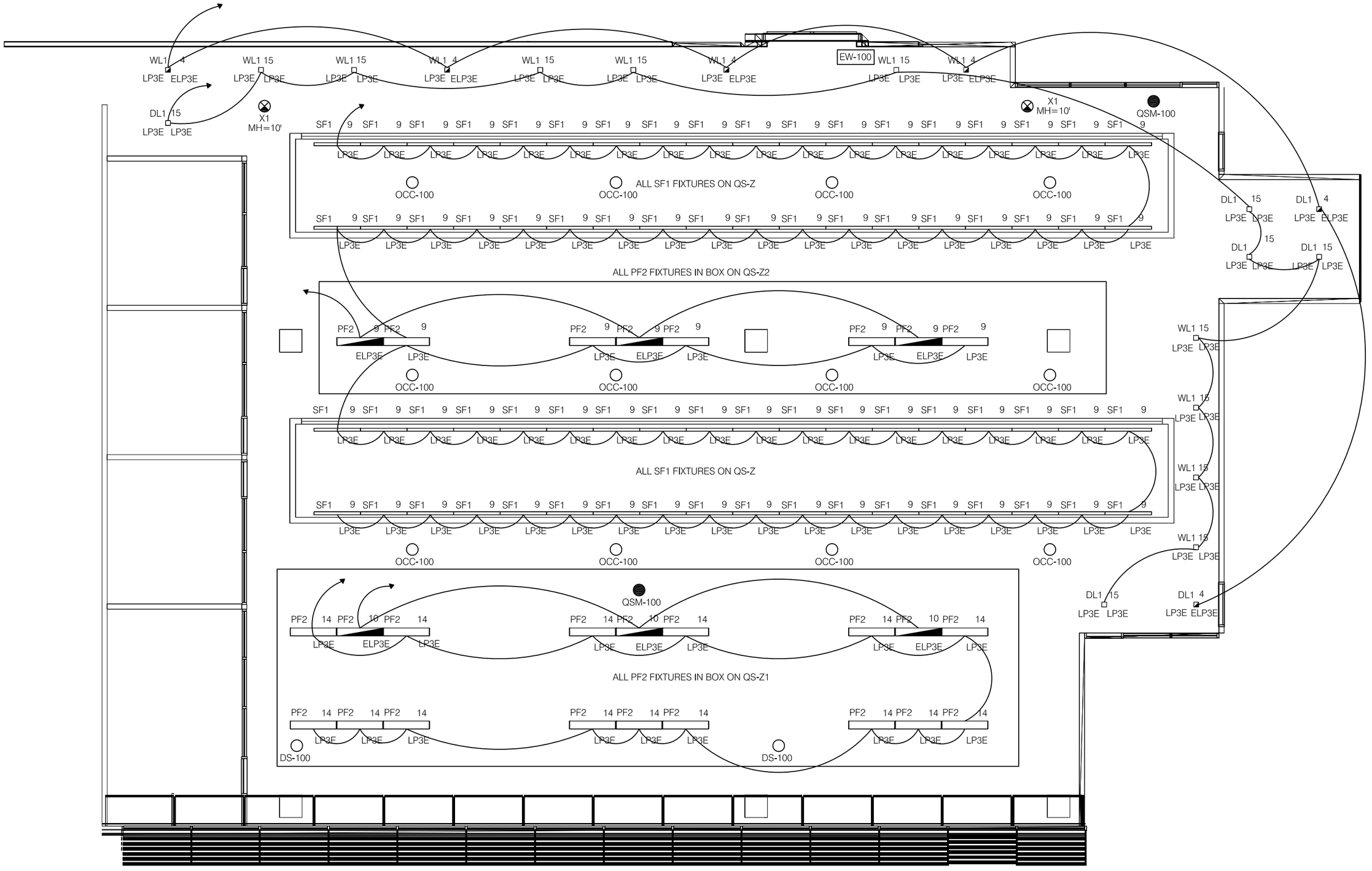
TITLE:
MARKETING OFFICE
LIGHTING PLAN

SHEET TITLE:
L.02



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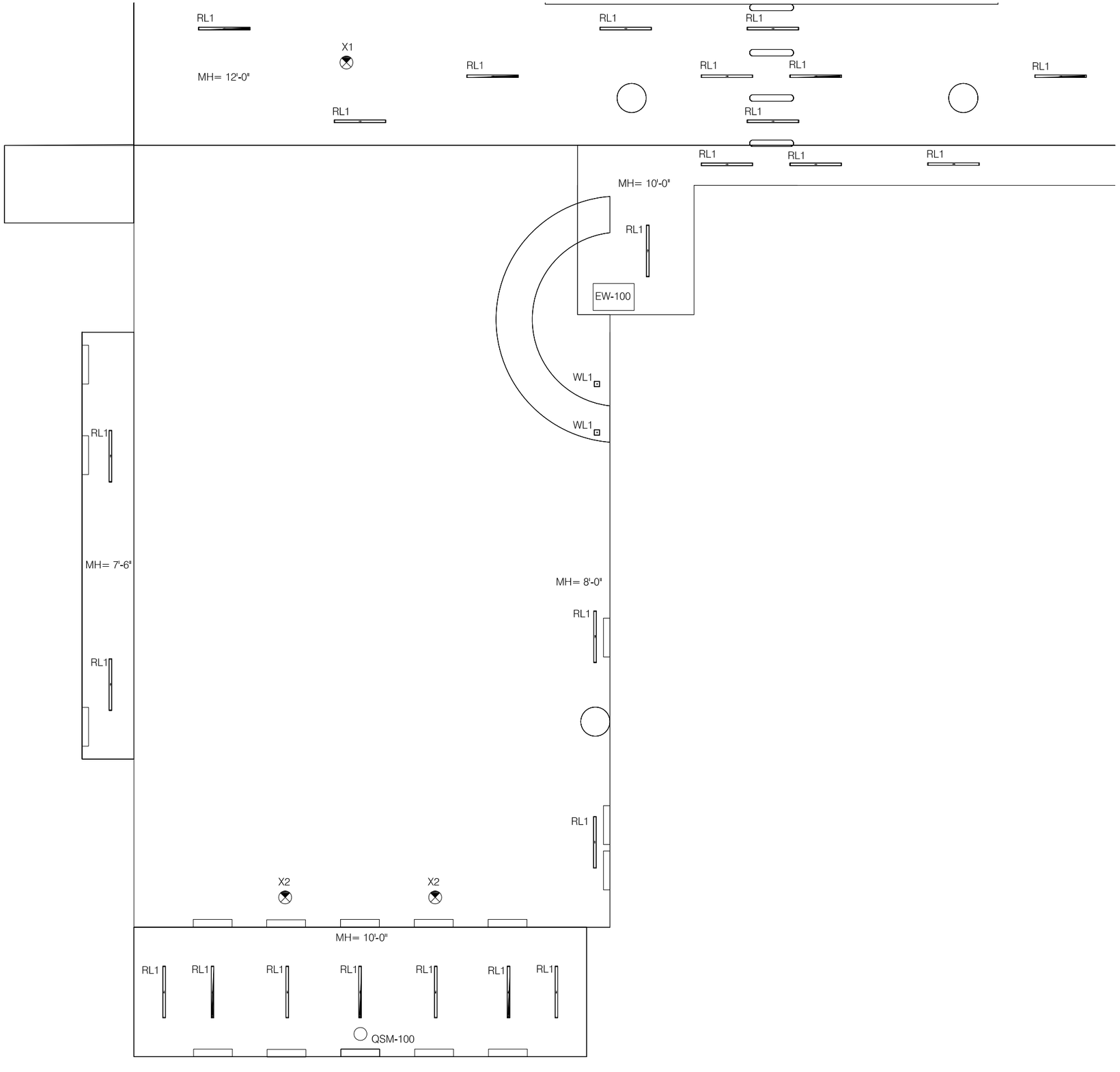
ISSUE DATE:
04/03/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
MARKETING OFFICE
CIRCUITING DIAGRAM

SHEET TITLE:
E.02



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SCALE:
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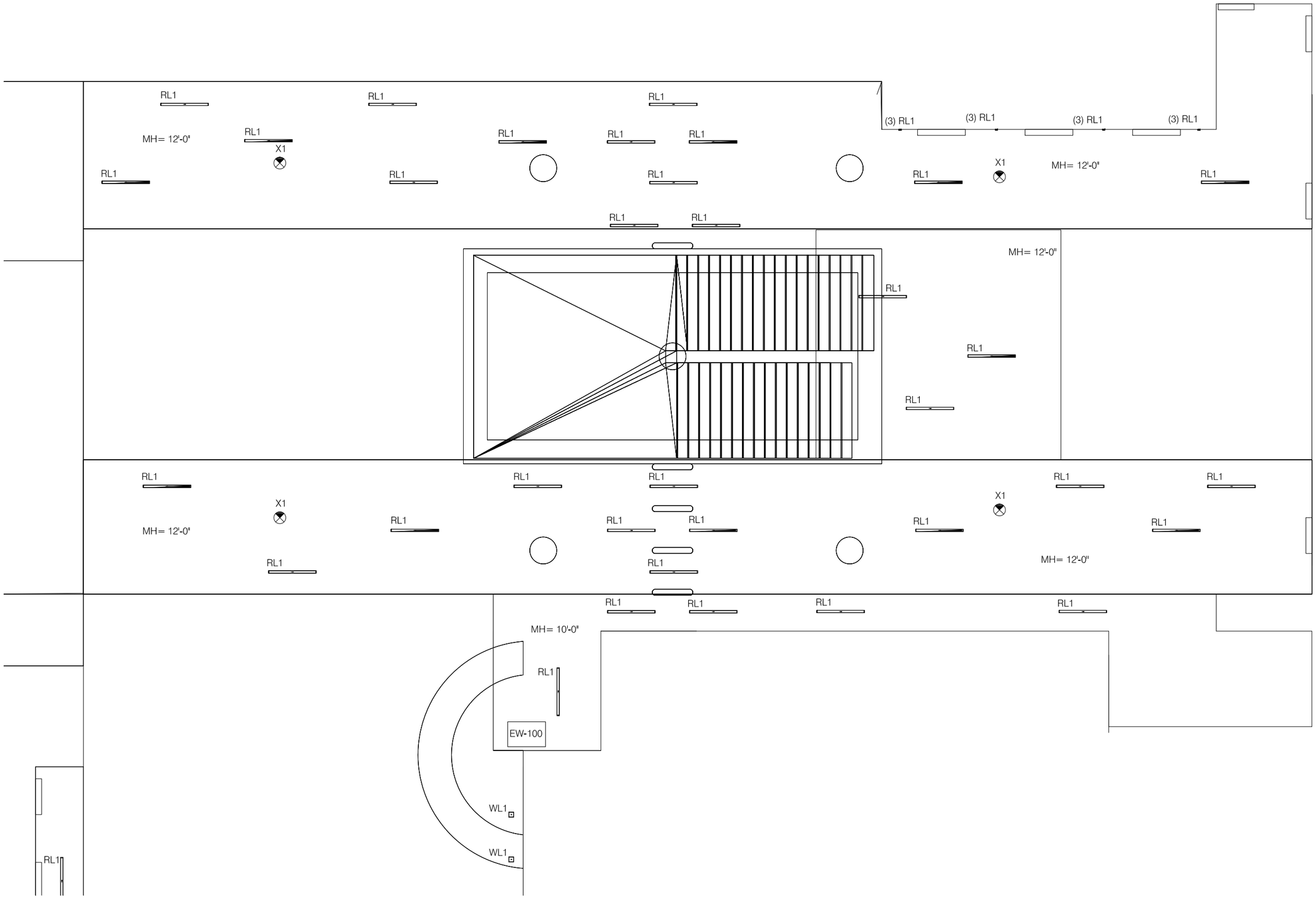
DRAWN BY:
SARAH WUJCIK

TITLE:
FIRST FLOOR
LOBBY LIGHTING PLAN

SHEET TITLE:
L.03



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SCALE:
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ISSUE DATE:
04/03/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
FIRST FLOOR
LOBBY LIGHTING PLAN

SHEET TITLE:
L.04

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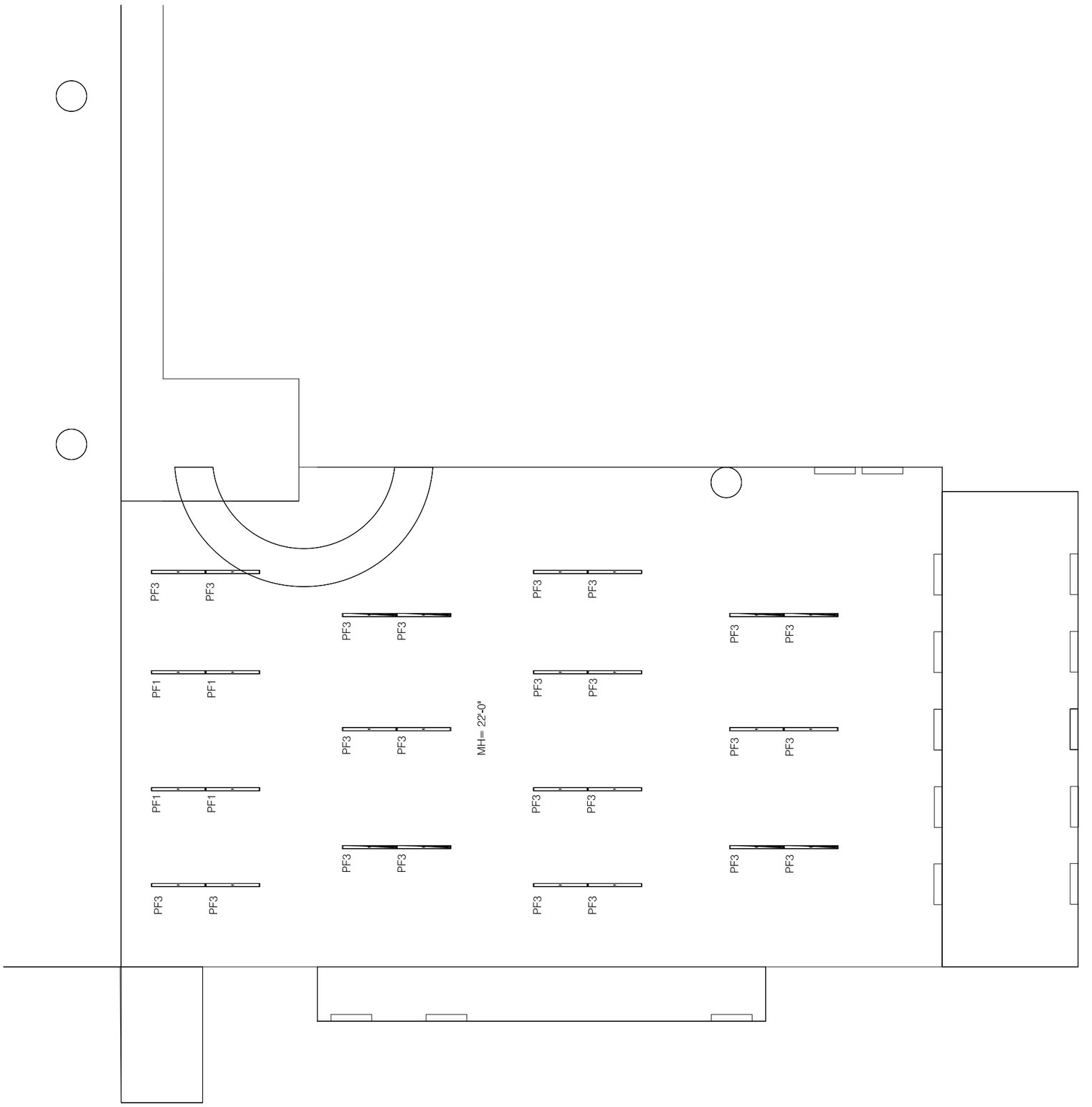
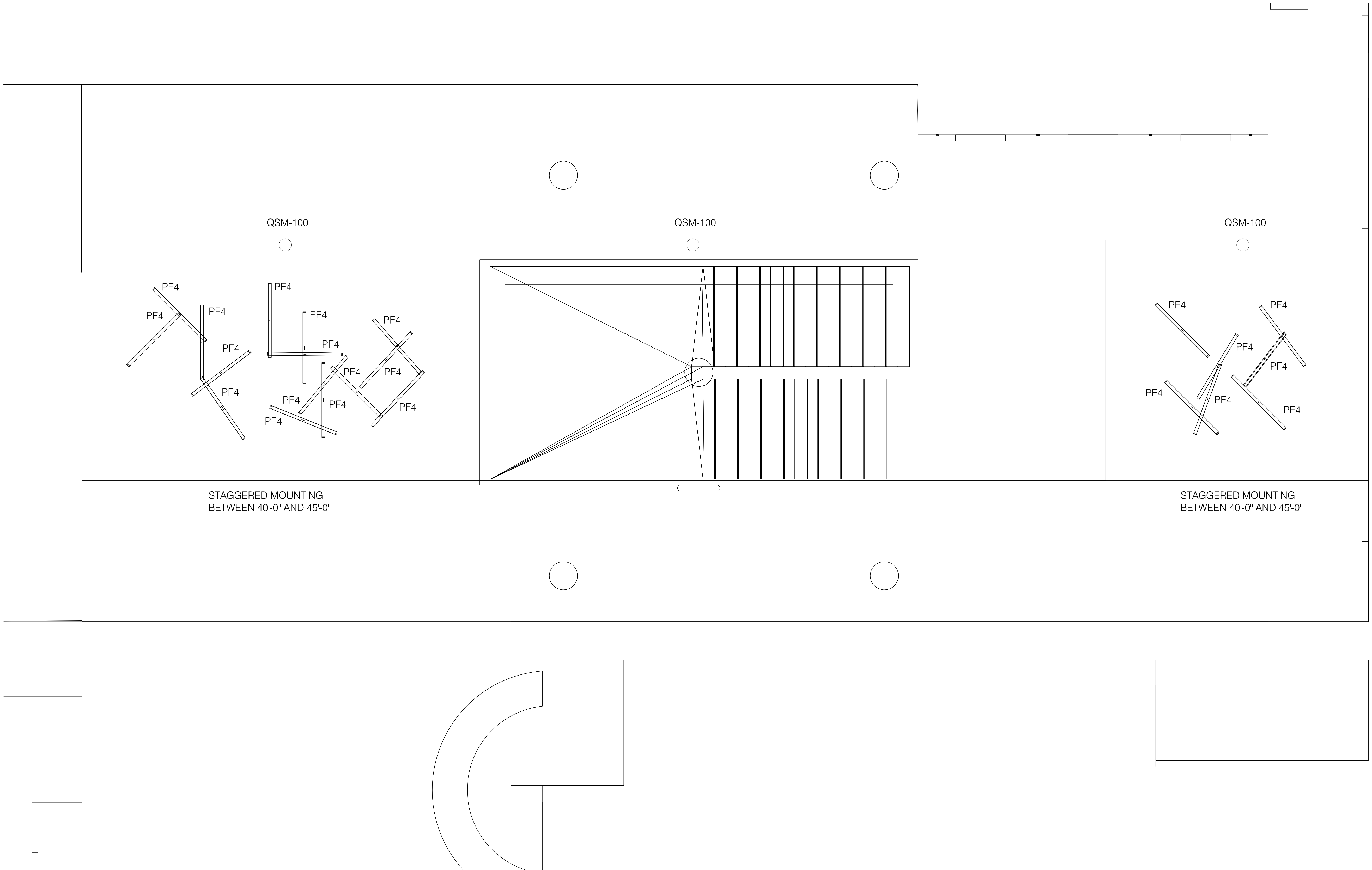
HARRISBURG, PA

SCALE:	ISSUE DATE:	DRAWN BY:	TITLE:	SHEET TITLE:
1/8" = 1'	04/03/2012	SARAH WUJCIK	SECOND FLOOR LOBBY LIGHTING PLAN	L.05





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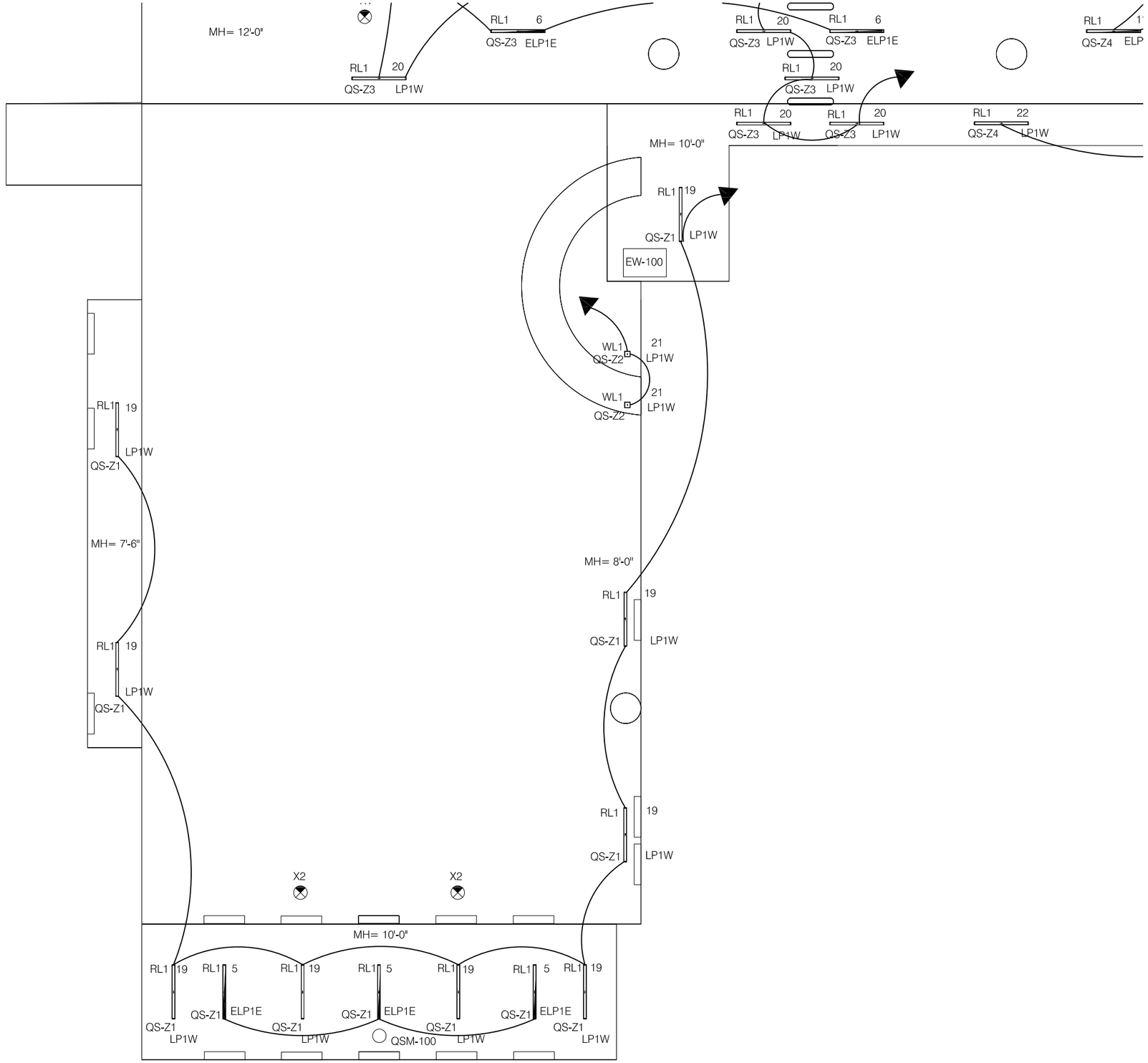
ISSUE DATE:
04/03/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
THIRD FLOOR
LOBBY LIGHTING PLAN

SHEET TITLE:
L.06



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HARRISBURG, PA

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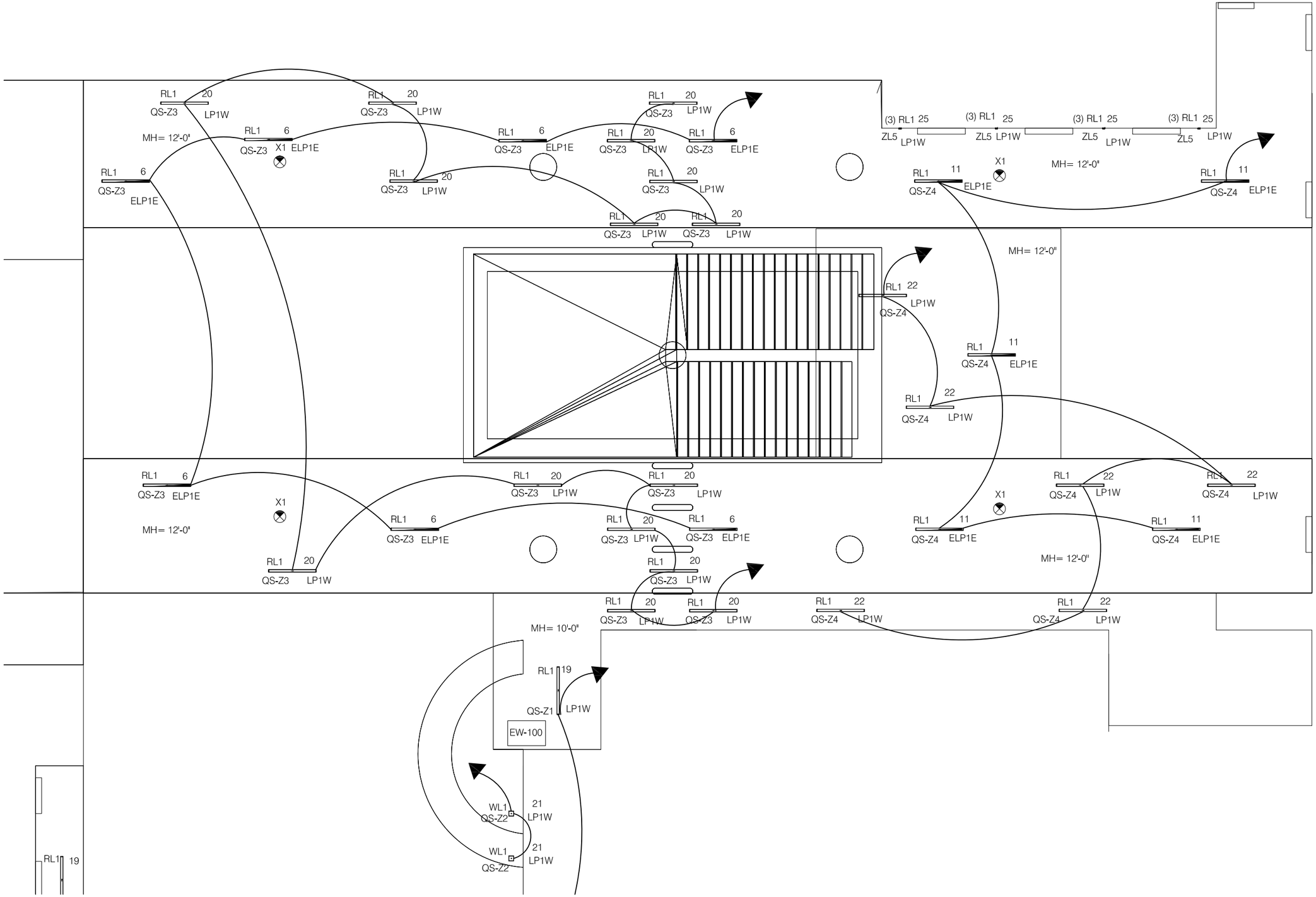
1/8" = 1'

ISSUE DATE:
04/03/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
FIRST FLOOR
LOBBY CIRCUITING DIAGRAM

SHEET TITLE:
E.03



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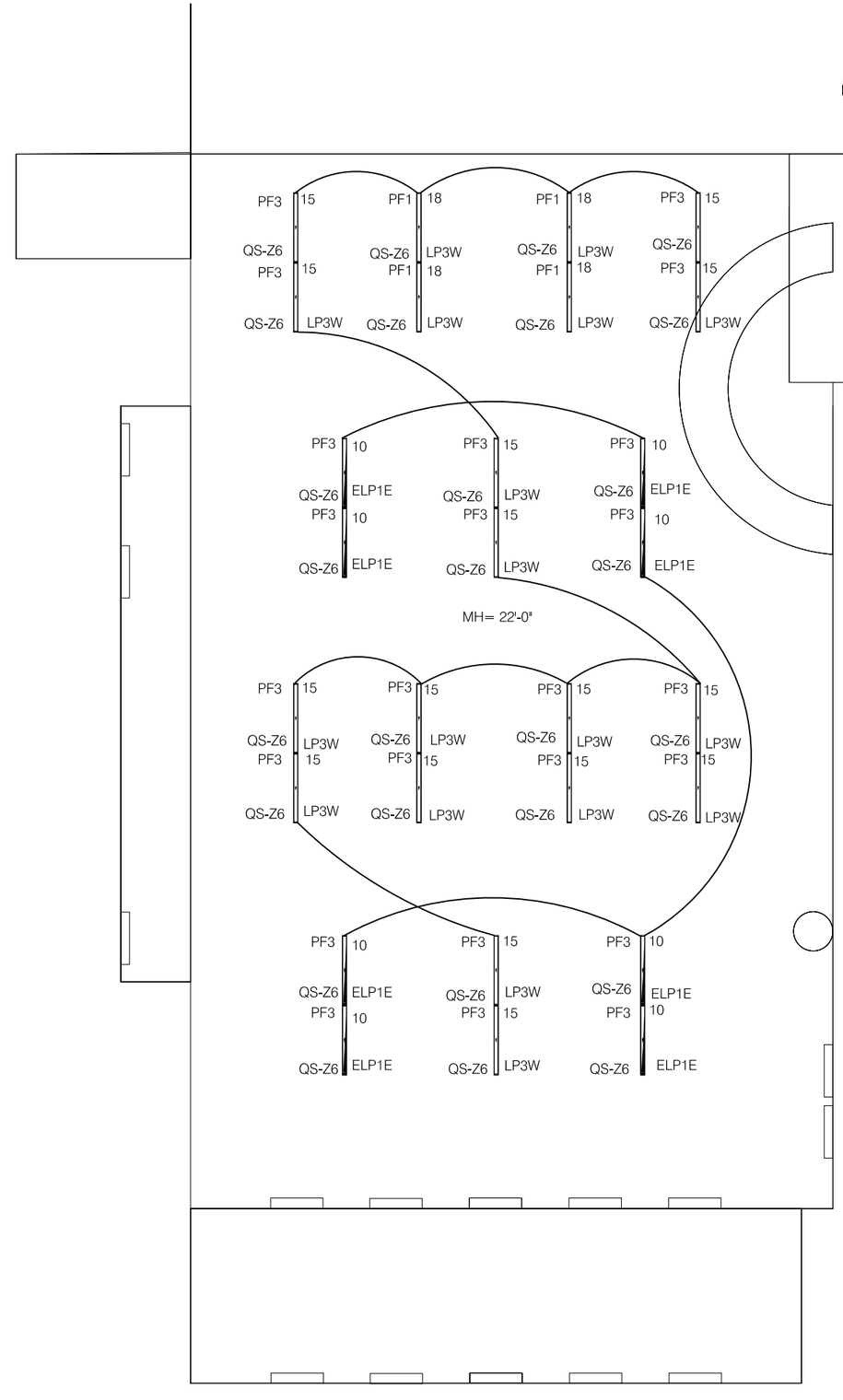
DRAWN BY:
SARAH WUJCIK

TITLE:
FIRST FLOOR
LOBBY CIRCUITING DIAGRAM

SHEET TITLE:
E.04



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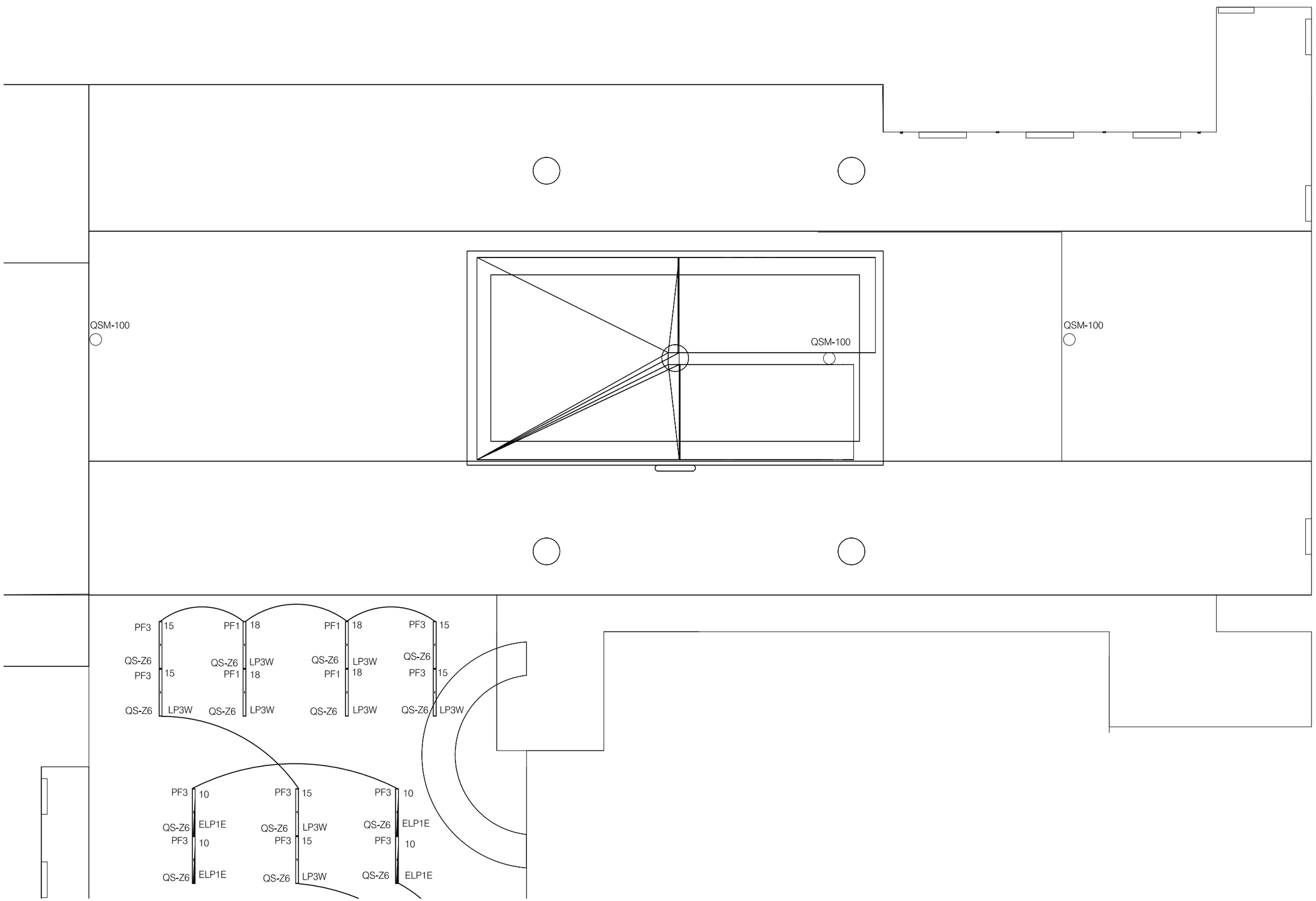
04/03/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
SECOND FLOOR
LOBBY CIRCUITING DIAGRAM

SHEET TITLE:
E.05



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TITLE:
SECOND FLOOR
LOBBY CIRCUITING DIAGRAM

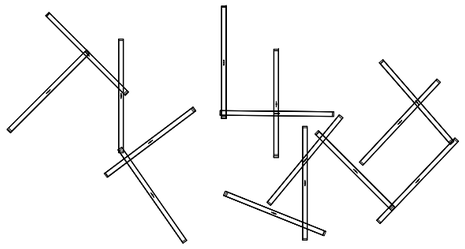
SHEET TITLE:
E.06

QSM-100

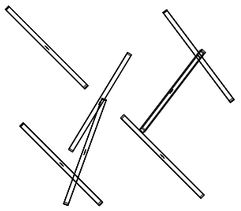
QSM-100

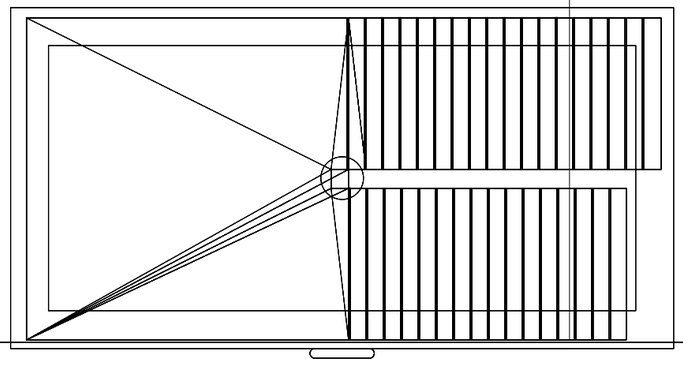
QSM-100

PF4; LP3W; 17; QS-Z7



PF4; LP3W; 16; QS-Z8





STAGGERED MOUNTING
BETWEEN 40'-0" AND 45'-0"

STAGGERED MOUNTING
BETWEEN 40'-0" AND 45'-0"

THE PENNSYLVANIA STATE EMPLOYEES CREDIT UNION
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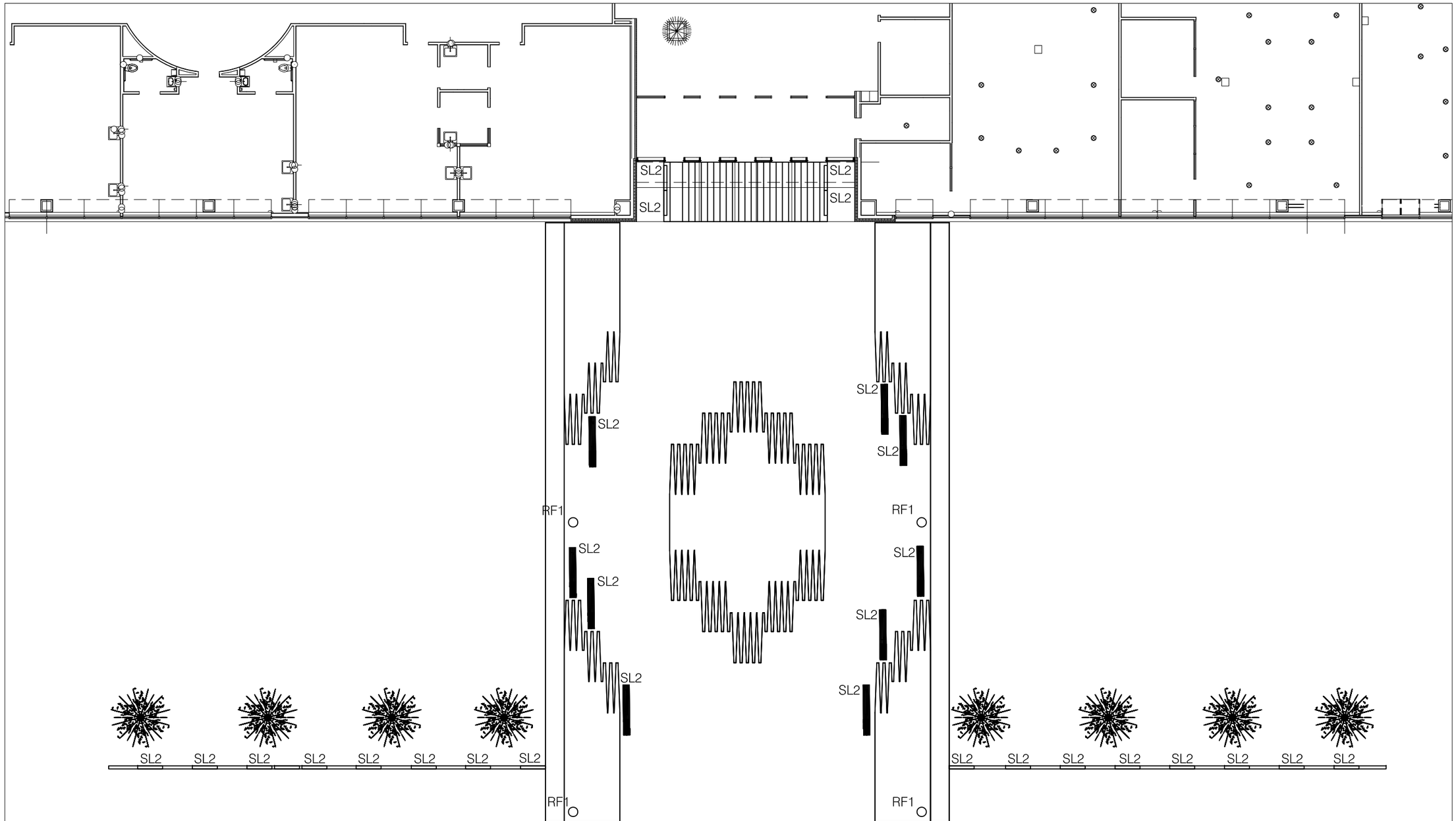
TITLE:
THIRD FLOOR
LOBBY CIRCUITING DIAGRAM

SHEET TITLE:
E.07



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SCALE:
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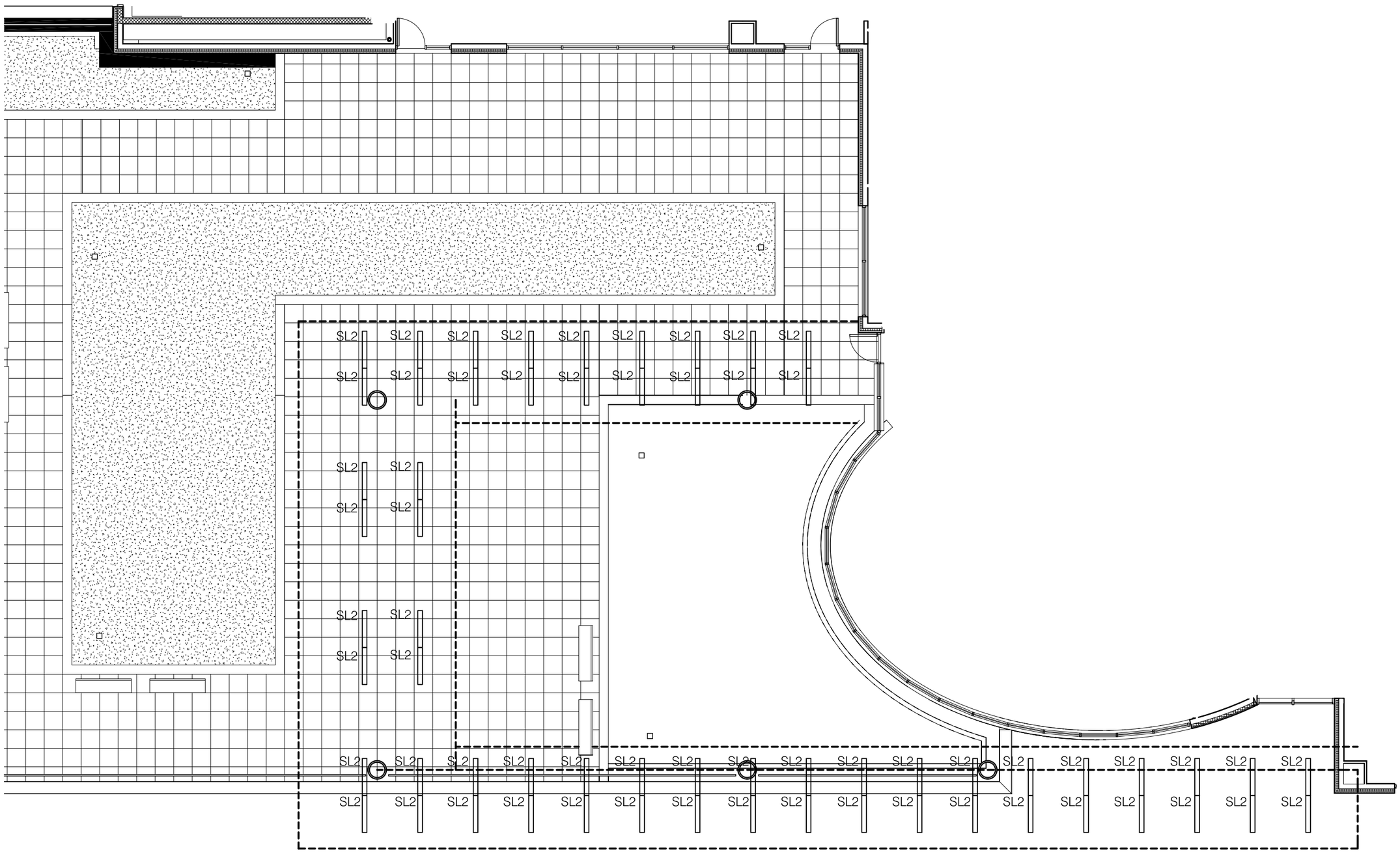
TITLE:
ENTRY PLAZA
LIGHTING PLAN

SHEET TITLE:
L.07



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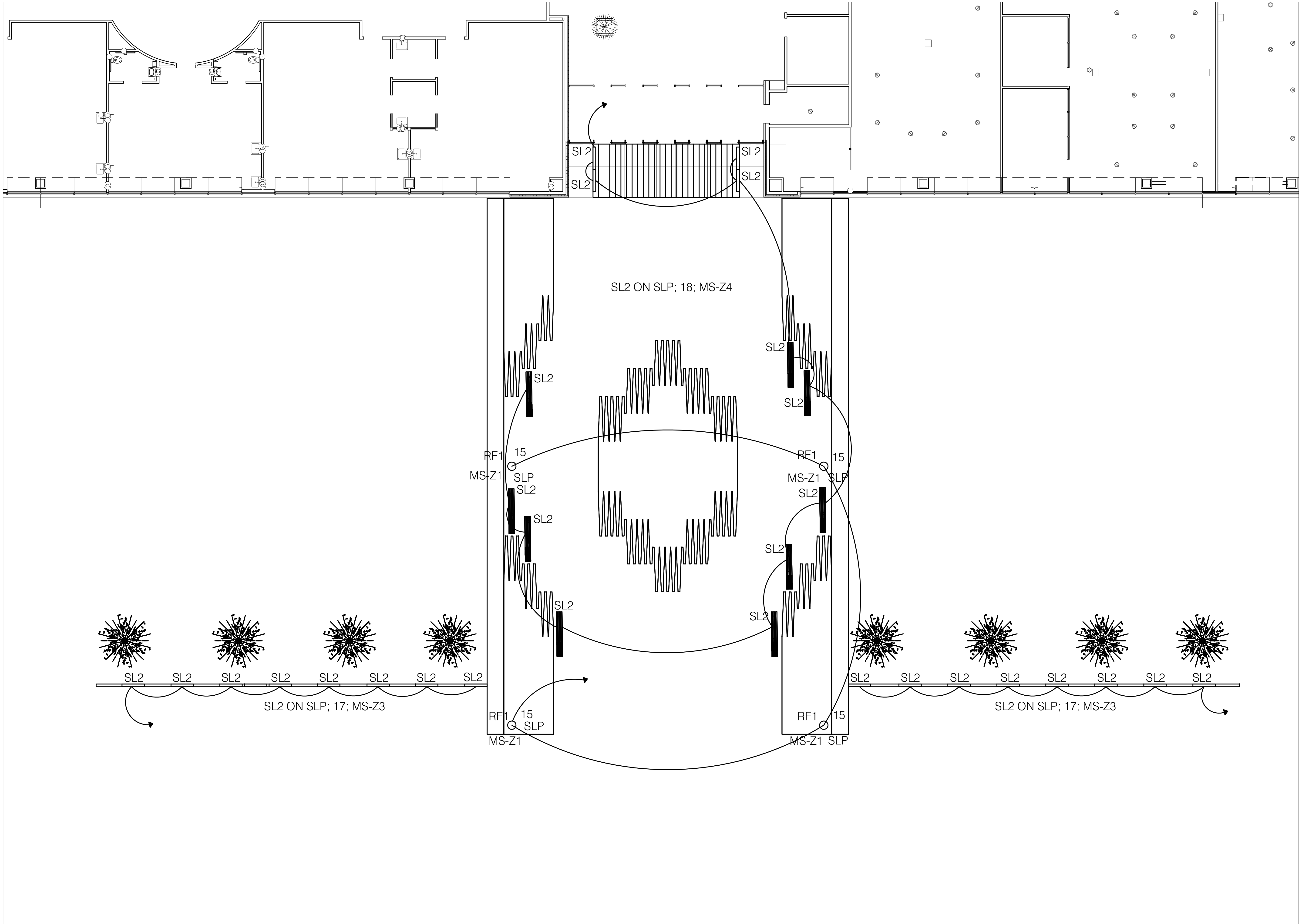
SCALE:
3/32" = 1'

ISSUE DATE:
04/03/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
ROOF GARDEN
LIGHTING PLAN

