



INDIANA DEPARTMENT OF TRANSPORTATION

STANDARDS COMMITTEE MEETING

*Driving Indiana's Economic Growth*

# AGENDA

## April 15, 2010 Standards Committee Meeting

MEMORANDUM

March 31, 2010

TO: Standards Committee

FROM: Greg Broz, Secretary

RE: Agenda for the April 15, 2010 Standards Committee Meeting

A Standards Committee meeting is scheduled for 9:00 a.m. on April 15, 2010 in the N925 Conference Center that is located on the north side of the building near the east elevator bank.

The following agenda items are listed for consideration.

A. GENERAL BUSINESS ITEMS

OLD BUSINESS

*(No items on this agenda)*

NEW BUSINESS

1. Approval of the March 18, 2010 Minutes

B. CONCEPTUAL PROPOSAL ITEMS

OLD BUSINESS

*(No items on this agenda)*

NEW BUSINESS

*(No items on this agenda)*

C. STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS  
PROPOSED ITEMS

OLD BUSINESS

*(No items on this agenda)*

<u>NEW BUSINESS</u>			
<u>Item No. 01</u>	<u>04/15/10 (2010 SS)</u>	<u>Mr. Boruff</u>	<u>5</u>
	920.01(b)1	High Mast Poles	
	920.01(b)2	Welding	
	920.01(b)3	Handholes	
	920.01(b)4	Luminaire Ring Assembly	
	Standard Drawings:		
	807-LTPD-01 (1 OF 2)	LIGHTING HIGH MAST POLES	
	807-LTPD-02 (2 OF 2)	LIGHTING HIGH MAST POLES	
	807-LTHM-02	HIGH MAST POLE PERFORATED ALUMINUM SKIRT	
	807-LTHM-03	LIGHTING HIGH MAST TOWER POLE	
	807-LTHM-04	LIGHTING HIGH MAST TOWER POLE	
	807-LTFD-07	HIGH MAST TOWER FOUNDATION	
	807-LTHI-05	HIGHWAY ILLUMINATION TOWER	
	IDM 78.7.0	HIGH MAST LIGHTING DESIGN	
<u>Item No. 02</u>	<u>04/15/10 (2010 SS)</u>	<u>Mr. Pankow</u>	<u>28</u>
	301.02	Materials	
	301.05	Spreading	
	303.03	Preparation of Subgrade	
	303.05	Spreading	
<u>Item No. 03</u>	<u>04/15/10 (2010 SS)</u>	<u>Mr. Pankow</u>	<u>32</u>
	306.02	General	
<u>Item No. 04</u>	<u>04/15/10 (2010 SS)</u>	<u>Mr. Pankow</u>	<u>35</u>
	616.02	Materials	
	Standard Drawings:		
	E 616-SWCO-07	SLOPEWALL AND DRAINAGE DETAILS	
	616-SWCO-07	SLOPEWALL AND DRAINAGE DETAILS	
<u>Item No. 05</u>	<u>04/15/10 (2010 SS)</u>	<u>Ms. Rearick</u>	<u>40</u>
	723-R-568	SCOUR PROTECTION	
	Standard Drawings:		
	714-XXXX-01	BOX CULVERT SCOUR PROTECTION	
	714-XXXX-02	BOX CULVERT SUMPING PROTECTION	
	715-PCSP-01	PIPE OR BOX CULVERT SUMPING PROTECTION	
<u>Item No. 06</u>	<u>04/15/10 (2010 SS)</u>	<u>Ms. Rearick</u>	<u>48</u>
	714.01	Description	
	714.02	Materials	
	714.03	General Requirements	
	714.04	Design Requirements	
	714.04(a)	Box Sections-Structure	
	714.04(b)	<del>Precast</del> Concrete Headwalls, <del>and</del> Wingwalls, <del>and</del> Footings	
	714.04(c)	Working Drawings	
	714.05	Erection Requirements	
	714.06	Precast Concrete Headwalls, <del>and</del> Wingwalls, <del>and</del> Footings	
	714.06(b)	Wingwall Placement	
	<del>714.06(c)</del>	<del>Wingwall Repairs</del>	
	714.06(d)	(c) Sealing	
	714.07	Rejection	
	714.08	Repairs	

714. <del>0709</del>	Extension of Existing Structure
714. <del>0709</del> (a)	Precast Reinforced Concrete Box <del>Section</del> Structure Extension
714. <del>0709</del> (b)	Cast-in-Place Concrete Structure Extension
714. <del>0810</del>	Precast Reinforced-Concrete Box Structure Section Joints
714. <del>0911</del>	Method of Measurement
714. <del>1012</del>	Basis of Payment
717.09	Basis of Payment
723.01	Description
723.02	Materials
723.03	<del>Shop Drawings</del> General Requirements
723.04	Design Requirements
723.04(a)	Placement of Reinforcement
723.04(b)	Splicing and Spacing of Reinforcement
723.04(c)	Working Drawings
723.05	Manufacture
<del>723.06</del>	Marking
<del>723.07</del>	Testing
723. <del>0806</del>	Rejection
723. <del>0907</del>	Repairs
723. <del>1008</del>	Trench Compaction
723. <del>1109</del>	Footings
723. <del>1210</del>	Pedestals
723. <del>1311</del>	Placement of Structure Sections and Wingwalls
723.12	Extension of existing Structure
723.12(a)	Precast Reinforced Concrete Three- Sided Structure Extension
723.12(b)	Cast-In Place Concrete Tree-Sided Structure Extension
723. <del>1413</del>	Sealing
723. <del>1514</del>	Joints
723. <del>1615</del>	Backfilling
723. <del>1716</del>	Scour Protection
723. <del>1817</del>	Method of Measurement
723. <del>1918</del>	Basis of Payment
907.05	Precast Reinforced Concrete <del>Box</del> Structure Sections
907.05(a)	Box
907.05(b)	Three-Sided
907.06	Precast Reinforced Concrete Headwalls, <del>and</del> Wingwalls, Footings and Spandrel Walls for <del>Box Structure</del> or Three-Sided Structure
907.07	<del>Blank</del> Joint Membrane System for Precast Reinforced Concrete Box Structure Sections

Item No. 07 04/15/10 (2010 SS)

Mr. Boruff

84

801-TCDV-03	MERGING OR SHIFTING TAPER
805-SCGO-04A	SIGNAL INDICATION MOUNTED ON STEEL POLE
805-SCGO-04B	SIGNAL INDICATION MOUNTED ON WOOD POLES
805-SGLI-02	TRAFFIC SIGNAL LOOP INSTALLATION

(Continued)

Page No.

805-SGLI-06  
FIGURE 46-4M

TRAFFIC SIGNAL LOOP INSTALLATION  
CHANNELIZED LEFT-TURN LANE FOR  
2- LANE HIGHWAY  
LONGITUDINAL TAPER RATE AND LENGTH

FIGURE 76-2B

Item No. 08 04/15/10 (2010 SS)  
706-B-140d (PAGE 3)

Ms. Rearick 93  
GUARDRAIL TRANSITION, TGS-1

cc: Committee Members (11)  
FHWA (2)  
ICA (1)

AGENDA

SPECIFICATION REVISIONS

REVISION TO THE STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The current material used for INDOT High Mast Tower, weathering steel, has been rusting excessively causing significant loss of section modulus at the tower base which can potentially lead to failure.

Additionally, across the industry this material is used less frequently than in the past meaning that towers made from weathering steel will become more expensive than the alternative material.

PROPOSED SOLUTION: Changing the material specification to Galvanized Steel. Changes to the welding procedure and inspection are also proposed as well as to the standard drawings for the foundation, for the aluminum skirt between the base plate and foundation, and for the concrete pads.

APPLICABLE STANDARD SPECIFICATIONS: 920.01(b) 1, 2, & 4

APPLICABLE STANDARD DRAWINGS: 807-LTPD-01, 807-LTPD-02(new), 807-LTFD-07,  
807-LTHM-02, 807-LTHM-03, 807-LTHM-04,  
807-LTHI-05

APPLICABLE DESIGN MANUAL SECTION: 78-7.0

APPLICABLE SECTION OF GIFE:

APPLICABLE RECURRING SPECIAL PROVISIONS:

Submitted By: David Boruff

Title: Traffic Administration Section Supervisor

Organization: INDOT

Phone Number: 317-899-8626

Date: 3/19/2010

APPLICABLE SUB-COMMITTEE ENDORSEMENT? Ad Hoc: Ron Heustis, Tony Uremovich,  
District Traffic Engineers

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 920.01(b) HIGH MAST STANDARDS OF 80 ft (24.5 m) AND OVER

The Standard Specifications are revised as follows:

SECTION 920, BEGIN LINE 223, DELETE AND INSERT AS FOLLOWS:

**1. High Mast Poles**

The poles shall be ~~made of steel in accordance with ASTM A 871 (A 871M).~~  
~~The steel shall have a minimum yield strength of 59,500 psi (410 MPa) tapered shafts having poly-sided or circular cross sections. The pole shaft sections shall be slip fitted and shall provide at least 1 in. (25 mm) radial clearance from all interior devices.~~

*All tower shaft components shall be fabricated from high strength, low alloy, steel in accordance with AASHTO M 270; ASTM A 595, Grade A or B; ASTM A 572, Grade 55; ASTM A 1011 (A 1011M); ASTM A 606, or ASTM A 808 (A 808M), with a minimum yield strength of 50,000 psi (345,000 kPa).*

*Sections which are slip fitted shall have slip joints with a minimum overlap of 1.5 times the diameter of the bottom of the upper section at the slip joint. Towers having slip joint construction shall be match marked at the factory and shall be shipped disassembled for assembly at the work site. Slip joints shall be marked to ensure that the 1.5 times diameter insertion is provided.*

All steel used in the base plate and shaft shall meet an impact property of 15 ft-lbs (20.3 J) at 40°F (4.5°C) in the longitudinal direction using the Charpy V-Notch test. This shall be an average of 3 tests per mill heat with no test below 10 ft-lbs (13.6 J). A copy of the certified mill test reports for this steel and the Charpy V-Notch test results shall be submitted. Sufficient information shall be furnished to demonstrate that this material is traceable to the mill heat number shown on the test report.

~~The tapered pole shall be multi sided or circular in shape. The pole shaft sections shall be welded together or slipfitted. The minimum diameter of the pole top shall be 7.5 in. (190 mm) and shall provide at least 1 in. (25 mm) radial clearance from all interior devices.~~

~~The exterior of the pole shall be thoroughly shotblasted or otherwise cleaned to a near white finish to remove all oily and foreign matter. The interior of the pole shall be cleaned of all mill scale and foreign matter by a pickling process or shotblasting.~~

~~Hardware~~ All tower shaft hardware including hardware for the handhole door, and the latch mechanism shall be stainless steel in accordance with ASTM A 276, type 304 or 305, except where otherwise specified.

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 920.01(b) HIGH MAST STANDARDS OF 80 ft (24.5 m) AND OVER (CONTINUED)

~~For the slipfit design, the pole shall be made up of not more than four sections for poles up to and including 120 ft (36.6 m) in length. For the poles between 120 ft (36.6 m) and 150 ft (45.7 m), five sections will be permitted. For poles over 150 ft (45.7 m) and up to 200 ft (61 m), six sections will be permitted. The inside edge of the lower section of the slip joint shall be beveled to prevent the transition joint assembly from catching on the edge. Slip joints shall have a minimum overlap of 1 1/2 times the diameter of the bottom of the upper section. The sections shall be pre-fitted and matchmarked at the factory.~~

*After fabrication, the pole shall be cleaned and galvanized. Galvanized steel towers, including the handhole, handhole door, base plate, mounting plate, and all other elements welded to the shaft shall be hot-dip galvanized in accordance with AASHTO M 111.*

## **2. Welding**

*The Contractor shall submit the manufacturer's welding procedure for approval prior to fabrication. The welding symbols and all information regarding location, type, size, welding sequence, and welding procedure specifications shall be shown on the shop drawings.*

*Welds shall be smooth and cleaned of flux and spatter in accordance with AWS procedure. Minimum preheats for welds shall be 100°F (65°C) for seams, and 225°F (110°C) for circumferential welds.*

All welds shall be performed at the factory. Circumferential welds shall be backed-up welds with 100% penetration. Longitudinal welds shall have a minimum of 60% penetration except within 2 ft (0.6 m) of either side of the circumferential joint, the welds shall be backed-up and of 100% penetration. Base plate welds shall be 100% penetration. Circumferential welds and 100% penetration longitudinal welds shall be 100% ultrasonically inspected. The 60% penetration longitudinal welds shall be 100% ultrasonically or radiographically inspected for soundness. Welding shall be performed in accordance with AWS D1.5 and 711.32. Weld filler shall provide Charpy V Notch equal to or greater than 20 ft-lbs (27.1 J) at 0° F (-18°C).

### **a. Inspection**

*The manufacturer shall provide quality control, QC, inspection. The inspector shall be an AWS certified welding inspector, CWI, in accordance with AWS D1.5. The NDT inspector shall be an independent non-destructive-testing inspector, certified as level II in RT, UT, or MT, or all as applicable. Copies of the inspection reports and NDT reports shall be provided to the Engineer.*

*The method for testing full penetration and partial penetration welds by the independent welding inspector shall be the same as specified above.*

REVISION TO THE STANDARD SPECIFICATIONS

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REVISION TO SECTION 920.01(b) HIGH MAST STANDARDS OF 80 ft (24.5 m) AND OVER (CONTINUED)

### 3. Handholes

Openings for handholes shall be reinforced to maintain the design strength of the pole. The handhole shall have a weatherproof gasket made of neoprene or silicone rubber. The gasket shall be formed for a forced fit around the handhole or be attached by mechanical means. Samples of the gaskets shall be furnished for approval. The door and hinges shall be the same type steel as the poles. The hinge pins and other securing hardware shall be stainless steel and tamperproof. The door shall be fabricated to allow for a padlock, which is not included in the hardware. The hasp used for padlocking shall be fabricated from stainless steel. Provisions shall be made to bolt the door securely shut. The door shall include a bug proof and weatherproof aperture with a minimum opening of 4 in.<sup>2</sup> (2580 mm<sup>2</sup>). Nylon or non-corrosive screens, or other approved methods of bugproofing shall be furnished. Two bonding plates shall be furnished which are accessible through the pole handhole for connecting the ground wires. A connection shall be furnished for an additional ground wire on the outside of the pole near the base plate.

### 4. Luminaire Ring Assembly

The ring shall be fabricated from ASTM A 666 Type 201 or 304 stainless steel and shall have a removable raceway cover. The ring shall be ~~designed~~ *fabricated* as an enclosed wire raceway to provide for the symmetrical mounting of *the* luminaires ~~having an effective projected area of 2.8 ft<sup>2</sup> (0.26 m<sup>2</sup>) and a weight of 85 lb (38.5 kg) or actual projected area and weight, if greater.~~ All structural connections shall be made with bolts and nuts.

The luminaire ring shall be supported by ~~three 3/16 in. (5mm) means of~~ stainless steel aircraft cables of seven strands with 19 wires ~~each per~~ strand with a minimum breaking strength of 3900 lb (17 350 N). ~~The cables shall be secured to the ring, and to cable terminating devices within the poles by means of stainless steel hardware.~~

~~Positive positioning devices shall be incorporated into the ring assembly. These devices shall be designed to prevent any horizontal movement in the ring assembly. The ring assembly shall have a minimum of six non-abrasive rollers on the ring interior.~~

REVISION TO THE STANDARD DRAWINGS

PROPOSED REVISED DRAWING 807-LTPD-01 LIGHTING HIGH MAST POLE  
POLE DATA SCHEDULE (1 OF 2) POLE HEIGHTS 100' - 140'

POLE DATA SCHEDULE												
POLE HEIGHT (E.M.H.)	POLE SHAFT DATA						BASE PLATE			ANCHOR BOLT		
	No. of Sec.	Sec.	Minimum Diameter in inches		Min. Wall Thickness in inches	Section Length in Feet	Size in inches	Bolt Circle (in.)	Thick-ness (in.)	No Req'd.	Diameter (in.)	Length (in.)
			Base	Top								
100'	2	A	21.50	14.21	0.250	52.50	36 x 33	31.50	2.00	6	2.25	90
		B	15.00	7.88	0.1875	50.89						
100'	3	A	20.79	17.26	0.250	25.25	36 x 36	31.50	2.00	6	2.25	90
		B	18.04	12.30	0.179	41.00						
		C	13.01	7.59	0.179	38.75						
105'	2	A	22.00	14.46	0.250	53.87	36 x 33	31.50	2.00	6	2.25	90
		B	15.25	7.68	0.1875	54.11						
105'	3	A	22.19	17.12	0.250	36.25	36 x 36	31.50	2.00	6	2.25	90
		B	18.04	12.30	0.179	41.00						
		C	13.01	8.29	0.179	33.75						
110'	3	A	22.50	16.67	0.250	41.65	36 x 36	31.50	2.00	6	2.25	90
		B	17.50	11.76	0.1875	41.02						
		C	12.50	7.85	0.1875	33.21						
115'	3	A	23.00	17.16	0.250	41.71	36 x 36	31.50	2.00	6	2.25	90
		B	18.00	12.25	0.1875	41.09						
		C	13.00	7.65	0.1875	38.21						
120'	3	A	24.00	18.14	0.250	41.84	36 x 36	31.50	2.00	6	2.25	90
		B	19.00	13.23	0.1875	41.21						
		C	14.00	7.95	0.1875	43.21						
125'	3	A	25.00	19.13	0.250	41.96	36 x 33	31.50	2.00	6	2.25	90
		B	20.00	14.21	0.1875	41.34						
		C	15.00	8.25	0.1875	48.21						
125'	4	A	24.30	20.17	0.250	29.50	36 x 36	31.50	2.00	6	2.25	90
		B	21.17	15.82	0.250	38.25						
		C	16.74	12.16	0.250	32.75						
		D	12.87	8.15	0.179	33.75						
130'	3	A	25.50	19.62	0.250	42.02	36 x 33	31.50	2.00	6	2.25	90
		B	20.50	14.21	0.1875	44.91						
		C	15.00	8.05	0.1875	49.64						
130'	4	A	24.30	20.17	0.250	29.50	36 x 36	31.50	2.00	6	2.25	90
		B	21.31	15.96	0.250	38.25						
		C	16.88	12.30	0.250	32.75						
		D	13.01	7.59	0.179	38.75						
135'	3	A	26.00	20.11	0.3125	42.09	36 x 33	31.50	2.00	6	2.25	90
		B	21.00	14.21	0.1875	48.48						
		C	15.00	7.85	0.1875	51.07						
135'	4	A	25.70	20.17	0.250	39.50	36 x 36	31.50	2.00	6	2.25	90
		B	21.31	15.96	0.250	38.25						
		C	16.88	12.30	0.250	32.75						
		D	13.01	8.29	0.179	33.75						
140'	3	A	26.50	20.60	0.3125	42.15	36 x 33	31.50	2.00	6	2.25	90
		B	21.50	14.21	0.1875	52.05						
		C	15.00	7.65	0.1875	52.50						
140'	4	A	25.70	20.17	0.250	39.50	36 x 36	31.50	2.00	6	2.25	90
		B	21.31	15.96	0.250	38.25						
		C	16.88	12.30	0.250	32.75						
		D	13.01	7.59	0.179	38.75						

INDIANA DEPARTMENT OF TRANSPORTATION	
LIGHTING HIGH MAST POLE POLE DATA SCHEDULE (1 of 2) POLE HEIGHTS 100' - 140' APRIL 2009	
STANDARD DRAWING NO. E 807-LTPD-01	
	/s/XXXXXXXXXX 01/01/09 DESIGN STANDARDS ENGINEER DATE
	/s/XXXXXXXXXX 01/01/09 CHIEF HIGHWAY ENGINEER DATE
DESIGN STANDARDS ENGINEER	

REVISION TO THE STANDARD DRAWINGS

PROPOSED NEW DRAWING 807-LTPD-02 LIGHTING HIGH MAST POLE  
POLE DATA SCHEDULE (2 OF 2) POLE HEIGHTS 145' - 200'

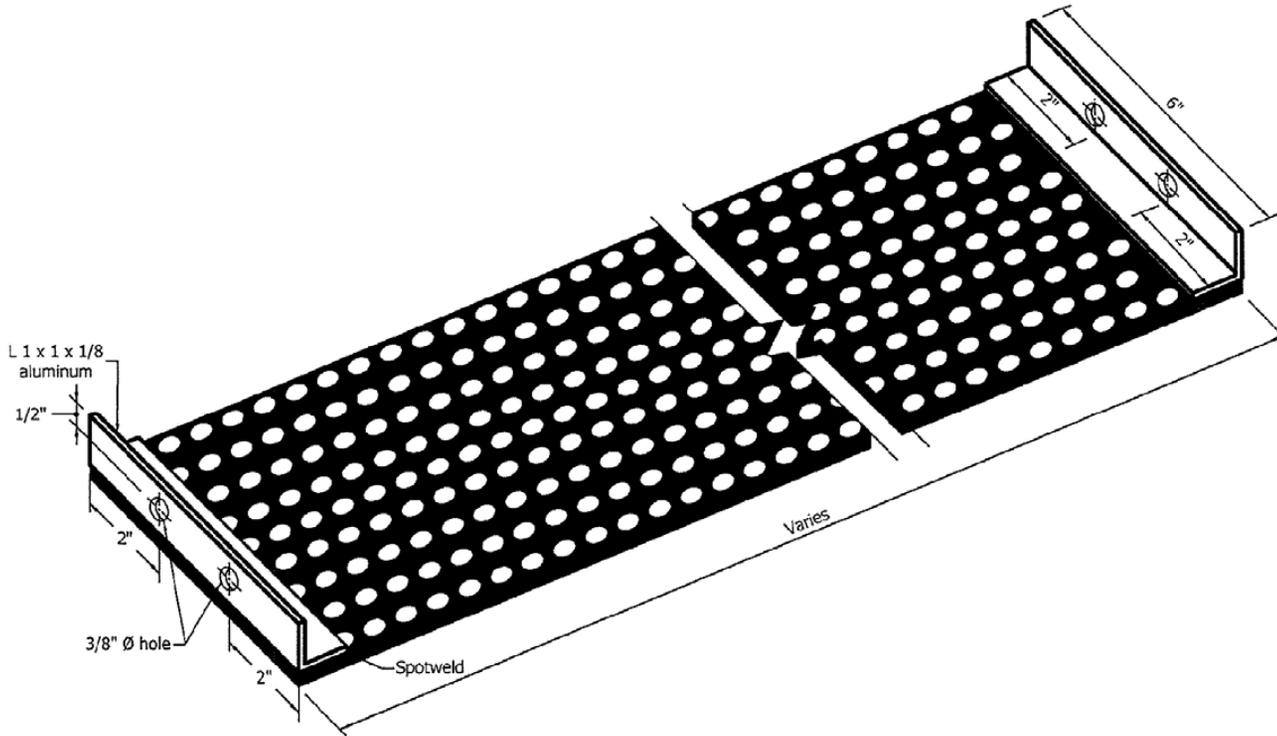
POLE DATA SCHEDULE												
POLE HEIGHT (E.M.H.)	POLE SHAFT DATA						BASE PLATE			ANCHOR BOLT		
	No. of Sec.	Sec.	Minimum Diameter in inches		Min. Wall Thickness in inches	Section Length in Feet	Size in inches	Bolt Circle (in.)	Thick-ness (in.)	No Req'd.	Diameter (in.)	Length (in.)
			Base	Top								
145'	3	A	27.50	21.09	0.3125	45.78	38 x 38	33.50	2.00	8	2.25	90
		B	22.00	14.70	0.1875	52.11						
		C	15.50	7.95	0.1875	52.93						
145'	4	A	27.10	20.17	0.250	49.50	38 x 38	33.50	2.00	8	2.25	90
		B	21.31	15.96	0.250	38.25						
		C	16.88	12.30	0.250	32.75						
		D	13.01	8.29	0.179	33.75						
150'	3	A	28.00	20.60	0.3125	52.86	38 x 38	33.50	2.00	8	2.25	90
		B	21.50	14.21	0.1875	52.05						
		C	15.00	7.75	0.1875	51.79						
150'	4	A	27.10	20.17	0.250	49.50	38 x 38	33.50	2.00	8	2.25	90
		B	21.31	15.96	0.250	38.25						
		C	16.88	12.30	0.250	32.75						
		D	13.01	7.59	0.179	38.75						
155'	4	A	28.50	23.06	0.3125	38.89	38 x 38	33.50	2.00	8	2.25	90
		B	24.00	18.14	0.1875	41.84						
		C	19.00	13.23	0.1875	41.21						
		D	14.00	7.93	0.1875	43.39						
160'	4	A	28.80	24.04	0.3125	34.01	38 x 38	33.50	2.00	8	2.25	90
		B	25.00	18.63	0.1875	45.47						
		C	19.50	13.23	0.1875	44.78						
		D	14.00	7.53	0.1875	46.25						
165'	4	A	29.50	24.04	0.3125	39.01	44 x 44	40.00	2.00	8	2.25	90
		B	25.00	18.63	0.1875	45.47						
		C	19.50	13.23	0.1875	44.78						
		D	14.00	7.53	0.1875	46.25						
170'	4	A	30.50	24.04	0.3125	46.16	44 x 44	40.00	2.00	8	2.25	90
		B	25.00	18.63	0.1875	45.47						
		C	19.50	13.23	0.1875	44.78						
		D	14.00	7.53	0.1875	44.11						
175'	4	A	31.00	25.02	0.3125	42.71	44 x 44	40.00	2.00	8	2.25	90
		B	26.00	19.62	0.1875	45.59						
		C	20.50	13.72	0.1875	48.42						
		D	14.50	7.63	0.1875	49.11						
180'	4	A	32.00	25.02	0.3125	49.85	44 x 44	40.00	2.00	8	2.25	90
		B	26.00	19.13	0.1875	49.10						
		C	20.00	13.23	0.1875	48.35						
		D	14.00	7.93	0.1875	43.39						
185'	4	A	32.50	25.02	0.375	53.42	44 x 44	40.00	2.00	8	2.25	90
		B	26.00	19.13	0.1875	49.10						
		C	20.00	13.23	0.1875	48.35						
		D	14.00	7.73	0.1875	44.82						
190'	4	A	33.00	26.00	0.375	49.98	44 x 44	40.00	2.00	8	2.25	90
		B	27.00	20.11	0.1875	49.23						
		C	21.00	14.21	0.1875	48.48						
		D	15.00	7.53	0.1875	53.39						
195'	4	A	34.00	26.49	0.375	53.61	44 x 44	40.00	2.00	8	2.25	90
		B	27.50	20.11	0.1875	52.80						
		C	21.00	14.21	0.1875	48.48						
		D	15.00	7.83	0.1875	51.25						
200'	4	A	34.50	26.92	0.375	54.11	44 x 44	40.00	2.00	8	2.25	90
		B	28.00	20.60	0.2187	52.86						
		C	21.50	14.21	0.1875	52.05						
		D	15.00	7.69	0.1875	52.23						

All Dimensions are in mm unless otherwise specified.

