

Bill of Materials: Yarbrough Hard Courts

Equipment Description	
48	Light-Structure System™ Retrofit Total Light Control® TLC-LED-1200 luminaires
✓	Factory wired and assembled pole top luminaire assemblies
✓	Factory wired electrical component enclosures
✓	Factory built wire harnesses with plug-in connections
Controls	
1	24" x 72" Control and monitoring cabinet
✓	High/medium/low dimming
12	30-amp contactors
2	Off/On/Auto (OOA) switches
2	Player-activated pushbuttons with strobe (LED)
Warranty	
✓	Musco's Constant 25™ - Controls and Monitoring product assurance and warranty program that eliminates 100% maintenance costs for 25 years, including labor, materials, monitoring and guaranteed light levels.

Yarbrough Hard Courts

Auburn,AL

Lighting System

Pole / Fixture Summary						
Pole ID	Pole Height	Mtg Height	Fixture Qty	Luminaire Type	Load	Circuit
T1, T3-T4, T6	50'	50'	3	TLC-LED-1200	3.51 kW	A
T2, T5	50'	50'	6	TLC-LED-1200	7.02 kW	A
T7, T9-T10, T12	50'	50'	3	TLC-LED-1200	3.51 kW	B
T8, T11	50'	50'	6	TLC-LED-1200	7.02 kW	B
12			48		56.16 kW	

Circuit Summary			
Circuit	Description	Load	Fixture Qty
A	Tennis 1-6	28.08 kW	24
B	Tennis 7-12	28.08 kW	24

Fixture Type Summary							
Type	Source	Wattage	Lumens	L90	L80	L70	Quantity
TLC-LED-1200	LED 5700K - 75 CRI	1170W	150,000	>120,000	>120,000	>120,000	48

Single Luminaire Amperage Draw Chart								
Driver (.90 min power factor)		Max Line Amperage Per Luminaire						
Single Phase Voltage		208 (60)	220 (60)	240 (60)	277 (60)	347 (60)	380 (60)	480 (60)
TLC-LED-1200		6.9	6.5	6.0	5.2	4.2	3.8	3.0

Light Level Summary

Calculation Grid Summary								
Grid Name	Calculation Metric	Illumination					Circuits	Fixture Qty
		Ave	Min	Max	Max/Min	Ave/Min		
Tennis 1-6	Horizontal Illuminance	75.9	64	86	1.34	1.19	A	24
Tennis 7-12	Horizontal Illuminance	76.2	64	86	1.35	1.19	B	24

From Hometown to Professional



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EQUIPMENT LIST FOR AREAS SHOWN								
Pole				Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
2	T1, T3	50'	7"	57'	TLC-LED-1200	3	3	0
1	T2	50'	7"	57'	TLC-LED-1200	6	6	0
2	T4, T6	50'	-	50'	TLC-LED-1200	3	3	0
1	T5	50'	-	50'	TLC-LED-1200	6	6	0
6	TOTALS					24	24	0

Yarbrough Hard Courts

Auburn,AL

GRID SUMMARY	
Name:	Tennis 1-6
Size:	6 Court - 24' Spacing
Spacing:	20.0' x 20.0'
Height:	3.0' above grade

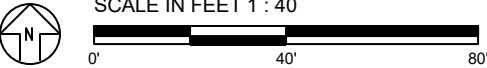
ILLUMINATION SUMMARY	
MAINTAINED HORIZONTAL FOOTCANDLES	
	Entire Grid
Guaranteed Average:	75
Scan Average:	75.88
Maximum:	86
Minimum:	64
Avg / Min:	1.18
Guaranteed Max / Min:	1.7
Max / Min:	1.34
UG (adjacent pts):	0.00
CU:	0.75
No. of Points:	90
LUMINAIRE INFORMATION	
Applied Circuits:	A
No. of Luminaires:	24
Total Load:	28.08 kW

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.



Pole location(s) ⚡ dimensions are relative to 0,0 reference point(s) ⊗



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EQUIPMENT LIST FOR AREAS SHOWN								
Pole				Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
1	T8	50'	-	50'	TLC-LED-1200	6	6	0
1	T11	50'	-	50'	TLC-LED-1200	6	6	0
4	T12	50'	-	50'	TLC-LED-1200	3	3	0
6	TOTALS					24	24	0

Yarbrough Hard Courts
Auburn,AL

GRID SUMMARY	
Name:	Tennis 7-12
Size:	6 Court - 24' Spacing
Spacing:	20.0' x 20.0'
Height:	3.0' above grade

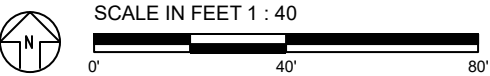
ILLUMINATION SUMMARY	
MAINTAINED HORIZONTAL FOOTCANDLES	
	Entire Grid
Guaranteed Average:	75
Scan Average:	76.21
Maximum:	86
Minimum:	64
Avg / Min:	1.19
Guaranteed Max / Min:	1.7
Max / Min:	1.35
UG (adjacent pts):	0.00
CU:	0.75
No. of Points:	90
LUMINAIRE INFORMATION	
Applied Circuits:	B
No. of Luminaires:	24
Total Load:	28.08 kW

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.



Pole location(s) ⦿ dimensions are relative to 0,0 reference point(s) ⊗



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Yarbrough Hard Courts

Auburn,AL

EQUIPMENT LAYOUT

INCLUDES:

- Tennis 1-6
- Tennis 7-12

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

EQUIPMENT LIST FOR AREAS SHOWN

QTY	Pole			Luminaires		QTY / POLE
	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	
2	T1, T3	50'	7'	57'	TLC-LED-1200	3
1	T2	50'	7'	57'	TLC-LED-1200	6
2	T5, T11	50'	-	50'	TLC-LED-1200	6
1	T8	50'	-	50'	TLC-LED-1200	6
6	T12 T4, T6-T7 T9-T10	50'	-	50'	TLC-LED-1200	3
12	TOTALS					48

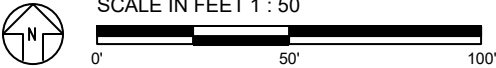
SINGLE LUMINAIRE AMPERAGE DRAW CHART

Driver (.90 min power factor)	Line Amperage Per Luminaire (max draw)						
	208 (60)	220 (60)	240 (60)	277 (60)	347 (60)	380 (60)	480 (60)
Single Phase Voltage	208 (60)	220 (60)	240 (60)	277 (60)	347 (60)	380 (60)	480 (60)
TLC-LED-1200	6.9	6.5	6.0	5.2	4.2	3.8	3.0

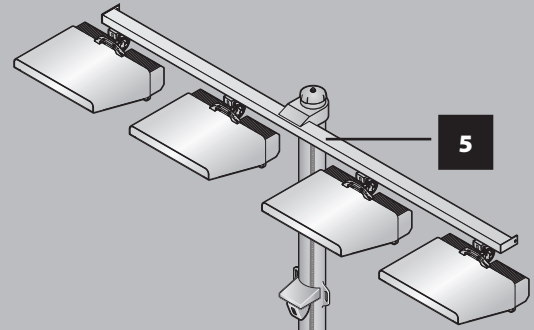


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Pole location(s) ⓧ dimensions are relative to 0,0 reference point(s) ⓧ



Installation Instructions: **Light-Structure System™ Retrofit Lighting System**

Upgrade to TLC for LED® with 5 Easy Pieces™
approach to system design

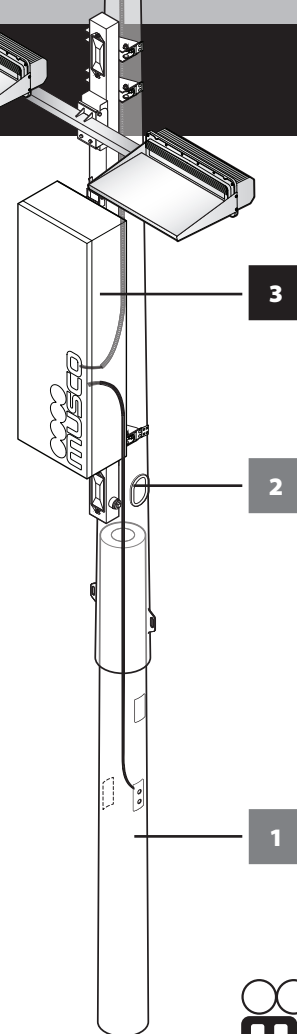
5 Poletop Luminaire Assembly

4 Wire Harness

3 Electrical Components Enclosure

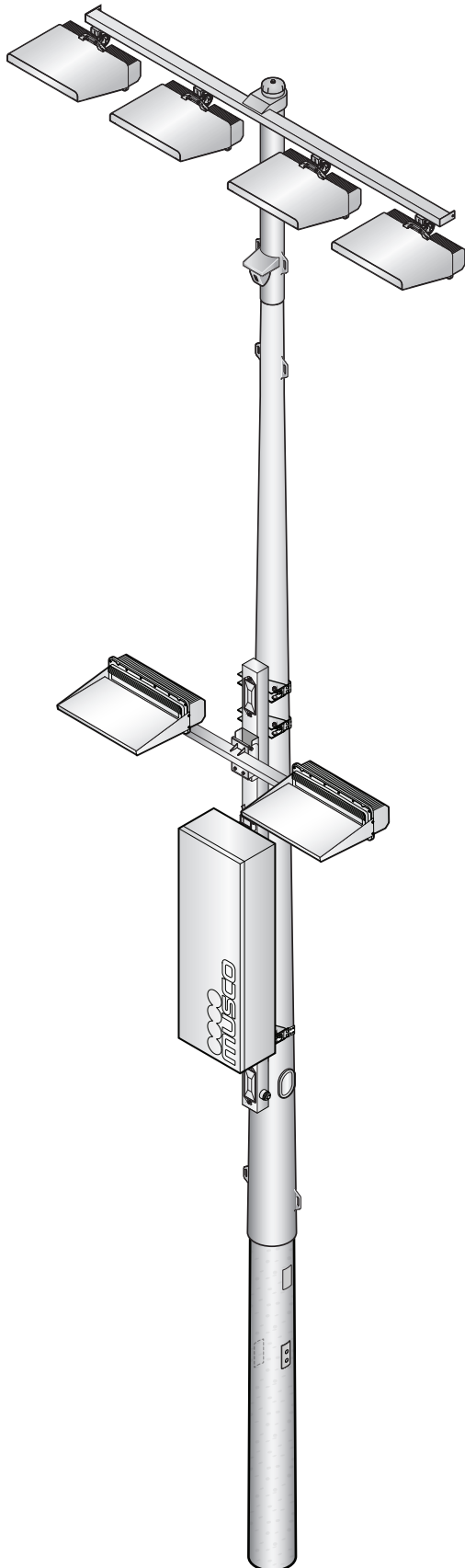
2 Existing Galvanized Steel Pole

1 Existing Precast Concrete Base



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Lighting
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Installation Instructions: **Light-Structure System™ Retrofit Lighting System**

Before You Begin

Safety Information

Electrical Safety Guidelines

Use extreme caution near overhead power lines or underground utilities. Observe all safety precautions for high-voltage equipment. Only qualified personnel may perform wiring. Follow all applicable building and electrical codes.

General Safety Guidelines

Follow proper safety procedures and established requirements during installation. Installers must wear the appropriate personal protective equipment including, but not limited to:

- Hard hat
- Steel-toed shoes
- Leather work gloves
- Eye protection
- High-visibility vest

Locate all underground utilities prior to digging.

All tools and equipment supplied by Musco are designed for specific use as described in these instructions. Do not use them in any other manner. Do not alter structural members in any way, such as bend, weld, or drill, without prior authorization from Musco.

Luminaire Mounting Information

Luminaire	Minimum Distance (per IEC/TR 62778) ¹	Projected Area (per IEC 60998-2-5) ²
TLC-LED-400	29 m (95 ft)	5.3 ft ² (0.49 m ²)
TLC-LED-550	29 m (95 ft)	3.3 ft ² (0.30 m ²)
TLC-LED-550NR	29 m (95 ft)	3.7 ft ² (0.34 m ²)
TLC-BT-575	12 m (40 ft)	3.8 ft ² (0.35 m ²)
TLC-LED-600	29 m (95 ft)	5.3 ft ² (0.49 m ²)
TLC-LED-900	29 m (95 ft)	5.3 ft ² (0.49 m ²)
TLC-LED-900NB	no minimum	4.2 ft ² (0.39 m ²)
TLC-LED-1200	42 m (138 ft)	5.8 ft ² (0.54 m ²)
TLC-LED-1400NB	38 m (124 ft)	4.2 ft ² (0.39 m ²)
TLC-LED-1500	42 m (138 ft)	6.3 ft ² (0.59 m ²)
TLC-RGB-U	12 m (40 ft)	0.95 ft ² (0.09 m ²)
TLC-RGBW/TLC-RGBA	15 m (49 ft)	5.3 ft ² (0.49 m ²)
TLC-BT-1500	42 m (138 ft)	6.3 ft ² (0.59 m ²)
TLC-RGBW-U/TLC-RGBA-U	15 m (49 ft)	1.9 ft ² (0.18 m ²)

1. The luminaires should be positioned so prolonged staring into the luminaire at a distance closer than 12 – 42 m (40 – 138 ft) is not expected, per IEC/TR 62778. See table.
2. Represents geometric area only. Your structures have been designed using Effective Projected Area (EPA).

Install luminaires outside arm's reach of unauthorized personnel.

Before You Begin

About These Instructions

These instructions give basic assembly procedures for the Light-Structure System retrofit. They are not a comprehensive guide to all possible situations. Direct any questions to your local Musco representative.

Throughout this manual note these important symbols:

- | | | | |
|--|---|---|---|
|  | The safety alert symbol alerts you of situations that require care and caution to avoid serious personal injury. |  | The go-to arrow indicates a branch in a procedure for special situations. In case of optional equipment, the instructions may be in another document. |
|  | The stop and check symbol signals you to stop and verify conditions before proceeding. |  | The tip symbol points out advice that makes installation easier. |
|  | The contact Musco symbol appears in special situations where you may need to contact Musco for further information. |  | The recycle symbol identifies recyclable materials. |

Installation Instructions: **Light-Structure System™ Retrofit Lighting System**

Before You Begin

Standard Tools/Supplies Checklist

Refer to supplemental instructions provided for additional tools required.

