

# ISOLATED LIGHTING PERMIT APPLICATION

DT1885 12/2012 s.84.02(4)(c) Wis. Stats.

Wisconsin Department of Transportation

State Project Number

1100-03-79

Submit 2 copies to the Regional Office of the Wisconsin Department of Transportation, including:

- Attach engineering drawing of lighting installation including all applicable information such as location, spacing of poles, wiring, lighting units, edge of pavement, curblines and shoulders, etc. Include complete proposed installation from sourceline to lighting fixture. Include specifications and special provisions.

## Information Form

Highway Zoo Freeway		Intersected Highway Name or Number; Area Limits Dakota Street Pedestrian Bridge		
Applicant Name and Mailing Address (Must be a Government Unit) City of West Allis Engineering Department c/o Peter Daniels, P.E. 7525 West Greenfield Avenue West Allis, WI 53214		Designer Name, Mailing Address and Telephone Patrick Engineering, Inc. c/o Kurt Feuerstein, P.E. 20900 Swenson Drive, Suite 100 Waukesha, WI 53186 262.901.2500		
		Maintainer Name, Mailing Address and Telephone City of West Allis Engineering Department c/o Peter Daniels, P.E. 7525 West Greenfield Avenue West Allis, WI 53214 414.302.8374		
County Milwaukee	Posted Speed Limit N/A mph	ADT & Year N/A vpd	Cross Section <input type="checkbox"/> Rural <input checked="" type="checkbox"/> Urban	
Number of Poles 19	Material & Class 30 LED	Mast Arm Length 8" cd/m sq	Base Type <input type="checkbox"/> Breakaway <input checked="" type="checkbox"/> Non-Breakaway <input type="checkbox"/> Direct Bury	Wiring <input type="checkbox"/> Overhead <input checked="" type="checkbox"/> Underground
Number of Luminaires 19	Mounting Height Above Pavement 12 ft	Watts Source 70	IES Distribution Type and BUG Rating II Medium, B2 UO G2	Initial Lumens 5907

The list of attachments to this permit application includes plan sheets, calculations, specifications, etc.

The designated applicant applies to the Wisconsin Department of Transportation, Division of Transportation System Development for permission to install, operate and maintain, or to contract for the installation, operation and maintenance of highway lighting units within the limits of the right of way of the state trunk highway, all as described above.

The applicant certifies that if the proposed lighting is located in another unit of government, written consent has been obtained as required by Wisconsin Statutes from the other unit of government in which the proposed lighting units and associated power line extensions are located, and that such consent is currently valid and covers all of the proposed work.

The undersigned certifies that s/he is authorized to sign this application on behalf of the designated applicant.

**X** \_\_\_\_\_  
(Applicant) (Date) (Title)

### Applicant: Do Not Write Below This Line

#### PERMIT APPROVAL

Permission is granted to the above applicant to install, operate and maintain highway lighting units and associated power lines and poles as described in this application and the attached drawings and specifications, subject to the conditions on the following page of this application.

#### ISOLATED LIGHTING

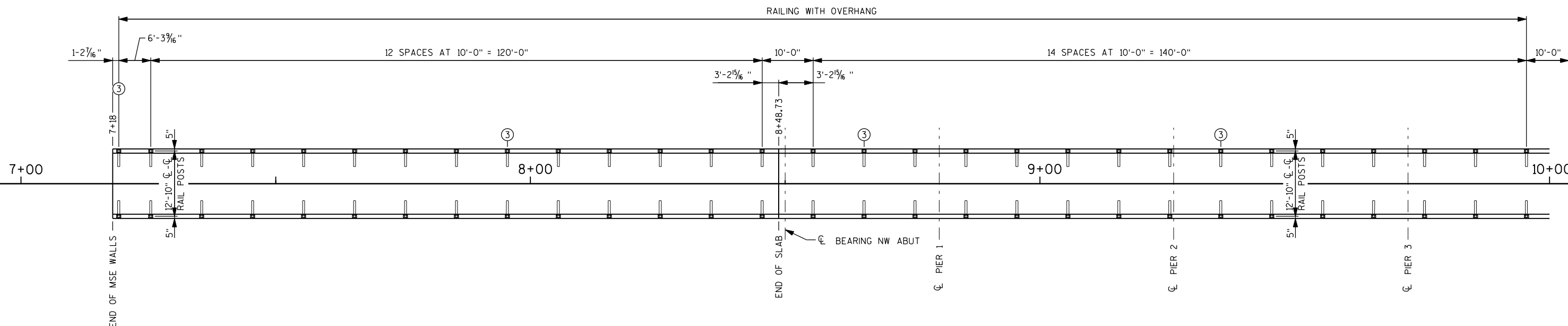
Permit Number	Date Issued	Approved for Regional Office <b>X</b> _____ (Signature)
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## Highway Lighting Installation Permit Conditions

1. The installation, including all wiring, supports, equipment, roadway clearance, etc., shall be in accordance with pertinent statutes, codes, and regulations as well as good trade and engineering practice, and shall be properly maintained.
2. The installation, operation, and maintenance of the highway lighting facilities shall be at the expense of the permittee. Alterations in any part of the installation as are required at any time by the Wisconsin Department of Transportation shall be made by the permittee at his/her own expense within 60 days.
3. Construction and maintenance operations shall be performed without closing the highway to traffic except as may be specifically authorized by authorized representatives of the governmental agency maintaining the highway. Unless otherwise authorized, two-way traffic shall be maintained at all times. Proper barricades, signs, flags, lights, and flagpersons shall be provided and maintained at all locations in accordance with the Manual on uniform Traffic Control Devices.
4. The permittee shall not interfere with the normal use of the adjoining land by the owners in the installation, alteration, maintenance, or removal of the facilities authorized by this permit.
5. A concrete base, if used, shall not extend more than four (4) inches above ground level at any point.
6. The highway lighting facilities installed by authority of this permit may be removed by the permittee, following 30 days written notice to the Wisconsin Department of Transportation, but such removal shall be subject to the conditions governing the installation of the lighting and associated electric power lines.
7. Any excavations necessitated by the proposed work shall be effectively backfilled and subsequent settlements after backfilling repaired to the satisfaction of the highway authority. Roadway surfaces, pavements, structures, vegetation, or other highway facilities damaged shall be repaired or restored to the satisfaction of the highway authority. Temporary sheeting and shoring shall be used as necessary to prevent soil caving in any trenches and tunnels.
8. Following any work on the highway right of way incident to an installation, alteration, or removal under this permit, the permittee shall restore the right of way to its condition previous to the work by the permittee, said restoration to meet with the approval of the Wisconsin Department of Transportation.
9. No trees or shrubs shall be cut, trimmed, or branches cut or broken in the construction or maintenance of the line without the consent of the owner of the trees or shrubs.
10. Any brush, trash, waste, or rubbish resulting from construction or maintenance of the line shall be removed from the highway right of way.
11. All wood and debris from any elm trees or other diseased trees which have been trimmed in performance of the work permitted under this permit shall be disposed of in accordance with approved Wisconsin Department of Transportation's procedure, a copy of which may be obtained from the approving district office.
12. The permittee shall immediately notify the district office when the installation has been completed.
13. Any special provisions attached shall be considered as part of this permit.

## Attachment 1

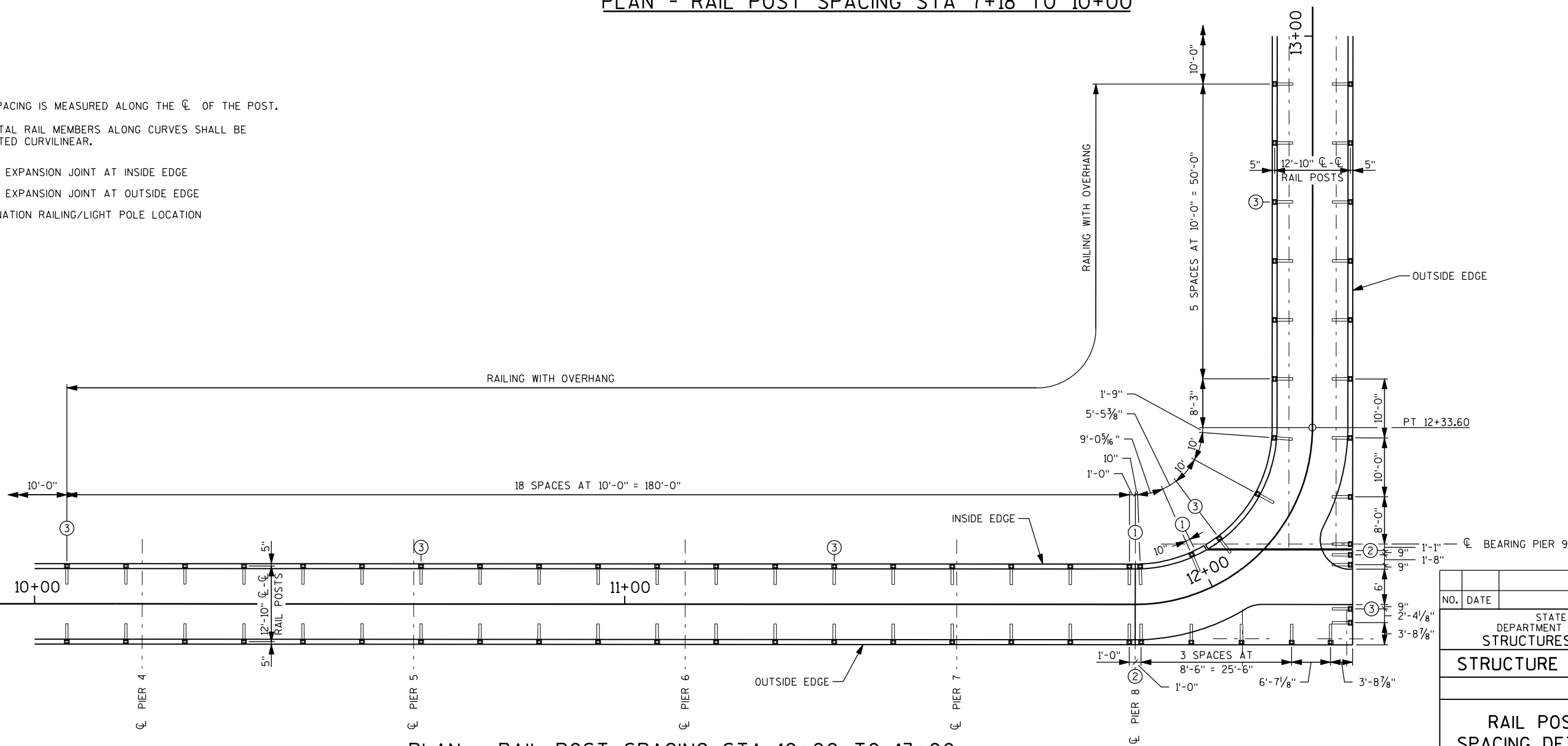
### Light Pole Locations and Spacing



PLAN - RAIL POST SPACING STA 7+18 TO 10+00

**NOTES:**

1. POST SPACING IS MEASURED ALONG THE  $\phi$  OF THE POST.
  2. HORIZONTAL RAIL MEMBERS ALONG CURVES SHALL BE FABRICATED CURVILINEAR.
- ①  $\phi$  OF EXPANSION JOINT AT INSIDE EDGE
  - ②  $\phi$  OF EXPANSION JOINT AT OUTSIDE EDGE
  - ③ COMBINATION RAILING/LIGHT POLE LOCATION

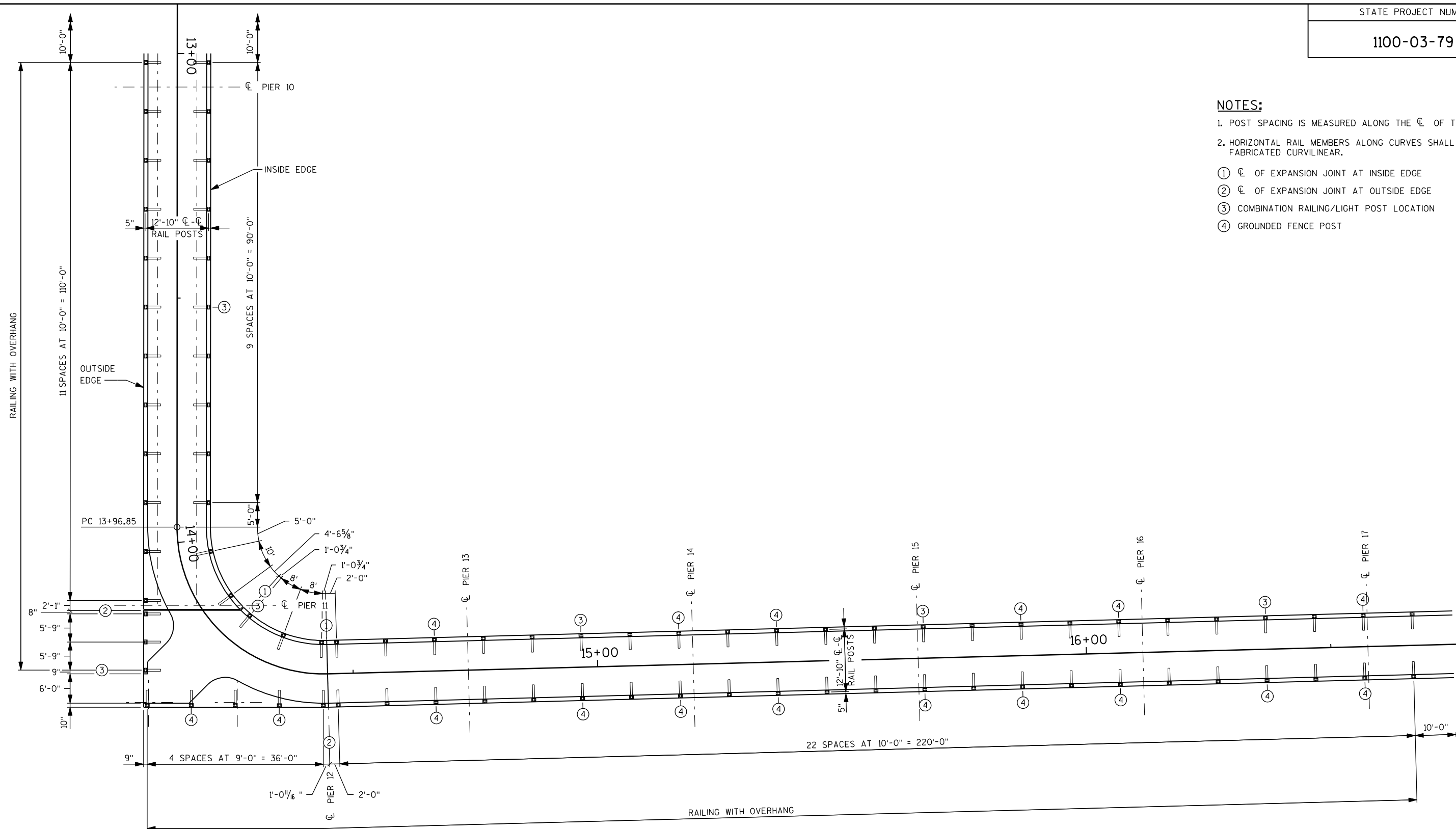


PLAN - RAIL POST SPACING STA 10+00 TO 13+00

NO.	DATE	REVISION	BY
STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION STRUCTURES DESIGN SECTION			
<b>STRUCTURE B-40-889</b>			
DRAWN BY		JRM	PLANS CK'D. PEW
<b>RAIL POST SPACING DETAILS</b>			SHEET OF