SHEET TITLE:
L.08



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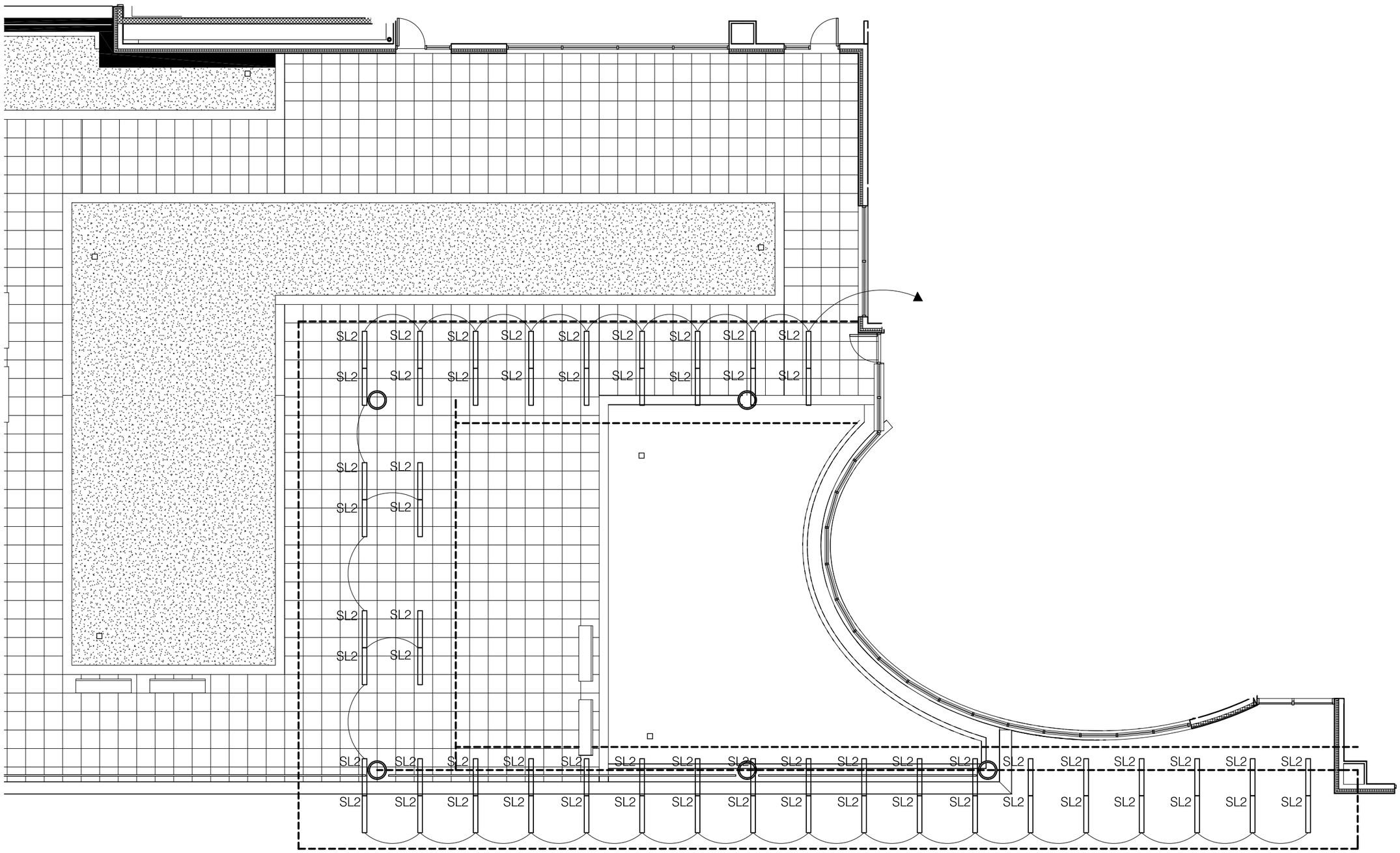
SCALE:
1/16" = 1'

ISSUE DATE:
04/03/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
ENTRY PLAZA
CIRCUITING DIAGRAM

SHEET TITLE:
E.08



ALL SL2 ON SLP; 16; MS-Z2

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ISSUE DATE:
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TITLE:
ROOF GARDEN
CIRCUITING DIAGRAM

SHEET TITLE:
E.09

Appendix B | Lighting Equipment Schedule and Cut Sheets

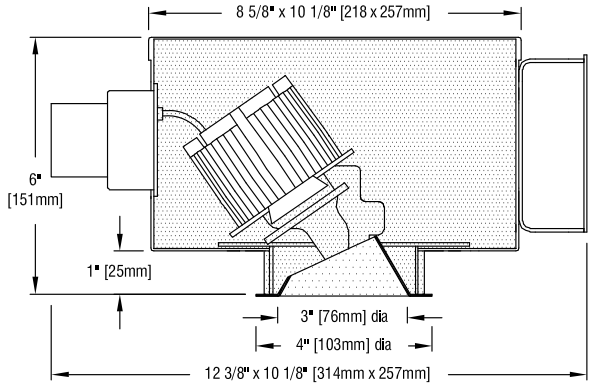
Lighting Equipment Schedule			
Type	**Description**	**Manufacturer**	**Lamp**
AL1	Recessed LED adjustable downlight with 3" aperture and 18 degree beam. Extruded aluminum finish	Edison Price Lighting	LED arrray with 800 lumen output, 3000K CCT, 85+ CRI
CL1	3' long x 6.5" wide LED asymmetric, surface mount, cove fixture with stainless steel finish	Winona Lighting	LED array, 44 watt, 1050 lumen output, 3000K CCT, 85+ CRI
DL1	Recessed LED downlight with 5" square aperture. Extruded aluminum housing. Dimmable to 10% output. 40 degree beam, 50,000 hour life.	Edison Price Lighting	LED array, 14 watt, 18 input watts, 800 lumen output, 3500K CCT, 85+ CRI
PF1	8 foot direct indirect fluorescent pendant with soft glow lens, extruded aluminum housing with aluminum finish, suspended 4 feet, 42% uplight. Integral ballast.	Litecontrol	(2) 54 watt T5HO, 85 CRI, 3500K CCT
PF2	4' long x 8" wide x 2" deep semi-indirect pendant mounted 8 ft A.F.F. with die cast aluminum housing and white paint finish.	Peerless	(1) 28 watt T5 fluorescent, 85 CRI, 3500K CCT, 32 input watts
PF3	8 foot direct indirect fluorescent pendant with soft glow lens, extruded aluminum housing with aluminum finish, suspended 4 feet, 42% uplight. Integral ballast.	Litecontrol	(2) 28 watt T5, 85 CRI, 3500K CCT
PF4	Suspended 2" wide x 6' long x 2" deep direct pendant mounted direct and indirect. Staggered mounting with extra diffuse lens and white finish. Integral ballast.	Architectural Lighting Works	(2) 21watt T5, 85 CRI, 3500K CCT
RF1	12 feet tall light column with die-cast aluminum housing, 8" diameter lens with refractor rings for anti-glare, 5" diameter pole with silver finish	Selux	(2) 32 watt T8, 3500K, 85 CRI
RL1	4 foot long x 2" wide LED linear recessed fixture with extruded aluminum housing and white enamel reflector. Integral electronic driver.	Amerlux LLC	21.6 watt LED array, 120 white LEDs, 73.6 lumens/ watt, 80+ CRI, 3500K CCT
SF1	4' long x 7" wide x 3" deep linear fluorescent wall mounted assymetric indirect fixture with extruded aluminum housing and white painted finish	Litecontrol	(1) 28 watt T5 fluorescent, 85 CRI, 3500K CCT, 32 input watts
SL1	1' LED adjustable surface mount fixture, 50 degree x 70 degree beam,	Philips Color Kinetics	LED array, 12.1 watt, 446 lumen output, 3000K CCT, 85+ CRI
SL2	4 foot long x 1" wide x 1" deep surface mount LED strip with clear anodized aluminum housing and soft focus lens	Lightwild	11.3 watts, 149 lumens/W, 80+ CRI, 3500K CCT
TL1	2" aperture LED cylinder, black die-cast aluminum finish, 26 degree beam, aluminum housing	Philips Lightoiler	LED array, 10 watt, 414 lumen output, 3000K CCT, 85+ CRI
WF1	4' recessed fluorescent direct-indirect wall wash fixture, 3" wide x 5" tall, integral dimming ballast, white powder finish	Cooper Lighting Neo-Ray	(1) 28 watt T5 lamp, 3000K CCT, 85 CRI
WF2	4' long x 6" wide recessed fluorescent grazer with open optics, steel housing, matte white housing, integral electronic dimming ballast	Focal Point	(1) 28 watt T5 lamp, 3000K CCT, 85 CRI
WL1	Recessed LED wall wash with 5" square aperture. Extruded aluminum housing. Dimmable to 10% output. 50,000 hour life.	Edison Price Lighting	LED array, 14 watt, 18 input watts, 800 lumen output, 3500K CCT, 85+ CRI

THREE LED CM AA

recessed LED accent light

AL1

FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE



Requires ceiling opening of 3 ¾" (95mm) for Overlap or Flush Detail.
Requires ceiling opening of 4" (102mm) for Trim Flush Detail.

FEATURES

Three LED CM AA is a 3" aperture LED accent light. Reflector design minimizes aperture brightness. Luminaire provides 365° horizontal rotation and 0 – 35° angular lamp adjustment. Once focused, adjustment can be locked in place by means of a lever and a wing nut. Conical reflector, cut at 25°, is designed for maximum angular adjustment. Optional reflectors cut at 0° and 15° are also available. Luminaire is 6" deep.

Luminaire is powered by Cree LED arrays of 700 or 900 lumen light output, with 2700K, 3000K, 3500K or 4000K white color, all with 80+ CRI and all with extraordinary color consistency (within 2-step MacAdam ellipse). See tables on the reverse for luminaire wattages and efficacies.

Luminaire includes an internal reflector to produce an 18° spot, 32° narrow flood or 52° wide flood beamspread. To allow beamspread to be changed in installed luminaires, internal reflectors are also available as accessories.

Luminaire with 900 lumen array and standard driver is dimmable to 10% with an electronic low voltage dimmer. Luminaires with 700 or 900 lumen arrays may be ordered with an optional driver dimmable to 1%.

Luminaire includes a holder to accept one of 14 available Optical Accessories including spread lenses and color filters.

LightPlate trim plate may be used instead of standard reflector.

Three LED CM AA includes a pair of mounting bars (¾" x 27" C channel). Specialty bars for wood joist and T-bar installations are also available.

APPLICATIONS

Luminaire is recommended for directional accent and display highlighting in stores, offices, museums, restaurants, showrooms, residences and hotels.

Luminaire is SR listed as an inherently protected luminaire and does not require a thermal protector. To maximize life of LED arrays luminaires equipped with 900-lumen arrays should be spaced at least 24" apart and 12" from walls, and should have ½" clearance above housing. Luminaire is listed for Damp Location, is RoHA compliant, is suitable for use in a fire rated ceiling and is approved for ten #12 wire 90° C branch circuit pull through wiring.

Removal of the reflector allows access to the LED array and junction box.

FULLY SUSTAINABLE

Three LED CM AA is fully sustainable. All critical components are replaceable and are available from Edison Price Lighting.

MODIFICATIONS AVAILABLE ▼ *See next page*

PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit ..... THREE-LED-CM-AA

Light Output
- 700 lumens ..... – 700
- 900 lumens *note spacing requirements: see* Applications *text* ..... – 900

Beamspread
- 18° ..... – 18D
- 32° ..... – 32D
- 52° ..... – 52D

Light Engine Color *all with 80+ CRI*
- 2700K ..... – 2700
- 3000K ..... – 3000
- 3500K ..... – 3500
- 4000K ..... – 4000

Voltage: standard luminaire operates on either 120 or 277 service

Reflector Color and Detail	*Overlap*	*Flush*	*Trim Flush**
Slightly diffuse Clear	VOL	VFL	VTF
Fully diffuse Clear	ECOL	ECFL	ECTF
Champagne Gold	GOL	GFL	GTF
Black	BOL	BFL	BTF

Other reflector finishes available on special order.

Standard reflector flange continues reflector finish. White painted flanges and custom painted flanges are available on special order. Add WF (white flange) or CCF (custom color flange).

Trim Flush reflector trim requires the use of a **plaster ring Accessory (see below).*

LightPlates may be ordered instead of the standard reflectors above (see next page).

LightPlate **Downlight Spot**, white	DP3-OL	DP3-FL	DP3-TF
LightPlate **Accent Spot**, white	AP3-OL	AP3-FL	AP3-TF
LightPlate **Accent Slot**, white	AL3-OL	AL3-FL	AL3-TF

Custom painted trims for LightPlate are available on special order. Add –CC

OPTIONS *Specify by adding to the basic unit.*

Dimmable to 10% ..... standard 900-lumen unit dims to 10% with an electronic low voltage (ELV) dimmer

Dimmable to 1% with Lutron® driver, compatible with Lutron 3-wire fluorescent dimmer or EcoSystem Bus Control; available with either 700-lumen or 900-lumen units .....–DLU

Remote emergency battery pack including two components – battery and plate with test switch and light – to be mounted adjacent to luminaire .....–REMX

0° cut reflector *(standard reflector is 25°cut)* .....–0

15° cut reflector *(standard reflector is 25°cut)* .....–15

ACCESSORIES *Specify as a separate line item.*

Plaster ring allows use of Trim Flush (-TF) reflector in sheetrock ceiling; 4" (102mm) dia hole is required.....TF RING/3

18° spot internal reflector CM-REF18

32° narrow flood reflector CM-REF32

52° flood reflector..... CM-REF52

OPTICAL ACCESSORIES ▼ *See next page*

EDISON PRICE LIGHTING

41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

THREE LED CM AA

AL1

MODIFICATIONS AVAILABLE *Contact factory with quantity for pricing; orders may require shop drawing approval.*

+TR: luminaire prepared for top re-lamping; add +TR to Product Code.
+DOD: luminaire suitable for **high humidity** environments; add +DOD to Product Code.
+MAR: reflector suitable for **marine** environments; add +MAR to Product Code.

LIGHTPLATES *LightPlates may be used instead of standard reflectors.*

DOWNLIGHT SPOT

straight-cut baffle for downlighting

ACCENT SPOT

angle-cut baffle for accent lighting

ACCENT SLOT

angle-cut baffle for accent lighting

OPTICAL ACCESSORIES *Specify as separate line*

All are 2 3/8" (60mm) diameter. Lenses and filters are glass; screens are aluminum.

diffuse glass DGS/2.375
prismatic lens (Solite) PLS/2.375
55° spread lens LENS/2.375
40° x 70° spread lens LENS/2.375-4070
beam smoother CLR/2.375
33% light reduction screen SCR33/2.375
50% light reduction screen SCR50/2.375

color filters

surprise pink PNK/2.375
daylight blue DAY/2.375
amber AMB/2.375
blue BLU/2.375
green GRN/2.375
red RED/2.375

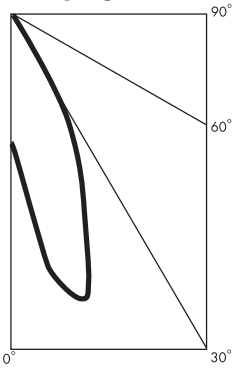
PHOTOMETRIC REPORT (tested per IESNA LM-79-2008)

LTL *Report No. 23087. Original Luminaire Testing Laboratories, Inc. (LTL) test reports furnished upon request.*

Luminaire ..... recessed LED accent light with slightly diffuse clear aluminum reflector, LED aimed at 15° above vertical
Light Source ..... one white LED with 18° beam spread integral reflector, 3000K CCT, 900 lumens.
Luminaire light output..... 450 lumens
Luminaire efficacy ..... 24 lumens per watt

LUMINAIRE STANDARD CANDLEPOWER DISTRIBUTION

Vertical Angle	*Horizontal Angle*				
	0	*45*	*90*	*135*	*180*
0	1042	1042	1042	1042	1042
5	1459	1269	956	714	582
15	2415	1260	390	83	8
25	1379	488	6	0	0
35	237	29	0	2	2
45	0	14	0	0	0
55	0	0	0	0	0
65	0	0	0	0	0
75	0	0	0	0	0
85	0	0	0	0	0
95	0	0	0	0	0



LUMINAIRE LIGHT OUTPUT AND EFFICACY

LED Light Output	*Luminaire Light Output*	*Luminaire Efficacy (lumens/watt)*	*System Wattage*
700 Lumens	370*	26*	14.5*
900 Lumens	450	24	19.0

**estimated values*

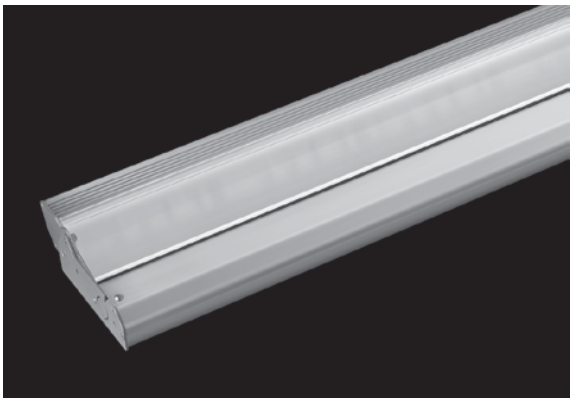
LIGHT OUTPUT MULTIPLIER

700 lumens light output	*900 lumens light output*
0.82 *(estimated)*	1.00

DRIVER INFORMATION *UL Class 2, dry and damp location*

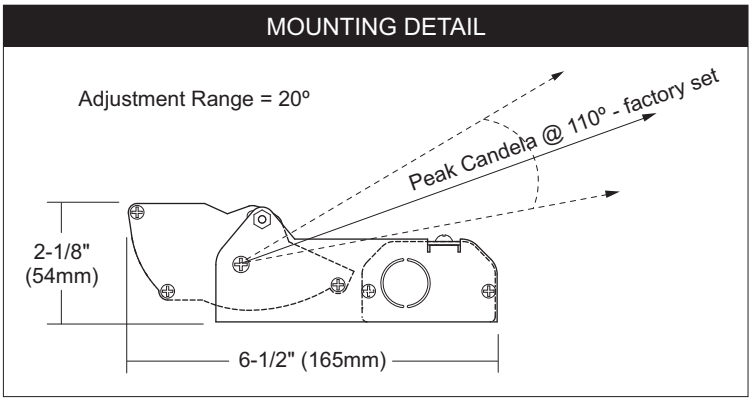
Line Voltage	*120*	*277*
Input Watts (700/900 lumens)	14.5/19.0	14.5/19.0
Input Current (A) (700/900 lumens)	0.12/0.16	0.05/0.07
Output Current (mA)	550/700	550/700
Output Voltage (Vdc)	23-25	23-25
Min. Power Factor (700/900 lumens)	>.9/>.99	>.9/>.99
Operating Temperature Range (F)	-13 to122	-13 to122

SCV1 SMALL ASYMMETRIC COVE • LED



SCV1 Asymmetric LED Cove
QUICK FIND #: QF-1130

MOUNTING DETAIL



Weight:

24" = 5 lbs	60" = 12 lbs
36" = 7 lbs	72" = 14 lbs
48" = 9 lbs	84" = 16 lbs
	96" = 18 lbs

MOUNTING- *Integral front wireway runs the length of the luminaire allowing for a continuous row mount without spaces betweens sections. Knock outs are located at each end of the housing to allow for through wiring. Individual aiming is achieved with the adjustable locking mechanism. See Mounting Detail above.*

TYPE- *Small profile linear luminaire. For indoor use only.*

COLOR AND LIGHT OUTPUT - *SCV1 Cove Series utilizes Nichia 183 white LEDs in five standard color temperatures. Model SCV1 features (12) LEDs/ft. Estimated LED lamp life is an industry standard 50,000 hours to 70% depreciation. A modular design has been incorporated that allows field replacement of the LED board/heat sink assembly for this product.*

Color	*Model SCV1*
ANSI-2700K White	*341 lm/ft*
ANSI-3000K White	*350 lm/ft*
ANSI-3500K White	*371 lm/ft*
ANSI-4000K White	*427 lm/ft*
non-ANSI-5000K White	*486 lm/ft*

PERFORMANCE- *High performance small profile linear luminaire incorporating an extruded reflector specifically designed for high output LED sources. The optical design allows for maximum beam projection across the target plane and even cove or slot illumination in tight setback applications. Has aimable and lockable optics, is ruggedly constructed and utilizes an extruded aluminum front wireway that allows low profile luminaires to be installed continuously, eliminating socket shadows.*

ELECTRICAL- *Power consumption is 15W/ft. (maximum run length 28 feet). Operates on 24VAC and can be dimmed with commonly available low voltage magnetic dimming equipment. A wide range of remote transformers are available in 120V and 277V primary (see technical section).*

PROFILE- P1 (basic): *Anodized, extruded high-purity aluminum specular reflector with solid aluminum end caps and wireway. Stainless steel hardware.*

OPERATING TEMPERATURE - *Minimum and Maximum ambient air temperatures around this luminaire shall not exceed -22°F to 113°F (-30°C to 45°C). Any application of this product should also take into consideration air flow and ventilation to ensure performance and reliability.*

FINISHES- *Bright anodized specular reflector with mill finish aluminum components and stainless steel hardware.*

• Winona Lighting reserves the right to make design revisions without prior notice.

3190865

Windirect SCV1 is ETL listed for dry location. This complies with UL Standard 2108.

RoHS COMPLIANT

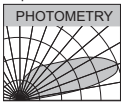
PRODUCT SPECIFICATION

SCV1 – SLC – LED1 – ____ – ____ – ____ – P1 – RA – X – ____

MOUNTING	TYPE	LAMP CODE	RUN LENGTH CODE	LED CODE	VOLTAGE	PROFILE	FINISH	OPTIONS	CLASS
SCV1 - front wireway	Indoor: dry label **SLC -** small LED cove	Lamp Code: **LED1** — Description: (12) Nichia 183 high output / ft.	**Total Run Length in Feet -** SCV1 offered in 12" increments starting at 24" ex. 60FT = 60 foot run or **Preconfigured Run Length Code -** see submittal at www.winonalighting.com (additional information see technical section) or **To Be Determined -** TBD when run length unknown	**27K -** 2700K ANSI-binned **30K -** 3000K ANSI-binned **35K -** 3500K ANSI-binned **40K -** 4000K ANSI-binned **50K -** 5000K non-ANSI-binned	**ND24V -** non-dimming 24 volt AC **DM24V -** dimming 24 volt AC	**P1** (basic)	**RA -** raw anodized anodized reflector with mill finish components	**X -** no options	**STD -** standard **MOD -** modified

Modification:

Nichia 183 LED
36" Luminaire
3000K
Report #15314



Visit the web for detailed photometry reports

Visit www.winonalighting.com for the most complete and current information.

LED SQUARE FTS DL/5

recessed LED downlight

DL1

FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE

FEATURES

LED Square FTS DL/5 is a 5" square downlight employing LED technology. Fixture is only 5 7/8" deep. Precise reflector design minimizes aperture brightness, virtually eliminates the inter-reflections inherent with square apertures and provides a shielding angle of 40°.

Luminaire is powered by a Philips Fortimo SLM LED module, dimmable to 10% with a 0-10 volt dimmer, with a CRI as high as 90 and a 5-year warranty. Luminaire may be specified with modules of 800, 1100 or 2000 lumen light output and with 2700K, 3000K, 3500K or 4000K color. Refer to the tables below for system wattages and luminaire efficacies.

Other features include:

- life: 50,000 hours at 70% of initial light output (IESNA LM80-2008)
- operational range: tolerates temperatures as low as -20° C (-4°F)

Luminaire reflectors are available with an optional glass shield or lens.

Luminaire reflectors are available in slightly diffuse clear natural aluminum or champagne gold Alzak®.

Luminaire includes a pair of mounting bars (¾" x 27" C channel). Specialty bars for wood joist and T-bar installations are also available.

APPLICATIONS

Luminaire is recommended for downlighting in commercial, retail and residential spaces.

Luminaire is ETL listed for Damp Location. Luminaire is prewired with thermal protector, approved for ten #12 wire 90° branch circuit pull-through wiring and suitable for use in a fire rated ceiling. To maximize life of LED modules luminaires equipped with 2000-lumen modules should be spaced at least 30" apart and 15" from walls, and should have ½" clearance above housing. All luminaires are RoHS compliant. Removal of the reflector allows access to the junction box.

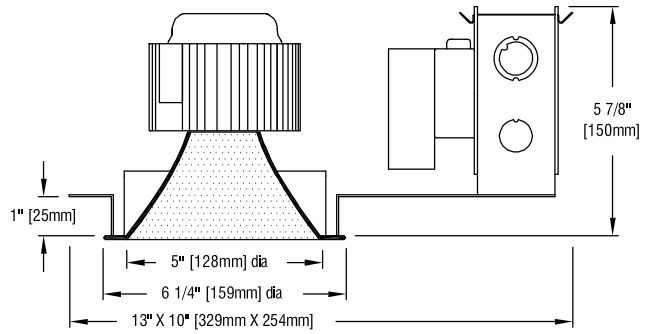
FULLY SUSTAINABLE

LED Square FTS DL/5 is fully sustainable. Both critical components – the LED module (diode array) and the driver (power conditioner) – can be replaced through the aperture with a screwdriver. Both components are, and will remain, available from Edison Price Lighting.

MODIFICATIONS AVAILABLE

Contact factory with quantity for pricing; orders may require shop drawing approval.

+DOD: luminaire suitable for **high humidity** environments; add +DOD to Product Code.
+MAR: reflector suitable for **marine** environments; add +MAR to Product Code.



Requires ceiling opening of 5 15/16" x 5 15/16" (151 x 151 mm)

PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit LED-SQ-FTS-DL/5
NOTE: Standard driver is dimmable to 10% with a 0-10 volt dimmer.

Light Output
- 800 lumens 800
- 1100 lumens 1100
- 2000 lumens *note spacing requirements: see* Applications *text.* 2000

Light Engine Color
- 2700K (90 CRI) 2700
- 3000K (90 CRI) 3000
- 3500K (80 CRI) 3500
- 4000K (80 CRI) 4000

Voltage
- 120 volt service 120
- 277 volt service 277

Reflector Color and Detail

	Overlap
Slightly diffuse Clear	VOL
Champagne Gold	GOL

Other reflector finishes available on special order.

Standard reflector flange continues reflector finish. White painted flanges and custom painted flanges are available on special order. Add WF (white flange) or CCF (custom color flange).

OPTIONS *Specify by adding to the basic unit.*

Dimmable ..standard driver is dimmable to 10% with a 0-10 volt dimmer.

Emergency battery pack operates luminaire in event of power outage. Includes a plate with ready light and test switch for adjacent installation by others ..... – REM

1/8" (3mm) thick **clear glass shield** ..... – GS
1/8" (3mm) thick **prismatic lens** ..... – WLS

EDISON PRICE LIGHTING

41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

LED SQUARE FTS DL/5

DL1

PHOTOMETRIC REPORT (tested per IESNA LM-79-2008)

LTL *Report No. 25254 and 25255. Original Luminaire Testing Laboratories, Inc. (LTL) test reports furnished upon request.*

Luminaire ..... recessed LED square downlight with aluminum reflector
Lamp ..... Philips LED Fortimo SLM 2000, 3000K CCT
Spacing Criteria 1.0
Luminaire light output..... 1575 lumens

LUMINAIRE LIGHT OUTPUT AND EFFICACY

Color	*800 lumens light engine*			*1100 lumens light engine*			*2000 lumens light engine*		
	Luminaire Light Output	*Luminaire Efficacy*	*System Wattage*	*Luminaire Light Output*	*Luminaire Efficacy*	*System Wattage*	*Luminaire Light Output*	*Luminaire Efficacy*	*System Wattage*
2700K	700*	37	19	963*	36	27	1575	38	42
3000K	700*	39	18	963*	39	25	1575	40	39
3500K	700*	50	14	963*	48	20	1575	53	30
4000K	700*	54	13	963*	51	19	1575	61	26

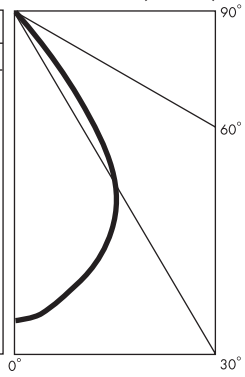
**estimated values*

LIGHT OUTPUT MULTIPLIER

800 lumens light engine	0.44
1100 lumens light engine	0.61
2000 lumens light engine	1

CANDLEPOWER DISTRIBUTION *(Candela)*

Vertical Angle	*Horizontal Angle*
	0
0	1566
5	1540
15	1392
25	1173
35	589
45	43
55	0
65	0
75	0
85	0
90	0



ZONAL LUMEN SUMMARY

Zone	*Lumens*	*% Fixture*
0 - 30°	1047	66.5
0 - 40°	1478	93.9
0 - 60°	1575	100.0
0 - 90°	1575	100.0
90 -180°	0	0.0
0 -180°	1575	100.0

LUMINANCE DATA *(Candela/m²)*

Vertical Angle	*Horizontal Angles*
	0
45	3807
55	0
65	0
75	0
85	0

DRIVER INFORMATION *UL Class 2, dry and damp location*

Voltage	*120*	*277*
Input Watts *(800/1100/2000 lumens), 3000K*	18/25/39	18/25/39
Input Current (A) *(800/1100/2000 lumens)*	0.15/0.21/0.33	0.06/0.09/0.14
Output Current (mA)	200-700	200-700
Output Voltage (Vdc)	25–56	25–56
Min. Power Factor	>0.9	>0.9
Operating Temperature Range (F)	–4 to 131	–4 to 131

DIMMING INFORMATION

Dimming Method	*Dimming Range (%)*	*Min. Output Power*
0 - 10V	10% -100%	15

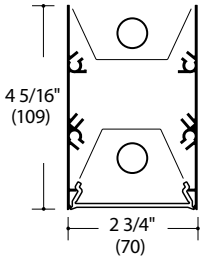
COMPATIBLE DIMMERS *Please verify with vendors*

CONTROL MANUFACTURER	WALLBOX DIMMER	POWER BOOSTER AVAILABLE
DOUGLAS LIGHTING CONTROLS	WPC-5721	
ENTERTAINMENT TECHNOLOGY	Tap Glide TG600FAM120(120V) Tap Glide Heatsink TGH1500FAM120 (120V) Oasis OA2000FAMU (120/277V)	
HONEYWELL, INC.	EL7315A1019 and EL7315A1009	EL7305A1010 (optional)
HUNT DIMMING	Preset slide: PS-010-IV-120V and PS-010-WH-120V Preset slide: PS-010-3W-IV-120V and PS-010-3W-WH-120V Preset slide: PS-010-IV-277V and PS-010-WH-277V Preset slide: PS-010-3W-IV-277V and PS-010-3W-WH-277V Preset slide, controls FD-010: PS-IFC-010-IV and PS-IFC-010-WH-120/277V Preset slide, controls FD-010: PS-IFC-010-3W-IV and PS-IFC-010-3W-WH-120/277V Remote mounted unit: FD-010-120V and FD-010-277V	
LEHIGH ELECTRIC PRODUCTS CO.	Solitarire	PBX
LEVITON LIGHTING CONTROLS DIV.	Leviton Centura Fluorescent Control System IllumaTech™ IP7 Series	CN100 PE300
LIGHTOLIER CONTROLS	Sunrise Preset slider ZP600FAM-120 (120V) Momentum Preset slider MP1500FAM-120 (120V) Vega Slider V2000FAMU (120-277V)	
LITHONIA CONTROLS	ISD BC SLD LPCS Digital Equinox (DEQ BC)	RDM FC
LUTRON ELECTRONICS CO., INC.	Visit **www.lutron.com/advance** for the latest control information and selection	
PDM ELECTRICAL PRODUCTS	WPC-5721	
STARFIELD CONTROLS	TR61 with DALI interface port	RT03 DALInet Routers
THE WATT STOPPER, INC.	LS-4 used with LCD-101 and LCD-103	

LITECONTROL

Fixture Type:
Project Name:

PF1



T5 or T5HO
SGL lens

LCS™ Control Solutions available

Mod™

P-ID-0200

Pendant-Mounted Indirect/Direct

Product Description

Small-scale indirect/direct extruded aluminum luminaire with separate up and downlight chambers. UL Listed. Cradle to Cradle Certified.CM

Ordering Guide

Product, Lamping, & Length										Options						
			Upper Lamp			Lower Lamp										
P -	ID -	02	2	8	T5HO	2	8	T5HO		SGL-	TCWM-	LP/ELB-	--	1CWQ-	F-	120
Mounting	Distribution	Series	Lamp Count	Nominal Length (ft)	Lamp Type	Lamp Count	Nominal Length (ft)	Lamp Type		Baffle or Diffuser	Finishes	Ballasts	Tandem Wiring	Pre-wiring	Other Options	Volts
P Pendant-mounted	**ID** Indirect/ Direct	**02**	**1 →**	**3**	**T5**	**1 →**	**3**	**T5**		**BW** **SGL** see **Baffle and Diffuser Options**	**CMA** (color machined aluminum) **TCWM** (textured matte white) are std. see **LiteColors™** for other finishes	**ELB10** is std. for T8 **LP/ELB** is std. for T5 & T5HO **DA/MK7** **DL/ECO** **DO/HEL** **LPD/CS/e** see **Ballast Options**	**--** →	**1CWQ**	**F** **LP/EF** see **Other options**	**120** **277**
			1 →	**4**	**T5HO** **T8**	**1 →**	**4**	**T5HO** **T8**					**TW →**	**2CWQ**		
			2 →	**6**		**2 →**	**6**									
			2 →	**8**		**2 →**	**8**									
			3 →	**12**		**3 →**	**12**									
			see **notes**			see **notes**										

notes:
Lamp count = total number of lamps in the fixture

For ordering guide information in shaded areas, choose selection by reading ACROSS the shaded areas for correct specifications.

Mounting
- add to end of catalog number
Aircraft cables
✓ **FAI/ACC** (field adjustable)
standard

P-ID-0228T5HO/28T5HO-SGL-TCWM-LP/ELB-1CWQ-F-120-FAI/ACC is a typical catalog number for a 2-lamp indirect (1 lamp in cross-section) / 2-lamp direct (1 lamp in cross-section), 8-foot long high output T5 indirect/direct fixture with soft glow lens, textured matte white finish, with a low-profile electronic T5HO ballast, one-circuit branch wiring and quick-connects, fuse, 120 volt, mounted with field adjustable aircraft cables.

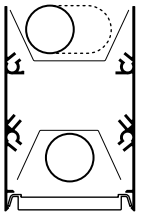
Cross-section lamping

1-T5 or T5HO

1-T8

Other Options

F Fuse. Slow or fast blow, determined by Litecontrol.
LP/EF Low-profile Emergency Fluorescent Ballast. Battery-powered ballast from a UL Listed manufacturer will operate one lamp for 1 1/2 hours.



T8
BW baffle

Baffle and Diffuser Options

BW Blade Baffle, White. 5/16" high and 1/2" OC, aluminum, flush to bottom of fixture housing.
SGL Soft Glow Lens. Extruded, frosted acrylic, flush to bottom of fixture housing.

Finishes

TCWM Textured Matte White paint.
CMA Color Machined Aluminum. Specially formulated powdercoat paint that reliably and uniformly mimics the appearance of machined/sandblasted aluminum.

For *LiteColors* or other finish choices, consult the Product Guide or litecontrol.com.

Ballast Options LCSe

Specify in place of **ELB10** or **LP/ELB**, contact factory for availability:

DA/MK7 Advance Mark VII dimming ballast
DL/ECO Lutron ECO-10 dimming ballast
DO/HEL Osram Sylvania dimming ballast

To have the fixture enabled for Lutron EcoSystem compatibility:
LPD/CS/e EcoSystem low-profile dimming electronic ballasts installed at the factory, along with all required internal EcoSystem wiring. For other configurations of the Lutron EcoSystem components, including custom device connection feeds to enable connection to ceiling-mounted sensors and control devices, consult litecontrol.com/cs or contact the factory.

Tandem Wiring & Circuiting Options

1CWQ Fixture is wired with a single-circuit so that all lamps are switched together.
TW-2CWQ Fixtures wired with two circuits. The fixture is wired so that the indirect and direct lamps are switched separately.

Questions to Ask

1. Row information, including desired fixture lengths?
2. Lamp type? **3.** White baffle or soft glow lens? **4.** White, clear anodized, *LiteColor*, or special color?
5. Ballast options? **6.** Controls solutions? **7.** Other options? **8.** 120 or 277 volt?

revised 2/24/2011

Click on **Quick Find** **02id**
litecontrol.com

Specifications

HOUSING. Two-piece extruded aluminum. Standard finishes include Textured Matte White (**TCWM**) paint or Color Machined Aluminum (**CMA**).
END CAPS. Required at each end of row and at both ends of an individual fixture. Either painted steel or Color Machined Aluminum (**CMA**) with no holes or knockouts, finished to match housing.
REFLECTOR. Die-formed steel with high-reflectance white finish.
LAMPING. Available in one-lamp T8, T5, or T5HO. T8 upper lamp is diagonally positioned along length to clear suspension hardware at fixture ends for "on-module" suspension, and provide symmetrical light distribution.
BALLAST. Electronic Ballast (**ELB10** for T8 lamping**)** or Low-profile Electronic Ballast (**LP/ELB** for T5 or T5HO lamping), high power factor, thermally protected Class P, Sound Rated A, manufactured by a UL-Listed manufacturer, as available, determined by Litecontrol. Ballasts with a voltage range of 120 to 277 will be used when fixture configuration and ballast availability allow. The minimum number of ballasts will be used.
CONTROLS. Available as an EcoSystem enabled fixture. See Ballast and Control options for details.
PRE-WIRING. Fixtures are supplied with #12 AWG type THHN wire for branch circuits. One end will have factory installed push-in quick-connects. The other end will be stripped back 1/2" for quick connection in field. For fixtures to accommodate special circuits such as night light and emergency, etc., in-field wiring will be required. See Pre-wiring Information online for details.
BALLAST DISCONNECT. Fixture supplied with a ballast disconnect device to enable compliance with the NEC.
ROW JOINING. Support points are centered above the midpoint of joint "on seam" for aligned, symmetrical appearance. Fixture end headers are threaded in one location to allow easy row joining without removing reflectors.
SUSPENSION Yoke with field adjustable aircraft cable attaches directly to the end header. Mounting points in rows are exactly "on module" at 36", 48", 72", 96", and 144", including at ends of rows.
CERTIFICATION. Fixture and electrical components shall be UL and/or CUL Listed and shall bear the I.B.E.W., A.F. of L. label. This fixture is Cradle to Cradle Certified[CM] Silver by MBDC.

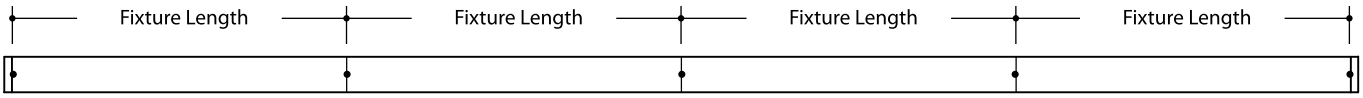
Note: Litecontrol reserves the right to change specifications without notice for product development and improvement.

Planning for installation

Suspension Assemblies
Provided with 3/64" diameter field adjustable aircraft cables (FAI/ACC) in 51" lengths (4' nominal). Longer length aircraft cables of 87" and 219" are available upon request. See Aircraft Cables sheets for further details.

Suspension mounting locations
Yoke with field adjustable aircraft cable attaches directly to end header. Mounting points in rows are exactly "on module" at 36", 48", 72", 96", and 144", including at ends of rows.

Row diagram



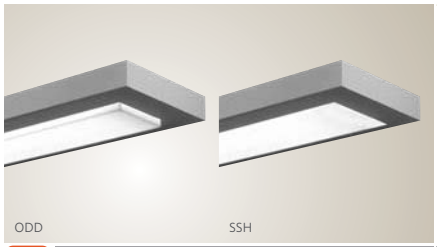
End cap

Fixture Lengths: 3', 4', 6', 8', and 12'
• Indicates pendant locations

LITECONTROL
employee owned | customer driven
100 Hawks Avenue Hanson, MA 02341
781 294 0100 f: 781 293 2849 litecontrol.com

PEERLESS®

PF2



Bruno

Diffuser / Softshine™ T5 / T5HO

Project:

SPECIFICATIONS Pendant Mount — Modular / 8" X 2" Rectangular BRM9

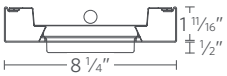
CATALOG NUMBER

FT

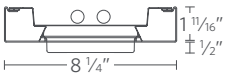
Examples: BRM9 2 28T5 SPR ODD 40FT R8 277 GEB10 DCT LP835 F1/18 C210 SCEP — BRM9 3 54T5HO SPR SSH R8 277 GEB10 1SE EL DCT LP835 F1/21 C110

AVAILABLE FIXTURES

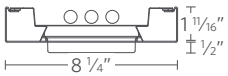
BRM9 - 1 - ODD



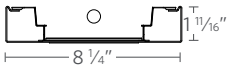
BRM9 - 2 - ODD



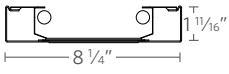
BRM9 - 3 - ODD



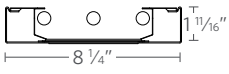
BRM9 - 1 - SSH



BRM9 - 2 - SSH



BRM9 - 3 - SSH



SPECIFICATIONS

Construction
Housing is a nominal 8 1/4" x 1 11/16" rectangular channel formed from cold-rolled steel. 5/8" thick aluminum die cast end caps are standard, 4" sculpted die cast aluminum end caps are optional.

Reflectors
Die formed specular reflector with 95% reflectance.

Shielding
Die formed drop acrylic diffuser or flush Softshine™ high performance lens.

Finish
Fine textured white polyester powder paint is standard. Consult factory for special finish requirements.

Electrical
Specify 120V, 277V, or 347V. Pre-wired with 16AWG fixture wire. For special circuiting or wire gauge, consult factory. Plug-in electrical connectors included. UL and C-UL listed and labeled.

Fixture Length
4' 3/8", 8' and 12' lengths in a single section for nominal support spacing 4'-0", 8'-0", and 12'-0". For total fixture length, add 5/8" for each flat end cap and 4" for each sculpted end cap. Using internal joiners, 4', 8' and 12' sections can be joined to form longer rows.

ORDERING LOGIC

Use guide below to order complete fixture runs from four feet to one-hundred feet in increments of four.

Fixture	# of Lamps in Cross Section	Lamp Type	Reflector	Distribution[2,3]	Shielding	Nominal Row Length[4] FT	Maximum Section Length	Voltage	Ballast Type	# of Emergency Modules
BRM9	1 2 3	28T5 54T5HO	**SPR** Specular Reflector	**Blank** Standard; 70% Up; 30% Down **20/80** 20% Up; 80% Down **0/100**[8] 0% Up; 100% Down	**ODD** Opal Drop Diffuser **SSH** Softshine™ High Performance Lens		**R4** **R8** **R12**	**120** **277** **347**	**GEB10** <10% THD ELECTRONIC **ADEZ**[1,5] Advance Mark 10 dimming **ECO10**[1] Lutron ECO-10 dimming **OSDIM**[1,5] Osram 0-10v dimming *Reference Ballast Chart on website or consult factory for other options.*	**Blank** No Emergency **1SE** 1 section **2SE** 2 sections **XSE** X sections

Emergency Type[6]	Switching	Lamp Color	Mounting Type /	Overall Suspension	Finish	Options
Blank No Emergency or Night Light **EL**[1] Emergency Battery Pack **EC** Emergency / Night Light Circuit **EN**[1] Emergency Battery Pack with Night Light Circuit	**SCT** Single Circuit **DCT** Dual Circuit	**L/LP** No Lamp **LP830** 3000K 80+ CRI **LP835** 3500K 80+ CRI **LP841** 4100K 80+ CRI **Available with T5 only:** **LP830** 3000K 80+ CRI Premier Lamp **LP835** 3500K 80+ CRI Premier Lamp **LP841** 4100K 80+ CRI Premier Lamp *Reference Lamp Chart on website or consult factory for other options.*	**F1** T-Bar Ceiling (Universal Mounting Bracket) **F1A** T-Bar Ceiling (UMB with Integrated J-Box) **F2** Hard Ceiling (Horizontal J-Box) **F3** Stem Mount **F4A** IDS Clip 15/16" Tee **F4B** IDS Clip 9/16" Tee **F4C** IDS Clip Screw Slot	**12** 12" overall suspension **15** 15" overall suspension **18** 18" overall suspension **21** 21" overall suspension **24** 24" overall suspension **XX** XX" overall suspension	**C210** Standard White White (fine-textured low gloss) **C110** Painted to match Aluminum Finish **C099** Custom Color	**ACG** Adjustable Cable Grippers **BLK** Black Cord, Cord Manager and Canopies **CP** Chicago Plenum **DL** Damp Location Label (not available with EL or EN) **DPC**[12] Daylight Photocell **DU**[7,8,9] Dust Cover **ELH** EM Through wire w/ Separate Feed **ELS** EM Through Wire w/ Single Feed **ELS2** Normal feed w/ EM Separate Neutral **GLR** Fusing (Fast blow) **GMF** Fusing (Slow Blow) **MCS** Matching Feed Canopy at Support **NYC** New York City Code **OJB** Offset Junction Box **SCEP** Sculptured End Cap **SLP**[10,11] Sloped Ceiling 10-45°

Notes:
1 Not available in 347 volt.
2 Nominal distribution. Refer to photometric reports for exact distribution.
3 Available with SSH (Softshine) only.
4 Must be in 4' increments.
5 Not available with 28T5 Lamp Type.
6 EL and EC are installed in last 4' of fixture sections and are not available concurrently. Separate feed required for each EL or EC unless ELS/ELH/ELS2 is specified.
7 Not available with 3 lamp.
8 Ambient conditions not to exceed 35° C for 2 or 3 Lamp 54T5HO.
9 Not available with 20/80 or 0/100 Distribution.
10 Available with F2 Mounting Type only.
11 Must order with OJB option.
12 Photocell installed approx. 4ft from the beginning of the row. DPC must be used w/ 0-10V dimming ballast.

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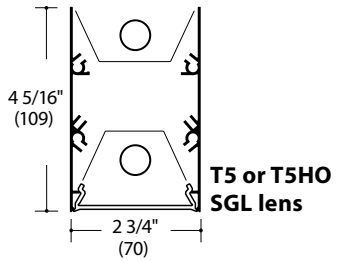
An AcuityBrands Company

LITECONTROL

Fixture Type:
Project Name:

PF3



LCS™ Control Solutions available

Mod™

P-ID-0200

Pendant-Mounted Indirect/Direct

Product Description

Small-scale indirect/direct extruded aluminum luminaire with separate up and downlight chambers. UL Listed. Cradle to Cradle Certified.CM

Ordering Guide

Product, Lamping, & Length

P -	ID -	02	Upper Lamp: 2	Upper Lamp: 8	Upper Lamp: T5HO	/ Lower Lamp: 2	Lower Lamp: 8	Lower Lamp: T5HO
Mounting	Distribution	Series	Lamp Count	Nominal Length (ft)	Lamp Type	Lamp Count	Nominal Length (ft)	Lamp Type
P Pendant-mounted	**ID** Indirect/ Direct	**02**	**1 →**	**3**	**T5**	**1 →**	**3**	**T5**
			1 →	**4**	**T5HO**	**1 →**	**4**	**T5HO**
			2 →	**6**	**T8**	**2 →**	**6**	**T8**
			2 →	**8**		**2 →**	**8**	
			3 →	**12**		**3 →**	**12**	
			see **notes**			see **notes**		

Mounting
- add to end of catalog number
Aircraft cables
✓ **FAI/ACC** (field adjustable)
standard

Options

SGL-	TCWM-	LP/ELB-	--	1CWQ-	F-	120
Baffle or Diffuser	Finishes	Ballasts	Tandem Wiring	Pre-wiring	Other Options	Volts
BW **SGL** see **Baffle and Diffuser Options**	**CMA** (color machined aluminum) **TCWM** (textured matte white) are std. see **LiteColors™** for other finishes	**ELB10** is std. for T8 **LP/ELB** is std. for T5 & T5HO **DA/MK7** **DL/ECO** **DO/HEL** **LPD/CS/e** see **Ballast Options**	**--** → **TW** →	**1CWQ** **2CWQ**	**F** **LP/EF** see **Other options**	**120** **277**

notes:
Lamp count = total number of lamps in the fixture

For ordering guide information in shaded areas, choose selection by reading ACROSS the shaded areas for correct specifications.

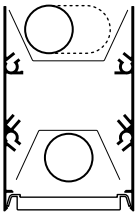
P-ID-0228T5HO/28T5HO-SGL-TCWM-LP/ELB-1CWQ-F-120-FAI/ACC is a typical catalog number for a 2-lamp indirect (1 lamp in cross-section) / 2-lamp direct (1 lamp in cross-section), 8-foot long high output T5 indirect/direct fixture with soft glow lens, textured matte white finish, with a low-profile electronic T5HO ballast, one-circuit branch wiring and quick-connects, fuse, 120 volt, mounted with field adjustable aircraft cables.

Cross-section lamping

1-T5 or T5HO **1-T8**

Other Options

F Fuse. Slow or fast blow, determined by Litecontrol.
LP/EF Low-profile Emergency Fluorescent Ballast. Battery-powered ballast from a UL Listed manufacturer will operate one lamp for 1 1/2 hours.



T8
BW baffle

Baffle and Diffuser Options

BW Blade Baffle, White. 5/16" high and 1/2" OC, aluminum, flush to bottom of fixture housing.
SGL Soft Glow Lens. Extruded, frosted acrylic, flush to bottom of fixture housing.

Finishes

TCWM Textured Matte White paint.
CMA Color Machined Aluminum. Specially formulated powdercoat paint that reliably and uniformly mimics the appearance of machined/sandblasted aluminum.
For *LiteColors* or other finish choices, consult the Product Guide or litecontrol.com.

Ballast Options LCSe

Specify in place of **ELB10** or **LP/ELB**, contact factory for availability:

DA/MK7 Advance Mark VII dimming ballast
DL/ECO Lutron ECO-10 dimming ballast
DO/HEL Osram Sylvania dimming ballast

To have the fixture enabled for Lutron EcoSystem compatibility:
LPD/CS/e EcoSystem low-profile dimming electronic ballasts installed at the factory, along with all required internal EcoSystem wiring. For other configurations of the Lutron EcoSystem components, including custom device connection feeds to enable connection to ceiling-mounted sensors and control devices, consult litecontrol.com/cs or contact the factory.

Tandem Wiring & Circuiting Options

1CWQ Fixture is wired with a single-circuit so that all lamps are switched together.
TW-2CWQ Fixtures wired with two circuits. The fixture is wired so that the indirect and direct lamps are switched separately.