Contractor/installer supplied tools	Function	Page
Hammer, pry bar, banding cutters	Unloading equipment	8, 10
Ground resistance meter	Verifying existing lightning ground system	9
Angle grinder	Removal of poletop luminaire assembly	10, 13
Dead blow mallet	Removal of poletop luminaire assembly	13
Two 1½ ton chain-type come-alongs	Jacking pole sections together	27, 30
Large Phillips-head screwdriver	Tightening captive screws to seal enclosure to pole hub	12, 14, 16
Standard screwdriver	Tightening distribution lugs, 45 A disconnect switch	36, 37
Torque wrench with ⅜, ⅞ and ⅝ in sockets	Tightening luminaire retaining cable and spreader bar hardware. Must cover a range of torque from 5 ft·lb to 40 ft·lb (6 N·m to 55 N·m)	22, 26, 33
Torque wrench to cover the following ranges: 60 in·lb (6.8 N·m) to 120 in·lb (13.6 N·m) 12 ft·lb (21.7 N·m) to 40 ft·lb (54.2 N·m)	Proper torquing of fasteners	17–37
Electrical fish tape, electrician's tape	Feeding wire harness through pole	17, 35
Spray paint, chalk, or flags	Marking points to sight in aiming	27
10 ft (3 m) stepladder or small line truck	Connecting supply wires to electrical enclosure	14, 36
Musco supplied tools	Function	Page
⅝ in wrench	Tightening poletop set screw, pole cap fastener, enclosure hanger bolt, and spreader bar hardware	11–32
1⅞ in socket, extension, breaker bar, and 1⅞ in wrench	Tightening structural fasteners	10, 13, 32
⅞ in ratcheting combination wrench	Tightening captive bolts to secure luminaire assembly	24, 26
⅝ in hex key	Attaching handhole covers on base and steel pole	34, 35, 37
⅜ in hex key	Attaching grounding conductors inside electrical enclosure	36, 37
⅝ in hex key	Attaching grounding conductors inside pole at handhole	36, 37
5 mm hex key	Landing primary feed wires on 125 A disconnect switch	36, 37
Dishwashing liquid (original Dawn®, ECOS® Pro, or DIAO™ brand)	Lubricating pole slip-fit connections	27
Machinery needed	Function	Page
Crane or forklift with nylon strapping and 8 ft (2.5 m) sling (sized to weight of poletop luminaire assembly)	Unloading materials, lifting new assemblies	8, 10–13, 21, 28
Manlift or bucket truck	Poletop setting and removal, enclosure setting and removal	14–36
Load-rated crane, nylon slings, and shackles	Setting poletops	8, 10–12, 21, 28

Documents You Need

- ☐ Musco Foundation and Pole Assembly Drawing
- ☐ Field Aiming Diagram
- ☐ Control System Summary



If you do not have all of these documents, contact your local Musco representative.



Before You Begin

Electrical System Requirements

A qualified electrician must handle the electrical supply installation and hook-up in accordance with national, state, and local codes. Your electrician should review this information before installation begins.

Ensure supply wiring is rated for 90°C. Review the label inside the electrical components enclosure door and *Control System Summary* for voltage and phase requirements.

Luminaires generate up to 2.6 mA per driver on the equipment grounding conductor and are designed to meet leakage current requirements per IEC 61347-1

Basic insulation provided between RS-485 control input and main power supply.

Basic insulation provided between lighting controller (driver control/power and dimming relay) terminals and main power supply.

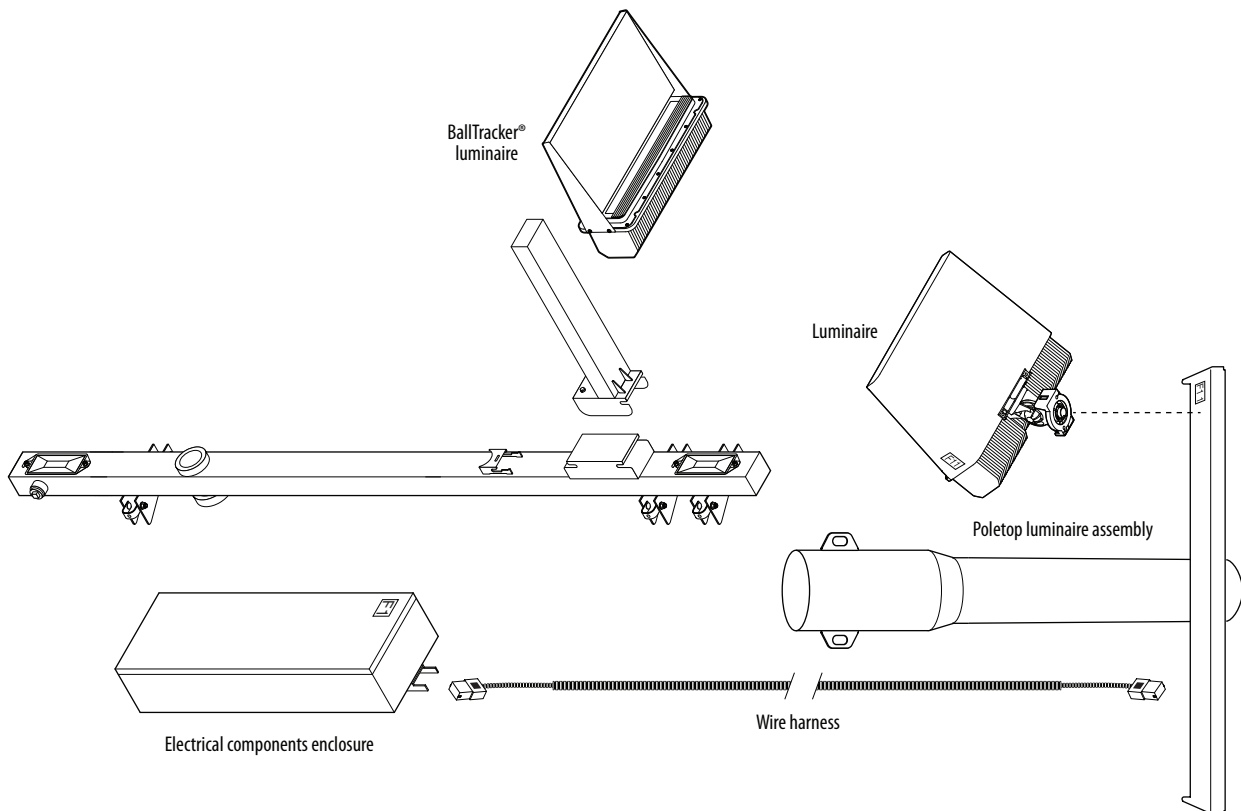
Inspect all wiring for damage prior to installation.

Always dispose of electronic waste in accordance with all applicable laws and regulations.

Components Matching and Labeling

Pole locations are identified by a pole ID (A1, A2, B1, B2, etc.) on the *Field Aiming Diagram*. These IDs are also marked on the individual components:

- Poletop luminaire assemblies, bolt-on crossarms, and luminaire shipping cartons
- Wire harnesses
- Electrical components enclosures



Before You Begin

[illegible][illegible]

FOUNDATION AND POLE ASSEMBLY DRAWING

Installation Instructions: **Light-Structure System™ Retrofit Lighting System**

Before You Begin

Unloading Instructions

A typical shipment includes electrical components enclosures, wire harnesses, and poletop luminaire assemblies with luminaires.



For ease of installation, set all matched components by the proper pole location as noted on the *Field Aiming Diagram*.

Tools/Materials Needed

- ☐ Crane with nylon web sling or forklift (load rated)
- ☐ Hammer
- ☐ Pry bar
- ☐ Banding cutters



Warning **Crushing hazard.**

Do not cut shipping bands or remove blocking from equipment until it is supported by unloading equipment.

- Check bill of lading to verify you have all materials.
- Inspect all materials for shipping damage.
- Store electrical components enclosures and luminaires in a dry location or cover with tarp until ready to install.



If additional information is needed, contact your local Musco representative.



Please recycle.

Luminaires, wire harnesses, and other components are shipped in recyclable cardboard packaging.



Installation Instructions: **Light-Structure System™** Retrofit Lighting System

Before You Begin

Inspections

1

A qualified inspector must examine the base and pole sections for damage or prior field modifications.

2

Inspect material used to protect exposed bolts. If repair is required, Musco recommends removing damaged material and replacing with wire mesh.

3

If pole is equipped with an external ground rod, test earth ground connection of pole. If greater than 25 ohms, install additional ground rod and retest.

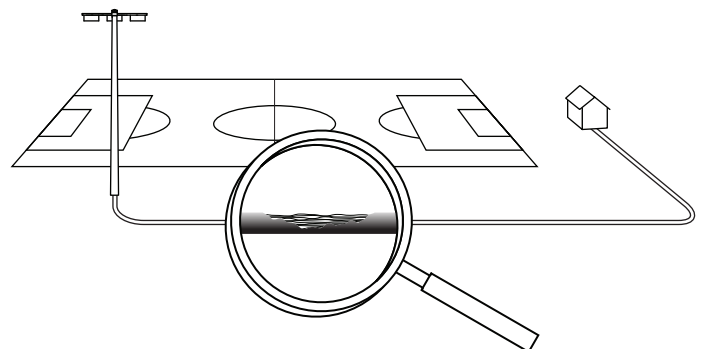
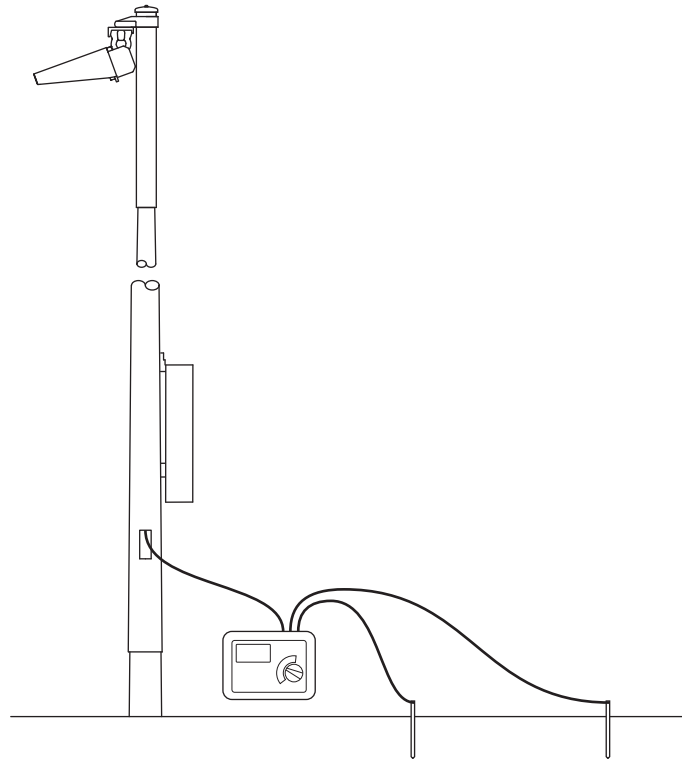
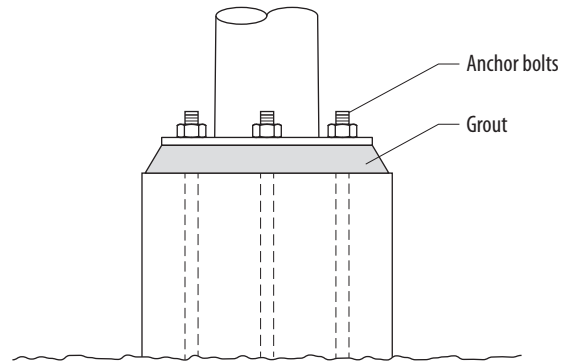
Repeat until < 25 ohms.

4

Conduct insulation test on all conductors. No individual conductor should be less than 100Mohms.



Notify your local Musco representative if concerns are identified with any of these items.



Disassembly

Overview

Remove the existing equipment to be replaced: electrical components enclosures, wire harness, and poletop luminaire assembly (or bolt-on crossarms).

Tools/Materials Needed

Musco Supplied (For bolt-on crossarms.)

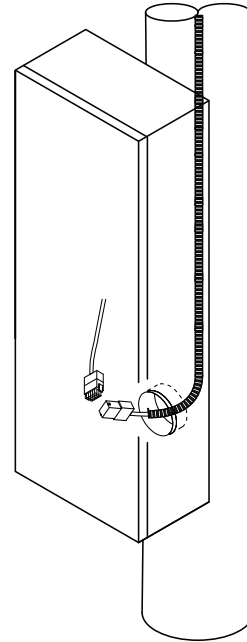
- ☐ 1½ in socket, ¾ in drive
- ☐ Breaker bar, ¾ in drive
- ☐ 4 in extension, ¾ in drive
- ☐ 1½ in wrench

Contractor Supplied

- ☐ ⅝ in wrench, ⅝ in socket and ratchet
- ☐ Angle grinder with metal cutting wheel
- ☐ Crane and slings to support poletop luminaire assembly
- ☐ Dead blow hammer
- ☐ Ratchet, ¾ in drive

Disassembly

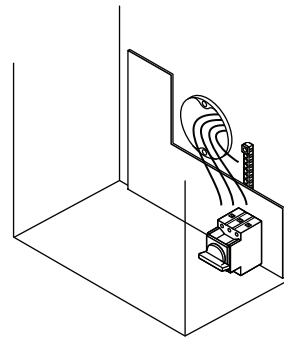
- 1 In electrical components enclosure, disconnect pole harness from enclosure harness. Feed end of pole harness into pole interior. Cut off connector if necessary.



Warning **Risk of electrical shock**

Ensure all circuits are disconnected before proceeding.