<b>INDIANA DEPARTMENT OF TRANSPORTATION</b>	
LIGHTING HIGH MAST POLE POLE DATA SCHEDULE (2 of 2) POLE HEIGHTS 145' - 200' MONTH-YEAR	
STANDARD DRAWING NO. E 807-LTPD-02	
	/s/XXXXXXXXXX 01/01/09 DESIGN STANDARDS ENGINEER DATE
	/s/XXXXXXXXXX 01/01/09 CHIEF HIGHWAY ENGINEER DATE
DESIGN STANDARDS ENGINEER	

REVISION TO THE STANDARD DRAWINGS

PROPOSED REVISED DRAWING 807-LTHM-02 HIGH MAST POLE PERFORATED ALUMINUM SKIRT



PERFORATED ALUMINUM SKIRT

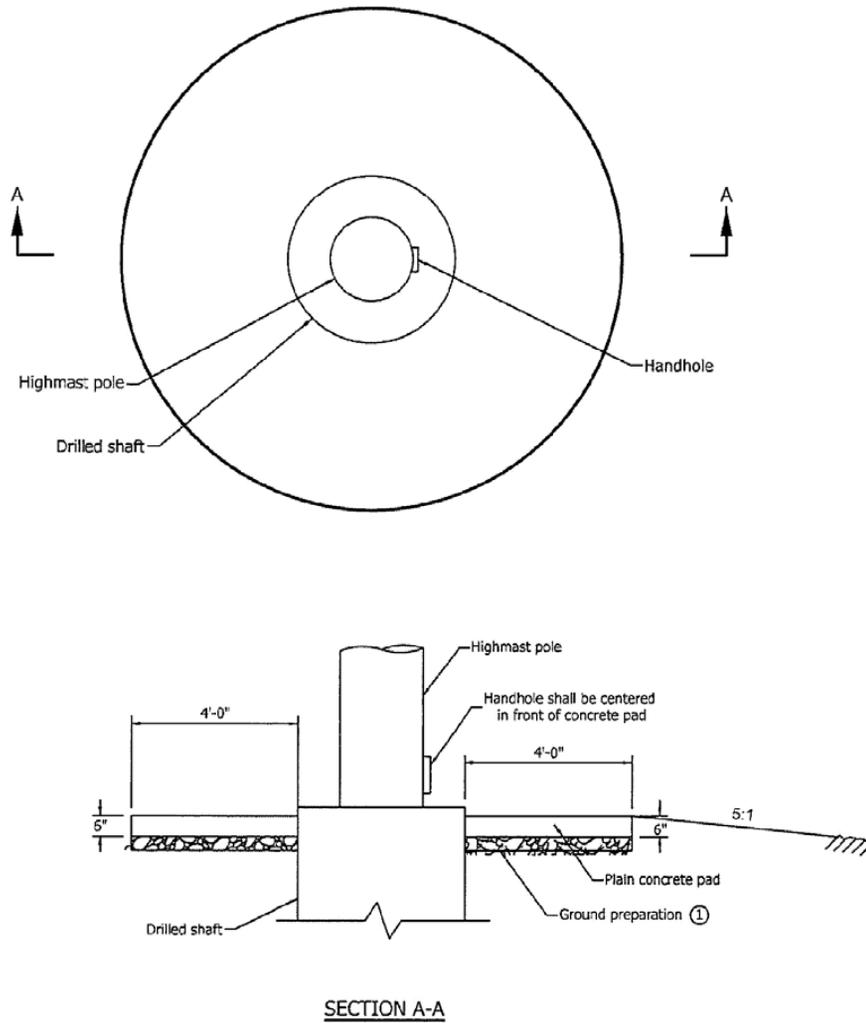
NOTES:

1. Holes shall be 3/8" dia., 1/2" outer circle, staggered.
2. The base plate of the high mast pole and exposed anchor bolts shall be enclosed by the aluminum skirt.

INDIANA DEPARTMENT OF TRANSPORTATION	
HIGH MAST POLE PERFORATED ALUMINUM SKIRT	
2010	
STANDARD DRAWING NO.	E 807-LTHM-02
	/s/XXXXXXXXXX 01/01/09 DESIGN STANDARDS ENGINEER DATE
	/s/XXXXXXXXXX 01/01/09 CHIEF HIGHWAY ENGINEER DATE
DESIGN STANDARDS ENGINEER	

REVISION TO THE STANDARD DRAWINGS

PROPOSED REVISED DRAWING 807-LTHM-03 LIGHTING HIGH MAST POLE CONCRETE PAD



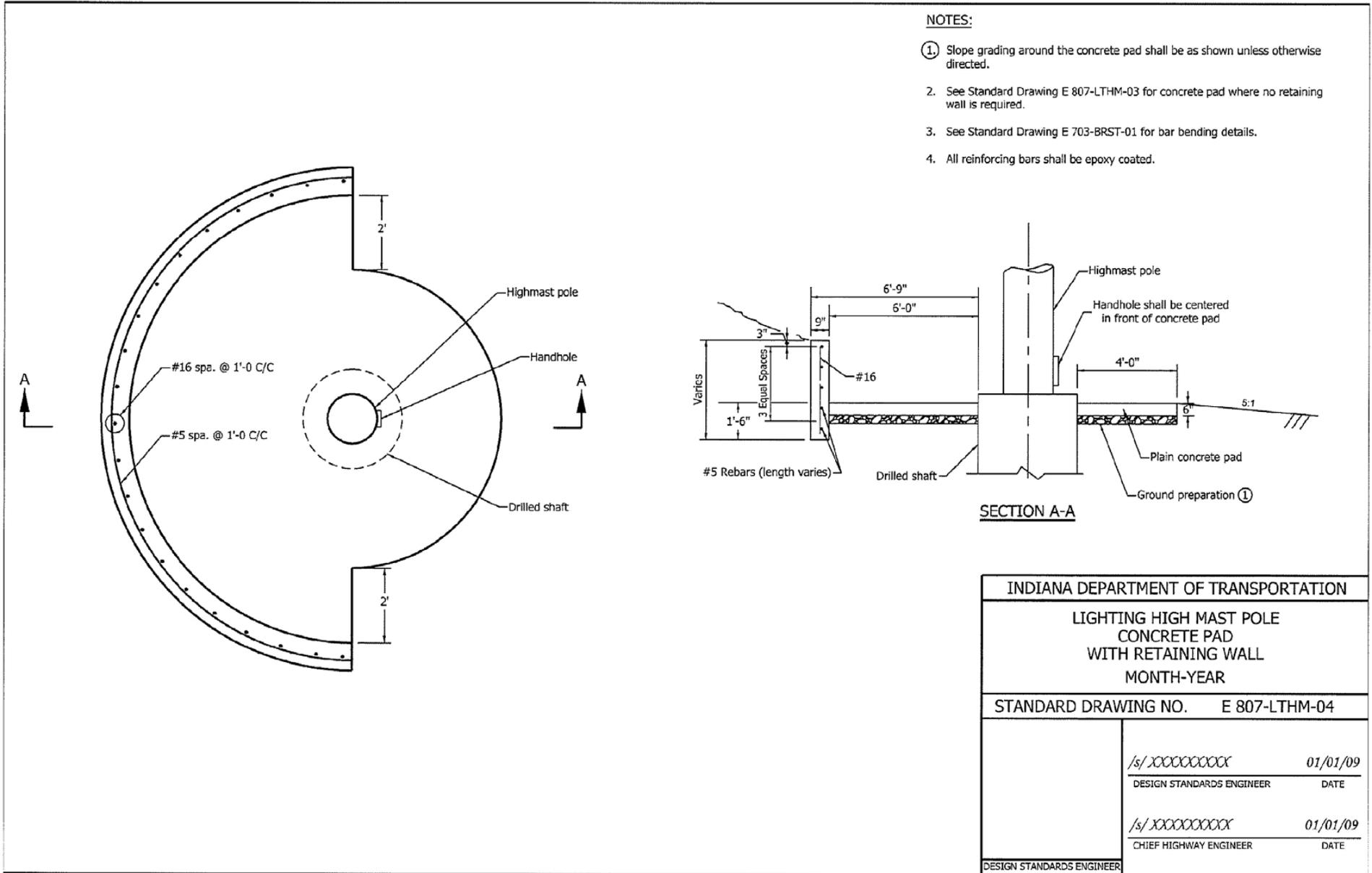
NOTES

- ① The slope grading around the concrete pad shall be as shown unless otherwise directed.
- 2. See Standard Drawing E 807-LTHM-04 for concrete pad where retaining wall is required.

INDIANA DEPARTMENT OF TRANSPORTATION	
LIGHTING HIGH MAST POLE CONCRETE PAD	
STANDARD DRAWING NO.	E 807-LTHM-03
2010	
/s/XXXXXXXXXX	01/01/09
DESIGN STANDARDS ENGINEER	DATE
/s/XXXXXXXXXX	01/01/09
DESIGN STANDARDS ENGINEER	CHIEF HIGHWAY ENGINEER
	DATE

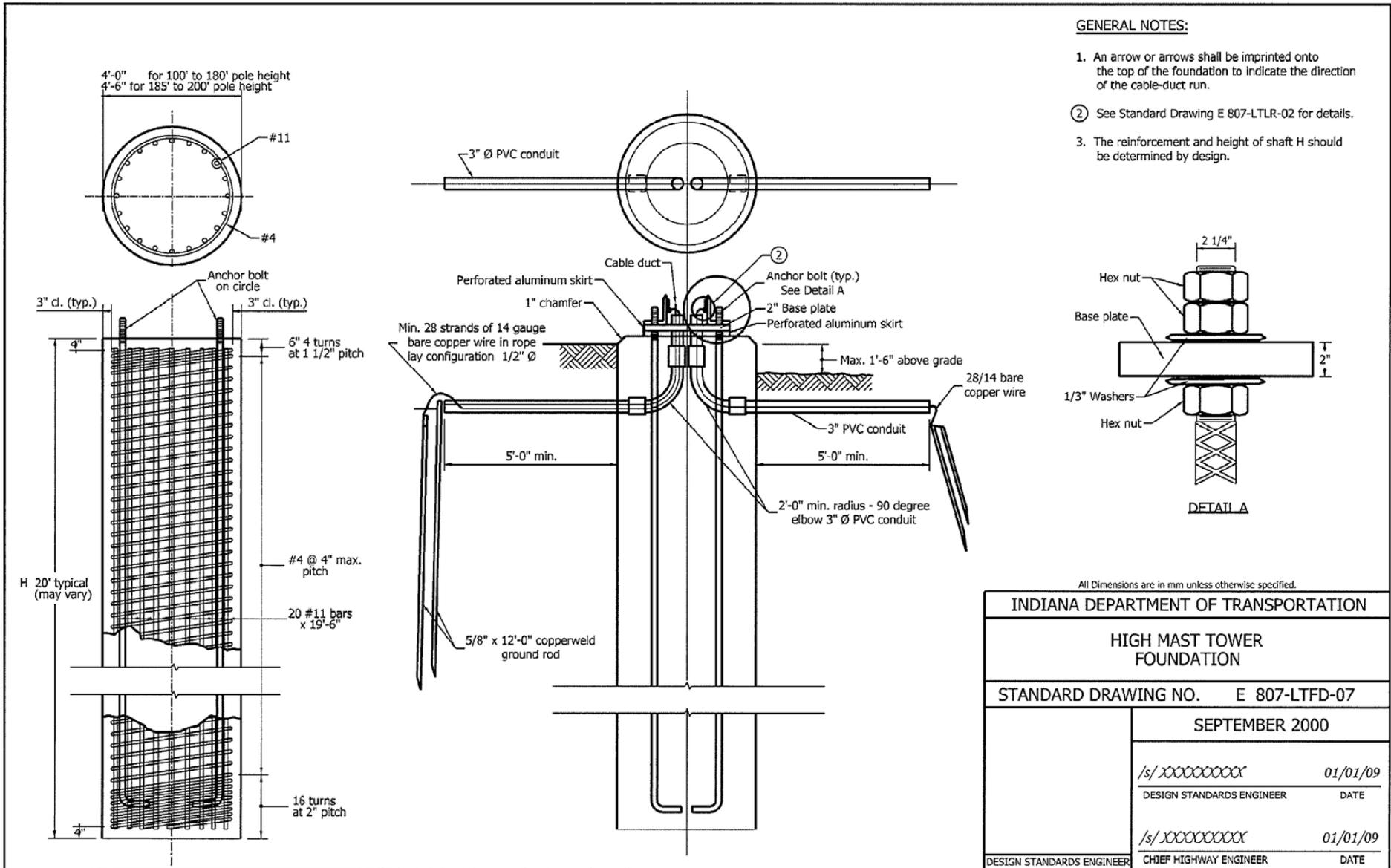
REVISION TO THE STANDARD DRAWINGS

PROPOSED REVISED DRAWING 807-LTHM-04 LIGHTING HIGH MAST POLE CONCRETE PAD WITH RETAINING WALL MONTH-YEAR



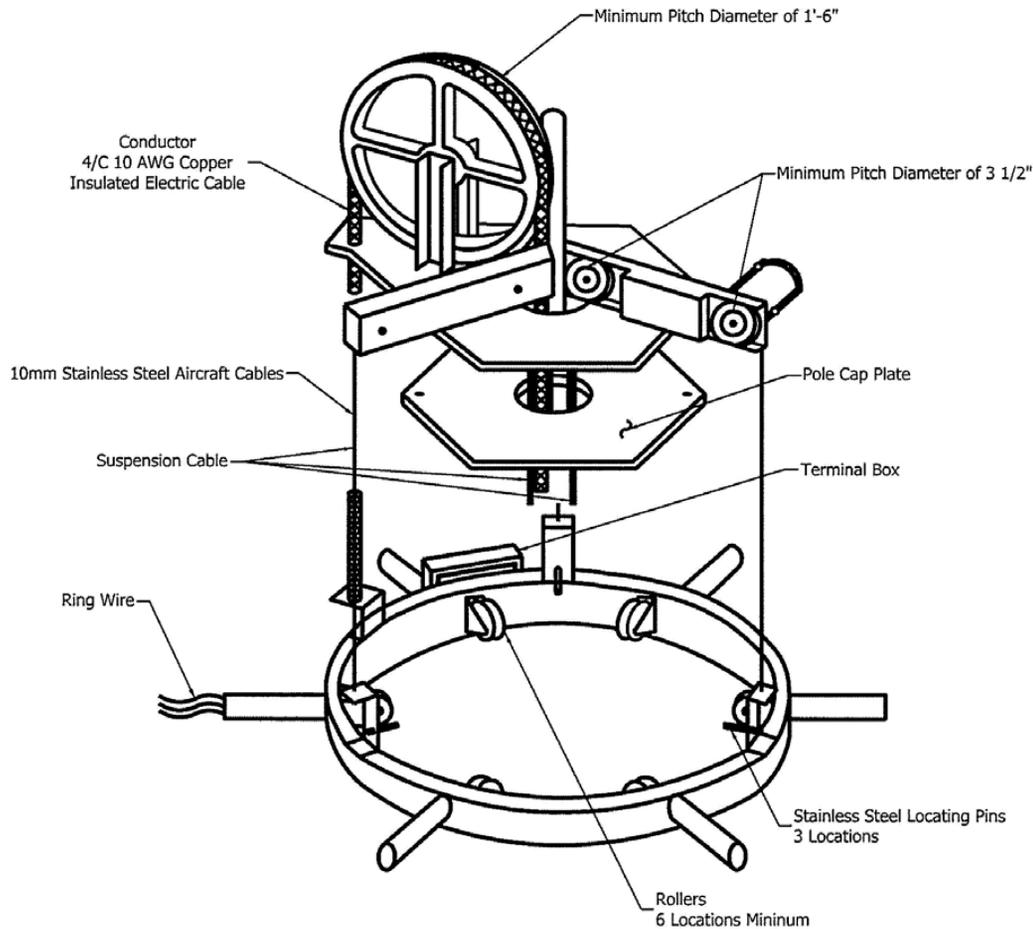
REVISION TO THE STANDARD DRAWINGS

PROPOSED REVISED DRAWING 807-LTFD-07 HIGH MAST TOWER FOUNDATION



REVISION TO THE STANDARD DRAWINGS

PROPOSED REVISED DRAWING 807-LTHI-05 HIGHWAY ILLUMINATION TOWER DETAILS BOTTOM LATCH



RING ASSEMBLY

All Dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION		
HIGHWAY ILLUMINATION TOWER DETAILS BOTTOM LATCH		
STANDARD DRAWING NO.		E 807-LTHI-05
DESIGN STANDARDS ENGINEER	/s/XXXXXXXXXX	01/01/09
	DESIGN STANDARDS ENGINEER	DATE
DESIGN STANDARDS ENGINEER	/s/XXXXXXXXXX	01/01/09
	CHIEF HIGHWAY ENGINEER	DATE

Item No. 01 04/15/10 (2010 SS)(contd.)  
Mr. Boruff  
Date: 04/15/10

REVISION TO THE STANDARD DRAWINGS

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AGENDA

REVISION TO THE STANDARD SPECIFICATIONS  
 PROPOSED REVISION TO IDM 78-7.0 HIGH MAST LIGHTING DESIGN

**78-7.0 HIGH-MAST LIGHTING DESIGN**

The design of a high-mast lighting system consists of the same design procedures as discussed in Section 78-5.02. In addition, the designer should consider the following:

- 1 Lighting Source. A 1000-W high pressure sodium light source should be used. The number of required luminaires should be determined based on the area to be lighted—~~It can be assumed that a mounting height of 100 ft will require 400,000 lm. A mounting height of 110 ft to 120 ft will require 600,000 lm. A mounting height of 150 ft will require 800,000 lm. The number of luminaires per pole ranges from 4 to 6 and should be as follows-~~

<u>Mounting Ht., H</u>	<u>Lumens</u>	<u>No. of Luminaires</u>
100'	400,000	4
105' ≤ H ≤ 120'	600,000	4,6
125' ≤ H ≤ 150'	800,000	6,8
155' ≤ H ≤ 200'	1,600,000	6, 8,10,12

2. Mounting Height. ~~Mounting height This~~ can range from ~~80~~ 100 ft to 200 ft in 5 ft increments. A height of 100 ft to 160 ft has proven to be the most practical. A greater height requires more luminaires to maintain the illumination level. However, a greater height allows for fewer poles and provides better uniformity. *Use of height greater than 160 ft should be confirmed with the District Traffic Engineer.*
3. Location. In determining the location for a high-mast pole, the designer should review the plan view of the area to determine the more critical areas requiring lighting. In selecting the appropriate luminaire supports for high-mast lighting, the designer should consider the following.
  - a. Critical Area. A pole should be located so that the highest localized level of illumination occurs within a critical-traffic area (e.g., freeway/ramp junction, ramp terminal, merge point).

REVISION TO THE STANDARD SPECIFICATIONS

PROPOSED REVISION TO IDM 78-7.0 HIGH MAST LIGHTING DESIGN

(CONTINUED)

- b. **Roadside Safety.** A pole should be located a sufficient distance from the roadway so that the probability of a collision is virtually eliminated. It should not be placed at the end of a long tangent.
  - c. **Sign.** A pole should be located so that it is not within a motorist's direct line of sight to a highway sign.
4. **Design.** The methodologies for checking the adequacy of uniformity are the point-by-point method and the template method. The point-by-point method checks illumination by using the manufacturer's Isolux diagram. The total illumination at a point is determined by the sum of the contributions of illumination from all mast assemblies within the effective range of the point. Due to the numerous calculations, a computer should be used to make these determinations. The template methodology uses isolux templates to determine the appropriate location for each pole. The templates may be moved to ensure that the minimum-maintained illumination is provided and uniformity ratio has been satisfied. Section 78-8.0 provides an example of using the template methodology.

*A retaining wall should be included with the concrete pad at the base of the tower if the surrounding ground slope is steeper than 5:1. The height of the retaining wall should be 3 ft for a slope of 2:1, 2.00 ft for of 3:1 and 1.50 ft for 4:1.*

5. **Foundation and Soil Test.** *After the final location of each tower is determined, a geotechnical investigation shall be requested from the Office of Geotechnical Engineering. The standard foundation of 20-ft depth and 4-ft diameter should be specified for each tower with the soil properties as follow.*
- a. ***Soft Clay.*** *Undrained shear strength of 750 psf, density of 120 pcf, and strain of 0.01 at half the maximum stress for an undrained triaxial test. The soil should not include excess rock.*
  - b. ***Sandy.*** *Angle of internal friction of 30 deg, density of 115 pcf, and modulus of subgrade reaction of 20 pci. The soil should include a minimum of gravel or clay.*

*If a tower of 180 ft or higher is required where soil is sandy, a foundation of 22-ft depth and 4.5-ft diameter shall be specified, and its details shall be shown on the plans*

*The standard foundation has been designed with the assumption that no ground water present. The Office of Geotechnical Engineering should be contacted if ground water is present or if excess rock is present in clay soil.*

REVISION TO THE STANDARD SPECIFICATIONS

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PROPOSED REVISION TO IDM 78-7.0 HIGH MAST LIGHTING DESIGN  
(CONTINUED)

*For other soil conditions or properties, the Office of Geotechnical Engineering may recommend an alternate foundation. Such alternate foundation should be shown on the plans.*

6. Information to be shown on the plans. This includes the tower location, foundation details if not standard, estimated mounting height, retaining-wall height if applicable, and number of luminaires.

AGENDA

Item No. 01 04/15/10 (2010 SS)(contd.)

Mr. Boruff

Date: 04/15/10

REVISION TO THE STANDARD SPECIFICATIONS

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PROPOSED REVISION TO IDM 78-7.0 HIGH MAST LIGHTING DESIGN

(CONTINUED)

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AGENDA

BACKUP NO. 1 STANDARD DRAWINGS

EXISTING STANDARD DRAWING: 807-LTPD-01 HIGH MAST POLES

POLE DATA SCHEDULE

POLE HEIGHT (E.M.H.)	SEC.	POLE SHAFT (INCHES)					ALTERNATE POLE SHAFT DESIGN MAXIMUM NUMBER OF SECTIONS	BASE PLATE			ANCHOR BOLT		
		BASE DIAMETER	TOP DIAMETER	WALL THK	SECTION LENGTH	MIN. SLIP REQUIRED		LG x NO. OR SQUARE	BOLT CIRCLE	THICKNESS	NUMBER REQUIRED	DIAMETER	LENGTH
100'-0"	A	20.875	14.62	0.25	48.00		3	36" x 33"	31.5"	2"	6	2.25"	90"
	B	15.4	8.25	0.188	55.00	22.52							
	C												
	D												
105'-0"	A	21.85	14.95	0.25	53.00		3	36" x 33"	31.5"	2"	6	2.25"	90"
	B	15.73	8.57	0.188	55.00	23.03							
	C												
	D												
110'-0"	A	21.675	19.88	0.281	13.80		3	36" x 33"	31.5"	2"	6	2.25"	90"
	B	20.87	14.62	0.25	48.00	30.56							
	C	15.4	8.25	0.188	55.00	22.54							
	D												
115'-0"	A	22.325	19.69	0.281	20.3		4	36" x 33"	31.5"	2"	6	2.25"	90"
	B	20.67	14.69	0.25	46.5	30.26							
	C	15.4	8.25	0.188	55.0	22.54							
	D												
120'-0"	A	23.56	20.13	0.281	26.4		4	36" x 33"	31.5"	2"	6	2.25"	90"
	B	21.12	15.21	0.25	45.5	30.93							
	C	15.99	8.84	0.188	55.0	23.42							
	D												
125'-0"	A	23.56	20.59	0.313	22.88		4	36" x 33"	31.5"	2"	6	2.25"	90"
	B	21.65	14.5	0.281	55.0	31.63							
	C	15.27	8.25	0.188	54.0	22.34							
	D												
130'-0"	A	24.21	20.59	0.13	27.87		4	36" x 33"	31.5"	2"	6	2.25"	90"
	B	21.65	14.5	0.281	55.0	31.63							
	C	15.27	8.25	0.188	54.0	22.34							
	D												
135'-0"	A	24.86	20.53	0.313	33.1		4	36" x 33"	31.5"	2"	6	2.25"	90"
	B	21.59	14.43	0.281	55.0	31.54							
	C	15.21	8.25	0.188	53.5	22.24							
	D												
140'-0"	A	25.51	20.09	0.344	41.71		4	36" x 33"	31.5"	2"	6	2.25"	90"
	B	21.14	13.99	0.281	55.0	30.87							
	C	14.75	8.25	0.188	50.0	21.56							
	D												
145'-0"	A	26.16	20.09	0.344	47.16		4	36" x 36"	33.5"	2"	8	2.25"	90"
	B	21.08	13.99	0.281	55.0	30.78							
	C	14.69	8.25	0.188	49.5	21.47							
	D												
150'-0"	A	26.81	20.03	0.344	52.7		4	36" x 36"	33.5"	2"	8	2.25"	90"
	B	21.08	13.93	0.281	55.0	30.67							
	C	14.62	8.25	0.188	49.0	21.37							
	D												
155'-0"	A	26.84	21.75	0.375	39.17		4	36" x 36"	33.5"	2"	8	2.25"	90"
	B	22.99	19.77	0.313	23.98	33.4							
	C	20.82	13.73	0.281	54.5	30.39							
	D	14.49	8.25	0.188	48.0	21.17							
160'-0"	A	27.5	21.13	0.375	49.0		4	36" x 36"	33.5"	2"	8	2.25"	90"
	B	22.26	19.47	0.313	21.5	32.45							
	C	20.51	13.36	0.281	55.0	29.92							
	D	14.11	8.26	0.188	45.0	20.60							

*existing*

GENERAL NOTES

1. High Mast pole shall meet the design requirements shown on the pole data schedule.
2. If alternative pole shaft design is chosen, the pole shaft dimensions, thickness and maximum deflection calculations shall be submitted for review and approval. The base plate thickness, anchor bolt number, diameter and length shall remain the same as shown.