**NOTES:**

1. POST SPACING IS MEASURED ALONG THE  $\phi$  OF THE POST.
  2. HORIZONTAL RAIL MEMBERS ALONG CURVES SHALL BE FABRICATED CURVILINEAR.
- ①  $\phi$  OF EXPANSION JOINT AT INSIDE EDGE
  - ②  $\phi$  OF EXPANSION JOINT AT OUTSIDE EDGE
  - ③ COMBINATION RAILING/LIGHT POST LOCATION
  - ④ GROUNDED FENCE POST



PLAN - RAIL POST SPACING STA 13+00 TO 16+75

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STRUCTURE B-40-889			
DRAWN BY JRM		PLANS CK'D. PEW	
RAIL POST SPACING DETAILS		SHEET OF	

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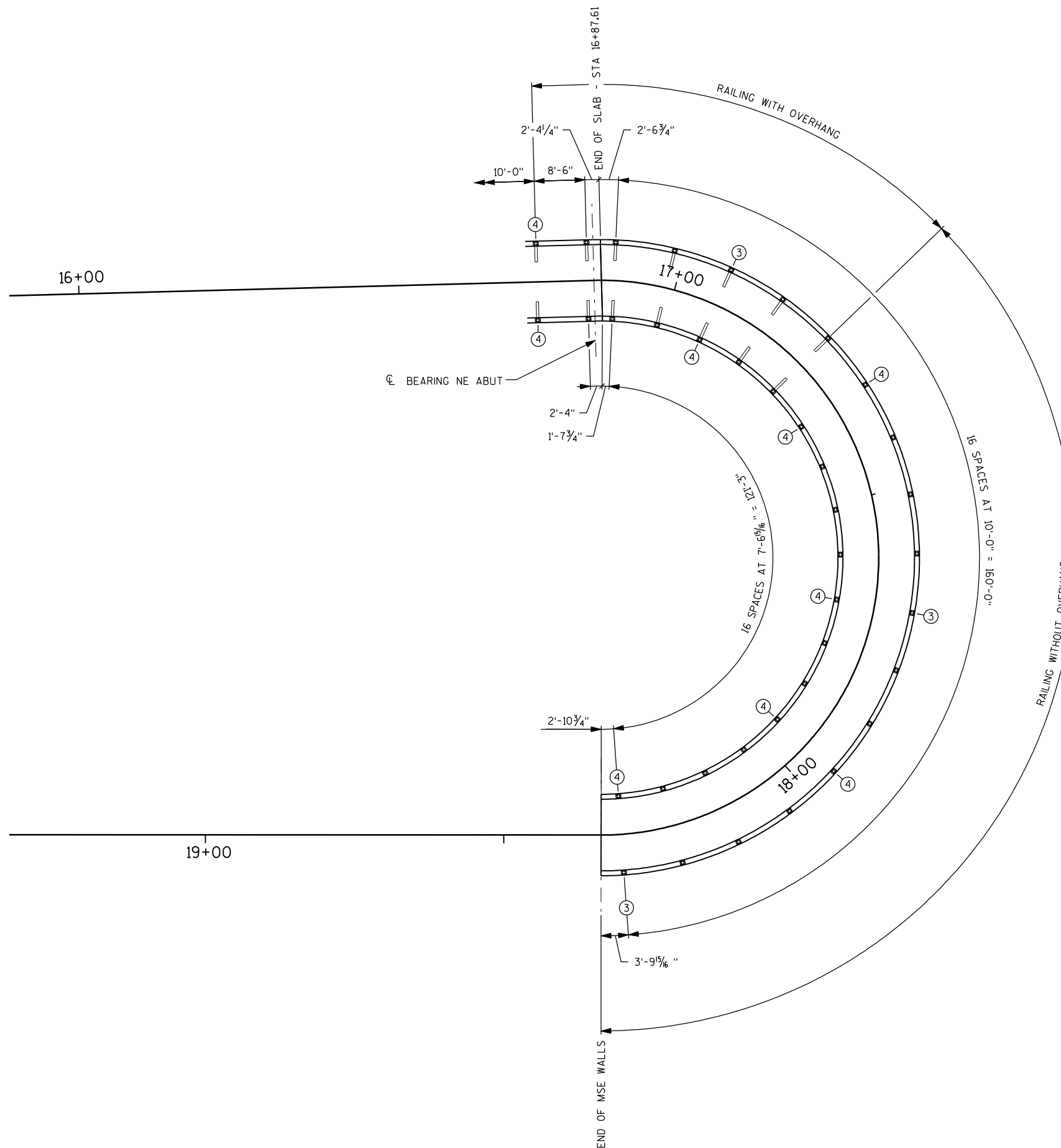
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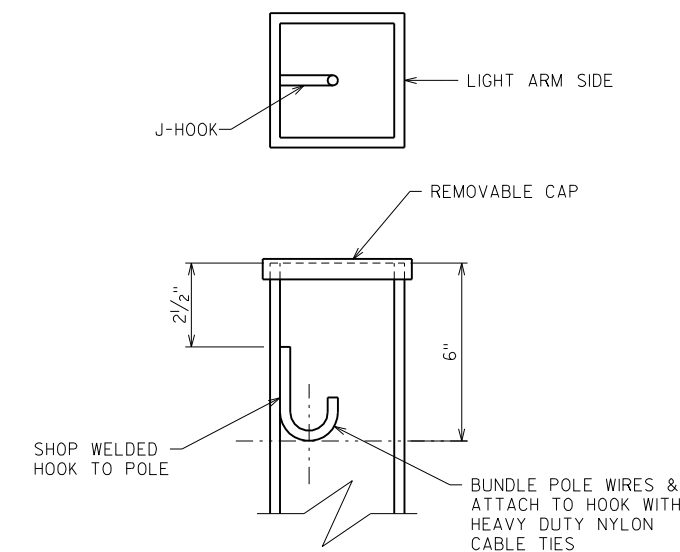
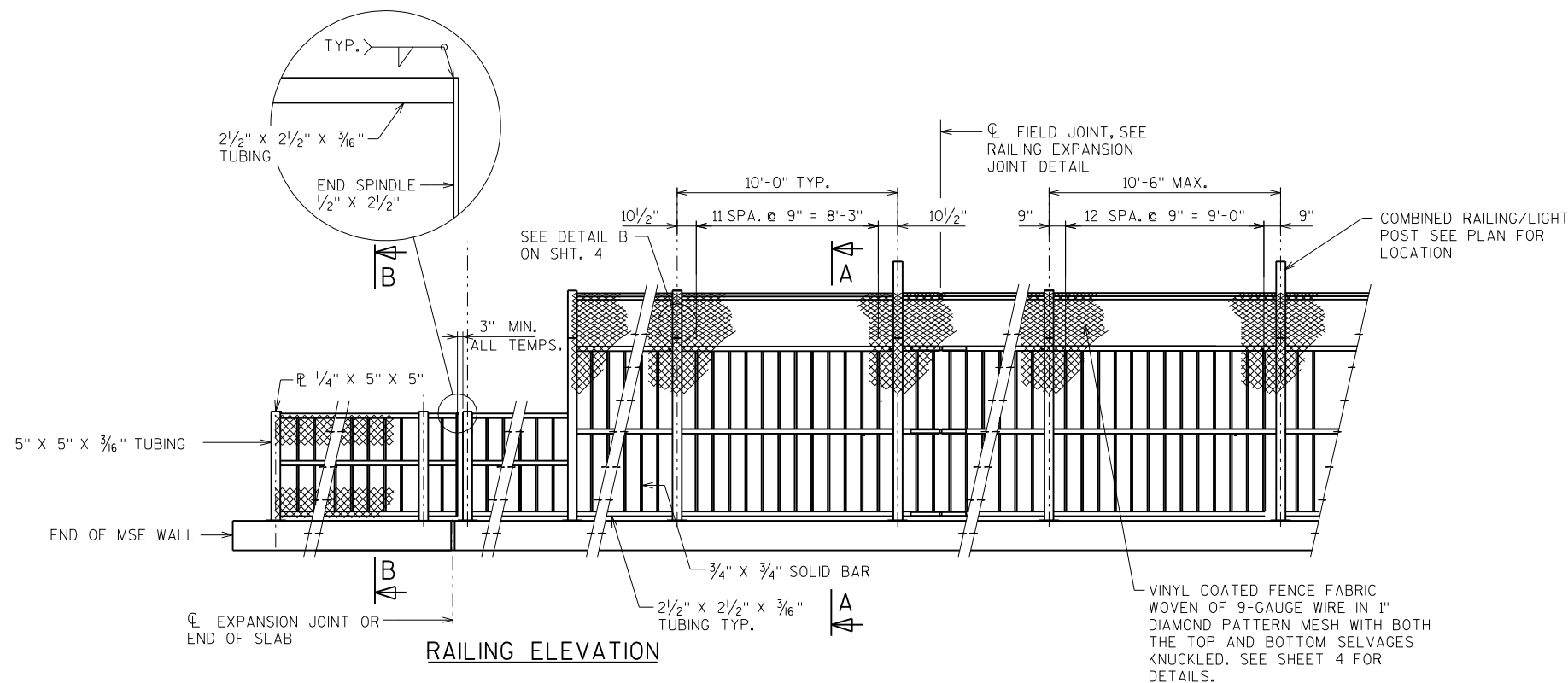
**NOTES:**

1. POST SPACING IS MEASURED ALONG THE  $\phi$  OF THE POST.
2. HORIZONTAL RAIL MEMBERS ALONG CURVES SHALL BE FABRICATED CURVILINEAR.
- ①  $\phi$  OF EXPANSION JOINT AT INSIDE EDGE
- ②  $\phi$  OF EXPANSION JOINT AT OUTSIDE EDGE
- ③ COMBINATION RAILING/LIGHT POST LOCATION
- ④ GROUNDED FENCE POST