Questions to Ask

1. Row information, including desired fixture lengths?
2. Lamp type? **3.** White baffle or soft glow lens? **4.** White, clear anodized, *LiteColor*, or special color?
5. Ballast options? **6.** Controls solutions? **7.** Other options? **8.** 120 or 277 volt?

revised 2/24/2011

Click on **Quick Find** **02id**
litecontrol.com

Specifications

HOUSING. Two-piece extruded aluminum. Standard finishes include Textured Matte White (**TCWM**) paint or Color Machined Aluminum (**CMA**).
END CAPS. Required at each end of row and at both ends of an individual fixture. Either painted steel or Color Machined Aluminum (**CMA**) with no holes or knockouts, finished to match housing.
REFLECTOR. Die-formed steel with high-reflectance white finish.
LAMPING. Available in one-lamp T8, T5, or T5HO. T8 upper lamp is diagonally positioned along length to clear suspension hardware at fixture ends for "on-module" suspension, and provide symmetrical light distribution.
BALLAST. Electronic Ballast (**ELB10** for T8 lamping**)** or Low-profile Electronic Ballast (**LP/ELB** for T5 or T5HO lamping), high power factor, thermally protected Class P, Sound Rated A, manufactured by a UL-Listed manufacturer, as available, determined by Litecontrol. Ballasts with a voltage range of 120 to 277 will be used when fixture configuration and ballast availability allow. The minimum number of ballasts will be used.
CONTROLS. Available as an EcoSystem enabled fixture. See Ballast and Control options for details.
PRE-WIRING. Fixtures are supplied with #12 AWG type THHN wire for branch circuits. One end will have factory installed push-in quick-connects. The other end will be stripped back 1/2" for quick connection in field. For fixtures to accommodate special circuits such as night light and emergency, etc., in-field wiring will be required. See Pre-wiring Information online for details.
BALLAST DISCONNECT. Fixture supplied with a ballast disconnect device to enable compliance with the NEC.
ROW JOINING. Support points are centered above the midpoint of joint "on seam" for aligned, symmetrical appearance. Fixture end headers are threaded in one location to allow easy row joining without removing reflectors.
SUSPENSION Yoke with field adjustable aircraft cable attaches directly to the end header. Mounting points in rows are exactly "on module" at 36", 48", 72", 96", and 144", including at ends of rows.
CERTIFICATION. Fixture and electrical components shall be UL and/or CUL Listed and shall bear the I.B.E.W., A.F. of L. label. This fixture is Cradle to Cradle Certified[CM] Silver by MBDC.

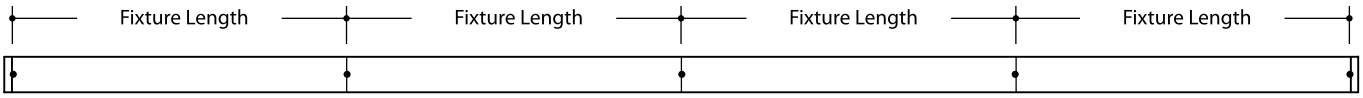
Note: Litecontrol reserves the right to change specifications without notice for product development and improvement.

Planning for installation

Suspension Assemblies
Provided with 3/64" diameter field adjustable aircraft cables (FAI/ACC) in 51" lengths (4' nominal). Longer length aircraft cables of 87" and 219" are available upon request. See Aircraft Cables sheets for further details.

Suspension mounting locations
Yoke with field adjustable aircraft cable attaches directly to end header. Mounting points in rows are exactly "on module" at 36", 48", 72", 96", and 144", including at ends of rows.

Row diagram



End cap

Fixture Lengths: 3', 4', 6', 8', and 12'
• Indicates pendant locations

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employee owned | customer driven
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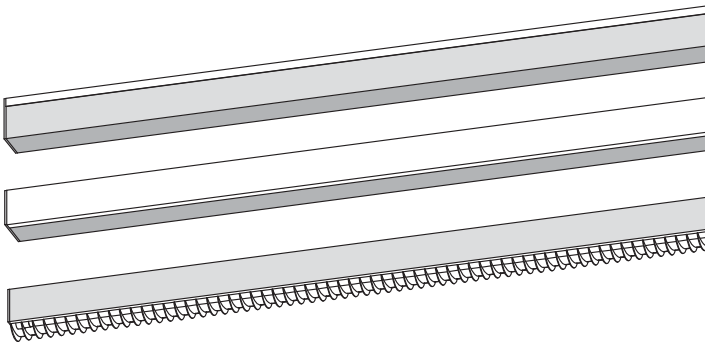
781 294 0100 f: 781 293 2849 litecontrol.com

LIGHTPLANE LINEAR - 2" Profile

ARCHITECTURAL LIGHTING WORKS

PF4

Specification and Ordering Information:



1. Style:

- ❑ LPLI - Suspended Indirect (LPLI)
- ❑ LPLD - Suspended Direct (LPLD)
- ❑ LPLSM - Ceiling/Surface Mount (LPLSM)
- ❑ WLPI - Wall Mount Indirect (WLPI)
- ❑ WLPD - Wall Mount Direct (WLPD)
- ❑ WLPIV - Wall Mount Vanity Style (WLPIV)
- ❑ WLPVERT - Wall Mount Vertical (WLPVERT)

2. Overall Run Length:

- ❑ Individual (2',3',4',5',6',7',8')
- ❑ Continuous (Enter total run length, i.e 20')

3. Lamping

- ❑ FSO - Fluorescent - Standard Output (FSO)
- ❑ FHO - Fluorescent - High Output (FHO)
- ❑ HP7- 80 LPW High Performance LED White 3500° 7W/LF (HP7)
- ❑ HP14- 80 LPW High Performance LED White 3500° 14W/LF (HP14)
- ❑ RGB - LED Color Changing (RGB)-Consult Factory for Control Interface Options
- ❑ LXHO - Seamlessline lamp (LXHO Feelux High Output)*
- ❑ LXHE - Seamlessline lamp (LXHE Feelux High Efficiency)*

*See Option 1A

4. Lamp Configuration:

- ❑ R - Regular (R)
- ❑ *S - Staggered (S)

*For Staggered lamping, it is recommended to use the EXT lens for maximum diffusion properties

5. Ballast Specification:

- ❑ LED - LED Power Supply, non-dim (LED)
- ❑ LED-DIM - LED Power Supply with 0-10V dimming (LEDDIM)
- ❑ STD - Standard Electronic, non-dim <10%THD (STD)
- ❑ * MK7 - Advance Mark 7® Dimming 0-10V (MK7)
- ❑ * MK10 - Advance Mark 10® Dimming (MK10)
- ❑ * HILUME - Lutron Hilume 3-D® (HILUME3D)
- ❑ * HSeries- Lutron H-SERIES® Dimming (HSERIES)
- ❑ * ECOSYS- Lutron ECOSYSTEM® Dimming (ECOSYS)
- ❑ * BALSTAR - Ballastar® Light level switching (BALSTAR)
- ❑ * USD - Superdim® Dimming (USD)
- ❑ * QUICK - Osram Quicktronic® Dimming (QUICK)

*Please consult ballast manufacturer for lamp/ballast compatability.

6. Voltage:

- ❑ 120 - 120 volt (120)
- ❑ 277 - 277 volt (277)
- ❑ UNV - Universal voltage (UNV) (Fluorescent Only)
- ❑ 347 - 347 volt (not available in dimming) (347)

7. Accessory options:

- ❑ WD - Lens (WD)
- ❑ *EXT - Extra Diffuse Lens (EXT)
- ❑ LV - Louver (LV)
- ❑ RO - Open, Reflector Only (RO)
- ❑ DG - Flush guard lens - Indirect only (DG)

*EXT is recommended for minimal lamp image

8. Finish:

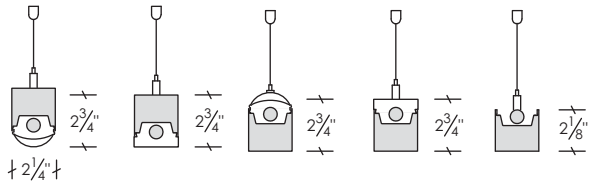
- ❑ * AL (Natural "Ultimatte" aluminum)
- ❑ BK (Black powdercoat)
- ❑ WH (White powdercoat)
- ❑ RAL (Specify RAL # of powdercoat of your choice)

* AL is standard on all Lightplane Linear product

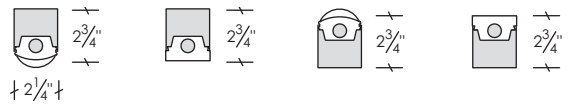
9. Additional Options:

- ❑ *OS - Occupancy Sensor
- ❑ *PH - Photocell - Consult Factory (OS)
- ❑ SB - Seismic Bracing- Consult Factory (SB)
- ❑ EM - Emergency Ballast (EM)
- ❑ EMC - Emergency Circuit (EMC)

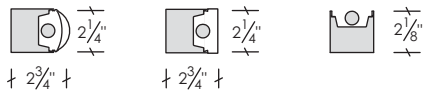
* Consult factory for options. Size limitations exist



Style: LPLD with LV (louver) | Style: LPLD with WD (lens) | Style: LPLI with LV (louver) | Style: LPLI with WD (lens) | Style: LPLI with RO (reflector only)

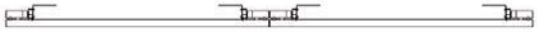


Style: WLPD with LV (louver) | Style: WLPD with WD (lens) | Style: WLPI with LV (louver) | Style: WLPI with WD (lens)



Style: WLPIV with LV (louver) | Style: WLPIV with WD (lens) | Style: WLPI with RO (reflector only)

*1A - Option: Seamlessline Lamp (SL) End to End Lamp Mounting



*Channel dimensions identical to standard T5 lamping. Luminous ends eliminate the need for staggered lamping. Consult factory for additional details.

8FT Suspension hardware standard (included)
Power canopy to cover 4-O Junction Box.

MTR Column

RF1

selux®

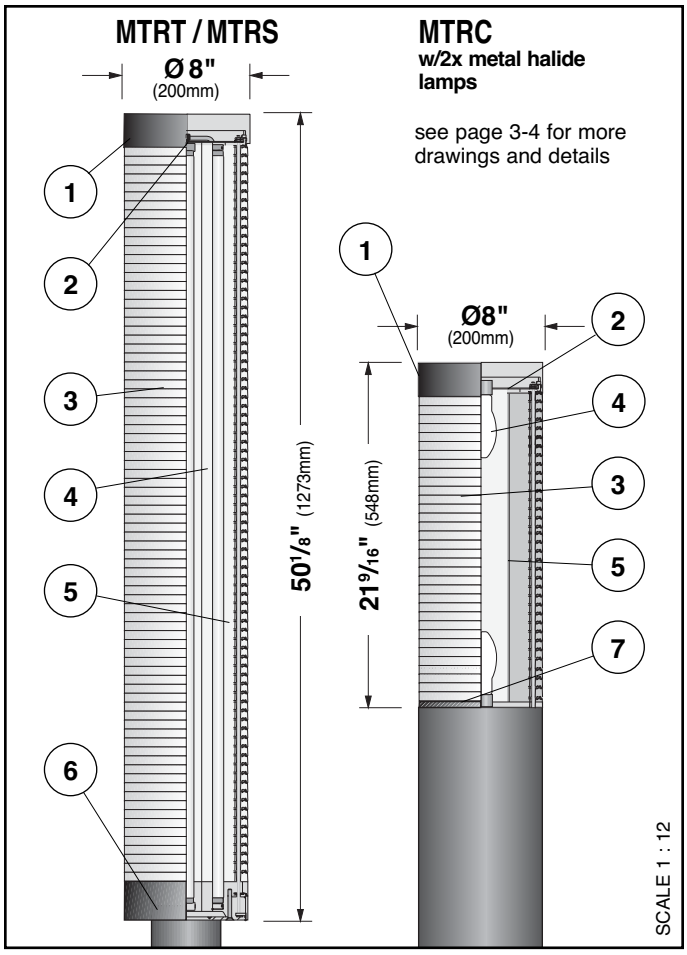
Project: _____

Type: _____ **Qty:** _____

Series	Height	Lamping	Finish	Voltage	Options

Series	Height	Lamping		Finish	Voltage	Options
MTRT MTR[1] Column Round Tapered Pole **MTRS** MTR[1] Column Round Straight Pole **MTRC** MTR[1] Column Round 8" Straight Pole	**12** 12 ft. **14** 14 ft. **16** 16 ft.	**Metal Halide** **2H050**[2] (2x)50w **2H070**[2] (2x)70w **2H100**[2] (2x)100w	**Fluorescent** **1T8** (1x)FO32T8 **2T8** (2x)FO32T8 **3T8** (3x)FO32T8 **4T8** (4x)FO32T8	**WH** White **BK** Black **BZ** Bronze **SV** Silver **SP** Specify Premium Color	**120** **277** **347**	**REC** GFCI Receptacle **CWB**[3] Cold Weather Ballast Consult factory for other heights and options

[1] US Patent No. 4,669,034 [2] Only available with MTRC (Round 8" Straight Pole) [3] Fluorescent Only.



1. Fixture Cover - Die-cast, alumi-num cover, with smooth crisp form to reflect and complement the column design. Thick-walled, alumi- num cover is painted white on the interior for maximum luminaire efficiency. Removes by loosening three vandal-resistant, stainless steel screws for easy access to lamp chamber.

2. Gasketing - Continuous gaskets provide weather-proofing, dust, and insect control at base of column, fixture cover, and between MTR rings.

3. Shielding - Consists of 8" (200mm) diameter injection-molded acrylic multi-prisms for total reflection (MTR). MTR rings have a wall thickness of .591" and are patterned after the light-bending characteristics of a prism (US Patent 4,669,034).

4. Lamping - One, two, three or four FO32T8 (32 watts each) fluorescent lamps on removable gear tray, mounted vertically; or two coated, medium base ED-17 metal halide up to 100w. Lamps provided by others.

5. Diffusing Cylinder - Satine acrylic cylinder between lamps and MTR rings to diffuse lamp image for maximum performance and visual comfort.

6. Pole Fitter - Self-leveling, die-cast aluminum, fitter base secured to pole with two, stainless steel, Allen head set screws. 31/2" (90mm) O.D. poles.

7. Column Fitter - Die-cast aluminum fitter, with built-in gasketing ridges, for smooth transition to column.

8. Ballast (not shown)- Electronic ESB, high power factor, class "P", type "A" sound rating. Minimum lamp starting temperature 0° F (-20° C). Cold Weather Ballast option (minimum lamp starting temp -20°F/ -29°C) available. Consult factory for more detailed ballast information.

9. Base Cover - (not shown - MTRT/MTRS only) Standard two-piece base cover is made from die-cast 356 alloy aluminum which is heat treated to produce a T6 temper, measuring 41/2" (115mm) height by 121/2" (316mm) diameter.

Exterior Luminaire Finish - SELUX utilizes a high quality Polyester Powder Coating. All SELUX luminaires and poles are finished in our Tiger Drylac certified facility and undergo a five stage intensive pretreatment process where product is thoroughly cleaned, phosphated and sealed. SELUX powder coated products provide excellent salt and humidity resistance as well as ultra violet resistance for color retention. All products are tested in accordance with test specifications for coatings from ASTM and PCI.

Standard exterior colors are White (WH), Black (BK), Bronze (BZ), and Silver (SV). Selux premium colors (SP) are available, please specify from your SELUX color selection guide. Hot Dip Galvanized finish (GV) on all steel parts also available.

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TEL (845) 691-7723
FAX (845) 691-6749
www.selux.com/usa
MTRC-1011-01 (ss-V2.7)

NRTL Listed (i.e. UL, CSA)

Union Made Affiliated with* IBEW *Local 363

MTR Column

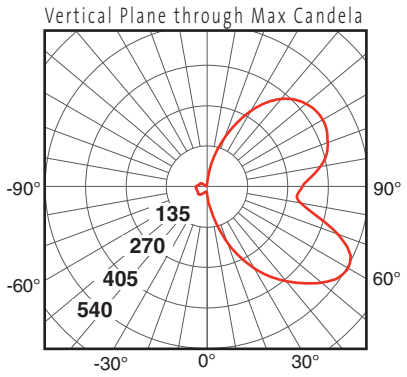
Photometry

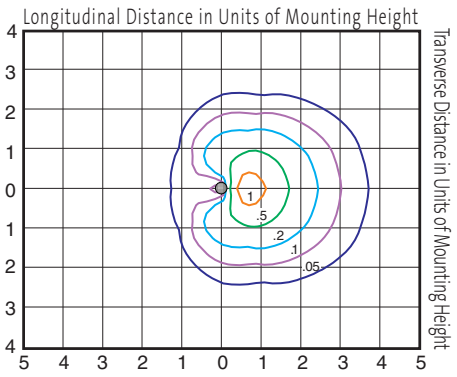
Round Tapered Pole / (1x)FO32T8

Catalog # MTRC-12-1T8
Report # SX-17021

- Round 8" Straight Pole
- Ideal for applications demanding max. spacing.
- Maximum candela of 540 at 60° from vertical.
- IES classification - Type IV Non-Cutoff.

DOWNLOAD IES FILE:
http://www.selux.com/web/files/exterior/MTRC-1T8.zip



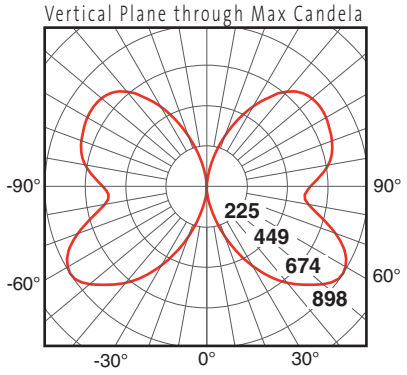


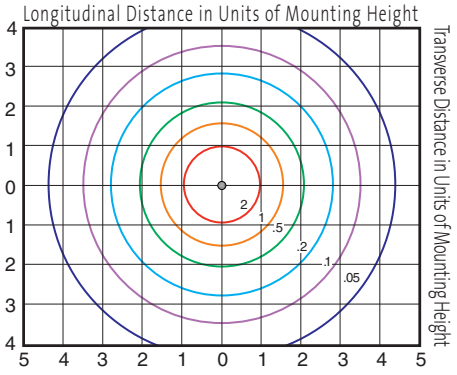
Round Tapered Pole / (4x)FO32T8

Catalog # MTRC-12-4T8
Report # SX-17020

- Round 8" Straight Pole
- Ideal for applications demanding max. spacing.
- Maximum candela of 898 at 58° from vertical.
- IES classification - Type V Non-Cutoff.

DOWNLOAD IES FILE:
http://www.selux.com/web/files/exterior/MTRC-4T8.zip



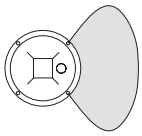


Conversion Chart
Values based on 14' (4.3m) mounting height.

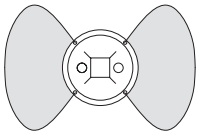
Mounting Height		Multiply
12'	(3.7m)	1.00
14'	(4.3m)	0.93
16'	(4.9m)	0.87

T8 Lamping Distribution Guide

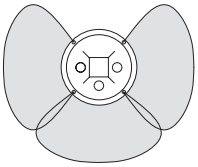
1T8



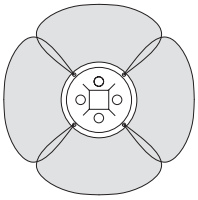
2T8



3T8



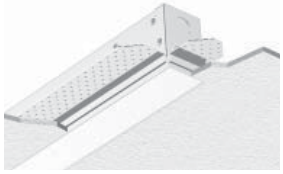
4T8



GRÜV MINI EXTRUDED

2.5" RECESSED LINEAR LED, GYP BOARD

GRU RL1



APPLICATIONS:
Retail and commercial ambient lighting in wall to ceiling applications

CONSTRUCTION:
Extruded aluminum housing
Ceiling trim is high reflectance white finish

MOUNTING:
For use in sheet rock ceilings or walls only
Fixtures must be installed before finished ceiling or walls are installed

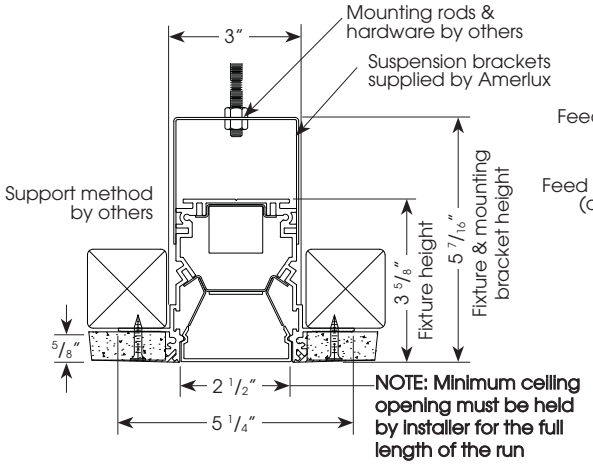
OPTICS:
5w/ft, 3500K LED's
Extruded white acrylic lens, snap-in, 8' maximum section
Amerlux exclusive white acrylic lens provides excellent transmission while effectively concealing lamp image

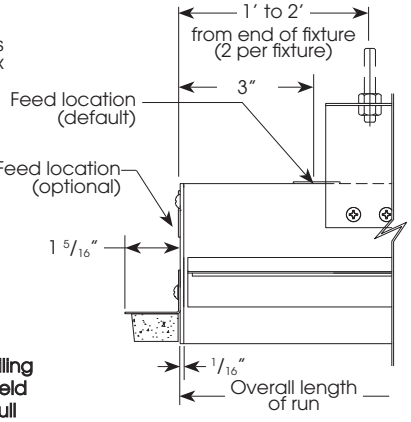
ELECTRICAL:
Electronic, multi-volt (120v-277v) constant current driver
Dimmable, 0-10v
This product complies with IEEE C62.41 for surge endurance up to 3KV. Amerlux recommends using additional surge protection with this unit (supplied by others), surge damage is not covered by warranty.
Emergency circuit via remote inverter or auxillary emergency power supply (by others)

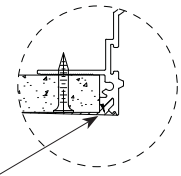
LABELING:
c UL us

PROJECT:

TYPE:







Ceiling contractor to spackle, feather & sand at ceiling interface.

Electrostatic sensitive device, observe precautions for handling

ELECTRICAL

		Lamping				
			4'		8'	
Driver	Wattage per foot		Input watts	Amps	Input watts	Amps
Electronic	5	120v	22	.18	44	.37
		277v	20	.07	40	.14

10 year limited warranty AMERLUX LED
(see website for details)

ORDERING INFORMATION:

Model	Wattage Per Foot	Lamp Type	Ballast	Voltage	Length	Mounting	Color Temp
GRUVM-EX-GB	5	LED	E - electronic	120/277	4 - 4' 8 - 8' (other consult factory)	For Straight Runs IND - individual BOR - beginning of run MOR - middle of run EOR - end of run For Ceiling/Wall Corner BORWC - beginning of run, wall corner EORWC - end of run, wall corner BORCC - beginning of run, ceiling corner EORCC - end of run, ceiling corner	3500

Example: GRUVM-EX-GB-5-LED-E-120/277-8-IND-3500

Cat #:

Amerlux reserves the right to change details that do not affect overall function and performance.

Amerlux, LLC • 23 daniel road, fairfield NJ 07004 • p: 973.882.5010 f: 973-882.2605 • www.amerlux.com

amerlux

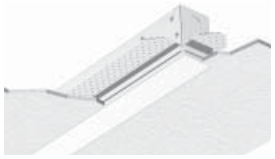
GRÜV MINI EXTRUDED

2.5" RECESSED LINEAR LED, GYP BOARD

GI RL1 B

amerlux

TYPE:

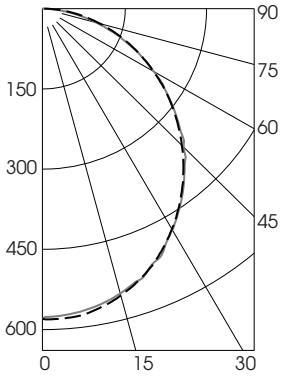


FIXTURE DATA:

Complete photometric data (.ies format) available upon request.

GRÜVM 5W LED
SOURCE: 120 WHITE LEDS LUMENS: 1592
RECESSED

LTL# 26361



ZONAL LUMEN SUMMARY

Zone	Lumens	%Lamp	%Fixt
0-30	446	NA	28.0
0-40	722	NA	45.4
0-60	1252	NA	78.7
0-90	1591	NA	100.0
90-180	0	0.1	0.0
0-180	1591	NA	100.0

Total Luminaire Efficacy = 73.6 lumens/watt

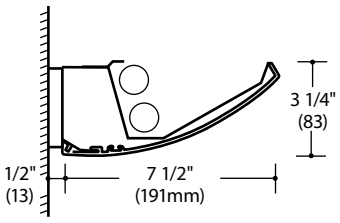
COEFFICIENTS OF UTILIZATION

RC		80		
RW	70	50	30	10
0	1895	1895	1895	1895
1	1728	1651	1582	1520
2	1572	1439	1329	1237
3	1433	1264	1133	1029
4	1312	1121	980	873
5	1207	1002	859	753
6	1116	903	760	658
7	1035	819	680	582
8	964	748	613	519
9	901	687	556	468
10	845	634	509	425

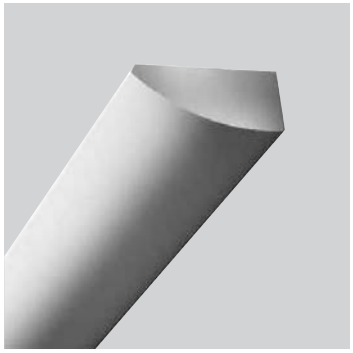
LITECONTROL

Fixture Type:
Project name:

SF1



T8



Wall Arcos™

W-AI-5600

Wall-Mounted Asymmetric Indirect

Product Description

Wall-mounted arcuate shaped extruded aluminum luminaire which complements Litecontrol's Arcos pendants. UL Listed. Cradle to Cradle Certified.CM

Ordering Guide

Product, lamping, & length

W -	AI -	56	2	4	T8-
Mounting	Distribution	Series	Lamp Count	Nominal Length (ft)	Lamp Type
W Wall-Mounted	**AI** Asymmetric Indirect	**56**	**1** →	**3** →	**T5HO**
			1 →	**4** →	**T5**
			2 →	**6** →	
			2 →	**8** →	
			3 →	**12** →	
			1, 2 →	**2** →	**T8**
			1, 2 →	**3** →	
			1, 2 →	**4** →	
			2, 4 →	**6** →	
			2, 4 →	**8** →	
			3, 6 →	**12** →	
			1 →	**2** →	**BX40**
			2 →	**4** →	**BX50**
			3 →	**6** →	
			4 →	**8** →	
			6 →	**12** →	
			2 →	**3** →	**BX39**
			see **notes**		

Options

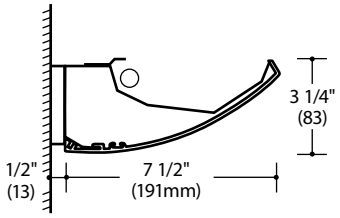
TCWM-	ELB10-	TW-	2CWQ-	F-	120
Finish	Ballast	Tandem Wiring	Pre-Wiring	Other Options	Volts
TCWM (textured matte white) is standard see **LiteColors**™ for other finishes	**ELB10** is std. for T8 or BX **LP/ELB** is std. for T5 or T5HO **DA/MK7*** **DL/ECO*** **DO/HEL*** **LPD/D10*** **LPD/ECO*** see **Ballast Options**	-- → **1CWQ** **TW** → **2CWQ** see **notes**		**F** **EF** **LP/EF** see **Other Options**	**120** **277**

notes:
Lamp count = total number of lamps in the fixture
Tandem wiring not available for one-lamp cross-section fixtures
*Dimming ballasts not available for all lamp types and combinations. Contact factory for details.
For ordering guide information in shaded areas choose selection by reading ACROSS the shaded areas for correct specifications.

W-AI-5624T8-TCWM-ELB10-TW-2CWQ-F-120 is a typical catalog number for a 2-lamp (2 lamps in cross-section), 4-foot long, T8 fixture with textured matte white finish, electronic ballast, tandem-wired, pre-wired with two-circuit branch wiring and quick-connects, fuse, 120 volts.

Cross-section lamping

1-T5 or T5HO | **1-T8** | **2-T8** | **1-BX39, 40 or 50**



T5 or T5HO

Ballast Options

Specify in place of **ELB10** or **LP/ELB**, contact factory for availability:

DA/MK7 Advance Mark VII dimming ballast
DL/ECO Lutron ECO-10 dimming ballast
DO/HEL Osram Sylvania dimming ballast
LPD/D10 Low-profile dimming electronic ballast (T8, T5, 4' and 8' T5HO)
LPD/ECO Low-profile Lutron ECO-10 dimming electronic ballast

Tandem Wiring & Circuiting Options

1CWQ Fixture is wired with a single-circuit so that all lamps are switched together.
TW-2CWQ Fixtures wired with two circuits. 2-lamp in cross section fixtures, the fixture is wired such that the inline lamps are switched separately. 3-lamp in cross section fixtures, the fixture is wired such that the inline center lamps are switched separately from the inline outer lamps.

Other Options

F Fuse. Slow or fast blow, determined by Litecontrol.
EF Emergency Fluorescent Ballast. Battery-powered ballast from a UL Listed manufacturer will operate one lamp for 1 1/2 hours.
LP/EF Low-profile Emergency Fluorescent Ballast. Battery-powered ballast from a UL Listed manufacturer will operate one lamp for 1 1/2 hours.

Questions to Ask

1. Row information, including desired fixture lengths?
2. Lamp type? **3.** Ballast options? **4.** White, *LiteColor*, or special color?
5. Controls solutions? **6.** Other options? **7.** 120 or 277 volt?

revised 7/12/2010

Click on **Quick Find 56**
litecontrol.com

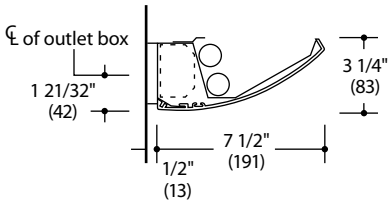
Specifications

HOUSING. Fixture body is one-piece extruded aluminum .100" thick attached to an 18-gauge steel back plate.
END CAPS. Steel, 14-gauge, with no holes or knockouts, finished to match housing.
REFLECTOR. Die-formed steel with high-reflectance white finish with additional areas of specular aluminum to enhance distribution and performance. Luminance Control Deflector™ (LCD) positioned above lamps provides uniform light distribution on wall to diminish any appearance of socket shadows.
LAMPING. Available in one- and two-lamp T8, one-lamp T5 or T5HO and one-lamp twin-tube compact fluorescent cross-sections.
BALLAST. Electronic Ballast (**ELB** - for T8 and BX lamping) or Low-profile Electronic Ballast (**LP/ELB** - for T5 or T5HO lamping), high power factor, thermally protected Class P, Sound Rated A, manufactured by a UL Listed manufacturer, as available, determined by Litecontrol. Ballasts with a voltage range of 120 to 277 will be used when fixture configuration and ballast availability allow. The minimum number of ballasts will be used.
TANDEM WIRING. When selected from Ordering guide below, fixtures wired to switch in-line lamps separately, providing two levels of light (2-lamp cross-section fixtures only).
BALLAST DISCONNECT. Fixture supplied with a ballast disconnect device to enable compliance with the NEC.
PRE-WIRING. Fixtures are supplied with #12 AWG type THHN wire for branch circuits. One end will have factory-installed push-in quick-connects. The other end will be stripped back 1/2" for quick connection in field. For fixtures to accommodate special circuits such as night light and emergency, etc., in-field wiring will be required. See Pre-Wiring Information for details.
MOUNTING. Provided with two wall-mounting brackets measuring 2 3/4" high x 7" wide x 1/2" deep. Finish is CWM (Matte White). **2' fixture:** provided with one wall-mounting bracket measuring 2 3/4" high x 22 1/2" wide x 1/2" deep. Finish is CWM (Matte White).
CERTIFICATION. Fixture and electrical components shall be UL and/or CUL Listed and shall bear the I.B.E.W., AF of L label. This fixture is Cradle to Cradle Certified℠ Silver by MBDC.

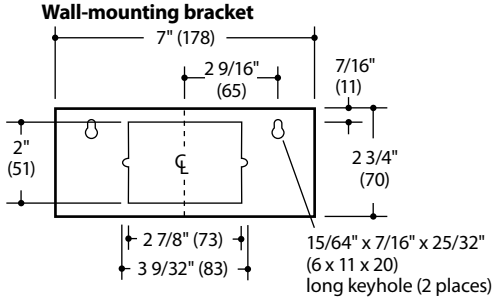
Note: Litecontrol reserves the right to change specifications without notice for product development and improvement.

Planning for installation

Cross-section

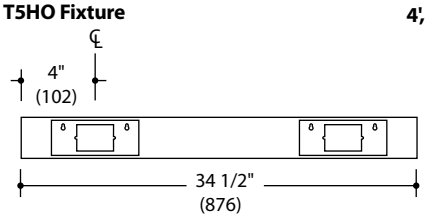


Wall-mounting bracket

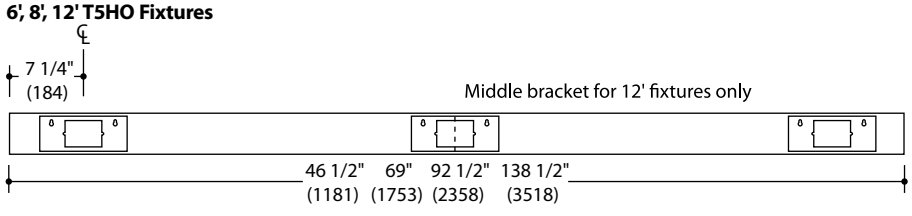


Mounts to and covers either a 2" x 4" single device box positioned horizontally or a standard outlet box with plaster ring ears positioned horizontally.

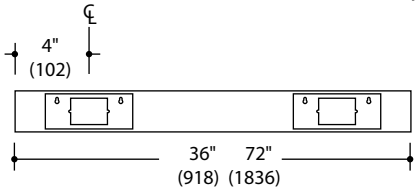
3' T5HO Fixture



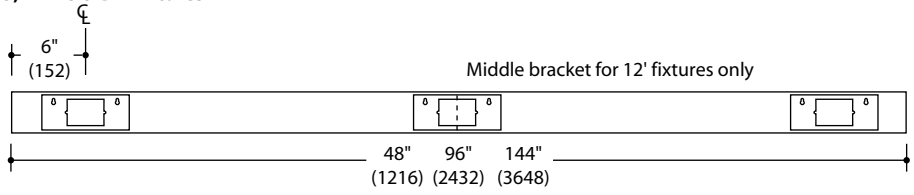
4', 6', 8', 12' T5HO Fixtures



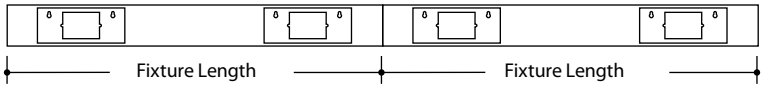
3' and 6' T8 & BX Fixtures



4', 8', 12' T8 & BX Fixtures



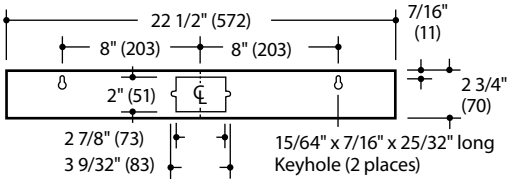
Row diagram



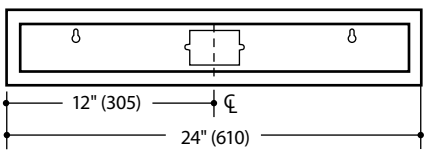
T5HO Fixture Lengths:
34 1/2", 46 1/2", 69", 92 1/2", 138 1/2"
T8 & BX Fixture Lengths:
24", 36," 48", 72," 96," and 144"

2' Fixture

Wall-mounting bracket



Back view of bracket and housing



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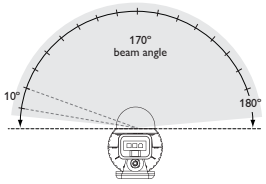
Specifications

SL1

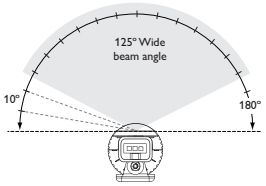
Due to continuous improvements and innovations, specifications may change without notice.

Color Temperature	Beam Angle	Lumens†	Efficacy (lm / W)	CRI
2200 K*	Very wide (170° x 115°)	425	35.7	79
2700 K*	Wide (125° x 120°)	527	43.9	83
	Medium (50° x 70°)	384	34.9	83
3000 K*	Wide (125° x 120°)	534	45.3	84
	Medium (50° x 70°)	446	36.9	83
3500 K*	Wide (125° x 120°)	576	48.4	84
	Medium (50° x 70°)	476	40.0	84
4000 K*	Wide (125° x 120°)	632	53.1	81
	Medium (50° x 70°)	518	43.5	82

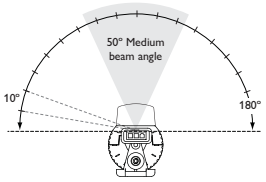
Item	Specification	Details
Output	Lumen Maintenance‡	50,000 hours L_{70} @ 25° C 37,000 hours L_{70} @ 50° C 90,000 hours L_{50} @ 25° C 80,000 hours L_{50} @ 50° C
Electrical	Input Voltage	100 – 277 VAC, auto-ranging, 50 / 60 Hz
	Power Consumption	12.5 W maximum at full output, steady state
	Power Factor	.99 @ 120 VAC
Control	Dimming	Compatible with selected commercially available reverse-phase ELV-type dimmers§
Physical	Dimensions *(Height x Width x Depth)*	2 x 12 x 1.5 in (51 x 305 x 38 mm) (very wide beam / wide beam) 1.64 x 12 x 1.5 in (42 x 305 x 38 mm) (medium beam)
	Weight	0.89 lbs (404 g) (very wide beam) 0.82 lbs (372 g) (wide beam) 1 lb (454 g) (medium beam)
	Housing	Die-cast aluminium, white powder-coated finish
	Lens	Polycarbonate / remote phosphor mix (very wide beam) Polycarbonate (wide beam / medium beam)
	Fixture Connections	Integral male / female connectors
	Temperature Ranges	-4° – 122° F (-20° – 50° C) Operating -4° – 122° F (-20° – 50° C) Startup -40° – 176° F (-40° – 80° C) Storage
	Humidity	0 – 95%, non-condensing
	Maximum Fixture Run Length‖	49 @ 100 VAC 59 @ 120 VAC 102 @ 208 VAC 108 @ 220 – 240 VAC 136 @ 277 VAC *Configuration: Fixtures installed end-to-end, 20 A circuit, standard 10 ft (3.1 m) Leader Cable*
Certification and Safety	Certification	UL / cUL, FCC, CE, CCC
	Environment	Dry / Damp Location, IP20
	Energy Efficiency	California Title 24 Compliant (wide beam angle only)



Very wide beam angle (170° x 115°)
2200 K only



Wide beam angle (125° x 120°)



Medium beam angle (50° x 70°)

To calculate the number of fixtures your specific installation can support, download the Configuration Calculator from www.philipscolorkinetics.com/support/install_tool/

* Color temperatures conform to nominal CCTs as defined in ANSI Chromaticity Standard C78.377A.

† Lumen measurement complies with IES LM-79-08 testing procedures.

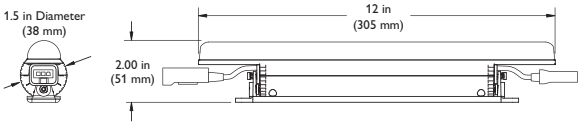
‡ L_{70} = 70% lumen maintenance (when light output drops below 70% of initial output).
L_{50} = 50% lumen maintenance (when light output drops below 50% of initial output). Ambient luminaire temperatures specified. Lumen maintenance calculations are based on lifetime prediction graphs supplied by LED source manufacturers. Calculations for white-light LED fixtures are based on measurements that comply with IES LM-80-08 testing procedures. Refer to www.philipscolorkinetics.com/support/appnotes/lm-80-08.pdf for more information.

§ Refer to www.philipscolorkinetics.com/support/appnotes/ for specific details.

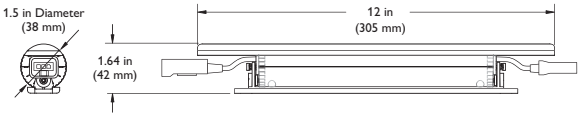
‖ These figures, provided as a guideline, are accurate for this configuration only. Changing the configuration can affect the fixture run lengths.

OPTIBIN® CK TECHNOLOGY | POWERCORE® CK TECHNOLOGY | DIMAND™ CK TECHNOLOGY

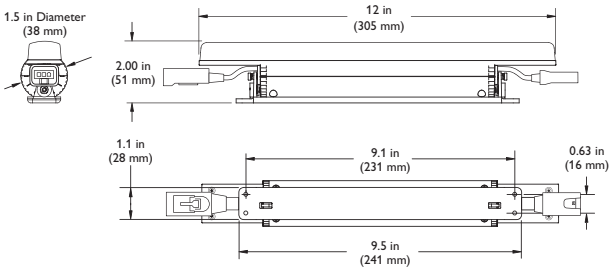
Very wide beam angle (2200 K)



Wide beam angle



Medium beam angle



LIGHTWILD

WIDE BEAM, WARM WHITE LUMENPOWER LITE 2.1 LINEAR

SL2

FIXTURE

▼ LENGTH (ENTER THE LENGTH IN INCHES. EXAMPLE: ENTER 12 FOR A 12-INCH FIXTURE) ▼ LOCATION ▼ MOUNT

LW - LUMPWRLT - W - WW - _____ - _____ - _____

☐12 INS (300 mm) ☐24 INS (600 mm) ☐48 INS (1200 mm)

☐ INT = INTERIOR ☐ EXT = EXTERIOR

☐ FM = FIXED ☐ AM = ADJUSTABLE

* NOMINAL DIMENSIONS LISTED. SEE DRAWINGS BELOW FOR ACTUAL DIMENSIONS.

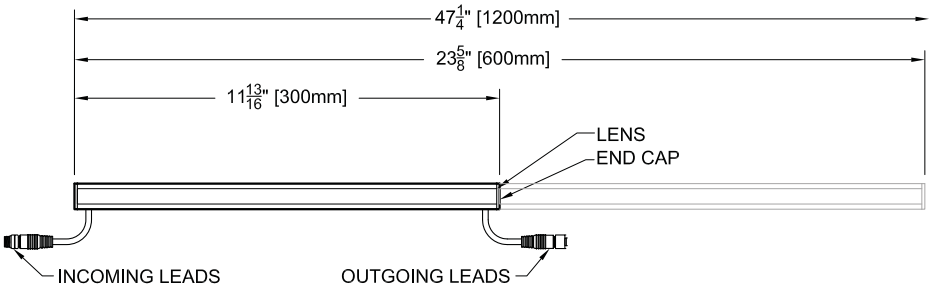
(EXTERIOR LOCATION MODEL PICTURED)

FEATURES

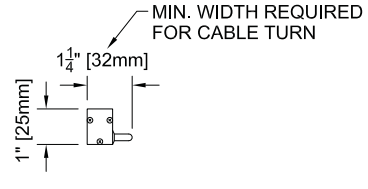
- **POWER REQUIREMENT:** 24VDC
- **LUMENS:** 149 lm/ft (489 lm/m)
- **BEAM ANGLE:** 120°
- **POWER CONSUMPTION:**
  - 12 IN., 2.8 WATTS PER FIXTURE
  - 24 IN., 5.6 WATTS PER FIXTURE
  - 48 IN., 11.3 WATTS PER FIXTURE
- **LISTINGS:** UL (2108)
- **ENVIRONMENTS**: MODELS AVAILABLE FOR DRY LOCATIONS OR WET LOCATIONS (IP65). NOT FOR USE AS A SUBMERSIBLE LIGHT SOURCE. PROPER DRAINAGE REQUIRED.
- **LENS:** COLORLESS SOFT FOCUSED GLASS
- **HOUSING:** CLEAR ANODIZED ALUMINUM (DRY LOCATION) OR BLACK ANODIZED ALUMINUM (WET LOCATION); DO NOT PAINT
- **CABLE ATTACHMENT:** CABLES EXIT ENDS OF FIXTURE ON SAME SIDE
- **CONNECTORS:** LOCKING, WATER-TIGHT (IP 65) CONNECTORS
- **MOUNTING:** SELECT FROM A FIXED MOUNT BRACKET OR ADJUSTABLE AND LOCKABLE 180-DEGREE HINGE
- **LED COLOR:** 2950K +/- 200K
- **TEMPERATURE RANGE:** -13° TO 158°F (-25° TO 70°C)
- **LUMEN MAINTENANCE (L70):** LED LIFETIMES ARE AFFECTED BY AMBIENT OPERATING TEMPERATURES AND OTHER FACTORS. CONSULT LIGHTWILD FOR DETAILS.

DIMENSIONS

(DOWNLOAD CAD-BASED DIMENSIONAL DRAWINGS AND PHOTOMETRIC DATA AT WWW.LIGHTWILD.COM)

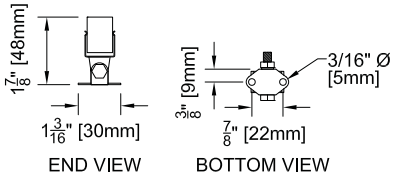


FIXTURE TOP VIEW

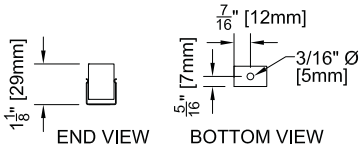


FIXTURE END VIEW

CONNECTOR DETAIL



ADJUSTABLE MOUNTING CLIP



FIXED MOUNTING CLIP

CONTROL

SERIES A CONTROL UNITS
- POWER ON/OFF CONTROL

SERIES B CONTROL UNITS
- POWER + DIMMING BY LIGHTWILD

OR • POWER + DIMMING BY OTHERS (0-10V OR DMX)

OR • DMX SHOW CONTROL BY OTHERS (LIGHTWILD CONTROL UNIT IS DMX READY)

SERIES C CONTROL UNITS
- INCLUDES ONE LIGHTWILD DMX DIRECTOR FOR SHOW CONTROL
- SHOW SELECTION OPTIONS:
  - LIGHTWILD SHOW SELECTOR WALL CONTROLLER

OR - THIRD PARTY SHOW SELECTOR VIA CONTACT CLOSURE INTERFACE

SERIES D CONTROL UNITS
- BUILT TO ORDER AND REQUIRES CONSULTATION WITH LIGHTWILD
- INDIVIDUALLY CONTROL LIGHTWILD FIXTURES

OR • CONTROL A LARGE NUMBER OF GROUPS OF LIGHTWILD FIXTURES

(SEE SEPARATE CONTROL UNIT SPECIFICATION SHEETS FOR MORE INFORMATION.)

PHOTOMETRIC VALUES AND DISTRIBUTION DATA ARE TYPICAL FOR THIS LUMINARE. LUMINAIRE PERFORMANCE WILL VARY DEPENDING ON LED AND POWER SUPPLY. LIGHTWILD MANUFACTURES THIS LUMINAIRE TO AN OVERALL PERFORMANCE TOLERANCE OF +/- 5%.

Photometrics · LightWild LumenPower Lite 2.1 · Warm White · Wide Beam Angle

▶ Zonal Lumen Summary

Tests performed on the 12-inch (300 mm) length of the LightWild LumenPower Lite Linear fixture.

	Lumens
Zone	**Warm White**
0-90	0.00
90-100	0.26
100-110	4.69
110-120	16.46
120-130	25.26
130-140	29.11
140-150	28.51
150-160	23.80
160-170	15.73
170-180	5.49
Total	**149.30**

▶ Luminaire Photo

Part No. LW-LUMPWRLT-W-WW

(EXTERIOR LOCATION MODEL PICTURED)

▶ Luminous Flux (Stabilized)

Color	Lumens (lm)	Power (Watts)	Efficacy (lm/W)
Warm White	149.3	2.8	53.3

Note: Efficacy figures are for the total luminaire.
Individual light sources are not represented.