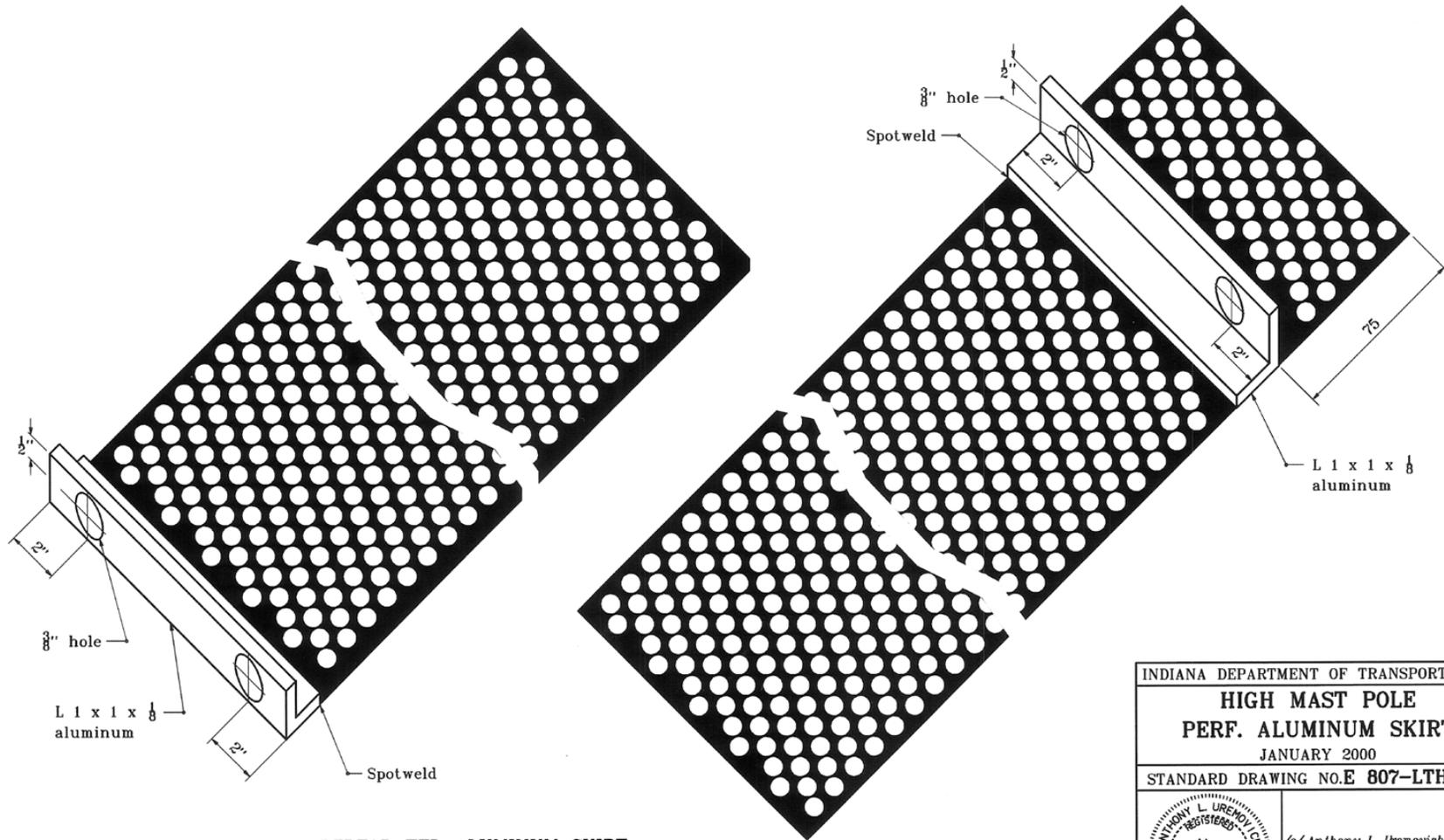
INDIANA DEPARTMENT OF TRANSPORTATION	
HIGH MAST POLES	
MARCH 2003	
STANDARD DRAWING NO. E 807-LTPD-01	
	/s/ Richard L. VanCleave DESIGN STANDARDS ENGINEER 3-03-03 DATE
	/s/ Richard K. Smutzer CHIEF HIGHWAY ENGINEER 3-03-03 DATE

BACKUP NO. 1 STANDARD DRAWINGS

EXISTING STANDARD DRAWING: 807-LTPD-02 HIGH MAST POLE PERF. ALUMINUM SKIRT

**GENERAL NOTES**

1. Perforated aluminum skirt shall be aluminum,  $\frac{1}{8}$ " thick,  $\frac{3}{8}$ " D holes,  $\frac{1}{2}$ " O.C. staggered material.
2. The base plate of the high mast pole and exposed anchor bolts shall be enclosed by the aluminum skirt.

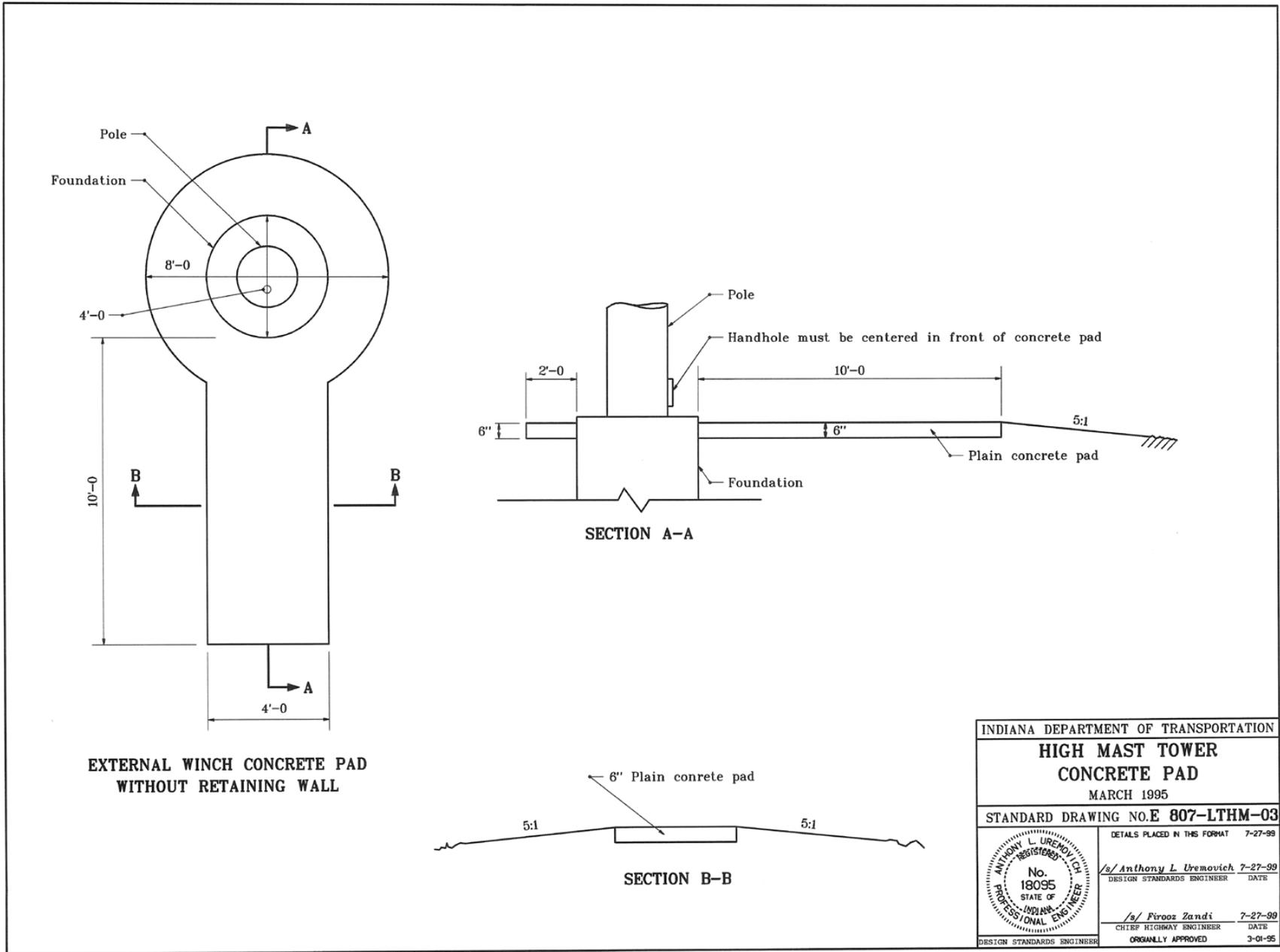


**PERFORATED ALUMINUM SKIRT**

INDIANA DEPARTMENT OF TRANSPORTATION	
HIGH MAST POLE	
PERF. ALUMINUM SKIRT	
JANUARY 2000	
STANDARD DRAWING NO.E 807-LTHM-02	
	/s/ Anthony L. Uremovich 1-03-00 DESIGN STANDARDS ENGINEER DATE
	/s/ Firooz Zandi 1-03-00 CHIEF HIGHWAY ENGINEER DATE
DESIGN STANDARDS ENGINEER	

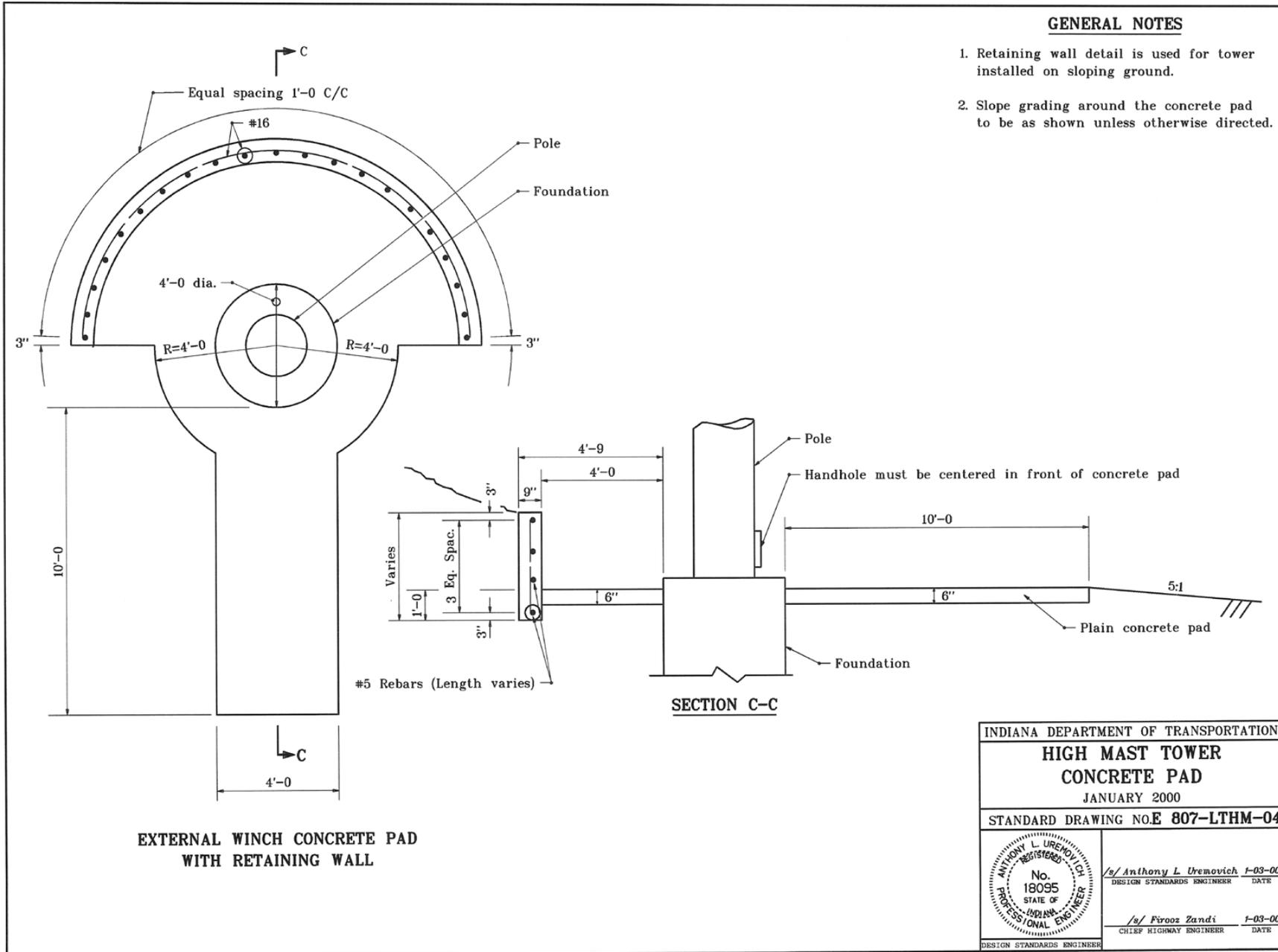
BACKUP NO. 1 STANDARD DRAWINGS

EXISTING STANDARD DRAWING: 807-LTHM-03 HIGH MAST TOWER CONCRETE PAD



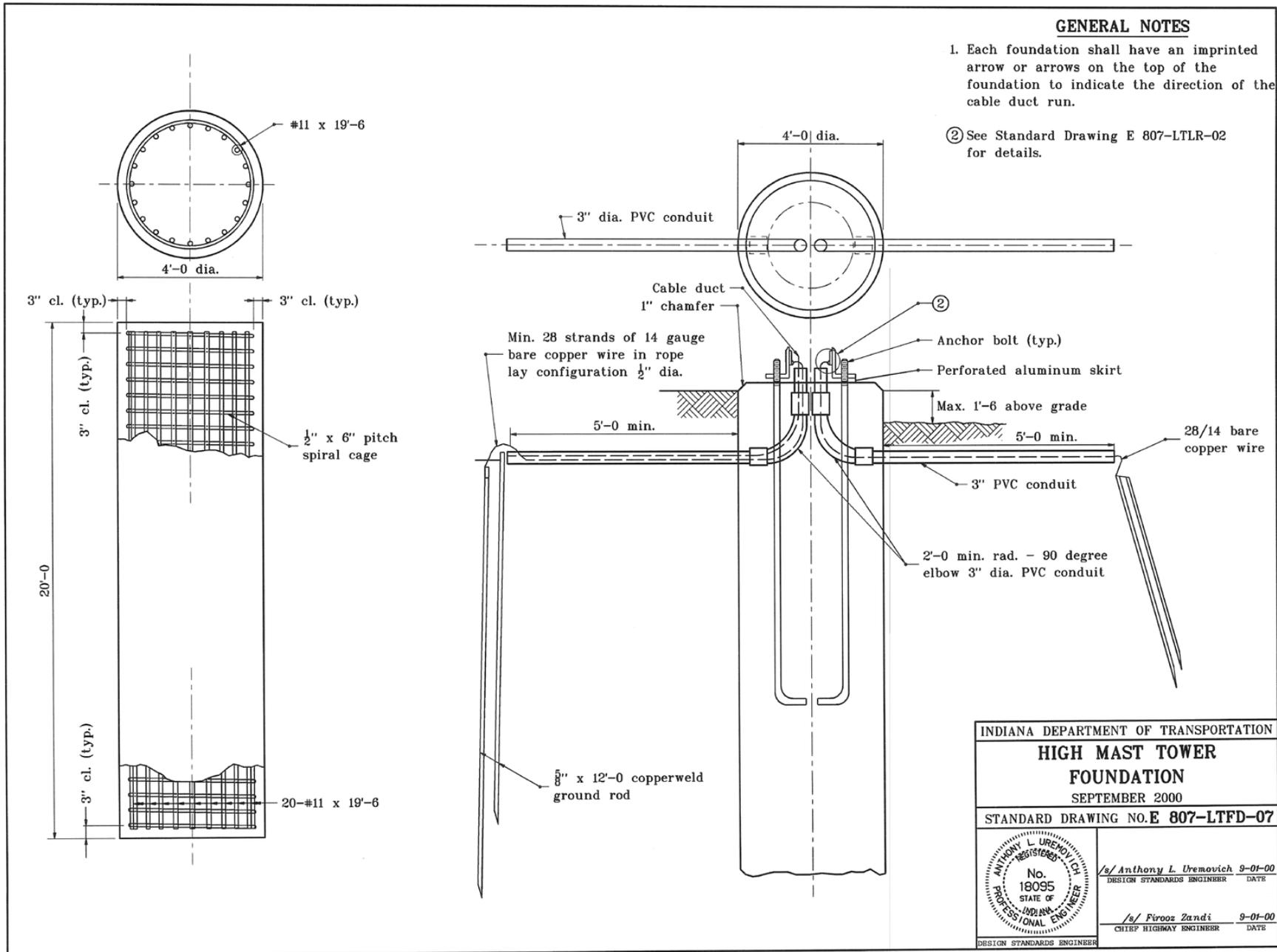
BACKUP NO. 1 STANDARD DRAWINGS

EXISTING STANDARD DRAWING: 807-LTHM-04 HIGH MAST TOWER CONCRETE PAD



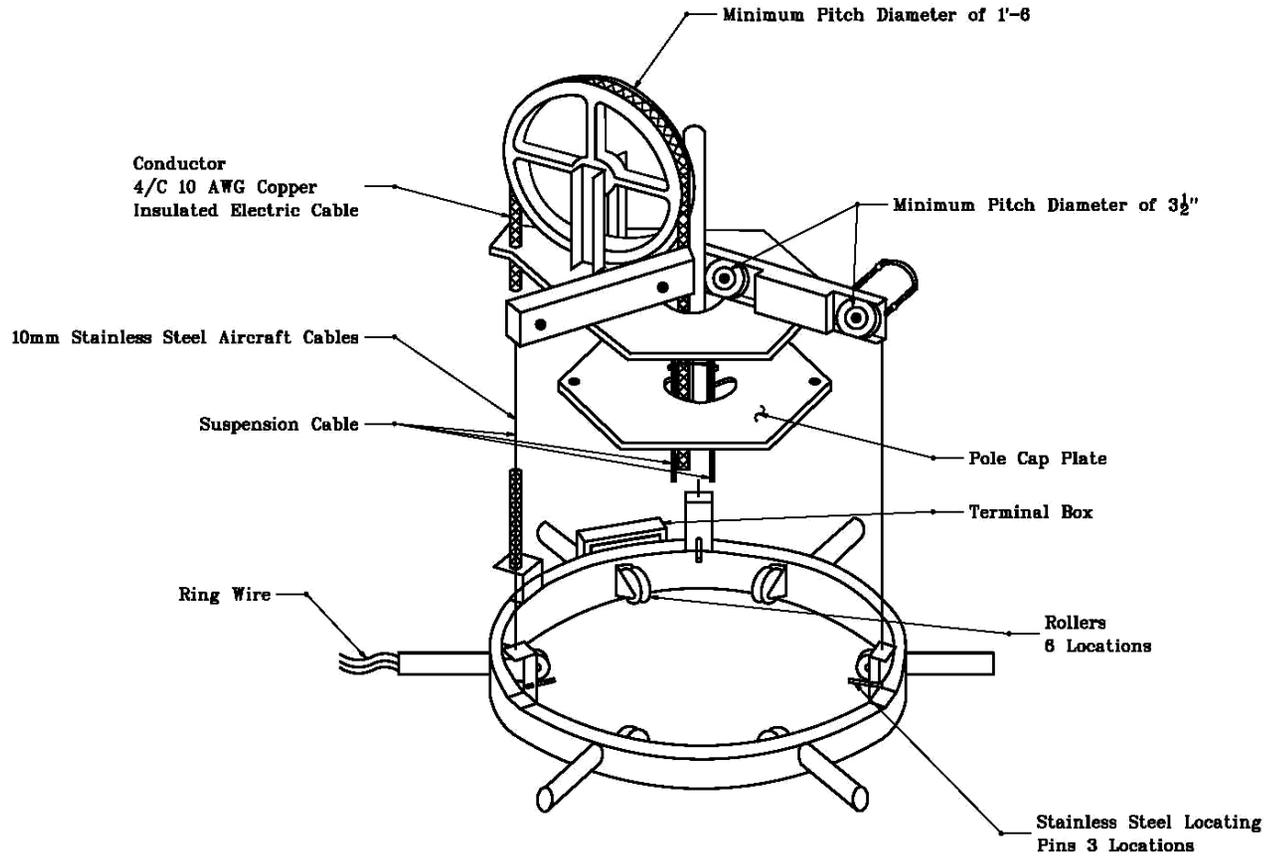
BACKUP NO. 1 STANDARD DRAWINGS

EXISTING STANDARD DRAWING: 807-LTFD-07 HIGH MAST TOWER FOUNDATION



BACKUP NO. 1 STANDARD DRAWINGS

EXISTING STANDARD DRAWING: 807-LTHI-05 HIGHWAY ILLUMINATION TOWER DETAILS BOTTOM LATCH



RING ASSEMBLY

INDIANA DEPARTMENT OF TRANSPORTATION	
HIGHWAY ILLUMINATION TOWER	
DETAILS BOTTOM LATCH	
MARCH 1985	
STANDARD DRAWING NO. E 807-LTHI-05	
	DETAILS PLACED IN THE FORMAT 11-15-88
	/s/ Anthony L. Uremovich 11-15-88 DESIGN STANDARDS ENGINEER DATE
	/s/ Piroos Zandi 11-15-88 CHIEF HIGHWAY ENGINEER DATE
	ORIGINALLY APPROVED 3-01-95

COMMENTS AND ACTION

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REVISION TO SECTION 920.01(b) HIGH MAST STANDARDS  
 REVISION TO STANDARD DRAWINGS: 807-LTPD-01, 02; 807-LTHM-02, 03, 04;  
 807-LTFD-07; 807-LTHI-05 (VARIOUS TITLES)  
 REVISION TO IDM 78-7.0 HIGH MAST LIGHTING DESIGN

Motion: Second: Ayes: Nays:	Action: <input type="checkbox"/> Passed as Submitted <input type="checkbox"/> Passed as Revised <input type="checkbox"/> Withdrawn
Standard Specifications Sections affected: 920.01(b)  Recurring Special Provision affected: None	<input type="checkbox"/> 20__ Standard Specifications Book  <input type="checkbox"/> Create RSP (No. ___) Effective ___ Letting RSP Sunset Date: ___  <input type="checkbox"/> Revise RSP (No. ___) Effective ___ Letting RSP Sunset Date: ___
Standard Sheets affected:  807-LTPD-01 807-LTHM-02 807-LTHM-03 807-LTHM-04 807-LTFD-07 807-LTHI-05	<input type="checkbox"/> Standard Drawing Effective ___ <input type="checkbox"/> Create RPD (No. ___) Effective ___ Letting <input type="checkbox"/> Technical Advisory
Design Manual Sections affected:  78-7.0	GIFE Update Req'd.? Y ___ N ___ By ___ Addition or ___ Revision
GIFE Sections cross-references:  NONE	Frequency Manual Update Req'd? Y ___ N ___ By ___ Addition or ___ Revision  Received FHWA Approval? ___

SPECIFICATION REVISIONS  
REVISION TO THE STANDARD SPECIFICATIONS

---

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: As a result of revisions to Chapter 52 Typical Sections, it is necessary to revise the 301 and 303 specifications to allow maximum 9 in lifts of compacted aggregate base and compacted aggregate used as a surface and shoulders. The Chapter 52 revisions also require the specifications to allow placement of compacted aggregate base used under shoulder pavement as well as compacted aggregate shoulders to be placed on subgrade that is not treated in accordance with 207.

PROPOSED SOLUTION: Proposed revisions to 301 and 303 to conform to the new Chapter 52 Typical Sections.

APPLICABLE STANDARD SPECIFICATIONS: 301 and 303

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: Chapter 52

APPLICABLE SECTION OF GIFE: Section 7

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

Submitted By: Greg Pankow/Jeff James

Title: Construction Engineer

Organization: INDOT Division of Construction Management

Phone Number: 317/232-5082

Date: March 22, 2010

APPLICABLE SUB-COMMITTEE ENDORSEMENT? N/A. Submitted at the request of Office of Pavement Engineering with approval of Director, Division of Construction Management.

REVISION TO THE STANDARD SPECIFICATIONS

---

REVISION TO SECTION 301 - AGGREGATE BASE

REVISION TO SECTION 303 - AGGREGATE PAVEMENTS OR SHOULDERS

The Standard Specifications are revised as follows:

SECTION 301, BEGIN LINE 16, DELETE AND INSERT AS FOLLOWS:

**301.03 Preparation of Subgrade**

*Subgrade For shoulders, the subgrade shall be compacted in accordance with 203.23 or 207.04 as shown on the plans. At all other locations, the subgrade shall be compacted in accordance with 207.04. In areas of 500 ft (150 m) or less in length, or for temporary runarounds, proofrolling will not be required. Proofrolling will not be required in trench sections where proofrolling equipment cannot be used.*

**301.04 Temperature Limitations**

Aggregate shall not be placed when the air temperature is less than 35°F (2°C). Aggregate shall not be placed on a frozen subgrade. Frozen aggregates shall not be placed.

**301.05 Spreading**

The aggregate shall be spread in uniform lifts with a spreading and leveling device approved by the Engineer. The spreading and leveling device shall be capable of placing aggregate to the depth, width, and slope specified. The compacted depth of each lift shall be a minimum of 3 in. (75 mm) and a maximum of 6 in. (150 mm), *except where utilized as a base under shoulder pavement. The compacted depth of each lift under shoulder pavement shall be a minimum of 3 in (75 mm) and a maximum of 9 in (225 mm).* The aggregate shall be handled and transported to minimize segregation and the loss of moisture. In areas inaccessible to mechanical equipment, approved hand spreading methods may be used.

SECTION 303, BEGIN LINE 18, DELETE AND INSERT AS FOLLOWS:

**303.03 Preparation of Subgrade**

*Subgrade For shoulders, the subgrade shall be compacted in accordance with 203.23 or 207.04 as shown on the plans. At all other locations, the subgrade shall be compacted in accordance with 207.04. In areas of 500 ft (150 m) or less in length, or for temporary runarounds, proofrolling will not be required. Proofrolling will not be required in trench sections where proofrolling equipment cannot be used.*

**303.04 Temperature Limitations**

Aggregate shall not be placed when the air temperature is less than 35°F (2°C). Aggregate shall not be placed on a frozen subgrade. Frozen aggregates shall not be placed.

**303.05 Spreading**

The aggregate shall be spread in uniform lifts with a spreading and leveling device approved by the Engineer. The spreading and leveling device shall be capable of placing aggregate to the depth, width, and slope specified. The compacted depth of each lift shall be a minimum of 3 in. (75 mm) and a maximum of 6 in. (150 mm), *except where utilized as a shoulder. The compacted depth of a lift for a shoulder shall be a minimum of*

REVISION TO THE STANDARD SPECIFICATIONS

---

REVISION TO SECTION 301 - AGGREGATE BASE

REVISION TO SECTION 303 - AGGREGATE PAVEMENTS OR SHOULDERS

*3 in (75 mm) and a maximum of 9 in (225 mm).* The aggregate shall be handled and transported to minimize segregation and the loss of moisture. In areas inaccessible to mechanical equipment, approved hand spreading methods may be used.