- 2 Disconnect electrical supply wiring and equipment grounding conductor.
- 3 Remove wire harnesses between top, middle, and bottom boxes.
- 4 Remove wiring between stacks.



Disassembly

5

Using $\frac{5}{16}$ in wrench and Phillips screwdriver, loosen enclosure hanger bolts, and captive hub screws.

6

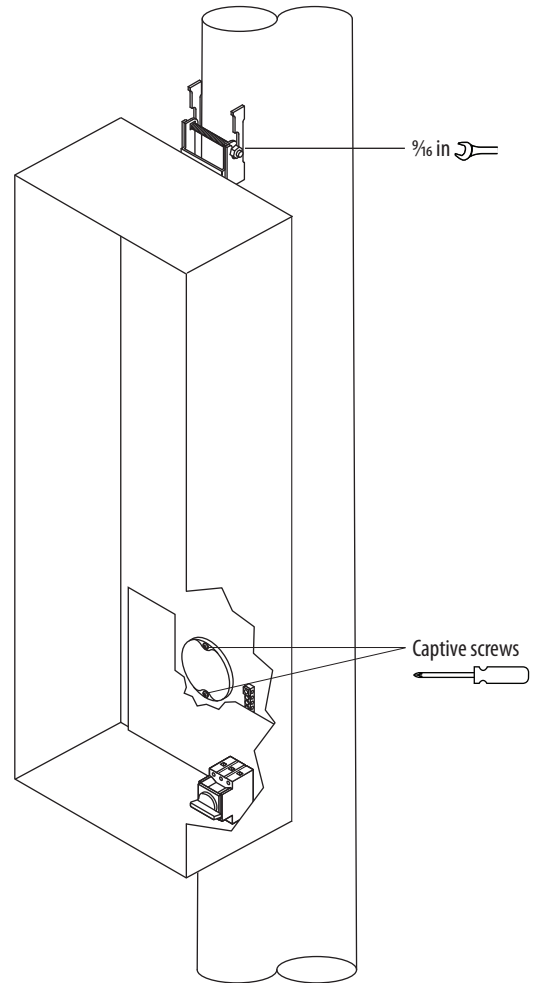
Using a crane and sling, remove enclosures from the stack, starting at the top.



Warning

Falling equipment hazard

Enclosures may weigh up to 225 lb (102 kg). Lift with caution.

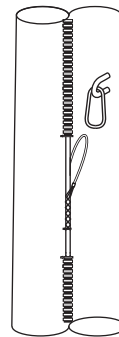


7

Disconnect middle wire support grip on poles greater than 80 ft (24.5 m).



Leave the pole harness connected to the poletop luminaire assembly. It will pull out as the poletop is removed.



Disassembly

- 8** Determine if entire poletop luminaire assembly (welded crossarms) or crossarms only (bolted crossarms) will be replaced.



If replacing bolt-on crossarms, skip to Step 13.

9

Using $\frac{9}{16}$ in wrench, loosen set screw.

10

Use crane to sling around the top crossarm and provide a slight separating force to the poletop.



Warning **Crushing hazard**

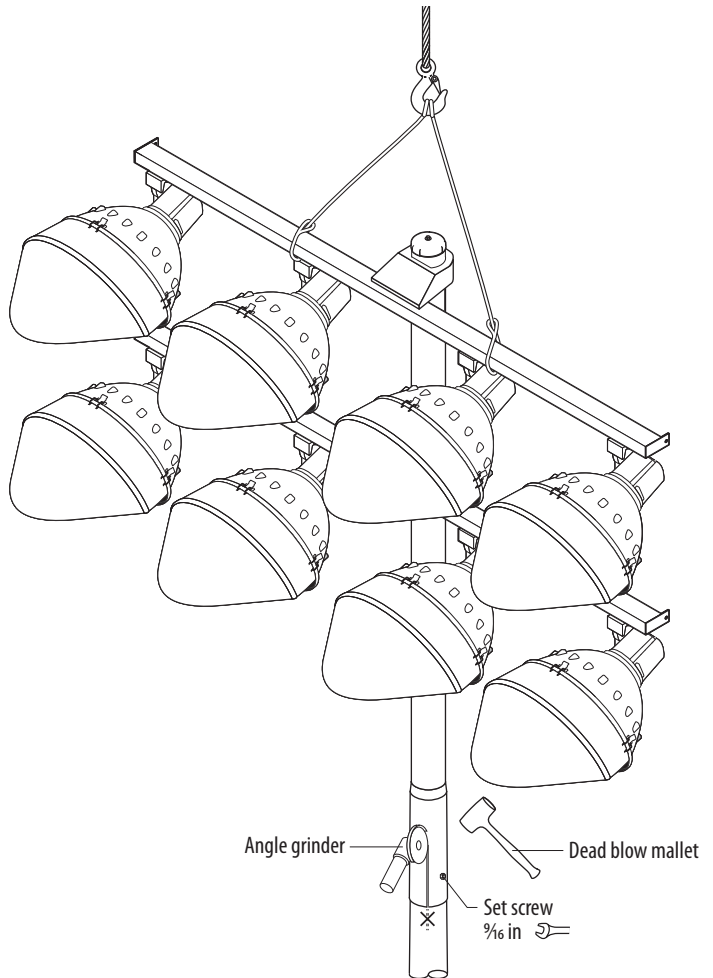
Do not attempt to "pop off" the poletop using the crane only as the high separating forces can cause an uncontrolled separation and potential injury.

11

Use an angle grinder to make a relief cut in the overlap area of the poletop luminaire assembly. Do not damage the pole section underneath the poletop.

12

Tap on the poletop with a dead blow mallet until it begins to move and separate.

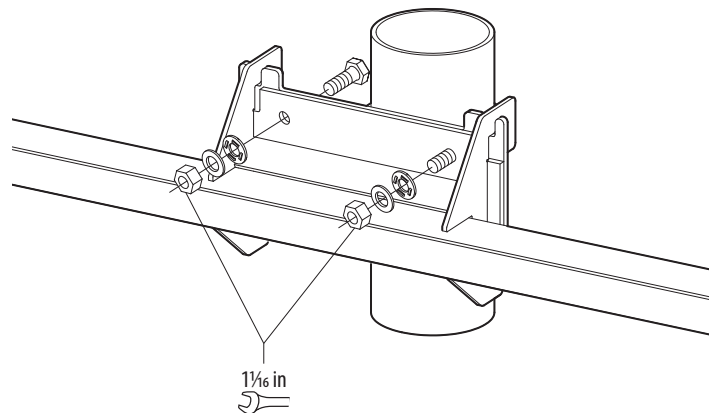


13

Use crane and sling to support crossarm.

14

Use supplied breaker bar, $1\frac{1}{16}$ in socket, extension, and wrench to remove crossarm retaining bolts.



Electrical Components Enclosure and BallTracker® Luminaire

Overview

The electrical components enclosure is factory-wired and tested. It contains essential electrical components of the lighting system in an accessible location.

Tools/Materials Needed

Musco Supplied

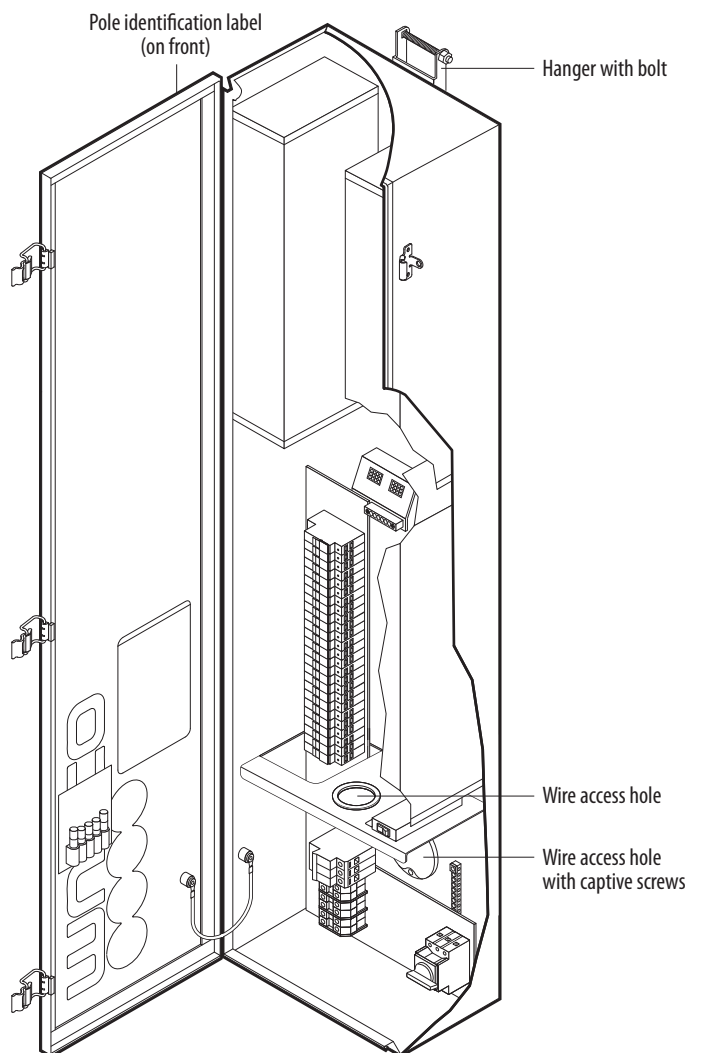
- ☐ ½ and ⅝ in offset combination wrenches
- ☐ Snips
- ☐ *Field Aiming Diagram*

Contractor Supplied

- ☐ Torque wrench with ½ and ⅝ in sockets
- ☐ Large Phillips-head screwdriver
- ☐ Measuring tape
- ☐ Marker
- ☐ 10 ft (3 m) stepladder or small line truck



Consult project documents to determine if your enclosures will mount on existing hangers or if new mounting bracket has been provided.



Installation Instructions: **Light-Structure System™** Retrofit Lighting System

Electrical Components Enclosure and BallTracker® Luminaire

Round Pole Strap Selection

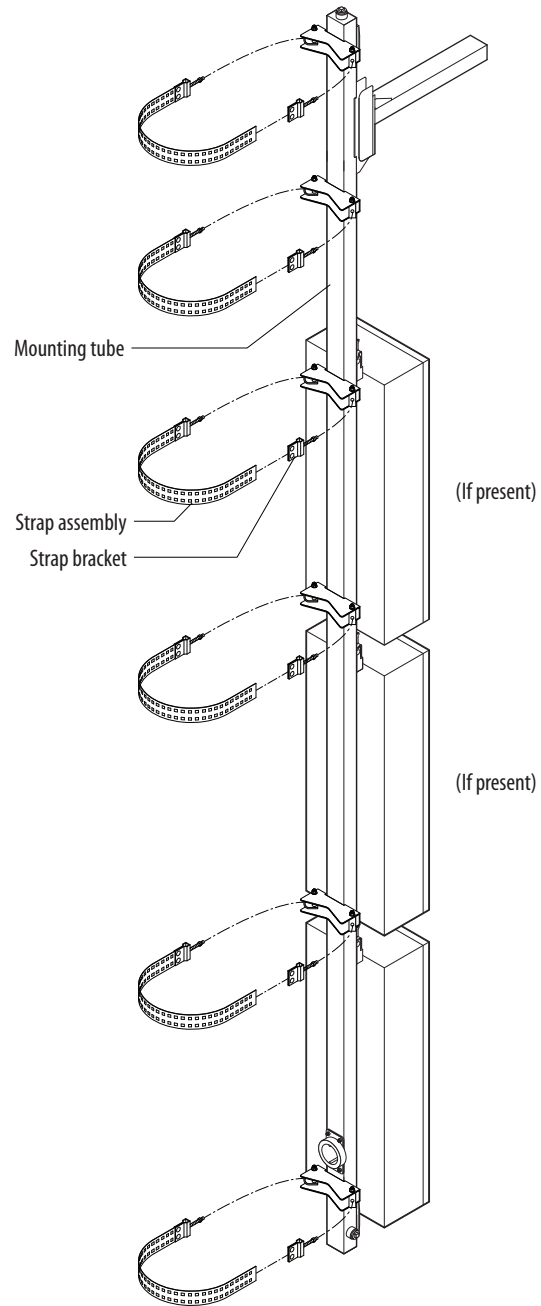
Diameter	Round Pole Strap Length
0 – 17 in (0 – 432 mm)	45 in (1143 mm)
17.01 – 22 in (432 – 559 mm)	60 in (1524 mm)
22.01 – 28 in (559 – 711 mm)	78 in (1981 mm)
28.01 – 34 in (711 – 864 mm)	96 in (2438 mm)
34.01 – 40 in (864 – 1016 mm)	114 in (2896 mm)
40.01 – 46 in (1016 – 1168 mm)	132 in (3353 mm)

Square Pole Strap and Bracket Selection

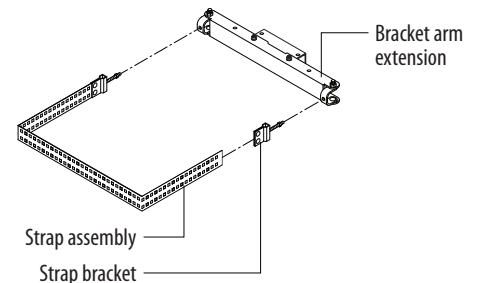
Width	Strap Length	Bracket Arm Extension Width
0 – 12 in (0 – 304 mm)	45 in (1143 mm)	14 in (356 mm)
12.01 – 16 in (304 – 406 mm)	60 in (1524 mm)	18.5 in (470 mm)
16.01 – 20 in (406 – 508 mm)	78 in (1981 mm)	22.5 in (572 mm)
20.01 – 24 in (508 – 610 mm)	96 in (2438 mm)	26.5 in (673 mm)
24.01 – 28 in (610 – 711 mm)	114 in (2896 mm)	30.5 in (775 mm)



Mounting tubes are marked with pole ID. One strap assembly and one strap bracket required per mounting arm (as shown).