▶ Luminaire Specifications

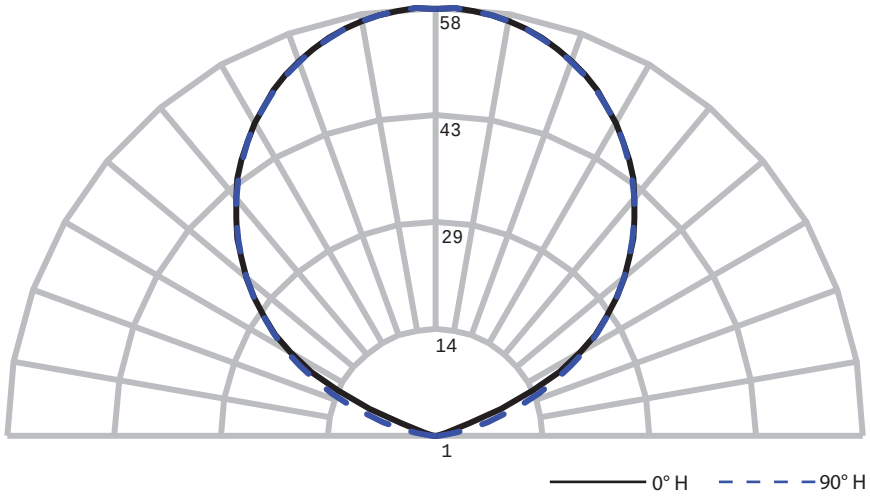
Source: 6 LEDs (Warm White) **CCT:** 2950K +/- 200K **Beam Angle:** 120° (50% Peak Intensity)

▶ Direct Illuminance Perpendicular to Luminaire

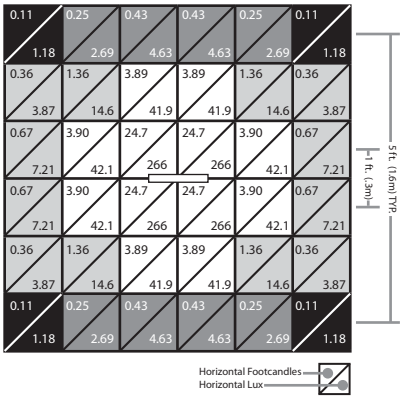
	Footcandles			
Color	**3 ft**	**6 ft**	**9 ft**	**12 ft**
Warm White	6.41	1.60	0.71	0.40

	Lux			
Color	**1 m**	**2 m**	**3 m**	**4 m**
Warm White	57.73	14.43	6.41	3.61

▶ Candela Plot



▶ Direct Illuminance Distribution



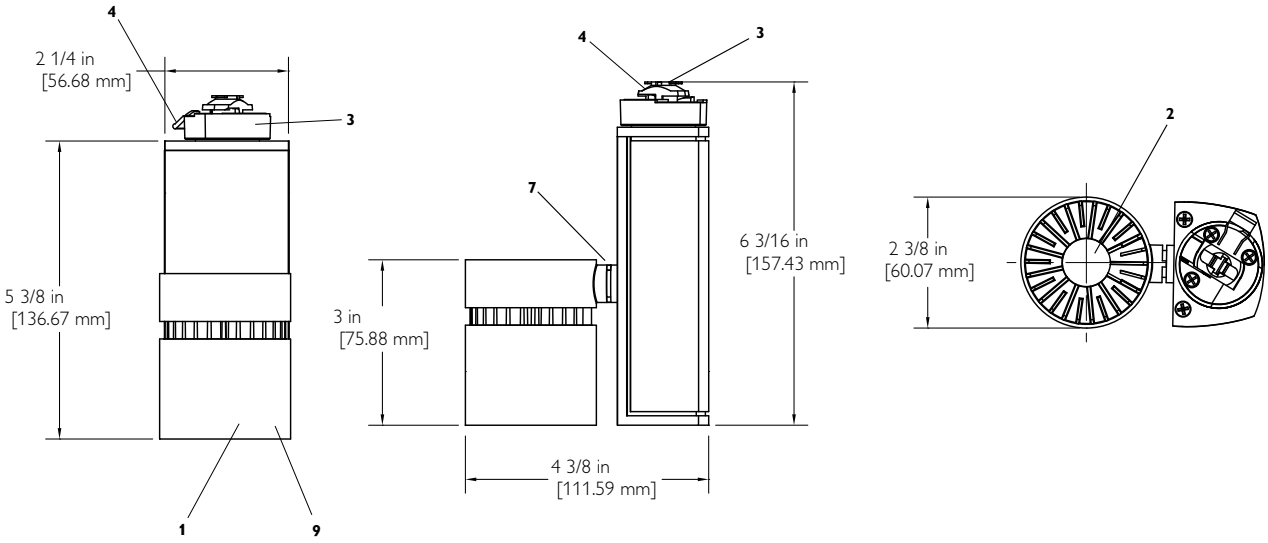
Luminaire centered 1 foot (.3 m) from and perpendicular to the surface.

Download electronic IES data at www.lightwild.com.

PHOTOMETRIC VALUES AND DISTRIBUTION DATA ARE TYPICAL FOR THIS LUMINARE. LUMINAIRE PERFORMANCE WILL VARY DEPENDING ON LED AND POWER SUPPLY. LIGHTWILD MANUFACTURES THIS LUMINAIRE TO AN OVERALL PERFORMANCE TOLERANCE OF +/- 5%.

LLA TL1

Lytespan Mini LED Micro Cylinder



Features

1. **LED board:** metal core board. 4 tightly packed high brightness white led's.
2. **Integrated housing heat sink:** die-cast aluminum maintains LED junction temperature for minimum 50,000 hr lifetime at 70% lumen maintenance.
3. **Track Attachment Fitting:** Molded polycarbonate. Integral color in gray, black or white. Rotates into track and locks into place with the use of push tabs.
4. **Push Tab:** Molded polycarbonate. Locks and detaches unit.
5. **Track Adaptor Housing:** Die-cast aluminum.

6 Movable Brass Contact: Brass extends for connection to second circuit (Advent track only).

7. **Pivot Mounts:** Allows for 350° horizontal and 320° vertical rotation.
8. **Driver Housing:** Extruded housing with die-cast aluminum covers.
9. **Interchangeable optics:** sold separately.

Finish

All painted finishes: Baked enamel.

Labels

CULus Listed, for dry locations only.

Ordering Information

Cat. No.	Finish	CCT	CRI
LLAV0030AL	Aluminum	3000K	85
LLAV0030BK	Black		
LLAV0030WH	White		
LLAV0027AL	Aluminum	2700K	83
LLAV0027BK	Black		
LLAV0027WH	White		

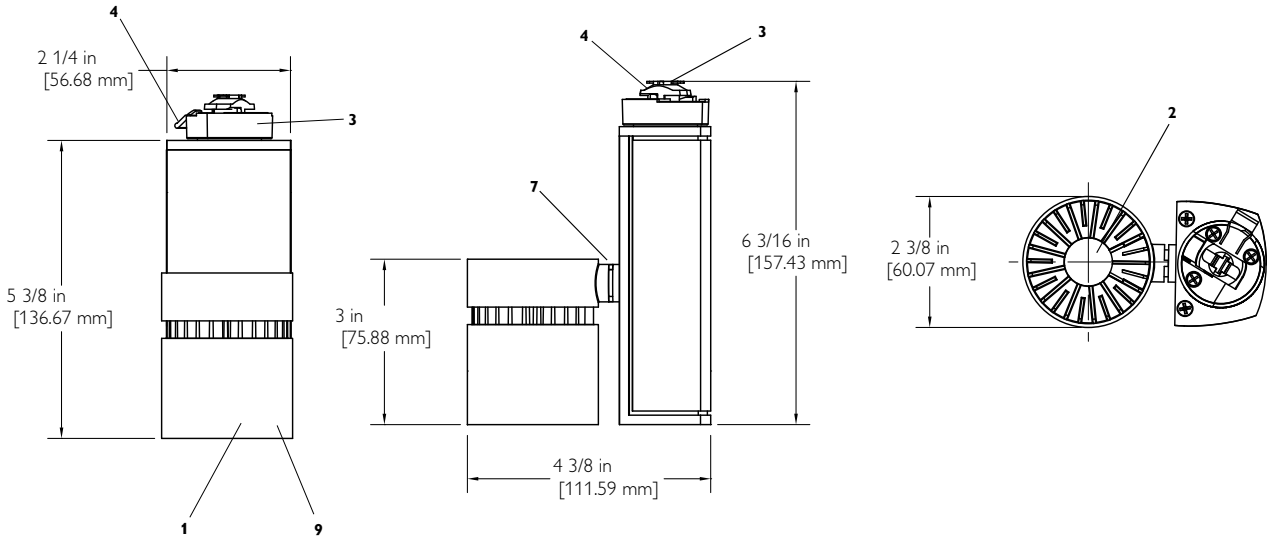
Job Information **Type:**

Job Name:

Cat. No.:

Notes:

PHILIPS LIGHTOLIER



Accessories

Accessory Holder

(When using two accessories must use holder)

LLA0V00AHBK	Accessory Holder Black

Snoot

22SR6WH	Snoot 2" dia. white
22SR6BK	Snoot 2" dia. black
22SR6AL	Snoot 2" dia. aluminum

Louver

AL2HC 2" Diam Hex Cell Louver

Diffusion or Color Filters

AF2, ADF2 Series

Mounting

All Monopoint, Multipoint, recessed track, suspension track, suspension stems, sloped ceiling adapter, Basic, Advent and Radius Track systems only. Ceiling and horizontal or vertical wall mounted. Not compatible with ProSpec track system.

Finish

All painted finishes are baked enamel.

Reflector Options (Sold Separately)

Ordered Separately. Field Changeable

LLAV00RS	Mini LED Micro Cylinder Spot Ref
LLAV00RNF	Mini LED Micro Cylinder, Narrow Flood Ref
LLAV00RF	Mini LED Micro Cylinder Flood Ref
LLAV00RSSOL	Mini LED Micro Cylinder, Spot Ref w/Solite
LLV00RNFSOL	Mini LED Micro Cylinder Narrow Flood Ref w/Solite
LLAV00RFSOL	Mini LED Micro Cylinder, Flood Ref w/Solite

Electrical

Electronic power supply input voltage: 120V, 60 Hz

Input power: 10W Efficacy: Approximately 44.8 LM/W

High power factor >0.9 ELV dimming available

Dimming

Lightolier Controls: ZP425QE

Lutron Skylark: SELV-300P-WH

Leviton Decora: IPE04-ILX

Labels

cULus listed. 5 year warranty,

Job Information	Type:

PHILIPS

LIGHTOLIER

DESCRIPTION

23XR wall wash completes the Straight & Narrow family. Its precise optical reflector design provides wall illumination up to 10' in height with smooth gradiation from top to bottom of the wall. 23XR application is perfect for classrooms, conference rooms, corridor walls, arcades and galleries. 23XR features excellent photometrics and high efficiency while offering smooth wall wash free of striations and shadows. Runs are provided to the nearest foot and the light source is hidden from most viewing angles.

Catalog #	WF1	
Project		
Comments		Date
Prepared by		03/13/07

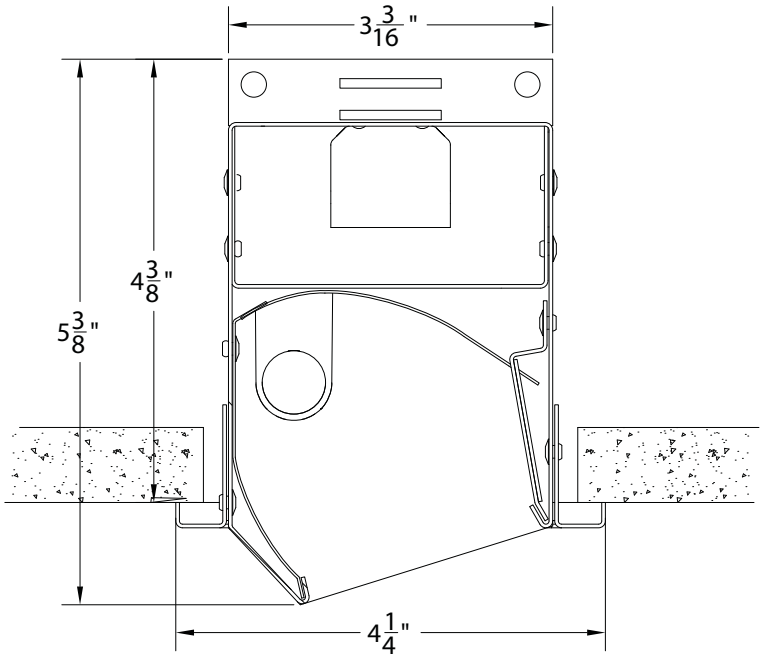
SPECIFICATION FEATURES

Construction
Housing is one-piece, die-formed, cold rolled steel. Standard 5', 4' and 3' fixture length.

Electrical
120, 277, 347 or Universal Voltage electronic ballast. Fixtures and electrical components certified to UL and CUL standards.

Finish
Durable, low gloss, white, powder coat acrylic. Optional custom finish.

Mounting
Recessed.



WALL WASH
23XR
Gen II

1T5
1T5HO

Wall Wash
Direct-Indirect

Light Distribution:
Indirect = 1%
Direct = 99%

ORDERING INFORMATION

SAMPLE NUMBER: S23XR-1T5-ETG4D-1EB-SI-EM-GLR-S90

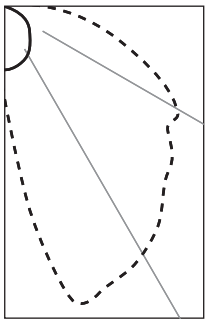
23X	R	1								SI		
Series 23X =Straight & Narrow wall wash	Mounting R=Recessed	Number of Lamps (not included) 1=1 Lamp	Lamp Type T5 T5HO	Ceiling Type ETG =15/16" Exposed T-grid FTG =9/16" Exposed T-grid STG =Screw Slot T-grid SR =Sheet Rock FSR = Flangeless Sheet Rock	Length 3 =3 ft 4 =4 ft 5 =5 ft	Section [2] D=Individual I=Intermediate B=Beginning of Run E=End of Run	Voltage 1=120V 2=277V 3=347V U=Universal	Ballast [1] EB =Electronic Ballast (standard) DB =Dimming Ballast		Switching Options SI =Single Switching	Emergency EM = Emergency Pack (consult factory) [1]	Fusing GLR GMF

1 Requires voltage information.
- Runs available for sheet rock only.
- For some electronic, dimming and EM battery pack ballast combinations, fixture has space limitation (consult factory).
- Due to various constraints, some options may not be combined with others. Please consult your Cooper Lighting representative for availability.

2 Fixture end plates butted end-to-end for continuous runs

PHOTOMETRICS

WF1



23XR
1T5HO lamp
Efficiency 61.7%
Test#168P236

0 - - - - -
90 ——

Zonal Lumen Summary

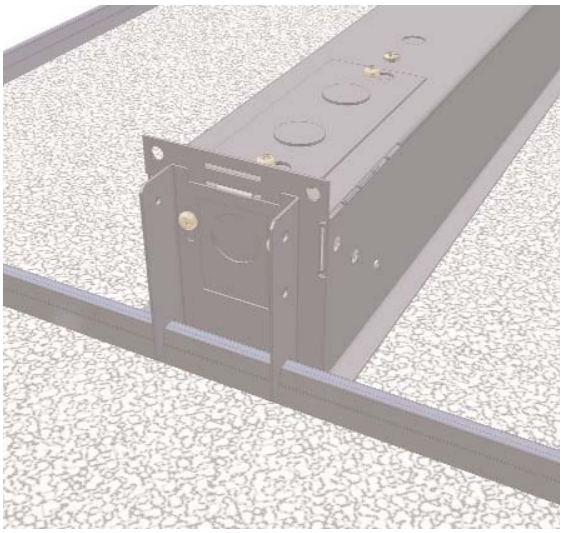
Zone	Lumens	%Lamp	%Fixture
0-30	650	13.0	21.1
0-40	1146	22.9	37.1
0-60	2174	43.5	70.4
0-90	3068	61.4	99.4
0-180	3086	61.7	100.0

Total Luminaire Efficiency = 61.7%

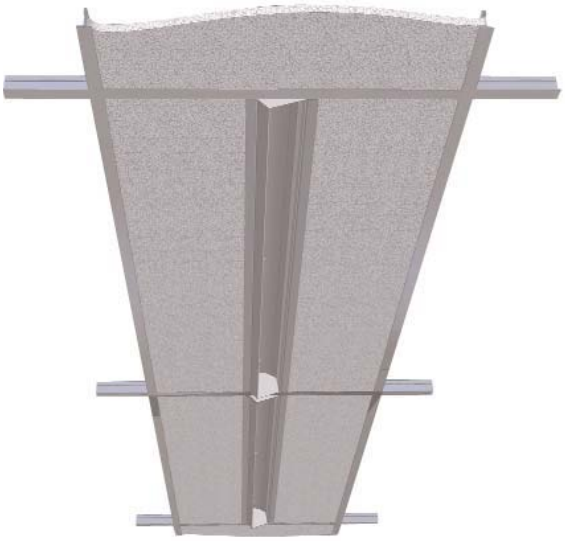
Candela

Angle	Along ∥	45°	Across ⊥
0	417	417	417
5	883	734	417
15	1999	1698	403
25	1912	1873	374
35	1768	1692	330
45	1530	1475	272
55	1344	1189	204
65	1143	968	132
75	746	661	63
85	419	310	9
90	222	144	2
95	46	6	2

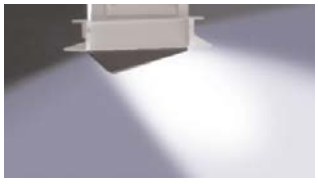
MOUNTING INFORMATION



Patent pending adjustable ceiling mounting system. Adjust to various ceiling grid types and enables end installation precise fit for integrated ceiling appearance. Access plate and pre-wired assembly allows for easy wiring.

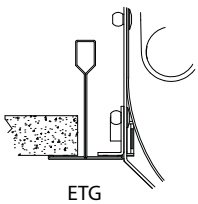


Recommended distance from fixture longitudinal axis and wall is 1' to 3'. Optimum performance distance is 2'. Fixture housing lengths are 3', 4' and 5' mounted individually in grid ceilings and in sheet rock can be mounted in continuous rows. Fixtures can be butted up against each other, end-to-end for continuous row mounting.

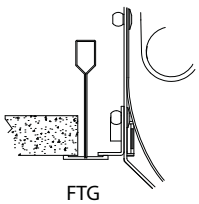


Ideal for vertical surfaces. The shape of the reflector was specially designed to produce uniform lighting on walls. The fitting's size is reduced. It uses high performance fluorescent lamps with low energy consumption. It is also quite easy to install.

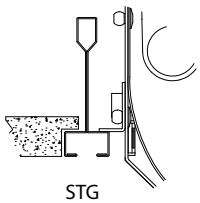
MOUNTING OPTIONS



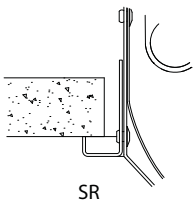
ETG
15/16" TEE GRID



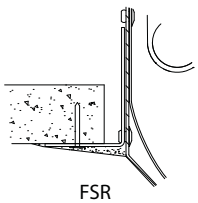
FTG
9/16" TEE GRID



STG
9/16" TEE GRID
(SLOTTED)



SR
SHEET ROCK

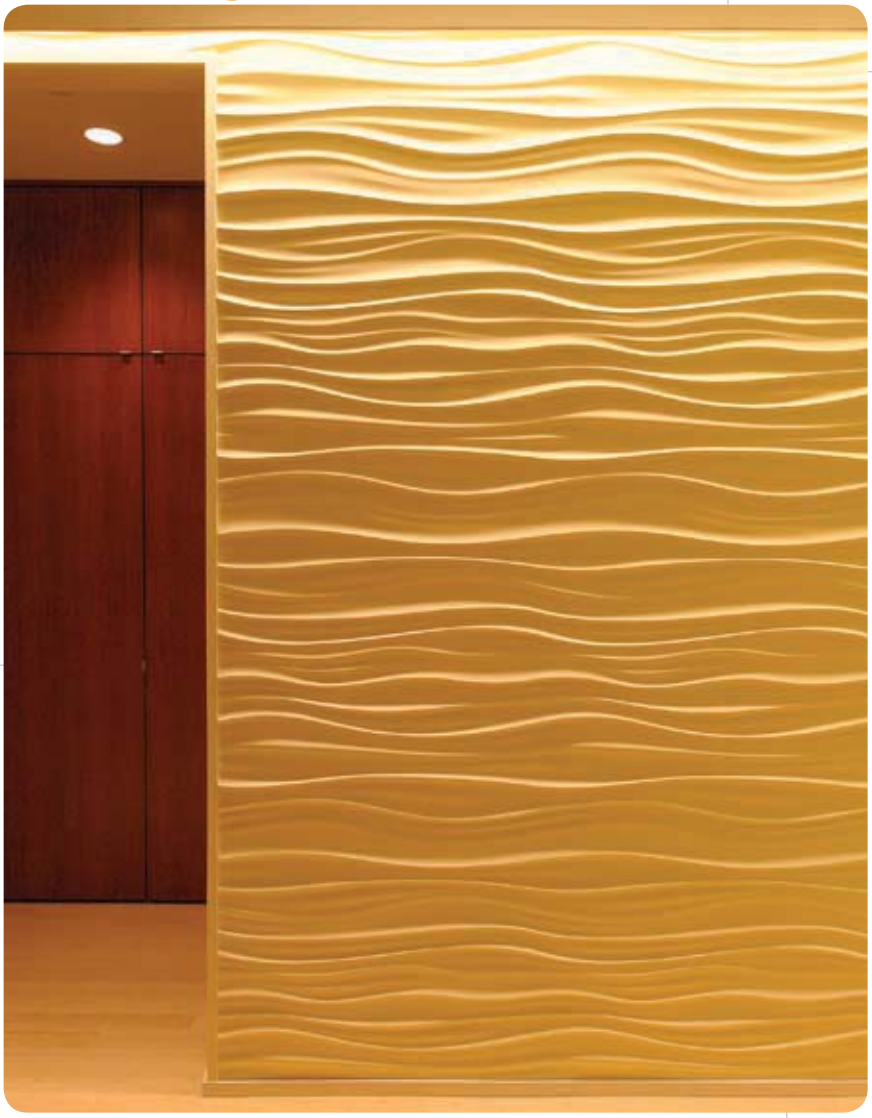


FSR
"FLANGELESS"
SHEET ROCK

WF2

FOCAL POINT®

mini-grazer™



features

High performance, T5 or T5HO Fluorescent Wall Grazer.

Nautilus optic designed to highlight textured walls and ceilings evenly from ceiling to floor.

Swing down lamp tray allows for easy lamp accessibility.

Housing creates 6" architectural slot.

Great energy solution that replaces multiple MR16 or PAR lamps commonly used for grazing applications.

Housing designed for drywall or grid ceilings.

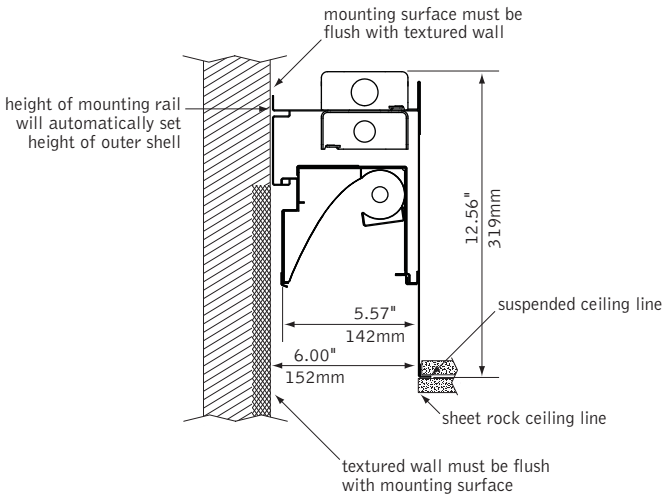
shielding options

open optic

baffle

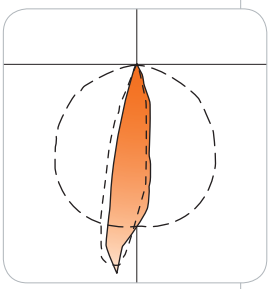
april 2009 A

dimensional data



performance

1-lamp T5HO
37% Efficiency
3734 cd @ 5°



Visit focalpointlights.com for complete photometric data.

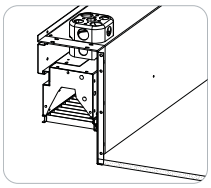
fixture:

project:

WF2

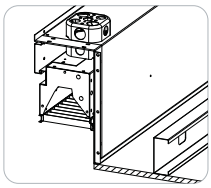
mounting information

Grid



Acoustical tile may rest on flange of luminaire.

Drywall

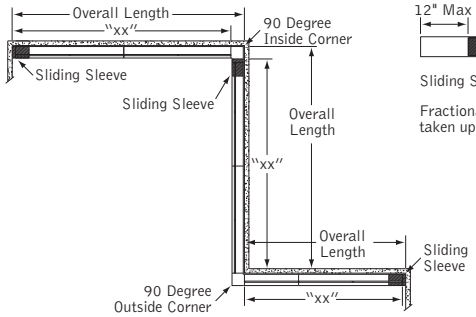


Mount drywall under luminaire and support to ceiling structure.

NOTE: Add drywall thickness to overall height of luminaire.

NOTE: Luminaire must be installed prior to ceiling.

typical run layout



Luminaires must be installed prior to ceiling.

Start run from corner with any standard luminaire.
Corner to corner runs end with a sliding sleeve.

sliding sleeves

Fractional Dimensions up to 12" are taken up by the use of a sliding sleeve.

specifications

construction

20 Ga. steel housing.

20 Ga. internal bulkheads.

20 Ga. steel rough–in housings are provided to create wall to wall slot.

20 Ga. steel sliding sleeve.

Optional baffle (.650"H x .800" frequency) provides 50° cutoff to lamp and held captive with torsion springs.

Luminaires are available in 3' and 4' lengths.

3' unit weight: 24 lbs
4' unit weight: 26 lbs

optic

CNC roll-formed specular .016" thick aluminum.

electrical

Electronic ballasts are thermally protected and have a Class "P" rating.

Consult factory for dimming specifications and availability.

UL and cUL listed.

finish

Polyester powder coat applied over a 5-stage pre–treatment.

ord

luminaire series		FMG
Mini-Grazer	FMG	
shielding		
No Shielding, Open Optic	NS	
Baffle, White	BB	
lamping		
One Lamp T5	1T5	
One Lamp T5HO	1T5HO	
circuits		1C
Single Circuit	1C	
voltage		
120 Volt	120	
277 Volt	277	
347 Volt	347	
ballast		
Electronic Dimming Ballast*	D	
Electronic Program Start <10% THD	S	
factory options		
Air Return	AR	
Chicago Plenum	CP	
Emergency Circuit*	EC	
Emergency Battery Pack*	EM	
HLR/GLR Fuse	FU	
Include 3000K Lamp	L830	
Include 3500K Lamp	L835	
Include 4100K Lamp	L841	
12" Sliding Sleeve	SS	
finish		WH
Matte White Housing	WH	
luminaire length		
Designate overall run length dimension (light modules provided in 3' & 4' lengths)	XX'	
corner options		
90–degree Inside Corner	FMG-IC90	
90–degree Outside Corner	FMG-OC90	

NOTE: Not intended for drywall surfaces unless a Level 5 finish is specified.

* for more information see Reference section.

Focal Point LLC | 4141 S. Pulaski Rd, Chicago, IL 60632 | T: 773.247.9494 | F: 773.247.8484 | info@focalpointlights.com | www.focalpointlights.com.

LED SQUARE FTS WL/5

recessed lensed LED wallwasher

WL1

FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE – FULLY SUSTAINABLE

FEATURES

LED Square FTS WL/5 is a 5" square lensed wallwasher employing LED technology. Fixture is only 5 7/8" deep. Luminaire provides uniform illumination on vertical surfaces up to the ceiling line.

Luminaire is powered by a Philips Fortimo SLM LED module, dimmable to 10% with a 0-10 volt dimmer, with a CRI as high as 90 and a 5-year warranty. Fixture may be specified with modules of 800, 1100 or 2000 lumen light output and with 2700K, 3000K, 3500K or 4000K color. Refer to the tables below for system wattages and luminaire efficacies.

Other features include:

- life: 50,000 hours at 70% of initial light output (IESNA LM80-2008)
- operational range: tolerates temperatures as low as -20° C (-4°F)

A precisely designed reflector and spread lens distributes light to the top of the wall, minimizes aperture brightness and virtually eliminates the inter-reflections inherent with square apertures.

Reflectors are available in slightly diffuse clear natural aluminum or champagne gold Alzak®. Other reflector finishes are available on special order.

Luminaire includes a pair of mounting bars (¾" x 27" C channel). Specialty bars for wood joist and T-bar installations are also available.

APPLICATIONS

Luminaire is recommended for wallwashing in commercial, retail and residential spaces.

Luminaire is cULus listed for Damp Location. Luminaire is prewired with thermal protector, approved for ten #12 wire 90° branch circuit pull-through wiring and suitable for use in a fire rated ceiling. To maximize life of LED modules luminaires equipped with 2000-lumen modules should be spaced at least 30" apart and 15" from walls, and should have ½" clearance above housing. All luminaires are RoHS compliant. Removal of the reflector allows access to the junction box.

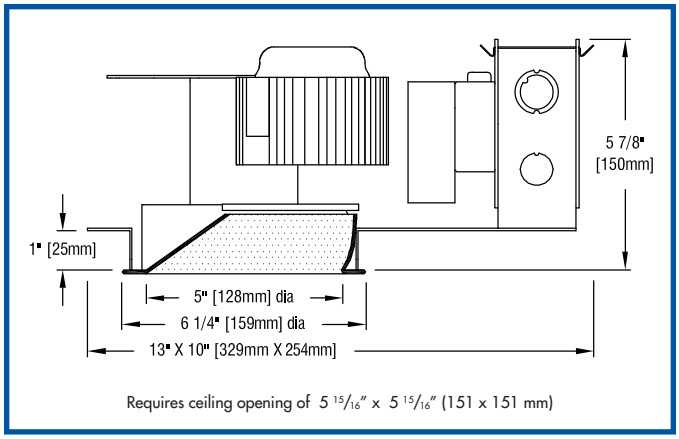
FULLY SUSTAINABLE

LED Square FTS WL/5 is fully sustainable. Both critical components – the LED module (diode array) and the driver (power conditioner) – can be replaced through the aperture with a screwdriver. Both components are, and will remain, available from Edison Price Lighting.

MODIFICATIONS AVAILABLE

Contact factory with quantity for pricing; orders may require shop drawing approval.

+DOD: luminaire suitable for **high humidity** environments; add +DOD to Product Code.
+MAR: reflector suitable for **marine** environments; add +MAR to Product Code.



Requires ceiling opening of 5 15/16" x 5 15/16" (151 x 151 mm)

PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit LED-SQ-FTS-WL/5
NOTE: Standard driver is dimmable to 10% with a 0-10 volt dimmer.

Light Output
800 lumens 800
1100 lumens 1100
2000 lumens *note spacing requirements: see* Applications *text.* 2000

Light Engine Color
2700K (90 CRI) 2700
3000K (90 CRI) 3000
3500K (80 CRI) 3500
4000K (80 CRI) 4000

Voltage
120 volt service 120
277 volt service 277

Reflector Color and Detail

	Overlap
Slightly diffuse Clear	VOL
Champagne Gold	GOL

Other reflector finishes available on special order.

Standard reflector flange continues reflector finish. White painted flanges and custom painted flanges are available on special order. Add WF (white flange) or CCF (custom color flange).

OPTIONS *Specify by adding to the basic unit.*

Dimmable ..standard driver is dimmable to 10% with a 0-10 volt dimmer.

Emergency battery pack operates luminaire in event of power outage. Includes a plate with ready light and test switch for adjacent installation by others ..... – REM

EDISON PRICE LIGHTING
41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

LED SQUARE FTS WL/5

WL1

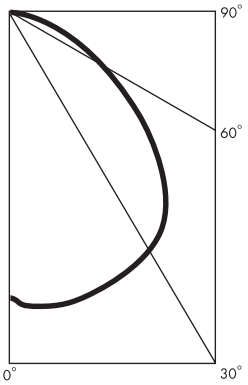
PHOTOMETRIC REPORT (tested per IESNA LM-79-2008)

Report No. 25257 and 25255.
Original Luminaire Testing Laboratories, Inc. (LTL) test reports furnished upon request.

Luminaire ..... recessed LED square lensed wallwasher with aluminum reflector
Lamp ..... Philips LED Fortimo SLM 2000, 3000K CCT
Luminaire light output..... 990 lumens

CANDLEPOWER DISTRIBUTION

(Candela)



LUMINAIRE LIGHT OUTPUT AND EFFICACY

Color	800 lumens light engine			1100 lumens light engine			2000 lumens light engine		
	Luminaire Light Output	Luminaire Efficacy	System Wattage	Luminaire Light Output	Luminaire Efficacy	System Wattage	Luminaire Light Output	Luminaire Efficacy	System Wattage
2700K	438*	23	19	573*	21	27	990	24	42
3000K	438*	24	18	573*	23	25	990	25	39
3500K	438*	31	14	573*	29	20	990	33	30
4000K	438*	34	13	573*	30	19	990	38	26

**estimated values*

LIGHT OUTPUT MULTIPLIER

800 lumens light engine	0.44
1100 lumens light engine	0.58
2000 lumens light engine	1

WALLWASH INFORMATION

Distance From Ceiling (Feet)	3'From Wall; 3'O.C.		3'6"From Wall; 3'O.C.		3'6"From Wall; 3'6" O.C.	
	Below Fixture	Between Fixtures	Below Fixture	Between Fixtures	Below Fixture	Between Fixtures
1	14	10	9	8	8	6
2	26	25	18	19	17	15
3	29	29	24	25	21	21
4	26	26	25	24	21	21
5	21	21	21	21	18	18
6	16	16	17	17	15	15
7	13	13	14	14	12	12
8	11	11	12	12	10	10
9	9	9	10	10	8	8
10	7	7	8	8	7	7
11			7	7	6	6
12			6	6	5	5

All vertical footcandles are initial values with no contribution from ceiling or floor reflectances. Computation performed with a total of ten wallwashers.

DRIVER INFORMATION *UL Class 2, dry and damp location*

Voltage	120	277
Input Watts *(800/1100/2000 lumens), 3000K*	18/25/39	18/25/39
Input Current (A) *(800/1100/2000 lumens)*	0.15/0.21/0.33	0.06/0.09/0.14
Output Current (mA)	200-700	200-700
Output Voltage (Vdc)	25–56	25–56
Min. Power Factor	>0.9	>0.9
Operating Temperature Range (F)	–4 to 131	–4 to 131

DIMMING INFORMATION

Dimming Method	Dimming Range (%)	Min. Output Power
0 - 10V	10% -100%	15

COMPATIBLE DIMMERS *Please verify with vendors*

CONTROL MANUFACTURER	WALLBOX DIMMER	POWER BOOSTER AVAILABLE
DOUGLAS LIGHTING CONTROLS	WPC-5721	
ENTERTAINMENT TECHNOLOGY	Tap Glide TG600FAM120(120V) Tap Glide Heatsink TGH1500FAM120 (120V) Oasis OA2000FAMU (120/277V)	
HONEYWELL, INC.	EL7315A1019 and EL7315A1009	EL7305A1010 (optional)
HUNT DIMMING	Preset slide: PS-010-IV-120V and PS-010-WH-120V Preset slide: PS-010-3W-IV-120V and PS-010-3W-WH-120V Preset slide: PS-010-IV-277V and PS-010-WH-277V Preset slide: PS-010-3W-IV–277V and PS-010-3W-WH-277V Preset slide, controls FD-010: PS-IFC-010-IV and PS-IFC-010-WH-120/277V Preset slide, controls FD-010: PS-IFC-010-3W-IV and PS-IFC-010-3W-WH-120/277V Remote mounted unit: FD-010-120V and FD-010-277V	
LEHIGH ELECTRIC PRODUCTS CO.	Solitarire	PBX
LEVITON LIGHTING CONTROLS DIV.	Leviton Centura Fluorescent Control System IllumaTech™ IP7 Series	CN100 PE300
LIGHTOLIER CONTROLS	Sunrise Preset slider ZP600FAM-120 (120V) Momentum Preset slider MP1500FAM-120 (120V) Vega Slider V2000FAMU (120-277V)	
LITHONIA CONTROLS	ISD BC SLD LPCS Digital Equinox (DEQ BC)	RDM FC
LUTRON ELECTRONICS CO., INC.	Visit **www.lutron.com/advance** for the latest control information and selection	
PDM ELECTRICAL PRODUCTS	WPC-5721	
STARFIELD CONTROLS	TR61 with DALI interface port	RT03 DALInet Routers
THE WATT STOPPER, INC.	LS-4 used with LCD-101 and LCD-103	

Appendix C | Lamp, Ballast, and Driver Cutsheets

T5 Standard

28W/835 Min Bipin T5 HE ALTO UNP

Philips T5 Fluorescent Lamps featuring ALTO® Lamp Technology offer increased energy savings and low toxicity in a slim profile.

Product data

- General Characteristics

System Description	High Efficiency
Base	Miniature Bipin
Base Information	Green [Green Base]
Bulb	T5 [16 mm]
Rated Avg. Life	24000 hr
Life to 10% fail	19000 hr
Preheat EL,3h	
LSF HF Preheat 20000h Rated,3h	85 %
LSF HF Preheat 16000h Rated,3h	94 %
LSF HF Preheat 12000h Rated,3h	95 %
LSF HF Preheat 8000h Rated,3h	97 %
LSF HF Preheat 6000h Rated,3h	98 %
LSF HF Preheat 4000h Rated,3h	98 %
LSF HF Preheat 2000h Rated,3h	99 %

- Light Technical Characteristics

Color Code	835 [CCT of 3500K]
Color Rendering Index	82 Ra8
Color Designation	White
Color Temperature	3500 K
Chromaticity Coordinate X	412 -
Chromaticity Coordinate Y	401 -
Initial Lumens	2900 Lm
Lum Efficacy Rated HF 25°C	94 Lm/W
Lum Efficacy Rated HF 35°C	104 Lm/W
LLMF HF 20000h Rated	88 %
LLMF HF 16000h Rated	90 %
LLMF HF 12000h Rated	91 %
LLMF HF 8000h Rated	93 %
LLMF HF 6000h Rated	94 %
LLMF HF 4000h Rated	95 %
LLMF HF 2000h Rated	96 %
Luminous Flux EL 25°C, Rated	2625 Lm
Luminous Flux EL 25°C, Nominal	2625 Lm
Design Temperature	35 C

- Electrical Characteristics

Watts	28 W
Lamp Voltage EL 25°C	166 V
Lamp Current EL 25°C	0.170 A
Dimmable	Yes
Lamp Wattage EL 35°C	27.8 W
Lamp Current EL 35°C	0.170 A
Lamp Voltage EL 35°C	167 V

PHILIPS

sense and simplicity

Lamp Wattage EL 25°C, Rated	27.9 W
Lamp Wattage EL 25°C, Nominal	28 W

- Environmental Characteristics

Energy Efficiency Label (EEL)	A
Mercury (Hg) Content	1.4 mg

- Measuring Conditions

Calibration Current	0.170 A
HF Generator Rated Voltage	329 V
Resistor	950 ohm

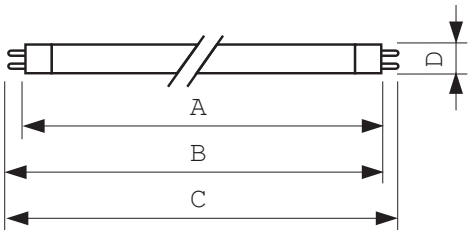
- Product Dimensions

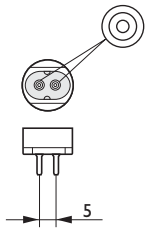
Base Face to Base Face A	1149.0 (max) mm
Insertion Length B	1153.7 (min), 1156.1 (max) mm
Overall Length C	1163.2 (max) mm
Diameter D	17 (max) mm

- Product Data

Product number	230854
Full product name	28W/835 Min Bipin T5 HE ALTO UNP
Short product name	28W/835 Min Bipin T5 HE ALTO UNP/40
Pieces per Sku	1
eop_pck_cfg	40
Skus/Case	40
Bar code on pack	46677230852
Bar code on case	50046677230857
Logistics code(s)	927990683522
tpd_ilcos_cd	FDH-28/35/1B-L/P-G5-16/1150
eop_net_weight_pp	104.500 gr

Dimensional drawing





G5

G5, T5

Product	A (Max)	B (Min)	B (Max)	C (Max)	D (Max)
TL5 HE F28T5/835 HE Alto	1149.0	1153.7	1156.1	1163.2	17

T8 Standard

F32T8/TL735 UNP

Philips T8 lamps offer high energy savings, superior lumen output, and long life in an environmentally responsible lamp.

Product data

• General Characteristics

Base	Medium Bi-Pin [Medium Bi-Pin Fluorescent]
Base Information	Green Base
Bulb	T8
Energy Saving	Energy Saving
Rated Avg Life [12-Hr Prog St]	36000 hr
Rated Avg Life [12-Hr Inst St]	30000 hr
Rated Avg Life [3-Hr Prog St]	30000 hr
Rated Avg Life [3-Hr Inst St]	24000 hr

• Light Technical Characteristics

Color Code	TL735 [CCT of 3500K]
Color Rendering Index	78 Ra8
Color Designation	TL735
Color Temperature	3500 K
Initial lumen	2600 Lm
Design Mean Lumens	2470 Lm

• Electrical Characteristics

Watts	32 W

• Environmental Characteristics

Mercury (Hg) Content	1.7 mg
Picogram per Lumen Hour	27 p/LuHr

• Product Dimensions

Nominal Length [inch]	48

• Footnotes

Footnotes Fluorescent/CFL	920 [Circle E- The encircled E means this bulb meets Federal minimum efficiency standards.]

• Product Data

Product number	272591
Full product name	F32T8/TL735 UNP
Short product name	F32T8/TL735 UNP/1350
Pieces per Sku	1
eop_pck_cfg	1350
Skus/Case	1350
Bar code on pack	46677272593
Bar code on case	70046677272592
Logistics code(s)	927869773502
eop_net_weight_pp	0.001 kg

PHILIPS

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Product Number: 21022

Order Abbreviation: FP54/850/HO/SL/ECO

General Description: 54W, T5, PENTRON High Output (HO) fluorescent lamp with Safeline coating. 5000K Color Temperature, rare earth phosphor, 85 CRI, ECO

Product Information	
Abbrev. With Packaging Info.	FP54850HOSLECO 40/CS 1/SKU
Actual Length (in)	45.795
Actual Length (mm)	1163.19
Average Rated Life (hr)	25000
Base	Miniature Bipin
Bulb	T5
Color Rendering Index (CRI)	85
Color Temperature/CCT (K)	5000
Diameter (in)	0.669
Diameter (mm)	17.00
Family Brand Name	PENTRON® SAFELINE®
Initial Lumens at 25C	4243
Initial Lumens at 35C	4753
Mean Lumens at 25C	3946
Mean Lumens at 35C	4420
Nominal Length (in)	48.000
Nominal Length (mm)	1219.20
Nominal Wattage (W)	54.00
Life at 3 hrs./start on PRS ballasts	30000
Life at 12 hrs./start on PRS ballasts	40000

ECOLOGIC ™

Footnotes

- ¿ Approximate initial lumens after 100 hours operation.
- ¿ The life ratings of fluorescent lamps are based on 3 hr. burning cycles under specified conditions and with ballast meeting ANSI specifications. If burning cycle is increased, there will be a corresponding increase in the average hours life.
- ¿ Minimum starting temperature is a function of the ballast; consult the ballast manufacturer.
- ¿ There is a NEMA supported, industry issue where T2, T4, and T5 fluorescent and compact fluorescent lamps operated on high frequency ballasts may experience an abnormal end-of-life phenomenon. This end-of-life phenomenon can resultin one or both of

the following: 1. Bulb wall cracking near the lamp base. 2. The lamp can overheat in the base area and possibly melt the base and socket. NEMA recommends that high frequency compact fluorescent ballasts have an end-of-life shutdown circuit which will safely and reliably shut down the system in the rare event of an abnormal end-of-life failure mode described above. The final requirements of this system are yet to be defined by ANSI. For additional information refer to NEMA papers on their WEBSITE at www.NEMA.org.

- SYLVANIA ECOLOGIC fluorescent lamps are designed to pass the Federal Toxic Characteristic Leaching Procedure (TCLP) criteria for classification as non-hazardous waste in most states. TCLP test results are available upon request. Lamp disposal regulations may vary, check your local & state regulations. For more information, please visit www.lamprecycle.org
- SAFELINE lamps satisfy the criteria of having a non-shattering covering for prevention of glass and other lamp components in your product by containment within the safety coating material. The covering must be intact or the lamp must be replaced to be in compliance. An onsite inspector will require correction if the lamps are installed improperly or not maintained properly.
- SAFELINE lamps are intended for indoor use only. Lamps must be used in ambient temperatures below 135 degrees F. For T8 and T12 lamps, the coating is designed to withstand constant operating temperatures up to 239 degrees F and has a melting point in excess of 500 degrees F. For T5 lamps, the coating is designed to withstand constant operating temperatures up to 500 degrees F and has a melting point in excess of 620 degrees F. Lamps must be used in open fixtures with sockets that provide adequate lamp pin to socket contact. Lamps must not be used with defective ballasts sockets, or fixtures with improper wiring.

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EcoSystem® H-Series Ballasts Overview

EcoSystem® H-Series digitally addressable ballasts provide a low-cost, flexible solution for any space in any application. Industry leading dimming to less than 1% meets the needs of the most demanding applications. Individual control with the EcoSystem® Digital Link eliminates the need to rewire, reduces design time, and provides a scalable solution from a small area to an entire building.

Features

- Continuous, flicker-free dimming from 100% to 1% or less for T8, and 1% for T5 and T5HO lamps.
- Compatible with Energi Savr Node™ with EcoSystem® unit, GRAFIK Eye® QS control unit, PowPak™ dimming module with EcoSystem® unit, and Quantum® software, allowing for integration into an existing or planned EcoSystem® lighting control solution.
- Programmed rapid start design preheats lamp cathodes before applying full arc voltage to ensure full-rated lamp life while dimming and cycling.
- 100% performance tested and burned in at factory.
- Lamps turn on to any dimmed level without going to full brightness.
- Low harmonic distortion throughout the entire dimming range maintains power quality.
- Frequency of operation ensures that ballast does not interfere with infrared devices operating between 38 kHz and 42 kHz.
- Ballasts maintain consistent light output for different lamp lengths, ensuring fixture-to-fixture uniformity
- Ultra-quiet operation.
- Ballast protected from miswires of any input power to control lead, or from lamp leads to each other and/or ground.
- End-of-lamp-life protection circuitry ensures safe operation throughout entire lamp life.
- Non-volatile memory restores all ballast settings after power failure.
- 100% compatible with all EcoSystem® digital controls.
- Custom ballast factors available for UL or CSA listed products. Design tool and specifications can be found at www.lutron.com/ballasttool

EcoSystem® H-Series, case type M

1.18 in (30 mm) W x 1.00 in (25 mm) H x 14.125 in (359 mm) L

EcoSystem® H-Series, case type G

2.38 in (60 mm) W x 1.0 in (25 mm) H x 9.5 in (241 mm) L

Job Name:	Model Numbers:	
Job Number:		

Specifications

Standards

- California Energy Commission Listed.
- UL Listed (evaluated to the requirements of UL935).
- CSA certified (evaluated to the requirements of C22.2 No. 74).
- Class P thermally protected.
- Meets ANSI C82.11 High Frequency Ballast Standard.
- Meets FCC Part 18 Non-Consumer requirements for EMI/RFI emissions.
- Meets ANSI C62.41 Category A surge protection standards up to and including 4 kV.
- Manufacturing facilities employ ESD reduction practices that comply with the requirements of ANSI/ESD S20.20.
- Lutron® Quality Systems registered to ISO9001.2008.

Ballast Wiring & Mounting

- Ballast is grounded via a mounting screw to the fixture.
- Ballast mounts using two screws (or sheet metal feature and one screw) within a fluorescent fixture.
- Power and lamp wiring terminals accept one 18 to 16 AWG (0.75 to 1.5 mm^2) solid copper wire per terminal.

• Lamp Seasoning

Refer to the lamp manufacturer's requirements for lamp seasoning requirements prior to dimming.

Environment

- Minimum lamp starting temperature: 50 °F (10 °C)
- Relative humidity: less than 90% non-condensing
- Sound Rating: Class A
- Maximum ballast case temperature: 80 °C

Performance

- Dimming Range: 100% to 0.7% measured Relative Light Output (RLO) for T8, 100% to 1% RLO for T5 and T5HO.
- Lamp Starting: programmed rapid start
- Lamp Current Crest Factor: less than 1.7
- Lamp Flicker: none visible
- Light Output Variation: constant ±2% light output for line voltage variations of ±10%
- Lamp Life: average lamp life meets or exceeds rating of lamp manufacturer.
- Power Factor: greater than 0.95
- Total Harmonic Distortion (THD): less than 10% *
- Operating Voltage: Universal input 120 V~, 220/240 V~, 277 V~ at 50 or 60 Hz
- Frequency of Operation: greater than 42 kHz
- Ballast Factor (BF): 1.0/1.17 for T8 lamps and 1.0 for T5 and T5HO lamps
- Standby Power: less than 1 W

Dimming Range for T8 lamps:

BF	Dimming Range (Max/Min [BF])	Dimming Ratio
1.17	1.17 / 0.0085	138:1
1.0	1.00 / 0.0085	118:1

Dimming Range for T5 and T5HO lamps:

BF	Dimming Range (Max/Min [BF])	Dimming Ratio
1.0	1.00 / 0.01	100:1

Warranty

- 5-year limited warranty with Lutron® field service commissioning (3-year standard warranty) from date of purchase. For additional Warranty information, please visit www.lutron.com/ResourceLibrary/warranty/Limited%20Comm.pdf

* Models EHDT817MU110, EHDT514MU110, EHDT521MU110 and EHDT521MU210 have less than 15% (THD).

Job Name:	Model Numbers:	
Job Number:		

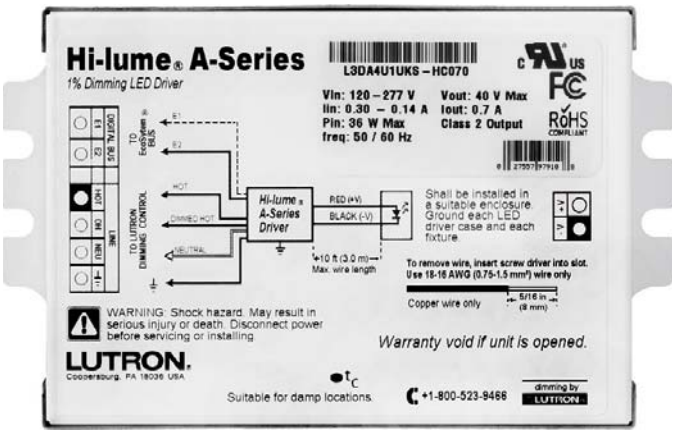
369-325 Rev. D 1 10.25.11

Hi-lume® A-Series Driver Overview EcoSystem® or 3-wire control

Hi-lume® A-Series Driver is a high-performance LED driver that provides smooth, continuous 1% dimming for virtually any LED fixture, whether it requires constant current or constant voltage. It is the most versatile LED driver offered today due to its compatibility with a wide variety of LED arrays, multiple form factors, and numerous control options.