AGENDA

COMMENTS AND ACTION

REVISION TO SECTION 301 - AGGREGATE BASE

REVISION TO SECTION 303 - AGGREGATE PAVEMENTS OR SHOULDERS

<p>Motion: Second: Ayes: Nays:</p>	<p>Action: <input type="checkbox"/> Passed as Submitted <input type="checkbox"/> Passed as Revised <input type="checkbox"/> Withdrawn</p>
<p>Standard Specifications Sections affected:</p>	<p><input type="checkbox"/> 20__ Standard Specifications Book</p>
<p>301 - AGGREGATE BASE 303 - AGGREGATE PAVEMENTS OR SHOULDERS</p>	<p><input type="checkbox"/> Create RSP (No. ___) Effective ___ Letting RSP Sunset Date: ___</p>
<p>Recurring Special Provision cross-references: 203-R-562 DYNAMIC CONE PENETROMETER TESTING FOR EMBANKMENT</p>	<p><input type="checkbox"/> Revise RSP (No. ___) Effective ___ Letting RSP Sunset Date: ___</p>
<p>Standard Sheets affected: None</p>	<p>Standard Drawing Effective ___ <input type="checkbox"/> Create RPD (No. ___) Effective ___ Letting</p>
<p>Design Manual Sections affected: Chapter 52</p>	<p><input type="checkbox"/> Technical Advisory</p>
<p>GIFE Sections cross-references: Section 7</p>	<p>GIFE Update Req'd.? Y ___ N ___ By ___ Addition or ___ Revision</p>
	<p>Frequency Manual Update Req'd? Y ___ N ___ By ___ Addition or ___ Revision</p>
	<p>Received FHWA Approval? ___</p>

SPECIFICATION REVISIONS  
REVISION TO THE STANDARD SPECIFICATIONS

---

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Recently, 401, 402, and 410 were revised to permit a longitudinal 2 in dropoff between adjacent lanes. There was no similar change made to 306 that would allow similar dropoffs adjacent to milled lanes.

PROPOSED SOLUTION: In order to provide consistency between the milling and asphalt paving specifications, it is proposed to modify 306.02 to allow a 2 in longitudinal dropoff between adjacent lanes.

APPLICABLE STANDARD SPECIFICATIONS: 306.02

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE: N/A

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

Submitted By: Greg Pankow/Jeff James

Title: Construction Engineer

Organization: INDOT Division of Construction Management

Phone Number: 317/232-5082

Date: 3/11/10

APPLICABLE SUB-COMMITTEE ENDORSEMENT? None

REVISION TO THE STANDARD SPECIFICATIONS

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SECTION 306 - MILLING

REVISION TO SECTION 306.02 GENERAL

The Standard Specifications are revised as follows:

SECTION 306, BEGIN LINE 9, DELETE AND INSERT AS FOLLOWS:

**306.02 General**

Milling operations shall be described in the QCP in accordance with ITM 803. Where the milling operation in a partial-day closure results in a *longitudinal* vertical or near vertical face exceeding ~~1.5 in. (38 mm)~~ 2 in (50 mm) in height, the adjacent lane shall be milled during the same day, the milled lane resurfaced during the same day, or the vertical face tapered at a 45° angle or flatter. Where located within 3 in. (75 mm) of a curb, surface material that cannot be removed by the cold-milling machine shall be removed by other approved methods.

AGENDA

COMMENTS AND ACTION

SECTION 306 - MILLING  
 REVISION TO SECTION 306.02 GENERAL

<p>Motion:          Second:          Ayes:          Nays:</p>	<p>Action:  <input type="checkbox"/> Passed as Submitted  <input type="checkbox"/> Passed as Revised  <input type="checkbox"/> Withdrawn</p>
<p>Standard Specifications Sections affected:              SECTION 306 - MILLING</p> <p>Recurring Special Provision affected:              None</p> <p>Standard Sheets affected:              NONE</p> <p>Design Manual Sections affected:              None</p> <p>GIFE Sections cross-references:              NONE</p>	<p><input type="checkbox"/> 20 Standard Specifications Book</p> <p><input type="checkbox"/> Create RSP (No. ___)              Effective ___ Letting              RSP Sunset Date: ___</p> <p><input type="checkbox"/> Revise RSP (No. ___)              Effective ___ Letting              RSP Sunset Date: ___</p> <p>Standard Drawing Effective ___  <input type="checkbox"/> Create RPD (No. ___)              Effective ___ Letting  <input type="checkbox"/> Technical Advisory</p> <p>GIFE Update Req'd.? Y ___ N ___          By ___ Addition or ___ Revision</p> <p>Frequency Manual Update Req'd? Y ___ N ___          By ___ Addition or ___ Revision</p> <p>Received FHWA Approval? ___</p>

SPECIFICATION REVISIONS  
REVISION TO THE STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

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PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Industry has changed the terminology used with welded wire fabric or mesh products. It is now welded wire reinforcement, or WWR.

The 616 section (sloped wall) has an incorrect WWR style designation.

PROPOSED SOLUTION: Delete the WWR style designation from 616 as it is duplicated on the standard drawing 616-SWCO-07. Correct the style designation on this standard drawing.

Correct the naming convention on the following standard drawings: 616-SWCO-03, 616-SWCO-04, 616-SWCO-06, 616-SWCO-07, 616-SWRR-01, 616-SWRR-02 to the WWR convention. Since the changes to the naming convention on these drawings is editorial in nature, they have not been included in this submittal.

APPLICABLE STANDARD SPECIFICATIONS: 616.02

APPLICABLE STANDARD DRAWINGS: 616-SWCO-03, 616-SWCO-04, 616-SWCO-06, 616-SWCO-07, 616-SWRR-01, 616-SWRR-02

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Greg Pankow

Title: State Construction Engineer

Organization: INDOT

Phone Number: 232-5502

Date: March 25, 2010

APPLICABLE SUB-COMMITTEE ENDORSEMENT?

Item No. 04 04/15/10 (2010 SS)  
Mr. Pankow  
Date: 04/15/10

REVISION TO THE STANDARD SPECIFICATIONS AND STANDARD DRAWINGS  
REVISION TO SECTION 616 - RIPRAP AND SLOPEWALL

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The Standard Specifications are revised as follows:

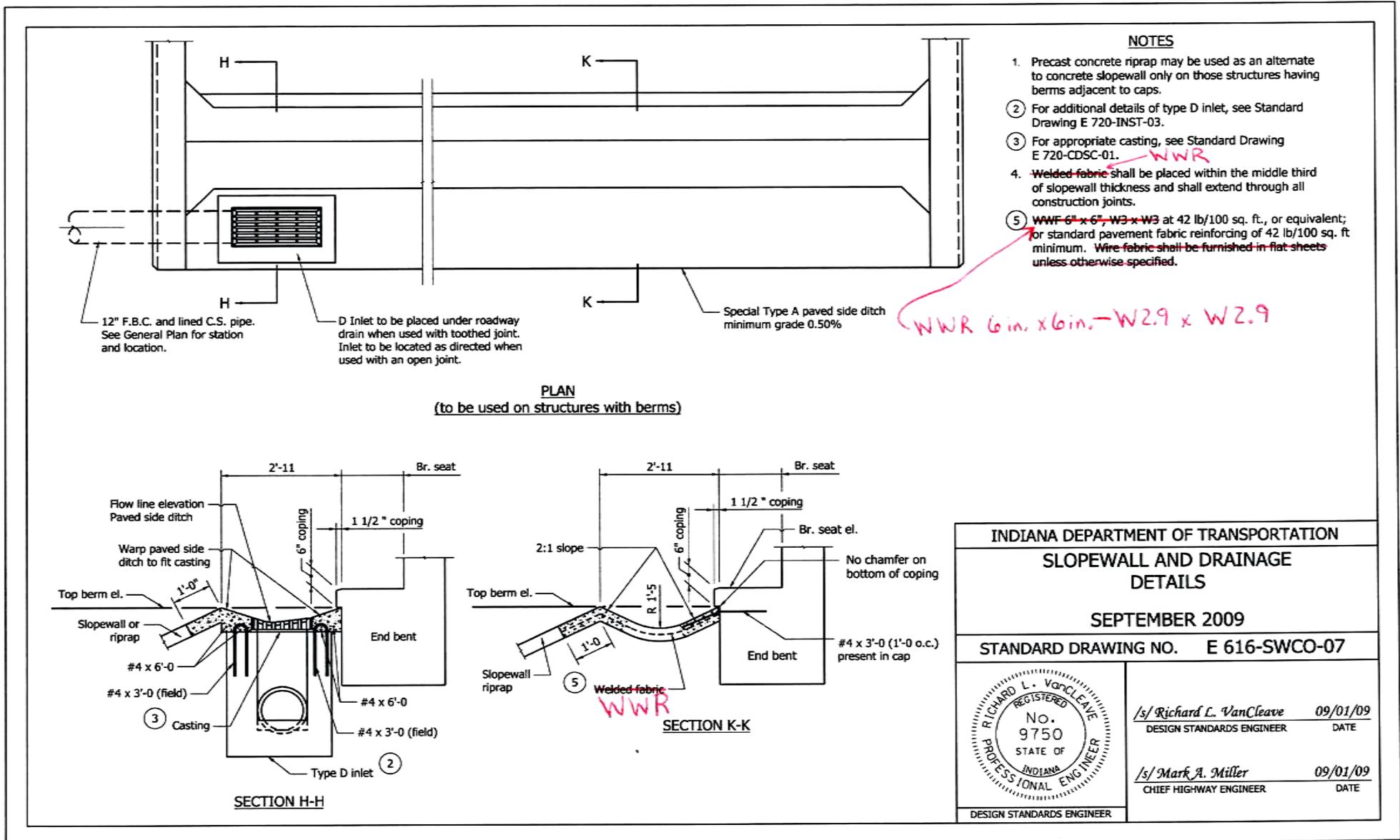
SECTION 616, BEGIN LINE 24, DELETE AS FOLLOWS:

~~Welded wire reinforcement shall be 6 in. by 6 in. (150 mm by 150 mm) mesh, W-3 x W-3 wires, with a weight (mass) per square area of 42 lb/100 ft<sup>2</sup> (205 kg/100 m<sup>2</sup>).~~

AGENDA

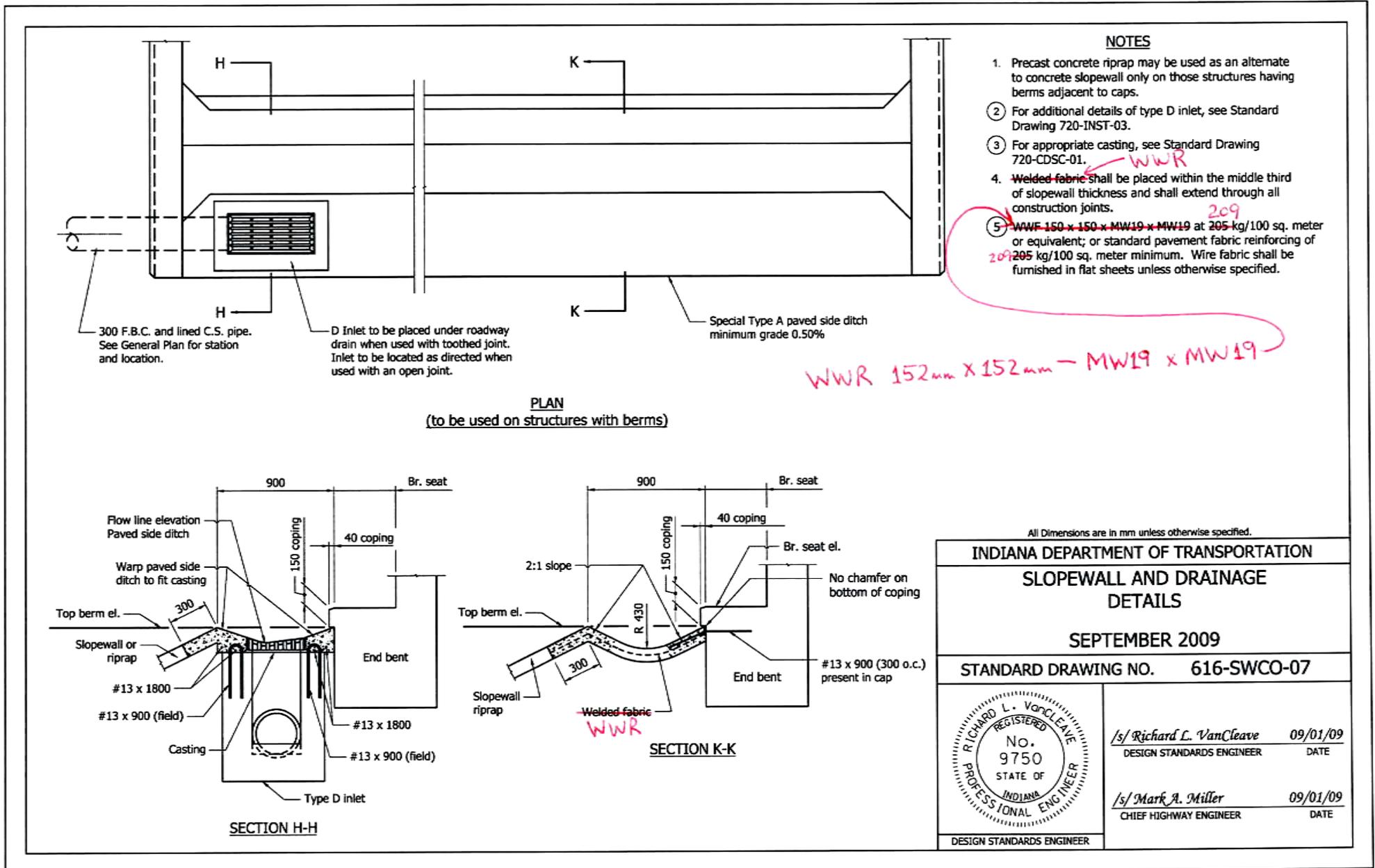
REVISION TO THE STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

REVISION TO THE STANDARD DRAWING E 616-SWCO-07 SLOPEWALL AND DRAINAGE DETAILS



REVISION TO THE STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

REVISION TO THE STANDARD DRAWING 616-SWCO-07 SLOPEWALL AND DRAINAGE DETAILS



COMMENTS AND ACTION

REVISION TO SECTION 616 - RIPRAP AND SLOPEWALL  
 REVISION TO THE E 616-SWCO-07 SLOPEWALL AND DRAINAGE DETAILS  
 REVISION TO THE 616-SWCO-07 SLOPEWALL AND DRAINAGE DETAILS

<p>Motion:                  Second:                  Ayes:                  Nays:</p>	<p>Action:  <input type="checkbox"/> Passed as Submitted  <input type="checkbox"/> Passed as Revised  <input type="checkbox"/> Withdrawn</p>
<p>Standard Specifications Sections affected:                  616.02 Materials</p> <p>Recurring Special Provision affected:                  None</p>	<p><input type="checkbox"/> 20__ Standard Specifications Book</p> <p><input type="checkbox"/> Create RSP (No. ___)                  Effective ___ Letting                  RSP Sunset Date: ___</p>
<p>Standard Sheets affected:                  616-SWCO-03,                  616-SWCO-04,                  616-SWCO-06,                  616-SWCO-07,                  616-SWRR-01,                  616-SWRR-02.</p>	<p><input type="checkbox"/> Revise RSP (No. ___)                  Effective ___ Letting                  RSP Sunset Date: ___</p>
<p>Design Manual Sections affected:                  None</p>	<p>Standard Drawing Effective ___  <input type="checkbox"/> Create RPD (No. ___)                  Effective ___ Letting  <input type="checkbox"/> Technical Advisory</p>
<p>GIFE Sections cross-references:                  NONE</p>	<p>GIFE Update Req'd.? Y ___ N ___                  By ___ Addition or ___ Revision</p>
	<p>Frequency Manual Update Req'd? Y ___ N ___                  By ___ Addition or ___ Revision</p>
	<p>Received FHWA Approval? ___</p>

SPECIFICATION REVISIONS

REVISION TO THE STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: A portion of item 02 from the March 18, 2010 Standards Committee Meeting regarding scour protection for pipes, section 715, was deleted from item 02 due to it being vague. After subsequent discussion with some committee members it was clarified. Also similar language for scour protection is needed in section 714, box culverts.

PROPOSED SOLUTION: This item should be considered for passage to follow along with the intent of item 03 from the October 15, 2009 meeting. At the October 15, 2009 meeting scour protection was added to section 723. Committee discussion at this meeting resulted in a consensus comment that this philosophy should be used on the box culverts and pipe structures as well. This proposal makes the necessary adjustments to incorporate scour protection into the 714 and 715 sections.

The new standard drawing to show the sump treatment for a pipe culvert, 715-PCSP-01, should be changed to only show the pipe structure and not the box culvert. A similar drawing showing only the box culvert should be created and have a 714 number.

This modified RSP for scour protection is proposed to be effective with the September 1, 2010 lettings, as discussed at the October 15, 2009 meeting.

APPLICABLE STANDARD SPECIFICATIONS: 714, 715

APPLICABLE STANDARD DRAWINGS: 715-PCSP-01 (new drawing passed 10-15-09, effective 9-1-10), and create two new drawings.

APPLICABLE DESIGN MANUAL SECTION: 31-3.04(07)

APPLICABLE SECTION OF GIFE:

APPLICABLE RECURRING SPECIAL PROVISIONS: add language to the 723-R-568 RSP for scour protection for the 714 & 715 sections.

Submitted By: Anne Rearick

Title: Manager, Office of Structural Services

Organization: INDOT

Phone Number: 317-232-5152

Date: 3/22/10

APPLICABLE SUB-COMMITTEE ENDORSEMENT?

REVISION TO THE SPECIAL PROVISION AND STANDARD DRAWINGS  
REVISION TO THE RECURRING SPECIAL PROVISION 723-R-568 SCOUR PROTECTION

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723-R-568 SCOUR PROTECTION

(Revised xx-xx-xx)

The Standard Specifications are revised as follows:

SECTION 714, AFTER LINE 45, INSERT AS FOLLOWS:

*Scour protection shall be installed as shown on the plans.*

*When riprap is specified, geotextile shall first be placed on the in-situ soil in accordance with 616.11. Riprap shall then be placed in accordance with 616.*

SECTION 714, BEGIN LINE 296, INSERT AS FOLLOWS:

The cost of excavation except as provided in 206.11(a), *scour protection*, expansion joint material, perpetuation of existing drains shown on the plans, removal of portions of existing structures, cleaning out old channels or structures, approved chemical anchor system, precast reinforced concrete structure joints, and necessary incidentals shall be included in the cost of the pay items in this section.

SECTION 715, AFTER LINE 181, INSERT AS FOLLOWS:

*Scour protection shall be installed as shown on the plans.*

*When riprap is specified, geotextile shall first be placed on the in-situ soil in accordance with 616.11. Riprap shall then be placed in accordance with 616.*

SECTION 715 BEGIN LINE 631, INSERT AS FOLLOWS:

The cost of sawing of pavement, excavation above the trench bottom elevation shown on plans, backfilling with material other than structure backfill or flowable backfill, *scour protection*, dewatering, shoring, timber mats, class A concrete required for collar construction or sealing existing pipe, joint materials, replacing pipe which is damaged during installation or re-laying operations, sanitary sewer testing required by the local utility, and all other necessary incidentals shall be included in the cost of the pay items in this section. The cost of removal of pavement, existing pipe, end sections, anchors, or headwalls, concrete collars, encasements, and the disposal of surplus materials shall be included in the cost of the pay items.

SECTION 723, BEGIN LINE 366, DELETE AND INSERT AS FOLLOWS:

**723.17 Scour Protection**

*Scour protection shall be installed as shown on the plans.*

*When riprap is specified, geotextile shall first be placed on the in-situ soil in accordance with 616.11. Riprap shall then be placed in accordance with 616.*

For concrete base slabs, concrete shall be placed in accordance with 702.

REVISION TO THE SPECIAL PROVISION AND STANDARD DRAWINGS  
 REVISION TO THE RECURRING SPECIAL PROVISION 723-R-568 SCOUR PROTECTION  
 (CONTINUED)

**723.18 Method of Measurement**

Structures and wingwalls will not be measured. The accepted quantities for payment will be the quantities shown on the plans.

Structure backfill will be measured in accordance with 211.09. Flowable backfill will be measured in accordance with 213.08. ~~Geotextile and riprap will be measured in accordance with 616.12.~~

**723.19 Basis of Payment**

The accepted quantities of structure will be paid for at the contract unit price per linear foot (meter) for structure, precast three-sided, of the span and rise specified. The accepted quantities of wingwalls will be paid for at the contract unit price per square foot (square meter) for wingwalls. Structure backfill will be paid for in accordance with 211.10. Flowable backfill will be paid for in accordance with 213.09. ~~Geotextiles and riprap will be paid for in accordance with 616.13.~~

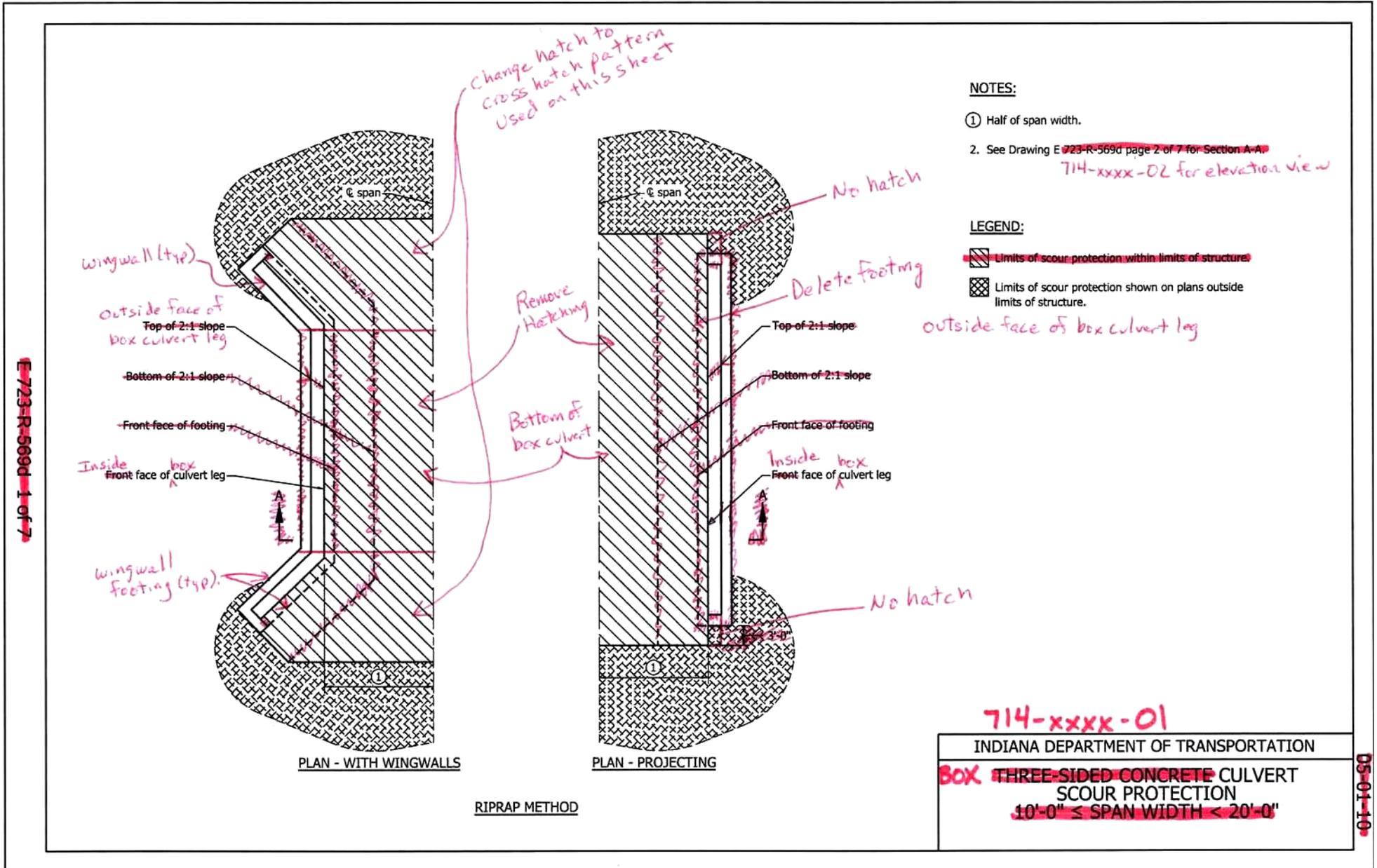
If a four-sided precast concrete box structure is substituted for the three-sided structure shown on the plans, it will be paid for as structure, precast, three-sided, of the span and rise shown in the Schedule of Pay Items.