Round pole option (shown)



Option for square pole

Electrical Components Enclosure and BallTracker® Luminaire



Verify pole ID on electrical components enclosure matches pole location on *Field Aiming Diagram*.

Assembly Procedure



Caution

Electrical components enclosures are heavy

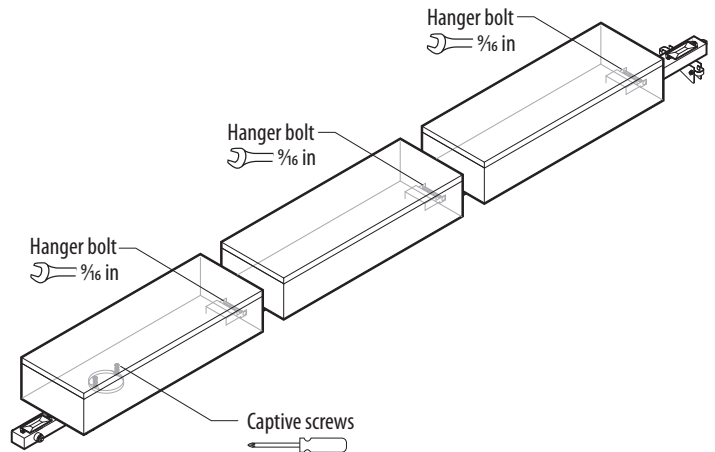
Electrical components enclosure may weigh up to 65 lb (30 kg). Lift carefully with two people to avoid injury.

1

Mount bottom enclosure on tube. Align wire access hole with hub. Tighten captive screw using Phillips-head screwdriver. Tighten hanger bolt with $\frac{5}{16}$ in wrench.

2

Mount middle and/or top enclosures. Align access hole with hub and slide box onto hanger bracket. Tighten hanger bolt with $\frac{5}{16}$ in wrench.



Electrical Components Enclosure and BallTracker® Luminaire

3 If pole includes a BallTracker® luminaire, attach bracket using $\frac{3}{4}$ in socket and torque wrench. Tighten captive bolts to 40 ft•lb (54 N•m).

4 Position crossarm near poletop, and feed crossarm wire harness through hole in center of poletop plate.

Route crossarm wire harness to upper handhole for connection to pole harness.



Ensure crossarm wire harness is not pinched between mating plates.

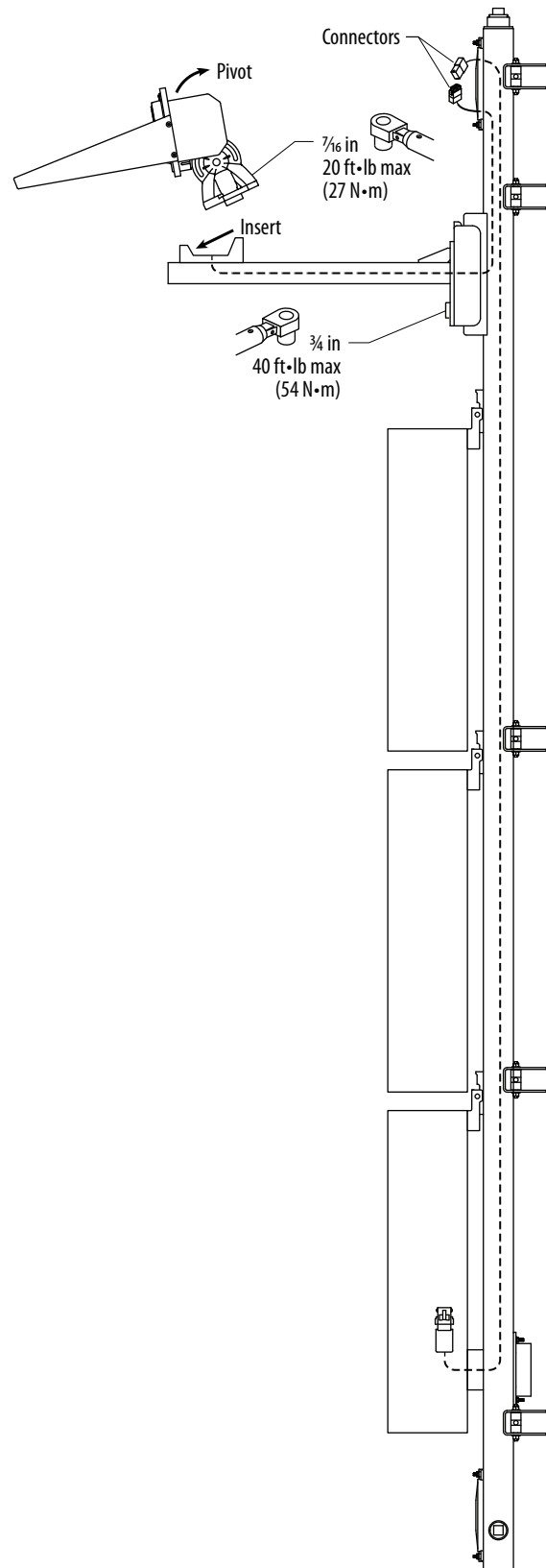
5 Using $\frac{7}{16}$ in socket and torque wrench, tighten captive mounting bolts to 20 ft•lb (27 N•m). Orange tag will break loose before all bolts are fully tight.

6 Pull BallTracker® wire harness through tube.
Feed bottom of harness into enclosure hub.

7 Fish all pole wire harnesses between poletop and appropriate electrical components enclosure(s). Use handholes to access tube and aid in routing pole harness. Ensure protective sleeve extends through access hub and tuck harnesses behind subpanel.

8 Attach support grips at top handhole.

9 Mate quick-connectors at poletop and inside electrical components enclosure(s). Match driver/luminaire IDs.



Electrical Components Enclosure and BallTracker® Luminaire



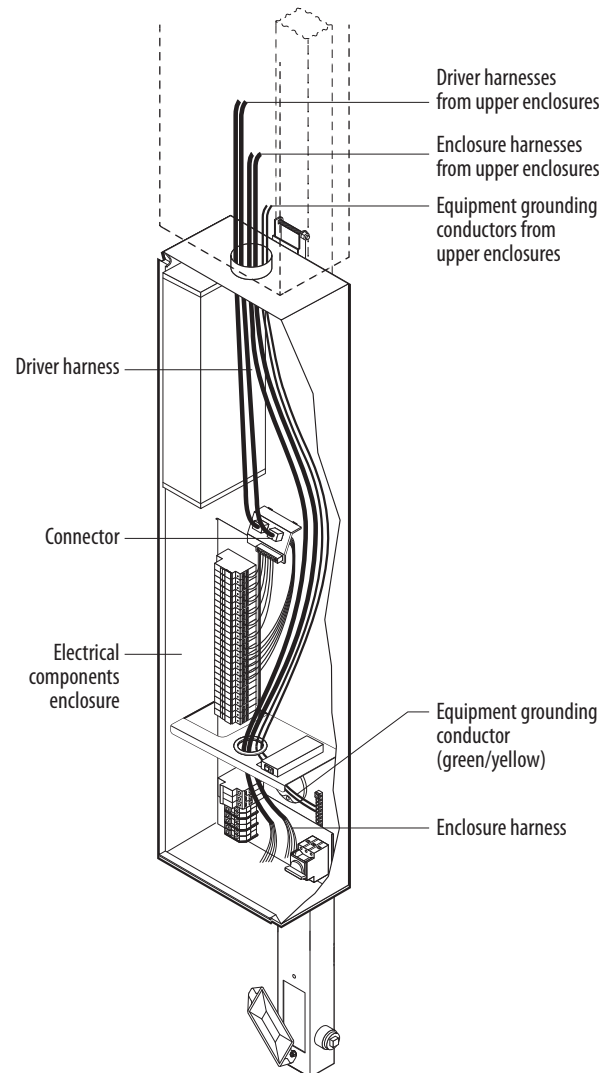
Only qualified personnel may perform wiring. Route wires as shown, but leave final connections for your electrician.

10

Route driver harnesses from top and middle enclosures to bottom enclosure and plug into connector mounted in bracket.

11

Route equipment grounding conductor and enclosure harnesses from top and middle enclosures to bottom enclosure.



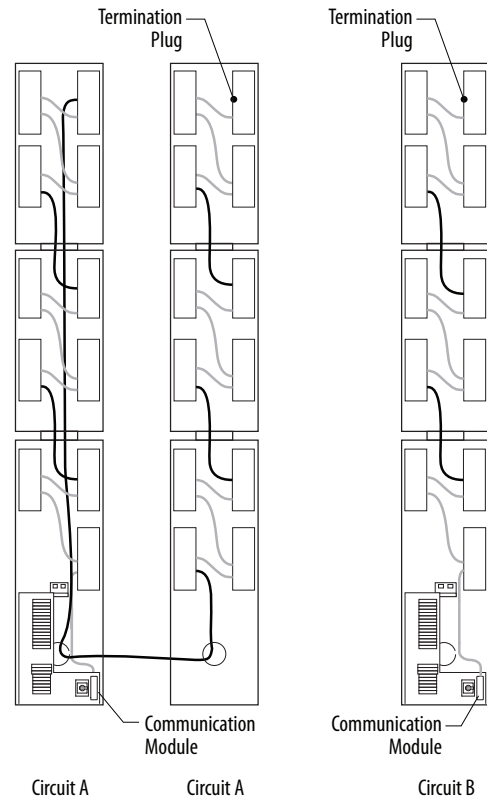
Electrical Components Enclosure and BallTracker® Luminaire

Note: Skip step 12 if drivers or controllers do not include communication.

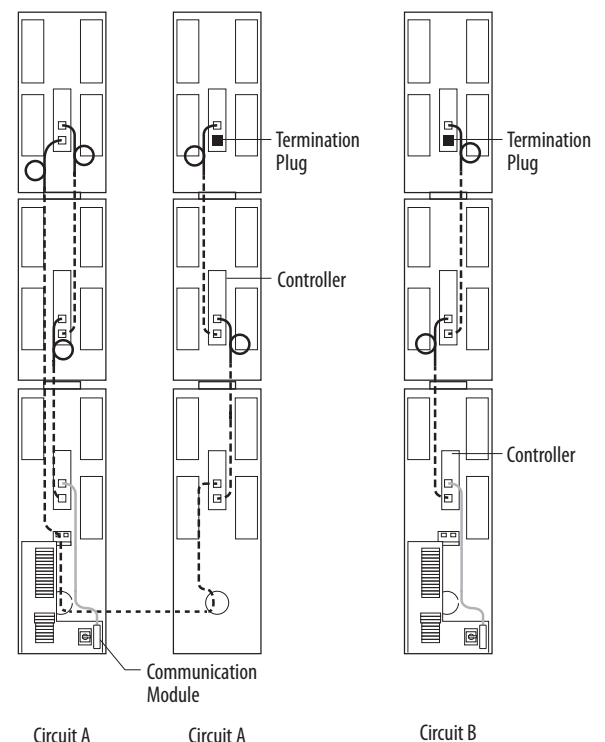
12

Pull communication cables down from top and middle boxes and plug into driver or controller in enclosure below as shown.

Connecting Drivers



Connecting Controllers

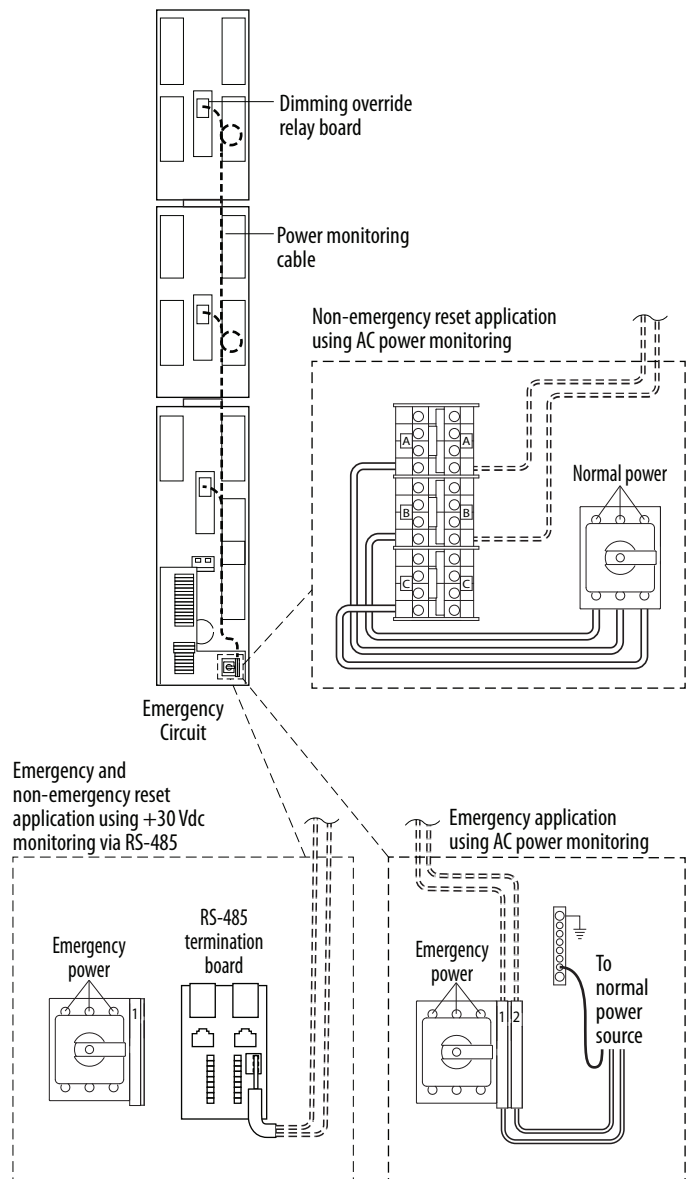


Electrical Components Enclosure and BallTracker® Luminaire

Skip Step 13 if emergency egress lighting dimming override relay board is not present.

13

Pull power monitoring cable from dimming override relay board in top and middle enclosures down to bottom enclosure and land black wire on terminal block M1 and blue/white wire on terminal block M2.