Features

- Continuous, flicker-free dimming from 100% to 1%.
- Compatible with Energi Savr Node™ with EcoSystem® unit, GRAFIK Eye® QS control unit, PowPak™ dimming module with EcoSystem®, and Quantum® systems, allowing for integration into a planned or existing EcoSystem® lighting control solution. Please see chart at the end of this document or contact Lutron for details regarding compatible controls.
- Standard 3-wire line-voltage phase-control technology for consistent dimming performance and compatibility with all Lutron® 3-wire fluorescent controls.
- Protected from miswires of input power to EcoSystem® control inputs.
- 100% performance tested at factory.
- 100% burned in at factory.
- A rated lifetime of 50,000 hours @ t_C = 149 °F (65 °C).
- UL recognized for United States and Canada.
- FCC Part 15 compliant for commercial applications at 120 V~ or 277 V~.
- Pulse Width Modulation (PWM) or Constant Current Reduction (CCR) dimming methods available. See Application Note #360 for details.
- For more information please go to: www.lutron.com/HilumeLED



Hi-lume® A-Series, case type K

3.00 in (76 mm) W x 1.00 in (25 mm) H x 4.90 in (124 mm) L

Hi-lume® A-Series, case type M

1.18 in (30 mm) W x 1.00 in (25 mm) H x 14.25 in (362 mm) L

LUTRON® SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

Specifications

Performance

- Dimming Range: 100% to 1%
- Operating Voltage: 120-277 V~ at 50/60 Hz
- A rated lifetime of 50,000 hours @ t_c = 149 °F (65 °C). Contact Lutron for derating information.
- Patented thermal foldback protection
- LEDs turn on to any dimmed level without going to full brightness.
- Nonvolatile memory restores all driver settings after power failure.
- Power Factor: > 0.90 at 40 W
- Standby Power Consumption: < 1.0 W
- Total Harmonic Distortion (THD): < 20% at 40 W
- Inrush Current: < 2 A
- Inrush Current Limiting Circuitry: eliminates circuit breaker tripping, switch arcing and relay failure.
- Open circuit protected
- Short circuit protected
- Turn-on time: ≤ 1 second
- PWM Dimming Frequency: 550 Hz

Environmental

- Sound Rating: Class A.
- Relative Humidity: Maximum 90% non-condensing.
- Minimum operating ambient temperature t_a = 32 °F (0 °C).

Standards

- Meets ANSI C62.41 category A surge protection standards up to and including 4 kV.
- FCC Part 15 compliant for commercial applications at 120 V~ or 277 V~.
- Manufacturing facilities employ ESD reduction practices that comply with the requirements of ANSI/ESD S20.20.
- Lutron® Quality Systems registered to ISO 9001.2008.
- UL 8750 recognized.
- Class 2 output available.
- Models available to meet LED Driver requirements for Energy Star 1.1.

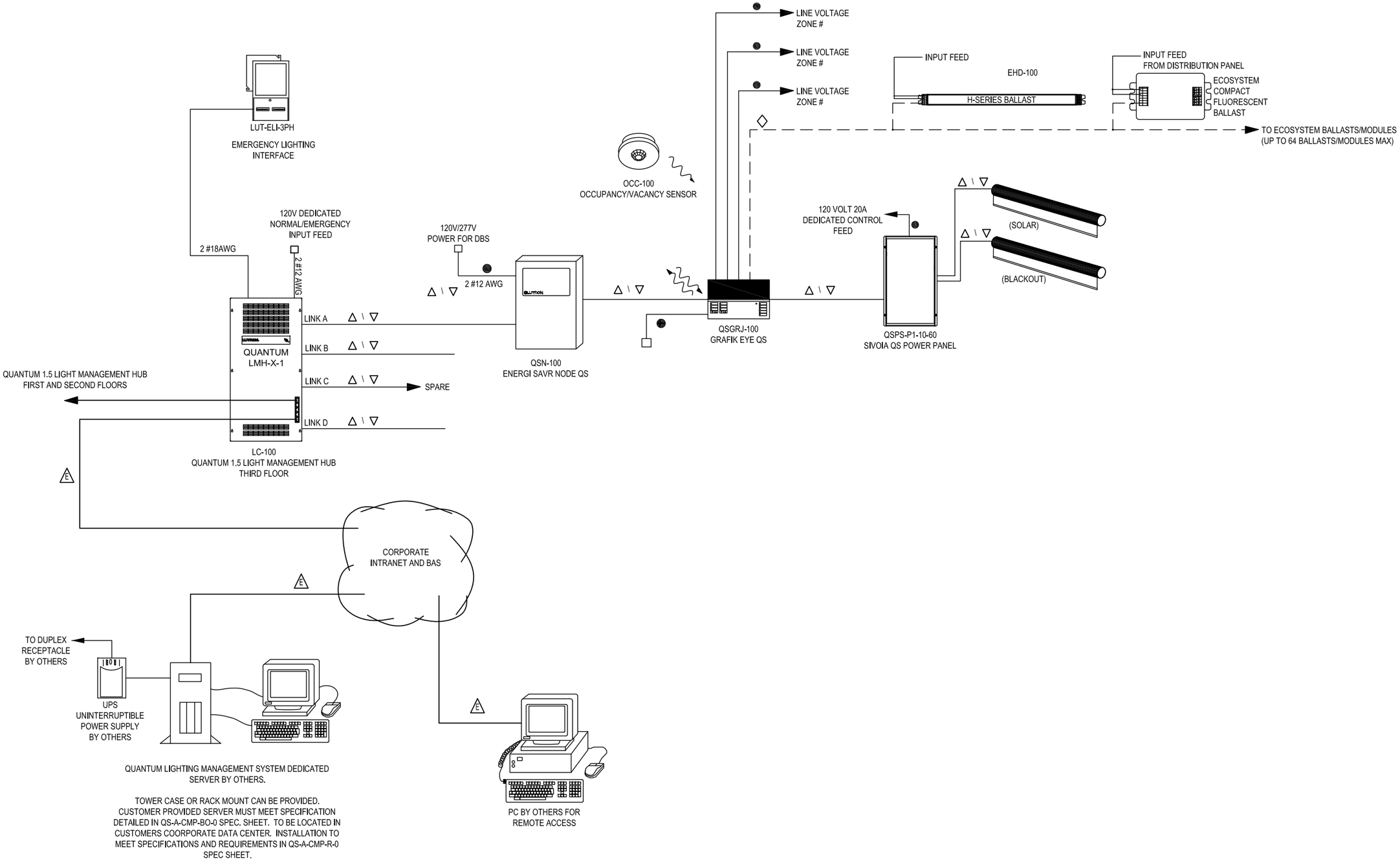
Driver Wiring & Mounting

- Driver is grounded by a mounting screw to the grounded fixture (or by terminal connection on the K case).
- Terminal blocks on the driver accept one solid wire per terminal from 18 to 16 AWG (0.75 to 1.5 mm^2).
- Fixture must be grounded in accordance with local and national electrical codes.
- Maximum driver–to–LED light engine wire length is 10 ft (3.0 m).

Job Name:	Model Numbers:	
Job Number:		

Appendix D | Control Schedule, Diagrams, and Cut Sheets

Lighting Control Equipment Schedule					
Type	**Manufacturer**	**Product Name**	**Catalog Number**	**Description**	**Location**
EHD-100	LUTRON	ECOSYSTEM H-SERIES BALLASTS	EHD T528 M U 1 10	Fluorescent Dimming Ballast with dimming capabilities to 1% output	EXTERIOR, LOBBY, OFFICE, BOARD ROOM
EW-100	LUTRON	ECOSYSTEM 4 BUTTON WALLSTATION	CC-4BRL-WH	Communicates with EcoSystem Ballasts and EnergiSavr Node. Up to three lighting scenes and on/off.	LOBBY, MARKETING OFFICE
DS-100	LUTRON	PHOTOSENSOR	LRFX-DCRB-WH	Wireless closed loop sliding setpoint daylight sensor that is compatible with up to 10 dimming and switching devices.	MARKETING OFFICE
GE-100	LUTRON	GRAFIK EYE QS	QSGRJ-16E	Contrls Board Room lighting with line voltage zones	BOARD ROOM
LC-100	LUTRON	QUANTUM LIGHT MANAGEMENT HUB	QP2-2P0CSE-120	Centralized connection for Lutron EcoSystem, supports up to 8 EcoSystem loops	DATA CENTER
LD-100	LUTRON	HI-LUME A-SERIES LED DRIVER	L3D 25 XXX A UNV 1	Dims continuously to 1% light levels, continuous flicker free dimming, line-voltage phase control	EXTERIOR, LOBBY, OFFICE, BOARD ROOM
MS-100	WATTSTOPPER	EW LOW VOLTAGE OUTDOOR MOTION SENSOR	EW-205-24-W	Motion sensor with capabilities to cover 270 degrees. Operates on 24 VDC and allows for high and low switching.	EXTERIOR
OCC-100	LUTRON	OCCUPANCY/VACANCY SNESOR	L2F2-OCRB-P-WH	Ceiling mounted occupancy sensor with up to 12' diameter coverage	LOBBY, OFFICE, BOARD ROOM
QSM-100	LUTRON	QUANTUM SENSOR MODULE	QSM2-4W-C	Quantum wireless sensor module that communicates with EcoSystem wallstation, occupancy sensors, and daylgiht sensors. Communicates with Grafik Eye QS	LOBBY, OFFICE
QSN-100	LUTRON	ENERGY SAVR NODE QS	QSN-2ECO-S	Controls occupancy sensors, daylight sensors, and EcoSystem Wallstations	DATA CENTER



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HARRISBURG, PA

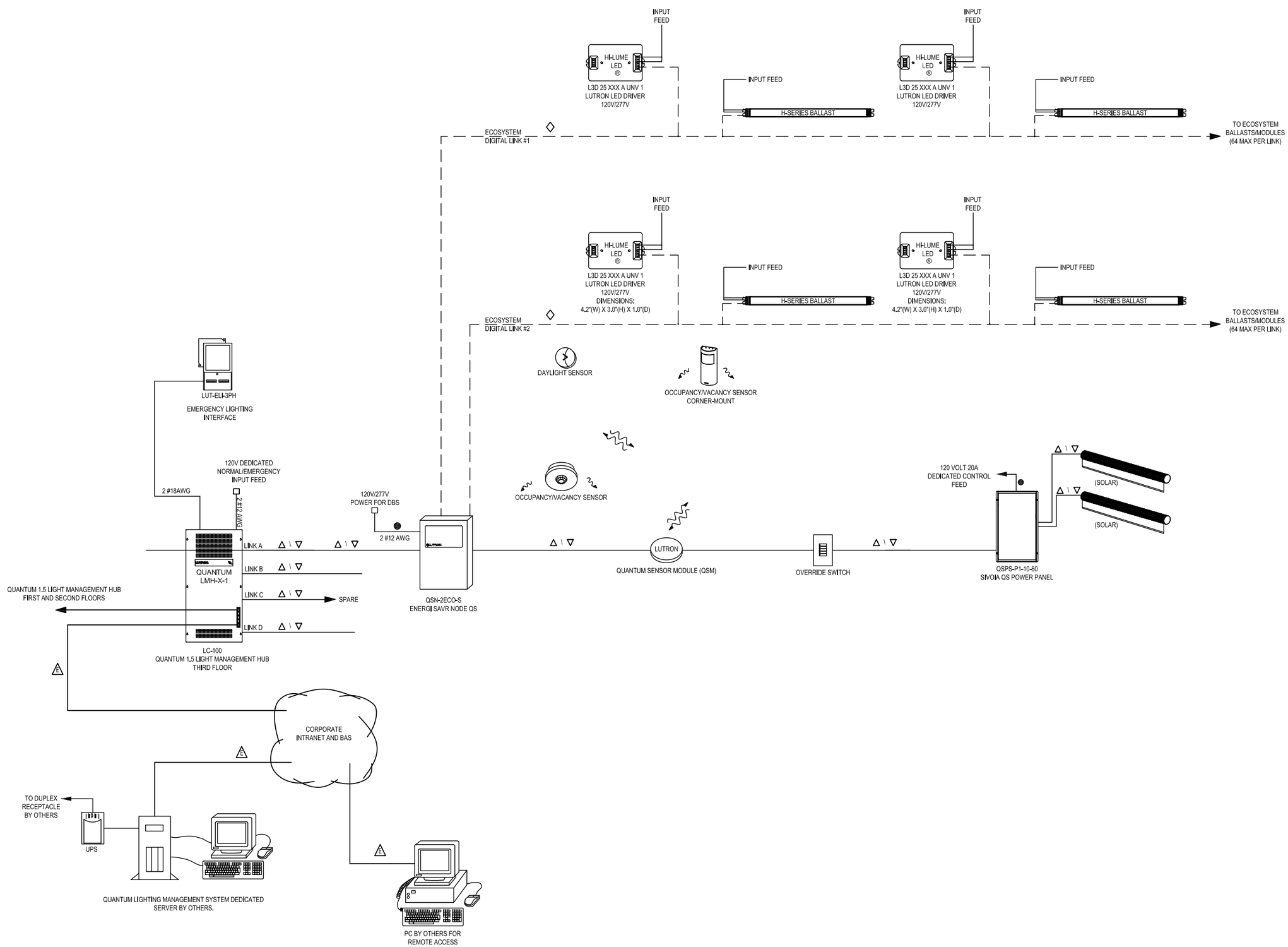
SCALE:
NOT TO SCALE

ISSUE DATE:
3/31/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
BOARD ROOM CONTROL DIAGRAM

SHEET TITLE:
C.01



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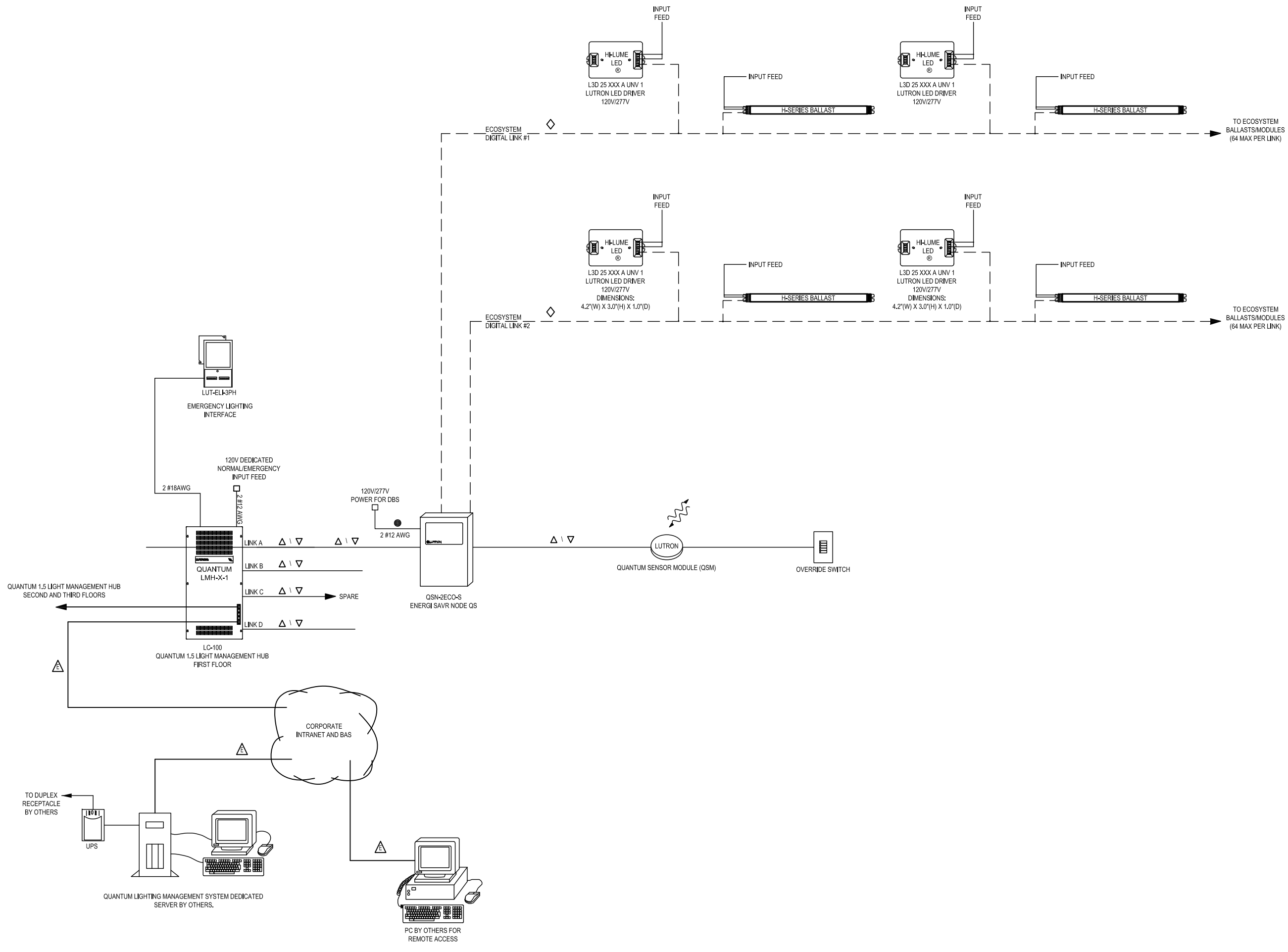
ISSUE DATE:
04/04/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
MARKETING OPEN OFFICE CONTROL DIAGRAM

SHEET TITLE:
C.02



THE PENNSYLVANIA STATE EMPLOYEES CREDIT UNION
CORPORATE HEADQUARTERS
HARRISBURG, PA

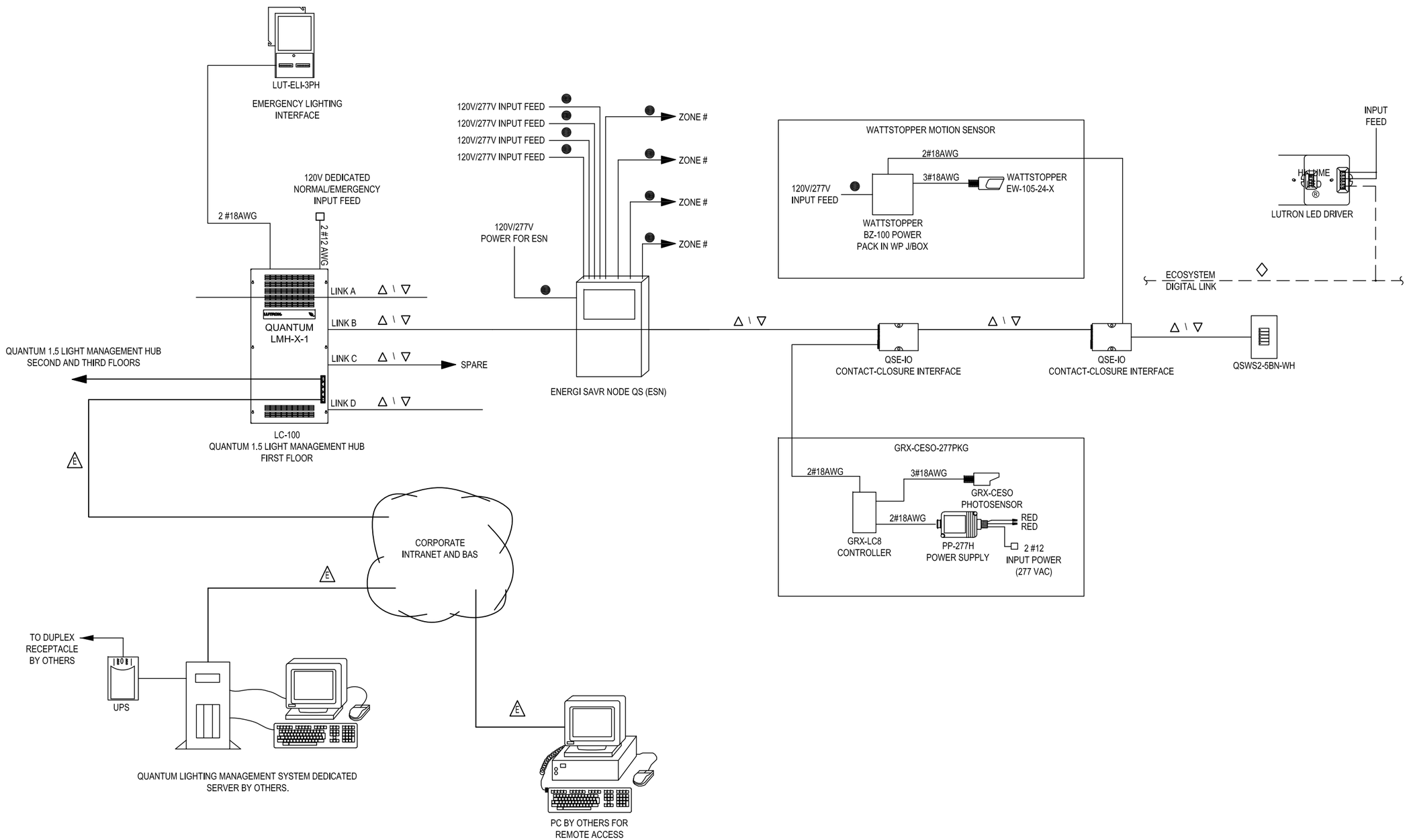
SCALE:
NOT TO SCALE

ISSUE DATE:
04/04/2012

DRAWN BY:
SARAH WUJCIK

TITLE:
LOBBY CONTROL DIAGRAM

SHEET TITLE:
C.03



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HARRISBURG, PA

SCALE:
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ISSUE DATE:
04/04/2012

DRAWN BY:
SARAH WUJCIK

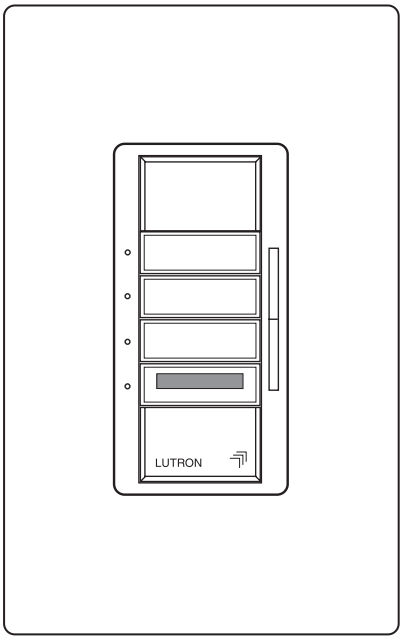
TITLE:
PARKING AREAS
CONTROL DIAGRAM

SHEET TITLE:
C.04

369407a 1 09.19.11

4-Button Wall Control with Raise/Lower

The 4-Button Wallstation recalls lighting presets for a group of EcoSystem® devices. The wallstation connects directly to the EcoSystem® ballast, ballast module, Energi Savr Node™, or QS Sensor Module (QSM) via low-voltage wiring.



Features

- Wires Class 2 / Low-Voltage
- Mounts easily in any single-gang wallbox
- 4 Presets as well as All On and All Off
- Raise/Lower rocker controls all assigned ballasts
- Built-in infrared receiver allows wallstation to be used as a programming point for EcoSystem® ballasts or ballast modules (traditional programming via PDA only)
- Infrared (IR) signals are received through the plastic button (maximum distance of 10 ft / 3 m)
- Programming of control groups can be performed at the wallstation
- Programming of scene levels can be performed at the wallstation when used only with EcoSystem® ballasts or ballast modules
- Multi-color LED to indicate button presses, programming mode, and reception of infrared signals
- Green LEDs shall be on at all times and operate as a “night light”
- Red LEDs shall indicate programming mode is active
- Fits any designer (Claro®) opening faceplates
- Faceplate not included
- Zone Control when used with Energi Savr Node™ or Quantum®

Notes

- Zone toggle and unaffected zone not supported in this model
- This product is designed to control a single ballast or group of ballasts or modules
- A second 4B control in the same group will perform the same function (recalls the same 4 scenes)

Job Name:	Model Numbers:	
Job Number:		

369-262 Rev. D 1 10.11.11

Radio Powr Savr™ Wireless Daylight Sensor

Lutron's wireless daylight sensor is a battery-powered sensor that automatically controls lights via RF communication to compatible dimming or switching devices. This sensor mounts to the ceiling and measures light in the space. The sensor then wirelessly transmits the light level to the associated dimming or switching devices that automatically control the lights to balance light level in the space. The sensor combines both convenience and exceptional energy savings potential along with ease of installation.

Features

- Wireless daylight sensor has simple calibration.
- Daylight compensation through Lutron's reliable open loop control.
- Designed to give a linear response to changes in viewed light level.
- Light range 0–107,000 Lux (0–10,000 fc).
- Uses ClearConnect™ technology.
- Works seamlessly with Radio Powr Savr™ occupancy sensors and Pico® wireless controls.
- One sensor can be associated to up to 10 compatible RF dimming and switching devices allowing for switching, stepped dimming, and continuous dimming of multiple zones.
- Intuitive test mode provides instant system verification.
- Multiple ceiling mount methods available for different ceiling materials.
- Front accessible test buttons make setup easy.
- 10-year battery life.
- RoHS compliant.

Model Number

LRFX-DCRB-WH

- Color Code
- Frequency / Channel Code

Frequency / Channel Codes

2 = 431.0 – 437.0 MHz (US, Canada, Mexico, Brazil)
3 = 868.125 – 869.850 MHz (Europe and UAE)
4 = 868.125 – 868.475 MHz (China and Singapore)
5 = 865.5 – 866.5 MHz (India)
6 = 312.3 – 314.8 MHz (Japan)
7 = 433.05 – 434.79 MHz (Hong Kong)

Color Code

WH = White

Compatible RF Devices

- For use with Lutron® products only
- Communicates to various wireless Lutron® systems*

* *Contact Lutron® Customer Service at www.lutron.com for frequency/channel code compatibility with your particular geographic region, and for integrating with other Lutron® lighting and shading products.*

Job Name:	Model Numbers:	
Job Number:		

Specifications

Regulatory

Lutron® Quality Systems Registered to ISO 9001:2008

Standards

LRF2-

- FCC certified
- IC certified
- COFETEL
- ANATEL
- ASEP
- CRC
- SUBTEL
- SUPERTEL
- SUTEL
- Meets CA (U.S.A.) Energy Commission Title 24 requirements

LRF3-

- CE Marked (European Union)
- TRA Type Approved (United Arab Emirates)

LRF4-

- SRRC Type Approved (Mainland China)
- iDA Registered (Singapore)

LRF5-

- WPC Type Approved (India)

LRF6-

- 007YUUL0688

LRF7-

- FCC certified

Power / Performance

- Operating voltage: 3 V⎓
- Operating current: 7 µA
- Requires one CR 2450 lithium battery
- 10-year battery life
- Non-volatile memory (settings are stored during power loss)

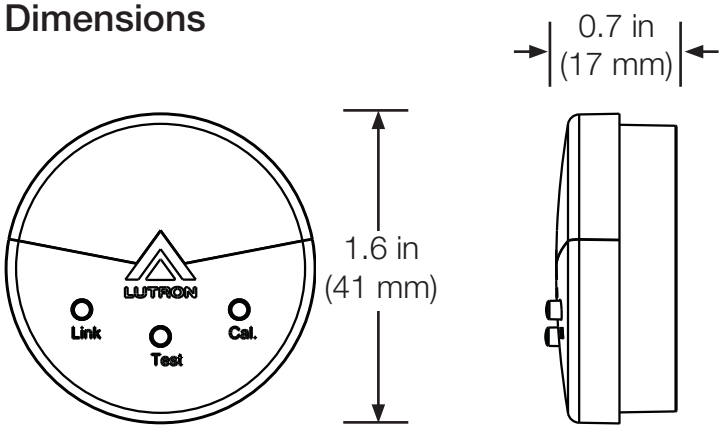
Enviroment

- Temperature: 32 ºF to 104 ºF (0 ºC to 40 ºC)
- For indoor use only
- Relative humidity: < 90% non-condensing

Range

- **LRF2, LRF3, LRF4, LRF5, LRF7**
  Local load controls must be located within 60 ft (18 m) line of sight, or 30 ft (9 m), through walls, of a sensor.
- **LRF6**
  Local load controls must be located within 23 ft (7 m), through walls, of a sensor.

Dimensions



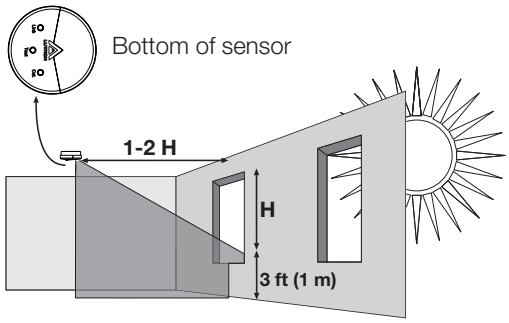
Job Name:	Model Numbers:	
Job Number:		

369-262 Rev. D 3 10.11.11

Mounting

Location for average size areas

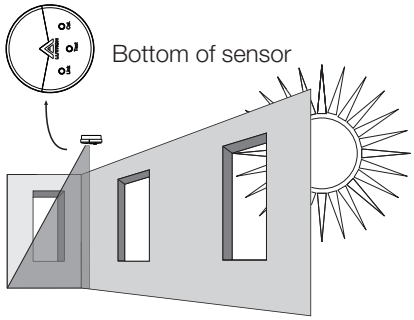
Arrow points towards the area viewed by the sensor (towards windows).



H = Effective Window Height

Location for narrow areas (corridors, private offices)

Arrow points towards the area viewed by the sensor (away from window)



Installation Overview

Determine the Daylight Sensor mounting location using the diagrams at left:

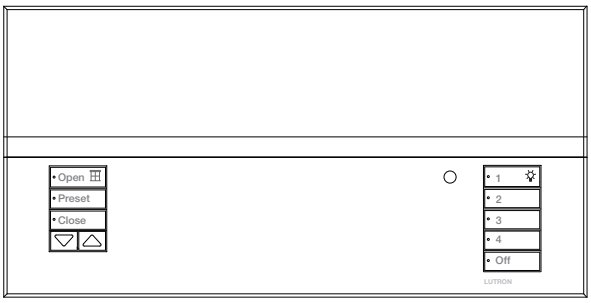
- The arrow on the daylight sensor points toward the area viewed by the sensor.
- Place the daylight sensor so its arrow is pointed at the nearest window at a distance from the window of one to two times the effective window height (H).
- The effective window height (H) starts at the window sill or 3 ft (1 m) up from the floor, whichever is higher, and ends at the top of the window.
- Ensure that the view of the daylight sensor is not obstructed (e.g. ceiling fans or pendant fixtures).
- Do not position the daylight sensor above an electric light that shines up at the ceiling or at the sensor.
- Do not position the daylight sensor in the well of a skylight or above indirect lighting fixtures.
- For narrow areas where the daylight sensor cannot be placed 1-2 (H) from windows, place sensor near windows facing into the space.
- Mount Sensor(s) away from large metal surfaces (e.g. light fixtures or metal-backed ceiling tiles). Metal objects will affect the Sensor's RF performance.

Daylight Sensor Communication

- A sensor can communicate with up to 10 local load devices.
- A local load device or zone can receive information from only one daylight sensor.

Job Name:	Model Numbers:	
Job Number:		

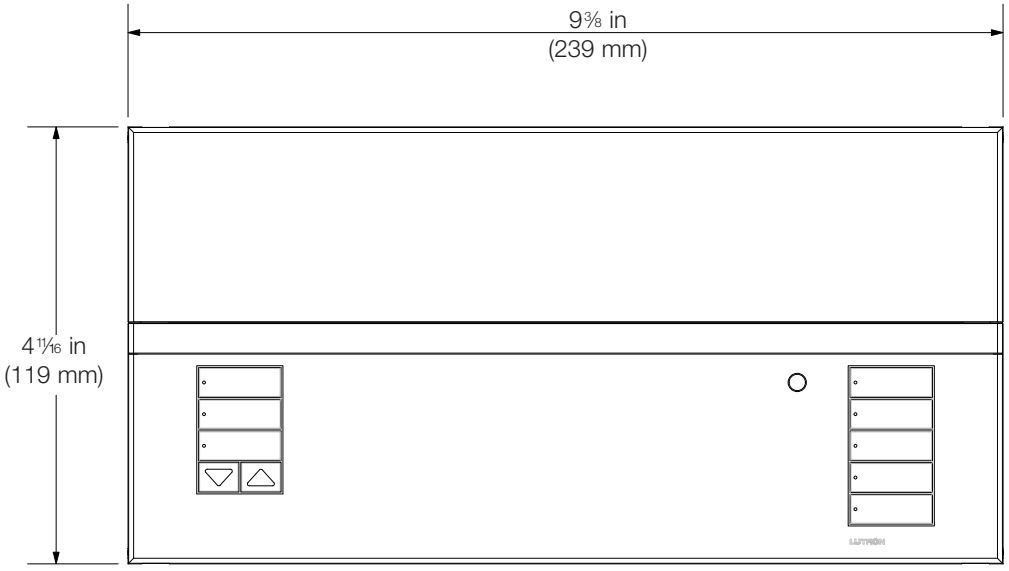
GRAFIK Eye® QS Wireless Control Unit with EcoSystem®



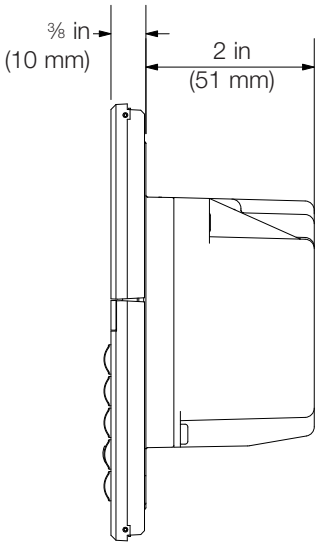
Description

GRAFIK Eye® QS Wireless with EcoSystem® is the premier energy-saving lighting and shade control. The GRAFIK Eye® QS control unit features an astronomic timeclock and intuitive lighting presets, which are seamlessly integrated with EcoSystem® fluorescent ballasts and LED drivers, and Lutron's QS components and systems. Now with wireless technology and an integral EcoSystem® bus supply, you can use the GRAFIK Eye® QS Wireless control unit with EcoSystem® to control ballasts and shades without interfaces, and integrate with a variety of Lutron wireless products and systems, including Radio Powr Savr™ occupancy, vacancy, and daylight sensors, Sivoia® QS wireless shades, Pico® wireless control, and other GRAFIK Eye® QS wireless control units. Additionally, the GRAFIK Eye® QS wireless control unit is compatible with all Lutron wired QS products and systems, including Quantum®.

Mechanical Dimensions



Front View



Side View

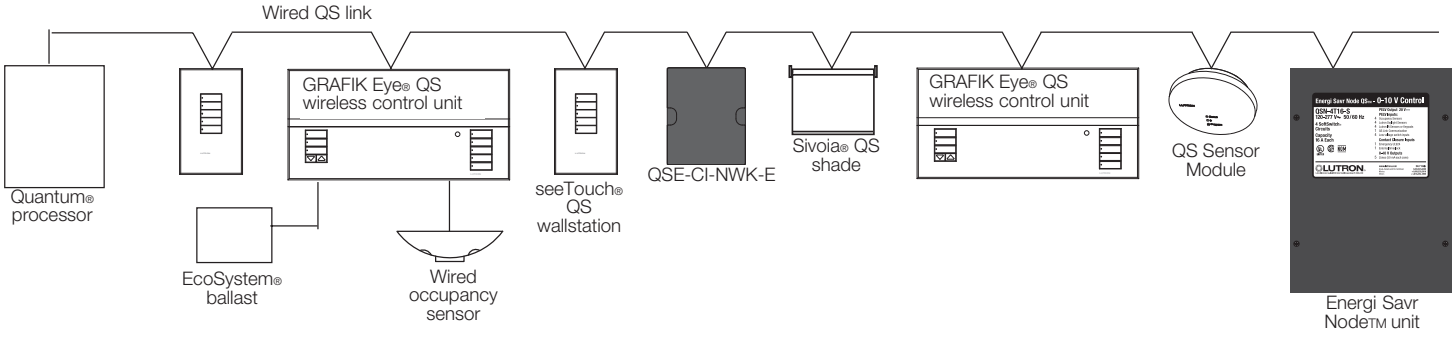
Fits into a 4-gang U.S. backbox, 3½ in (89 mm) deep; Lutron P/N 241-400

Job Name:	Model Numbers:	
Job Number:		

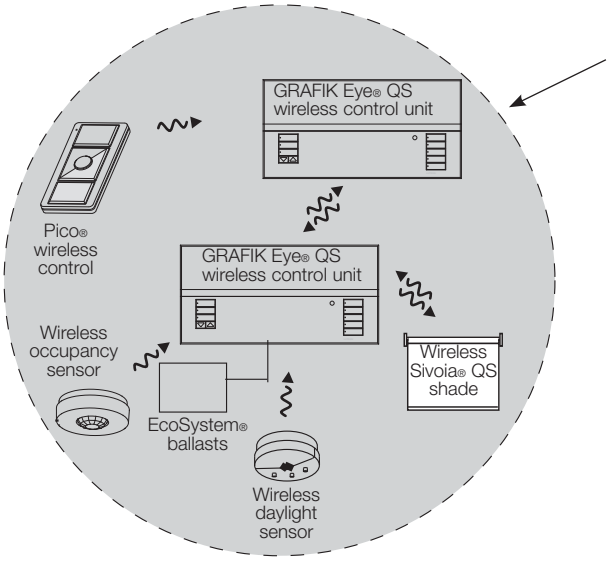
System Topologies

The GRAFIK Eye® QS Wireless control unit with EcoSystem® can be specified in three different system topologies. Examples of each are shown below.

Example of Wired System

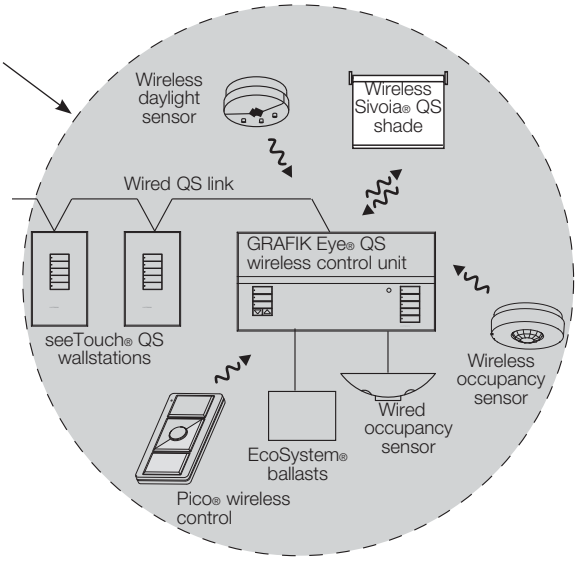


Example of GRAFIK Eye®-centric Wireless System



30 ft (10 m) wireless range; 60 ft (20 m) in open air

Example of Mixed GRAFIK Eye®-centric Wired/Wireless System



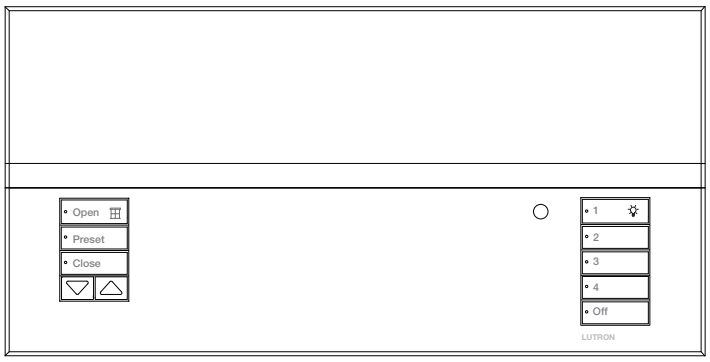
Job Name:	Model Numbers:	
Job Number:		

Application Suggestions and Differences between GRAFIK Eye® QS with EcoSystem® and Standard EcoSystem® Bus Supply

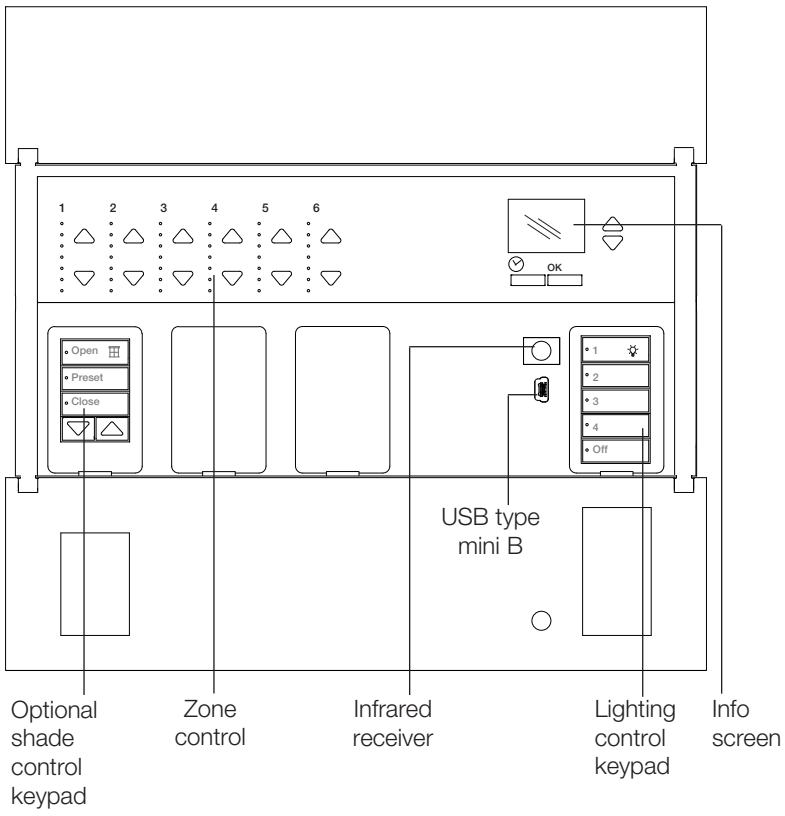
	GRAFIK Eye® QS with EcoSystem®	Energi Savr Node™ with EcoSystem®
Suggested/Recommended Applications	**Single rooms, partitioned spaces, e.g., conference room, classroom, ballroom, lobby**	**Open spaces, multiple enclosed rooms, e.g., open office, window offices**
Programming Method	Info Screen on the QS control unit	Via Energi Savr Node™ App for *iPod* mobile digital device
Integral Timeclock	Yes	No
Compatible with seeTouch® QS Keypads	Yes	Yes
Compatible with EcoSystem® Wall Controls	No	Yes
Compatible with EcoSystem® IR Sensors	No	Yes
Includes dry contact closure for integration to BMS or Security Systems	Yes	Yes
Input Voltage	120-127 or 220-240 V~ 50/60 Hz	120/240/277 V~ 50/60 Hz
Number of EcoSystem® Busses	1	1 or 2
Number of Zones	6, 8, or 16	Programmable
Number of Line-Voltage Outputs	3 (Zones 1-3 only)	--
Compatible with other QS Devices	Yes	Yes

iPod is a trademark of Apple Inc., registered in the United States and other countries.

Job Name:	Model Numbers:	
Job Number:		



Note: General Engraving (-EGN) shown.



Features

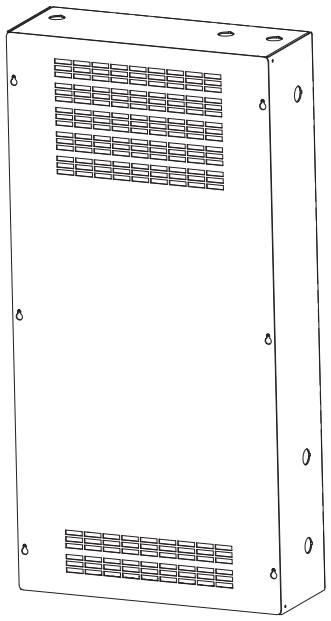
- Lutron's proprietary Clear Connect™ RF technology. Operates in the 434 MHz band.
- Pushbutton recall of four preset lighting scenes, plus Off.
- Twelve (12) additional scenes accessible through other QS devices, such as seeTouch® QS wallstations.
- Zones 1, 2, and 3 can control many light source types directly and others using power modules.
- Optional integrated shade control buttons, which can also be added to the unit after installation.
- Master override buttons to raise and lower all lights.
- Allows setup of lighting scenes and shade presets using buttons on the control unit.
- Built-in infrared (IR) receiver.
- External IR connection.
- Built-in astronomic timeclock.
- Info screen shows zone light level percentage, energy savings, zone labeling, programming, and EcoSystem® setup.
- Lockout option prevents accidental changes.
- One occupancy sensor input and 24 V⎓ power for occupancy sensor.
- QS communication link for seamless integration of lights, motorized window treatments, occupancy sensors, wallstations, and integration interfaces.
- Compatible with all Lutron QS system components.
- Wireless communication for seamless integration with a variety of Lutron wireless products and systems, including Radio Powr Savr™ occupancy, vacancy, and daylight sensors, Sivoia® QS wireless shades, Pico® wireless controls, and other GRAFIK Eye® QS Wireless control units.
- Control up to 6, 8, or 16 EcoSystem® zones from internal bus supply.
- Zones 1, 2, and 3 are integral line voltage dimming zones and can be optionally programmed as EcoSystem® zones.
- Up to 64 EcoSystem® or Hi-lume® 3D ballasts can be addressed and grouped to zones.
- Integral EcoSystem® setup and programming replaces the need for a handheld programmer (C-PDA-CLR does not communicate with the GRAFIK Eye® QS with EcoSystem® control unit)
- Backlit buttons with engraving make unit easy to locate and operate.
- Available in a variety of colors and finishes.

Job Name:	Model Numbers:	
Job Number:		

Light Management Hub

Description

The Quantum® light management hub provides a centralized connection point for Lutron® EcoSystem® digital ballast modules, *Lutron* power panels, GRAFIK Eye® QS, and Sivoia® QS shades.



Features

- Designed to control, manage, and monitor *EcoSystem* lighting, Energi Savr Node™ with *EcoSystem*, Lutron power panels, *GRAFIK Eye* QS, and *Sivoia* QS shade systems in a building or whole campus.
- Supports both astronomic and time-of-day events to automatically control the lights and shades in the system.
- Simple reconfiguration of a space without rewiring.
- Individually control, monitor, and adjust any light or shade in a space.
- QS control links and *EcoSystem* loops are topology-free.
- For *EcoSystem* loads, the light management hub accepts one normally closed (NC) emergency input per *Quantum* bus supply.
- *EcoSystem* bus may be wired NEC® Class 1 or PELV (Class 2: USA).

Panel Capabilities

- Each hub supports up to 8 *EcoSystem* loops, (4 *Quantum* bus supplies)
- Each loop can have a combination of 64 *EcoSystem* ballasts and ballast modules, plus a maximum of 16 daylight sensors, 32 occupancy sensors, and 64 infrared (IR) devices.
- Supports up to 2 *Quantum* processors with 2 links each that can be individually configured to communicate with:
  - *Quantum* bus supply (limited to one link per bus)
  - Lutron power panels
  - Lutron QS devices

Job Name:	Model Numbers:	
Job Number:		

Specifications

Power

- Input voltage: 120 V~, normal/emergency feed
  50 / 60 Hz 15 A
- Output: EcoSystem® - 18 V⎓ 250 mA per loop
  Processor - 24 V⎓ 1 A per link

Physical Design

- Enclosure: NEMA Type 1, IP-20 protection
  16 U.S. gauge steel
- Weight: 45 pounds (20.4 kg)

Mounting

- Surface mount only

Environment

- For indoor use only
- 32 to 104 ºF (0 to 40 ºC)
- Relative humidity less than 90% non-condensing

Job Name:	Model Numbers:	
Job Number:		

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How to Build a Model Number

Example

QP2 - 2P8CSE - 120

- QP2 — Panel Type
- 2P — Number of Processors
- 8C — Number of Loops
- SE — Accesory Device
- 120 — Voltage

Available Model Numbers

Contact Lutron for options not listed below.

QP2-0P0CSE-120 (for rough-in use)
QP2-1P0CSE-120
QP2-1P2CSE-120
QP2-1P4CSE-120
QP2-1P6CSE-120
QP2-1P8CSE-120
QP2-2P0CSE-120
QP2-2P2CSE-120
QP2-2P4CSE-120
QP2-2P6CSE-120
QP2-2P8CSE-120

Panel Type
QP2 = Quantum® Light Management Hub

Number of Processors
0P = 0 *Quantum* processors
1P = 1 *Quantum* processor
2P = 2 *Quantum* processors

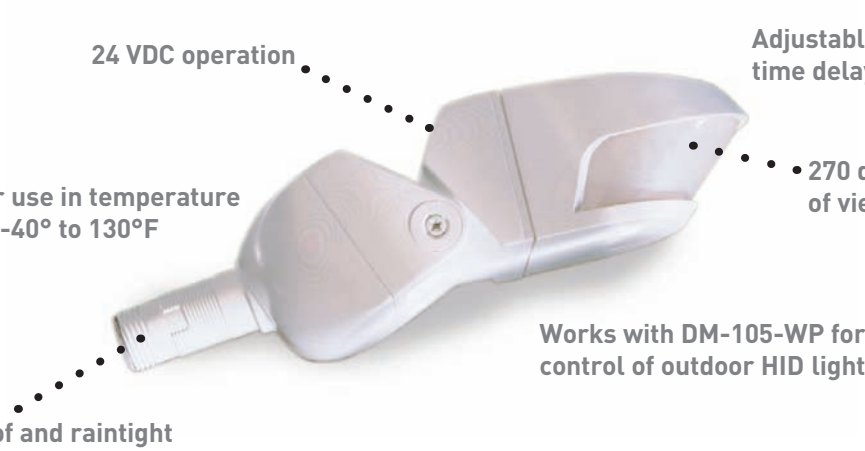
Number of Loops
0C = 0 EcoSystem® loops
2C = 2 *EcoSystem* loops
4C = 4 *EcoSystem* loops
6C = 6 *EcoSystem* loops
8C = 8 *EcoSystem* loops

Accessory Device
SE = 5-port Unmanaged Ethernet Switch

Voltage
120 for 120 V~

Job Name:	Model Numbers:	
Job Number:		

EW Low Voltage Outdoor Motion Sensor



PROJECT
LOCATION/TYPE

Product Overview

Description

WattStopper's EW outdoor motion sensors provide occupancy based control of outdoor lighting. Raintight and rated for -40°F to 130°F, EW sensors perform reliably in all weather conditions.