Payment will be made under:

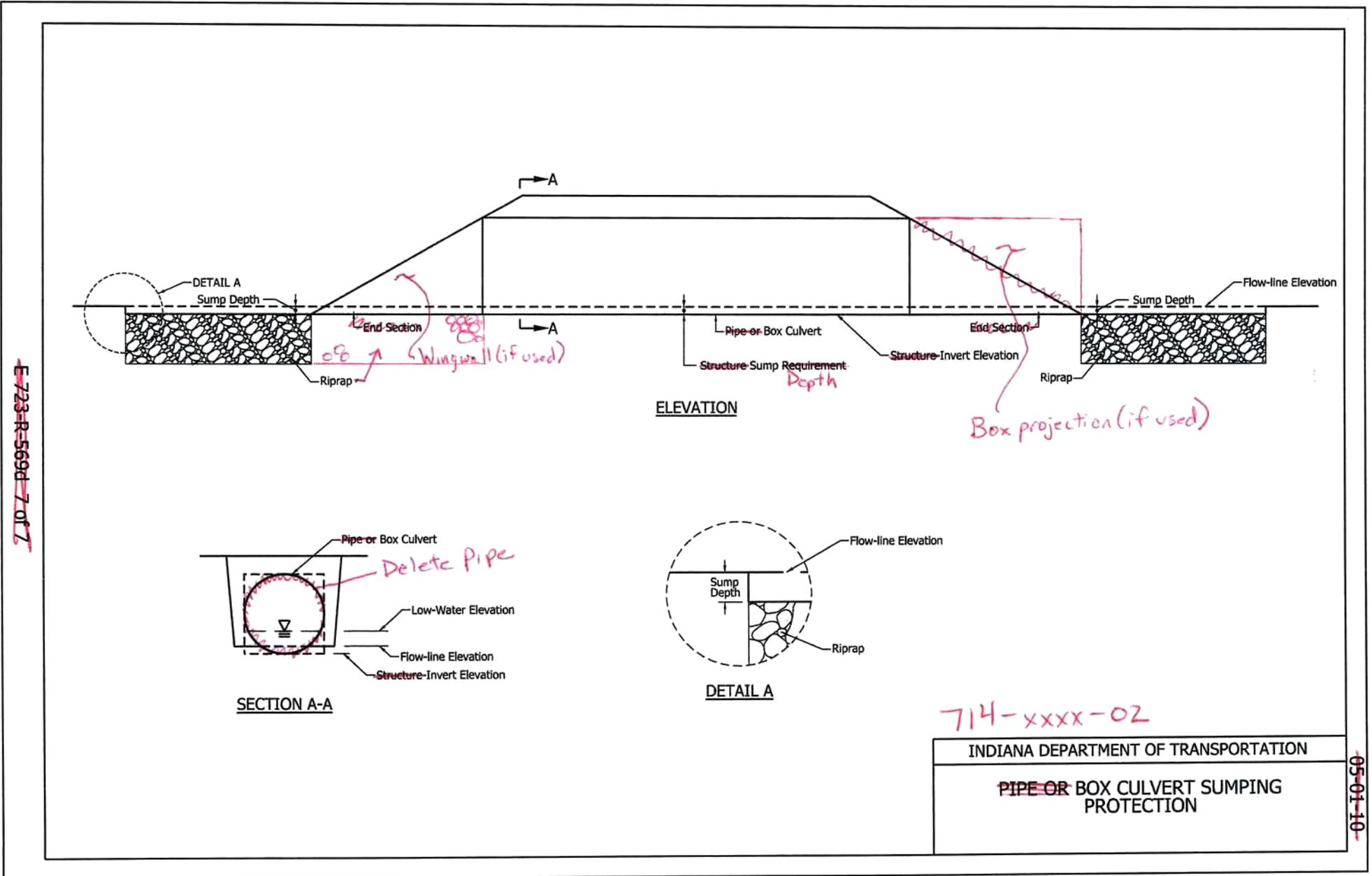
<b>Pay Item</b>	<b>Pay Unit Symbol</b>
Structure, Precast Three-Sided, _____ in. x _____ in. <div style="margin-left: 100px;">span                      rise</div> ( _____ mm x _____ mm) .....	LFT (m)
Wingwall.....	SFT (m2)

The cost of designing, coring, testing, pedestals or extended legs, reinforcement, excavation, *scour protection*, repairs, plugging core and handling holes, mortar, sealer, and necessary incidentals shall be included in the cost of the structure.

REVISION TO THE RECURRING SPECIAL PROVISION AND STANDARD DRAWINGS  
 PROPOSED NEW STANDARD DRAWING 714-XXXX-01 BOX CULVERT SCOUR PROTECTION



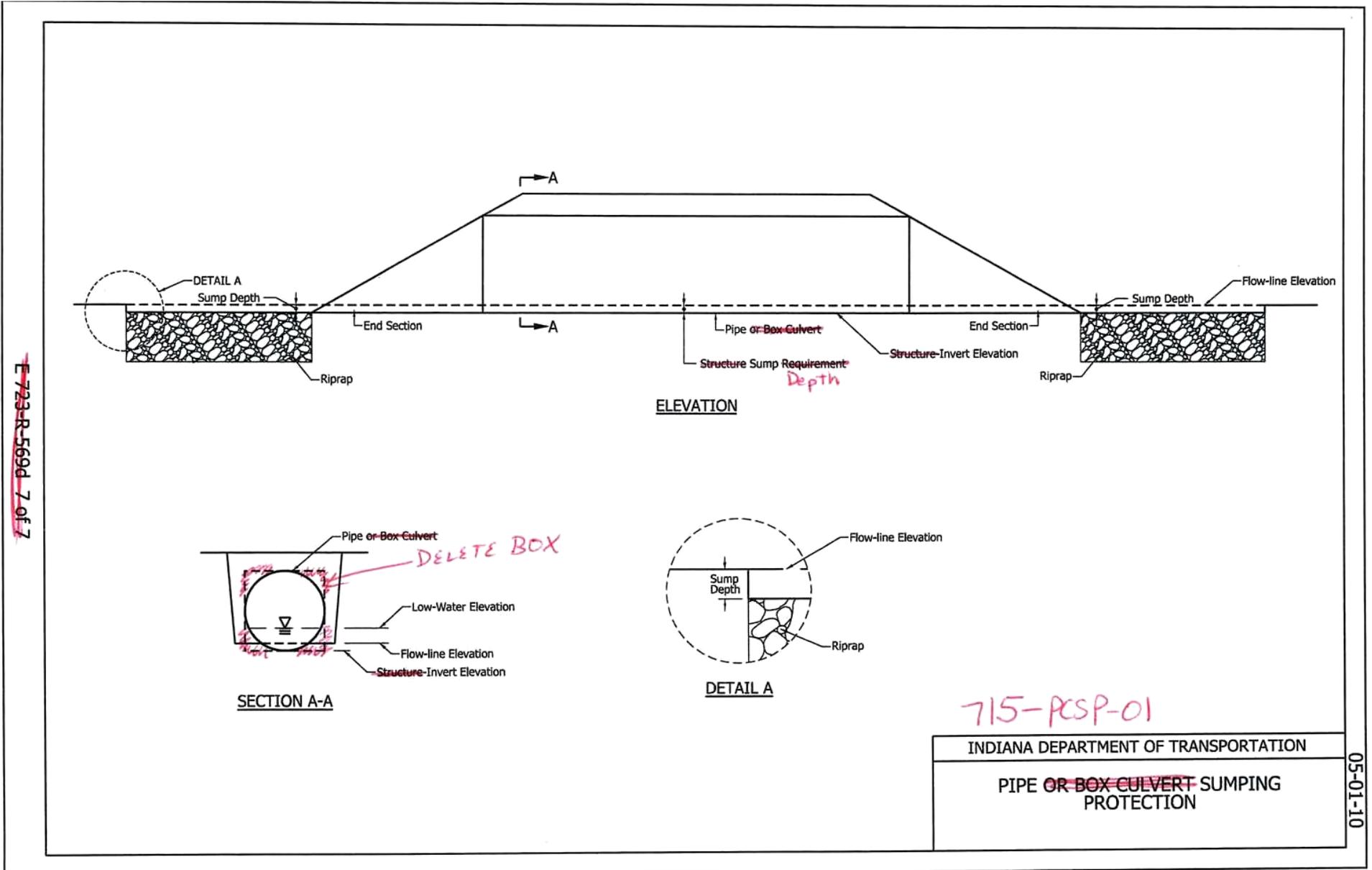
REVISION TO THE RECURRING SPECIAL PROVISION AND STANDARD DRAWINGS  
 PROPOSED NEW STANDARD DRAWING 714-XXXX-02 BOX CULVERT SUMPING PROTECTION



E-723-R-569d-7 of 7

05-01-10

REVISION TO THE RECURRING SPECIAL PROVISION AND STANDARD DRAWINGS  
REVISION TO THE STANDARD DRAWING 715-PCSP-01 PIPE SUMPING PROTECTION



E 723-R-569d 7 of 7

INDIANA DEPARTMENT OF TRANSPORTATION  
~~PIPE OR BOX CULVERT~~ SUMPING PROTECTION

05-01-10

Item No. 05 04/15/10 (2010 SS)(contd.)  
Ms. Rearick  
Date: 04/15/10

REVISION TO THE RECURRING SPECIAL PROVISION AND STANDARD DRAWINGS  
REVISION TO THE STANDARD DRAWING 715-PCSP-01 PIPE SUMPING PROTECTION

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AGENDA

COMMENTS AND ACTION

REVISION TO THE RECURRING SPECIAL PROVISION 723-R-568 SCOUR PROTECTION  
 NEW STANDARD DRAWING 714-XXXX-01 BOX CULVERT SCOUR PROTECTION  
 PROPOSED NEW STANDARD DRAWING 714-XXXX-02 BOX CULVERT SUMPING PROTECTION  
 REVISION TO THE STANDARD DRAWING 715-PCSP-01 PIPE SUMPING PROTECTION

<p>Motion:          Second:          Ayes:          Nays:</p>	<p>Action:  <input type="checkbox"/> Passed as Submitted  <input type="checkbox"/> Passed as Revised  <input type="checkbox"/> Withdrawn</p>
<p>Standard Specifications Sections affected:</p>	<p><input type="checkbox"/> 20__ Standard Specifications Book</p>
<p>SECTIONS 714; 715 AND 723</p>	<p><input type="checkbox"/> Create RSP (No. ___)</p>
<p>Recurring Special Provision affected:          723-R-568 SCOUR PROTECTION</p>	<p>Effective ___ Letting          RSP Sunset Date: ___</p>
<p>Standard Sheets affected:          715-PCSP-01 PIPE OR BOX CULVERT SUMPING PROTECTION</p>	<p><input type="checkbox"/> Revise RSP (No. ___)          Effective ___ Letting          RSP Sunset Date: ___</p>
<p>Design Manual Sections affected:          31-3.04 (07)</p>	<p>Standard Drawing Effective ___  <input type="checkbox"/> Create RPD (No. ___)          Effective ___ Letting</p>
<p>GIFE Sections cross-references:          NONE</p>	<p><input type="checkbox"/> Technical Advisory</p>
<p></p>	<p>GIFE Update Req'd.? Y ___ N ___          By ___ Addition or ___ Revision</p>
<p></p>	<p>Frequency Manual Update Req'd? Y ___ N ___          By ___ Addition or ___ Revision</p>
<p></p>	<p>Received FHWA Approval? ___</p>

SPECIFICATION REVISIONS

REVISION TO THE STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

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PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: There are some inconsistencies between the 714 (box culvert) and 723 (three sided culvert) specifications which could be hindering competition in the marketplace.

PROPOSED SOLUTION: Review & rewrite 714 & 723, making them consistent with each other wherever possible.

APPLICABLE STANDARD SPECIFICATIONS: 714, 723, 907.05, 907.06 and 907.07

APPLICABLE STANDARD DRAWINGS: 714-BCEX-01

APPLICABLE DESIGN MANUAL SECTION: 31-4.05; 31-4.06

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Anne Rearick

Title: Manager, Office of Structural Services

Organization: INDOT

Phone Number: 317-232-5152

Date: 3/22/10

APPLICABLE SUB-COMMITTEE ENDORSEMENT? Ad Hoc committee of Merrill Dougherty, Anne Rearick, Jim Reilman, Tony Uremovich, & John Wright. Industry representatives (Eric Carleton, Dave Keaffaber, Steve Smart, Bill Waller, & Eric Wathen) were also involved.

REVISION TO THE STANDARD SPECIFICATIONS  
REVISION TO SECTION 714 - CONCRETE BOX STRUCTURES

(Changes that are shown with the side bar line have been approved by the Standards Committee on March 18, 2010)

The Standard Specifications are revised as follows:

SECTION 714, BEGIN LINE 1, DELETE AND INSERT AS FOLLOWS:

**SECTION 714 – REINFORCED CONCRETE BOX STRUCTURES**

**714.01 Description**

This work shall consist of the construction of a cast-in-place or precast *reinforced* concrete box ~~drainage~~ structures with ~~20 ft (6.1 m) span or less as measured along the roadway centerline,~~ and such parts of similar structures composed of concrete in accordance with these specifications and 105.03.

*The Contractor will be allowed to substitute a three-sided structure in accordance with 723. The three-sided structure shall be of equivalent hydraulic capacity to that of the box structure shown on the plans. The structure shall be sumped as shown on the plans.*

**714.02 Materials**

Materials shall be in accordance with the following:

<del>Bituminous Mastic Pipe Joint Sealer</del> Sealant .....	<del>906.05</del> 907.11
Chemical Anchor System.....	901.05
Coarse Aggregates, Class A or Higher, Size No. 91.....	904
Concrete .....	702
<i>Epoxy Coated Reinforcing Bars</i> .....	<i>910.01</i>
Flowable Backfill .....	213
Geotextile .....	<i>918.01</i> or 918.02
<i>Hydrated Lime</i> .....	<i>913.04(a)</i>
Joint Membrane System for Precast Reinforced Concrete Box <i>Structure</i> Sections .....	<del>906.06</del> 907.07
<i>Masonry Cement</i> .....	<i>901.01(c)</i>
<i>Mortar Sand</i> .....	<i>904.02(e)</i>
<i>Natural Sand</i> .....	<i>904.02(a)</i>
<i>Portland Cement</i> .....	<i>901.01(b)</i>
Precast Reinforced Concrete <del>Box</del> <i>Structure</i> Sections .....	907.05
Precast Reinforced Concrete Headwalls, <del>and</del> Wingwalls, <i>Footings, and Spandrel Walls</i> .....	907.06
Reinforcing Bars .....	910.01
<i>Riprap</i> .....	904
Sealer.....	909.09 or 909.10
Steel Welded Wire Reinforcement, Smooth and Deformed .....	910.01
Structure Backfill .....	904

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 714 - CONCRETE BOX STRUCTURES  
(CONTINUED)

Cast-in-place concrete for a reinforced concrete box structure, or splices between an existing culvert structure and a precast reinforced concrete box structure section extension shall be class A or higher in accordance with 707.04(c). It shall have a 28-day minimum concrete compressive strength of 5,000 psi (34 500 kPa). Cast-in-place concrete for headwalls or wingwalls, and headwalls, shall be class A. ~~Concrete for cast-in-place splices between an existing culvert and a precast reinforced concrete box section extension or used to seal existing culverts shall be class A or higher in accordance with 707.04(c). It shall have a 28-day minimum concrete compressive strength of 4,000 psi (27 600 kPa). Cast in place concrete for footings shall be class B.~~

When the Contractor elects to provide a cast-in-place structure, acceptance of the structure will be based on tests for relative yield, air content, slump, water cementitious ratio, and compressive strength. Relative yield and air content shall be in accordance with 702.05. The slump and concrete temperature shall be in accordance with 707.04(c). The amount of time from the introduction of mixing water to the cement and aggregates to the completion of the discharge of the concrete shall not exceed 90 minutes. The water cementitious ratio shall be in accordance with 707.04(d). The 28 day compressive strength shall be equal to or greater than the specified concrete compressive strength and otherwise shall be in accordance with 707.04(c)3. The Contractor shall provide the necessary 6 in. diameter by 12 in. cylinder molds for the Department's use.

For plastic concrete sampling, acceptance testing procedures and casting cylinders will be in accordance with 505.01. Except for footings, concrete flexural strength or results from beam breaks will not be accepted in lieu of concrete compression cylinder test results.

Cast-in-place concrete used to seal existing culverts shall be class A. Cast-in-place concrete for footings shall be class B.

Unless otherwise specified herein, reinforcement may consist of either reinforcing bars or welded wire reinforcement, WWR. If specified to be coated, WWR shall be coated with either galvanized coating or epoxy coating, and reinforcing bars shall be coated with epoxy coating. Epoxy coated WWR shall be coated with Type I coating with Class A minimum coating thickness in accordance with ASTM A 884. Galvanized WWR shall be coated in accordance with ASTM A 123 and shall have a minimum coating grade of 35. For WWR, material with minimum yield strength of 65 ksi (448 MPa) shall be used.

## CONSTRUCTION REQUIREMENTS

### 714.03 General Requirements

Unless otherwise specified, the applicable requirements of 702 and 703 shall apply to the construction of box structures, box-structure extensions, and concrete parts of similar structures. Excavation and disposal shall be in accordance with the applicable requirements of 206. The areas designated for waterproofing shall be waterproofed in

REVISION TO THE STANDARD SPECIFICATIONS  
REVISION TO SECTION 714 - CONCRETE BOX STRUCTURES  
(CONTINUED)

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accordance with 702.23. All underground drains encountered during excavation for the structure shall be perpetuated as dictated by field conditions. Drainage openings through masonry shall be in accordance with 702.16. Handling of box structures shall be in accordance with 907.05. Handling of wingwalls shall be in accordance with 907.06.

*Scour protection shall be installed as shown on the plans.*

*When riprap is specified, geotextile shall first be placed on the in-situ soil in accordance with 616.11. Riprap shall then be placed in accordance with 616.*

#### **714.04 Design Requirements**

*Where reinforcing bars are used, reinforcing bar splicing and spacing shall be in accordance with the AASHTO LRFD Bridge Design Specifications, except as modified herein.*

##### **(a) Box Sections Structure**

~~A box structure section shall be designed in accordance with the methodology presented in ASTM C 1577 with the following exceptions. except that the area of reinforcement shall be in accordance with this section.~~

~~The box section shall be designed for HL-93 plus impact loading, in accordance with AASHTO Load Reduction Factor Design, LRFD Bridge Design Specifications. The box structure shall be designed in accordance with the soil parameters shown in the contract documents.~~

~~Shop drawings shall be submitted in accordance with 105.02 for fabrication of a precast reinforced concrete box structure greater than 12 ft (3.6 m) span, or box culverts of a size not described in ASTM C 1577, or for precast concrete headwalls, or wingwalls. The shop drawings for a precast reinforced concrete box structure shall include all details, dimensions, and quantities necessary to construct the structure, and shall include, but not be limited to, structure section details showing all concrete dimensions and reinforcement requirements.~~

~~Detailed plans for falsework and centering will not be required.~~

~~If the structure is specified as having epoxy coated reinforcement, all top slab reinforcement defined as As2, As5, As6, and As7 in ASTM C 1577 in that structure shall be epoxy coated.~~

Minimum structural reinforcement area shall be at least 0.002 of the gross concrete area  $A_g$  or 0.125 in.<sup>2</sup>/ft (265 mm<sup>2</sup>/m), whichever is greater. The permissible variation in diameter of reinforcement shall be in accordance with the tolerances prescribed in the AASHTO specification for that type of reinforcement.

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 714 - CONCRETE BOX STRUCTURES  
(CONTINUED)

~~The minimum thickness of top slab, bottom slab, and sidewalls, shall each be 12 in. (300 mm) for structure sections greater than 12 ft (3.6 m) span. Haunch dimensions shall be as described in ASTM C 1577.~~

~~Reinforcing bar splicing and spacing requirements shall be in accordance with the AASHTO LRFD Bridge Specifications, except as indicated herein. The concrete cover over the circumferential reinforcement shall be 1 in. (25 mm). However, for a box culvert with cover less than 2.0 ft (600 mm) in the outside top of the top slab it shall be 2 in. (50 mm).~~

*If coated reinforcement is specified, all reinforcement, including all support devices, in that structure shall be coated. In lieu of coating, the support device may be manufactured of a non-corrosive material.*

**(b) ~~Precast Concrete Headwalls, and Wingwalls, and Footings~~**

~~Headwalls, wingwalls, and footings may be precast or cast-in place. Headwalls and wingwalls shall be designed based on a minimum equivalent fluid pressure of 40 lb/ft<sup>3</sup> (6.3 kN/m<sup>3</sup>). If flowable backfill is to be used, the Contractor shall consider the effects of hydrostatic pressure on the wingwalls. Weep holes shall be provided in all wingwalls. Horizontal pressures shall be increased for sloping backfill surfaces and live-load surcharge. Headwall connections and wingwall footings shall be checked for sliding and for overturning. Footings shall be designed for the allowable soil bearing shown on the plans.~~

~~Wingwalls and wingwall footings shall be designed in accordance with the soil parameters shown ~~on~~ in the plans ~~contract documents~~. Headwall connections and wingwall footings shall be checked for sliding and for overturning.~~

~~A headwall with bridge railing mounted on top and the anchorage of the headwall to the box structure section shall be designed for the bridge railing test level shown on the plans. Concrete cover for headwall and wingwall reinforcement shall be a minimum of 2 in. (50 mm). Concrete cover for footing reinforcement shall be 3 in. (75 mm) for the top and sides, and 4 in. (100 mm) for the bottom.~~

~~All ~~Reinforcement in headwalls shall be consist of reinforcing bars and shall be epoxy coated. Reinforcing bar splicing and spacing requirements shall be in accordance with the AASHTO LRFD Bridge Specifications, except as described herein. Tension splices in circumferential reinforcement shall be made by means of lapping. Where reinforcing bars are used in wingwalls, The~~ maximum spacing for wingwall reinforcing bars shall be 18 in. (450 mm) for horizontal bars and 12 in. (300 mm) for vertical bars.~~

~~Concrete cover for headwall and wingwall reinforcement shall be a minimum of 2 in. (50 mm). Concrete cover for footing reinforcement shall be 3 in. (75 mm) for the top and sides, and 4 in. (100 mm) for the bottom.~~

REVISION TO THE STANDARD SPECIFICATIONS  
REVISION TO SECTION 714 - CONCRETE BOX STRUCTURES  
(CONTINUED)

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~~Shop drawings shall be submitted in accordance with 105.02 for fabrication of precast concrete headwalls, or wingwalls. Shop drawings for precast concrete headwalls and wingwalls shall include, but not be limited to, the following information.~~

- ~~1. Footing details showing all concrete dimensions, elevations, and reinforcement sizes, reinforcement bending diagrams, lengths, and spacings indicated. Footing plan and section views shall be provided. The actual soil bearing pressure shall be shown on the footing details sheets.~~
- ~~2. Design computations which show the effects of hydrostatic pressure on the structure.~~
- ~~3. Wingwall design computations and details showing all concrete dimensions, reinforcing bars, bar bending diagrams, and anchorage details. Wingwall plan, elevation, and section views shall be provided.~~
- ~~4. Headwall details, showing all concrete dimensions, reinforcing bars, bar bending diagrams, and anchorage details. Headwall elevation and section views shall be provided.~~
- ~~5. Wingwall backfill type and limits.~~

**(c) Working Drawings**

*Working drawings shall be submitted in accordance with 105.02 for fabrication of a precast reinforced concrete box structure greater than 12 ft (3.6 m) span, a box structure of a size not described in ASTM C 1577, headwalls, wingwalls, and footings. Design computations which show the effects of hydrostatic pressure on the structure shall also be submitted with the working drawings. Detailed plans for falsework and centering will not be required. Working drawings shall include all details, dimensions, and quantities necessary to construct the structure, headwalls, wingwalls, or footings and shall include, but not be limited to, the following information.*

- 1. Structure span and rise.*
- 2. Structure section details showing all concrete dimensions and reinforcement requirements.*
- 3. Headwall details, showing all concrete dimensions, elevations, reinforcing bar sizes, reinforcing bar bending diagrams, lengths, spacings, and anchorage details. Headwall elevation and section views shall be provided.*

REVISION TO THE STANDARD SPECIFICATIONS  
REVISION TO SECTION 714 - CONCRETE BOX STRUCTURES  
(CONTINUED)

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4. *Wingwall design computations and details showing all concrete dimensions, elevations, reinforcement sizes, bending diagrams, lengths, spacings, and anchorage details. Wingwall plan, elevation, and section views shall be provided.*
5. *Wingwall backfill type and limits.*
6. *Footing details showing all concrete dimensions, elevations, reinforcing bar sizes, reinforcing bar bending diagrams, lengths, and spacings indicated. Footing plan and section views shall be provided. The actual soil bearing pressure shall be shown on the footing detail sheets.*
7. *Structure backfill type and limits for the structure and wingwalls.*
8. *Minimum concrete strength for all concrete portions of the structure.*

**714.05 Erection Requirements**

The soils in the bottom of the excavation shall be compacted in accordance with 715.04.

Where a precast footing is utilized, a 4 in. (100 mm) layer of coarse aggregate No. 53 in accordance with 301 shall be placed under the full width of the footing. All cast-in-place footings shall be given a smooth float finish. The footing concrete shall reach a compressive strength of 2,000 psi (13 800 kPa) or flexural strength in accordance with 702.24(c) before placement of the wingwalls. The surface shall not vary more than 1/4 in. in 10 ft (6 mm in 3 m) if tested with a 10 ft (3 m) straightedge.

~~Tapered handling holes shall be filled with material in accordance with 901.07 or 901.08 or with precast concrete plugs, which shall be secured with portland cement mortar or other approved adhesive, before backfilling. Drilled handling holes shall be filled with portland cement mortar. Prior to backfilling, all holes shall be covered with joint wrap material with a minimum width of 9 in. (225 mm).~~

Structure backfill shall be placed and compacted in accordance with 211. ~~Structure b~~Backfill material shall be brought up uniformly placed and compacted on each side of the structure to the fill line shown on the plans. During the backfill operation, the difference in elevations of the fill on each side of the structure shall not exceed 24 in. (610 mm).

*Unless otherwise specified by the manufacturer on the working drawings, once the level of structure backfill reaches the top of the structure, two lifts shall be spread and hand compacted over the structure without traversing the structure with heavy*

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(CONTINUED)

*equipment. Compaction with heavy equipment will not be allowed until a minimum of two lifts have been placed, hand compacted, and accepted.*

The operation of equipment over a structure shall be in accordance with the structure manufacturer's recommendations.

### **714.06 Precast Concrete Headwalls, ~~and~~ Wingwalls, and Footings**

#### **(a) Headwall Reinforcement Placement Relative to Top of Structure**

The vertical headwall reinforcement shall be attached to the top of the structure by either drilling holes or precasting holes. A chemical anchoring material, if used, shall be one from the Department's List of Approved Chemical Anchoring Materials.

#### **(b) Wingwall Placement**

Each wingwall *that is not precast as one unit with the footing* shall be set on ~~either~~ masonite or steel shims. A minimum gap of 0.5 in. (13 mm) shall be provided between the footing and the bottom of each wingwall. ~~The gap shall be filled with a mortar in accordance with 707.09. Wingwalls shall be connected to the outside box structure sections with bolted steel plates. Once the wingwalls are placed, the space underneath the wingwall section to the top of the keyway sides shall be filled with prepackaged grout in accordance with ASTM C 1107, or conventional or self-consolidating fine grout in accordance with ASTM C 476, except as modified herein. If conventional fine grout is used, it shall be troweled into the keyway and mounded on one side of the wingwall. The mound of conventional fine grout shall be vibrated until it passes through to the other side of the wingwall. After completing this process on one side, if the conventional fine grout has not passed through to the other side, the process shall be repeated on the other side. Conventional or self-consolidating fine grout shall be from a prepackaged source or composed of one of the following mixtures.~~

1. 930 lb/yd<sup>3</sup> (552 kg/m<sup>3</sup>) Type I portland cement with No. 23 natural sand or mortar sand.
2. 930 lb/yd<sup>3</sup> (552 kg/m<sup>3</sup>) Type M masonry cement with No. 23 natural sand or mortar sand.
3. 828 lb/yd<sup>3</sup> (491 kg/m<sup>3</sup>) Type I portland cement and 75 lbs/yd<sup>3</sup> (44 kg/m<sup>3</sup>) hydrated lime with No. 23 natural sand or mortar sand.