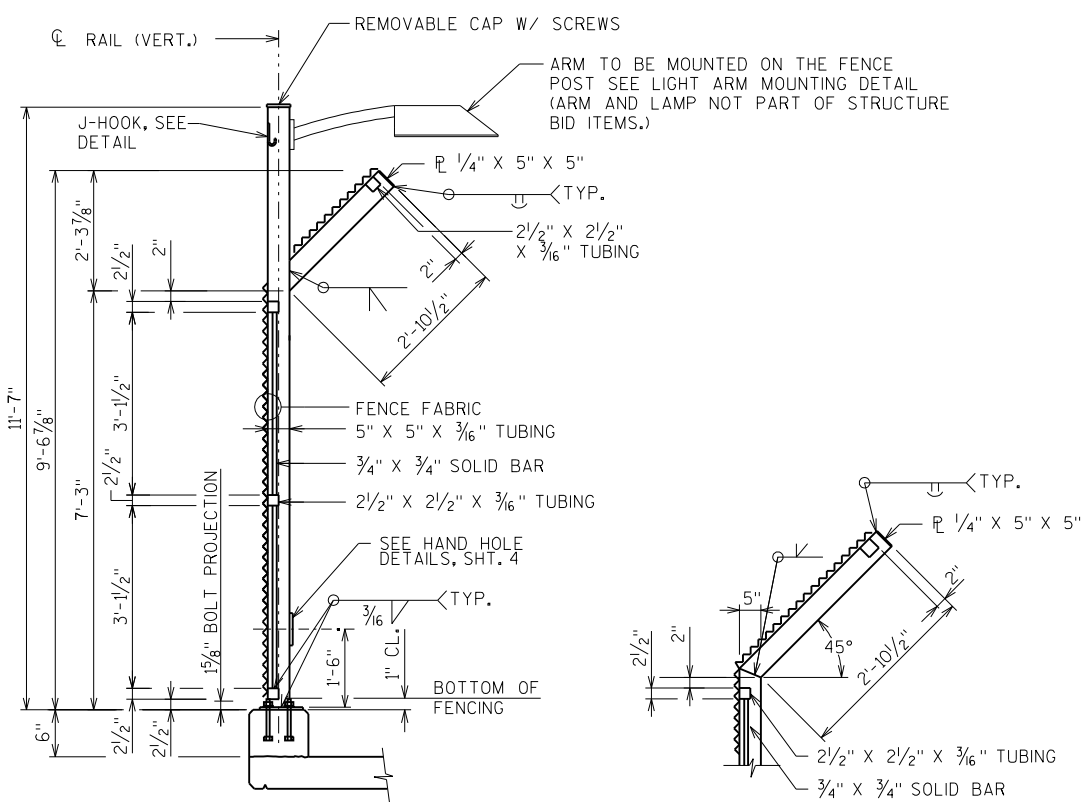


PLAN - RAIL POST SPACING STA 16+75 TO 18+33.69

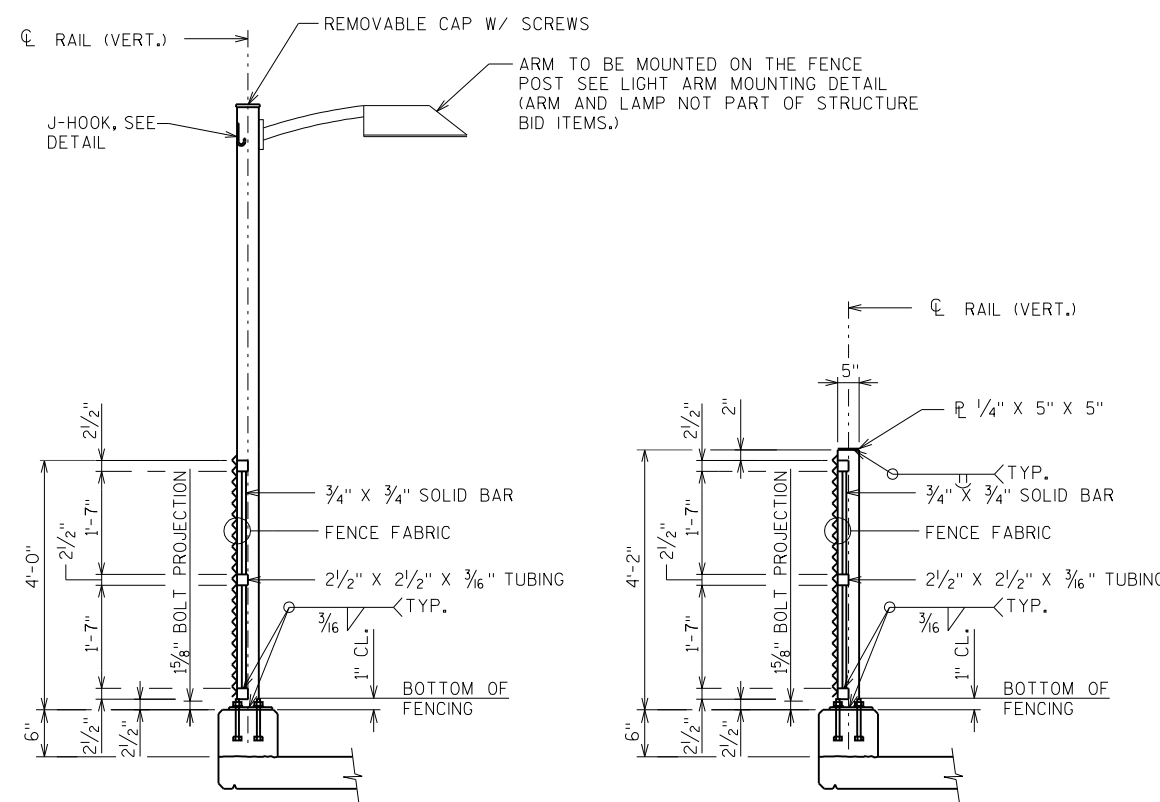
NO.	DATE	REVISION	BY
STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION STRUCTURES DESIGN SECTION			
<b>STRUCTURE B-40-889</b>			
DRAWN BY		JRM	PLANS CK'D. PEW
<b>RAIL POST SPACING DETAILS</b>			SHEET OF



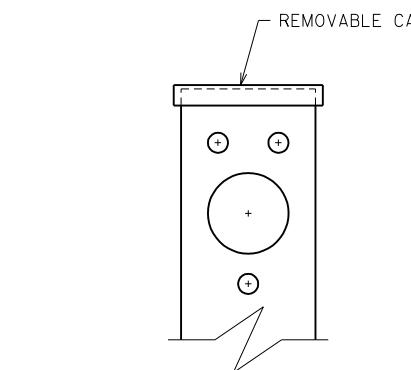
THE "J" HOOK SHALL BE MOUNTED DIRECTLY OPPOSITE THE LIGHT ARM HOLE AS SHOWN.



SECTION THRU RAILING WITHOUT LIGHTPOLE



SECTION THRU RAILING WITHOUT LIGHTPOLE

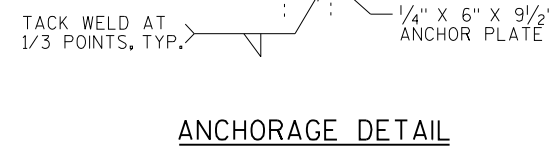
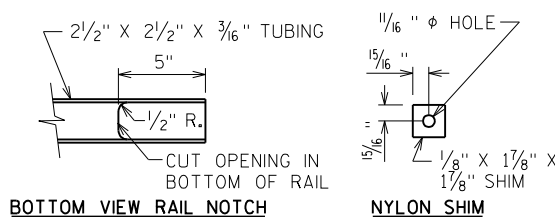
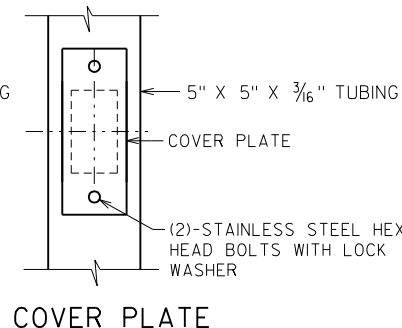
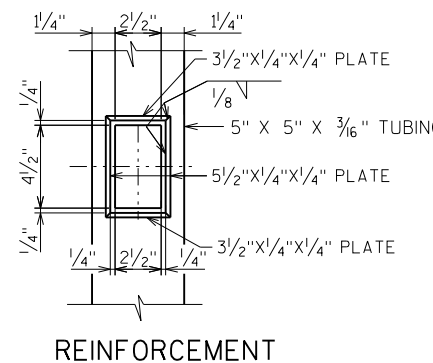
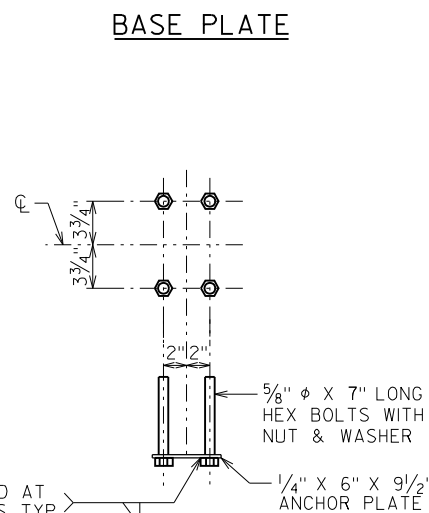
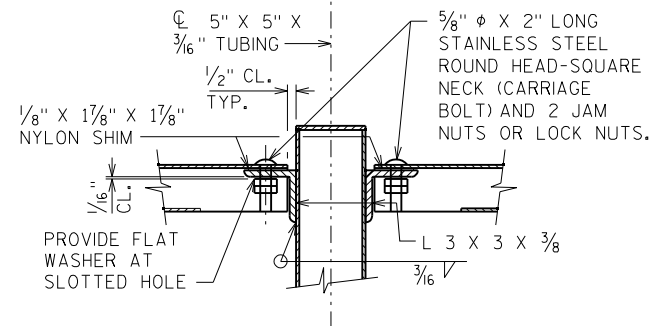
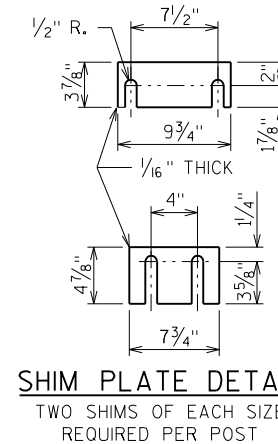
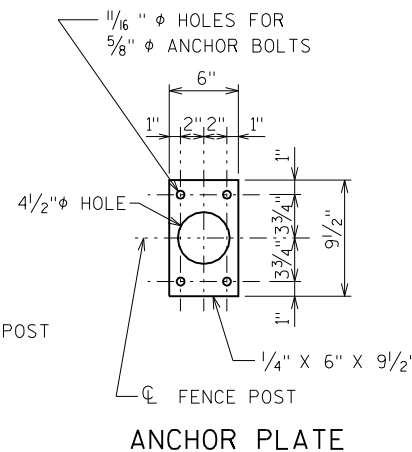
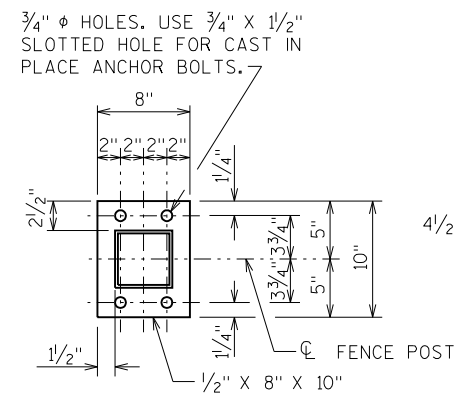
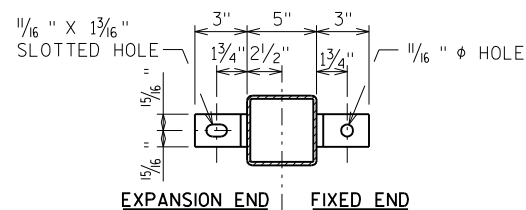


LIGHT ARM MOUNTING TO BE DESIGNED BY CONTRACTOR AND APPROVED BY THE ENGINEER. THE MINIMUM ALLOWABLE DISTANCE FROM THE LUMINAIRE TO THE DECK IS 12'-0".

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<b>RAILING DETAILS</b>		SHEET OF	

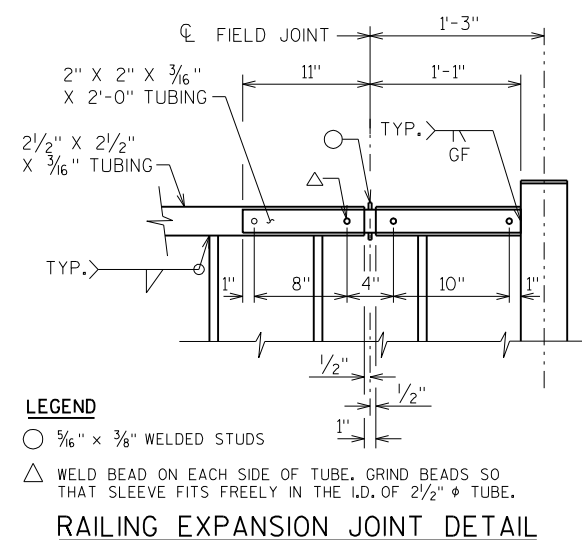
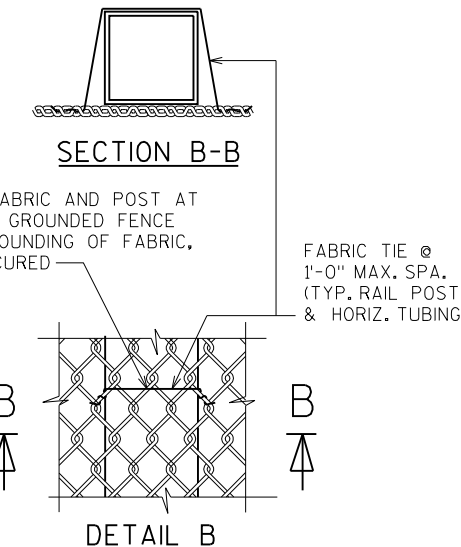
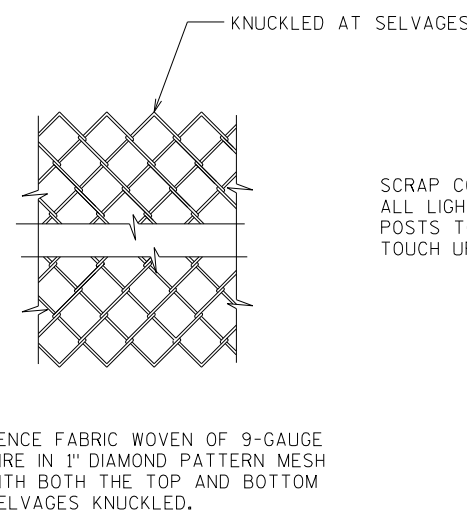
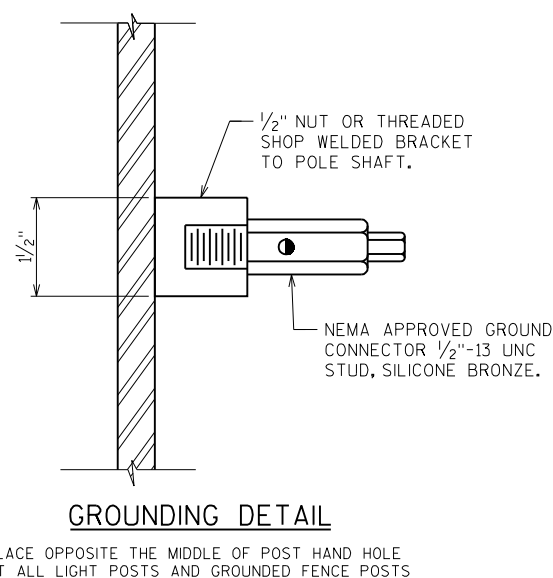
**NOTES**

- POST BASE PLATES SHALL BE FLAT WITH ALL SURFACES SMOOTH AND FREE FROM WARP AND ALL EDGES SMOOTH, STRAIGHT AND VERTICAL. ALL PLATE CUTS SHALL BE MACHINE OR MACHINE FLAME CUT.
- RAILS AND POSTS TO BE A.S.T.M. A500, GRADE B. BASE PLATES AND SHIMS TO BE A.S.T.M. A709, GRADE 36. ALL GALVANIZED AFTER FABRICATION.
- ANCHORAGES SHALL BE ACCURATELY PLACED TO PROVIDE CORRECT ALIGNMENT OF RAILING. SET POSTS NORMAL TO GRADE.
- ALL POST SPA. ARE TAKEN HORIZ. ALONG CENTER LINE OF RAILING AT BASE OF POST.
- SHIMS SHALL BE USED UNDER BASE PLATES WHERE REQUIRED FOR ALIGNMENT.
- CAULK AROUND PERIMETER OF BASE PLATES AND FILL PORTION OF SLOTTED HOLES AROUND ANCHOR BOLTS WITH NON-STAINING NON-BITUMINOUS JOINT SEALER, COLOR TO MATCH STAIN.
- CUT BOTTOM OF POST TO MAKE VERTICAL IN TRANSVERSE DIRECTION.
- ANCHOR BOLTS, NUTS AND WASHERS SHALL BE EITHER STAINLESS STEEL OR A.S.T.M. 307. IF 307 IS USED, ANCHOR BOLTS, NUTS, AND WASHERS SHALL BE GALVANIZED.
- RAILING TO BE PAINTED AND FENCE FABRIC AND TIES TO BE VINYL COATED. FEDERAL COLOR NO. 27038 (BLACK).
- THE BID ITEM SHALL BE "RAILING TUBULAR SCREENING SPECIAL B-40-889, R-40-614, R-40-615, R-40-616 AND R-40-617" WHICH SHALL INCLUDE ALL ITEMS SHOWN ON RAILING SHEETS
- RAILING SHALL BE FABRICATED IN LENGTHS THAT INCLUDE NOT MORE THAN 3 POSTS. ALL LENGTHS FROM STA 14+00 TO STA 18+33.69 SHALL INCLUDE A GROUNDED LIGHT POST OR GROUNDED FENCE POST.
- VENT HOLES SHALL BE DRILLED IN MEMBERS AS REQUIRED TO FACILITATE GALVANIZING.
- ALL MATERIAL SHALL BE GALVANIZED AFTER FABRICATION. PRIOR TO GALVANIZING ALL STEEL RAILING POSTS AND STEEL TUBING SHALL BE GIVEN A #6 BLAST CLEANING BY SSPC SPECIFICATIONS. PAINT OVER GALVANIZING WITH APPROVED TIE COAT AND TOPCOAT.