Operation

EW sensors operate at 24 VDC and are mounted onto a standard, outdoor junction box. Utilizing advanced passive infrared (PIR) technology, the sensors detect the difference between infrared energy in motion and the background space to turn lighting on when a person or vehicle enters the coverage area. After the area is vacated and the time delay elapses, lighting automatically turns off. The EW's dual PIR detectors and three level lens increase the detection density as well as the accuracy of motion detection.

Applications

The low voltage EW sensors are ideal to use in conjunction with WattStopper DM-105-WP outdoor HID control module. Here, the EW allows the outdoor HID lighting to switch between high and low based on motion detection. Applications include walkways, parking lots, dock lighting and warehouses. When used with a power pack, the low voltage EW also provides an outdoor lighting control solution for areas where line voltage is not available or where the load is too large for a single line voltage sensor to handle.

Features

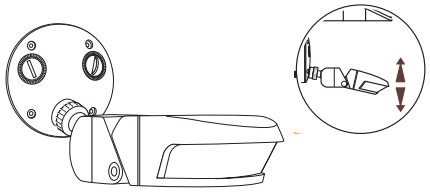
- Sensors can be mounted on walls, eaves, or ceilings for installation convenience
- 270° coverage pattern
- Front rotates for easy coverage adjustment
- Precision, double-shot tooling with internal silicon gaskets prevents water and dust contamination
- Optional override-ON to turn lights on remotely for the length of the time delay
- User-adjustable time delay from 12 seconds to 16 minutes
- Adjustable light level setting allows users to set the level at which lighting will turn on upon occupancy
- ASIC enhances reliability and helps to eliminate false triggers
- Pulse Count Processing eliminates false triggers and provide RFI and EMI immunity
- Includes hardware for mounting sensor to standard 4" round outdoor junction box

Specifications

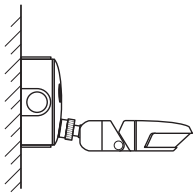
- Operating temperature range -40°F to +130°F
- UL 773A rated raintight
- 24 VDC operation
- 270° coverage
- Adjustable light level of 0.5 to 200 footcandles (5.4 - 2,152.8 lux)
- 1/2" threaded nipple fits standard NEMA weatherproof fixture fitting
- Sensor dimensions: 6.7" x 3.2" x 2.2" (170mm x 80mm x 55mm)
- Five year warranty

Wiring & Installation

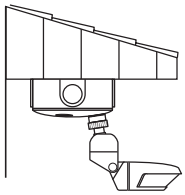
Installation & Positioning



Mounting Diagrams

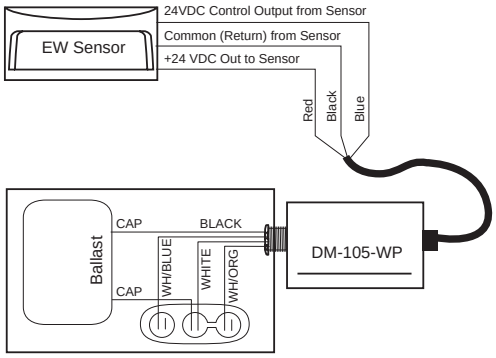


Wall or pole mounting

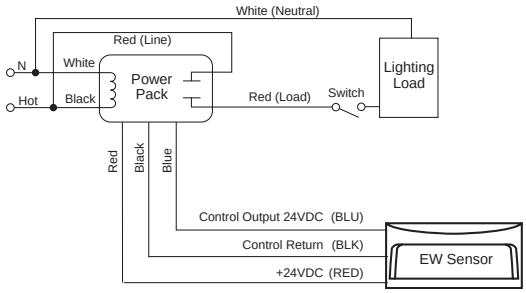


Ceiling/eave mounting

EW Wiring with DM-105-WP HID Control

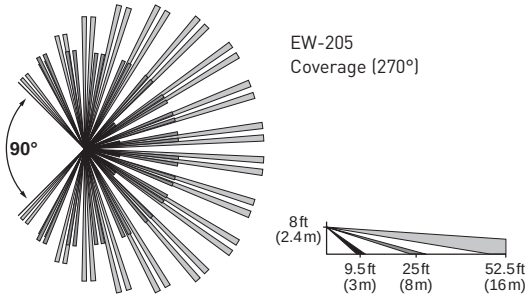


EW and Power Pack Wiring



Coverage

Coverage Pattern



Ordering Information

Catalog No.	Color	Voltage	Current	Coverage
EW-205-24-W	Arctic white	24 VDC	7 mA	270°
EW-205-24-G	Arch. grey	24 VDC	7 mA	270°

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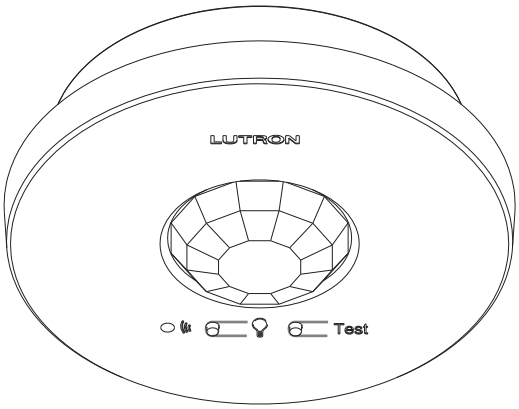
Wireless Ceiling Mount Sensor

Lutron's ceiling-mounted occupancy/vacancy sensors are wireless, battery-powered passive infrared (PIR) sensors that automatically control lights via RF communication to compatible dimming and switching devices. These sensors detect the heat from people (IR radiation of 9.5 µm) moving within an area to determine when the space is occupied. The sensors then wirelessly transmit the appropriate commands to the associated dimming and switching devices to turn the lights on or off automatically. They combine both convenience and exceptional energy savings potential along with ease of installation.



Features

- Wireless occupancy sensor has 3 settings available: Auto-On/Auto-Off, Auto-On Low-Light/Auto-Off, and Manual-On/Auto-Off
- Auto-On Low-Light feature will only turn lights on automatically if there is less than approximately 10 Lux (1 fc) of ambient light
- Vacancy only model available to meet California (U.S.A.) Title 24 requirements
- Uses Clear Connect™ technology
- Passive infrared motion detection with exclusive Lutron XCT™ Technology for fine motion detection
- 360˚ coverage ranges from 324 sq ft (98 sq m) to 676 sq ft (206 sq m), depending on mounting height
- Simple and intuitive adjustments available for Timeout, Auto-On, and Activity settings
- Supports advanced occupancy features, such as dependent occupancy groups and customizable occupied/unoccupied presets in some systems
- Multiple sensors can be added for extended coverage—refer to product specification submittal of receiving device to determine system limits
- Lens illuminates during test mode to verify ideal locations
- Multiple ceiling-mount methods available for different ceiling materials
- Front accessible test buttons make setup easy
- 10-year battery life design
- RoHS compliant

Models Available

- LRFX-OCR2B-P-WH
  - Color Code
  - Frequency/Channel Code
- LRF2-VCR2B-P-WH
  - *Vacancy Only Sensor*
  - Available for Channel Code 2 Only

Frequency/Channel Codes

2 = 431.0 – 437.0 MHz (US, Canada, Mexico, Brazil)
3 = 868.125 – 869.850 MHz (Europe and UAE)
4 = 868.125 – 868.475 MHz (China and Singapore)
5 = 865.5 – 866.5 MHz (India)
6 = 312.3 – 314.8 MHz (Japan)
7 = 433.05 – 434.79 MHz (Hong Kong)

Color Code

WH = White

Compatible RF Devices

- For use with Lutron® products only
- Communicates to various wireless Lutron® systems*

* *Contact Lutron® Customer Service at www.lutron.com for frequency/channel code compatibility with your particular geographic region, and for integrating with other Lutron® lighting and shading products.*

Job Name:	Model Numbers:	
Job Number:		

Specifications

Regulatory

- Lutron® Quality Systems Registered to ISO 9001:2008

Standards

LRF2-

- FCC certified
- IC certified
- COFETEL certified
- ANATEL certified
- SUTEL certified
- Meets CA (U.S.A.) Energy Commission Title 24 requirements

LRF3-

- CE Marked (European Union) [expected Q4 2011]
- TRA Type Approved (United Arab Emirates) [expected Q4 2011]

LRF4-

- SRRC Type Approved (Mainland China) [expected Q4 2011]
- iDA Registered (Singapore) [expected Q4 2011]

LRF5-

- WPC Type Approved (India)

LRF6-

- 007YUUL0689

LRF7-

- FCC certified

Power/Performance

- Operating voltage: 3 V ⎓
- Operating current: 14 µA nominal
- Requires one CR 123 lithium battery
- 10-year battery life design
- Non-volatile memory (saved changes are stored during power loss)

Environment

- Temperature: 32 ˚F to 104 ˚F (0 ˚C to 40 ˚C)
- For indoor use only

Range

- **LRF2, LRF3, LRF4, LRF5, LRF7**
  Local load controls must be located within 60 ft (18 m) line of sight, or 30 ft (9 m), through walls, of a sensor.
- **LRF6**
  Local load controls must be located within 40 ft (12.2 m) line of sight or 23 ft (7 m), through walls, of a sensor.

Sensor Coverage Test

- Front accessible test button
- Lens illuminates orange in response to motion during test mode and is visible from 60 ft (18 m)

Wireless Communication Test

- Front accessible test button
- Turn associated loads on and off

Timeout Options

- 1 minute *
- 5 minutes
- 15 minutes – default setting
- 30 minutes

Auto-On Options (Occupancy Versions Only)

- “Enabled” * – Sensor turns lights ON and OFF automatically – default setting.
- “Low Light” – Sensor turns lights ON automatically only in low ambient light conditions. Sensor turns lights OFF automatically.
- “Disabled” ** – Lights must be turned ON manually from dimming or switching device. Sensor turns lights OFF automatically.

Activity Options

- Low Activity – default setting
- Medium Activity
- High Activity

* Intended for use in high-activity, briefly occupied areas only

** There is a 15-second grace period that begins when the lights are automatically turned off, during which the lights will automatically turn back on in response to motion. This grace period is provided as a safety and convenience feature in the event the lights turn off while the room is still occupied, so that the user does not need to manually turn the lights back on. After 15 seconds, the grace period expires and the lights must be manually turned on.

Job Name:	Model Numbers:	
Job Number:		

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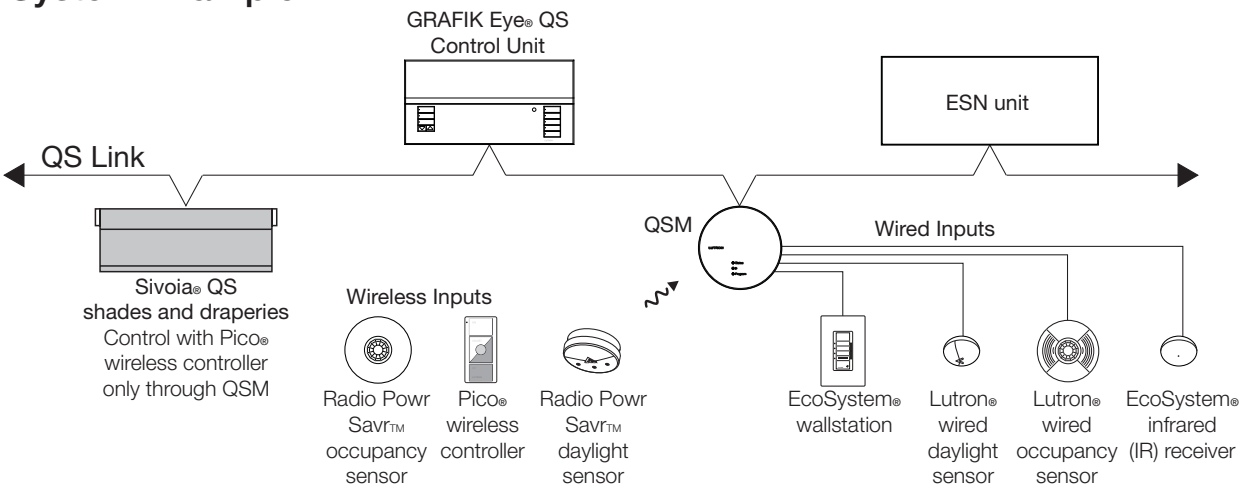
QS Sensor Module

The QS Sensor Module (QSM) is a ceiling-mounted device that integrates Lutron® wireless and wired sensors and controls through the QS communication link to Energi Savr Node™ (ESN) units, GRAFIK Eye® QS, Quantum®, and Sivoia® QS shades and draperies.

Features

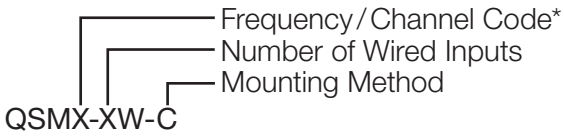
- Uses Clear Connect™ RF Technology for communication with Radio Powr Savr™ occupancy sensors, Radio Powr Savr™ daylight sensors, and Pico® wireless controllers.
- QSM connects to four Lutron® wired sensors or controls—occupancy sensors, daylight sensors, EcoSystem® infrared (IR) receivers, or EcoSystem® wallstations. Does not apply to wireless only models.
- Powered by the QS link—no line voltage connections are required.
- Contact Lutron® for compatibility details with the Quantum® system.
- Compatible with the entire ESN product family:
  - — Allows Lutron® wired occupancy sensors, daylight sensors, EcoSystem® wall stations, EcoSystem® IR receivers, Pico® wireless controllers, Radio Powr Savr™ wireless occupancy sensors and daylight sensors to control ESN units.
- Compatible with GRAFIK Eye® QS control units.
  - — GRAFIK Eye® QS control unit models starting with QSGR.
  - — Allows Lutron® wired or Radio Powr Savr™ wireless occupancy sensors and daylight sensors linked to a QSM to control the GRAFIK Eye® QS control unit.
  - — Contact Lutron® for compatibility with Pico® wireless controllers, EcoSystem® wallstations, and EcoSystem® infrared (IR) receivers.
- Compatible with Sivoia® QS shades and draperies.
  - — Allows Pico® wireless controllers to control Sivoia® QS shades and draperies (QSM models with wireless inputs only).

System Example



Job Name:	Model Numbers:	
Job Number:		

Models



Frequency/Channel Code*

2—431.5 - 436.6 MHz U.S.A., Canada and Mexico
3—868.1 - 869.8 MHz European Union and United Arab Emirates
4—868.1 - 868.5 MHz Singapore and China
5—865.5 - 866.5 MHz India
7—433.0 - 434.7 MHz Hong Kong
X—No RF

*Contact Lutron® for frequency/channel code compatibility with your particular geographic region if it is not indicated above.

Number of Wired Inputs

4—4
X—None

Mounting Method

C-Ceiling Mount
J-Junction Box Ceiling Mount

Availability/Compatibility

Refer to the chart below to determine QSM model availability and compatibility with different sensor models.

	Lutron® Radio Powr Savr™		
Models Available	**Occupancy/Vacancy Sensors**	**Daylight Sensors**	**Lutron® Pico® Wireless Controllers**
QSM2-4W-C QSM2-XW-C QSM2-4W-J QSM2-XW-J	LRF2-OCRB-P, LRF2-OHLB-P, LRF2-OKLB-P, LRF2-OWLB-P, LRF2-VHLB-P, LRF2-VKLB-P, LRF2-VWLB-P, LRF2-OCR2B-WH, LRF2-VCR2B-WH	LRF2-DCRB	MRF2-3BRL, MRF2-3B, MRF2-2BRL, MRF2-2B, QSR4P-3R
QSM3-4W-C QSM3-XW-C	LRF3-OCRB-P	LRF3-DCRB	QSRKP-2, QSRKP-2R, QSRKP-3R
QSM4-4W-C QSM4-XW-C	LRF4-OCRB-P	LRF4-DCRB	QSRMP-2, QSRMP-2R, QSRMP-3R
QSM5-XW-C	LRF5-OCRB-P	LRF5-DCRB	QSRNP-2, QSRNP-2R, QSRNP-3, QSRNP-3R
QSM7-4W-C QSM7-XW-C	LRF7-OCR2B-P	LRF7-DCRB	QSRQP-2, QSRQP-2R QSRQP-3, QSRQP-3R
QSMX-4W-C	N/A	N/A	N/A

Specifications

QS Sensor Module (QSM)

Power

- 24 V⎓
- Current draw:
  max 400 mA (models with wired input)
  max 100 mA (models without wired input)
- Power Draw Units: (PDU)
  Refer to the section titled “QS Link limits” as well as the QS Link Power Draw Units specification submittal (Lutron® P/N 369405) for information concerning PDUs on the QS Link. Use only Lutron® approved power sources.
- 10-year power failure memory: restores settings and programming after power interruption.

Regulatory

- Lutron® Quality Systems registered to ISO 9001.2008.

QSM2 –

- cUL US Listed (USA and Canada).
- FCC Compliant. Complies with the limits for a Class B digital device, persuant to Part 15 of the FCC Rules (USA).
- IC Certified. (Canada).
- SCT Certified (Mexico).

QSM3 –

- CE Marked (European Union).
- TRA Type Approved (United Arab Emirates).

QSM5 –

- WPC Type Approved (India).

QSM7 –

- FCC Compliant. Complies with the limits for a Class B digital device, persuant to Part 15 of the FCC Rules (USA).

Environment

- Ambient Temperature Operating Range: 32 ºF to 104 ºF (0 ºC to 40 ºC).
- Relative humidity: less than 90% non-condensing.
- For indoor use only.

Terminals

- Input wiring: 22 AWG to 12 AWG (0.5 mm^2 to 4.0 mm^2)
- QS link wiring: 22 AWG to 12 AWG (0.5 mm^2 to 4.0 mm^2)

Mounting

- QSM units should be mounted in the middle of non-metal ceiling tile or drywall, visible from inside the space.
- Installation near metal other than a Junction Box may reduce RF range.

Wireless Communication (models with wireless inputs only)

- RF Range: 60 ft (18 m) line of sight, or 30 ft (9 m) through typical construction materials.
- To ensure optimal wireless range, install the QSM in the ceiling in a visible position from inside the space.
- Lutron® Radio Powr Savr™ Occupancy sensor (up to 10)
- Lutron® Radio Powr Savr™ daylight sensor (up to 10)
- Lutron® Pico® wireless controllers (up to 10)

Wired Inputs

- There are 4 universal wired inputs. Each input can accept one of the following:
  - Lutron® EcoSystem® wallstations
  - Lutron® occupancy sensors (LOS- series)
  - Lutron® daylight sensors (EC-DIR- series)
  - Lutron® EcoSystem® infrared (IR) receivers (EC-IR, EC-DIR- series)
- Maximum wiring distance = 150 ft (46 m)

QS Link Limits

- The QS link can have up to 100 devices.
- Each QSM counts as 1 device towards the 100 device limit.
- Each QSM draws 3 Power Draw Units (PDUs) on the QS link.
- Wired sensors add to the PDU draw of a QSM. Refer to the QS Link Power Draw Units specification submittal (Lutron® P/N 369405) for information concerning PDUs.
- QS link maximum wire run length is 2000 ft (610 m).

Job Name:	Model Numbers:	
Job Number:		

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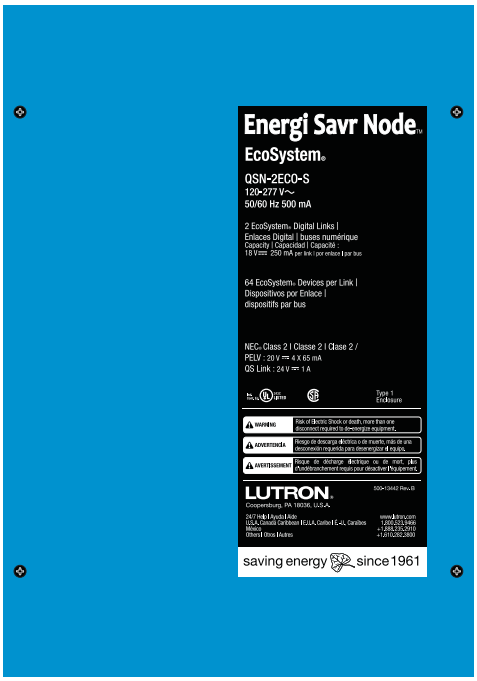
Energi Savr Node™ with EcoSystem®

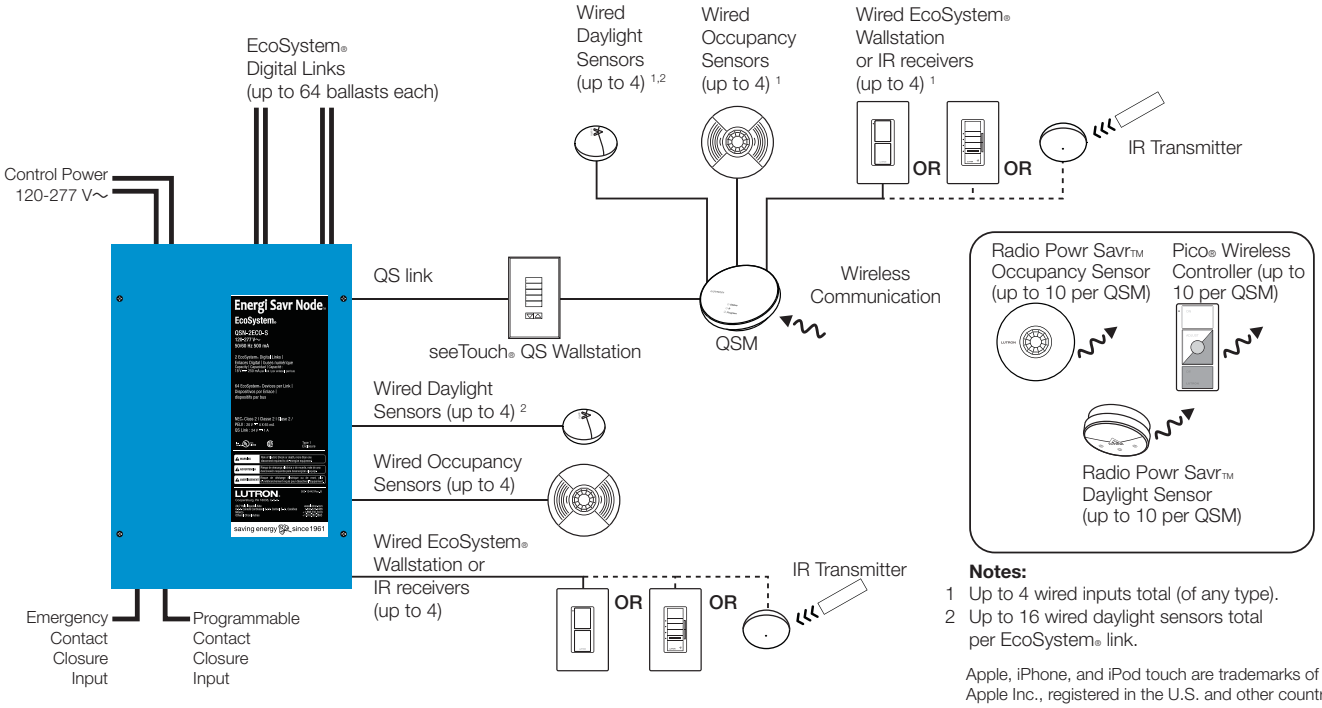
The Energi Savr Node™ family is a group of intelligent, modular products for the control of lighting loads. This document describes the Energi Savr Node™ with EcoSystem® unit, which can control all EcoSystem®-compatible products including EcoSystem® ballasts and modules, Hi-lume® 3D ballasts, EcoSystem® H-Series ballasts, and Hi-lume® LED and Hi-lume® A-Series LED drivers.

- Energi Savr Node™ with EcoSystem® unit with 1 EcoSystem® Digital Link (QSN-1ECO-S).
- Energi Savr Node™ with EcoSystem® unit with 2 EcoSystem® Digital Links (QSN-2ECO-S).



Features

- Powers up to 2 EcoSystem® Digital Links (QSN-2ECO-S).
- Easy system programming with an intuitive application for *Apple iPhone* or *iPod touch* mobile digital devices (required for non-Quantum® systems).
- Four occupancy sensor inputs for automated control of lights.
- Four daylight sensor inputs automatically adjust light levels based on the amount of natural light entering through the windows.
- Four IR receiver inputs for personal control.
- Includes QS control link for seamless integration of lights, control stations, and QS sensor modules.
- Expand the number of sensors and controls using the QS Sensor Module (QSM) or sensors connections on EcoSystem® ballasts and modules.
- Connect directly to other Energi Savr Node™ units, GRAFIK Eye® QS units, or Quantum® systems to expand functionality and control.



Notes:

1 Up to 4 wired inputs total (of any type).

2 Up to 16 wired daylight sensors total per EcoSystem® link.

LUTRON® SPECIFICATION SUBMITTAL

Page 1

Job Name:	Model Numbers:	
Job Number:		

Specifications

Energi Savr Node™ with EcoSystem®

Power

- Control Power: 120-277 V~ 50/60 Hz.
- Lightning strike protection meets ANSI/IEEE standard 62.31-1980. Can withstand voltage surges of up to 6000 V~ and current surges of up to 3000 A.
- Current draw: 0.5 A.
- 10-year power failure memory: restores lighting to levels prior to power interruption.

Standards

- UL Listed
- CSA
- NOM Certified
- Lutron® Quality Systems registered to ISO 9001.2008

Environment

- Ambient Temperature Operating Range: 32 ºF to 104 ºF (0 ºC to 40 ºC).
- Relative humidity: less than 90% non-condensing.
- For indoor use only.
- Can be installed in accordance with National Electrical Code® (NEC®) Article 300.22(c) "Other spaces used for environmental air".

Terminals

- Control Power wiring: 14 AWG to 12 AWG (2.5 mm^2 to 4.0 mm^2)
- EcoSystem® Digital Link Wiring: 18 AWG to 12 AWG (1.0 mm^2 to 4.0 mm^2)
- Input Group Wiring: 22 AWG to 12 AWG (0.5 mm^2 to 4.0 mm^2)
- QS Link Wiring: 22 AWG to 12 AWG (0.5 mm^2 to 4.0 mm^2)

Physical Design

- NEMA Type 1, IP-20 protection.

Mounting

- Surface mount.

Programming Requirements

- An *Apple iPod touch* or *iPhone* mobile digital device with the Energi Savr app is required for programming Energi Savr Node™ with EcoSystem® systems.
- The Energi Savr app is available from the *Apple AppStore* online store.
- The Energi Savr app cannot be used to program the Energi Savr Node™ with EcoSystem® units when installed as part of a Quantum® system.
- The *Apple iPod touch* or *iPhone* communicates with the Energi Savr Node™ unit via a WiFi router (not included).
- See "Wiring: System Programming Connection" section for further information.

Input Default Associations

- Energi Savr Node™ with EcoSystem® units are pre-programmed from the factory to respond to inputs wired directly to the Energi Savr Node™ with EcoSystem® unit.
- Programmable CCI activates a scene using a normally open momentary closure by default.

EcoSystem®

- Control up to 64 EcoSystem®-compatible devices (ballast, modules, or LED drivers) per EcoSystem® Digital Link (up to 128 devices per Energi Savr Node™ with EcoSystem® unit):
  - — EcoSystem® ballasts and modules
  - — EcoSystem® H-Series ballasts
  - — Hi-lume® 3D ballasts
  - — Hi-lume® LED drivers
  - — Hi-lume® A-Series LED drivers
- Digitally define areas and zones.
- Configure wired or wireless sensors and controls to control devices on multiple EcoSystem® Digital Links and/or multiple Energi Savr Node™ units.
- Automatic replacement of a single failed ballast, module, or driver.
- Simple method of replacing multiple failed ballasts, modules, or drivers.
- EcoSystem® Digital Link can be wired as Class 1 or IEC PELV/NEC® Class 2 for maximum wiring flexibility.

Job Name:	Model Numbers:	
Job Number:		

Occupancy Sensors

- Use Lutron® LOS series of wired occupancy sensors in occupancy mode to control one or more areas.
- Use Lutron® occupancy sensors in vacancy mode to automatically turn the lights off in an area after it becomes vacant.
- Use Lutron® occupancy sensors to automatically turn the lights on in area when it becomes occupied and to automatically turn the lights off in an area after it becomes vacant.
- Each of the four occupancy inputs can power one Lutron® occupancy sensor.
- Each area's occupied light level and unoccupied light level can be programmed independently.
- Up to four additional Lutron® Wired Occupancy Sensors or ten additional Radio Powr Savr™ Occupancy/Vacancy Sensors can be assigned per QS Sensor Module (QSM) on the QS link.

seeTouch® QS Controls

- seeTouch® QS wallstations can be configured as a zone toggle or scene wallstation.
- In zone toggle mode, zone buttons are able to turn one or more zones on and off.
- In scene mode, buttons are able to recall scenes in one or more areas.
- All buttons on a wallstation will be in the same mode—zone toggle or scene.
- LED indicator displays zone or scene status.
- A single button can control lights or shades, but not both.

IR Wallstation or Receiver Input

- Four inputs for IR receivers or wallstations for control of lighting zones can be connected directly to the Energi Savr Node™ with EcoSystem® unit.
- Use Lutron® CC-4BRL-WH wallstations to control one or more zones.
- Use Lutron® EC-IR-WH or EC-DIR-WH ceiling mount sensors to control one or more zones.
- Up to four additional wired wallstations or IR receivers can be assigned per QS Sensor Module (QSM) on the QS link.

Daylight Sensors

- Lutron® daylight sensors allow daylight harvesting with programmable effect on light output.
- Four daylight sensors can be connected directly to the Energi Savr Node™ with EcoSystem® unit.
- Use Lutron® EC-DIR-WH sensors to control one or more daylight rows.
- Alternatively, up to four additional Lutron® Wired Daylight Sensors or ten additional Radio Powr Savr™ Daylight Sensors can be assigned per QS Sensor Module (QSM) on the QS link.
- Control 4 daylight rows per area with a maximum of 2 daylight sensors per area.

Contact Closure Input (CCI)

- Activate scenes using momentary or maintained closures from an external device like a timeclock.
- Start or stop Afterhours mode using a maintained closure.
- Enable or disable Load Shed mode to save energy during peak demand periods using a maintained closure.
- The attached device must provide a dry contact closure or solid-state output.
- Configurable for normally open (NO) or normally closed (NC) operation.
- Input is miswire-protected up to 36 V⎓.

Emergency Contact Closure Input

- By default, contact closure input from Lutron's Emergency Lighting Interface (LUT-ELI-3PH), security, or fire alarm systems turns all zones on to full output when emergency state is detected.
- Emergency contact closure input is normally closed (NC). The Energi Savr Node™ with EcoSystem® unit is shipped with a jumper pre-installed.
- Response of each zone is configurable.
- Attached devices, by default, will go to maximum output and ignore control inputs.
- No operations will be allowed until emergency signal is cleared.
- The attached device must provide a normally-closed (NC) dry contact closure or solid-state output.
- Input is miswire-protected up to 36 V⎓.
- Emergency CCI cannot control other Energi Savr Node™ units.
- See Application Note #140, "EcoSystem® Ballasts and Emergency Wiring" at www.lutron.com for more details.

Job Name:	Model Numbers:	
Job Number:		

Functionality with GRAFIK Eye® QS

- Energi Savr Node™ with EcoSystem® areas follow GRAFIK Eye® QS unit scene activations when associated with the GRAFIK Eye® QS unit.
- Energi Savr Node™ with EcoSystem® areas respond to commands initiated by the GRAFIK Eye® QS unit astronomic time clock when associated with the GRAFIK Eye® QS unit.
- Energi Savr Node™ with EcoSystem® areas operate in Afterhours mode when associated with a GRAFIK Eye® QS unit that is in Afterhours mode.
- Zones on Energi Savr Node™ units cannot be associated with zone controls on GRAFIK Eye® QS units.

Functionality with QSE-IO

- Energi Savr Node™ with EcoSystem® unit responds to scene commands initiated by the QSE-IO, if the QSE-IO DIP switches have been set to either Scene Selection mode, Zone Toggle mode, Partition mode, or Occupancy Sensor mode.

Functionality with QSE-CI-NWK-E

- Integrate the Energi Savr Node™ with EcoSystem® unit with touchscreens, PCs, A/V systems, or other digital systems and devices.
- Recall scenes and set/adjust zone levels.

QS Sensor Module (QSM)

- Use the QSM to integrate Radio Powr Savr™ Occupancy/Vacancy sensors, Radio Powr Savr™ Daylight sensors, and Pico® Wireless Controllers with an Energi Savr Node™ with EcoSystem® unit.
- Associate up to 99 QSMs per Energi Savr Node™ with EcoSystem® unit.
- Assign up to 10 Radio Powr Savr™ Occupancy sensors per QSM.
- Assign up to 10 Radio Powr Savr™ Daylight sensors per QSM.
- Assign up to 10 Pico® Wireless Controllers per QSM.
- Connect up to 100 wired or wireless sensors of each type per QS link.
- Wire and power up to 4 wired sensors per QSM:
  - — Daylight sensors
  - — Occupancy sensors
  - — Infrared (IR) receivers or wallstations
- The Radio Powr Savr™ sensors and Pico® Wireless Controllers associated with the QSM should be mounted within 60 ft (18 m) line of sight, or 30 ft (9 m) through walls, of the QSM.
- Refer to QSM Specification Submittal for more information.

EcoSystem Digital Link Limits

- Up to 64 EcoSystem®-compatible fluorescent ballasts and/or LED drivers per EcoSystem® digital link.
- Sensor and control communication limits:
  - — 16 daylight sensors
  - — 64 occupancy sensors
  - — 64 infrared (IR) receivers or wallstations

  A sensor or control counts as a device on the EcoSystem® digital link if it is wired to an EcoSystem® ballast on the same link, or is programmed to communicate with a fluorescent ballast or LED driver on the EcoSystem® digital link.
- EcoSystem®-compatible fluorescent ballasts and LED drivers on the EcoSystem® digital link do not count as QS devices.

QS Link Limits

- Each Energi Savr Node™ with EcoSystem® unit can provide up to 30 Power Draw Units for other QS devices. Refer to the QS Link Power Draw Units specification submittal (Lutron® P/N 369405) for more information concerning Power Draw Units.
- The QS Link can have up to 100 devices and 100 zones.
- Each Energi Savr Node™ with EcoSystem® unit counts as 1 device towards the 100 device limit.
- Each Energi Savr Node™ with EcoSystem® unit can count as 1 to 100 zones towards the 100 zone limit, depending on the number of zones created (up to 128 zones in a Quantum® system).
- A maximum of 8 EcoSystem® digital links may be connected to the QS link. Energi Savr Node™ with EcoSystem® unit counts as up to 64 or up to 128 ballasts.

Job Name:	Model Numbers:	
Job Number:		

Appendix E | Cost Benefit Analysis of Increasing Feeder Sizes Worksheets

The following are the tables used to compute the cost benefit analysis. Please refer to the cost benefit analysis of increasing feeder sizes electrical depth for further detail.

FEEDER SCHEDULE FOR EXISTING FEEDERS

INPUTS	
DEMAND FACTOR	0.3
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
1	UTILITY	MDP1	3	40	3000	900	100	154302.4944	14967.34196	
5	MDP1	PPK	2	5	600	180	153	17478.51264	1695.415726	
6	MDP1	LP1E	1	5	400	120	88	6372.3744	618.1203168	
7	MDP1	PPM1E	1	5	100	30	96	1820.6784	176.6058048	
8	MDP1	LP2E	1	5	400	120	110	8010.98496	777.0655411	
9	MDP1	PPM2E	1	5	100	30	96	1820.6784	176.6058048	
10	MDP1	LP3E	1	5	400	120	130	9467.52768	918.350185	
11	MDP1	PPM3E	1	5	100	30	140	2639.98368	256.078417	
12	MDP1	ELEV #1	1	4	100	30	115	2184.81408	211.9269658	
13	MDP1	ELEV #2	1	4	100	30	115	2184.81408	211.9269658	
14	MDP1	CHILLER #1	3	4	1000	300	170	32772.2112	3178.904486	
15	MDP1	MAU-1	1	4	20	6	170	910.3392	88.3029024	
16	MDP1	EFR-10	1	4	20	6	140	746.478144	72.40837997	
17	MDP1	EFR-12	1	4	20	6	180	964.959552	93.60107654	
18	MDP1	P-10	1	4	60	18	150	1283.578272	124.5070924	
19	MDP1	SF1-1	1	4	20	6	230	1228.95792	119.2089182	
20	MDP1	AHU-6	1	4	70	21	190	2198.469168	213.2515093	
21	MDP1	AHU-7	1	4	100	30	100	1911.71232	185.436095	
22	MDP1	AHU-9	1	4	20	6	100	537.100128	52.09871242	
23	MDP1	AHU-10	1	4	150	45	100	2321.36496	225.1724011	
24	PPK	T-RPK	1	4	400	120	20	1456.54272	141.2846438	
25	LP1E	T-RP1E	1	4	150	45	10	136.55088	13.24543536	
26	LP1E	T-RP1MR	1	4	80	24	230	3495.702528	339.0831452	
27	LP1E	T-RP1WM	1	4	30	9	275	2143.848816	207.9533352	
28	PPM1E	T-RPM1E	1	4	60	18	20	245.791584	23.84178365	
29	LP2E	T-RPM2E	1	4	150	45	15	204.82632	19.86815304	
30	PPM2E	T-RPM2E	1	4	60	18	15	191.171232	18.5436095	
31	LP3E	T-PRP3E	1	4	150	45	15	204.82632	19.86815304	
32	PPM3E	T-RPM3E	1	4	80	24	15	218.481408	21.19269658	
33	T-RPK	RPK-11,12,13	2	5	800	240	20	2913.08544	282.5692877	
34	T-RP1E	RP1E1,2,3	1	5	250	75	10	341.3772	33.1135884	
35	T-RP1MR	RP1MR	1	5	175	52.5	15	238.96404	23.17951188	
36	T-RP1WM	RP1WM	1	5	60	18	15	191.171232	18.5436095	
37	T-RPM1E	RPM1E1,2	1	5	100	30	20	364.13568	35.32116096	
38	T-RPM2E	RP2E1,2,3	1	5	250	75	15	568.962	55.189314	
39	T-RPM2E	RPM2E	1	5	100	30	15	273.10176	26.49087072	
40	T-PRP3E	RP3E1,2,3	1	5	250	75	15	568.962	55.189314	
41	T-RPM3E	RPM3E1,2	1	5	175	52.5	15	398.2734	38.6325198	
42	MDP2	LP1W	2	5	400	120	255	16021.96992	1554.131082	
43	MDP2	PPM1W	1	5	100	30	240	3049.63632	295.814723	
44	MDP2	LP2W	2	5	400	120	240	15111.63072	1465.82818	
45	MDP2	PPM2W	1	5	100	30	250	3140.67024	304.6450133	
46	MDP2	LP3W	2	5	400	120	260	16386.1056	1589.452243	
47	MDP2	PPM3W	1	5	100	30	270	3413.772	331.135884	
48	MDP2	DWP	1	4	100	30	20	273.10176	26.49087072	
49	LP1W	T-RP1FC	1	4	60	18	20	245.791584	23.84178365	
50	LP1W	T-RP1W	1	4	150	45	25	546.20352	52.98174144	
51	PPM1W	T-RPM1W	1	4	60	18	15	191.171232	18.5436095	
52	LP2W	T-RP2W	1	4	150	45	15	341.3772	33.1135884	
53	PPM2W	T-RPM2W	1	4	60	18	15	191.171232	18.5436095	
54	LP3W	T-RP3W	1	4	150	45	15	341.3772	33.1135884	
55	PPM3W	T-RPM3W	1	4	60	18	15	191.171232	18.5436095	
56	T-RP1FC	RP1FC	1	5	125	37.5	15	227.5848	22.0757256	
57	T-RP1WM	RP1W1,2,3	1	5	250	75	15	568.962	55.189314	
58	T-RPM1W	RPM1W	1	5	100	30	15	273.10176	26.49087072	
59	T-RP2W	RP2W1,2	1	5	250	75	15	568.962	55.189314	
60	T-RPM2W	RPM2W	1	5	100	30	15	273.10176	26.49087072	

FEEDER SCHEDULE FOR EXISTING FEEDERS

INPUTS	
DEMAND FACTOR	0.3
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
61	T-RP3W	RP3W1,2,3	1	5	150	45	15	204.82632	19.86815304	
62	T-RPM3W	RPM3W	1	5	100	30	15	273.10176	26.49087072	
63	MDP2	SLP	1	5	100	30	20	364.13568	35.32116096	
64	MDP2	CH-2	2	4	800	240	170	24761.22624	2401.838945	
65	MDP2	ELEV-3	1	4	100	30	115	2184.81408	211.9269658	
66	MDP2	ELEV-4	1	4	100	30	115	2184.81408	211.9269658	
67	MDP2	ELEV-5	1	4	100	30	115	2184.81408	211.9269658	
101	MDP1	AHU-5	1	4	40	12	108.5	946.752768	91.8350185	
102	MDP1	AHU-15	1	4	40	12	63	564.410304	54.74779949	
103	MDP1	AHU-11	1	4	40	12	60	527.996736	51.21568339	
104	MDP1	B-3	1	4	40	12	170	1492.956288	144.8167599	
105	MDP1	UPS-WS	1	5	200	60	70	2093.78016	203.0966755	
107	UPS-WS	MAINTENANCE BYPASS PANEL	1	5	200	60	100	3004.11936	291.3995779	
108	MAINTENANCE BYPASS PANEL	T-DPUPSWS	1	4	250	75	20	682.7544	66.2271768	
109	T-DPUPSWS	DPUPSWS	2	5	500	150	20	2048.2632	198.6815304	
110	DPUPSWS	RPUPS1	1	5	100	30	20	364.13568	35.32116096	
111	DPUPSWS	RPUPS2	1	5	300	90	20	819.30528	79.47261216	
112	DPUPSWS	RPUPS3	1	5	250	75	20	682.7544	66.2271768	
113	MDP1	MAINTENANCE BYPASS PANEL	1	5	200	60	100	3004.11936	291.3995779	
128	MDP2	EFR-22	1	4	30	9	172	1338.198624	129.8052665	
129	MDP2	EFR-13	1	4	30	9	360	2812.948128	272.8559684	
130	MDP2	EFR-16	1	4	30	9	130	1010.476512	98.01622166	
131	MDP2	P-11	1	4	70	21	150	1752.40296	169.9830871	
132	MDP2	EFR-15	1	4	20	6	140	746.478144	72.40837997	
133	MDP2	AHU-1	1	4	90	27	340	5202.588528	504.6510872	
134	MDP2	AHU-2	1	4	70	21	350	4046.457744	392.5064012	
135	MDP2	AHU-3	1	4	80	24	170.7	2585.363328	250.7802428	
136	MDP2	AHU-4	1	4	80	24	245	3714.183936	360.2758418	
137	MDP2	AHU-8	1	4	20	6	160	855.718848	83.00472826	
138	MDP2	AHU-13	1	4	60	18	350	4478.868864	434.4502798	
139	MDP2	P-9	1	4	20	6	150	801.098496	77.70655411	
140	MDP2	P-13	1	4	20	6	150	801.098496	77.70655411	
141	MDP2	P-2	1	4	150	45	150	3482.04744	337.7586017	
142	MDP2	SF1-2	1	4	30	9	20	150.205968	14.5699789	
143	MDP2	ELEV 3	1	4	100	30	113	6417.89136	622.5354619	
144	MDP2	ELEV 4	1	4	100	30	113	6417.89136	622.5354619	
145	MDP2	ELEV 5	1	4	100	30	113	6417.89136	622.5354619	

FEEDER SCHEDULE FOR ONE SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.3
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
1	UTILITY	MDP1	3	40	3000	900	100	132454.3536	12848.0723	
5	MDP1	PPK	2	5	600	180	153	15839.90208	1536.470502	
6	MDP1	LP1E	1	5	400	120	88	6372.3744	618.1203168	
7	MDP1	PPM1E	1	5	100	30	96	1502.05968	145.699789	
8	MDP1	LP2E	1	5	400	120	110	8010.98496	777.0655411	
9	MDP1	PPM2E	1	5	100	30	96	1502.05968	145.699789	
10	MDP1	LP3E	1	5	400	120	130	9467.52768	918.350185	
11	MDP1	PPM3E	1	5	100	30	140	2184.81408	211.9269658	
12	MDP1	ELEV #1	1	4	100	30	115	1820.6784	176.6058048	
13	MDP1	ELEV #2	1	4	100	30	115	1820.6784	176.6058048	
14	MDP1	CHILLER #1	3	4	1000	300	170	28675.6848	2781.541426	
15	MDP1	MAU-1	1	4	20	6	170	591.72048	57.39688656	
16	MDP1	EFR-10	1	4	20	6	140	482.479776	46.80053827	
17	MDP1	EFR-12	1	4	20	6	180	628.134048	60.92900266	
18	MDP1	P-10	1	4	60	18	150	1010.476512	98.01622166	
19	MDP1	SF1-1	1	4	20	6	230	801.098496	77.70655411	
20	MDP1	AHU-6	1	4	70	21	190	1752.40296	169.9830871	
21	MDP1	AHU-7	1	4	100	30	100	1593.0936	154.5300792	
22	MDP1	AHU-9	1	4	20	6	100	345.928896	33.55510291	
23	MDP1	AHU-10	1	4	150	45	100	1979.98776	192.0588127	
24	PPK	T-RPK	1	4	400	120	20	1456.54272	141.2846438	
25	LP1E	T-RP1E	1	4	150	45	10	204.82632	19.86815304	
26	LP1E	T-RP1MR	1	4	80	24	230	2767.431168	268.4408233	
27	LP1E	T-RP1WM	1	4	30	9	275	1365.5088	132.4543536	
28	PPM1E	T-RPM1E	1	4	60	18	20	163.861056	15.89452243	
29	LP2E	T-RPM2E	1	4	150	45	15	273.10176	26.49087072	
30	PPM2E	T-RPM2E	1	4	60	18	15	136.55088	13.24543536	
31	LP3E	T-PRP3E	1	4	150	45	15	273.10176	26.49087072	
32	PPM3E	T-RPM3E	1	4	80	24	15	182.06784	17.66058048	
33	T-RPK	RPK-11,12,13	2	5	800	240	20	2913.08544	282.5692877	
34	T-RP1E	RP1E1,2,3	1	5	250	75	10	341.3772	33.1135884	
35	T-RP1MR	RP1MR	1	5	175	52.5	15	318.61872	30.90601584	
36	T-RP1WM	RP1WM	1	5	60	18	15	136.55088	13.24543536	
37	T-RPM1E	RPM1E1,2	1	5	100	30	20	318.61872	30.90601584	
38	T-RPM2E	RP2E1,2,3	1	5	250	75	15	455.1696	44.1514512	
39	T-RPM2E	RPM2E	1	5	100	30	15	227.5848	22.0757256	
40	T-PRP3E	RP3E1,2,3	1	5	250	75	15	455.1696	44.1514512	
41	T-RPM3E	RPM3E1,2	1	5	175	52.5	15	318.61872	30.90601584	
42	MDP2	LP1W	2	5	400	120	255	14201.29152	1377.525277	
43	MDP2	PPM1W	1	5	100	30	240	2457.91584	238.4178365	
44	MDP2	LP2W	2	5	400	120	240	13290.95232	1289.222375	
45	MDP2	PPM2W	1	5	100	30	250	2548.94976	247.2481267	
46	MDP2	LP3W	2	5	400	120	260	14383.35936	1395.185858	
47	MDP2	PPM3W	1	5	100	30	270	2776.53456	269.3238523	
48	MDP2	DWP	1	4	100	30	20	227.5848	22.0757256	
49	LP1W	T-RP1FC	1	4	60	18	20	163.861056	15.89452243	
50	LP1W	T-RP1W	1	4	150	45	25	477.92808	46.35902376	
51	PPM1W	T-RPM1W	1	4	60	18	15	136.55088	13.24543536	
52	LP2W	T-RP2W	1	4	150	45	15	273.10176	26.49087072	
53	PPM2W	T-RPM2W	1	4	60	18	15	136.55088	13.24543536	
54	LP3W	T-RP3W	1	4	150	45	15	273.10176	26.49087072	
55	PPM3W	T-RPM3W	1	4	60	18	15	136.55088	13.24543536	
56	T-RP1FC	RP1FC	1	5	125	37.5	15	2048.2632	198.6815304	
57	T-RP1WM	RP1W1,2,3	1	5	250	75	15	455.1696	44.1514512	
58	T-RPM1W	RPM1W	1	5	100	30	15	227.5848	22.0757256	
59	T-RP2W	RP2W1,2	1	5	250	75	15	455.1696	44.1514512	
60	T-RPM2W	RPM2W	1	5	100	30	15	227.5848	22.0757256	