*The maximum water/cement ratio shall be 0.446 for both conventional and self-consolidating fine grout. An air entraining agent from the Department's list of approved PCC admixtures may be used. A type F or G chemical admixture from the Department's list of approved PCC admixtures shall be used in self-consolidating fine grout in order to achieve the slump flow and visual stability index requirements. Filling procedure B of*

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*ASTM C 1611 will be used for measuring slump flow. Appendix X1 of ASTM C 1611 will be used for determining the visual stability index value.*

*Acceptance of conventional fine grout will be based on an air content of 12% ± 4%. Acceptance of self-consolidating fine grout will be based on tests for air content, slump flow, and visual stability index. Air content shall be 12% ± 4%. Slump flow shall be 27 in. ± 3 in. (685 mm ± 75 mm). Visual stability index value shall not exceed 1.*

*Where prepackaged grout is used, a type C certification in accordance with 916 shall be provided.*

*Wingwalls shall be connected to the outside box structure sections with bolted steel plates.*

**~~(c) Wingwall Repairs~~**

~~Wingwalls shall be repaired, if necessary, due to imperfections in manufacture, or damage caused by handling or construction. Repairs will be acceptable if it is determined that the repairs are sound, properly finished and cured, and if the repaired wingwall is in accordance with the requirements herein.~~

**(d) Sealing**

Sealer shall be applied in accordance with 709 on the top surfaces of *the structure section*, headwalls, and wingwalls. It shall extend 5 ft (1.5 m) vertically down the *exterior of each section or 5 ft (1.5 m) vertically down both faces of each headwall or wingwall section* or to the bottom of each section, whichever is less. *Sealer material shall not be placed in keyway joints, if present. The sealer shall be provided for the full length of the structure.* Surface preparation and application procedures shall be as recommended by the sealer manufacturer.

**714.07 Rejection**

*Structure sections, headwalls, wingwalls, or footings will be rejected due to the following conditions.*

- (a) fractures or cracks passing through the section or wall, except for a single end crack which does not exceed one-half the thickness of the section or wall;*
- (b) defects which indicate proportioning, mixing, or molding which are not in accordance with this specification;*
- (c) honeycombed or open texture; or*
- (d) damaged section ends, where such damage prevents making a satisfactory joint.*

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**714.08 Repairs**

*Structure sections, headwalls, wingwalls, and footings shall be repaired, if necessary, due to imperfections in manufacture, or damage caused by handling or construction. Repairs will be acceptable if it is determined that the repairs are sound, properly finished and cured, and if the repaired structure section, headwall, wingwall, or footing is in accordance with the requirements herein.*

**714.0709 Extension of Existing Structure**

All ~~pertinent~~ applicable requirements of this specification shall apply to the extension of an existing box structure, slab-top structure, or arch structure. Such portions of the existing structure designated for removal shall be removed. All portions of the existing structure which are to remain in place and are damaged shall be repaired or replaced as directed. Those portions left in place which are wholly or partially filled with debris shall be cleaned out. Material removed shall be disposed of in accordance with the applicable requirements of 202.02.

Before removing concrete from an existing structure with wingwalls, the Contractor shall saw around the perimeter of the removal area on the interior and exterior of the existing structure a depth of 1 in. (25 mm). All existing reinforcement in the top slab, bottom slab, and sidewalls exposed after concrete removal shall be cleaned and straightened in preparation for lapping with reinforcement from adjacent new work. Where existing reinforcement has deteriorated or been damaged during the removal operation, holes shall be drilled into the face of the existing structure to provide embedment for replacement reinforcing bars. The holes shall be of the diameter and depth required by the manufacturer of the approved chemical anchor system. The holes shall be cleaned prior to placing the *approved chemical anchor system and the reinforcement-reinforcing bars and the approved chemical anchor system.*

No concrete shall be removed from an existing structure that has a headwall but no wingwalls. Reinforcing bars to tie the existing structure to the new ~~culvert~~ structure section shall be installed by drilling holes into the face of the existing structure to provide embedment for reinforcing bars. The diameter and depth of the holes shall be according to the recommendations of the manufacturer of the approved chemical anchor system. The holes shall be cleaned prior to placing the *approved chemical anchor system and the reinforcement-reinforcing bars and the approved chemical anchor system.*

An existing structure shall be extended by one of the following methods.

**(a) Precast Reinforced Concrete Box ~~Section~~ Structure Extension**

A cast-in-place concrete splice shall be constructed as a transition between the existing structure and the precast *structure* extension. The splice reinforcement in the ~~new~~ precast *structure* extension *section that will abut the existing structure* shall be exposed 18 in. (450 mm) on the tongue end of the precast ~~box~~ *structure* extension *section.*

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(CONTINUED)

~~and~~ It shall be lapped 18 in. (450 mm) with ~~either the~~ exposed existing structure reinforcement, *in the case of an existing structure with wingwalls, or newly installed reinforcing bars in the existing structure, in the case of an existing structure with a headwall only* as shown on the plans. ~~A precast box section with 18 in. (450 mm) of exposed reinforcement on the tongue end shall be special order.~~ Existing *exposed* structure reinforcement *from an existing structure with wingwalls* shall be cut off 1 in. (25 mm) from the face of the new precast extension.

If the existing tongue or groove joint end is ~~in good condition~~ *acceptable* and ~~exactly matches the~~ *mating joint on the* new precast reinforced concrete box section structure extensions, the new extension may be installed using the mating joint of the existing box sections ~~structure~~. No cutting of the box structure or splicing of reinforcement is *then* required. The joint between the new *precast box section structure extension* and the existing ~~box section structure~~ shall be sealed as directed below.

**(b) Cast-In-Place Concrete Structure Extension**

The ~~reinforcing bars~~ reinforcement for the structure extension shall be ~~directly~~ lapped with the exposed reinforcement of the existing structure as shown on the plans.

**714.0810 Precast Reinforced-Concrete Box Structure Section Joints**

Precast reinforced concrete box structure section joints shall be sealed as shown on the plans. ~~A bituminous mastic pipe joint sealant~~ *sealer system or self-adhering joint membrane systems* shall be applied once the concrete surface temperature is above 40°F (5°C) or ~~sufficient to allow adherence~~ *above the minimum application temperature recommended by the pipe joint sealant manufacturer*. The concrete surfaces shall be cleaned and dry prior to application of the ~~mastic or membrane material~~ *pipe joint sealant*. Heat may be applied to the concrete surfaces until they are in accordance with the temperature and dryness requirements. The ~~mastic or membrane material~~ *pipe joint sealant* shall be centered on both sides of the joint as it is being applied. After application, the geotextile or membrane material shall be rolled to avoid wrinkling. If the roll of geotextile or membrane material does not cover the full length of the joint, an overlap of at least 2 1/2 in. (65 mm) will be required to start the next roll of material. The manufacturer's application instructions shall apply in addition to the above requirements.

**714.0911 Method of Measurement**

Precast reinforced concrete box ~~sections~~ *structures or structure extensions*, precast epoxy-coated reinforced concrete box ~~sections~~ *structures or structure extensions*, precast headwalls, precast wingwalls, cast-in-place reinforced concrete box structures or structure extensions, cast-in-place coated reinforced concrete box structures or structure extensions, cast-in-place headwalls, and cast-in-place wingwalls ~~precast reinforced concrete box section extensions, and precast epoxy-coated reinforced concrete box section extensions~~, will not be measured by the linear foot (meter), complete in place. *The accepted quantities for payment will be the quantities shown on the plans. Precast concrete headwalls and wingwalls will be measured by the square foot (square meter).*

REVISION TO THE STANDARD SPECIFICATIONS  
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~~Cast in-place concrete used in structures and structure extensions will be measured in accordance with 702.27. Reinforcing bars and epoxy coated reinforcing bars will be measured in accordance with 703.07. Structure backfill will be measured in accordance with 211.09. Flowable backfill will be measured in accordance with 213.08. Field drilled holes will be measured in accordance with 702.27.~~

*Plain or coated reinforcement or WWR used in precast reinforced concrete box structures or structure extensions, precast headwalls, precast wingwalls, cast-in-place reinforced concrete box structures or structure extensions, cast-in-place headwalls, or cast-in-place wingwalls will not be measured for payment.*

*If the Contractor elects to provide a three-sided structure in lieu of the box structure shown on the plans, it will be measured in accordance with 723.17.*

**714.1012 Basis of Payment**

~~The accepted quantities of cast in-place concrete used in structures and structure extensions will be paid for at the contract unit price per cubic yard (cubic meter) for concrete, of the class specified, structures. Precast reinforced concrete box sections of the size specified will be paid for at the contract unit price per linear foot (meter). Precast epoxy coated reinforced concrete box sections of the size specified will be paid for at the contract unit price per linear foot (meter). Precast reinforced concrete box section extensions and precast epoxy coated reinforced concrete box section extensions of the size specified will be paid for at the contract unit price per linear foot (meter). Precast concrete headwalls and wingwalls will be paid for at the contract unit price per square foot (square meter).~~

*The accepted quantities of precast reinforced concrete box structures or structure extensions, precast coated reinforced concrete box structures or structure extensions, cast-in-place reinforced concrete box structures or structure extensions, and cast-in-place coated reinforced concrete box structures or structure extensions of the size specified will be paid for at the contract unit price per linear foot (meter).*

~~Reinforcing bars plain or epoxy coated will be paid for in accordance with 703.08. Geotextile or riprap will be paid for in accordance with 616.13. Structure backfill will be paid for in accordance with 211.10. Flowable backfill will be paid for in accordance with 213.09. Field drilled holes will be paid for in accordance with 702.28.~~

*If the Contractor elects to provide a three-sided structure in lieu of the box structure shown on the plans, it will be paid for in accordance with 723.18. The Department will not incur additional cost for allowing the Contractor to substitute a three-sided structure for the box structure shown on the plans.*

Payment will be made under:

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Pay Item	Pay Unit Symbol
Concrete, _____, Structures .....	CYS (m <sup>3</sup> )
class	
Concrete Structure Extension, Precast Reinforced Concrete, Box Sections, _____ ft (mm) x _____ ft (mm) .....	LFT (m)
<del>span</del> <del>rise</del>	
Concrete Structure Extension, Precast Epoxy Coated Reinforced Concrete, Box Sections, _____ ft (mm) x _____ ft (mm) .....	LFT (m)
span                      rise	
Headwall .....	SFT (m <sup>2</sup> )
Structure, Precast Reinforced Concrete, Box Sections, _____ ft (mm) x _____ ft (mm) .....	LFT (m)
<del>span</del> <del>rise</del>	
Structure, Precast Epoxy Coated Reinforced Concrete, Box Sections, _____ ft (mm) x _____ ft (mm) .....	LFT (m)
<del>span</del> <del>rise</del>	
Wingwall .....	SFT (m <sup>2</sup> )
Structure, Coated Reinforced Concrete, Box Sections, _____ ft (mm) x _____ ft (mm) .....	LFT (m)
span                      rise	
Structure Extension, Coated Reinforced Concrete, Box Sections, _____ ft (mm) x _____ ft (mm) .....	LFT (m)
span                      rise	
Structure Extension, Reinforced Concrete, Box Sections, _____ ft (mm) x _____ ft (mm) .....	LFT (m)
span                      rise	
Structure, Reinforced Concrete, Box Sections, _____ ft (mm) x _____ ft (mm) .....	LFT (m)
span                      rise	

The cost of excavation except as provided in 206.11(a), *scour protection*, expansion joint material, perpetuation of existing drains shown on the plans, removal of portions of existing structures, cleaning out old channels or structures, approved chemical anchor system, precast reinforced concrete structure joints, and necessary incidentals shall be included in the cost of the ~~pay items in this section~~ *structure or structure extension*.

*The cost of precast concrete headwalls, precast concrete wingwalls, cast-in-place headwalls, or cast-in-place wingwalls shall be included in the cost of the structure or structure extension.*

REVISION TO THE STANDARD SPECIFICATIONS

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REVISION TO SECTION 714 - CONCRETE BOX STRUCTURES  
(CONTINUED)

*The cost of plain or coated reinforcement or WWR used in precast reinforced concrete box structures or structure extensions, precast headwalls, precast wingwalls, cast-in-place reinforced concrete box structures or structure extensions, cast-in-place headwalls, or cast-in-place wingwalls shall be included in the cost of the structure or structure extension.*

*The cost of concrete used in a cast-in-place splice shall be included in the cost of the structure extension.*

The cost of designing a box structure, *box structure extension*, headwalls, and wingwalls shall be included in the cost of the ~~pay items of this section~~ *structure or structure extension*.

The costs of coring, testing, ~~reinforcing bars~~, excavation, repairs, plugging core and handling holes, mortar, *grout*, sealer, *cylinder molds*, and necessary incidentals shall be included in the cost of ~~headwall or wingwall~~ *the structure*. The cost of wingwall footing and the aggregate base under such footing shall be included in the cost of ~~the wingwall~~ *structure or structure extension*.

No additional payment will be made for carrying an underground drain through a structure or structure extension. However, no deduction will be made for the volume of concrete occupied by the drain pipe in a cast-in-place structure or structure extension.

No additional payment will be made for the repair or replacement of existing concrete damaged by Contractor operations.

REVISION TO THE STANDARD SPECIFICATIONS

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REVISION TO SECTION 717 - STRUCTURAL PLATE PIPE, PIPE-ARCHES, AND  
ARCHES

The Standard Specifications are revised as follows:

SECTION 717, BEGIN LINE 148, DELETE AND INSERT AS FOLLOWS:

**717.09 Basis of Payment**

The accepted quantities of new, extended, or re-laid structural plate pipe, or pipe-arch will be paid for in accordance with 715.14. Structural plate arches will be paid for at the contract unit price for arch, structural plate, of the size specified. Concrete, A, structures will be paid for in accordance with ~~714.10~~702.28. Reinforcing bars in substructures will be paid for in accordance with 703.08. Concrete or grouted riprap paved flowline placed in structural plate arch structures will be paid for at the contract unit price per square yard (square meter) for concrete paved flowline, arch, structural plate; or riprap, grouted. Concrete anchors will be paid for in accordance with 715.14.

AGENDA

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 723 - REINFORCED CONCRETE THREE-SIDED DRAINAGE  
STRUCTURE

(Changes that are shown with the side bar line have been approved by the Standards  
Committee on March 18, 2010)

The Standard Specifications are revised as follows:

SECTION 723, BEGIN LINE 1, DELETE AND INSERT AS FOLLOWS:

**SECTION 723 – REINFORCED CONCRETE THREE-SIDED DRAINAGE  
STRUCTURES**

**723.01 Description**

This work shall consist of constructing a ~~precast~~ reinforced concrete three-sided arch-topped ~~drainage~~ structure or structure extension with headwalls and wingwalls, a ~~precast~~ reinforced concrete three-sided flat-topped ~~drainage~~ structure or structure extension with headwalls and wingwalls, or a ~~precast~~ reinforced concrete true arch shape ~~drainage~~ structure or structure extension with spandrel walls and wingwalls in accordance with 105.03, ~~714, and~~ ASTM C 1504. *The reinforced concrete three-sided structure, structure extension, headwalls, Wwingwalls, footings, headwalls, and spandrel walls may be precast or cast-in-place.*

~~If the span is at least 12 ft (3600 mm) and not greater than 20 ft (6100 mm), the Contractor will be permitted to substitute a four sided precast concrete box structure in accordance with 714. The four sided precast concrete box structure shall be of equivalent hydraulic capacity to that of the three sided structure shown on the plans. The Contractor will be allowed to substitute a box structure in accordance with 714. The box structure shall be of equivalent hydraulic capacity to that of the three-sided structure shown on the plans. The structure shall be sumped as shown on the plans.~~

**MATERIALS**

**723.02 Materials**

Materials shall be in accordance with the following:

<i>Chemical Anchor System</i> .....	901.05
<i>Coarse Aggregates, Class A or Higher, Size No. 91</i> .....	904
<i>Concrete</i> .....	702
<i>Epoxy Coated Reinforcing Bars</i> .....	910.01(b)9
<i>Flowable Backfill</i> .....	213
<i>Geotextiles</i> .....	913.18918.01, 918.02, or 918.03
<i>Hydrated Lime</i> .....	913.04(a)
<i>Masonry Cement</i> .....	901.01(c)
<i>Mortar Sand</i> .....	904.02(e)
<i>Natural Sand</i> .....	904.02(a)
<i>Pipe Joint Sealant</i> .....	907.11
<i>Portland Cement</i> .....	901.01(b)

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 723 - REINFORCED CONCRETE THREE-SIDED DRAINAGE  
STRUCTURE (CONTINUED)

<i>Precast Reinforced Concrete Headwalls, Wingwalls, Footings, and Spandrel Walls</i> .....	907.06
<i>Precast Reinforced Concrete Structure Sections</i> .....	907.0
<i>Reinforcing Bars</i> .....	910.01
<i>Riprap</i> .....	904
<i>Sealer</i> .....	909.09 or 909.10
<i>Steel Welded Wire Reinforcement, Smooth and Deformed</i> .....	910.01
<i>Structure Backfill</i> .....	904

*Cast-in-place concrete for a reinforced concrete three-sided structure, or splices between an existing culvert structure and a precast reinforced concrete three-sided structure extension shall be class A or higher in accordance with 707.04(c). It shall have a 28-day minimum concrete compressive strength of 5,000 psi (34 500 kPa). Cast-in-place concrete for headwalls, wingwalls, or spandrel walls shall be class A or higher in accordance with 707.04(c). It shall have a 28-day minimum concrete compressive strength of 4,000 psi (27 600 kPa).*

*When the Contractor elects to provide a cast-in-place structure, acceptance of the structure will be based on tests for relative yield, air content, slump, water cementitious ratio, and compressive strength. Relative yield and air content shall be in accordance with 702.05. The slump and concrete temperature shall be in accordance with 707.04(c). The amount of time from the introduction of mixing water to the cement and aggregates to the completion of the discharge of the concrete shall not exceed 90 minutes. The water cementitious ratio shall be in accordance with 707.04(d). The 28 day compressive strength shall be equal to or greater than the specified concrete compressive strength and otherwise shall be in accordance with 707.04(c)3. The Contractor shall provide the necessary 6 in. diameter by 12 in. cylinder molds for the Department's use.*

*For plastic concrete sampling, acceptance testing procedures and casting cylinders will be in accordance with 505.01. Except for footings, concrete flexural strength or results from beam breaks will not be accepted in lieu of concrete compression cylinder test results.*

*Cast-in-place concrete used to seal existing culverts shall be class A. Cast-in-place concrete for footings and base slabs shall be class B ~~in accordance with 702.~~ The coarse aggregate for precast members shall be size No. 91 in accordance with 904.*

~~A water-reducing admixture from the Department's list of approved Water-Reducing Admixtures may be used.~~

*Unless otherwise specified herein, reinforcement may consist of either reinforcing bars or welded wire reinforcement, WWR. If specified to be coated, WWR shall be coated*

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 723 - REINFORCED CONCRETE THREE-SIDED DRAINAGE  
STRUCTURE (CONTINUED)

*with either galvanized coating or epoxy coating, and reinforcing bars shall be coated with epoxy coating. Epoxy coated WWR shall be coated with Type I coating with Class A minimum coating thickness in accordance with ASTM A 884. Galvanized WWR shall be coated in accordance with ASTM A 123 and shall have a minimum coating grade of 35. For WWR, material with minimum yield strength of 65 ksi (448 MPa) shall be used.*

~~Reinforcement in structure sections and precast wingwalls shall be either smooth or deformed steel welded wire reinforcement, or deformed billet steel bars in accordance with 910.01, except as noted herein. Reinforcement in cast in place wingwalls, pedestals, base slabs, headwalls, and footings shall be deformed billet steel bars in accordance with 910.01. Reinforcement in headwalls and pedestals shall consist of reinforcing bars and shall be epoxy coated. Reinforcement in and spandrel walls shall be epoxy coated. Reinforcement in structure sections shall be epoxy coated where the height of cover, including the pavement section, is less than 2 ft (600 mm) as measured at the edge of travel lane. If the structure is specified as requiring coated reinforcement, all reinforcement, including all support devices, in that structure shall be coated. In lieu of coating, the support device may be manufactured of a non-corrosive material.~~

~~Headwalls, Wwingwalls, headwalls, and spandrel walls shall be connected to the outside structure sections. Wingwalls shall be connected to the spandrel walls if the structure is a true arch shape structure. Precast headwalls, precast wingwalls, and precast spandrel walls shall be connected with bolted steel plates. Steel used in bolted connections of wingwalls to structure sections or spandrel walls shall be in accordance with AASHTO M 270 grade 36 (AASHTO M 270M grade 250) and galvanized after fabrication in accordance with AASHTO M 232 (AASHTO M 232M), Class A or B. Bolts shall be in accordance with ASTM A 307 and galvanized in accordance with AASHTO M 232 (AASHTO M 232M).~~

~~Weep holes shall be provided in all wingwalls.~~

## CONSTRUCTION REQUIREMENTS

### ~~723.03 Shop Drawings~~*General Requirements*

~~The Contractor shall submit, for approval, three copies of design computations and five sets of shop drawings. Each sheet shall be signed by and shall bear the seal of a professional engineer. The shop drawings shall include all details, dimensions, and quantities necessary to construct the structure, wingwalls, and headwalls or spandrel walls if applicable and shall include, but not be limited to, the following information.~~

- ~~(a) Structure span and rise.~~
- ~~(b) Structure section details showing all concrete dimensions and reinforcement requirements.~~

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 723 - REINFORCED CONCRETE THREE-SIDED DRAINAGE  
STRUCTURE (CONTINUED)

- ~~(e) Design computations and details for pedestals, if required.~~
- ~~(d) Footing design computations and details showing all concrete dimensions, elevations, and reinforcement, with bar sizes, bar bending diagrams, lengths, and spacings indicated. Footing plan and section views shall be provided. If a pile footing is required, the pile layout shall be shown. The actual soil bearing pressure shall be noted on the footing detail sheets.~~
- ~~(e) Wingwall design computations and details showing all concrete dimensions, reinforcing bars, bar bending diagrams, and anchorage details. Wingwall plan, elevation, and section views shall be provided.~~
- ~~(f) Headwall or spandrel wall details showing all concrete dimensions, reinforcing bars, bar bending diagrams, and anchorage details. Headwall or spandrel wall elevation and section views shall be provided.~~
- ~~(g) Structure backfill type and limits for the structure and wingwalls.~~
- ~~(h) Minimum concrete strength for all precast portions of the structure.~~

~~Structure section or wingwall fabrication shall not begin until written approval of the shop drawings and design computations have been received from the Engineer.~~

*Excavation and disposal shall be in accordance with the applicable requirements of 206. The areas designated for waterproofing shall be waterproofed in accordance with 702.23. All underground drains encountered during excavation for the structure shall be perpetuated as dictated by field conditions. Drainage openings through masonry shall be in accordance with 702.16. Handling of three-sided structures shall be in accordance with 907.05. Handling of wingwalls and spandrel walls shall be in accordance with 907.06.*

**723.04 Design Requirements**

~~Except as modified herein, the structure sections shall be designed for the following:~~  
*A three-sided structure shall be designed for HL-93 loading in accordance with AASHTO LRFD Bridge Design Specifications.*

- ~~(a) the live load shown on the General Plan for the structure, or~~
- ~~(b) HL 93 in accordance with the AASHTO LRFD Bridge Design Specifications, if no live load design criteria are shown on the General Plan.~~

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 723 - REINFORCED CONCRETE THREE-SIDED DRAINAGE  
STRUCTURE (CONTINUED)

*The three-sided structure, headwalls, wingwalls, footings, and spandrel walls shall be designed in accordance with the soil parameters shown in the contract documents.*

~~The minimum design concrete compressive strength for structure sections shall be 5000 psi (35 000 kPa). For wingwalls, headwalls, and spandrel walls it shall be 4,000 psi (27 600 kPa). Wingwalls, h~~Headwalls, wingwalls, and spandrel walls shall be designed based on a minimum equivalent fluid pressure of 40 lb/ft<sup>3</sup> (6.3 kN/m<sup>3</sup>). If flowable backfill is to be used, the Contractor shall consider the effects of hydrostatic pressure on the structure. *Weep holes shall be provided in all wingwalls.* Horizontal pressures shall be increased for sloping backfill surfaces and live load surcharge. *Headwall connections, wingwall footings, and spandrel walls shall be checked for sliding and for overturning.*

~~Footings shall be designed for the allowable soil bearing shown on the plans. Wingwalls and wingwall footings shall be designed in accordance with the soil parameters shown on the plans. Wingwall footings, headwall connections, and spandrel walls shall be checked for sliding and for overturning.~~

~~A H~~headwalls with bridge railing mounted on top, and the anchorage of the headwall or spandrel wall to the structure section, shall be designed for the bridge railing test level shown on the plans.

Continuity shall be established between the structure footing and the wingwall footing.

**(a) Placement of Reinforcement**

For three-sided arch-*topped* or true arch shape structure sections, the concrete cover over the outside circumferential reinforcement shall be a minimum of 2 in. (50 mm). The cover over the inside circumferential reinforcement shall be a minimum of 1 1/2 in. (40 mm). The clear distance of the end circumferential reinforcement shall not be less than 1 in. (25 mm) nor more than 2 in. (50 mm) from the ends of the structure section. The ends of the longitudinal distribution reinforcement shall be not more than 3 in. (75 mm) from the ends of the structure section.

For flat-topped structure sections, the cover dimension over the top mat of reinforcement shall be a minimum of 2 in. (50 mm). The cover over the lower mat of reinforcement in the structure top shall be a minimum of 1 1/2 in. (40 mm). The cover in the legs shall be a minimum of 2 in. (50 mm). The clear distance of the end circumferential reinforcement shall not be less than 1 in. (25 mm) nor more than 2 in. (50 mm) from the ends of the structure section. The ends of the longitudinal distribution reinforcement shall not be more than 2 in. (50 mm) from the ends of the structure section.

Cover for *headwall, wingwall, pedestal, headwall, and spandrel wall, and pedestal* reinforcement shall be a minimum of 2 in. (50 mm). Cover for footing and base

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STRUCTURE (CONTINUED)

slab reinforcement shall be 3 in. (75 mm) for the top and sides and 4 in. (100 mm) for the bottom.