**HAND HOLE DETAILS**

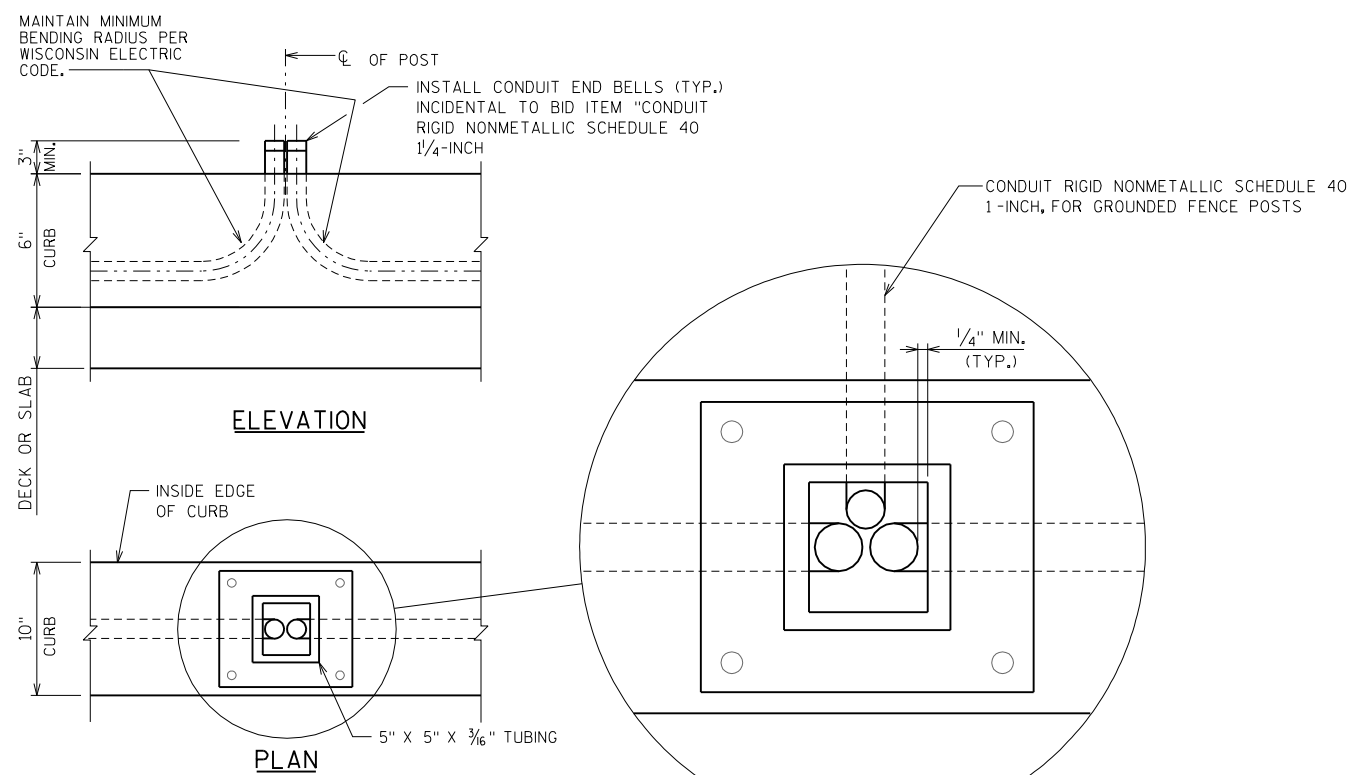
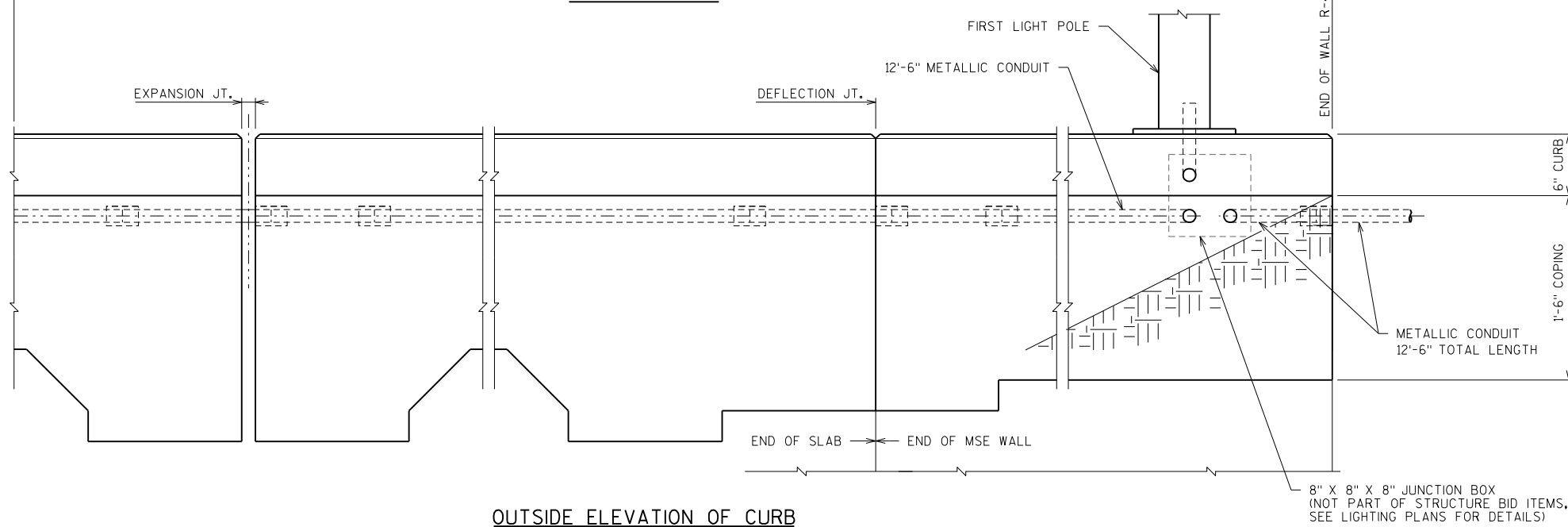
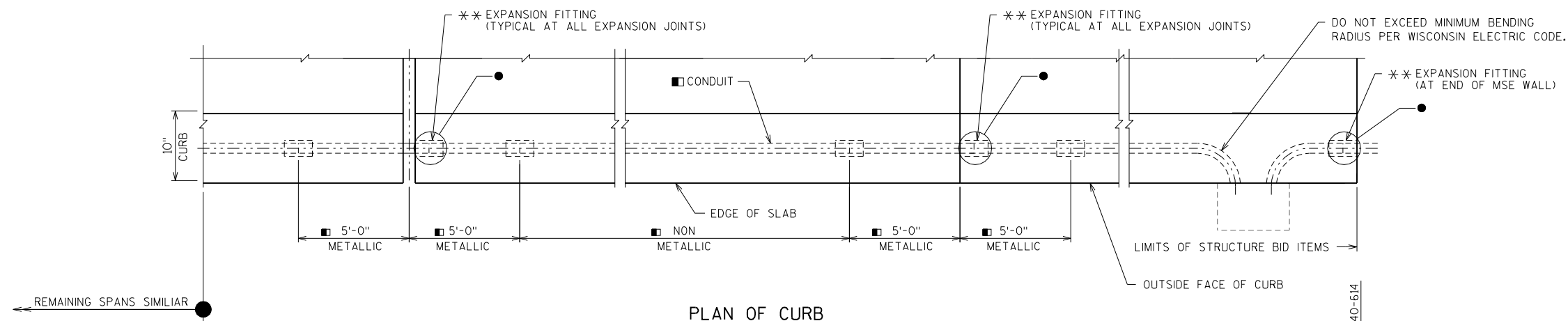
2 1/2" X 4 1/2" REINFORCED HANDHOLE AND COVER ASSEMBLY SECURED BY (2)-STAINLESS STEEL HEX HEAD BOLTS AT ALL LIGHT POSTS AND GROUNDED FENCE POSTS



**LEGEND**  
 ○ 3/8" x 3/8" WELDED STUDS  
 △ WELD BEAD ON EACH SIDE OF TUBE. GRIND BEADS SO THAT SLEEVE FITS FREELY IN THE I.D. OF 2 1/2" φ TUBE.

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<b>RAILING DETAILS</b>		SHEET OF	





**NOTES & LEGEND**

- BID ITEMS SHALL BE:  
 "CONDUIT RIGID NONMETALLIC SCHEDULE 40 1/4-INCH"  
 "CONDUIT RIGID METALLIC 1/4-INCH".
- EXPANSION FITTINGS, ANGLES AND ADAPTER FITTINGS TO BE INCIDENTAL TO "CONDUIT RIGID METALLIC 1/4-INCH".
- WHEN CONNECTING NONMETALLIC CONDUIT TO METALLIC CONDUIT, ONLY ADAPTER FITTINGS U.L. LISTED FOR ELECTRICAL USE SHALL BE USED.
- APPROVED MANUFACTURER OR EQUIVALENT - EXPANSION FITTING O-Z/GEDNEY TYPE AX-200 AND BONDING JUMPER (4" TOTAL CONDUIT MOVEMENT).
- POSITION MOVABLE END OF CONDUIT INSIDE EXPANSION FITTING, SUCH THAT IT WILL HAVE THE SAME ALLOWANCE FOR MOVEMENT (EXPANSION/CONTRACTION) AS THE EXPANSION DEVICE SET AT THE LOCATION. TAKE CARE TO INSTALL EXPANSION FITTING AND CONDUIT EXACTLY PARALLEL TO BRIDGE MOVEMENT.
  - USE 1/4"φ RIGID NON-METALLIC CONDUIT EXCEPT AT EXPANSION LOCATIONS AND THE END OF THE MSE WALL, USE RIGID METALLIC CONDUIT 5'-0" ON EITHER SIDE AT EXPANSION LOCATIONS, AT THE JUNCTION BOX USE A MINIMUM OF 12'-6" OF METALLIC CONDUIT ON BOTH SIDES (FOR GROUNDING PURPOSES).
- \*\* EXPANSION FITTING REQUIREMENTS
- USE AN APPROVED EXPANSION FITTING AT EACH EXPANSION OR DEFLECTION JOINT.
  - RUN CONDUIT STRAIGHT THROUGH (WITHOUT A FITTING) AT EACH FIXED JOINT.
  - TOTAL OF 9 LOCATIONS REQUIRE EXPANSION FITTINGS.

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<b>CONDUIT DETAILS</b>		SHEET OF	

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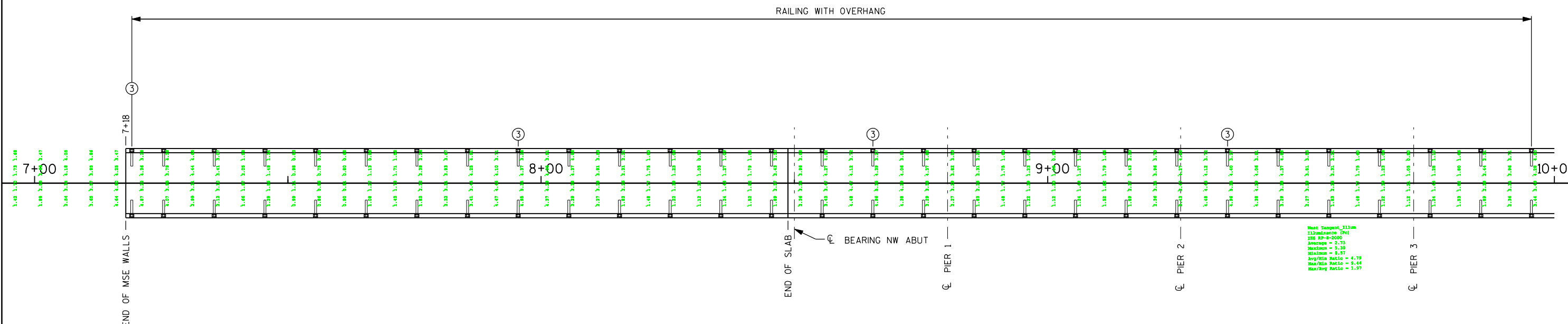
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FILE SCALE =