Electrical Components Enclosure and BallTracker® Luminaire

Installation Procedure



Verify pole ID on electrical components enclosure matches pole location on *Field Aiming Diagram*.

1

Sling enclosure stack under the welded arm for strapping connections (not under BallTracker luminaire crossarm) and lift enclosure stack.

2

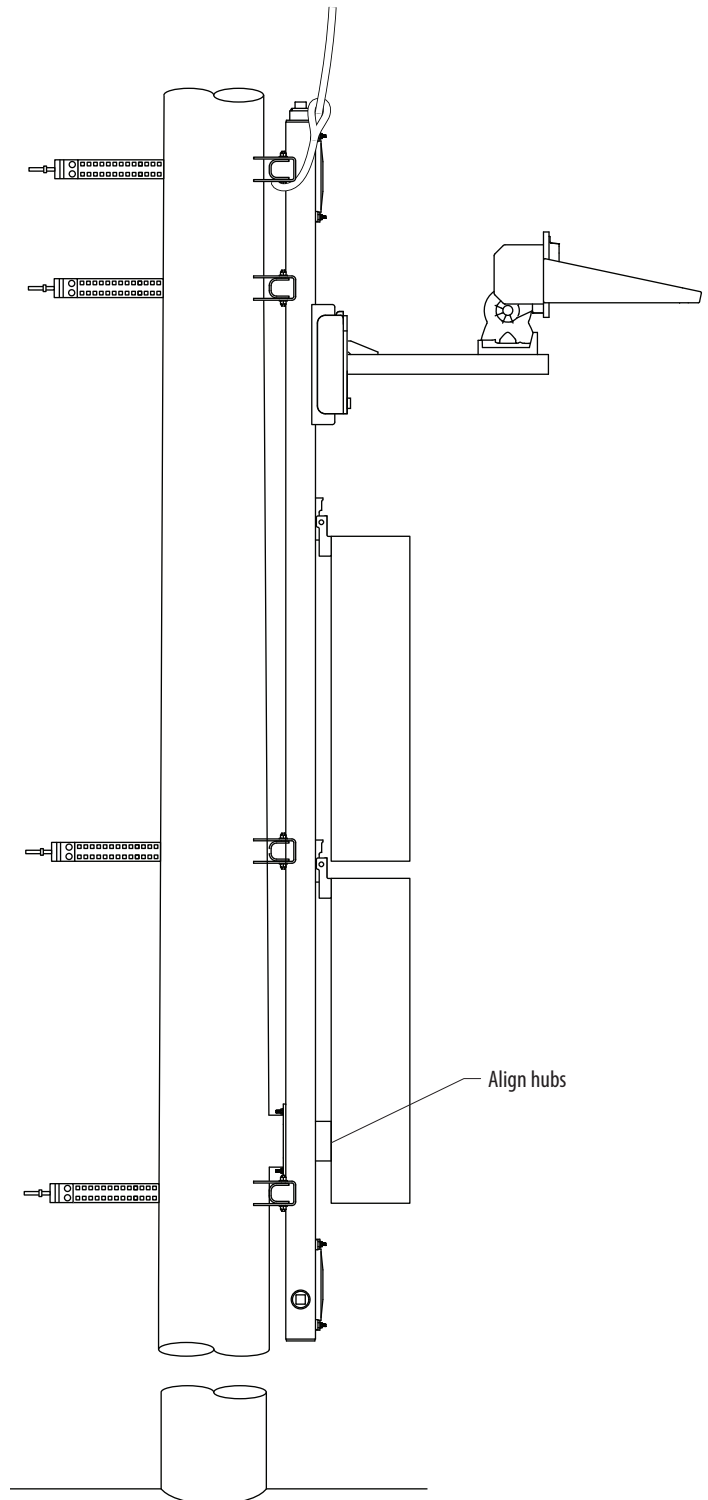
Align hub on tube with pole hub.



Enclosure stacks that are not mounted on a pole hub will include cover plates for tube opening. Ensure these plates are installed.



BallTracker® luminaires should face the field. If pole hub does not face the field, contact your Project Engineer or local Musco representative.



Electrical Components Enclosure and BallTracker® Luminaire

3

Cut straps to required length. Pull tight around pole and trim excess within 1 in (25 mm) of strap bracket. Cut across square holes, not between them.

4

Attach brackets to pole. Torque $\frac{5}{16}$ in strap bracket hardware A to 12 ft•lb (16 N•m) using $\frac{1}{2}$ in socket and torque wrench. Torque all $\frac{3}{8}$ in tensioning nuts B to 20 ft•lb (27 N•m) using $\frac{5}{16}$ in socket and torque wrench.



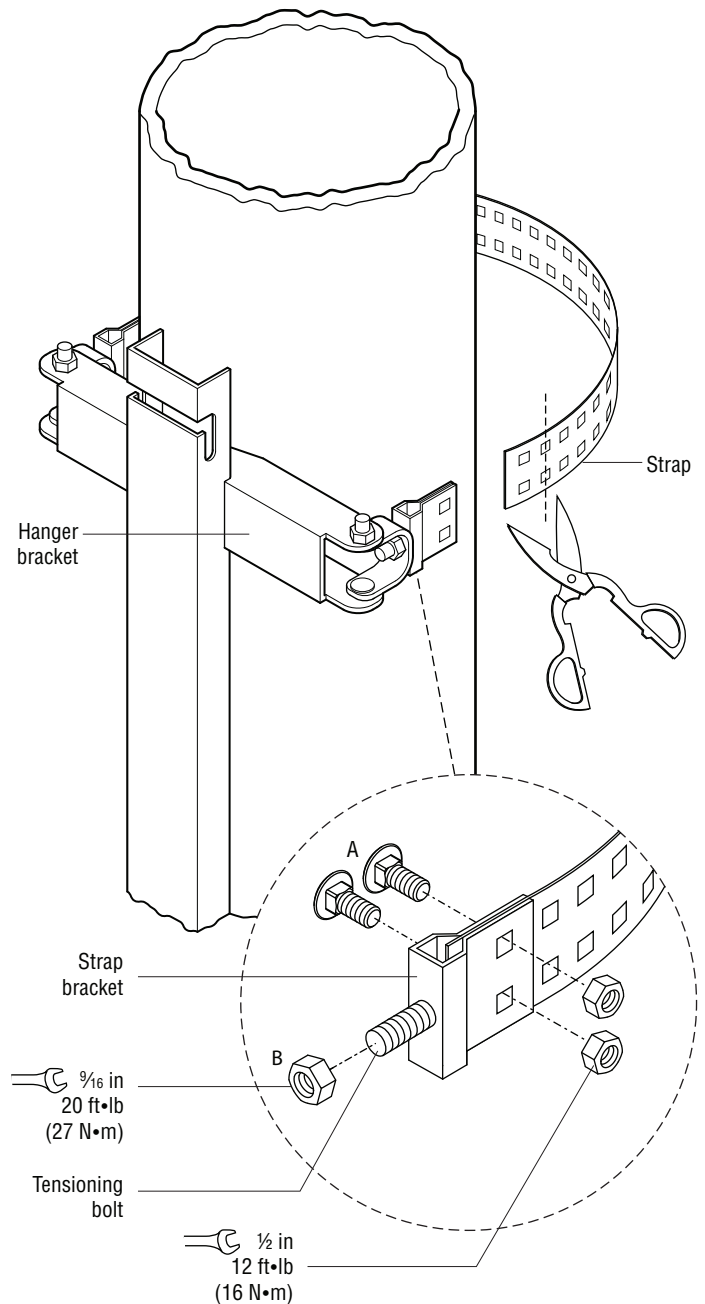
Caution

Falling equipment hazard

Ensure you meet torque values specified on all tensioning hardware.



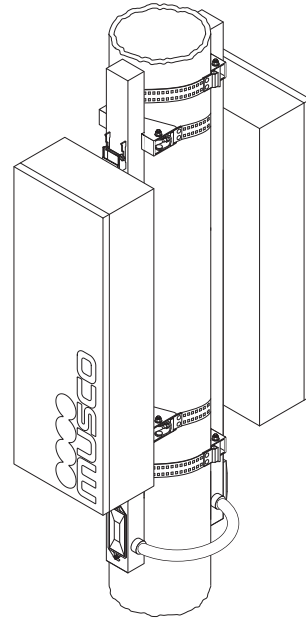
If tensioning bolt is fully seated and strap is not yet tight, trim strap at next set of holes and repeat step 4.



Electrical Components Enclosure and BallTracker® Luminaire

5

Repeat steps 3 and 4 for back-to-back or multiple stacks.



6

Use 1 1/4 in hubs provided to run flex conduit between electrical component enclosure stacks.

Installation Instructions: **Light-Structure System™ Retrofit Lighting System**

Luminaire Attachment

Overview

Luminaires are factory built and shipped in individual cartons. They are factory aimed and ready for installation. Do not disassemble knuckle.

Tools/Materials Needed

Musco Supplied

- ☐ 7/16 in ratcheting combination wrench

Contractor Supplied:

- ☐ Torque wrench with 7/16 in socket

Note: Leave luminaires in box until ready to assemble. Keep protective cover on luminaire until ready to set pole. Do not leave luminaires unassembled from crossarm in wet conditions.



Caution

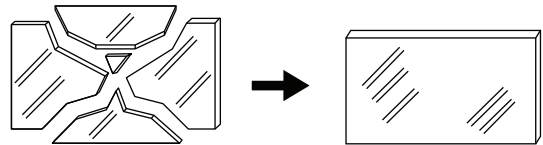
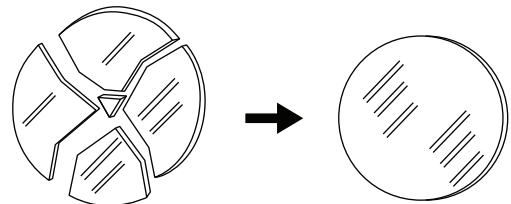
No User Serviceable Parts

If protective lens glass is cracked or broken, luminaire must be replaced.

Luminaire light source is not replaceable; when light source reaches end of life entire luminaire must be replaced.



Contact your local Musco representative for maintenance or replacement.



Assembly Procedure

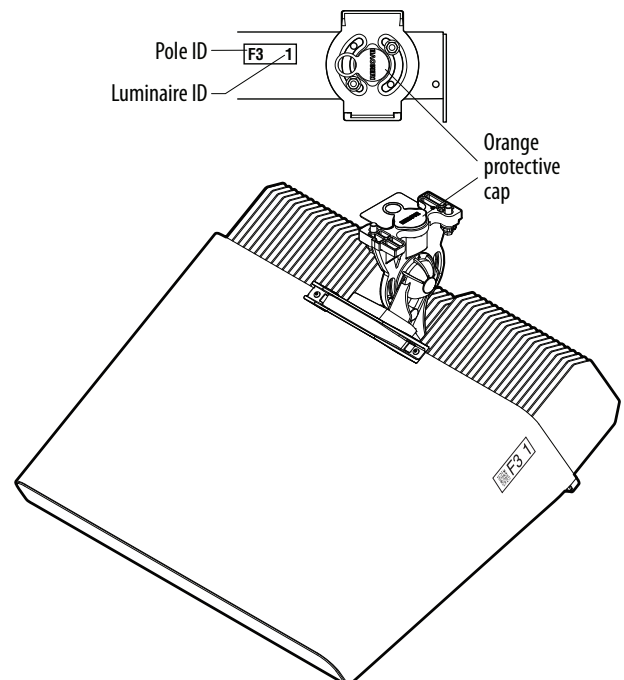


Verify pole ID on luminaire cartons matches pole and location on *Field Aiming Diagram*.

1

Remove and discard orange protective caps from luminaire knuckle and mounting plate that cover electrical connections. Do not remove orange tag around captive bolts.

Note: The luminaire style may vary from what is shown.



Luminaire Attachment



Warning

Risk of injury or property damage

Rotation may be required to assemble all luminaires onto the poletop luminaire assembly. Do not stand under poletop when lifting. Steady with two people holding crossarms. Allow for poletop to safely rotate around when it is high enough for crossarms to clear the ground.



Caution

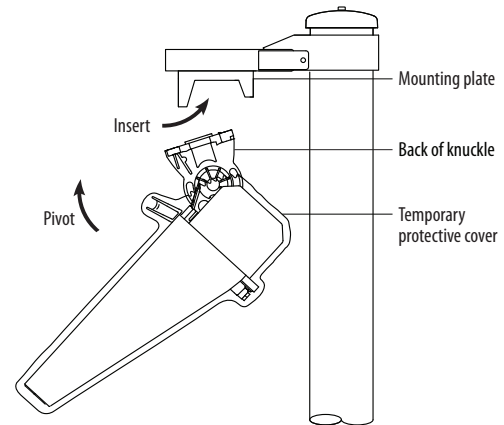
Risk of injury or property damage

Pole may move without warning. Properly support pole before attaching luminaires.

2

Match luminaire ID to crossarm and install luminaire onto mounting plate. Use handle if present to lift luminaire. Insert back of knuckle into mounting plate and pivot into position.

Note: The luminaire style may vary from what is shown.



Luminaire	Weight
TLC-LED-400	40 lb (18 kg)
TLC-LED-550	25 lb (11 kg)
TLC-LED-550NR	38 lb (17 kg)
TLC-BT-575	34 lb (15 kg)
TLC-LED-600	40 lb (18 kg)
TLC-LED-900	40 lb (18 kg)
TLC-LED-900NB	114 lb (52 kg)
TLC-LED-1200	45 lb (20 kg)
TLC-LED-1400NB	106 lb (48 kg)
TLC-LED-1500	67 lb (30 kg)
TLC-RGB-A	40 lb (18 kg)
TLC-RGB-U	20 lb (9 kg)
TLC-RGBW	40 lb (18 kg)
TLC-TW	40 lb (18 kg)
TLC-BT-1500	67 lb (30 kg)
TLC-RGBW-U/ TLC-RGBA-U	40 lb (18 kg)



Caution

Luminaire May Be Heavy

Lift carefully with two people. Do not use visor to lift. Use handle if provided.