**(b) Splicing and Spacing of Reinforcement**

~~Except as noted herein, reinforcement splicing and spacing requirements shall be in accordance with the AASHTO document referenced on the General Plan for the structure or the AASHTO LRFD Bridge Design Specifications if no AASHTO document is referenced except as indicated herein.~~ Tension splices in circumferential reinforcement shall be made by *means of lapping*. ~~Deformed billet steel bars~~ *Where reinforcing bars are used for longitudinal distribution reinforcement, the reinforcing bars shall have a center to center spacing not to exceed 12 in. (300 mm) in flat-topped structure sections, or 16 in. (400 mm) in arch-topped or true arch shape structure sections.*

~~The maximum spacing for wingwall reinforcement shall be 18 in. (450 mm) for horizontal bars and 12 in. (300 mm) for vertical bars. Where reinforcing bars are used in wingwalls, the maximum spacing for wingwall reinforcing bars shall be 18 in. (450 mm) for horizontal bars and 12 in. (300 mm) for vertical bars.~~

Exterior corner reinforcement for flat-topped structure sections shall be fully developed beyond the point where it is no longer required to resist flexure.

**(c) Working Drawings**

*Working drawings shall be submitted in accordance with 105.02 for fabrication of a precast or cast-in-place reinforced concrete three-sided structure, precast or cast-in-place reinforced concrete three-sided structure extension, precast or cast-in place headwalls, precast or cast-in place wingwalls, and precast or cast-in place spandrel walls. The working drawings shall include all details, dimensions, and quantities necessary to construct the structure, headwalls, wingwalls, or spandrel walls and shall include, but not be limited to, the following information.*

1. *Structure span and rise.*
2. *Structure section details showing all concrete dimensions and reinforcement requirements.*
3. *Headwall details showing all concrete dimensions, elevations, reinforcing bar sizes, reinforcing bar bending diagrams, lengths, spacings, and anchorage details. Headwall elevation and section views shall be provided.*
4. *Wingwall design computations and details showing all concrete dimensions, elevations, reinforcement sizes, bending diagrams, lengths, spacings, and anchorage details. Wingwall plan, elevation, and section views shall be provided.*

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STRUCTURE (CONTINUED)

5. *Spandrel wall details showing all concrete dimensions, elevations, reinforcement sizes, bending diagrams, lengths, spacings, and anchorage details. Spandrel wall elevation and section views shall be provided.*
6. *Footing design computations and details showing all concrete dimensions, elevations, reinforcing bar sizes, reinforcing bar bending diagrams, lengths, and spacings indicated. Footing plan and section views shall be provided. If a pile footing is required, the pile layout shall be shown. The actual soil bearing pressure shall be shown on the footing detail sheets.*
7. *Design computations and details for pedestals, if required.*
8. *Structure backfill type and limits for the structure and wingwalls.*
9. *Minimum concrete strength for all concrete portions of the structure.*

**723.05 Manufacture**

~~Handling devices or holes will be permitted in each structure or wingwall section. However, not more than six holes shall be cast or drilled in each section. Cast holes shall be tapered.~~

~~The section ends shall be of such design and shall be so formed that when the structure sections are erected, they shall make a continuous line of structure with a smooth interior free of irregularities.~~

~~The structure sections, *headwalls*, wingwalls, *footings*, ~~headwalls~~, and spandrel walls shall be free of fractures. *Headwalls, wingwalls, and spandrel walls shall be given a finish in accordance with 702.21.* The ends of the structure sections shall be normal to the walls and centerline, except where beveled ends are specified. The surface of the structure sections shall be a smooth steel form or troweled surface. Trapped air pockets causing surface defects shall be considered as part of a smooth steel form finish.~~

~~Wingwalls, headwalls, and spandrel walls shall be given a finish in accordance with 702.21.~~

The structure units shall not be stored in an upright position until the designated handling and storage compressive strength, as shown on the shop drawings, has been achieved.

**723.06 Marking**

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STRUCTURE (CONTINUED)

~~Each structure section and wingwall shall be clearly marked with waterproof paint. The following information shall be shown on the inside face of each wingwall and on a vertical leg of each structure section.~~

- ~~(a) structure span and rise (structure sections only)~~
- ~~(b) date of manufacture~~
- ~~(c) name or trademark of the manufacturer~~
- ~~(d) design earth cover~~

**723.07 Testing**

**(a) Type of Test Specimen**

~~Concrete compressive strength shall be determined from compression tests made on cylinders or cores. For cylinder testing, a minimum of four cylinders shall be taken during each production run of structure sections or wingwalls. For core testing, one core shall be cut from a structure section selected at random from each group of 15 structure sections or less of a particular size and production run. One core shall be cut from each group of four or fewer wingwalls. For each continuous production run, each group of 15 structure sections of a single size or fraction thereof or four wingwalls shall be considered separately for the purpose of testing and acceptance. A production run shall be considered continuous if not interrupted for more than three consecutive days.~~

**(b) Compression Testing**

~~Cylinders shall be made and tested in accordance with ASTM C 39. Cores shall be obtained and tested for compressive strength in accordance with ASTM C 497 (ASTM C 497M).~~

**(c) Acceptability of Core Tests**

~~The compressive strength of the concrete in each group of sections as defined above will be acceptable when the core test strength is equal to or greater than the design concrete strength.~~

~~If the compressive strength of the core tested is less than the design concrete strength, the structure section or wingwall from which that core was taken may be recored. If the compressive strength of the recore is equal to or greater than the design concrete strength, the compressive strength of the concrete in that group of sections will be acceptable.~~

~~If the compressive strength of a recore is less than the design concrete strength, the structure section or wingwall from which that core was taken will be rejected. Two structure sections or wingwalls from the remainder of the group shall be selected at~~

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~~random. One core shall be taken from each. If the compressive strength of both cores is equal to or greater than the design concrete strength, the remainder of the structure sections or wingwalls in that group will be acceptable. If the compressive strength of either of the two cores tested is less than the design concrete strength, the remainder of the structure sections or wingwalls in the group will be rejected. However, at the option of the manufacturer, each remaining structure section or wingwall in the remainder of the group may be cored and accepted individually. The sections which have cores with less than the design concrete strength will be rejected.~~

**(d) Plugging Core Holes**

~~The core holes shall be plugged and cured by the manufacturer such that the structure is in accordance with all test requirements of these specifications. Structure sections or wingwalls repaired accordingly will be considered satisfactory for use.~~

**(e) Test Equipment**

~~The manufacturer shall furnish all facilities, equipment, and personnel necessary to conduct the required testing.~~

**723.08 06 Rejection**

Structure sections, *headwalls*, wingwalls, *footings*, or spandrel walls will be rejected due to the following conditions.

- (a) fractures or cracks passing through the *section* or wall, except for a single end crack which does not exceed one-half the thickness of the *section* or wall;
- (b) defects which indicate proportioning, mixing, or molding which are not in accordance with this specification;
- (c) honeycombed or open texture; or
- (d) damaged section ends, where such damage prevents making a satisfactory joint.

**723.0907 Repairs**

Structure sections, *headwalls*, wingwalls, *footings*, or spandrel walls ~~may~~ shall be repaired, if necessary, due to imperfections in manufacture, handling damage, or construction. Repairs will be acceptable if it is determined that the repairs are sound, properly finished and cured, and if the repaired structure section, ~~or~~ *headwall*, wingwall, *footing*, or *spandrel wall* is in accordance with the requirements herein.

**723.10-08 Trench Compaction**

The soils in the bottom of the excavation shall be compacted to 95% of the maximum dry density *in accordance with 203.23*. If 95% of the maximum dry density

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STRUCTURE (CONTINUED)

cannot be obtained in the bottom of the excavation or in other areas, the Office of Geotechnical Engineering shall be contacted for additional recommendations. If during construction, soft soils are encountered at depths that make removal impractical, the Office of Geotechnical Engineering shall be contacted for additional recommendations.

**723.11-09 Footings**

~~Footings may be cast in place or precast.~~ Where a precast footing is utilized, a 4 in. (100 mm) layer of coarse aggregate No. 53 in accordance with 301 shall be placed under the full width of the footing. All footings shall be given a smooth float finish. The footing concrete shall reach a compressive strength of 2,000 psi (13 800 kPa) *or flexural strength in accordance with 702.24(c)* before placement of the structure sections or wingwalls. The surface shall not vary more than 1/4 in. in 10 ft (6 mm in 3 m) when tested with 10 ft (3 m) straightedge.

**723.12-10 Pedestals**

Where a reinforced concrete pedestal is required between the base of the structure leg and the top of the footing, the Contractor shall have the option of providing a structure with extended legs or constructing the pedestals.

**723.13-11 Placement of Structure Sections and Wingwalls**

For three-sided arch-topped structures and three-sided flat-topped structures, the structure sections, ~~and wingwalls~~ shall be set on masonite or steel shims. *Each wingwall that is not precast as one unit with the footing shall be set on masonite or steel shims. A minimum gap of 0.5 in. (13 mm) shall be provided between the footing and the bottom of each section or wingwall. Once the wingwalls or structure sections are placed, the space underneath the wingwall or structure leg section to the top of the keyway sides shall be filled with prepackaged grout in accordance with ASTM C 1107, or conventional or self-consolidating fine grout in accordance with ASTM C 476, except as modified herein. If conventional fine grout is used, it shall be troweled into the keyway and mounded on one side of the leg or wingwall. The mound of conventional fine grout shall be vibrated until it passes through to the other side of the leg or wingwall. After completing this process on one side, if the conventional fine grout has not passed through to the other side, the process shall be repeated on the other side. The gap shall be filled with a mortar in accordance with 707.09* Conventional or self-consolidating fine grout shall be from a prepackaged source or composed of one of the following mixtures.

- (a) 930 lb/yd<sup>3</sup> (552 kg/m<sup>3</sup>) Type I portland cement with No. 23 natural sand or mortar sand.
- (b) 930 lb/yd<sup>3</sup> (552 kg/m<sup>3</sup>) Type M masonry cement with No. 23 natural sand or mortar sand.
- (c) 828 lb/yd<sup>3</sup> (491 kg/m<sup>3</sup>) Type I portland cement and 75 lbs/yd<sup>3</sup> (44 kg/m<sup>3</sup>) hydrated lime with No. 23 natural sand or mortar sand.

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STRUCTURE (CONTINUED)

*The maximum water/cement ratio shall be 0.446 for both conventional and self-consolidating fine grout. An air entraining agent from the Department's list of approved PCC admixtures may be used. A type F or G chemical admixture from the Department's list of approved PCC admixtures shall be used in self-consolidating fine grout in order to achieve the slump flow and visual stability index requirements. Filling procedure B of ASTM C 1611 will be used for measuring slump flow. Appendix XI of ASTM C 1611 will be used for determining the visual stability index value.*

*Acceptance of conventional fine grout will be based on an air content of 12% ± 4%. Acceptance of self-consolidating fine grout will be based on tests for air content, slump flow, and visual stability index. Air content shall be 12% ± 4%. Slump flow shall be 27 in. ± 3 in. (685 mm ± 75 mm). Visual stability index value shall not exceed 1.*

*Where prepackaged grout is used, a type C certification in accordance with 916 shall be provided.*

True arch shape structures may have ~~mortar~~grout leveling pads poured in the footing keyways to ensure the correct seating of the true arch sections. Leveling pads shall be approximately 2 in. (50 mm) thick and 16 in. (400 mm) long to ensure that each true arch section is resting on approximately 8 in. (200 mm) of pad at each joint. The leveling pads shall be poured within 1/8 in. (3 mm) of the required elevation. No loads shall be placed on the ~~mortar~~grout leveling pads within 72 hr of their placement. Masonite shims may also be used as leveling pads. Concrete blocks of 1 1/2 in. (40 mm) thickness, hardwood wedges, and steel or plastic shims shall be placed to retain the true arch sections in their proper positions until grout can be placed in the keyway. Grout shall be ~~compacted~~consolidated in the keyway to ensure that the entire area around the true arch section is completely filled. The ~~mortar~~grout used to construct the leveling pads and to ~~grout~~fill the keyways shall be in accordance with ~~707.09~~this section. Grouting shall not be ~~performed~~placed if the air temperature is expected to be below 35°F (2°C) for a period of 72 hr following grout placement.

**723.12 Extension of Existing Structure**

*All applicable requirements of this specification shall apply to the extension of an existing three-sided arch-topped structure with headwalls and wingwalls, a three-sided flat-topped structure with headwalls and wingwalls, or a true arch shape structure with spandrel walls and wingwalls. Such portions of the existing structure designated for removal shall be removed. All portions of the existing structure which are to remain in place and are damaged shall be repaired or replaced as directed. Those portions left in place which are wholly or partially filled with debris shall be cleaned out. Material removed shall be disposed of in accordance with the applicable requirements of 202.02.*

*Before removing concrete from an existing structure with wingwalls, the Contractor shall saw around the perimeter of the removal area on the interior and*

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STRUCTURE (CONTINUED)

*exterior of the existing structure a depth of 1 in. (25 mm). All existing reinforcement in the top slab and sidewalls exposed after concrete removal shall be cleaned and straightened in preparation for lapping with reinforcement from adjacent new work. Where existing reinforcement has deteriorated or been damaged during the removal operation, holes shall be drilled into the face of the existing structure to provide embedment for replacement reinforcing bars. The holes shall be of the diameter and depth required by the approved chemical anchor system manufacturer. The holes shall be cleaned prior to placing the approved chemical anchor system and the reinforcing bars.*

*No concrete shall be removed from an existing structure that has a headwall but no wingwalls. Reinforcing bars to tie the existing structure to the new structure section shall be installed by drilling holes into the face of the existing structure to provide embedment for reinforcing bars. The diameter and depth of the holes shall be in accordance with the recommendations of the manufacturer of the approved chemical anchoring system. The holes shall be cleaned prior to placing the approved chemical anchor system and the reinforcing bars.*

*An existing structure shall be extended by means of one of the following methods.*

***(a) Precast Reinforced Concrete Three-Sided Structure Extension***

*A cast-in-place concrete splice shall be constructed as a transition between the existing structure and the precast structure extension. The splice reinforcement in the precast structure extension section that will abut the existing structure shall be exposed 18 in. (450 mm) on the tongue end of the precast structure extension section. It shall be lapped 18 in. (450 mm) with either exposed existing structure reinforcement, in the case of an existing structure with wingwalls, or newly installed reinforcing bars in the existing structure, in the case of an existing structure with a headwall only as shown on the plans. Existing exposed structure reinforcement from an existing structure with wingwalls shall be cut off 1 in. (25 mm) from the face of the new precast extension.*

*If the existing tongue or groove joint end is acceptable and matches the mating joint on the new precast reinforced concrete structure extension section, the new extension may be installed using the mating joint of the existing structure. No cutting of the structure or splicing of reinforcement is then required. The joint between the new precast structure extension and the existing structure shall be sealed as directed below.*

***(b) Cast-In Place Concrete Three-Sided Structure Extension***

*The reinforcement for the structure extension shall be lapped with the exposed reinforcement of the existing structure as shown on the plans.*

**723.14-13 Sealing**

*Sealer shall be applied in accordance with 709 on the top surface of the structure section, headwalls, and wingwalls. Such sealer shall extend 5 ft (1.5 m) vertically down the exterior of each vertical leg or 5 ft (1.5 m) vertically down both faces of each*

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STRUCTURE (CONTINUED)

*headwall or wingwall or to the bottom of each, whichever is less.* Sealer material shall not be placed in keyway joints, if present. The sealer shall be provided for the full length of the structure. Surface preparation and application procedures shall be as recommended by the sealer manufacturer.

**723.15-14 Joints**

Joints between structure sections for three-sided arch-topped structures and true arch shape structures, and for flat-topped structures with cover of 3 ft (0.9 m) or more, may be either butt joints or keyway joints.

The sections ~~for~~ of flat-topped structures with less than 3 ft (0.9 m) of cover shall be produced with a minimum 4 in. (100 mm) ~~deep~~-depth by 1.5 in. (40 mm) ~~wide~~-width keyway joint. ~~Mortar~~ Non-shrink grout in accordance with 707.09 shall be placed in the keyway joint.

All butt joints between structure sections shall be covered with a joint wrap in accordance with ASTM C 877 (~~ASTM C 877M~~), type H. The surface shall be free of dirt before the joint material is applied. The entire joint shall be continuously covered. Joints between structure sections and wingwalls, between *wingwalls and* spandrel walls ~~and wingwalls~~, and between structure sections and headwalls or spandrel walls shall be covered with either the same wrap used between structure sections or with geotextile in accordance with 918.03.

The joint wrap shall be kept in its proper location over the joint. It shall not be damaged during the backfilling operation.

Joints in true arch shape structures shall be sealed with 1/2 in. (40 mm) diameter preformed ~~mastic~~ pipe joint sealant before placement of the joint wrap.

**723.16-15 Backfilling**

~~Tapered or drilled holes for handling shall be filled in accordance with 907.05. Prior to backfilling the structure, all holes shall be covered with joint wrap material with a minimum width of 9 in. (225 mm).~~

Structure backfill shall be placed and compacted in accordance with 211. *Structure backfill shall be placed and compacted on each side of the structure to the fill line shown on the plans. During the backfill operation, the difference in elevations of the fill on each side of the structure shall not exceed 24 in. (610 mm).*

*Unless otherwise specified by the manufacturer on the working drawings,* Once the level of structure backfill reaches the top of the structure, two lifts shall be spread and hand compacted over the structure without traversing the structure with heavy equipment. Compaction with heavy equipment will not be allowed until a minimum of two lifts have been placed, hand compacted, and ~~tested~~ accepted.

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STRUCTURE (CONTINUED)

~~The structure backfill shall be placed and compacted to the same elevation on both sides of the structure before proceeding to the next lift.~~

~~For three-sided arch or three-sided flat-topped structures where the height of cover as shown on the plans is 12 in. (300 mm) or less, the portion of the structure under the paved portion of the roadway and shoulders shall be backfilled with flowable backfill to the top of the vertical leg of the structure.~~

~~For true arch shape structures, the backfill shall be structure backfill with a minimum height of cover of 18 in. (450 mm) including the pavement section.~~

The operation of equipment over the structure shall be in accordance with the structure manufacturer's recommendations.

**723.17-16 Scour Protection**

*Scour protection shall be installed as shown on the plans.*

When riprap is specified, geotextile shall first be placed on the in-situ soil in accordance with 616.11. Riprap shall then be placed in accordance with 616.

For concrete base slabs, concrete shall be placed in accordance with 702.

**723.1817 Method of Measurement**

~~Structures and wingwalls will not be measured. Precast reinforced concrete three-sided flat-topped structures or structure extensions, precast reinforced concrete three-sided arch-topped structures or structure extensions, precast reinforced concrete true arch structures or structure extensions, cast-in-place reinforced concrete three-sided flat-topped structures or structure extensions, cast-in-place reinforced concrete three-sided arch-topped structures or structure extensions, and cast-in-place reinforced concrete true arch structures or structure extensions will not be measured. The accepted quantities for payment will be the quantities shown on the plans.~~

Structure backfill will be measured in accordance with 211.09. Flowable backfill will be measured in accordance with 213.08. ~~Geotextile and riprap will be measured in accordance with 616.12. Field drilled holes will be measured in accordance with 702.27.~~

*Plain or coated reinforcement or WWR used in precast reinforced concrete three-sided flat-topped structures or structure extensions, precast reinforced concrete three-sided arch-topped structures or structure extensions, precast reinforced concrete true arch structures or structure extensions, precast headwalls, precast wingwalls, cast-in-place reinforced concrete three-sided flat-topped structures or structure extensions, cast-in-place reinforced concrete three-sided arch-topped structures or structure extensions,*

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REVISION TO SECTION 723 - REINFORCED CONCRETE THREE-SIDED DRAINAGE  
 STRUCTURE (CONTINUED)

*cast-in-place reinforced concrete true arch structures or structure extensions, cast-in-place headwalls, or cast-in-place wingwalls will not be measured for payment.*

*If the Contractor elects to provide a box structure in lieu of the three-sided structure shown on the plans, it will be measured in accordance with 714.09.*

**723.19-18 Basis of Payment**

The accepted quantities of *precast reinforced concrete three-sided flat-topped structures or structure extensions, precast reinforced concrete three-sided arch-topped structures or structure extensions, precast reinforced concrete true arch structures or structure extensions, cast-in-place reinforced concrete three-sided flat-topped structures or structure extensions, cast-in-place reinforced concrete three-sided arch-topped structures or structure extensions, and cast-in-place reinforced concrete true arch structures or structure extensions, of the size specified* will be paid for at the contract unit price per linear foot (meter) for structure, ~~precast three-sided, of the span and rise specified.~~ The accepted quantities of wingwalls will be paid for at the contract unit price per square foot (square meter) for wingwalls.

Structure backfill will be paid for in accordance with 211.10. Flowable backfill will be paid for in accordance with 213.09. ~~Geotextiles and riprap will be paid for in accordance with 616.13.~~ Field drilled holes will be paid for in accordance with 702.28.

~~If a four sided precast concrete box structure is substituted for the three sided structure shown on the plans, it will be paid for as structure, precast, three sided, of the span and rise shown in the Schedule of Pay Items.~~ *If the Contractor elects to provide a box structure in lieu of the three-sided structure shown on the plans, it will be paid for in accordance with 714.10. The Department will not incur additional cost for allowing the Contractor to substitute a box structure for the three-sided structure shown on the plans.*

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit Symbol</b>
<del>Structure, Precast, Three Sided, _____ in. x _____ in.</del> <div style="display: flex; justify-content: space-around; width: 100%;"> <span>span</span> <span>rise</span> </div> <del>(_____ mm x _____ mm)</del> ..... LFT (m) <div style="display: flex; justify-content: space-around; width: 100%;"> <span>span</span> <span>rise</span> </div>	
Wingwall ..... SFT (m <sup>2</sup> ) <i>Structure, Coated Reinforced Concrete, Three-Sided Sections,</i> _____ in. (mm) x _____ in. (mm) ..... LFT (m) <div style="display: flex; justify-content: space-around; width: 100%;"> <span>span</span> <span>rise</span> </div>	

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REVISION TO SECTION 723 - REINFORCED CONCRETE THREE-SIDED DRAINAGE  
STRUCTURE (CONTINUED)

*Structure Extension, Coated Reinforced Concrete, Three-Sided*

*Sections, \_\_\_\_\_ in. (mm) x \_\_\_\_\_ in. (mm)..... LFT (m)*  
*span rise*

*Structure Extension, Reinforced Concrete, Three-Sided*

*Sections, \_\_\_\_\_ in. (mm) x \_\_\_\_\_ in. (mm) ..... LFT (m)*  
*span rise*

*Structure, Reinforced Concrete, Three-Sided Sections,*

*\_\_\_\_\_ in. (mm) x \_\_\_\_\_ in. (mm)..... LFT (m)*  
*span rise*

The cost of ~~all designing, coring, testing, pedestals or extended legs, reinforcement,~~ excavation, *scour protection*, repairs, plugging core and handling holes, mortar, *grout*, sealer, *cylinder molds*, and necessary incidentals shall be included in the cost of the structure *or structure extension*. *The cost of spandrel walls, concrete base slab, footings, and aggregate base under precast footings shall be included in the cost of the structure or structure extension.*

*The cost of precast concrete headwalls, precast concrete wingwalls, cast-in-place headwalls, or cast-in-place wingwalls shall be included in the cost of the structure or structure extension.*

*The cost of plain or coated reinforcement or WWR used in precast reinforced concrete three-sided structures, precast reinforced concrete three-sided structure extensions, precast headwalls, precast wingwalls, cast-in-place reinforced concrete three-sided structures, cast-in-place reinforced concrete three-sided structure extensions, cast-in-place headwalls, or cast-in-place wingwalls shall be included in the cost of the structure or structure extension.*

*The cost of concrete used in a cast-in-place splice shall be included in the cost of the structure extension.*

~~The cost of headwalls or spandrel walls, concrete base slab, footings, and aggregate base under precast footings shall be included in the cost of the structure. The cost of footings for wingwalls and aggregate base under the wingwall footings shall be included in the cost of wingwall~~ *the structure or structure extension.*

The quantities for payment shall remain as shown on the plans whether the Contractor installs the three-sided arch-topped structure; *or structure extension*, the three-sided flat-topped structure; *or structure extension*, or the true arch shape structure *or structure extension*.

*No additional payment will be made for carrying an underground drain through a structure or structure extension. However, no deduction will be made for the volume of concrete occupied by the drain pipe in a cast-in-place structure or structure extension.*

Item No. 06 04/15/10 (2010 SS)(contd.)  
Ms. Rearick  
Date: 04/15/10

REVISION TO THE STANDARD SPECIFICATIONS

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REVISION TO SECTION 723 - REINFORCED CONCRETE THREE-SIDED DRAINAGE  
STRUCTURE (CONTINUED)

*No additional payment will be made for the repair or replacement of existing concrete damaged by Contractor operations.*

AGENDA

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE  
COMPONENTS

(Changes that are shown with the side bar line have been approved by the Standards Committee on March 18, 2010)

The Standard Specifications are revised as follows:

SECTION 907, BEGIN LINE 72, DELETE AND INSERT AS FOLLOWS:

**907.05 Precast Reinforced Concrete ~~Box~~ Structure Sections**

Precast *reinforced* concrete ~~units~~ *structure sections* shall be ~~in accordance with ASTM C 1577 and shall be~~ from a source listed in the Department's List of Certified Precast Concrete Producers, in accordance with ITM 813. A *water-reducing admixture from the Department's list of approved Water-Reducing Admixtures may be used.*

~~Not more than four holes may be cast or drilled, or otherwise neatly made in the shell of each piece of box section for the purpose of handling or laying. The holes shall be tapered unless cored.~~

*Handling devices or holes will be permitted in each structure section. Holes for handling shall be filled with material in accordance with 901.07, 901.08, or with precast concrete plugs which shall be secured with portland cement mortar or other approved adhesive before backfilling. Drilled handling holes shall be filled with portland cement mortar. Prior to backfilling the structure, all holes shall be covered with joint wrap material with a minimum width of 9 in. (225 mm).*

*The section ends shall be of such design and shall be so formed that when the structure sections are erected, they shall make a continuous line of structure with a smooth interior free of irregularities. The ends of the structure sections shall be normal to the walls and centerline, except where beveled ends are specified. The surface of the structure sections shall be cast from a smooth steel form or troweled surface. Trapped air pockets causing surface defects shall be considered as part of a smooth steel form finish.*

**(a) Box**

*Box structure sections shall be in accordance with ASTM C 1577 and the exceptions to ASTM C 1577 listed in 714.04. Not more than four holes may be cast, drilled, or otherwise made in each box section for the purpose of handling or laying.*

**(b) Three-Sided**

*Three-sided structure sections shall be in accordance with ASTM C 1504 and the exceptions to ASTM C 1504 listed in 723.04. Not more than 6 holes shall be cast, drilled, or otherwise made in each section for the purpose of handling or laying.*

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE  
COMPONENTS (CONTINUED)

**907.06 Precast Reinforced Concrete Headwalls, ~~and~~ Wingwalls, Footings, and Spandrel Walls ~~for Box Structure or Three-Sided Structure~~**

Precast concrete units shall be from a source listed in the Department's List of Certified Precast Concrete Producers, in accordance with ITM 813. *A water-reducing admixture from the Department's list of approved Water-Reducing Admixtures may be used.*

Handling devices or holes will be permitted in each wingwall and *spandrel wall* section. Not more than four holes shall be cast or drilled in each section for the purpose of handling or setting. ~~The holes shall be tapered unless cored.~~ Weep holes shall be provided in all wingwalls. *Headwalls, ~~W~~ wingwalls, and spandrel walls* shall be free of fractures and shall be given a finish in accordance with 702.21.