Attachment 2

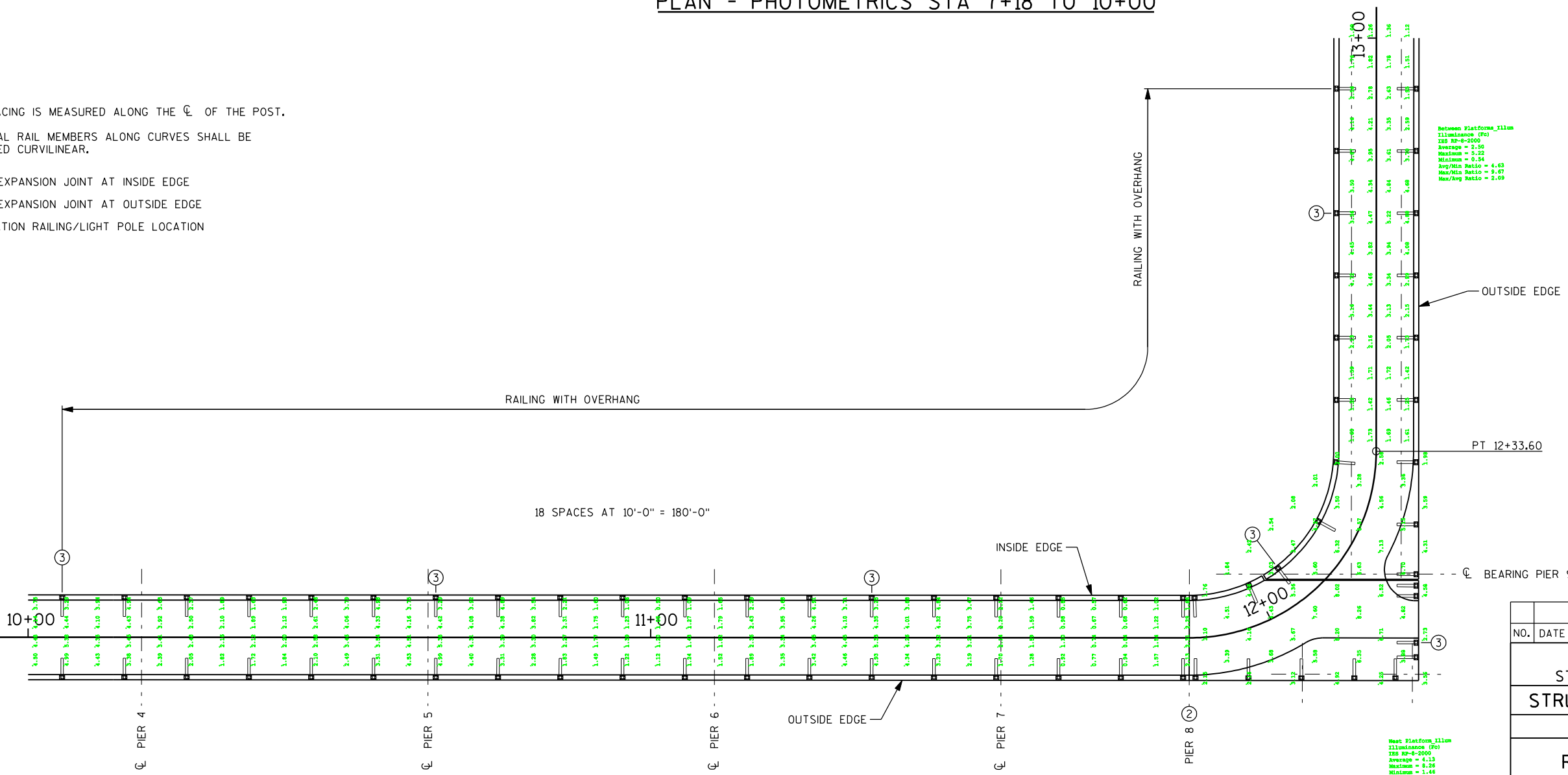
Photometrics



PLAN - PHOTOMETRICS STA 7+18 TO 10+00

NOTES:

1. POST SPACING IS MEASURED ALONG THE  $\phi$  OF THE POST.
  2. HORIZONTAL RAIL MEMBERS ALONG CURVES SHALL BE FABRICATED CURVILINEAR.
- ①  $\phi$  OF EXPANSION JOINT AT INSIDE EDGE  
 ②  $\phi$  OF EXPANSION JOINT AT OUTSIDE EDGE  
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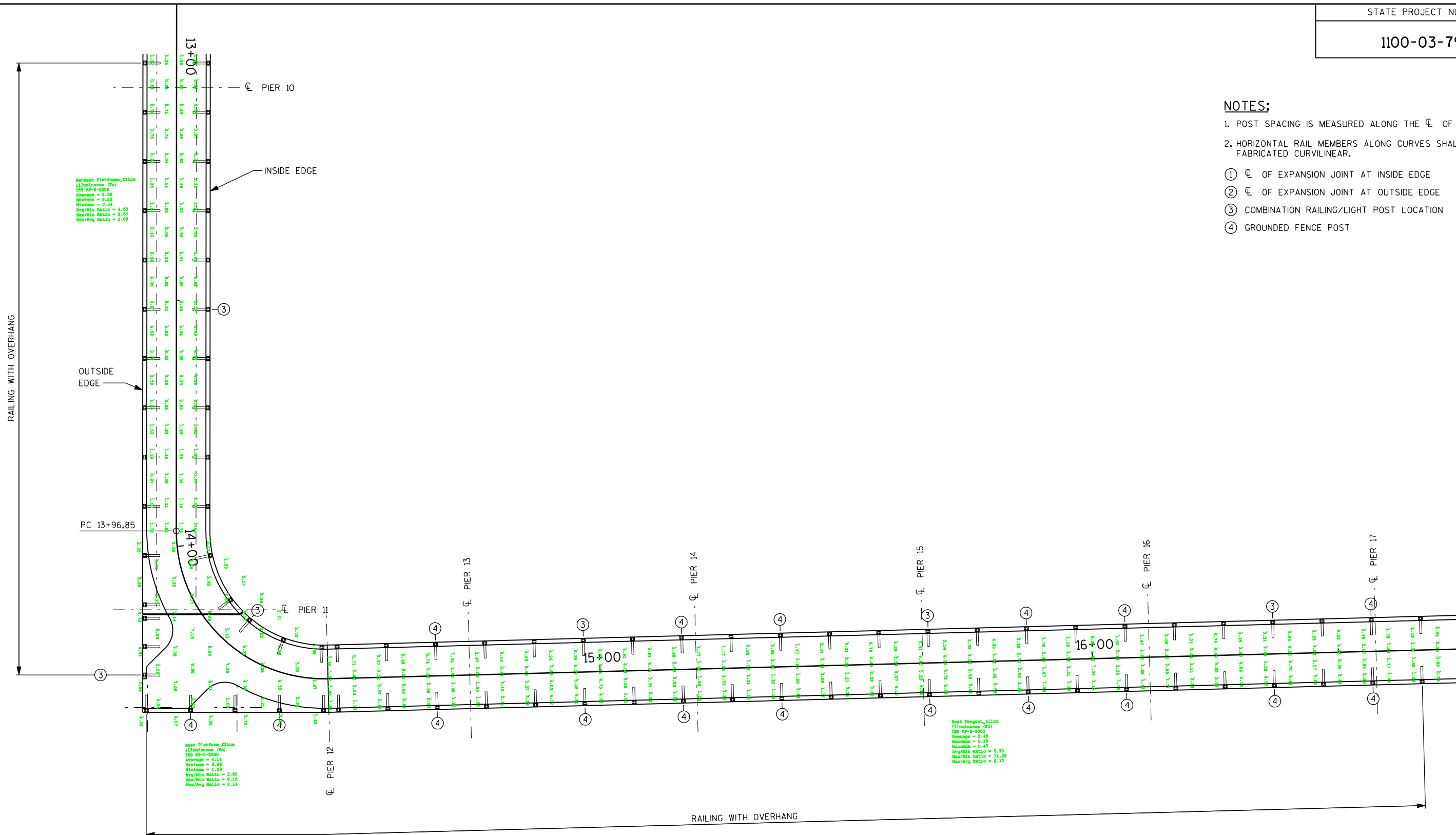


PLAN - PHOTOMETRICS STA 10+00 TO 13+00

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<b>RAIL POST SPACING DETAILS</b>		SHEET OF	

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- ④ GROUNDED FENCE POST



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**PLAN - PHOTOMETRICS STA 13+00 TO 16+75**

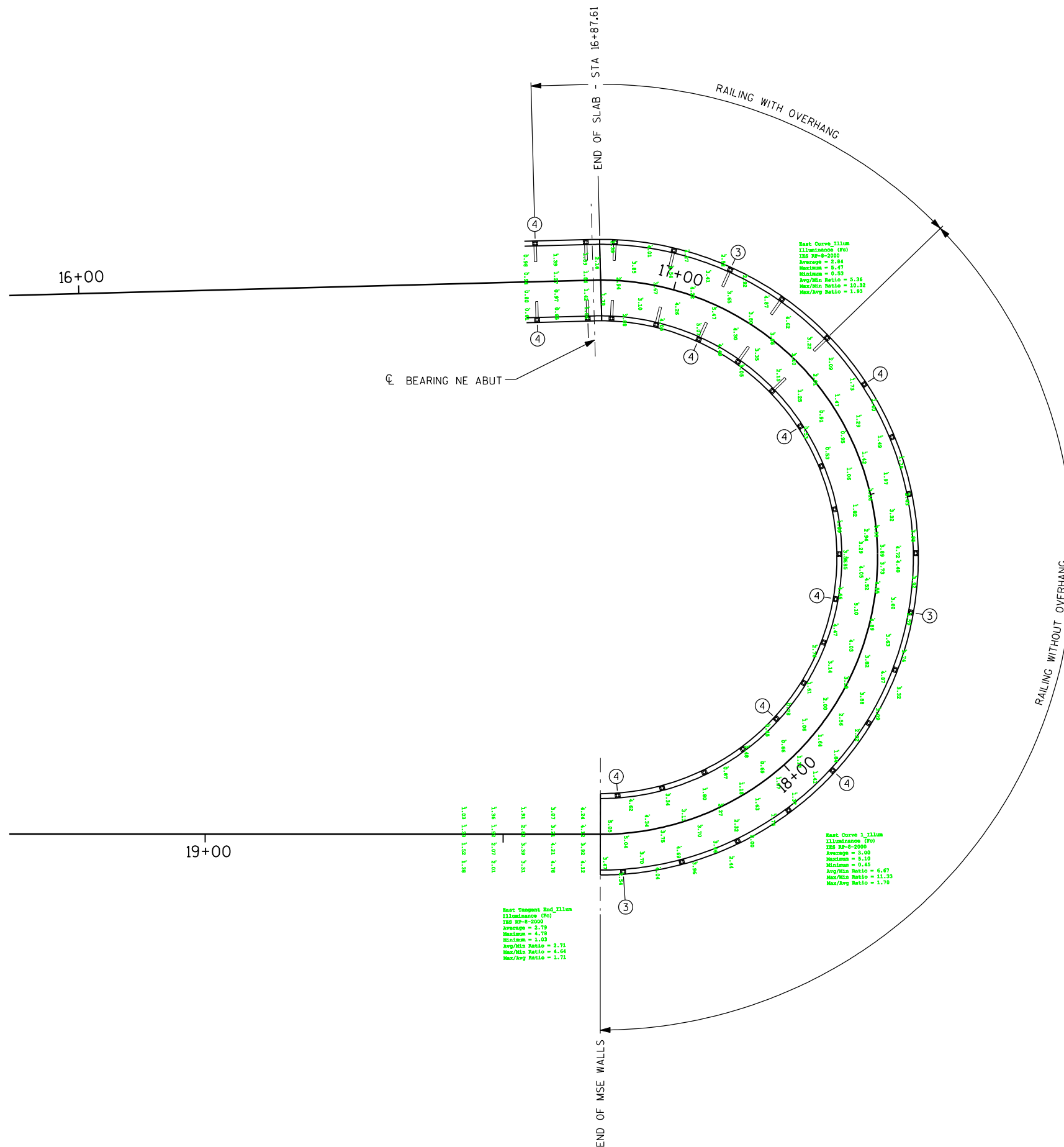
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<b>RAIL POST SPACING DETAILS</b>		SHEET OF	

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PLAN - PHOTOMETRICS STA 16+75 TO 18+33.69

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DRAWN BY		JRM	PLANS CK'D. PEW
<b>RAIL POST SPACING DETAILS</b>			SHEET OF

Photometric Calculation Summary  
 WisDOT - Dakota Street Pedestrian Bridge  
 PROJECT # 21152.022

Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
Between Platforms_Illum	Illuminance	Fc	2.5	5.22	0.54	4.63	9.67
East Curve 1_Illum	Illuminance	Fc	3	5.1	0.45	6.67	11.33
East Curve_Illum	Illuminance	Fc	2.84	5.47	0.53	5.36	10.32
East Platform_Illum	Illuminance	Fc	4.14	8.88	1.09	3.8	8.15
East Tangent End_Illum	Illuminance	Fc	2.79	4.78	1.03	2.71	4.64
East Tangent_Illum	Illuminance	Fc	2.49	5.29	0.47	5.3	11.26
West Platform_Illum	Illuminance	Fc	4.13	8.26	1.46	2.83	5.66
West Tangent_Illum	Illuminance	Fc	2.73	5.38	0.57	4.79	9.44
StatArea	Illuminance	Fc	2.85	8.9	0.5	5.7	17.8

Attachment 3

Luminaire Catalog Cut Sheet

# STR-LWY-2M-HT-02-06

LEDway® Street Light – Type II Medium – Horizontal Tenon Mount – 20-60 LEDs

## Product Description

Luminaire housing is all aluminum construction. Standard luminaire utilizes terminal block for power input suitable for #2-#14 AWG wire. Luminaire is designed to mount on a 2" (51mm) IP, 2.375" (60mm) O.D. horizontal tenon and/or a 1.25" (32mm) IP, 1.66" (42mm) O.D. horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/- 5° to allow for luminaire leveling (two axis T-level included).