Luminaire Attachment

3

Using $\frac{7}{16}$ in socket and torque wrench, tighten captive mounting bolts to 20 ft•lb (27 N•m). Orange tag will break loose before all bolts are fully tight.

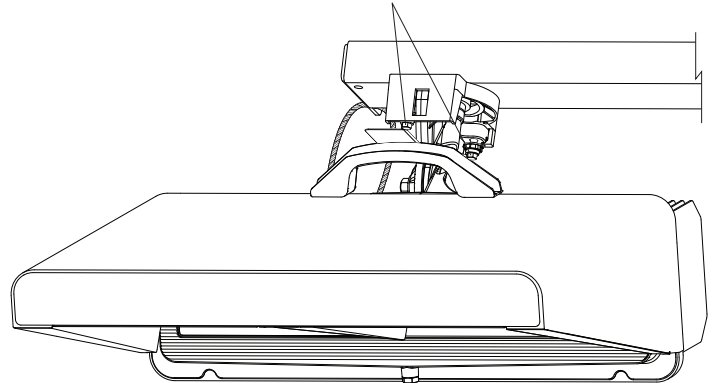


Warning

Luminaire may fall if bolts are not tight.

Do not remove tag before tightening bolts.

Captive mounting bolts $\frac{7}{16}$ in 20 ft•lb (27 N•m)

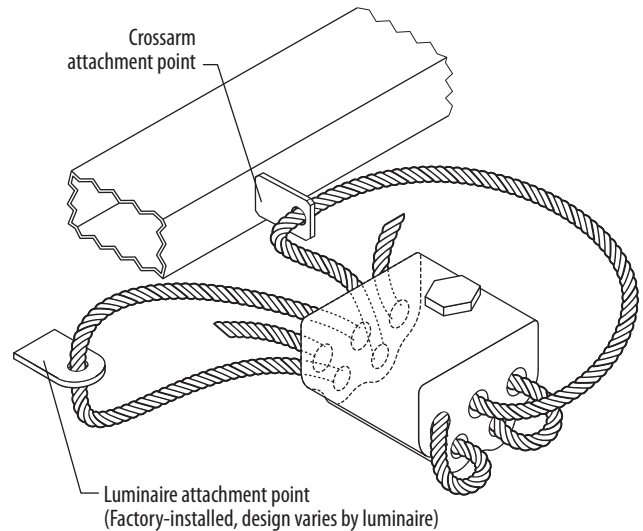


4

Attach luminaire retaining cable (if present). Route luminaire cable through crossarm anchor point, through luminaire block, and back through the block under the set screw. Luminaire attachment point will vary per luminaire design.

5

Using $\frac{7}{16}$ in socket and torque wrench, tighten cable set screw to 60 in•lb (6.8 N•m).



Installation Instructions: **Light-Structure System™** Retrofit Lighting System

Poletop Luminaire Assembly

Overview

The galvanized steel pole and poletop luminaire assembly are designed to slip-fit together. Jacking ears on pole section and poletop assembly provide attachment points to pull sections together. The *Musco Foundation and Pole Assembly Drawing* gives minimum overlap specifications for each poletop luminaire assembly.

Tools/Materials Needed

Musco Supplied

- ☐ Musco *Foundation and Pole Assembly Drawing*

- ☐ 5/16 in wrench

- ☐ Dishwashing liquid (original Dawn®, ECOS® Pro, or DIAO™ brand)

Contractor Supplied

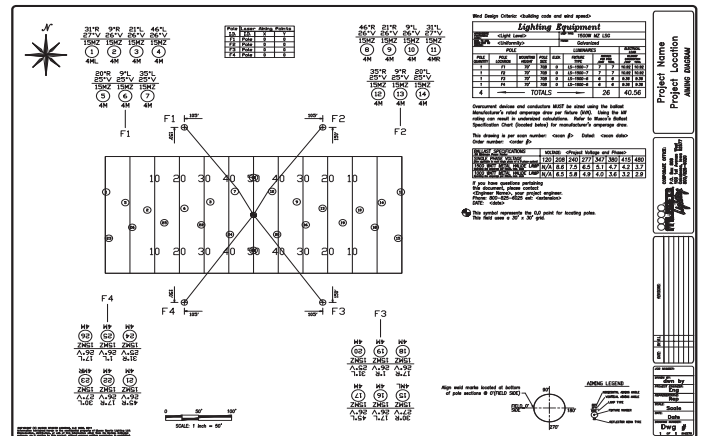
- ☐ Two 1½ ton chain come-alongs

 If pole utilizes bolt-on bars, skip to next section. See *Musco Foundation and Pole Assembly Drawing*.

Assembly Procedure

 Verify pole ID on each poletop luminaire assembly matches pole location on *Field Aiming Diagram*. Pole ID is labeled on crossarm.

1 Plot and mark aiming point(s) on field. Refer to *Field Aiming Diagram*.



Poletop Luminaire Assembly



Warning

Laser radiation hazard

Pole alignment beam is safe for viewing at a distance of three feet (one meter) or more. Do not look into beam from closer than three feet (one meter).

2

Turn on pole alignment beam.

3

Hook pole harness wire support grip to the poletop luminaire assembly u-hook and bundle the pole harness to the bottom crossarm.

4

Lubricate top of steel pole section with supplied dishwashing liquid.

5

Sling and lift poletop luminaire assembly into place.

6

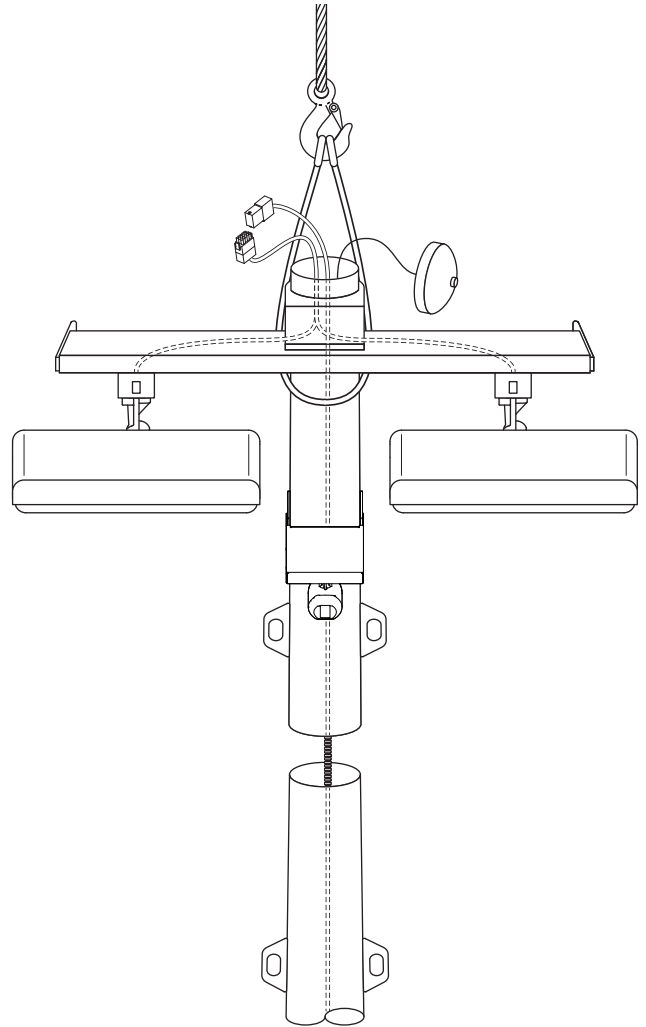
Carefully lower the pole harness(es) down into the pole. The attached cable support hook will prevent the pole harness from dropping.



Warning

Falling material hazard

If erecting pole with luminaire assembly attached, do not attach rigging to luminaire assembly. Follow pole supplier instructions for lifting.



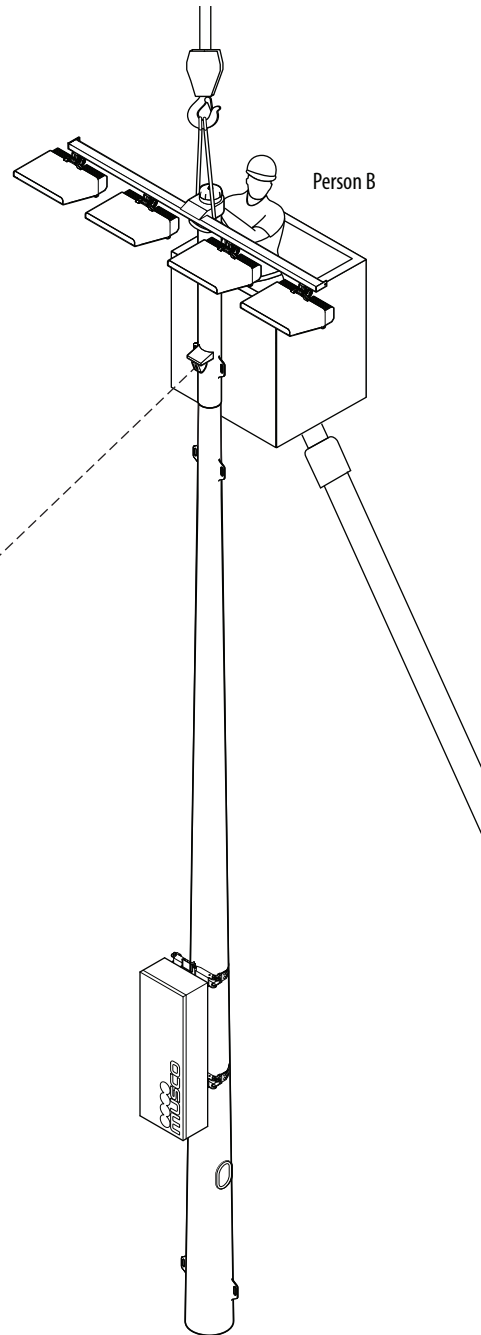
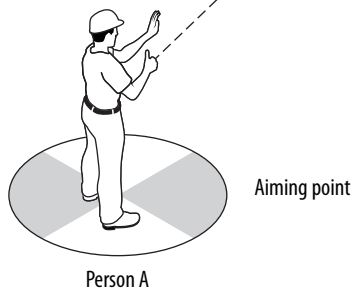
Poletop Luminaire Assembly

7

Aim luminaire assembly using alignment beam. Device projects a narrow vertical beam of light that is only visible when you are aligned with it. This step requires two people.

Person A: Stand on field aiming point and look at pole alignment device. It is attached to a luminaire. Walk parallel to crossarms until you see beam. Signal person B to rotate luminaire assembly left or right until beam aligns with aiming point. Beam may be visible, however when pole is aligned, you will see a bright flash as you stand directly on aiming point.

Person B: Following direction from person A, rotate luminaire assembly left or right until it is aligned.



Warning

Laser radiation hazard

Pole alignment beam is safe for viewing at a distance of three feet (one meter) or more. Do not look into beam from closer than three feet (one meter). Do not use binoculars, camera, or telescope to view beam from any distance. Locator beam is a class 2M laser device. Wavelength: 635-660 nm, Laser power for classification: <1 mW continuous, divergence: <1.5 mrad x 1 rad. Using alignment beam in a manner other than as described here may result in hazardous exposure. Do not modify, dismantle, or attempt to repair.

Poletop Luminaire Assembly

8

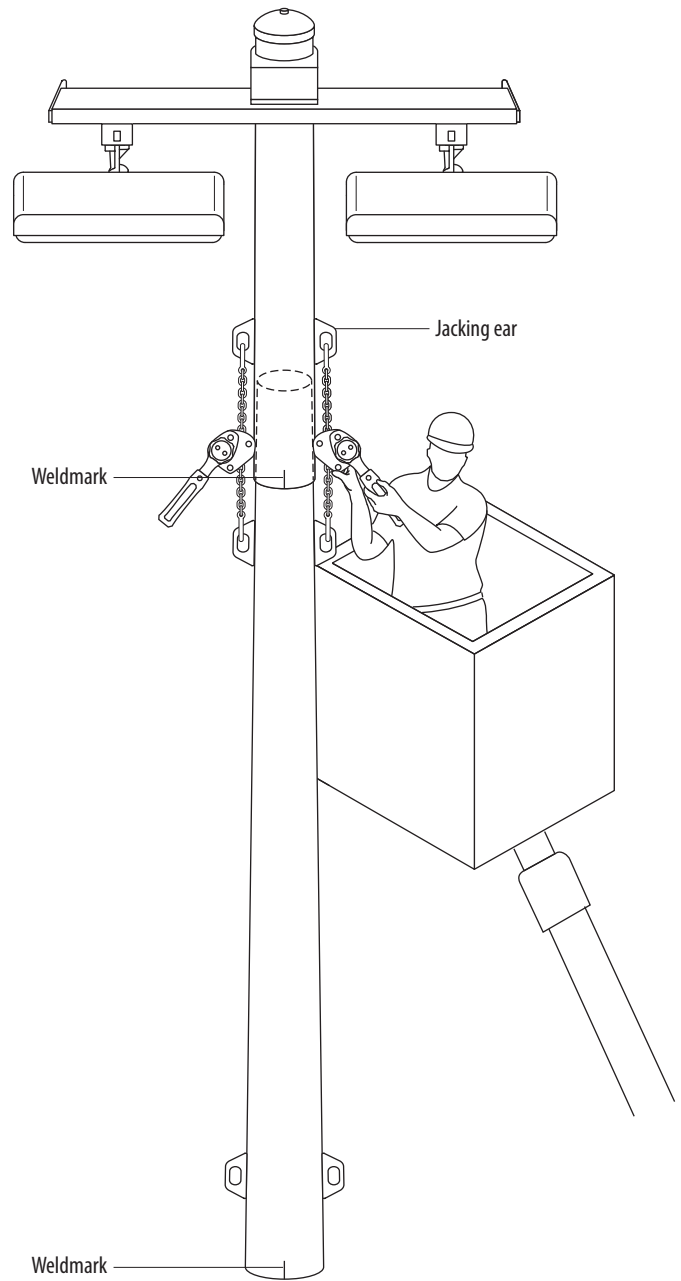
Using two 1½ ton come-alongs, pull poletop luminaire assembly onto pole evenly until tight. Ensure minimum overlap per Musco Foundation and Pole Assembly Drawing.