FEEDER SCHEDULE FOR ONE SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.3
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
61	T-RP3W	RP3W1,2,3	1	5	150	45	15	273.10176	26.49087072	
62	T-RPM3W	RPM3W	1	5	110	33	15	300.411936	29.13995779	
63	MDP2	SLP	1	5	100	30	20	318.61872	30.90601584	
64	MDP2	CH-2	2	4	800	240	170	24761.22624	2401.838945	
65	MDP2	ELEV-3	1	4	100	30	115	1820.6784	176.6058048	
66	MDP2	ELEV-4	1	4	100	30	115	1820.6784	176.6058048	
67	MDP2	ELEV-5	1	4	100	30	115	1820.6784	176.6058048	
101	MDP1	AHU-5	1	4	40	12	108.5	619.030656	60.04597363	
102	MDP1	AHU-15	1	4	40	12	60	345.928896	33.55510291	
103	MDP1	AHU-11	1	4	40	12	60	345.928896	33.55510291	
104	MDP1	B-3	1	4	40	12	170	964.959552	93.60107654	
105	MDP1	UPS-WS	1	5	200	60	70	1729.64448	167.7755146	
107	UPS-WS	MAINTENANCE BYPASS PANEL	1	5	200	60	100	2548.94976	247.2481267	
108	MAINTENANCE BYPASS PANEL	T-DPUPSWS	1	4	250	75	20	682.7544	66.2271768	
109	T-DPUPSWS	DPUPSWS	2	5	500	150	20	1820.6784	176.6058048	
110	DPUPSWS	RPUPS1	1	5	100	30	20	318.61872	30.90601584	
111	DPUPSWS	RPUPS2	1	5	300	90	20	819.30528	79.47261216	
112	DPUPSWS	RPUPS3	1	5	250	75	20	682.7544	66.2271768	
113	MDP1	MAINTENANCE BYPASS PANEL	1	5	200	60	100	1729.64448	167.7755146	
128	MDP2	EFR-22	1	4	30	9	172	860.270544	83.44624277	
129	MDP2	EFR-13	1	4	30	9	360	1788.816528	173.5152032	
130	MDP2	EFR-16	1	4	30	9	130	641.789136	62.25354619	
131	MDP2	P-11	1	4	70	21	150	1401.922368	135.9864697	
132	MDP2	EFR-15	1	4	20	6	140	482.479776	46.80053827	
133	MDP2	AHU-1	1	4	90	27	340	4342.317984	421.2048444	
134	MDP2	AHU-2	1	4	70	21	350	3249.910944	315.2413616	
135	MDP2	AHU-3	1	4	80	24	170	2075.573376	201.3306175	
136	MDP2	AHU-4	1	4	80	24	245	2949.499008	286.1014038	
137	MDP2	AHU-8	1	4	20	6	160	555.306912	53.86477046	
138	MDP2	AHU-13	1	4	60	18	350	2976.809184	288.7504908	
139	MDP2	P-9	1	4	20	6	150	518.893344	50.33265437	
140	MDP2	P-13	1	4	20	6	150	518.893344	50.33265437	
141	MDP2	P-2	1	4	150	45	150	2935.84392	284.7768602	
142	MDP2	SF1-2	1	4	30	9	20	95.585616	9.271804752	
143	MDP2	ELEV 3	1	4	100	30	113	1775.16144	172.1906597	
144	MDP2	ELEV 4	1	4	100	30	113	1775.16144	172.1906597	
145	MDP2	ELEV 5	1	4	100	30	113	1775.16144	172.1906597	

FEEDER SCHEDULE FOR TWO SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.3
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
1	UTILITY	MDP1	4	40	3000	900	100	107875.1952	10463.89393	
5	MDP1	PPK	2	5	600	180	153	13655.088	1324.543536	
6	MDP1	LP1E	1	5	400	120	88	5826.17088	565.1385754	
7	MDP1	PPM1E	1	5	100	30	96	1274.47488	123.6240634	
8	MDP1	LP2E	1	5	400	120	110	7282.7136	706.4232192	
9	MDP1	PPM2E	1	5	100	30	96	1274.47488	123.6240634	
10	MDP1	LP3E	1	5	400	120	130	8557.18848	830.0472826	
11	MDP1	PPM3E	1	5	100	30	140	1775.16144	172.1906597	
12	MDP1	ELEV #1	1	4	100	30	115	1456.54272	141.2846438	
13	MDP1	ELEV #2	1	4	100	30	115	1456.54272	141.2846438	
14	MDP1	CHILLER #1	3	4	1000	300	170	25944.6672	2516.632718	
15	MDP1	MAU-1	1	4	20	6	170	373.239072	36.20418998	
16	MDP1	EFR-10	1	4	20	6	140	309.515328	30.02298682	
17	MDP1	EFR-12	1	4	20	6	180	400.549248	38.85327706	
18	MDP1	P-10	1	4	60	18	150	846.615456	82.12169923	
19	MDP1	SF1-1	1	4	20	6	230	509.789952	49.44962534	
20	MDP1	AHU-6	1	4	70	21	190	1465.646112	142.1676729	
21	MDP1	AHU-7	1	4	100	30	100	1274.47488	123.6240634	
22	MDP1	AHU-9	1	4	20	6	100	218.481408	21.19269658	
23	MDP1	AHU-10	1	4	150	45	100	1638.61056	158.9452243	
24	PPK	T-RPK	1	4	400	120	20	1274.47488	123.6240634	
25	LP1E	T-RP1E	1	4	150	45	10	341.3772	33.1135884	
26	LP1E	T-RP1MR	1	4	80	24	230	2330.468352	226.0554301	
27	LP1E	T-RP1WM	1	4	30	9	275	873.925632	84.7707863	
28	PPM1E	T-RPM1E	1	4	60	18	20	136.55088	13.24543536	
29	LP2E	T-RPM2E	1	4	150	45	15	341.3772	33.1135884	
30	PPM2E	T-RPM2E	1	4	60	18	15	136.55088	13.24543536	
31	LP3E	T-PRP3E	1	4	150	45	15	341.3772	33.1135884	
32	PPM3E	T-RPM3E	1	4	80	24	15	145.654272	14.12846438	
33	T-RPK	RPK-11,12,13	2	5	800	240	20	2548.94976	247.2481267	
34	T-RP1E	RP1E1,2,3	1	5	250	75	10	341.3772	33.1135884	
35	T-RP1MR	RP1MR	1	5	175	52.5	15	398.2734	38.6325198	
36	T-RP1WM	RP1WM	1	5	60	18	15	109.240704	10.59634829	
37	T-RPM1E	RPM1E1,2	1	5	100	30	20	273.10176	26.49087072	
38	T-RPM2E	RP2E1,2,3	1	5	250	75	15	568.962	55.189314	
39	T-RPM2E	RPM2E	1	5	100	30	15	182.06784	17.66058048	
40	T-PRP3E	RP3E1,2,3	1	5	250	75	15	568.962	55.189314	
41	T-RPM3E	RPM3E1,2	1	5	175	52.5	15	398.2734	38.6325198	
42	MDP2	LP1W	2	5	400	120	255	12926.81664	1253.901214	
43	MDP2	PPM1W	1	5	100	30	240	2093.78016	203.0966755	
44	MDP2	LP2W	2	5	400	120	240	12198.54528	1183.258892	
45	MDP2	PPM2W	1	5	100	30	250	2093.78016	203.0966755	
46	MDP2	LP3W	2	5	400	120	260	13108.88448	1271.561795	
47	MDP2	PPM3W	1	5	100	30	270	2321.36496	225.1724011	
48	MDP2	DWP	1	4	100	30	20	182.06784	17.66058048	
49	LP1W	T-RP1FC	1	4	60	18	20	136.55088	13.24543536	
50	LP1W	T-RP1W	1	4	150	45	25	409.65264	39.73630608	
51	PPM1W	T-RPM1W	1	4	60	18	15	136.55088	13.24543536	
52	LP2W	T-RP2W	1	4	150	45	15	341.3772	33.1135884	
53	PPM2W	T-RPM2W	1	4	60	18	15	136.55088	13.24543536	
54	LP3W	T-RP3W	1	4	150	45	15	341.3772	33.1135884	
55	PPM3W	T-RPM3W	1	4	60	18	15	136.55088	13.24543536	
56	T-RP1FC	RP1FC	1	5	125	37.5	15	170.6886	16.5567942	
57	T-RP1WM	RP1W1,2,3	1	5	250	75	15	568.962	55.189314	
58	T-RPM1W	RPM1W	1	5	100	30	15	182.06784	17.66058048	
59	T-RP2W	RP2W1,2	1	5	250	75	15	568.962	55.189314	
60	T-RPM2W	RPM2W	1	5	100	30	15	182.06784	17.66058048	

FEEDER SCHEDULE FOR TWO SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.3
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
61	T-RP3W	RP3W1,2,3	1	5	150	45	15	341.3772	33.1135884	
62	T-RPM3W	RPM3W	1	5	110	33	15	200.274624	19.42663853	
63	MDP2	SLP	1	5	100	30	20	273.10176	26.49087072	
64	MDP2	CH-2	2	4	800	240	170	22212.27648	2154.590819	
65	MDP2	ELEV-3	1	4	100	30	115	1456.54272	141.2846438	
66	MDP2	ELEV-4	1	4	100	30	115	1456.54272	141.2846438	
67	MDP2	ELEV-5	1	4	100	30	115	1456.54272	141.2846438	
101	MDP1	AHU-5	1	4	40	12	110	418.756032	40.6193351	
102	MDP1	AHU-15	1	4	40	12	60	218.481408	21.19269658	
103	MDP1	AHU-11	1	4	40	12	60	218.481408	21.19269658	
104	MDP1	B-3	1	4	40	12	170	637.23744	61.81203168	
105	MDP1	UPS-WS	1	5	200	60	70	1638.61056	158.9452243	
107	UPS-WS	MAINTENANCE BYPASS PANEL	1	5	200	60	100	2275.848	220.757256	
108	MAINTENANCE BYPASS PANEL	T-DPUPSWS	1	4	250	75	20	568.962	55.189314	
109	T-DPUPSWS	DPUPSWS	2	5	500	150	20	1593.0936	154.5300792	
110	DPUPSWS	RPUPS1	1	5	100	30	20	273.10176	26.49087072	
111	DPUPSWS	RPUPS2	1	5	300	90	20	682.7544	66.2271768	
112	DPUPSWS	RPUPS3	1	5	250	75	20	568.962	55.189314	
113	MDP1	MAINTENANCE BYPASS PANEL	1	5	200	60	100	2275.848	220.757256	
128	MDP2	EFR-22	1	4	30	9	172	573.513696	55.63082851	
129	MDP2	EFR-13	1	4	30	9	360	1147.027392	111.261657	
130	MDP2	EFR-16	1	4	30	9	130	409.65264	39.73630608	
131	MDP2	P-11	1	4	70	21	150	1147.027392	111.261657	
132	MDP2	EFR-15	1	4	20	6	140	309.515328	30.02298682	
133	MDP2	AHU-1	1	4	90	27	340	3482.04744	337.7586017	
134	MDP2	AHU-2	1	4	70	21	350	2708.25912	262.7011346	
135	MDP2	AHU-3	1	4	80	24	170	1711.437696	166.0094565	
136	MDP2	AHU-4	1	4	80	24	245	2476.122624	240.1838945	
137	MDP2	AHU-8	1	4	20	6	160	355.032288	34.43813194	
138	MDP2	AHU-13	1	4	60	18	350	2375.985312	230.4705753	
139	MDP2	P-9	1	4	20	6	150	327.722112	31.78904486	
140	MDP2	P-13	1	4	20	6	150	327.722112	31.78904486	
141	MDP2	P-2	1	4	150	45	150	2526.19128	245.0405542	
142	MDP2	SF1-2	1	4	30	9	20	68.27544	6.62271768	
143	MDP2	ELEV 3	1	4	100	30	110	1365.5088	132.4543536	
144	MDP2	ELEV 4	1	4	100	30	110	1365.5088	132.4543536	
145	MDP2	ELEV 5	1	4	100	30	110	1365.5088	132.4543536	

FEEDER SCHEDULE FOR EXISTING FEEDERS

INPUTS	
DEMAND FACTOR	0.5
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
1	UTILITY	MDP1	3	40	3000	1500	100	257170.824	24945.56993	
5	MDP1	PPK	2	5	600	300	153	29130.8544	2825.692877	
6	MDP1	LP1E	1	5	400	200	88	10620.624	1030.200528	
7	MDP1	PPM1E	1	5	100	50	96	3034.464	294.343008	
8	MDP1	LP2E	1	5	400	200	110	13351.6416	1295.109235	
9	MDP1	PPM2E	1	5	100	50	96	3034.464	294.343008	
10	MDP1	LP3E	1	5	400	200	130	15779.2128	1530.583642	
11	MDP1	PPM3E	1	5	100	50	140	4399.9728	426.7973616	
12	MDP1	ELEV #1	1	4	100	50	115	3641.3568	353.2116096	
13	MDP1	ELEV #2	1	4	100	50	115	3641.3568	353.2116096	
14	MDP1	CHILLER #1	3	4	1000	500	170	54620.352	5298.174144	
15	MDP1	MAU-1	1	4	20	10	170	1517.232	147.171504	
16	MDP1	EFR-10	1	4	20	10	140	1244.13024	120.6806333	
17	MDP1	EFR-12	1	4	20	10	180	1608.26592	156.0017942	
18	MDP1	P-10	1	4	60	30	150	2139.29712	207.5118206	
19	MDP1	SF1-1	1	4	20	10	230	2048.2632	198.6815304	
20	MDP1	AHU-6	1	4	70	35	190	3664.11528	355.4191822	
21	MDP1	AHU-7	1	4	100	50	100	3186.1872	309.0601584	
22	MDP1	AHU-9	1	4	20	10	100	895.16688	86.83118736	
23	MDP1	AHU-10	1	4	150	75	100	3868.9416	375.2873352	
24	PPK	T-RPK	1	4	400	200	20	2427.5712	235.4744064	
25	LP1E	T-RP1E	1	4	150	75	10	227.5848	22.0757256	
26	LP1E	T-RP1MR	1	4	80	40	230	5826.17088	565.1385754	
27	LP1E	T-RP1WM	1	4	30	15	275	3573.08136	346.5888919	
28	PPM1E	T-RPM1E	1	4	60	30	20	409.65264	39.73630608	
29	LP2E	T-RPM2E	1	4	150	75	15	341.3772	33.1135884	
30	PPM2E	T-RPM2E	1	4	60	30	15	318.61872	30.90601584	
31	LP3E	T-PRP3E	1	4	150	75	15	341.3772	33.1135884	
32	PPM3E	T-RPM3E	1	4	80	40	15	364.13568	35.32116096	
33	T-RPK	RPK-11,12,13	2	5	800	400	20	4855.1424	470.9488128	
34	T-RP1E	RP1E1,2,3	1	5	250	125	10	568.962	55.189314	
35	T-RP1MR	RP1MR	1	5	175	87.5	15	398.2734	38.6325198	
36	T-RP1WM	RP1WM	1	5	60	30	15	318.61872	30.90601584	
37	T-RPM1E	RPM1E1,2	1	5	100	50	20	606.8928	58.8686016	
38	T-RPM2E	RP2E1,2,3	1	5	250	125	15	948.27	91.98219	
39	T-RPM2E	RPM2E	1	5	100	50	15	455.1696	44.1514512	
40	T-PRP3E	RP3E1,2,3	1	5	250	125	15	948.27	91.98219	
41	T-RPM3E	RPM3E1,2	1	5	175	87.5	15	663.789	64.387533	
42	MDP2	LP1W	2	5	400	200	255	26703.2832	2590.21847	
43	MDP2	PPM1W	1	5	100	50	240	5082.7272	493.0245384	
44	MDP2	LP2W	2	5	400	200	240	25186.0512	2443.046966	
45	MDP2	PPM2W	1	5	100	50	250	5234.4504	507.7416888	
46	MDP2	LP3W	2	5	400	200	260	27310.176	2649.087072	
47	MDP2	PPM3W	1	5	100	50	270	5689.62	551.89314	
48	MDP2	DWP	1	4	100	50	20	455.1696	44.1514512	
49	LP1W	T-RP1FC	1	4	60	30	20	409.65264	39.73630608	
50	LP1W	T-RP1W	1	4	150	75	25	910.3392	88.3029024	
51	PPM1W	T-RPM1W	1	4	60	30	15	318.61872	30.90601584	
52	LP2W	T-RP2W	1	4	150	75	15	568.962	55.189314	
53	PPM2W	T-RPM2W	1	4	60	30	15	318.61872	30.90601584	
54	LP3W	T-RP3W	1	4	150	75	15	568.962	55.189314	
55	PPM3W	T-RPM3W	1	4	60	30	15	318.61872	30.90601584	
56	T-RP1FC	RP1FC	1	5	125	62.5	15	379.308	36.792876	
57	T-RP1WM	RP1W1,2,3	1	5	250	125	15	948.27	91.98219	
58	T-RPM1W	RPM1W	1	5	100	50	15	455.1696	44.1514512	
59	T-RP2W	RP2W1,2	1	5	250	125	15	948.27	91.98219	
60	T-RPM2W	RPM2W	1	5	100	50	15	455.1696	44.1514512	

FEEDER SCHEDULE FOR EXISTING FEEDERS

INPUTS	
DEMAND FACTOR	0.5
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
61	T-RP3W	RP3W1,2,3	1	5	150	75	15	341.3772	33.1135884	
62	T-RPM3W	RPM3W	1	5	100	50	15	455.1696	44.1514512	
63	MDP2	SLP	1	5	100	50	20	606.8928	58.8686016	
64	MDP2	CH-2	2	4	800	400	170	41268.7104	4003.064909	
65	MDP2	ELEV-3	1	4	100	50	115	3641.3568	353.2116096	
66	MDP2	ELEV-4	1	4	100	50	115	3641.3568	353.2116096	
67	MDP2	ELEV-5	1	4	100	50	115	3641.3568	353.2116096	
101	MDP1	AHU-5	1	4	40	20	108.5	1577.92128	153.0583642	
102	MDP1	AHU-15	1	4	40	20	63	940.68384	91.24633248	
103	MDP1	AHU-11	1	4	40	20	60	879.99456	85.35947232	
104	MDP1	B-3	1	4	40	20	170	2488.26048	241.3612666	
105	MDP1	UPS-WS	1	5	200	100	70	3489.6336	338.4944592	
107	UPS-WS	MAINTENANCE BYPASS PANEL	1	5	200	100	100	5006.8656	485.6659632	
108	MAINTENANCE BYPASS PANEL	T-DPUPSWS	1	4	250	125	20	1137.924	110.378628	
109	T-DPUPSWS	DPUPSWS	2	5	500	250	20	3413.772	331.135884	
110	DPUPSWS	RPUPS1	1	5	100	50	20	606.8928	58.8686016	
111	DPUPSWS	RPUPS2	1	5	300	150	20	1365.5088	132.4543536	
112	DPUPSWS	RPUPS3	1	5	250	125	20	1137.924	110.378628	
113	MDP1	MAINTENANCE BYPASS PANEL	1	5	200	100	100	5006.8656	485.6659632	
128	MDP2	EFR-22	1	4	30	15	172	2230.33104	216.3421109	
129	MDP2	EFR-13	1	4	30	15	360	4688.24688	454.7599474	
130	MDP2	EFR-16	1	4	30	15	130	1684.12752	163.3603694	
131	MDP2	P-11	1	4	70	35	150	2920.6716	283.3051452	
132	MDP2	EFR-15	1	4	20	10	140	1244.13024	120.6806333	
133	MDP2	AHU-1	1	4	90	45	340	8670.98088	841.0851454	
134	MDP2	AHU-2	1	4	70	35	350	6744.09624	654.1773353	
135	MDP2	AHU-3	1	4	80	40	170.7	4308.93888	417.9670714	
136	MDP2	AHU-4	1	4	80	40	245	6190.30656	600.4597363	
137	MDP2	AHU-8	1	4	20	10	160	1426.19808	138.3412138	
138	MDP2	AHU-13	1	4	60	30	350	7464.78144	724.0837997	
139	MDP2	P-9	1	4	20	10	150	1335.16416	129.5109235	
140	MDP2	P-13	1	4	20	10	150	1335.16416	129.5109235	
141	MDP2	P-2	1	4	150	75	150	5803.4124	562.9310028	
142	MDP2	SF1-2	1	4	30	15	20	250.34328	24.28329816	
143	MDP2	ELEV 3	1	4	100	50	113	10696.4856	1037.559103	
144	MDP2	ELEV 4	1	4	100	50	113	10696.4856	1037.559103	
145	MDP2	ELEV 5	1	4	100	50	113	10696.4856	1037.559103	

FEEDER SCHEDULE FOR ONE SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.5
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
1	UTILITY	MDP1	3	40	3000	1500	100	220757.256	21413.45383	
5	MDP1	PPK	2	5	600	300	153	26399.8368	2560.78417	
6	MDP1	LP1E	1	5	400	200	88	10620.624	1030.200528	
7	MDP1	PPM1E	1	5	100	50	96	2503.4328	242.8329816	
8	MDP1	LP2E	1	5	400	200	110	13351.6416	1295.109235	
9	MDP1	PPM2E	1	5	100	50	96	2503.4328	242.8329816	
10	MDP1	LP3E	1	5	400	200	130	15779.2128	1530.583642	
11	MDP1	PPM3E	1	5	100	50	140	3641.3568	353.2116096	
12	MDP1	ELEV #1	1	4	100	50	115	3034.464	294.343008	
13	MDP1	ELEV #2	1	4	100	50	115	3034.464	294.343008	
14	MDP1	CHILLER #1	3	4	1000	500	170	47792.808	4635.902376	
15	MDP1	MAU-1	1	4	20	10	170	986.2008	95.6614776	
16	MDP1	EFR-10	1	4	20	10	140	804.13296	78.00089712	
17	MDP1	EFR-12	1	4	20	10	180	1046.89008	101.5483378	
18	MDP1	P-10	1	4	60	30	150	1684.12752	163.3603694	
19	MDP1	SF1-1	1	4	20	10	230	1335.16416	129.5109235	
20	MDP1	AHU-6	1	4	70	35	190	2920.6716	283.3051452	
21	MDP1	AHU-7	1	4	100	50	100	2655.156	257.550132	
22	MDP1	AHU-9	1	4	20	10	100	576.54816	55.92517152	
23	MDP1	AHU-10	1	4	150	75	100	3299.9796	320.0980212	
24	PPK	T-RPK	1	4	400	200	20	2427.5712	235.4744064	
25	LP1E	T-RP1E	1	4	150	75	10	341.3772	33.1135884	
26	LP1E	T-RP1MR	1	4	80	40	230	4612.38528	447.4013722	
27	LP1E	T-RP1WM	1	4	30	15	275	2275.848	220.757256	
28	PPM1E	T-RPM1E	1	4	60	30	20	273.10176	26.49087072	
29	LP2E	T-RPM2E	1	4	150	75	15	455.1696	44.1514512	
30	PPM2E	T-RPM2E	1	4	60	30	15	227.5848	22.0757256	
31	LP3E	T-PRP3E	1	4	150	75	15	455.1696	44.1514512	
32	PPM3E	T-RPM3E	1	4	80	40	15	303.4464	29.4343008	
33	T-RPK	RPK-11,12,13	2	5	800	400	20	4855.1424	470.9488128	
34	T-RP1E	RP1E1,2,3	1	5	250	125	10	568.962	55.189314	
35	T-RP1MR	RP1MR	1	5	175	87.5	15	531.0312	51.5100264	
36	T-RP1WM	RP1WM	1	5	60	30	15	227.5848	22.0757256	
37	T-RPM1E	RPM1E1,2	1	5	100	50	20	531.0312	51.5100264	
38	T-RPM2E	RP2E1,2,3	1	5	250	125	15	758.616	73.585752	
39	T-RPM2E	RPM2E	1	5	100	50	15	379.308	36.792876	
40	T-PRP3E	RP3E1,2,3	1	5	250	125	15	758.616	73.585752	
41	T-RPM3E	RPM3E1,2	1	5	175	87.5	15	531.0312	51.5100264	
42	MDP2	LP1W	2	5	400	200	255	23668.8192	2295.875462	
43	MDP2	PPM1W	1	5	100	50	240	4096.5264	397.3630608	
44	MDP2	LP2W	2	5	400	200	240	22151.5872	2148.703958	
45	MDP2	PPM2W	1	5	100	50	250	4248.2496	412.0802112	
46	MDP2	LP3W	2	5	400	200	260	23972.2656	2325.309763	
47	MDP2	PPM3W	1	5	100	50	270	4627.5576	448.8730872	
48	MDP2	DWP	1	4	100	50	20	379.308	36.792876	
49	LP1W	T-RP1FC	1	4	60	30	20	273.10176	26.49087072	
50	LP1W	T-RP1W	1	4	150	75	25	796.5468	77.2650396	
51	PPM1W	T-RPM1W	1	4	60	30	15	227.5848	22.0757256	
52	LP2W	T-RP2W	1	4	150	75	15	455.1696	44.1514512	
53	PPM2W	T-RPM2W	1	4	60	30	15	227.5848	22.0757256	
54	LP3W	T-RP3W	1	4	150	75	15	455.1696	44.1514512	
55	PPM3W	T-RPM3W	1	4	60	30	15	227.5848	22.0757256	
56	T-RP1FC	RP1FC	1	5	125	62.5	15	3413.772	331.135884	
57	T-RP1WM	RP1W1,2,3	1	5	250	125	15	758.616	73.585752	
58	T-RPM1W	RPM1W	1	5	100	50	15	379.308	36.792876	
59	T-RP2W	RP2W1,2	1	5	250	125	15	758.616	73.585752	
60	T-RPM2W	RPM2W	1	5	100	50	15	379.308	36.792876	

FEEDER SCHEDULE FOR ONE SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.5
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
61	T-RP3W	RP3W1,2,3	1	5	150	75	15	455.1696	44.1514512	
62	T-RPM3W	RPM3W	1	5	110	55	15	500.68656	48.56659632	
63	MDP2	SLP	1	5	100	50	20	531.0312	51.5100264	
64	MDP2	CH-2	2	4	800	400	170	41268.7104	4003.064909	
65	MDP2	ELEV-3	1	4	100	50	115	3034.464	294.343008	
66	MDP2	ELEV-4	1	4	100	50	115	3034.464	294.343008	
67	MDP2	ELEV-5	1	4	100	50	115	3034.464	294.343008	
101	MDP1	AHU-5	1	4	40	20	108.5	1031.71776	100.0766227	
102	MDP1	AHU-15	1	4	40	20	60	576.54816	55.92517152	
103	MDP1	AHU-11	1	4	40	20	60	576.54816	55.92517152	
104	MDP1	B-3	1	4	40	20	170	1608.26592	156.0017942	
105	MDP1	UPS-WS	1	5	200	100	70	2882.7408	279.6258576	
107	UPS-WS	MAINTENANCE BYPASS PANEL	1	5	200	100	100	4248.2496	412.0802112	
108	MAINTENANCE BYPASS PANEL	T-DPUPSWS	1	4	250	125	20	1137.924	110.378628	
109	T-DPUPSWS	DPUPSWS	2	5	500	250	20	3034.464	294.343008	
110	DPUPSWS	RPUPS1	1	5	100	50	20	531.0312	51.5100264	
111	DPUPSWS	RPUPS2	1	5	300	150	20	1365.5088	132.4543536	
112	DPUPSWS	RPUPS3	1	5	250	125	20	1137.924	110.378628	
113	MDP1	MAINTENANCE BYPASS PANEL	1	5	200	100	100	2882.7408	279.6258576	
128	MDP2	EFR-22	1	4	30	15	172	1433.78424	139.0770713	
129	MDP2	EFR-13	1	4	30	15	360	2981.36088	289.1920054	
130	MDP2	EFR-16	1	4	30	15	130	1069.64856	103.7559103	
131	MDP2	P-11	1	4	70	35	150	2336.53728	226.6441162	
132	MDP2	EFR-15	1	4	20	10	140	804.13296	78.00089712	
133	MDP2	AHU-1	1	4	90	45	340	7237.19664	702.0080741	
134	MDP2	AHU-2	1	4	70	35	350	5416.51824	525.4022693	
135	MDP2	AHU-3	1	4	80	40	170	3459.28896	335.5510291	
136	MDP2	AHU-4	1	4	80	40	245	4915.83168	476.835673	
137	MDP2	AHU-8	1	4	20	10	160	925.51152	89.77461744	
138	MDP2	AHU-13	1	4	60	30	350	4961.34864	481.2508181	
139	MDP2	P-9	1	4	20	10	150	864.82224	83.88775728	
140	MDP2	P-13	1	4	20	10	150	864.82224	83.88775728	
141	MDP2	P-2	1	4	150	75	150	4893.0732	474.6281004	
142	MDP2	SF1-2	1	4	30	15	20	159.30936	15.45300792	
143	MDP2	ELEV 3	1	4	100	50	113	2958.6024	286.9844328	
144	MDP2	ELEV 4	1	4	100	50	113	2958.6024	286.9844328	
145	MDP2	ELEV 5	1	4	100	50	113	2958.6024	286.9844328	

FEEDER SCHEDULE FOR TWO SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.5
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
1	UTILITY	MDP1	4	40	3000	1500	100	179791.992	17439.82322	
5	MDP1	PPK	2	5	600	300	153	22758.48	2207.57256	
6	MDP1	LP1E	1	5	400	200	88	9710.2848	941.8976256	
7	MDP1	PPM1E	1	5	100	50	96	2124.1248	206.0401056	
8	MDP1	LP2E	1	5	400	200	110	12137.856	1177.372032	
9	MDP1	PPM2E	1	5	100	50	96	2124.1248	206.0401056	
10	MDP1	LP3E	1	5	400	200	130	14261.9808	1383.412138	
11	MDP1	PPM3E	1	5	100	50	140	2958.6024	286.9844328	
12	MDP1	ELEV #1	1	4	100	50	115	2427.5712	235.4744064	
13	MDP1	ELEV #2	1	4	100	50	115	2427.5712	235.4744064	
14	MDP1	CHILLER #1	3	4	1000	500	170	43241.112	4194.387864	
15	MDP1	MAU-1	1	4	20	10	170	622.06512	60.34031664	
16	MDP1	EFR-10	1	4	20	10	140	515.85888	50.03831136	
17	MDP1	EFR-12	1	4	20	10	180	667.58208	64.75546176	
18	MDP1	P-10	1	4	60	30	150	1411.02576	136.8694987	
19	MDP1	SF1-1	1	4	20	10	230	849.64992	82.41604224	
20	MDP1	AHU-6	1	4	70	35	190	2442.74352	236.9461214	
21	MDP1	AHU-7	1	4	100	50	100	2124.1248	206.0401056	
22	MDP1	AHU-9	1	4	20	10	100	364.13568	35.32116096	
23	MDP1	AHU-10	1	4	150	75	100	2731.0176	264.9087072	
24	PPK	T-RPK	1	4	400	200	20	2124.1248	206.0401056	
25	LP1E	T-RP1E	1	4	150	75	10	568.962	55.189314	
26	LP1E	T-RP1MR	1	4	80	40	230	3884.11392	376.7590502	
27	LP1E	T-RP1WM	1	4	30	15	275	1456.54272	141.2846438	
28	PPM1E	T-RPM1E	1	4	60	30	20	227.5848	22.0757256	
29	LP2E	T-RPM2E	1	4	150	75	15	568.962	55.189314	
30	PPM2E	T-RPM2E	1	4	60	30	15	227.5848	22.0757256	
31	LP3E	T-PRP3E	1	4	150	75	15	568.962	55.189314	
32	PPM3E	T-RPM3E	1	4	80	40	15	242.75712	23.54744064	
33	T-RPK	RPK-11,12,13	2	5	800	400	20	4248.2496	412.0802112	
34	T-RP1E	RP1E1,2,3	1	5	250	125	10	568.962	55.189314	
35	T-RP1MR	RP1MR	1	5	175	87.5	15	663.789	64.387533	
36	T-RP1WM	RP1WM	1	5	60	30	15	182.06784	17.66058048	
37	T-RPM1E	RPM1E1,2	1	5	100	50	20	455.1696	44.1514512	
38	T-RPM2E	RP2E1,2,3	1	5	250	125	15	948.27	91.98219	
39	T-RPM2E	RPM2E	1	5	100	50	15	303.4464	29.4343008	
40	T-PRP3E	RP3E1,2,3	1	5	250	125	15	948.27	91.98219	
41	T-RPM3E	RPM3E1,2	1	5	175	87.5	15	663.789	64.387533	
42	MDP2	LP1W	2	5	400	200	255	21544.6944	2089.835357	
43	MDP2	PPM1W	1	5	100	50	240	3489.6336	338.4944592	
44	MDP2	LP2W	2	5	400	200	240	20330.9088	1972.098154	
45	MDP2	PPM2W	1	5	100	50	250	3489.6336	338.4944592	
46	MDP2	LP3W	2	5	400	200	260	21848.1408	2119.269658	
47	MDP2	PPM3W	1	5	100	50	270	3868.9416	375.2873352	
48	MDP2	DWP	1	4	100	50	20	303.4464	29.4343008	
49	LP1W	T-RP1FC	1	4	60	30	20	227.5848	22.0757256	
50	LP1W	T-RP1W	1	4	150	75	25	682.7544	66.2271768	
51	PPM1W	T-RPM1W	1	4	60	30	15	227.5848	22.0757256	
52	LP2W	T-RP2W	1	4	150	75	15	568.962	55.189314	
53	PPM2W	T-RPM2W	1	4	60	30	15	227.5848	22.0757256	
54	LP3W	T-RP3W	1	4	150	75	15	568.962	55.189314	
55	PPM3W	T-RPM3W	1	4	60	30	15	227.5848	22.0757256	
56	T-RP1FC	RP1FC	1	5	125	62.5	15	284.481	27.594657	
57	T-RP1WM	RP1W1,2,3	1	5	250	125	15	948.27	91.98219	
58	T-RPM1W	RPM1W	1	5	100	50	15	303.4464	29.4343008	
59	T-RP2W	RP2W1,2	1	5	250	125	15	948.27	91.98219	
60	T-RPM2W	RPM2W	1	5	100	50	15	303.4464	29.4343008	

FEEDER SCHEDULE FOR TWO SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.5
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
61	T-RP3W	RP3W1,2,3	1	5	150	75	15	568.962	55.189314	
62	T-RPM3W	RPM3W	1	5	110	55	15	333.79104	32.37773088	
63	MDP2	SLP	1	5	100	50	20	455.1696	44.1514512	
64	MDP2	CH-2	2	4	800	400	170	37020.4608	3590.984698	
65	MDP2	ELEV-3	1	4	100	50	115	2427.5712	235.4744064	
66	MDP2	ELEV-4	1	4	100	50	115	2427.5712	235.4744064	
67	MDP2	ELEV-5	1	4	100	50	115	2427.5712	235.4744064	
101	MDP1	AHU-5	1	4	40	20	110	697.92672	67.69889184	
102	MDP1	AHU-15	1	4	40	20	60	364.13568	35.32116096	
103	MDP1	AHU-11	1	4	40	20	60	364.13568	35.32116096	
104	MDP1	B-3	1	4	40	20	170	1062.0624	103.0200528	
105	MDP1	UPS-WS	1	5	200	100	70	2731.0176	264.9087072	
107	UPS-WS	MAINTENANCE BYPASS PANEL	1	5	200	100	100	3793.08	367.92876	
108	MAINTENANCE BYPASS PANEL	T-DPUPSWS	1	4	250	125	20	948.27	91.98219	
109	T-DPUPSWS	DPUPSWS	2	5	500	250	20	2655.156	257.550132	
110	DPUPSWS	RPUPS1	1	5	100	50	20	455.1696	44.1514512	
111	DPUPSWS	RPUPS2	1	5	300	150	20	1137.924	110.378628	
112	DPUPSWS	RPUPS3	1	5	250	125	20	948.27	91.98219	
113	MDP1	MAINTENANCE BYPASS PANEL	1	5	200	100	100	3793.08	367.92876	
128	MDP2	EFR-22	1	4	30	15	172	955.85616	92.71804752	
129	MDP2	EFR-13	1	4	30	15	360	1911.71232	185.436095	
130	MDP2	EFR-16	1	4	30	15	130	682.7544	66.2271768	
131	MDP2	P-11	1	4	70	35	150	1911.71232	185.436095	
132	MDP2	EFR-15	1	4	20	10	140	515.85888	50.03831136	
133	MDP2	AHU-1	1	4	90	45	340	5803.4124	562.9310028	
134	MDP2	AHU-2	1	4	70	35	350	4513.7652	437.8352244	
135	MDP2	AHU-3	1	4	80	40	170	2852.39616	276.6824275	
136	MDP2	AHU-4	1	4	80	40	245	4126.87104	400.3064909	
137	MDP2	AHU-8	1	4	20	10	160	591.72048	57.39688656	
138	MDP2	AHU-13	1	4	60	30	350	3959.97552	384.1176254	
139	MDP2	P-9	1	4	20	10	150	546.20352	52.98174144	
140	MDP2	P-13	1	4	20	10	150	546.20352	52.98174144	
141	MDP2	P-2	1	4	150	75	150	4210.3188	408.4009236	
142	MDP2	SF1-2	1	4	30	15	20	113.7924	11.0378628	
143	MDP2	ELEV 3	1	4	100	50	110	2275.848	220.757256	
144	MDP2	ELEV 4	1	4	100	50	110	2275.848	220.757256	
145	MDP2	ELEV 5	1	4	100	50	110	2275.848	220.757256	

FEEDER SCHEDULE FOR EXISTING FEEDERS

INPUTS	
DEMAND FACTOR	0.7
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
1	UTILITY	MDP1	3	40	3000	2100	100	360039.1536	34923.7979	
5	MDP1	PPK	2	5	600	420	153	40783.19616	3955.970028	
6	MDP1	LP1E	1	5	400	280	88	14868.8736	1442.280739	
7	MDP1	PPM1E	1	5	100	70	96	4248.2496	412.0802112	
8	MDP1	LP2E	1	5	400	280	110	18692.29824	1813.152929	
9	MDP1	PPM2E	1	5	100	70	96	4248.2496	412.0802112	
10	MDP1	LP3E	1	5	400	280	130	22090.89792	2142.817098	
11	MDP1	PPM3E	1	5	100	70	140	6159.96192	597.5163062	
12	MDP1	ELEV #1	1	4	100	70	115	5097.89952	494.4962534	
13	MDP1	ELEV #2	1	4	100	70	115	5097.89952	494.4962534	
14	MDP1	CHILLER #1	3	4	1000	700	170	76468.4928	7417.443802	
15	MDP1	MAU-1	1	4	20	14	170	2124.1248	206.0401056	
16	MDP1	EFR-10	1	4	20	14	140	1741.782336	168.9528866	
17	MDP1	EFR-12	1	4	20	14	180	2251.572288	218.4025119	
18	MDP1	P-10	1	4	60	42	150	2995.015968	290.5165489	
19	MDP1	SF1-1	1	4	20	14	230	2867.56848	278.1541426	
20	MDP1	AHU-6	1	4	70	49	190	5129.761392	497.586855	
21	MDP1	AHU-7	1	4	100	70	100	4460.66208	432.6842218	
22	MDP1	AHU-9	1	4	20	14	100	1253.233632	121.5636623	
23	MDP1	AHU-10	1	4	150	105	100	5416.51824	525.4022693	
24	PPK	T-RPK	1	4	400	280	20	3398.59968	329.664169	
25	LP1E	T-RP1E	1	4	150	105	10	318.61872	30.90601584	
26	LP1E	T-RP1MR	1	4	80	56	230	8156.639232	791.1940055	
27	LP1E	T-RP1WM	1	4	30	21	275	5002.313904	485.2244487	
28	PPM1E	T-RPM1E	1	4	60	42	20	573.513696	55.63082851	
29	LP2E	T-RPM2E	1	4	150	105	15	477.92808	46.35902376	
30	PPM2E	T-RPM2E	1	4	60	42	15	446.066208	43.26842218	
31	LP3E	T-PRP3E	1	4	150	105	15	477.92808	46.35902376	
32	PPM3E	T-RPM3E	1	4	80	56	15	509.789952	49.44962534	
33	T-RPK	RPK-11,12,13	2	5	800	560	20	6797.19936	659.3283379	
34	T-RP1E	RP1E1,2,3	1	5	250	175	10	796.5468	77.2650396	
35	T-RP1MR	RP1MR	1	5	175	122.5	15	557.58276	54.08552772	
36	T-RP1WM	RP1WM	1	5	60	42	15	446.066208	43.26842218	
37	T-RPM1E	RPM1E1,2	1	5	100	70	20	849.64992	82.41604224	
38	T-RPM2E	RP2E1,2,3	1	5	250	175	15	1327.578	128.775066	
39	T-RPM2E	RPM2E	1	5	100	70	15	637.23744	61.81203168	
40	T-PRP3E	RP3E1,2,3	1	5	250	175	15	1327.578	128.775066	
41	T-RPM3E	RPM3E1,2	1	5	175	122.5	15	929.3046	90.1425462	
42	MDP2	LP1W	2	5	400	280	255	37384.59648	3626.305859	
43	MDP2	PPM1W	1	5	100	70	240	7115.81808	690.2343538	
44	MDP2	LP2W	2	5	400	280	240	35260.47168	3420.265753	
45	MDP2	PPM2W	1	5	100	70	250	7328.23056	710.8383643	
46	MDP2	LP3W	2	5	400	280	260	38234.2464	3708.721901	
47	MDP2	PPM3W	1	5	100	70	270	7965.468	772.650396	
48	MDP2	DWP	1	4	100	70	20	637.23744	61.81203168	
49	LP1W	T-RP1FC	1	4	60	42	20	573.513696	55.63082851	
50	LP1W	T-RP1W	1	4	150	105	25	1274.47488	123.6240634	
51	PPM1W	T-RPM1W	1	4	60	42	15	446.066208	43.26842218	
52	LP2W	T-RP2W	1	4	150	105	15	796.5468	77.2650396	
53	PPM2W	T-RPM2W	1	4	60	42	15	446.066208	43.26842218	
54	LP3W	T-RP3W	1	4	150	105	15	796.5468	77.2650396	
55	PPM3W	T-RPM3W	1	4	60	42	15	446.066208	43.26842218	
56	T-RP1FC	RP1FC	1	5	125	87.5	15	531.0312	51.5100264	
57	T-RP1WM	RP1W1,2,3	1	5	250	175	15	1327.578	128.775066	
58	T-RPM1W	RPM1W	1	5	100	70	15	637.23744	61.81203168	
59	T-RP2W	RP2W1,2	1	5	250	175	15	1327.578	128.775066	
60	T-RPM2W	RPM2W	1	5	100	70	15	637.23744	61.81203168	

FEEDER SCHEDULE FOR EXISTING FEEDERS

INPUTS	
DEMAND FACTOR	0.7
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
61	T-RP3W	RP3W1,2,3	1	5	150	105	15	477.92808	46.35902376	
62	T-RPM3W	RPM3W	1	5	100	70	15	637.23744	61.81203168	
63	MDP2	SLP	1	5	100	70	20	849.64992	82.41604224	
64	MDP2	CH-2	2	4	800	560	170	57776.19456	5604.290872	
65	MDP2	ELEV-3	1	4	100	70	115	5097.89952	494.4962534	
66	MDP2	ELEV-4	1	4	100	70	115	5097.89952	494.4962534	
67	MDP2	ELEV-5	1	4	100	70	115	5097.89952	494.4962534	
101	MDP1	AHU-5	1	4	40	28	108.5	2209.089792	214.2817098	
102	MDP1	AHU-15	1	4	40	28	63	1316.957376	127.7448655	
103	MDP1	AHU-11	1	4	40	28	60	1231.992384	119.5032612	
104	MDP1	B-3	1	4	40	28	170	3483.564672	337.9057732	
105	MDP1	UPS-WS	1	5	200	140	70	4885.48704	473.8922429	
107	UPS-WS	MAINTENANCE BYPASS PANEL	1	5	200	140	100	7009.61184	679.9323485	
108	MAINTENANCE BYPASS PANEL	T-DPUPSWS	1	4	250	175	20	1593.0936	154.5300792	
109	T-DPUPSWS	DPUPSWS	2	5	500	350	20	4779.2808	463.5902376	
110	DPUPSWS	RPUPS1	1	5	100	70	20	849.64992	82.41604224	
111	DPUPSWS	RPUPS2	1	5	300	210	20	1911.71232	185.436095	
112	DPUPSWS	RPUPS3	1	5	250	175	20	1593.0936	154.5300792	
113	MDP1	MAINTENANCE BYPASS PANEL	1	5	200	140	100	7009.61184	679.9323485	
128	MDP2	EFR-22	1	4	30	21	172	3122.463456	302.8789552	
129	MDP2	EFR-13	1	4	30	21	360	6563.545632	636.6639263	
130	MDP2	EFR-16	1	4	30	21	130	2357.778528	228.7045172	
131	MDP2	P-11	1	4	70	49	150	4088.94024	396.6272033	
132	MDP2	EFR-15	1	4	20	14	140	1741.782336	168.9528866	
133	MDP2	AHU-1	1	4	90	63	340	12139.37323	1177.519204	
134	MDP2	AHU-2	1	4	70	49	350	9441.734736	915.8482694	
135	MDP2	AHU-3	1	4	80	56	170.7	6032.514432	585.1538999	
136	MDP2	AHU-4	1	4	80	56	245	8666.429184	840.6436308	
137	MDP2	AHU-8	1	4	20	14	160	1996.677312	193.6776993	
138	MDP2	AHU-13	1	4	60	42	350	10450.69402	1013.71732	
139	MDP2	P-9	1	4	20	14	150	1869.229824	181.3152929	
140	MDP2	P-13	1	4	20	14	150	1869.229824	181.3152929	
141	MDP2	P-2	1	4	150	105	150	8124.77736	788.1034039	
142	MDP2	SF1-2	1	4	30	21	20	350.480592	33.99661742	
143	MDP2	ELEV 3	1	4	100	70	113	14975.07984	1452.582744	
144	MDP2	ELEV 4	1	4	100	70	113	14975.07984	1452.582744	
145	MDP2	ELEV 5	1	4	100	70	113	14975.07984	1452.582744	

FEEDER SCHEDULE FOR ONE SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.7
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
1	UTILITY	MDP1	3	40	3000	2100	100	309060.1584	29978.83536	
5	MDP1	PPK	2	5	600	420	153	36959.77152	3585.097837	
6	MDP1	LP1E	1	5	400	280	88	14868.8736	1442.280739	
7	MDP1	PPM1E	1	5	100	70	96	3504.80592	339.9661742	
8	MDP1	LP2E	1	5	400	280	110	18692.29824	1813.152929	
9	MDP1	PPM2E	1	5	100	70	96	3504.80592	339.9661742	
10	MDP1	LP3E	1	5	400	280	130	22090.89792	2142.817098	
11	MDP1	PPM3E	1	5	100	70	140	5097.89952	494.4962534	
12	MDP1	ELEV #1	1	4	100	70	115	4248.2496	412.0802112	
13	MDP1	ELEV #2	1	4	100	70	115	4248.2496	412.0802112	
14	MDP1	CHILLER #1	3	4	1000	700	170	66909.9312	6490.263326	
15	MDP1	MAU-1	1	4	20	14	170	1380.68112	133.9260686	
16	MDP1	EFR-10	1	4	20	14	140	1125.786144	109.201256	
17	MDP1	EFR-12	1	4	20	14	180	1465.646112	142.1676729	
18	MDP1	P-10	1	4	60	42	150	2357.778528	228.7045172	
19	MDP1	SF1-1	1	4	20	14	230	1869.229824	181.3152929	
20	MDP1	AHU-6	1	4	70	49	190	4088.94024	396.6272033	
21	MDP1	AHU-7	1	4	100	70	100	3717.2184	360.5701848	
22	MDP1	AHU-9	1	4	20	14	100	807.167424	78.29524013	
23	MDP1	AHU-10	1	4	150	105	100	4619.97144	448.1372297	
24	PPK	T-RPK	1	4	400	280	20	3398.59968	329.664169	
25	LP1E	T-RP1E	1	4	150	105	10	477.92808	46.35902376	
26	LP1E	T-RP1MR	1	4	80	56	230	6457.339392	626.361921	
27	LP1E	T-RP1WM	1	4	30	21	275	3186.1872	309.0601584	
28	PPM1E	T-RPM1E	1	4	60	42	20	382.342464	37.08721901	
29	LP2E	T-RPM2E	1	4	150	105	15	637.23744	61.81203168	
30	PPM2E	T-RPM2E	1	4	60	42	15	318.61872	30.90601584	
31	LP3E	T-PRP3E	1	4	150	105	15	637.23744	61.81203168	
32	PPM3E	T-RPM3E	1	4	80	56	15	424.82496	41.20802112	
33	T-RPK	RPK-11,12,13	2	5	800	560	20	6797.19936	659.3283379	
34	T-RP1E	RP1E1,2,3	1	5	250	175	10	796.5468	77.2650396	
35	T-RP1MR	RP1MR	1	5	175	122.5	15	743.44368	72.11403696	
36	T-RP1WM	RP1WM	1	5	60	42	15	318.61872	30.90601584	
37	T-RPM1E	RPM1E1,2	1	5	100	70	20	743.44368	72.11403696	
38	T-RPM2E	RP2E1,2,3	1	5	250	175	15	1062.0624	103.0200528	
39	T-RPM2E	RPM2E	1	5	100	70	15	531.0312	51.5100264	
40	T-PRP3E	RP3E1,2,3	1	5	250	175	15	1062.0624	103.0200528	
41	T-RPM3E	RPM3E1,2	1	5	175	122.5	15	743.44368	72.11403696	
42	MDP2	LP1W	2	5	400	280	255	33136.34688	3214.225647	
43	MDP2	PPM1W	1	5	100	70	240	5735.13696	556.3082851	
44	MDP2	LP2W	2	5	400	280	240	31012.22208	3008.185542	
45	MDP2	PPM2W	1	5	100	70	250	5947.54944	576.9122957	
46	MDP2	LP3W	2	5	400	280	260	33561.17184	3255.433668	
47	MDP2	PPM3W	1	5	100	70	270	6478.58064	628.4223221	
48	MDP2	DWP	1	4	100	70	20	531.0312	51.5100264	
49	LP1W	T-RP1FC	1	4	60	42	20	382.342464	37.08721901	
50	LP1W	T-RP1W	1	4	150	105	25	1115.16552	108.1710554	
51	PPM1W	T-RPM1W	1	4	60	42	15	318.61872	30.90601584	
52	LP2W	T-RP2W	1	4	150	105	15	637.23744	61.81203168	
53	PPM2W	T-RPM2W	1	4	60	42	15	318.61872	30.90601584	
54	LP3W	T-RP3W	1	4	150	105	15	637.23744	61.81203168	
55	PPM3W	T-RPM3W	1	4	60	42	15	318.61872	30.90601584	
56	T-RP1FC	RP1FC	1	5	125	87.5	15	4779.2808	463.5902376	
57	T-RP1WM	RP1W1,2,3	1	5	250	175	15	1062.0624	103.0200528	
58	T-RPM1W	RPM1W	1	5	100	70	15	531.0312	51.5100264	
59	T-RP2W	RP2W1,2	1	5	250	175	15	1062.0624	103.0200528	
60	T-RPM2W	RPM2W	1	5	100	70	15	531.0312	51.5100264	