## Performance Summary

- Utilizes BetaLED® Technology
- Patented NanoOptic® Product Technology
- Made in the U.S.A. of U.S. and imported parts
- CRI:** Minimum 70 CRI
- CCT:** 5700K (+ / - 500K) Standard, 4000K (+ / - 300K)
- Limited Warranty:** 10 years on luminaire / 10 years on Colorfast DeltaGuard® finish
- EPA and Weight:** Reference EPA and Weight spec sheet

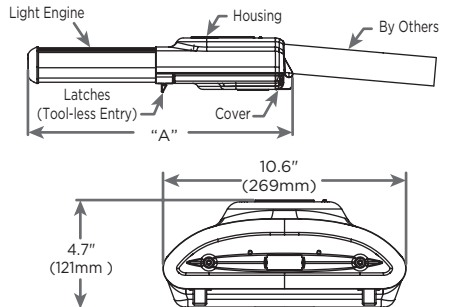
## Accessories

Field Installed Accessories	
<b>XA-BRDSPK30 (20-30 LEDs)</b>	<b>XA-XSLBLS30 (20-30 LEDs)</b>
<b>XA-BRDSPK60 (40-60 LEDs)</b> Bird Spikes for Light Engine	<b>XA-XSLBLS60 (40-60 LEDs)</b> External Backlight Shield
<b>XA-BRDSPKHSG</b> Bird Spikes for Housing	

## Ordering Information

Example: STR-LWY-2M-HT-02-E-UL-SV-525-OPTIONS

STR-LWY	2M	HT		E				
Product	Optic	Mounting	LED Count (x10)	Version	Voltage	Color Options*	Drive Current	Options (For additional options see IP66 spec sheet)
STR-LWY	2M Type II Medium	HT Horizontal Tenon	02 03 04 05 06	E	UL Universal 120-277V UH Universal 347-480V	SV Silver (Standard) BK Black BZ Bronze PB Platinum Bronze WH White	525** 525mA 700 700mA	<b>40K 4000K Color Temperature</b> - Color temperature per luminaire <b>DIM 0-10V Dimming</b> - Control by others - Refer to dimming spec sheet for details - Can't exceed specified drive current <b>F Fuse</b> - Not available with all ML options. Refer to ML spec sheet for availability with ML options - When code dictates fusing, use time delay fuse <b>HL Hi / Low (175 / 350 / 525 Dual Circuit Input)</b> - Refer to ML spec sheet for details - Sensor not included <b>N No Quick Disconnect Harness or Leveling Bubble</b> - Standard product features unless N option is specified <b>PD Power Door</b> - All connections between door and luminaire are shipped unconnected from the factory; door release spring included to open door automatically when the latches are released <b>R NEMA Photocell Receptacle</b> - Not available with all ML options. Refer to ML spec sheet for availability with ML options - Photocell by others - Intended for downlight applications at 0° tilt <b>SC Door Safety Tether</b> - Stainless steel aircraft cable <b>UTL Utility</b> - Includes exterior wattage label that reflects watts for the drive current selected. The ability to exceed selected drive current will be disabled



LED Count (x10)	Dimension	Measurements
02	"A"	17.5" (443mm)
03	"A"	17.5" (443mm)
04	"A"	22.0" (559mm)
05	"A"	22.0" (559mm)
06	"A"	22.0" (559mm)

\* See www.cree.com/lighting/products/warranty for warranty terms.

\* Light engine portion of extrusion is not painted and will remain natural aluminum regardless of color selection. \*\* Available on luminaires with 30-60 LEDs.



Rev. Date 07/18/2013





**Product Specifications**

**CONSTRUCTION & MATERIALS**

- Housing is all aluminum construction
- Terminal block for power input suitable for #2-#14 AWG wire
- Luminaire is designed to mount on a 2" (51mm) IP, 2.375" (60mm) O.D. horizontal tenon and/or a 1.25" (32mm) IP, 1.66" (42mm) O.D. horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/- 5° to allow for luminaire leveling (two axis T-level included)
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Standard is silver. Bronze, black, white, and platinum bronze are also available

**ELECTRICAL SYSTEM**

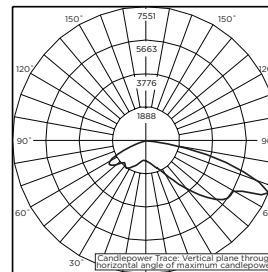
- **Input Voltage:** 120-277V or 347-480V, 50/60Hz, Class 1 drivers
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Quick disconnect harness suitable for mate and break under load provided on power feed to driver for ease of maintenance
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C / D breaker should be used

**REGULATORY & VOLUNTARY QUALIFICATIONS**

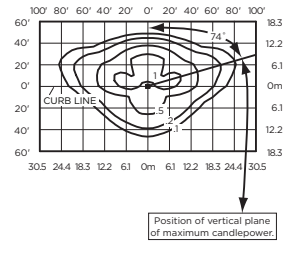
- cULus Listed
- Suitable for wet locations
- Consult factory for CE Certified products
- Meets CALTrans 611 Vibration testing and GR-63-CORE Section 4.4.1 / 5.4.2 Earthquake Zone 4
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- 10K surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Luminaire and finish are endurance tested to withstand 5,000 hours of elevated ambient salt fog as defined in ASTM Standard B 117
- Product qualified on the DesignLights Consortium ("DLC") Qualified Products List ("QPL") when ordered without full backlight control shield
- RoHS Compliant
- Meets Buy American requirements within ARRA

**Photometry**

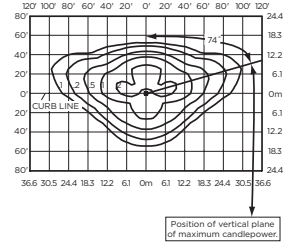
All published luminaire photometric testing performed to IESNA LM-79-08 standards by a NVLAP certified laboratory.



**ITL Test Report #: 77237**  
**STR-LWY-2M-\*\*-06-E-UL-700-40K**  
**Initial Delivered Lumens: 11,094**



**STR-LWY-2M-\*\*-03-E-UL-700**  
**Mounting Height: 25' (7.6m) A.F.G.**  
**Initial Delivered Lumens: 5,688**  
**Initial FC at grade**



**STR-LWY-2M-\*\*-06-E-UL-700**  
**Mounting Height: 25' (7.6m) A.F.G.**  
**Initial Delivered Lumens: 11,250**  
**Initial FC at grade**

**IES Files**

To obtain an IES file specific to your project consult:  
<http://www.cree.com/lighting/tools-and-support/exterior-ies-configuration-tool>

**Lumen Output, Electrical, and Lumen Maintenance Data**

Type II Medium Distribution													
LED Count (x10)	5700K		4000K		System Watts 120-480V	System Watts 347-480V	TOTAL CURRENT						50K Hours Projected Lumen Maintenance Factor @ 15° C (59° F)**
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11			120V	208V	240V	277V	347V	480V	
<b>525mA @ 25° C (77° F)</b>													
03	4,725	B1 U0 G1	4,550	B1 U0 G1	53	55	0.45	0.26	0.23	0.21	0.16	0.13	93%
04	6,313	B2 U0 G2	6,079	B2 U0 G2	66	71	0.56	0.33	0.29	0.26	0.21	0.16	
05	7,839	B2 U0 G2	7,549	B2 U0 G2	86	87	0.72	0.42	0.37	0.33	0.25	0.19	
06	9,346	B2 U0 G2	9,000	B2 U0 G2	100	103	0.84	0.49	0.43	0.38	0.30	0.22	91%
<b>700mA @ 25° C (77° F)</b>													
02	3,977	B1 U0 G1	3,830	B1 U0 G1	47	51	0.39	0.23	0.21	0.19	0.15	0.12	
03	5,907	B2 U0 G2	5,688	B2 U0 G2	70	73	0.59	0.34	0.30	0.27	0.21	0.16	
04	7,891	B2 U0 G2	7,598	B2 U0 G2	91	93	0.77	0.45	0.39	0.35	0.27	0.20	
05	9,799	B2 U0 G2	9,436	B2 U0 G2	113	115	0.96	0.55	0.48	0.43	0.33	0.25	
06	11,683	B3 U0 G3	11,250	B2 U0 G2	134	135	1.13	0.65	0.57	0.50	0.39	0.29	

\* Actual production yield may vary between -4 and +10% of initial delivered lumens.  
 \*\* For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit [www.iesna.org/PDF/Erratas/TM-15-11BugRatingsAddendum.pdf](http://www.iesna.org/PDF/Erratas/TM-15-11BugRatingsAddendum.pdf). Valid with no tilt.  
 \*\*\* For recommended lumen maintenance factor data see TD-13. Calculated L70 based on 6,000 hours LM-80-08 testing; > 150,000 hours.

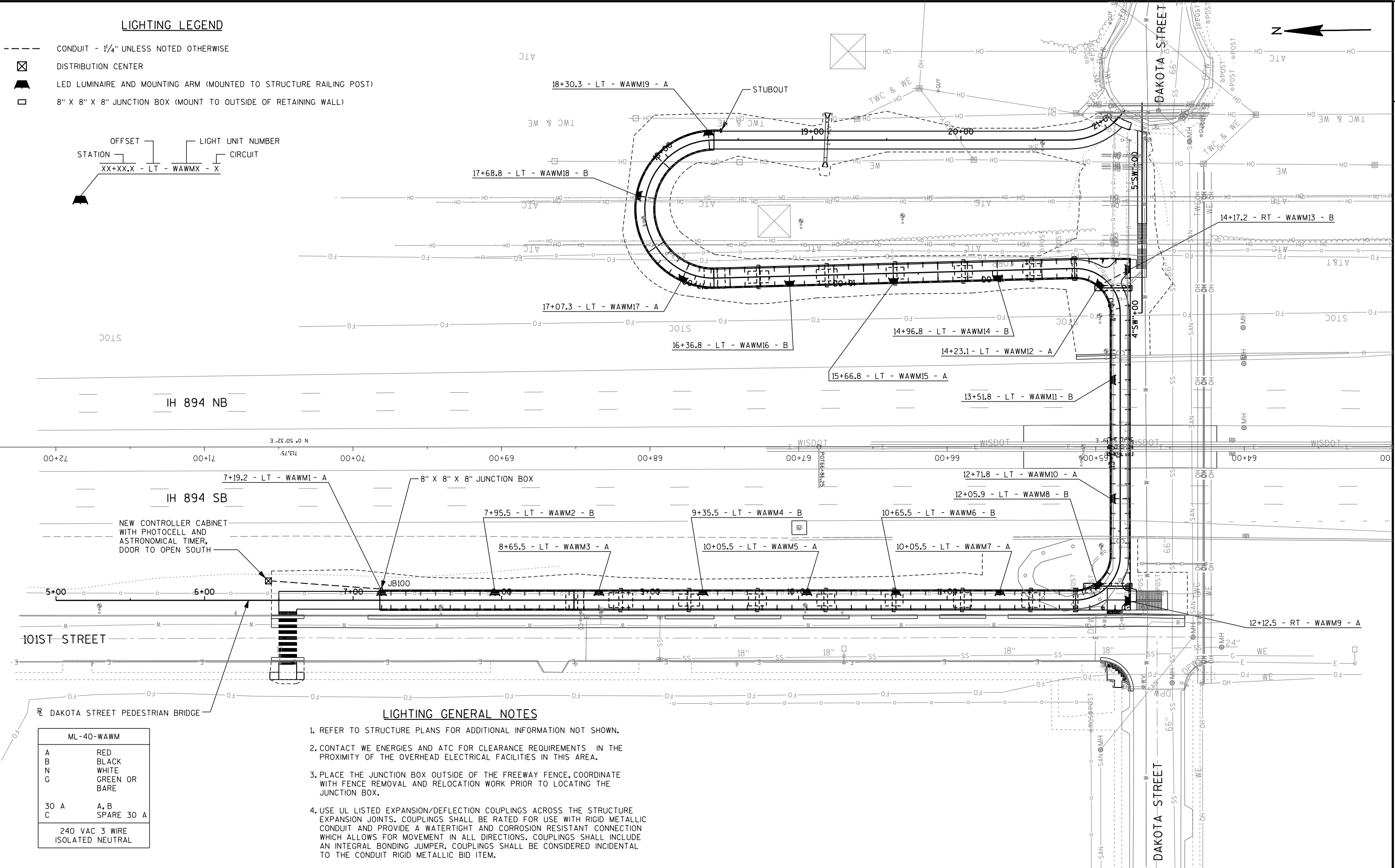
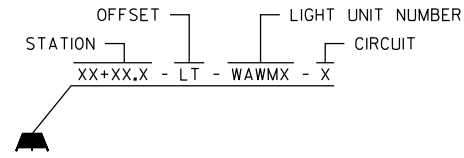


## Attachment 4

### Lighting Plans and Special Provisions

LIGHTING LEGEND

- CONDUIT - 1/4" UNLESS NOTED OTHERWISE
- ⊠ DISTRIBUTION CENTER
- ▲ LED LUMINAIRE AND MOUNTING ARM (MOUNTED TO STRUCTURE RAILING POST)
- 8" X 8" X 8" JUNCTION BOX (MOUNT TO OUTSIDE OF RETAINING WALL)