Ensure alignment is maintained while tightening.

9

Tighten set screw using ⅝ in wrench.



Bolt-on Crossarms

Overview

Bolt-on bar style may vary from what is shown. Replacement procedure is identical.

Tools/Materials Needed

Musco Supplied:

- ☐ ¾ in drive 1 ¼ in socket
- ☐ ¾ in drive breaker bar
- ☐ ¾ in drive 4 in extension
- ☐ 1 ¼ in wrench
- ☐ Spreader bars
- ☐ ⅜ in fasteners (for spreader bars)
- ☐ ⅝ in structural fasteners
- ☐ ⅞ in wrench

Contractor Supplied:

- ☐ Torque wrench with ⅞ in socket

Assembly Procedure



Verify pole ID on crossarm matches ID of pole.

Note: Each crossarm is factory assembled for a specific position on poletop section to ensure correct aiming. Top side of crossarm is labeled with crossarm's position number. Example: Position 1 is installed on first position from top of poletop section.

1

Position crossarm near poletop, and feed crossarm wire harness through hole in center of poletop plate.

Route wire harness for crossarms 1–3 to top of pole.

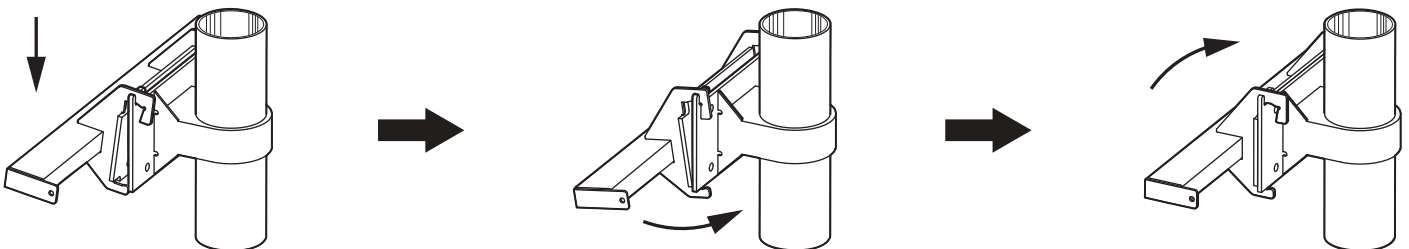
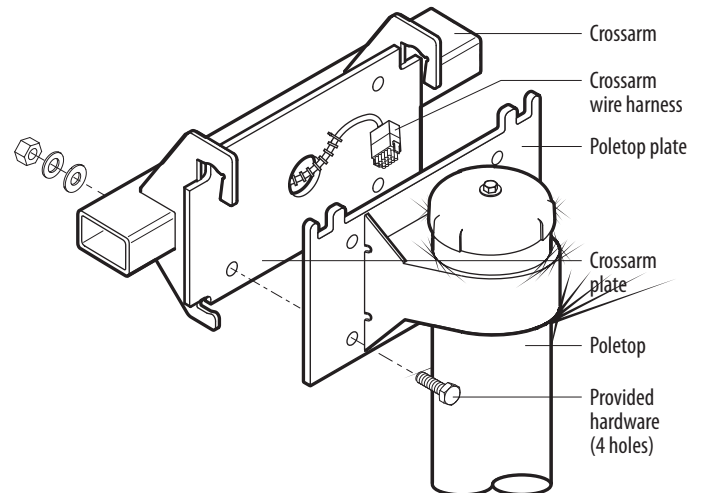
Route wire harness for crossarms 4–7 to handhole below crossarm position 5.

2

Position crossarm as shown below.



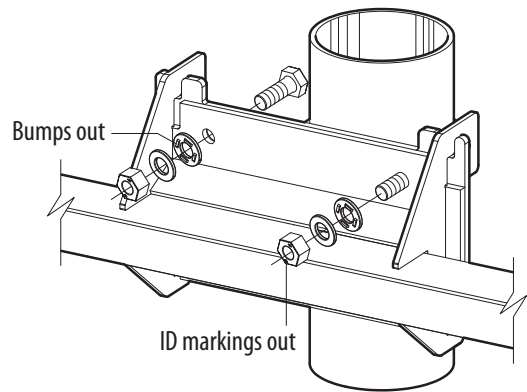
Ensure crossarm wire harness is not pinched between mating plates.



Bolt-on Crossarms

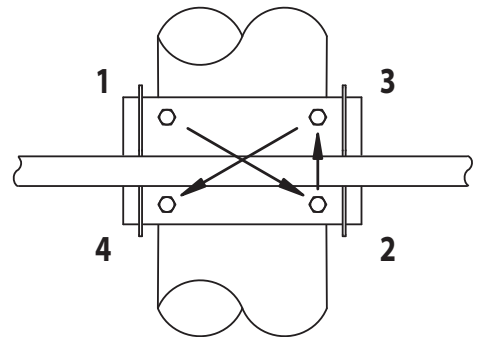
3

Install bolts through plates with threads away from pole. Place direct tension indicating (DTI) washer next, with flat surface (orange material) against plate, and bumps facing out toward nut. Place flat washer next, followed by nut. Small ID markings on nut must face out to allow proper identification of nut.



4

Snug all nuts. Using supplied $1\frac{1}{16}$ in wrench, tighten each nut until plates are in firm contact. Follow tightening sequence shown.

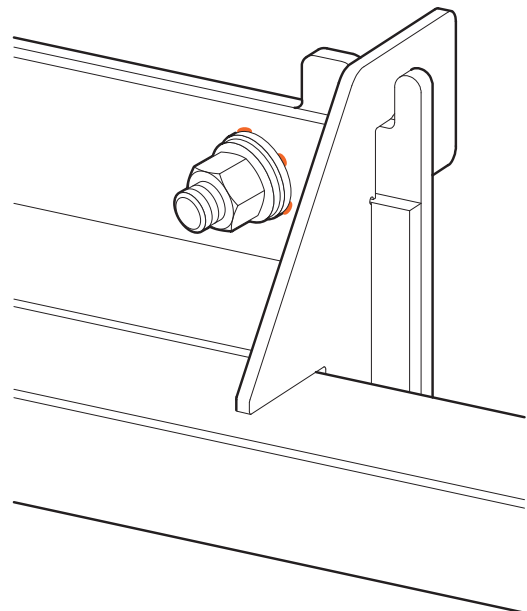


5

Using supplied breaker bar, $1\frac{1}{16}$ in socket, extension, and wrench, tighten each nut until orange extrusion appears from at least three bumps.

6

Repeat steps 1–5 for remaining crossarms.



Do not reuse structural fasteners. Discard if removed or loosened after tightening.

Bolt-on Crossarms

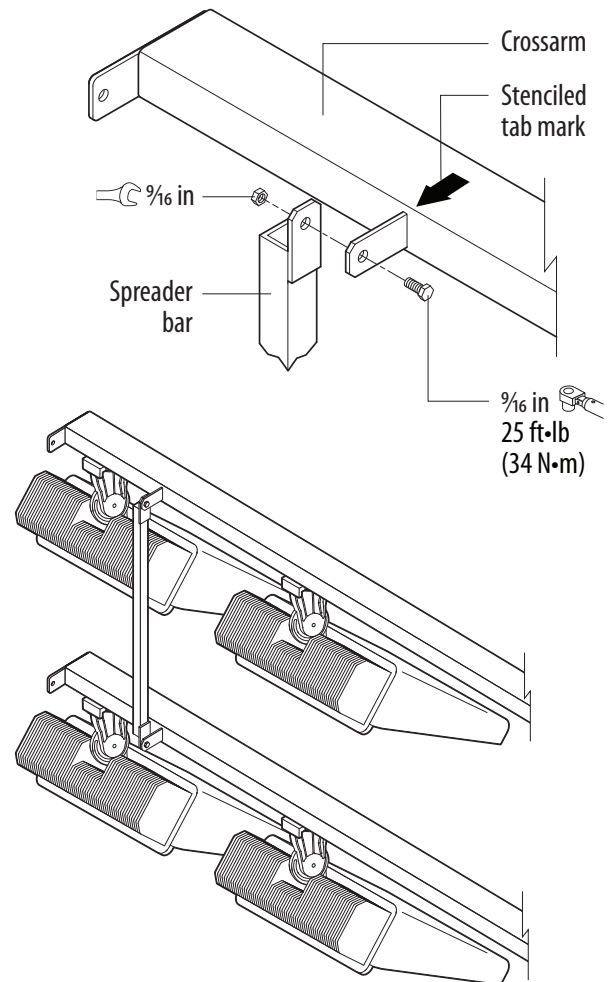


Refer to the Musco *Field Aiming Diagram* to determine if a pole requires spreader bars. If so, spreader bars are bundled together and marked with pole ID. Additionally, the pole crossarms are stenciled indicating which tabs to use. Crossarms are joined in groups of two or three with the greatest grouping on top; do not form other groupings.

7

Install spreader bars with $\frac{3}{8}$ in fasteners at locations marked on each crossarm. Torque to 25 ft·lb (34 N·m).

Spreader bars may come in two sizes, 30½ in (775 mm) and 60 in (1524 mm). Always install longer bars to upper three crossarms.



Installation Instructions: **Light-Structure System™ Retrofit Lighting System**

Wire Harness

Overview

The factory-built wire harness connects the electrical components enclosure to the poletop luminaire assembly.

Tools/Materials Needed

Musco Supplied

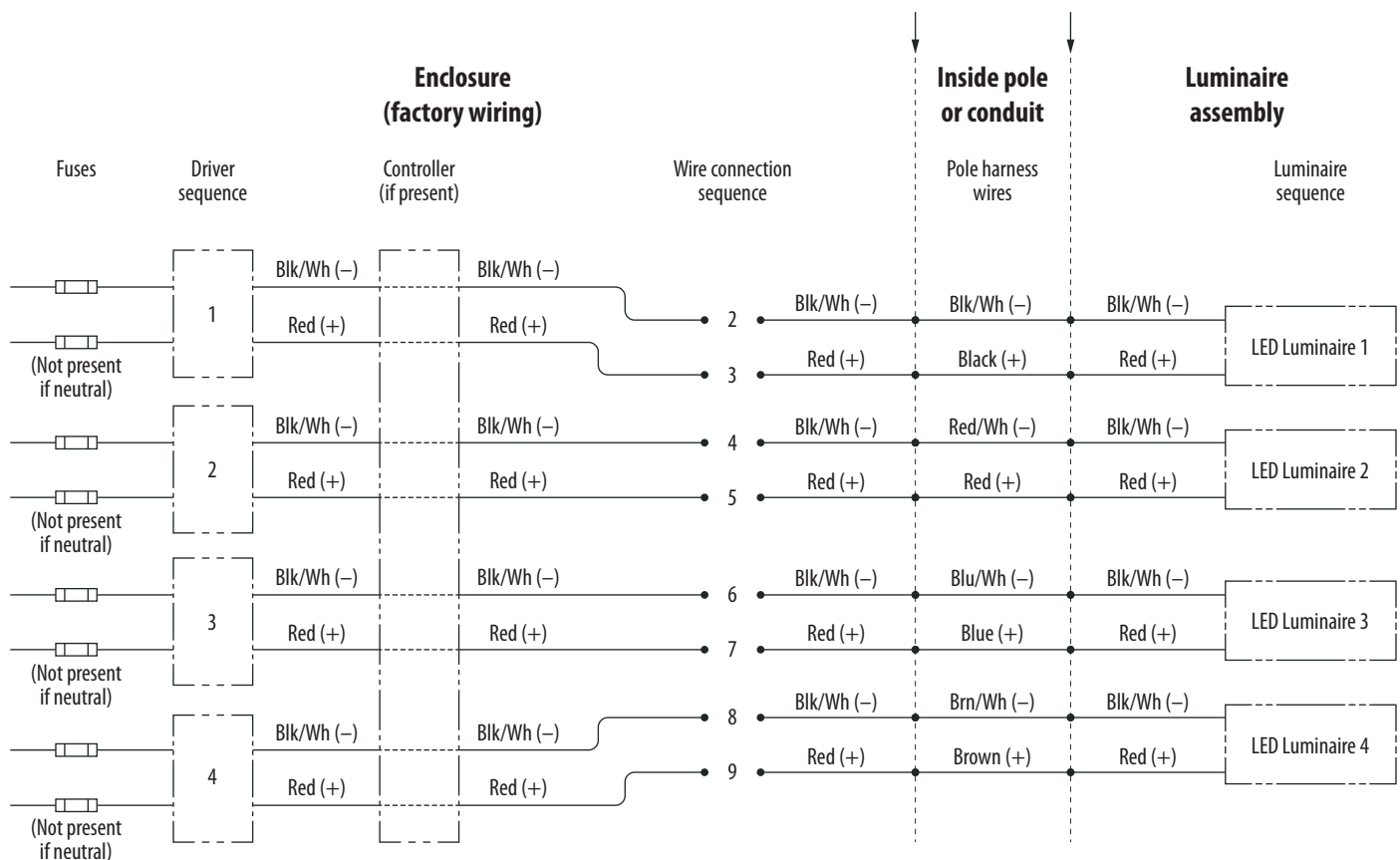
☐ 5/32 in hex key

☐ 9/16 in wrench

Contractor Supplied

☐ Fish tape

☐ Electrician's tape



Notes:

1. Pole harness wire color indicated if provided by Musco.
2. Enclosure factory wiring may be different than shown above.
One pair of wires per luminaire is required in pole harness.

Wire Harness

Assembly Procedure



Verify pole ID on wire harness matches pole location on *Field Aiming Diagram*.