FEEDER SCHEDULE FOR ONE SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.7
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
61	T-RP3W	RP3W1,2,3	1	5	150	105	15	637.23744	61.81203168	
62	T-RPM3W	RPM3W	1	5	110	77	15	700.961184	67.99323485	
63	MDP2	SLP	1	5	100	70	20	743.44368	72.11403696	
64	MDP2	CH-2	2	4	800	560	170	57776.19456	5604.290872	
65	MDP2	ELEV-3	1	4	100	70	115	4248.2496	412.0802112	
66	MDP2	ELEV-4	1	4	100	70	115	4248.2496	412.0802112	
67	MDP2	ELEV-5	1	4	100	70	115	4248.2496	412.0802112	
101	MDP1	AHU-5	1	4	40	28	108.5	1444.404864	140.1072718	
102	MDP1	AHU-15	1	4	40	28	60	807.167424	78.29524013	
103	MDP1	AHU-11	1	4	40	28	60	807.167424	78.29524013	
104	MDP1	B-3	1	4	40	28	170	2251.572288	218.4025119	
105	MDP1	UPS-WS	1	5	200	140	70	4035.83712	391.4762006	
107	UPS-WS	MAINTENANCE BYPASS PANEL	1	5	200	140	100	5947.54944	576.9122957	
108	MAINTENANCE BYPASS PANEL	T-DPUPSWS	1	4	250	175	20	1593.0936	154.5300792	
109	T-DPUPSWS	DPUPSWS	2	5	500	350	20	4248.2496	412.0802112	
110	DPUPSWS	RPUPS1	1	5	100	70	20	743.44368	72.11403696	
111	DPUPSWS	RPUPS2	1	5	300	210	20	1911.71232	185.436095	
112	DPUPSWS	RPUPS3	1	5	250	175	20	1593.0936	154.5300792	
113	MDP1	MAINTENANCE BYPASS PANEL	1	5	200	140	100	4035.83712	391.4762006	
128	MDP2	EFR-22	1	4	30	21	172	2007.297936	194.7078998	
129	MDP2	EFR-13	1	4	30	21	360	4173.905232	404.8688075	
130	MDP2	EFR-16	1	4	30	21	130	1497.507984	145.2582744	
131	MDP2	P-11	1	4	70	49	150	3271.152192	317.3017626	
132	MDP2	EFR-15	1	4	20	14	140	1125.786144	109.201256	
133	MDP2	AHU-1	1	4	90	63	340	10132.0753	982.8113037	
134	MDP2	AHU-2	1	4	70	49	350	7583.125536	735.563177	
135	MDP2	AHU-3	1	4	80	56	170	4843.004544	469.7714408	
136	MDP2	AHU-4	1	4	80	56	245	6882.164352	667.5699421	
137	MDP2	AHU-8	1	4	20	14	160	1295.716128	125.6844644	
138	MDP2	AHU-13	1	4	60	42	350	6945.888096	673.7511453	
139	MDP2	P-9	1	4	20	14	150	1210.751136	117.4428602	
140	MDP2	P-13	1	4	20	14	150	1210.751136	117.4428602	
141	MDP2	P-2	1	4	150	105	150	6850.30248	664.4793406	
142	MDP2	SF1-2	1	4	30	21	20	223.033104	21.63421109	
143	MDP2	ELEV 3	1	4	100	70	113	4142.04336	401.7782059	
144	MDP2	ELEV 4	1	4	100	70	113	4142.04336	401.7782059	
145	MDP2	ELEV 5	1	4	100	70	113	4142.04336	401.7782059	

FEEDER SCHEDULE FOR TWO SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.7
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
1	UTILITY	MDP1	4	40	3000	2100	100	251708.7888	24415.75251	
5	MDP1	PPK	2	5	600	420	153	31861.872	3090.601584	
6	MDP1	LP1E	1	5	400	280	88	13594.39872	1318.656676	
7	MDP1	PPM1E	1	5	100	70	96	2973.77472	288.4561478	
8	MDP1	LP2E	1	5	400	280	110	16992.9984	1648.320845	
9	MDP1	PPM2E	1	5	100	70	96	2973.77472	288.4561478	
10	MDP1	LP3E	1	5	400	280	130	19966.77312	1936.776993	
11	MDP1	PPM3E	1	5	100	70	140	4142.04336	401.7782059	
12	MDP1	ELEV #1	1	4	100	70	115	3398.59968	329.664169	
13	MDP1	ELEV #2	1	4	100	70	115	3398.59968	329.664169	
14	MDP1	CHILLER #1	3	4	1000	700	170	60537.5568	5872.14301	
15	MDP1	MAU-1	1	4	20	14	170	870.891168	84.4764433	
16	MDP1	EFR-10	1	4	20	14	140	722.202432	70.0536359	
17	MDP1	EFR-12	1	4	20	14	180	934.614912	90.65764646	
18	MDP1	P-10	1	4	60	42	150	1975.436064	191.6172982	
19	MDP1	SF1-1	1	4	20	14	230	1189.509888	115.3824591	
20	MDP1	AHU-6	1	4	70	49	190	3419.840928	331.72457	
21	MDP1	AHU-7	1	4	100	70	100	2973.77472	288.4561478	
22	MDP1	AHU-9	1	4	20	14	100	509.789952	49.44962534	
23	MDP1	AHU-10	1	4	150	105	100	3823.42464	370.8721901	
24	PPK	T-RPK	1	4	400	280	20	2973.77472	288.4561478	
25	LP1E	T-RP1E	1	4	150	105	10	796.5468	77.2650396	
26	LP1E	T-RP1MR	1	4	80	56	230	5437.759488	527.4626703	
27	LP1E	T-RP1WM	1	4	30	21	275	2039.159808	197.7985014	
28	PPM1E	T-RPM1E	1	4	60	42	20	318.61872	30.90601584	
29	LP2E	T-RPM2E	1	4	150	105	15	796.5468	77.2650396	
30	PPM2E	T-RPM2E	1	4	60	42	15	318.61872	30.90601584	
31	LP3E	T-PRP3E	1	4	150	105	15	796.5468	77.2650396	
32	PPM3E	T-RPM3E	1	4	80	56	15	339.859968	32.9664169	
33	T-RPK	RPK-11,12,13	2	5	800	560	20	5947.54944	576.9122957	
34	T-RP1E	RP1E1,2,3	1	5	250	175	10	796.5468	77.2650396	
35	T-RP1MR	RP1MR	1	5	175	122.5	15	929.3046	90.1425462	
36	T-RP1WM	RP1WM	1	5	60	42	15	254.894976	24.72481267	
37	T-RPM1E	RPM1E1,2	1	5	100	70	20	637.23744	61.81203168	
38	T-RPM2E	RP2E1,2,3	1	5	250	175	15	1327.578	128.775066	
39	T-RPM2E	RPM2E	1	5	100	70	15	424.82496	41.20802112	
40	T-PRP3E	RP3E1,2,3	1	5	250	175	15	1327.578	128.775066	
41	T-RPM3E	RPM3E1,2	1	5	175	122.5	15	929.3046	90.1425462	
42	MDP2	LP1W	2	5	400	280	255	30162.57216	2925.7695	
43	MDP2	PPM1W	1	5	100	70	240	4885.48704	473.8922429	
44	MDP2	LP2W	2	5	400	280	240	28463.27232	2760.937415	
45	MDP2	PPM2W	1	5	100	70	250	4885.48704	473.8922429	
46	MDP2	LP3W	2	5	400	280	260	30587.39712	2966.977521	
47	MDP2	PPM3W	1	5	100	70	270	5416.51824	525.4022693	
48	MDP2	DWP	1	4	100	70	20	424.82496	41.20802112	
49	LP1W	T-RP1FC	1	4	60	42	20	318.61872	30.90601584	
50	LP1W	T-RP1W	1	4	150	105	25	955.85616	92.71804752	
51	PPM1W	T-RPM1W	1	4	60	42	15	318.61872	30.90601584	
52	LP2W	T-RP2W	1	4	150	105	15	796.5468	77.2650396	
53	PPM2W	T-RPM2W	1	4	60	42	15	318.61872	30.90601584	
54	LP3W	T-RP3W	1	4	150	105	15	796.5468	77.2650396	
55	PPM3W	T-RPM3W	1	4	60	42	15	318.61872	30.90601584	
56	T-RP1FC	RP1FC	1	5	125	87.5	15	398.2734	38.6325198	
57	T-RP1WM	RP1W1,2,3	1	5	250	175	15	1327.578	128.775066	
58	T-RPM1W	RPM1W	1	5	100	70	15	424.82496	41.20802112	
59	T-RP2W	RP2W1,2	1	5	250	175	15	1327.578	128.775066	
60	T-RPM2W	RPM2W	1	5	100	70	15	424.82496	41.20802112	

FEEDER SCHEDULE FOR TWO SIZE INCREASE

INPUTS	
DEMAND FACTOR	0.5
POWER FACTOR	0.85
VOLTAGE	480

TAG	FROM	TO	NO OF SETS	NO OF CONDUCTORS	SIZE OF OVERCURRENT PROTECTION (A)	LOAD	LENGTH OF FEEDER (ft)	kWh	Cost of energy loss	REMARKS
61	T-RP3W	RP3W1,2,3	1	5	150	75	15	568.962	55.189314	
62	T-RPM3W	RPM3W	1	5	110	55	15	333.79104	32.37773088	
63	MDP2	SLP	1	5	100	50	20	455.1696	44.1514512	
64	MDP2	CH-2	2	4	800	400	170	37020.4608	3590.984698	
65	MDP2	ELEV-3	1	4	100	50	115	2427.5712	235.4744064	
66	MDP2	ELEV-4	1	4	100	50	115	2427.5712	235.4744064	
67	MDP2	ELEV-5	1	4	100	50	115	2427.5712	235.4744064	
101	MDP1	AHU-5	1	4	40	20	110	697.92672	67.69889184	
102	MDP1	AHU-15	1	4	40	20	60	364.13568	35.32116096	
103	MDP1	AHU-11	1	4	40	20	60	364.13568	35.32116096	
104	MDP1	B-3	1	4	40	20	170	1062.0624	103.0200528	
105	MDP1	UPS-WS	1	5	200	100	70	2731.0176	264.9087072	
107	UPS-WS	MAINTENANCE BYPASS PANEL	1	5	200	100	100	3793.08	367.92876	
108	MAINTENANCE BYPASS PANEL	T-DPUPSWS	1	4	250	125	20	948.27	91.98219	
109	T-DPUPSWS	DPUPSWS	2	5	500	250	20	2655.156	257.550132	
110	DPUPSWS	RPUPS1	1	5	100	50	20	455.1696	44.1514512	
111	DPUPSWS	RPUPS2	1	5	300	150	20	1137.924	110.378628	
112	DPUPSWS	RPUPS3	1	5	250	125	20	948.27	91.98219	
113	MDP1	MAINTENANCE BYPASS PANEL	1	5	200	100	100	3793.08	367.92876	
128	MDP2	EFR-22	1	4	30	15	172	955.85616	92.71804752	
129	MDP2	EFR-13	1	4	30	15	360	1911.71232	185.436095	
130	MDP2	EFR-16	1	4	30	15	130	682.7544	66.2271768	
131	MDP2	P-11	1	4	70	35	150	1911.71232	185.436095	
132	MDP2	EFR-15	1	4	20	10	140	515.85888	50.03831136	
133	MDP2	AHU-1	1	4	90	45	340	5803.4124	562.9310028	
134	MDP2	AHU-2	1	4	70	35	350	4513.7652	437.8352244	
135	MDP2	AHU-3	1	4	80	40	170	2852.39616	276.6824275	
136	MDP2	AHU-4	1	4	80	40	245	4126.87104	400.3064909	
137	MDP2	AHU-8	1	4	20	10	160	591.72048	57.39688656	
138	MDP2	AHU-13	1	4	60	30	350	3959.97552	384.1176254	
139	MDP2	P-9	1	4	20	10	150	546.20352	52.98174144	
140	MDP2	P-13	1	4	20	10	150	546.20352	52.98174144	
141	MDP2	P-2	1	4	150	75	150	4210.3188	408.4009236	
142	MDP2	SF1-2	1	4	30	15	20	113.7924	11.0378628	
143	MDP2	ELEV 3	1	4	100	50	110	2275.848	220.757256	
144	MDP2	ELEV 4	1	4	100	50	110	2275.848	220.757256	
145	MDP2	ELEV 5	1	4	100	50	110	2275.848	220.757256	

Appendix F | Panelboard Cut Sheets

3

Type PRL1a Panelboard

Contents

Product Description

Eaton's EZ box and EZ trim represents the first significant change in panelboard box and trim designs in more than a half-century. The EZ box and EZ trim have been designed for faster, more secure and safer installations. The new EZ box and EZ trim are provided standard for Eaton's Pow-R-Line 1a and Pow-R-Line 2a lighting panelboards, as well as the Pow-R-Line 3a and Pow-R-Line 3E mid-range panelboard.

Flange Detail

Features

- Virtually eliminates sharp edges
- Trim installs in seconds rather than minutes
- Door-in-door is standard
- Ability to adjust flush box to wall irregularities
- Trim installs without the need for tools
- No exposed hardware (because there is none)

The EZ box flanges are bent and painted, which virtually eliminates the sharp edges associated with traditional boxes. Additionally, all steel panelboard chassis parts are painted. This significantly reduces potential injury for material handlers and installers. Each flange is adjustable outward up to 3/4-inch (19.1 mm). This feature allows the installer to adjust flush box applications to be level and flat with the finished wall after the wall material is installed to help correct wall irregularities. The new box flange also provides the means for attaching the EZ trim.

Standalone Trim and Bottom Flange Hanger with Notch

Corner Flange Detail

Fast Installation

The EZ trim incorporates a groundbreaking design that installs in seconds, rather than minutes. The standard trim features include door-in-door construction; no exposed hardware and no tools are required for installation.

Each EZ trim includes hangers attached on the right side. The bottom trim hanger has a notch in its base. To install, the bottom hanger is inserted into the bottom right side box flange opening, resting the notch on the flange.

Trim Hanger Inserted Into Box Flange

The balance of the hangers are aligned with the other flange openings and pushed in. When all hangers are in the box flange, the trim is lifted up slightly to clear the notch on the bottom hanger, and the trim in self-supported on the EZ box.

The installation is completed by swinging the trim to the closed position, then lifting and pushing slightly to the right. The trim will drop into place totally secured. The multi-point catches on the left side of the trim will lock into the left side box flange openings.

To prevent the trim from being removed by non-authorized persons, a unique sliding means automatically latches in place when the trim door is closed. Along with a new lock, the EZ trim offers a high degree of door security.

Trim Hanging on Surface Mounted Box

Standards and Certifications

When used with Eaton's panelboard chassis, EZ boxes and EZ trims meet the following applicable industry standards:

- UL 50 listed
- NEMA Standard PB1
- Federal specifications
- National Electrical Code

Listed

Product Selection

Boxes and Trims Only—Type 1

3

Types PRL1a, PRL2a and PRL3a (400A Maximum)

Box Dimensions—Inches (mm)	Height	YS Box Catalog Number	LT Trim Catalog Number	EZ Box ① Catalog Number	EZ Trim ① Catalog Number
20.00 W x 5.75 D (508.0 W x 146.1 D)	36.00 (914.4)	**YS2036**	**LT2036S or F**	**EZB2036R**	**EZT2036S or F**
	42.00 (1066.8)	**YS2042**	**LT2042S or F**	**EZB2042R**	**EZT2042S or F**
	48.00 (1219.2)	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	60.00 (1524.0)	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	72.00 (1828.8)	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
	90.00 (2286.0)	**YS2090**	**LT2090S or F**	**EZB2090R**	**EZT2090S or F**

Type PRL3a (600A)

Box Dimensions—Inches (mm)	Height	YS Box Catalog Number	LT Trim Catalog Number	EZ Box ① Catalog Number	EZ Trim ① Catalog Number
20.00 W x 5.75 D (508.0 W x 146.1 D)	36.00 (914.4)	**YS2036**	**LTV2036S or F**	**EZB2036R**	**EZTV2036S or F**
	48.00 (1219.2)	**YS2048**	**LTV2048S or F**	**EZB2048R**	**EZTV2048S or F**
	60.00 (1524.0)	**YS2060**	**LTV2060S or F**	**EZB2060R**	**EZTV2060S or F**
	72.00 (1828.8)	**YS2072**	**LTV2072S or F**	**EZB2072R**	**EZTV2072S or F**
	90.00 (2286.0)	**YS2090**	**LTV2090S or F**	**EZB2090R**	**EZTV2090S or F**

Type PRL3a (800A)

Box Dimensions—Inches (mm)	Height	YS Box Catalog Number	LT Trim Catalog Number
28.00 W x 5.75 D	36.00 (914.4)	**YS2836**	**LTV2836S or F**
	48.00 (1219.2)	**YS2848**	**LTV2848S or F**
	60.00 (1524.0)	**YS2860**	**LTV2860S or F**
	72.00 (1828.8)	**YS2872**	**LTV2872S or F**
	90.00 (2286.0)	**YS2890**	**LTV2890S or F**

Note

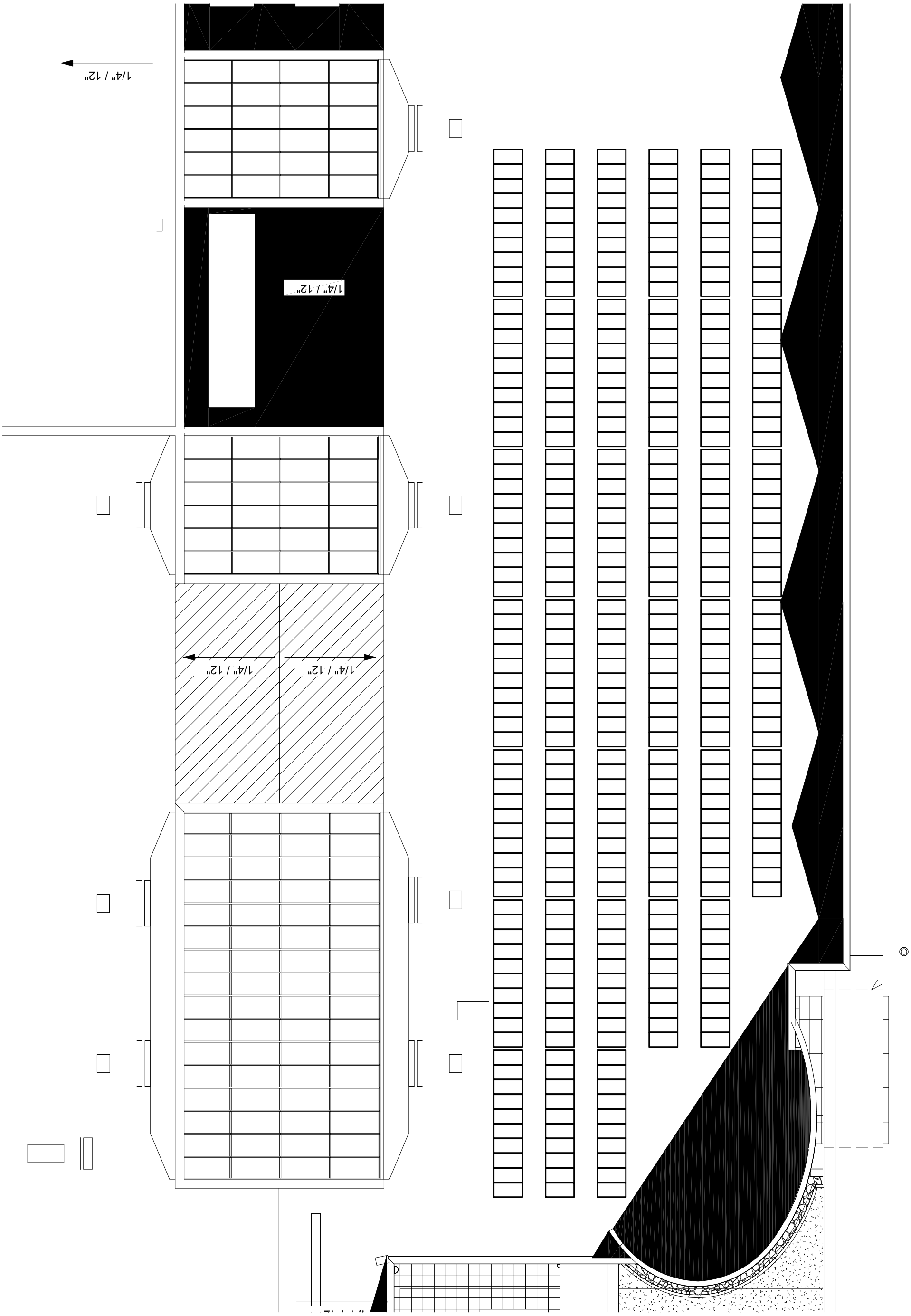
① EZ box must be used with EZ trim.

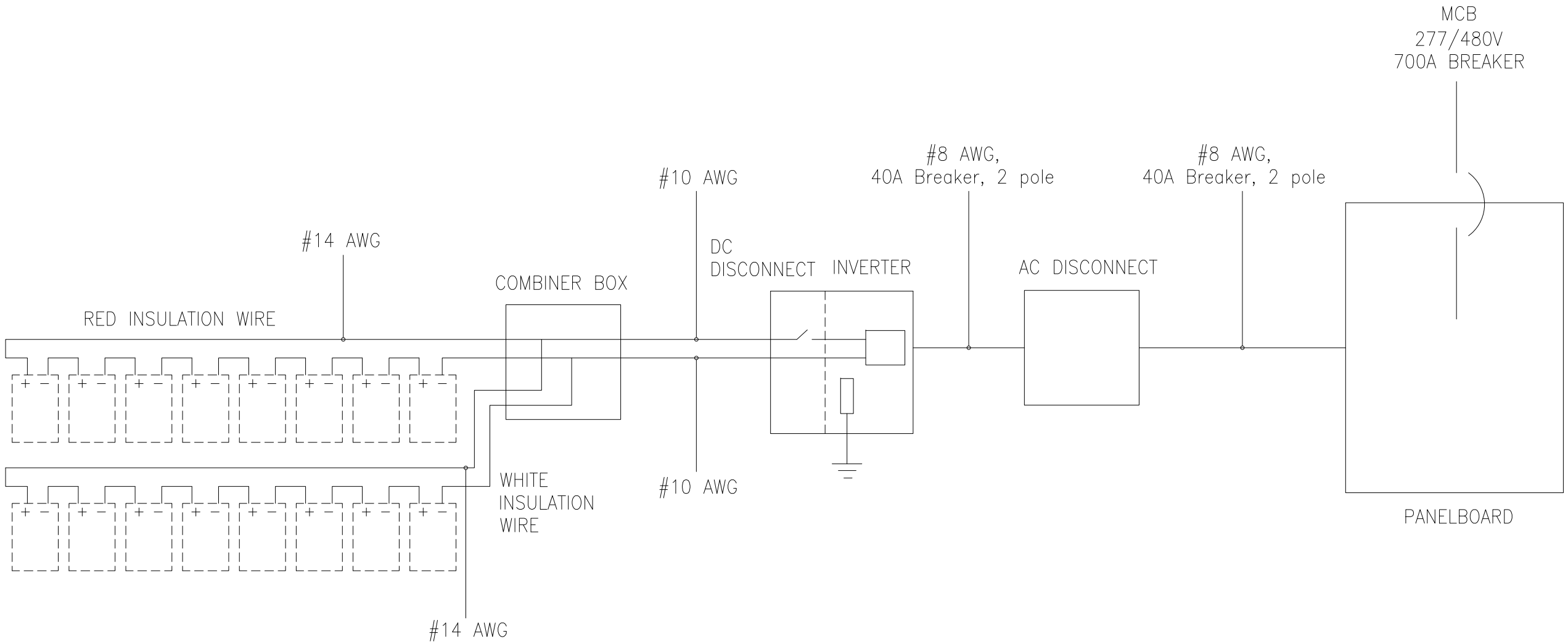
Appendix G | Photovoltaic Layout, Wiring Diagram, Single-line Diagram, and Cutsheets

THE PENNSYLVANIA STATE EMPLOYEES CREDIT UNION
CORPORATE HEADQUARTERS

HARRISBURG, PA

SCALE:	1/16" = 1'
ISSUE DATE:	04/04/2012
DRAWN BY:	SARAH WUJCIK
TITLE:	PHOTOVOLTAIC MODULE ROOF PLAN LAYOUT
SHEET TITLE:	





TYPICAL FOR 19 STRINGS IN PARALLEL

PENNSYLVANIA STATE EMPLOYEES CREDIT UNION CORPORATE HEADQUARTERS

ADDRESS:
HARRISBURG, PA

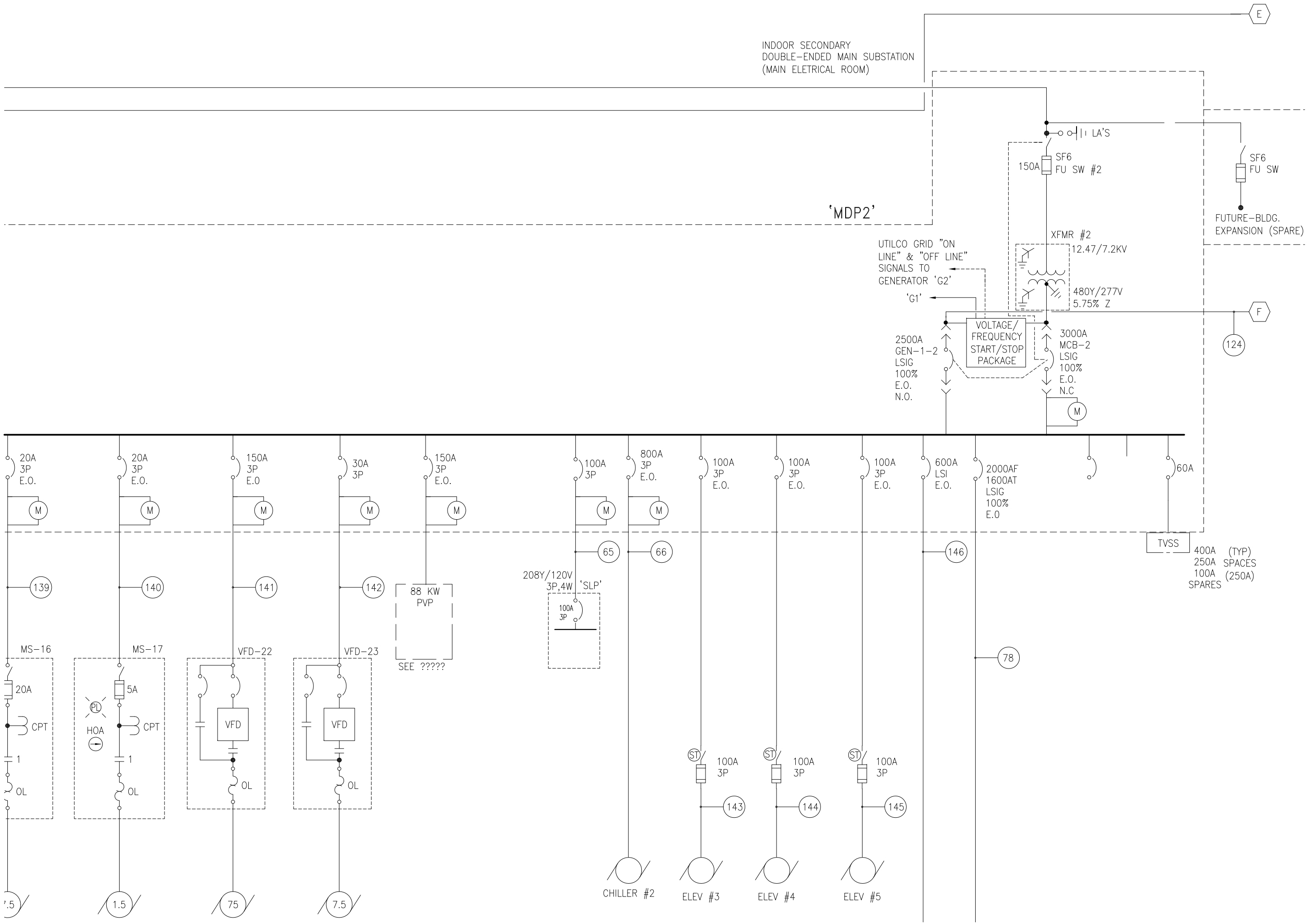
SCALE:
NOT TO SCALE

ISSUE:
03/26/2012

DRAWN BY:
SARAH WUJCIK

TYPICAL PHOTOVOLTAIC ARRAY LAYOUT

SHEET TITLE:



PENNSYLVANIA STATE EMPLOYEES CREDIT UNION CORPORATE HEADQUARTERS

ADDRESS:
HARRISBURG, PA

SCALE:
NOT TO SCALE

ISSUE:
04/04/2012

DRAWN BY:
SARAH WUJCIK

PHOTOVOLTAIC
PANELBOARD
SINGLE-LINE

SHEET TITLE:

Fronius **IG Plus** PV Inverter

The first complete solution. Reliable. Proven. Smart.

An outstanding addition to the family: The next generation Fronius IG Plus inverter builds on a successful model with multiple enhancements, including maximum power harvest, a built-in six circuit string combiner, integrated, lockable DC Disconnect, significantly improved efficiency, and unbeatable reliability. New, larger power stages expand the proven Fronius IG family from 2 to 12 kW in a single inverter.

Fronius

POWERING YOUR FUTURE

INPUT DATA **Fronius IG Plus**	**3.0-1 UNI**	**3.8-1 UNI**	**5.0-1 UNI**	**6.0-1 UNI**	**7.5-1 UNI**	**10.0-1 UNI**	**11.4-1 UNI**	**11.4-3 Delta**	**12.0-3 WYE277**
Recommended PV-Power (Wp)	2500-3450	3200-4400	4250-5750	5100-6900	6350-8600	8500-11500	9700-13100	9700-13100	10200-13800
MPPT-Voltage Range	230 ... 500 V								
DC Startup Voltage	245 V								
Max. Input Voltage (at 1000 W/m² 14°F (-10°C) in open circuit operation)	600 V								
Nominal Input Current	8.3 A	10.5 A	13.8 A	16.6 A	20.7 A	27.6 A	31.4 A	31.4 A	33.1 A
Max. usable Input Current	14.0 A	17.8 A	23.4 A	28.1 A	35.1 A	46.7 A	53.3 A	53.3 A	56.1 A
Admissible conductor size (DC)	No. 14 - 6 AWG								
Number of DC Input Terminals	6								
Max. Current per DC Input Terminal	20 A; Bus bar available for higher input currents								

OUTPUT DATA **Fronius IG Plus**		**3.0-1 UNI**	**3.8-1 UNI**	**5.0-1 UNI**	**6.0-1 UNI**	**7.5-1 UNI**	**10.0-1 UNI**	**11.4-1 UNI**	**11.4-3 Delta**	**12.0-3 WYE277**
Nominal output power ($P_{AC\ nom}$)		3000 W	3800 W	5000 W	6000 W	7500 W	9995 W	11400 W	11400 W	12000 W
Max. continuous output power 104°F (40°C) 208 V / 240 V / 277 V		3000 W	3800 W	5000 W	6000 W	7500 W	9995 W	11400 W	11400 W	12000 W
Nominal AC output voltage		208 V / 240 V / 277 V							208 V / 240 V	277 V
Operating AC voltage range (default)	208 V	183 - 229 V (-12 / +10 %)								
	240 V	211 - 264 V (-12 / +10 %)								
	277 V	244 - 305 V (-12 / +10 %)								
Max. continuous output current	208 V	14.4 A	18.3 A	24.0 A	28.8 A	36.1 A	48.1 A	54.8 A	31.6 A*	n.a.
	240 V	12.5 A	15.8 A	20.8 A	25.0 A	31.3 A	41.7 A	47.5 A	27.4 A*	n.a.
	277 V	10.8 A	13.7 A	18.1 A	21.7 A	27.1 A	36.1 A	41.2 A	n.a.	14.4 A*
Admissible conductor size (AC)		No. 14 - 4 AWG								
Max. continuous utility back feed current		0 A								
Nominal output frequency		60 Hz								
Operating frequency range		59.3 - 60.5 Hz								
Total harmonic distortion		< 3 %								
Power factor		1								

GENERAL DATA **Fronius IG Plus**		**3.0-1 UNI**	**3.8-1 UNI**	**5.0-1 UNI**	**6.0-1 UNI**	**7.5-1 UNI**	**10.0-1 UNI**	**11.4-1 UNI**	**11.4-3 Delta**	**12.0-3 WYE277**
Max. Efficiency		96.2 %								
CEC Efficiency	208 V	95.0 %	95.0 %	95.5 %	95.5 %	95.0 %	95.0 %	95.5 %	95.0 %	n.a.
	240 V	95.5 %	95.5 %	95.5 %	96.0 %	95.5 %	95.5 %	96.0 %	95.5 %	n.a.
	277 V	95.5 %	95.5 %	96.0 %	96.0 %	96.0 %	96.0 %	96.0 %	n.a.	96.0 %
Consumption in standby (night)		< 1 W								
Consumption during operation		8 W			15 W			22 W		
Cooling		Controlled forced ventilation, variable fan speed								
Enclosure Type		NEMA 3R								
Unit Dimensions (W x H x D)		17.1 x 24.8 x 9.6 in.			17.1 x 36.4 x 9.6 in.			17.1 x 48.1 x 9.6 in.		
Power Stack Weight		31 lbs. (14 kg)			57 lbs. (26 kg)			82 lbs. (37 kg)		
Wiring Compartment Weight		24 lbs. (11 kg)			26 lbs. (12 kg)			26 lbs. (12 kg)		
Admissible ambient operating temperature		-4 ... 122°F (-20 ... +50°C)								
Compliance		UL 1741-2005, IEEE 1547-2003, IEEE 1547.1, ANSI/IEEE C62.41, FCC Part 15 A& B, NEC Article 690, C22. 2 No. 107.1-01 (Sept. 2001)								

PROTECTION DEVICES **Fronius IG Plus**	**3.0-1 UNI**	**3.8-1 UNI**	**5.0-1 UNI**	**6.0-1 UNI**	**7.5-1 UNI**	**10.0-1 UNI**	**11.4-1 UNI**	**11.4-3 Delta**	**12.0-3 WYE277**
Ground fault protection	Internal GFDI (Ground Fault Detector/Interrupter); in accordance with UL 1741-2005 and NEC Art. 690								
DC reverse polarity protection	Internal diode								
Islanding protection	Internal; in accordance with UL 1741-2005, IEEE 1547-2003 and NEC								
Over temperature	Output power derating / active cooling								

* per Phase

Fronius USA LLC Solar Electronic Division
10421 Citation Drive, Suite 1100, Brighton, Michigan, 48116
E-Mail: pv-us@fronius.com
www.fronius-usa.com

40,0006,2981,AE v01 2009 as02

SUNPOWER

E18 / 230 SOLAR PANEL

EXCEPTIONAL EFFICIENCY AND PERFORMANCE

BENEFITS

Highest Efficiency
SunPower™ Solar Panels are the most efficient photovoltaic panels on the market today.

More Power
Our panels produce more power in the same amount of space—up to 50% more than conventional designs and 100% more than thin film solar panels.

Reduced Installation Cost
More power per panel means fewer panels per install. This saves both time and money.

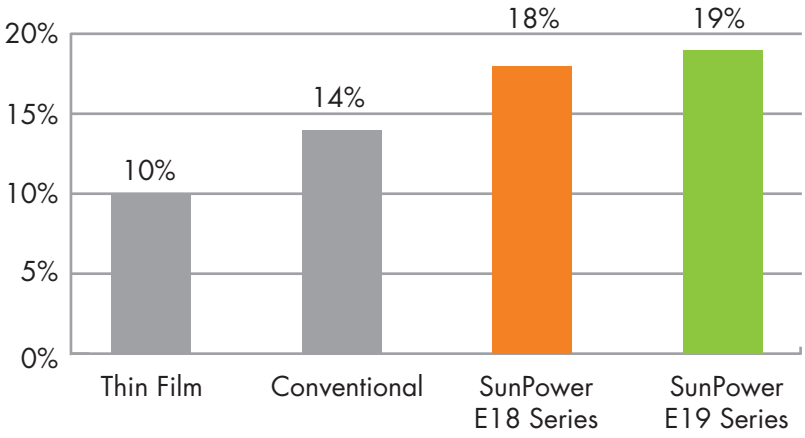
Reliable and Robust Design
Proven materials, tempered front glass, and a sturdy anodized frame allow panel to operate reliably in multiple mounting configurations.

SPR-230E-WHT-D

E18 SERIES

The SunPower™ 230 Solar Panel provides today's highest efficiency and performance. Utilizing 72 all back-contact solar cells, the SunPower 230 delivers a total panel conversion efficiency of 18.5%. The panel's reduced voltage-temperature coefficient and exceptional low-light performance attributes provide outstanding energy delivery per peak power watt.

SunPower's High Efficiency Advantage



c UL us

SUNPOWER™

E18 / 230 SOLAR PANEL

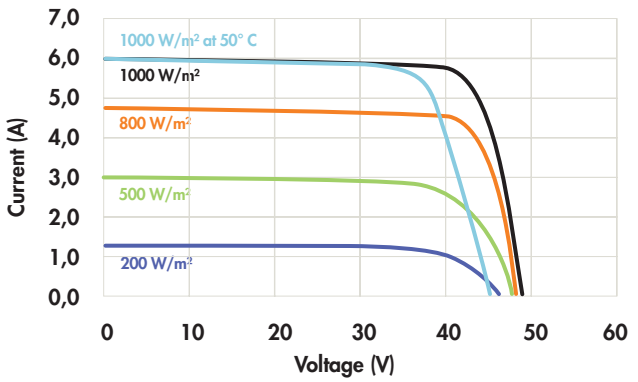
EXCEPTIONAL EFFICIENCY AND PERFORMANCE

Electrical Data

Measured at Standard Test Conditions (STC): irradiance of 1000W/m², AM 1.5, and cell temperature 25° C

Peak Power (+5/-3%)	P_{max}	230 W
Efficiency	η	18.5 %
Rated Voltage	V_{mpp}	40.5 V
Rated Current	I_{mpp}	5.68 A
Open Circuit Voltage	V_{oc}	48.2 V
Short Circuit Current	I_{sc}	6.05 A
Maximum System Voltage	UL	600 V
Temperature Coefficients	Power (P)	-0.38% / K
	Voltage (V_{oc})	-132.5mV / K
	Current (I_{sc})	3.5mA / K
NOCT		45° C +/-2° C
Series Fuse Rating		20 A

I-V Curve



Current/voltage characteristics with dependence on irradiance and module temperature.

Mechanical Data

Solar Cells	72 SunPower all-back contact monocrystalline
Front Glass	High transmission tempered glass
Junction Box	IP-65 rated with 3 bypass diodes Dimensions: 32 x 155 x 128 (mm)
Output Cables	1000mm length cables / MultiContact (MC4) connectors
Frame	Anodized aluminum alloy type 6063 (black)
Weight	33.1 lbs. (15.0 kg)

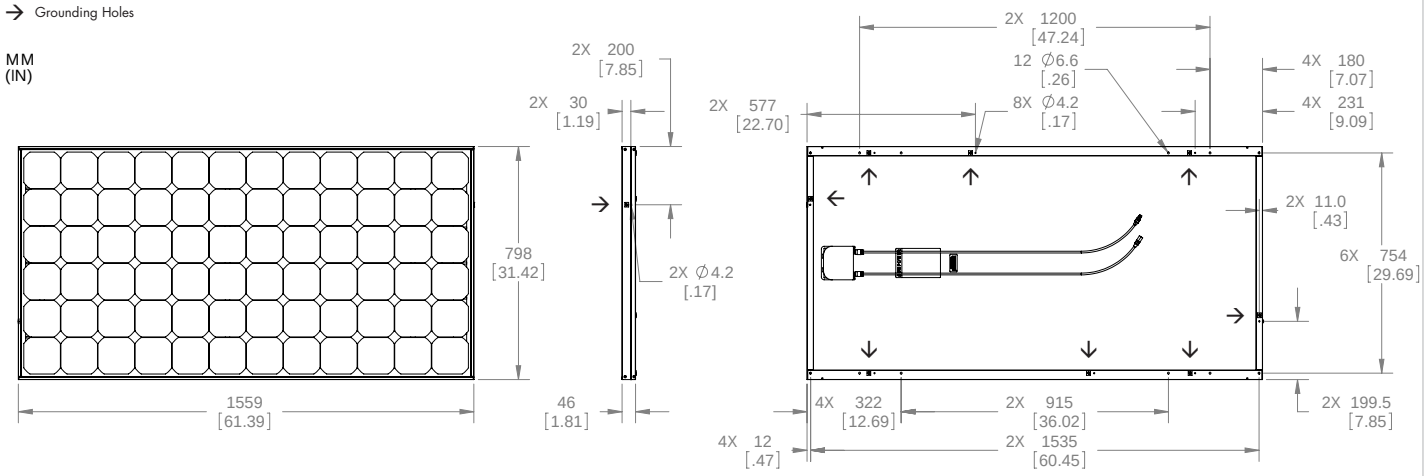
Tested Operating Conditions

Temperature	-40° F to +185° F (-40° C to + 85° C)
Max load	113 psf 550kg/m² (5400 Pa) front – e.g. snow; 50 psf 245kg/m² (2400 Pa) front and back – e.g. wind
Impact Resistance	Hail 1 in (25 mm) at 52mph (23 m/s)

Warranties and Certifications

Warranties	25 year limited power warranty
	10 year limited product warranty
Certifications	Tested to UL 1703. Class C Fire Rating

Dimensions



CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

Visit sunpowercorp.com for details

Appendix H | Mechanical Breadth Trace Results

Room Checksums

By ACADEMIC

Default

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 14
Outside Air: OADB/WB/HR: 91 / 74 / 102

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	18,238	18,238	16
Glass Solar	24,074	0	24,074	21
Glass/Door Cond	3,386	0	3,386	3
Wall Cond	0	368	368	0
Partition/Door	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	19,753		19,753	17
Sub Total ==>	47,212	18,605	65,817	58
Internal Loads				
Lights	17,827	0	17,827	16
People	10,000	0	10,000	9
Misc	3	0	3	0
Sub Total ==>	27,831	0	27,831	24
Ceiling Load	5,622	-5,622	0	0
Ventilation Load	0	0	24,080	21
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0		0	0
Exhaust Heat		-3,468	-3,468	-3
Sup. Fan Heat			0	0
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	80,665	9,515	114,260	100.00

CLG SPACE PEAK

Mo/Hr: 9 / 14
OADB: 83

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	44,545	56
Glass/Door Cond	1,586	2
Wall Cond	0	0
Partition/Door	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	3,798	5
Sub Total ==>	49,928	63
Internal Loads		
Lights	17,827	22
People	10,000	13
Misc	3	0
Sub Total ==>	27,831	35
Ceiling Load	1,587	2
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Ov/Undr Sizing	0	0
Exhaust Heat		
OA Preheat Diff.		
RA Preheat Diff.		
Additional Reheat		
System Plenum Heat		
Underflr Sup Ht Pkup		
Supply Air Leakage		
Grand Total ==>	79,346	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 11

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-49,806	38.53
Glass Solar	0	0	0.00
Glass/Door Cond	-14,139	-14,139	10.94
Wall Cond	0	-331	0.26
Partition/Door	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0.00
Infiltration	-27,701	-27,701	21.43
Sub Total ==>	-41,840	-91,977	71.15
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-25,736	0	0.00
Ventilation Load	0	-33,769	26.12
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		15,877	-12.28
OA Preheat Diff.		0	0.00
RA Preheat Diff.		-663	0.51
Additional Reheat		-17,853	13.81
System Plenum Heat		-891	0.69
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-67,576	-129,276	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	70.0
Ra Plenum	78.3	54.8
Return	78.3	54.8
Ret/OA	80.4	33.7
Fn MtrTD	0.0	0.0
Fn BldTD	0.0	0.0
Fn Frict	0.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	3,603	1,081
Terminal	3,603	1,081
Main Fan	3,603	1,081
Sec Fan	0	0
Nom Vent	520	520
AHU Vent	520	520
Infil	426	426
MinStop/Rh	1,081	1,081
Return	4,029	1,507
Exhaust	946	946
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	14.4	48.1
cfm/ft²	0.68	0.20
cfm/ton	378.41	
ft²/ton	559.78	
Btu/hr·ft²	21.44	-20.90
No. People	40	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter gr/lb	Leave DB °F	Leave WB °F	Leave gr/lb
Main Clg	9.5	114.3	86.6	3,096	80.4	63.6	62.2	55.0	50.8	49.3
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	9.5	114.3								

AREAS

	Gross Total ft²	Glass ft²	Glass (%)
Floor	5,330		
Part	0		
Int Door	0		
ExFlr	0		
Roof	5,330	0	0
Wall	864	847	98
Ext Door	0	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-85.4	0	0.0	0.0
Aux Htg	0.0	0	0.0	0.0
Preheat	-26.0	3,603	48.5	55.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-111.4			

Room Checksums

By ACADEMIC

Skylights

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 14
Outside Air: OADB/WB/HR: 91 / 74 / 102

	Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total
	Btu/h	Btu/h	Btu/h	(%)
Envelope Loads				
Skylite Solar	3,919	0	3,919	3
Skylite Cond	0	1,209	1,209	1
Roof Cond	0	18,901	18,901	15
Glass Solar	24,074	0	24,074	19
Glass/Door Cond	3,386	0	3,386	3
Wall Cond	0	368	368	0
Partition/Door	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	21,932		21,932	17
Sub Total ==>	53,311	20,477	73,788	59
Internal Loads				
Lights	19,794	0	19,794	16
People	10,000	0	10,000	8
Misc	3	0	3	0
Sub Total ==>	29,798	0	29,798	24
Ceiling Load	6,242	-6,242	0	0
Ventilation Load	0	0	25,714	20
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0		0	0
Exhaust Heat		-3,770	-3,770	-3
Sup. Fan Heat			0	0
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	89,350	10,465	125,529	100.00

CLG SPACE PEAK

Mo/Hr: 9 / 14
OADB: 83

	Space Sensible	Percent Of Total
	Btu/h	(%)
Envelope Loads		
Skylite Solar	3,054	4
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	44,545	52
Glass/Door Cond	1,586	2
Wall Cond	0	0
Partition/Door	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	4,217	5
Sub Total ==>	53,402	63
Internal Loads		
Lights	19,794	23
People	10,000	12
Misc	3	0
Sub Total ==>	29,798	35
Ceiling Load	1,762	2
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Ov/Undr Sizing	0	0
Exhaust Heat		
OA Preheat Diff.		
RA Preheat Diff.		
Additional Reheat		
System Plenum Heat		
Underflr Sup Ht Pkup		
Supply Air Leakage		
Grand Total ==>	84,961	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 11

	Space Peak Space Sens	Coil Peak Tot Sens	Percent Of Total
	Btu/h	Btu/h	(%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	-4,882	3.50
Roof Cond	0	-51,618	37.01
Glass Solar	0	0	0.00
Glass/Door Cond	-14,139	-14,139	10.14
Wall Cond	0	-331	0.24
Partition/Door	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0.00
Infiltration	-30,757	-30,757	22.05
Sub Total ==>	-44,896	-101,726	72.94
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-28,575	0	0.00
Ventilation Load	0	-36,061	25.86
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		17,258	-12.37
OA Preheat Diff.		0	0.00
RA Preheat Diff.		-710	0.51
Additional Reheat		-19,116	13.71
System Plenum Heat		891	-0.64
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-73,471	-139,465	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	70.0
Ra Plenum	78.3	54.8
Return	78.3	54.8
Ret/OA	80.3	33.8
Fn MtrTD	0.0	0.0
Fn BldTD	0.0	0.0
Fn Frict	0.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	3,858	1,157
Terminal	3,858	1,157
Main Fan	3,858	1,157
Sec Fan	0	0
Nom Vent	555	555
AHU Vent	555	555
Infil	473	473
MinStop/Rh	1,157	1,157
Return	4,331	1,631
Exhaust	1,029	1,029
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	14.4	48.0
cfm/ft²	0.65	0.20
cfm/ton	368.81	
ft²/ton	565.73	
Btu/hr·ft²	21.21	-20.34
No. People	40	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter gr/lb	Leave DB °F	Leave WB °F	Leave gr/lb
Main Clg	10.5	125.5	95.4	3,428	80.3	63.5	61.9	55.0	50.8	49.3
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	10.5	125.5								

AREAS

	Gross Total ft²	Glass ft²	Glass (%)
Floor	5,918		
Part	0		
Int Door	0		
ExFlr	0		
Roof	5,918	394	7
Wall	864	847	98
Ext Door	0	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-92.6	0	0.0	0.0
Aux Htg	0.0	0	0.0	0.0
Preheat	-27.8	3,858	48.5	55.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-120.4			