NEW CONTROLLER CABINET WITH PHOTOCELL AND ASTRONOMICAL TIMER, DOOR TO OPEN SOUTH

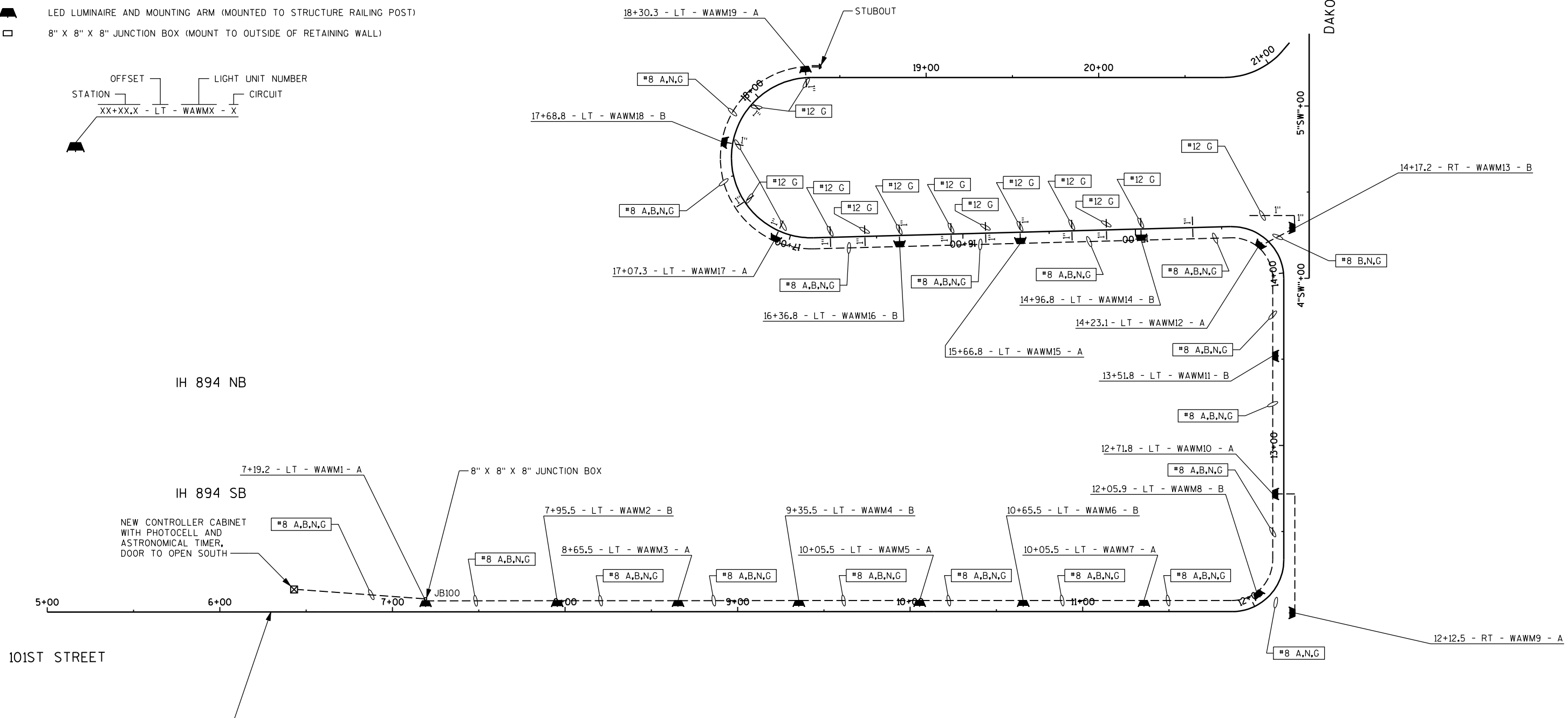
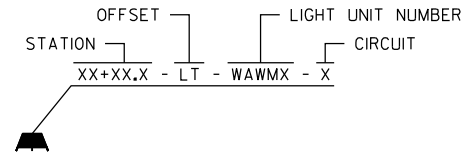
LIGHTING GENERAL NOTES

1. REFER TO STRUCTURE PLANS FOR ADDITIONAL INFORMATION NOT SHOWN.
2. CONTACT WE ENERGIES AND ATC FOR CLEARANCE REQUIREMENTS IN THE PROXIMITY OF THE OVERHEAD ELECTRICAL FACILITIES IN THIS AREA.
3. PLACE THE JUNCTION BOX OUTSIDE OF THE FREEWAY FENCE, COORDINATE WITH FENCE REMOVAL AND RELOCATION WORK PRIOR TO LOCATING THE JUNCTION BOX.
4. USE UL LISTED EXPANSION/DEFLECTION COUPLINGS ACROSS THE STRUCTURE EXPANSION JOINTS. COUPLINGS SHALL BE RATED FOR USE WITH RIGID METALLIC CONDUIT AND PROVIDE A WATERTIGHT AND CORROSION RESISTANT CONNECTION WHICH ALLOWS FOR MOVEMENT IN ALL DIRECTIONS. COUPLINGS SHALL INCLUDE AN INTEGRAL BONDING JUMPER. COUPLINGS SHALL BE CONSIDERED INCIDENTAL TO THE CONDUIT RIGID METALLIC BID ITEM.

ML-40-WAWM	
A	RED
B	BLACK
N	WHITE
G	GREEN OR BARE
30 A	A, B
C	SPARE 30 A
240 VAC 3 WIRE ISOLATED NEUTRAL	

### LIGHTING LEGEND

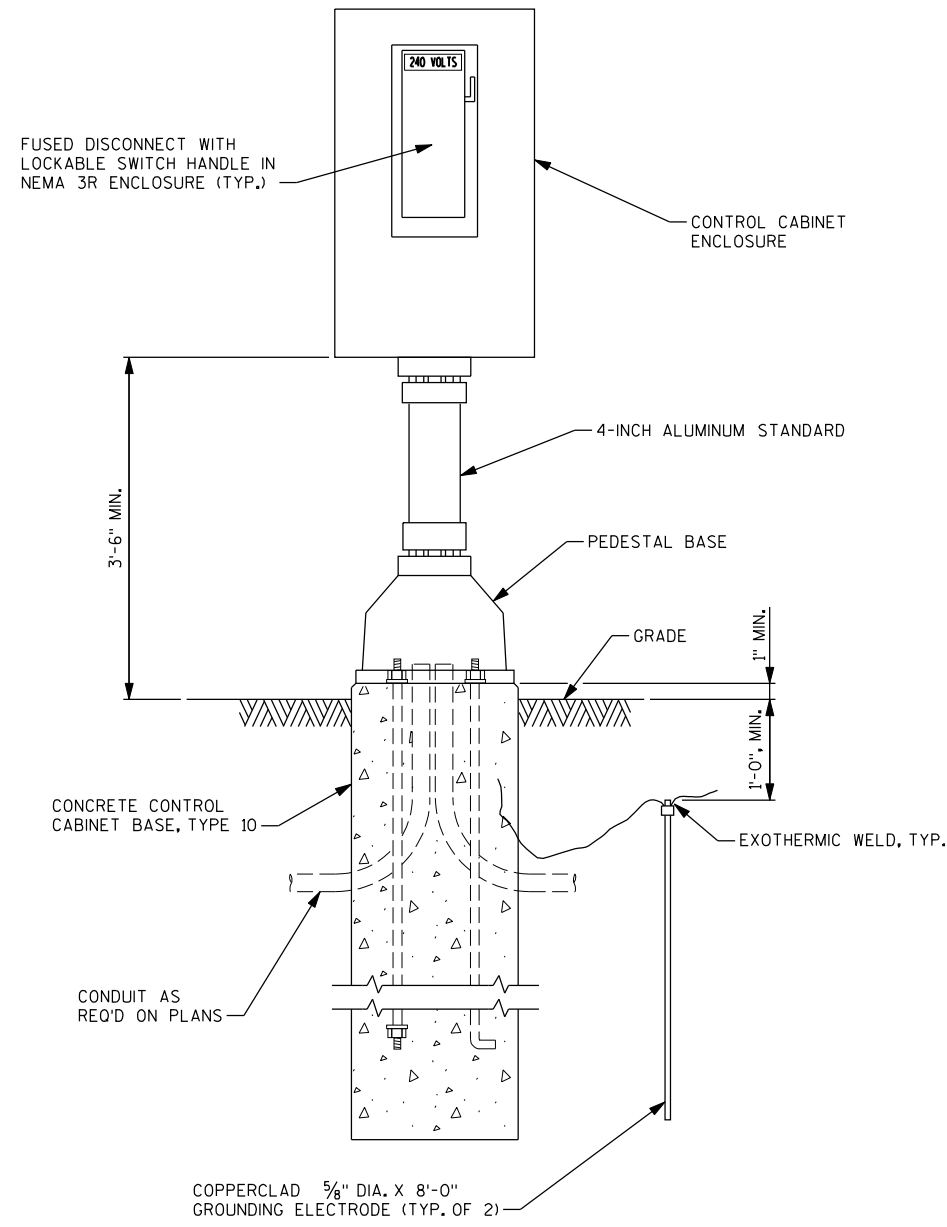
- CONDUIT - 1/4" UNLESS NOTED OTHERWISE
- ⊠ DISTRIBUTION CENTER
- ▲ LED LUMINAIRE AND MOUNTING ARM (MOUNTED TO STRUCTURE RAILING POST)
- 8" X 8" X 8" JUNCTION BOX (MOUNT TO OUTSIDE OF RETAINING WALL)



### LIGHTING GENERAL NOTES

1. REFER TO STRUCTURE PLANS FOR ADDITIONAL INFORMATION NOT SHOWN.
2. CONTACT WE ENERGIES AND ATC FOR CLEARANCE REQUIREMENTS IN THE PROXIMITY OF THE OVERHEAD ELECTRICAL FACILITIES IN THIS AREA.
3. PLACE THE JUNCTION BOX OUTSIDE OF THE FREEWAY FENCE, COORDINATE WITH FENCE REMOVAL AND RELOCATION WORK PRIOR TO LOCATING THE JUNCTION BOX.
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ML-40-WAWM	
A	RED
B	BLACK
N	WHITE
G	GREEN OR BARE
30 A	A, B
C	SPARE 30 A
240 VAC 3 WIRE ISOLATED NEUTRAL	



**LIGHTING CONTROL CABINET SPECIAL**

**NOTES:**

1. ALL ITEMS SHOWN ABOVE GROUND TO BE CONSIDERED INCIDENTAL TO LIGHTING CONTROL CABINET SPECIAL BID ITEM.
2. ALL ITEMS SHALL HAVE MATCHING BLACK FINISH.
3. INSTALLATION OF ALL COMPONENTS SHALL BE IN COMPLIANCE WITH THE WSEC & LOCAL CODES.
4. THE OWNER/MAINTAINER OF THIS SYSTEM IS THE CITY OF WEST ALLIS DEPARTMENT OF PUBLIC WORKS.

CATEGORY 0070

LIGHTING ITEMS GENERAL

SYSTEM	LOCATION	654.0220	656.0200	SPV.0060.12	SPV.0105.10	SPV.0105.11
		CONCRETE CONTROL CABINET BASE TYPE 10 EACH	ELECTRICAL SERVICE METER BREAKER PEDESTAL EACH	LIGHTING CONTROL CABINET SPECIAL EACH	LIGHTING SYSTEM INTEGRATOR LS	LIGHTING SYSTEM SURVEY LS
ML-40-WAWM	6+40 - 13' LT	1	1	1	1	1
TOTAL		1	1	1	1	1

CATEGORY 0070

LIGHTING - CONDUIT AND JUNCTION BOX

SYSTEM	LOCATION TO LOCATION	652.0115	652.0215	653.0208
		CONDUIT RIGID METALLIC 1 1/4-INCH LF	CONDUIT RIGID NONMETALLIC SCHEDULE 40 1 1/4-INCH LF	JUNCTION BOXES 8x8x8-INCH EACH
ML-40-WAWM	CABINET TO JB100	13	68	1
TOTAL		13	68	1

CATEGORY 0070

LIGHTING ITEMS

SYSTEM	SEQUENCE ID	LOCATION	655.0610 <sup>1</sup>	655.0640	SPV.0060.13
			ELECTRICAL WIRE LIGHTING 12 AWG LF	ELECTRICAL WIRE LIGHTING 1 AWG LF	LED LUMINAIRE AND MOUNTING ARM LS
ML-40-WAWM		CABINET	---	18	---
ML-40-WAWM	WAWM1-A	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM2-B	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM3-A	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM4-B	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM5-A	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM6-B	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM7-A	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM8-B	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM9-A	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM10-A	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM11-B	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM12-A	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM13-B	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM14-B	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM15-A	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM16-B	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM17-A	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM18-B	ON STRUCTURE	45	---	1
ML-40-WAWM	WAWM19-A	ON STRUCTURE	45	---	1
TOTAL			860	18	19

NOTES:

1. ADDITIONAL QUANTITIES LISTED ELSEWHERE.

CATEGORY 0070

SYSTEM	NETWORK	LOCATION TO LOCATION	DISTANCE	655.0620	655.0610 <sup>1</sup>
				ELECTRICAL WIRE LIGHTING 8 AWG LF	ELECTRICAL WIRE LIGHTING 12 AWG LF
ML-40-WAWM	A/B/N/G	CONTROLLER CABINET TO JB100	80	330	---
ML-40-WAWM	A/N/G	JB100 TO WAWM1-A	5	20	---
ML-40-WAWM	A/B/N/G	JB100 TO WAWM2-B	80	325	---
ML-40-WAWM	A/B/N/G	WAWM2-B TO WAWM3-A	75	305	---
ML-40-WAWM	A/B/N/G	WAWM3-A TO WAWM4-B	75	305	---
ML-40-WAWM	A/B/N/G	WAWM4-B TO WAWM5-A	75	305	---
ML-40-WAWM	A/B/N/G	WAWM5-A TO WAWM6-B	65	265	---
ML-40-WAWM	A/B/N/G	WAWM6-B TO WAWM7-A	75	305	---
ML-40-WAWM	A/B/N/G	WAWM7-A TO WAWM8-B	80	325	---
ML-40-WAWM	A/B/N/G	WAWM8-B TO WAWM10-A	65	265	---
ML-40-WAWM	A/B/N/G	WAWM9-A TO WAWM10-A	85	345	---
ML-40-WAWM	A/B/N/G	WAWM10-A TO WAWM11-B	85	345	---
ML-40-WAWM	A/B/N/G	WAWM11-B TO WAWM12-A	70	285	---
ML-40-WAWM	G	GFP TO GFP	18	---	23
ML-40-WAWM	G	GFP TO WAWM13-B	17	---	22
ML-40-WAWM	A/N/G	WAWM13-B TO WAWM12-A	30	95	---
ML-40-WAWM	A/B/N/G	WAWM12-A TO WAWM14-B	70	285	---
ML-40-WAWM	G	GFP TO WAWM14-B	43	---	48
ML-40-WAWM	G	GFP TO WAWM14-B	15	---	20
ML-40-WAWM	A/B/N/G	WAWM14-B TO WAWM15-A	75	305	---
ML-40-WAWM	G	GFP TO GFP	50	---	55
ML-40-WAWM	G	GFP TO WAWM15-A	45	---	50
ML-40-WAWM	G	GFP TO WAWM15-A	15	---	20
ML-40-WAWM	A/B/N/G	WAWM15-A TO WAWM16-B	75	305	---
ML-40-WAWM	G	GFP TO GFP	50	---	55
ML-40-WAWM	G	GFP TO WAWM16-B	45	---	50
ML-40-WAWM	G	GFP TO WAWM16-B	15	---	20
ML-40-WAWM	A/B/N/G	WAWM16-B TO WAWM17-A	75	305	---
ML-40-WAWM	G	GFP TO GFP	50	---	55
ML-40-WAWM	G	GFP TO WAWM17-A	50	---	55
ML-40-WAWM	G	GFP TO WAWM17-A	15	---	20
ML-40-WAWM	A/B/N/G	WAWM17-A TO WAWM18-B	75	305	---
ML-40-WAWM	G	GFP TO WAWM18-B	60	---	65
ML-40-WAWM	G	GFP TO WAWM18-B	15	---	20
ML-40-WAWM	A/B/N/G	WAWM18-B TO WAWM19-A	75	305	---
ML-40-WAWM	G	GFP TO WAWM18-B	50	---	55
TOTAL				5630	630

NOTES:

1. ADDITIONAL QUANTITIES LISTED ELSEWHERE.  
2. GFP = GROUNDED FENCE POST.

### **39. General Requirements for Electrical Work.**

*Amend standard spec 651.2, Materials, by adding the following paragraphs:*

(7) The approved products list is located at:

<http://www.dot.wisconsin.gov/business/engrserv/docs/ap1/electrical.pdf>

(8) Within 10 days of notice of award of contract furnish a complete list of materials proposing to use to Peter Daniels at the City West Allis (414-302-8374) for review and comment. The engineer will provide material acceptance using input from the City of West Allis. Provide written and/or graphical depictions of the compatibility between all contract bid items to the engineer and City of West Allis. Depictions of compatibility shall consist of bolt pattern, bolt size and projection, base plate dimensions, etc.