1

Remove handhole covers using $\frac{5}{32}$ in hex key. Remove polecap using $\frac{1}{16}$ in wrench.

2

Fish all pole wire harnesses between poletop and appropriate electrical components enclosure(s). Use lower handhole to access enclosure hubs. Ensure protective sleeve extends through access hub and tuck harnesses behind subpanel.

3

Attach support grips at midpole (if present).

4

Mate quick connectors at poletop and inside first stack of electrical components enclosures. Match driver/luminaire IDs.

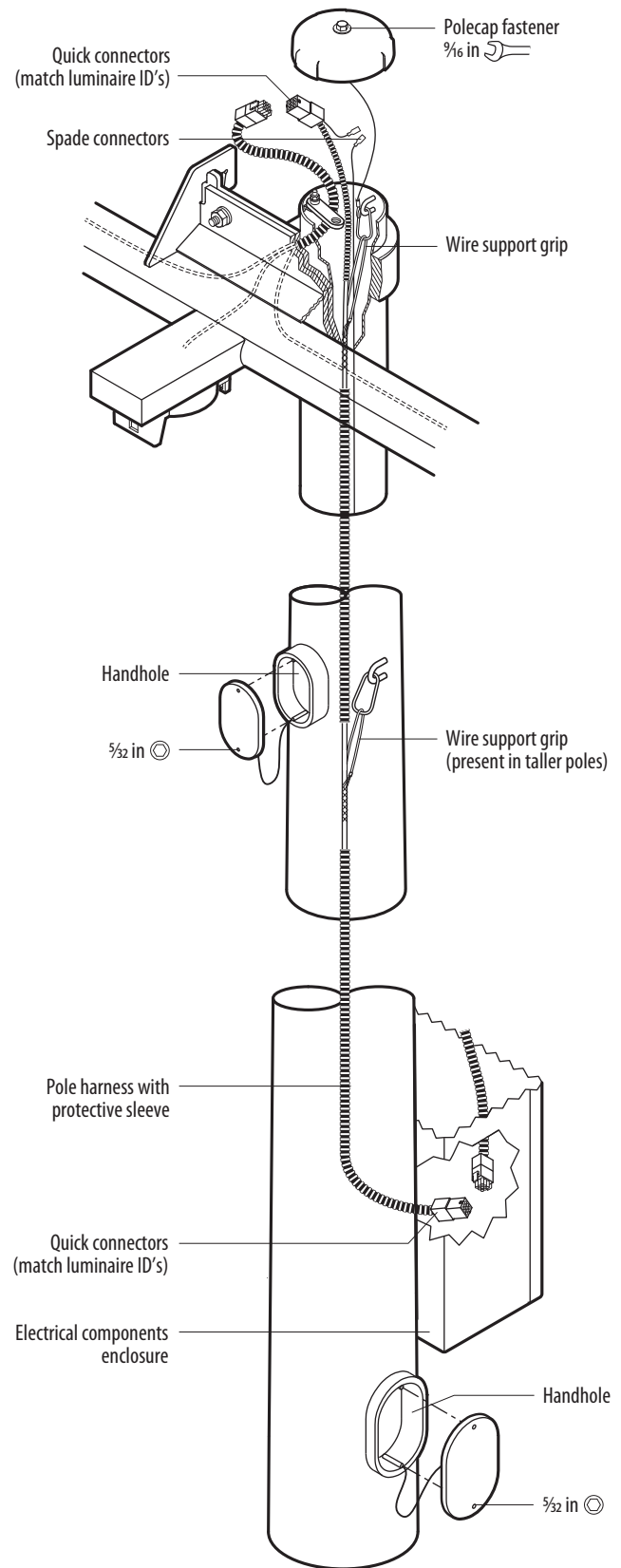
For additional stacks of enclosures, connect pole harnesses using Musco-provided LEVER-NUTS wire connectors. Match luminaire ID and wire polarity per each wire label.



Use electrical tape to ensure LEVER-NUTS® levers stay secure and don't snag on surrounding wires.

5

Replace handhole covers and polecap.



Connecting to Supply Wiring

Overview

The final step of installation is connecting supply wiring at the subpanel. Terminals for phase wires and neutral (if used), disconnect switch with lockout, and equipment ground bar are provided on the subpanel in the electrical components enclosure. If there are multiple circuits on the pole, a disconnect is provided for each circuit. This may be on a separate subpanel in another enclosure. Depending on foundation design and/or soil conditions, a supplemental grounding electrode may be required.

Tools/Materials Needed

Musco Supplied

- ☐ $\frac{3}{16}$ in hex key (ground bar)
- ☐ $\frac{5}{16}$ in hex key (bonding terminal inside handhole)
- ☐ $\frac{5}{32}$ in hex key (handhole covers)
- ☐ 5 mm hex key (125 A disconnect terminals)
- ☐ Equipment bonding jumper

Contractor Supplied

- ☐ Standard screwdriver
- ☐ 3 m (10 ft) stepladder or small line truck

Installation Procedure

 Musco *Control System Summary* or *Field Aiming Diagram* provides electrical loading information needed to size wire and switchgear.

Musco provides instructions for installing Control-Link™ control system or lighting contactor cabinet when these items are part of your project.

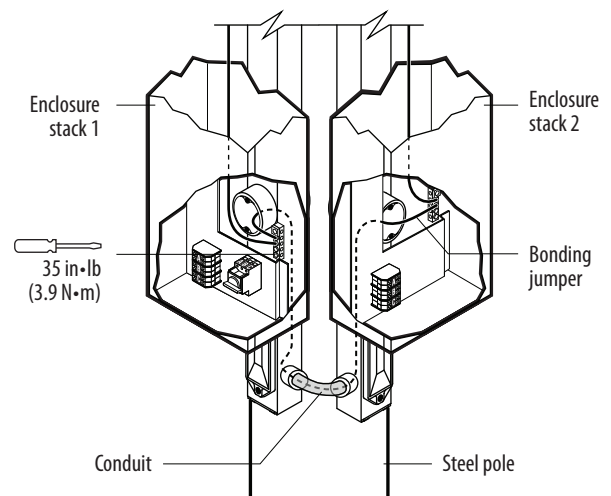
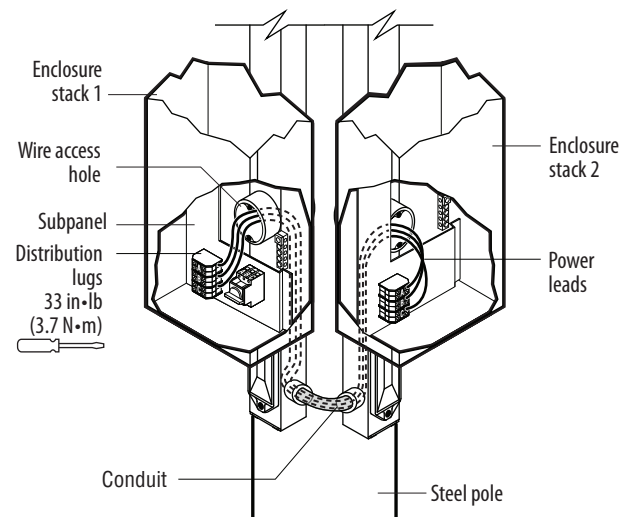
1

If pole has multiple stacks on the same electrical circuit then route lower loads from second stack to distribution lugs on main subpanel.

Route all power leads for lighting equipment to appropriate subpanel locations.

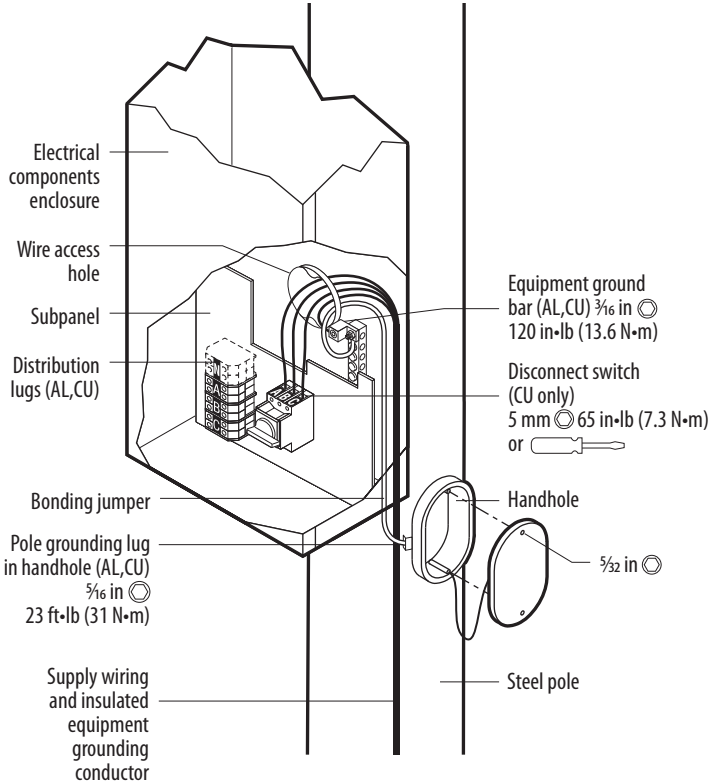
2

Connect equipment grounding conductors (green/yellow) from each upper enclosure to equipment ground bar in bottom enclosure. If pole has multiple stacks, connect bonding jumper from stack one. Tighten lugs using $\frac{3}{16}$ in hex key.



Installation Instructions: **Light-Structure System™** Retrofit Lighting System

Connecting to Supply Wiring

- 3** Remove handhole cover using $\frac{5}{32}$ in hex key. Route supply wiring through access hub into electrical components enclosure.
 - 4** Connect insulated equipment grounding conductor (supply) to ground bar. Tighten lug using $\frac{3}{16}$ in hex key.
 -  Disconnect is rated for copper wire only. Contact Musco for adaptor or use UL Listed adaptor for aluminum supply wire.
 - 5** Connect phase wires (supply) to disconnect switch. Tighten lugs using standard screwdriver (45 A disconnect) or 5 mm hex key (125 A disconnect). Connect neutral wire (if used) to distribution lug. Tighten lug using standard screwdriver.
- 
- The diagram illustrates the internal wiring of the Light-Structure System enclosure. Key components labeled include: Electrical components enclosure, Wire access hole, Subpanel, Distribution lugs (AL, CU), Bonding jumper, Pole grounding lug in handhole (AL, CU) $\frac{5}{16}$ in $\odot$ 23 ft-lb (31 N-m), Supply wiring and insulated equipment grounding conductor, Equipment ground bar (AL, CU) $\frac{3}{16}$ in $\odot$ 120 in-lb (13.6 N-m), Disconnect switch (CU only) 5 mm $\odot$ 65 in-lb (7.3 N-m) or , Handhole, $\frac{5}{32}$ in $\odot$, and Steel pole.

Disconnect Wiring Information

Disconnect Rating	Terminal	Wire Size Range	Strip Length	Torque
45 A	L	12 – 3 AWG (4 – 25 mm ²)*	0.63 in (16 mm)	25 in-lb (2.8 N-m)
	N	16 – 4 AWG (1.5 – 25 mm ²)*	0.56 in (14 mm)	27 in-lb (3.1 N-m)
	G	14 – 2/0 AWG (2.5 – 50 mm ²)**	NA	120 in-lb (13.6 N-m)
125 A	L	10 – 2 AWG (6 – 35 mm ²)*	0.63 in (16 mm)	50 in-lb (5.6 N-m)
		1 – 2/0 AWG (40 – 50 mm ²)*	0.63 in (16 mm)	65 in-lb (7.3 N-m)
	N	16 – 1/0 AWG (1.5 – 50 mm ²)*	0.71 in (18 mm)	33 in-lb (3.7 N-m)
	G	14 – 2/0 AWG (2.5 – 50 mm ²)**	NA	120 in-lb (13.6 N-m)

*Stranded cable, single conductor, copper only

**Stranded cable, single conductor, copper or aluminum

Connecting to Supply Wiring

6

Route provided equipment bonding jumper (green/yellow) through access hub to pole grounding lug inside handhole. Tighten lug using $\frac{5}{16}$ in hex key.

7

Ensure all handhole covers are installed and electrical components enclosure is closed and latched.



If your project includes a supplemental grounding electrode kit, follow instructions in kit for installing electrode.



Warning **Risk of electric shock**

Terminate equipment grounding conductor at equipment ground bar in electrical components enclosure.



Warning **Lightning hazard**

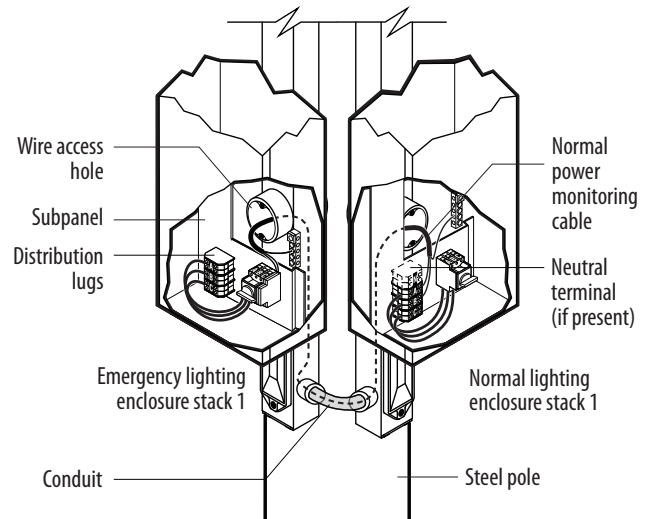
For poles located near metal fences, metal bleachers, or other metal structures, bond structures to pole ground to maintain equal electrical potential.



Skip step 8 if no emergency egress lighting is present.

8

Route cable for normal power to adjacent enclosure stack. Connect black wire and blue/white wire to any two active terminals A, B, C, or neutral, if present, and green wire to ground bar.



Notes

[illegible]



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Musco Light-Structure System™ product referenced or shown may be protected by one or more of the patents listed here: https://www.musco.com/patents/lss-retro_m-2768.pdf