### **40. Electrical Service Meter Breaker Pedestal Station 6+40 – 13' LT, Item 656.0200.01.**

#### **A Description**

This work shall be in accordance to the requirements of standard spec 656, the plans, standard detail drawings, and as hereinafter provided.

#### **B Materials**

*Amend standard spec 656.2.3, Meter Breaker Pedestal Service, paragraph (1) to read as follows:*

- (1) Furnish an approved service having a meter breaker pedestal, 22,000-AIC circuit breakers unless the local utility requires otherwise, grounding electrodes and connections, conduit and fittings, and all necessary conductors and equipment required by the WSEC and the utility for a service connection. When the meter breaker pedestal is energized, install an approved meter seal at all access points on the meter trough. Meter shall be time of use type if local utility permits.

*Amend standard spec 656.2.3, Meter Breaker Pedestal Service, by adding the following paragraph:*

- (2) Furnish meter pedestal with black painted finish. Repaint meter pedestal using an epoxy primer and topcoat to match the lighting control cabinet finish if a black factory finish is not available.

#### **C Construction**

*Amend standard spec 656.3.2, Service Lateral, paragraph (1) to read as follows:*

(1) The local utility shall furnish and install a 100 A, 120/240 volt AC, single phase, 3-wire underground electrical service lateral. Arrange and assume responsibility for the timely installation of the service lateral by the utility. The lateral shall be terminated at a meter pedestal as the plans show. Submit the application to the utility for all required electrical services. The City of West Allis will pay all utility installation costs directly.

Arrange for future monthly energy usage billing to be established in the name of the appropriate entity. Contact the City of West Allis for this information. Ensure that electrical service is installed and energized a minimum of one week prior to the lighting system activation deadline.

#### **D Measurement**

The department will measure the Electrical Service Meter Breaker Pedestal bid item as a single lump sum for each service, acceptably completed.

#### **E Payment**

In accordance to the plans and standard spec 656.5.

### **52. Lighting Control Cabinet Special, Item SPV.0060.12.**

#### **A. Description**

This special provision describes furnishing and installing a lighting control cabinet with all electrical components, post, mounting hardware, and wiring assembled.

#### **B. Materials**

##### **B.1 Enclosure**

Provide a NEMA 3R minimum enclosure made from .125" Type 5052-H32 aluminum. The doorframe shall be double flanged and gasketed. All exterior hardware shall be stainless steel. Door handle shall be 3/4" diameter stainless steel with three point latching system and hasp. Provide mounting plates at back (interior) of enclosure. Provide a weatherproof pad lock with 2-3/8" wide body, repinnable/replaceable cylinder, and five keys. There shall be no louvers or Corbin main door lock. Furnish an enclosure large enough for all required equipment and interior clearances.

Enclosure shall have a factory prefabricated photocell receptacle.

Enclosure shall be furnished with a black painted finish. Epoxy primer and topcoat shall match other components of the assembly and lighting bid items in the contract.

Enclosure shall be post mounted to a concrete foundation using an aluminum standard conforming to the pertinent provisions in standard spec 657.2.4.

##### **B.2 Panel Equipment**

Furnish a 100A 2-pole main circuit breaker, and at least 2-30A 2P common trip branch circuit breakers to provide for up to two 240V lighting circuits. Provide a ground bus bar



in addition to the copper bus bars. Provide bolt-on, thermal-magnetic circuit breakers that clearly indicate ON, OFF, or TRIPPED position in the panel.

**B.3 Photocell**

Furnish a button type photocell and install into the enclosure’s prefabricated receptacle. Apply silicone caulk to maintain the watertight integrity of the enclosure. The photocell shall be rated for the installation with 30-60 second delay between “on-off” operations.

**B.4 Time Switch**

Furnish an astronomic microprocessor-based 2-channel controller.

**B.5 HOA Switch**

Provide a hand-off-auto switch that is accessible without opening dead-front door.

**B.6 Incidental Materials**

Furnish all conduit, straps, clamps, threaded rod and other mounting hardware as required to complete a full installation. Secure all wiring using screw attachment type straps; adhesive type shall not be allowed.

**C. Construction**

Install the control cabinet as shown the standard detail drawing for “Post Mounted Controller Service Installation”, as shown on the plans and per the local utility requirements. Pretest the cabinet prior to shipment to the site.

Mount all equipment to panel in enclosure. Train the cables in straight horizontal and vertical directions and be parallel next to and adjacent to other cables whenever possible.

**D Measurement**

The department will measure Lighting Control Cabinet Special as each individual unit acceptably completed.

**E Payment**

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.12	Lighting Control Cabinet Special	Each

Payment is full compensation for furnishing and installing photo control, panel, aluminum standard, mounting hardware, enclosure, grounding, wiring and electrical components.

**53. LED Luminaire and Mounting Arm, Item SPV.0060.13.**

**A. Description**

This special provision describes furnishing and installing LED luminaires and Mounting Arms at the locations shown in the plan.

## **B. Materials**

### **B.1 Material Qualifications**

Furnish a complete list of documentation in accordance to standard spec 651.2 and the following requirements. Be prepared to provide the following materials and/or data to the Engineer for review and approval:

One example luminaire matching what is proposed for use on the project. Example luminaire shall be available for evaluation for up to two weeks time. Furnish the following list of specific documentation detailing the characteristics of the LED luminaire:

- Fixture IES files (.ies format) for illumination modeling.
- Lighting design calculations using the proposed luminaire.
- Cut sheets, warranty information and parts list for all equipment.
- Luminaire heat dissipation techniques.
- Energy usage information.
- Color spectrum with HID lamp comparison.
- Optical design features.
- Luminaire to pole mounting methods and equipment.

The information required in the above list must be furnished to the City of West Allis and the engineer after letting. The City of West Allis will not approve any materials prior to bid letting. Do not order materials until the engineer approves the list.

### **B.2 Luminaire and Mounting Arm**

Furnish LED luminaires with a slim, low profile design that minimizes wind loading. Luminaires shall be constructed of cast and extruded aluminum with integral, weathertight LED driver components with high performance aluminum heat-sinks. Each luminaire shall use a terminal block for power input suitable for #2 to #14 AWG wire. Luminaire shall be IESNA Type II Short distribution with partial backlight control.

Luminaire mounting shall allow for a maximum horizontal offset from the pole between 0.5-feet to 4-feet. Luminaire mounting offset may vary. Luminaire mounting shall be rigid and weather tight. Mounting arm shall work with both the light pole and the structure railing posts in the same fashion. Engineer shall approve the mounting equipment prior to ordering materials.

#### **B.2.1 Electronic Components**

Luminaire shall accommodate varied lighting output from high brightness, 6000K (+/- 500K), minimum 70 CRI, LED sources. Drivers shall operate across 120-277V, 50/60 Hertz as standard. LED drivers shall have a power factor greater than 90%. All luminaires shall come equipped with an integral surge suppression protection standard and a quick disconnect harness suitable for mate and break under load provided on power feed to driver for ease of maintenance.

#### **B.2.2 Optical / Illumination Performance**

Luminaire shall illuminate the average section of the path using the proposed lighting layout and mounting equipment on the subject project to the following preset criteria:

- Luminaire tested and certified by an independent test laboratory to meet the photometric performance criteria established by IESNA LM-79.
- Luminaire shall be IESNA Type II Short distribution.
- Luminaire shall deliver a minimum of 3,500 lumens and be rated to consume no more than 160 watts (+/- 10%) while operating for a minimum of 70,000 hours (+/- 10%).
- The resulting illumination of the average section of the path under the proposed lighting layout and mounting equipment shall meet an average illumination of 5 to 1.0 foot-candles and an average-minimum illumination ratio of 10:1; all within a tolerance of +/- 5%.

### **B.2.3 Finish**

The luminaire fixture finish shall feature an epoxy primer with a black powder topcoat, providing resistance to corrosion, ultraviolet degradation and abrasion. Alternative equivalent finishes shall be approved by the engineer.

### **B.2.4 Ratings / Certification**

Luminaires shall be rated and/or certified as follows:

- U.L. listed for wet locations.
- RoHS compliant for lead and mercury standards.
- IP-65 minimum weather fastness rating.
- IDA dark sky cutoff rating.

### **C. Construction**

Install LED Luminaire in accordance to the pertinent provisions of section 659 of the standard specifications and as the manufacturer directs.

### **D Measurement**

The department will measure LED Luminaire and Mounting Arm as each individual unit acceptably completed.

### **E Payment**

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.13	LED Luminaire and Mounting Arm	Each

Payment is full compensation for furnishing all materials; and installing a complete luminaire and mounting arm.

## 64. Lighting System Integrator, Item SPV.0105.10.

### A Description

These special provisions describe coordinating lighting with various parties; record keeping, and documentation. Where the Department is responsible for freeway lighting operation, maintenance, or utility locates on existing systems or systems overlapping project boundaries, the contractor's freeway lighting integrator will serve as the contractor's liaison to the Department's electrical operations unit.

### B Personnel Qualifications

Assign personnel experienced in underground utility construction and Department lighting specifications and practices.

### C Construction

At any one time during the project, the contractor shall assign one individual person as the freeway lighting integrator.

The lighting system integrator shall:

1. Familiarize himself with the location and nature of existing lighting circuits. This familiarity shall include the extent of any lighting system that overlaps project limits.
2. Maintain a file of applicable permits or licenses issued to the contractor, and convey copies to the Engineer.
3. Keep with him at all times a contact list of affected lighting personnel.
4. Maintain a record of tagouts and the clearance of tagouts.
5. Interface with Department electrical personnel to determine how contract limits might affect maintenance or operation of existing systems.
6. Maintain ongoing contact with the Department's Diggers' Hotline Coordinator to ensure that each of the two persons knows that all requested utility locates are marked in the field by the appropriate party. The intent here is to assure coordination. This special provision does not transfer additional utility locating responsibilities to the contractor, beyond those responsibilities already assigned to him by other provisions of the contract.
7. Inform the Department of any lighting outages, including outside the project limits where a lighting system crosses the project boundary.
8. Maintain in any format real-time records of existing, removed and new lighting facilities. Include utility service extensions. Additional required records will include temporary connections and their ultimate removal.
9. Maintain records of tests, including: "meg" tests, amperage draw per circuit leg, voltage reading at the disconnect, and voltage reading at the furthest pole per circuit leg. Convey these records at time of acceptance or partial acceptance.
- 10. At the time of acceptance or partial acceptance, convey as-built drawings in both the following formats: plan redlines and .dgn electronic. Include utility service extensions.**
11. Secure copies of operators manuals, tear sheets, etc. as may be provided by manufacturers of some lighting materials, and convey a minimum of three sets to the Department.

12. Work with the Engineer to notify Department electrical personnel of acceptance or partial acceptance.
13. Perform related duties as may be needed to ensure continuity of freeway lighting during construction, and orderly transfer upon completion.

**D Measurement**

The Department will measure Lighting System Integrator as one complete unit item of work per each pay item for all required coordination, record-keeping, and documentation.

**E Payment**

The department will pay for the measured quantity at the contract lump sum price under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0105.10	Lighting System Integrator	LS

Payment will be full compensation for personnel costs; and for all labor, tools, equipment and incidentals necessary to complete the contract work.

**65. Lighting System Survey, Item SPV.0105.11.**

**A Description**

These special provisions describe performing lighting system survey using Global Position System (GPS).

**B Vacant**

**C Construction**

Locate and survey using GPS all the lighting units and control cabinets. Maintain neat, orderly, and complete survey notes. Enter the coordinates into a Microsoft Excel 2007 spreadsheet along with other required fields as specified by WisDOT.

**D Measurement**

The department will measure Lighting System Survey for all lighting units and control cabinets as a single lump sum unit acceptably completed.

**E Payment**

The department will pay for measured quantities at the contract unit prices under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0105.11	Lighting System Survey	LS

Payment will be full compensation for locating and surveying all the lighting units and control cabinets and for furnishing all labor, tools, materials, equipment and incidentals necessary to complete the contract work.

Attachment 5  
Voltage Drop Calculations

# VOLTAGE DROP CALCULATIONS

WisDOT - Dakota Street Pedestrian Bridge  
PROJECT # 21152.022

VOLTAGE DROP CALCULATIONS										
PANEL	CKT.	LOCATION	LOADS (xWAWMx)	NUMBER OF FIXTURES	MAX FIXTURE WATTAGE	CIRCUIT AMPACITY	ONE WAY DISTANCE	MAX. VOLTAGE DROP (%)	CABLE SIZE REQUIRED (CM)	REQUIRED WIRE (MIN.)
WAWM	A (1, N)	Structure Lighting	1, 3, 5, 7, 9, 10, 12, 13, 15, 17, 19	11	70	3.21	1200	5.00	7,123	#10 AWG
WAWM	B (2, N)	Structure Lighting	2, 4, 6, 8, 11, 14, 16, 18	8	70	2.33	1200	5.00	5,180	#10 AWG
<b>SYSTEM VOLTAGE =</b>					240 V					