The concrete compressive strength for headwalls, ~~and~~ wingwalls, and *spandrel walls* shall have a minimum 28 day compressive strength of 4,000 psi (~~27.6 MPa~~ 27 600 kPa), as determined by compressive strength testing of concrete cylinders. *The concrete compressive strength for footings shall have a minimum 28 day compressive strength of 2,000 psi (13 800 kPa), as determined by compressive strength testing of concrete cylinders.*

Structural steel used in bolted connections of headwalls or wingwalls to a box-structure section, or of wingwalls to a three-sided-structure section or spandrel wall, shall be in accordance with 910.02(a), and zinc coated after fabrication in accordance with ASTM A 153.

Bolts and studs shall be hot dipped in accordance with 910.02(g)1. Nuts shall be in accordance with ASTM A 563, Grade A, Hex style; unless specified otherwise. Washers shall be in accordance ASTM F 844, unless specified otherwise. Bolts, nuts and washers shall be hot dip zinc coated.

**907.07 ~~Blank~~ Joint Membrane System for Precast Reinforced Concrete Box Structure Sections**

*The Contractor may elect to use an approved self-adhering membrane system in lieu of the detail shown on the plans.*

*Joint membrane systems shall be in accordance with the following requirements.*

<b>PROPERTY</b>	<b>TEST METHOD</b>	<b>REQUIREMENTS</b>
<i>Thickness</i>	<i>ASTM D 3767 Procedure A</i>	<i>59 mil (1.5 mm) Min.</i>

REVISION TO THE STANDARD SPECIFICATIONS

REVISION TO SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE  
COMPONENTS (CONTINUED)

<i>Tensile Strength</i>	<i>Grab Tensile Strength, ASTM D 4632</i>	<i>650 N Min.</i>
<i>Elongation</i>	<i>Grab Tensile Strength, ASTM D 4632</i>	<i>20% Min.</i>
<i>Bursting Strength</i>	<i>Mullen Burst, ASTM D 3786</i>	<i><del>2.0</del> 290 psi (2 000 kPa) Min.</i>
<i>Peel Strength</i>	<i>ASTM D 903</i>	<i>850 N/m Min.</i>
<i>Permeance</i>	<i>ASTM E 96, Water Method</i>	<i>1.05 Perm (60 ng/Pa·s·m<sup>2</sup> <del>Pa</del>) Max.</i>

*The membrane system shall be supplied in roll widths of at least 12 in. (300 mm). The membrane shall be a composite sheet material composed of a non-woven fabric and a polymer membrane material. The membrane shall be protected by a release paper.*

*Material furnished under this specification shall be covered by type B certification in accordance with 916.*

COMMENTS AND ACTION

SECTION 714 - CONCRETE BOX STRUCTURES  
 SECTION 717 - STRUCTURAL PLATE PIPE, PIPE-ARCHES, AND ARCHES  
 SECTION 723 - REINFORCED CONCRETE THREE-SIDED DRAINAGE STRUCTURE  
 SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS

<p>Motion:          Second:          Ayes:          Nays:</p>	<p>Action:  <input type="checkbox"/> Passed as Submitted  <input type="checkbox"/> Passed as Revised  <input type="checkbox"/> Withdrawn</p>
<p>Standard Specifications Sections affected:          714,717,723 and 907</p>	<p><input type="checkbox"/> 20 Standard Specifications Book  <input type="checkbox"/> Create RSP (No. ___)          Effective ___ Letting</p>
<p>Recurring Special Provision affected:          723-R-568 SCOUR PROTECTION</p>	<p>RSP Sunset Date: ___  <input type="checkbox"/> Revise RSP (No. ___)          Effective ___ Letting</p>
<p>Standard Sheets affected:          714-BCEX-01</p>	<p>RSP Sunset Date: ___          Standard Drawing Effective ___  <input type="checkbox"/> Create RPD (No. ___)          Effective ___ Letting</p>
<p>Design Manual Sections affected:          None</p>	<p>Technical Advisory  <input type="checkbox"/> Technical Advisory</p>
<p>GIFE Sections cross-references:          NONE</p>	<p>GIFE Update Req'd.? Y ___ N ___          By ___ Addition or ___ Revision</p>
	<p>Frequency Manual Update Req'd? Y ___ N ___          By ___ Addition or ___ Revision          Received FHWA Approval? ___</p>

Item No. 07 04/15/10 (2010 SS)  
Mr. Boruff  
Date: 04/15/10

REVISION TO THE STANDARD DRAWINGS

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PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Current standard drawings need updating due to the lack of information on them. Issues include: taper lengths, distinction between steel strain and wood signal poles, loop detection wire continuity and shape.

PROPOSED SOLUTION: To revise existing drawings or add new drawings.

APPLICABLE STANDARD SPECIFICATIONS: None

APPLICABLE STANDARD DRAWINGS: 801-TCDV-03, 805-SCGO-04A, 805-SCGO-04B,  
805-SGLI-02, 805-SGLI-06

APPLICABLE DESIGN MANUAL SECTION: Figures 46-4M and 76-2B

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: David Boruff

Title: Traffic Administration Section Supervisor

Organization: INDOT

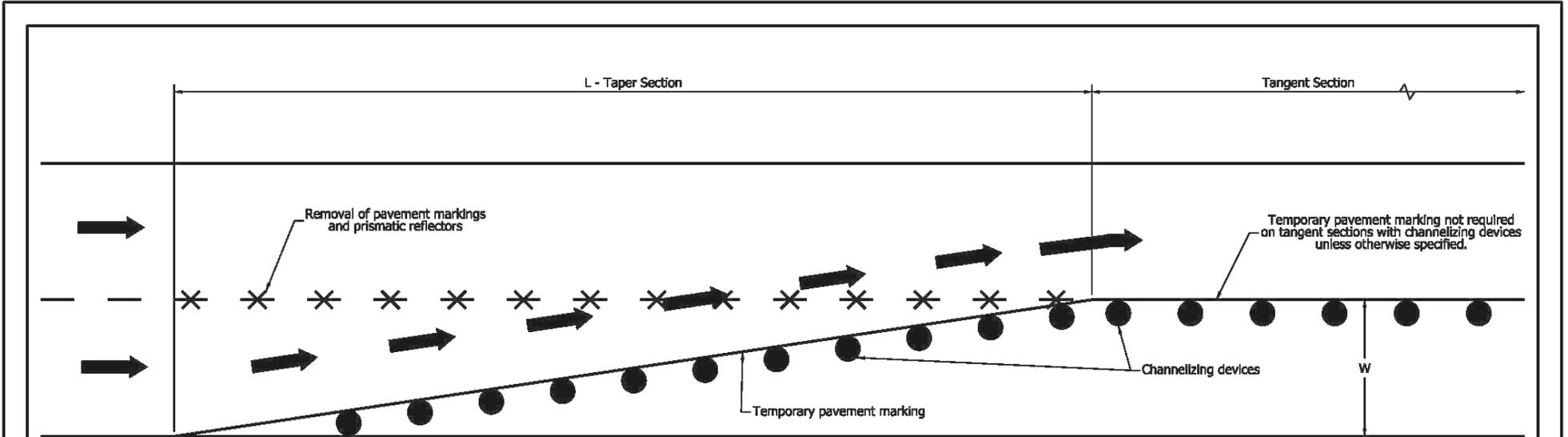
Phone Number: 317-899-8626

Date: 3/26/10

APPLICABLE SUB-COMMITTEE ENDORSEMENT?

REVISION TO THE STANDARD DRAWINGS

REVISION TO 801-TCDV-03 MERGING OR SHIFTING TAPER



**LEGEND**

L - Minimum length of taper in feet.

S - Posted speed limit prior to the construction zone in mph.

W - Width of lane or shift in feet.

MERGING TAPER				
S MPH	L			
	W = 9	W = 10	W = 11	W = 12
20	60	70	75	80
25	95	105	115	125
30	135	150	165	180
35	185	205	225	245
40	240	270	300	320
45	405	450	500	540
50	450	500	550	600
55	495	550	605	660
60	540	600	660	720
65	585	650	715	780
70	630	700	770	840

For W not shown in the table,  $L = W \times S$  for a speed of 45 mph or greater.  
 $L = W \times S^2/60$  for a speed of 70 km/h or lower.

SHIFTING TAPER				
S MPH	L			
	W = 9	W = 10	W = 11	W = 12
20	30	35	40	40
25	50	55	60	65
30	70	75	85	90
35	95	105	115	125
40	120	135	150	160
45	205	225	250	270
50	225	250	275	300
55	250	275	305	330
60	540	600	660	720
65	295	325	360	390
70	315	350	385	420

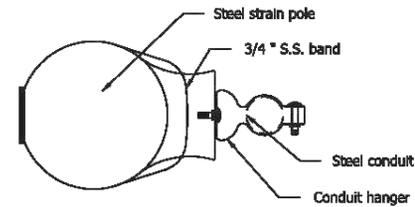
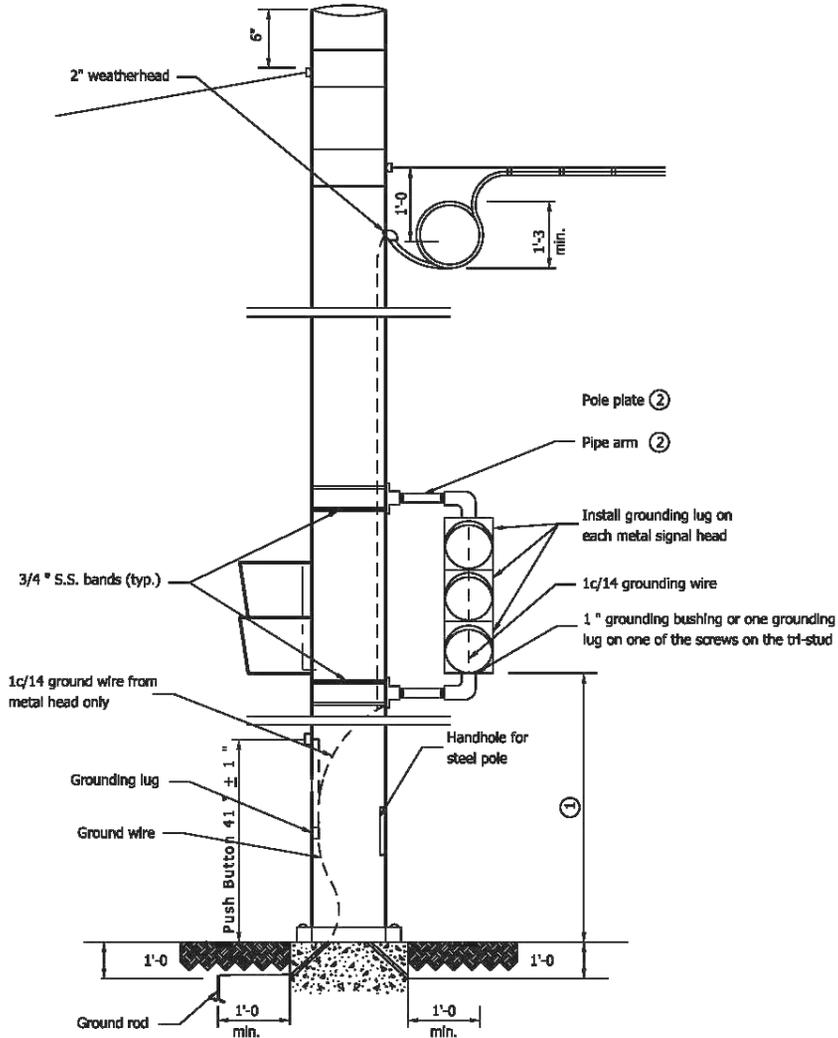
For W not shown in the table, L is one half that required for a merging taper.

Shifting taper preceded by lane closure taper must be separated by tangent section equal in length to the shifting taper.

<b>INDIANA DEPARTMENT OF TRANSPORTATION</b>	
<b>MERGING OR SHIFTING TAPER</b>	
<b>DRAFT</b>	
<b>STANDARD DRAWING NO. E 801-TCDV-03</b>	
	DESIGN STANDARDS ENGINEER      DATE
	CHIEF HIGHWAY ENGINEER      DATE
DESIGN STANDARDS ENGINEER	

REVISION TO THE STANDARD DRAWINGS

REVISION TO 805-SGCO-04A SIGNAL INDICATION MOUNTED ON STEEL POLE



DETAIL A

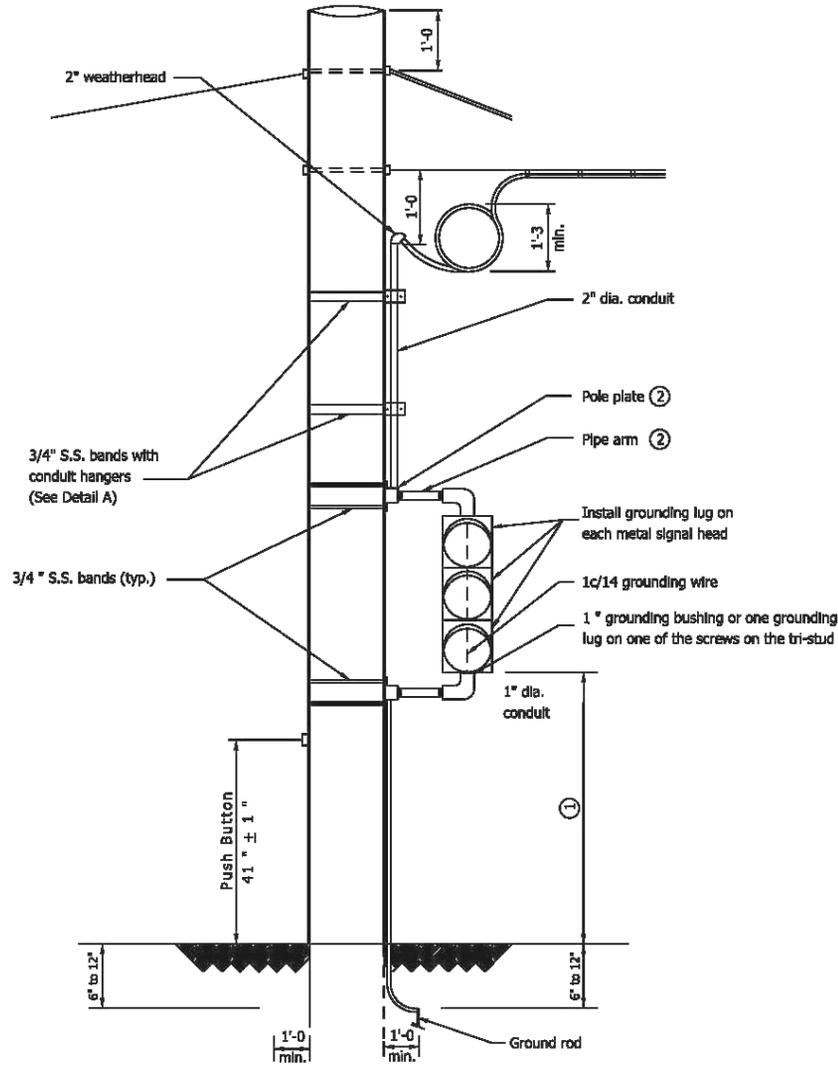
GENERAL NOTES

- ① This distance shall be from 10 ft to 15 ft above centerline of pavement for vehicular signals and from 7 ft to 10 ft above top of sidewalk for pedestrian signals.
- ② Each pedestrian signal and each vehicular signal requires 2 pole plates and 2 pipe arms.

<b>INDIANA DEPARTMENT OF TRANSPORTATION</b>	
<b>SIGNAL INDICATION MOUNTED ON STEEL POLE</b>	
<b>DRAFT</b>	
<b>STANDARD DRAWING NO. E 805-SGCO-04A</b>	
	/s/XXXXXXXXXX DESIGN STANDARDS ENGINEER      DATE
	/s/XXXXXXXXXX CHIEF HIGHWAY ENGINEER      DATE
DESIGN STANDARDS ENGINEER	

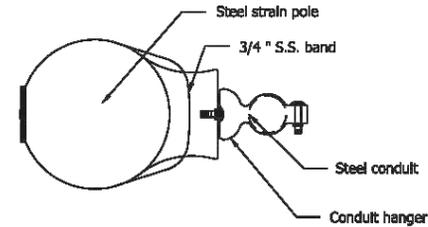
REVISION TO THE STANDARD DRAWINGS

REVISION TO 805-SGCO-04B SIGNAL INDICATION MOUNTED ON WOOD POLES



GENERAL NOTES

- ① This distance shall be from 10 ft to 15 ft above centerline of pavement for vehicular signals and from 7 ft to 10 ft above top of sidewalk for pedestrian signals.
- ② Each pedestrian signal and each vehicular signal requires 2 pole plates and 2 pipe arms.

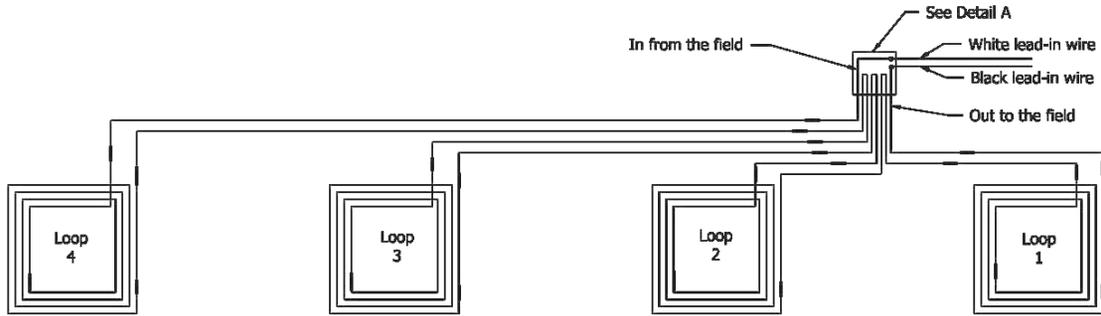


DETAIL A

INDIANA DEPARTMENT OF TRANSPORTATION	
SIGNAL INDICATION MOUNTED ON WOOD POLES	
DRAFT	
STANDARD DRAWING NO. E 805-SGCO-04B	
	/s/XXXXXXXXXX DESIGN STANDARDS ENGINEER      DATE
	/s/XXXXXXXXXX CHIEF HIGHWAY ENGINEER      DATE
DESIGN STANDARDS ENGINEER	

REVISION TO THE STANDARD DRAWINGS

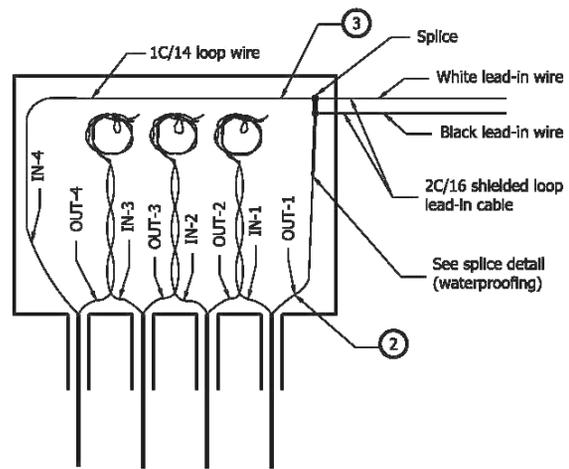
REVISION TO 805-SGLI-02 TRAFFIC SIGNAL LOOP INSTALLATION



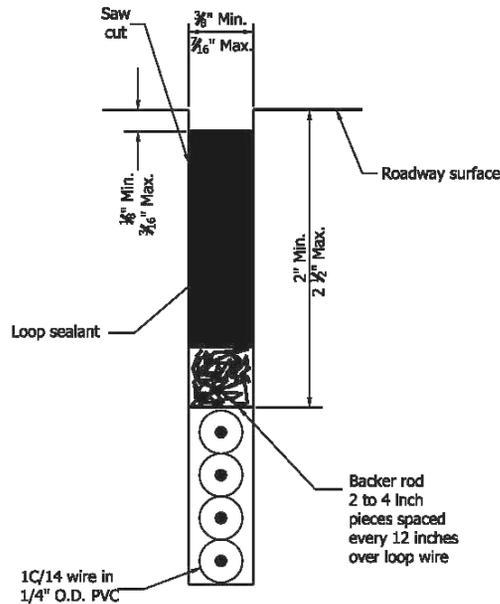
**LOOP WIRING DIAGRAM**

**GENERAL NOTES**

- ① Duct loop wires to be twisted around each other a minimum of 5 turns/ft then coiled and tied with self-locking strips.
- ② Loop wires to be tagged in or out as indicated.
- ③ See splice detail (waterproofing) on Standard Drawing E 805-SGLI-04.
- ④ The loop wire is continuously wound in the loop saw slot for the required number of turns.



**DETAIL A  
DETECTOR HOUSING WIRING**



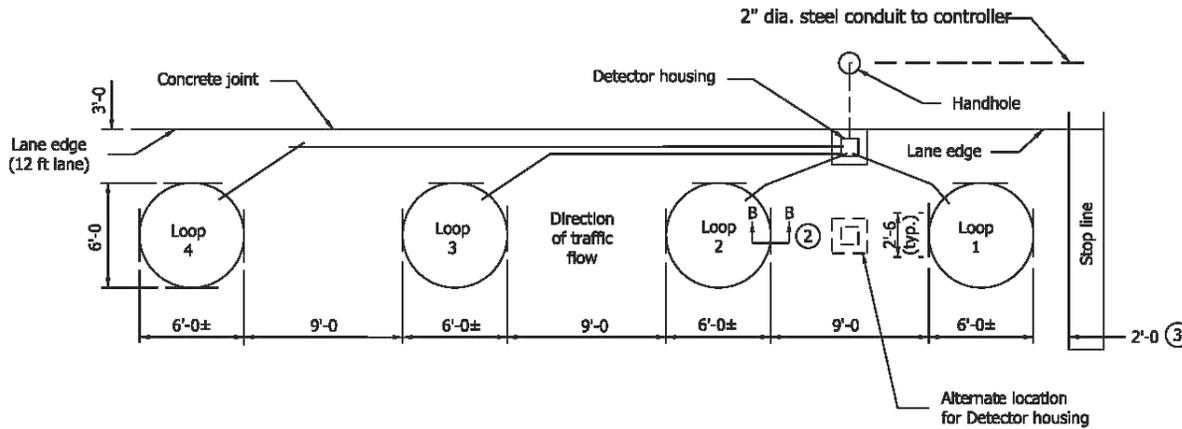
**LOOP SAW-CUT DETAIL  
SECTION B-B**

<b>INDIANA DEPARTMENT OF TRANSPORTATION</b>	
<b>TRAFFIC SIGNAL LOOP INSTALLATION</b>	
<b>DRAFT</b>	
<b>STANDARD DRAWING NO. E 805-SGLI-02</b>	
	/s/XXXXXXXXXX DESIGN STANDARDS ENGINEER      DATE
	/s/XXXXXXXXXX CHIEF HIGHWAY ENGINEER      DATE
DESIGN STANDARDS ENGINEER	

REVISION TO THE STANDARD DRAWINGS

REVISION TO 805-SGLI-06 TRAFFIC SIGNAL LOOP INSTALLATION

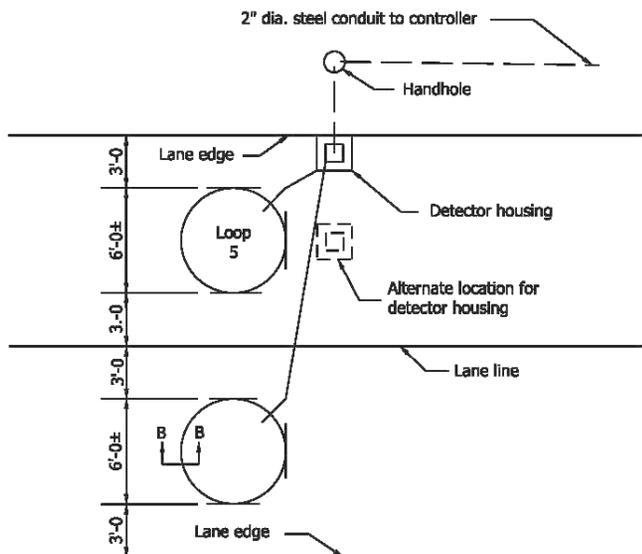
**TYPICAL LOOP DETECTION SAW-CUT PLAN (ONE LANE)**



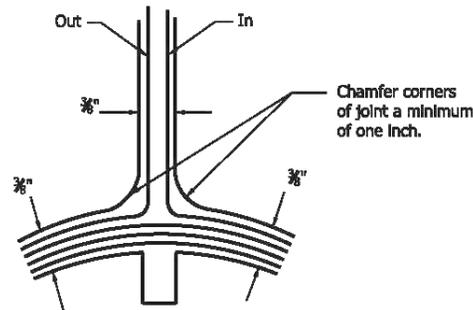
**GENERAL NOTES**

1. Loop saw-cuts as shown on plan sheets are to be considered as schematic only. In the event of discrepancies, this detail shall govern.
2. See Standard Drawing E 805-SGLI-02 for Section B-B.
3. This distance is typical depending on the intersection geometrics; a loop can be sawed in front of the stop line.
4. The loop(s) shall be centered transversely in the travel lane.
5. The saw slot for the line to the detector housing shall be approximately perpendicular to the tangent of the circular loop at the point of intersection.

**TYPICAL LOOP DETECTION (TWO LANES)**



**DETAIL A  
DETECTOR HOUSING WIRING**



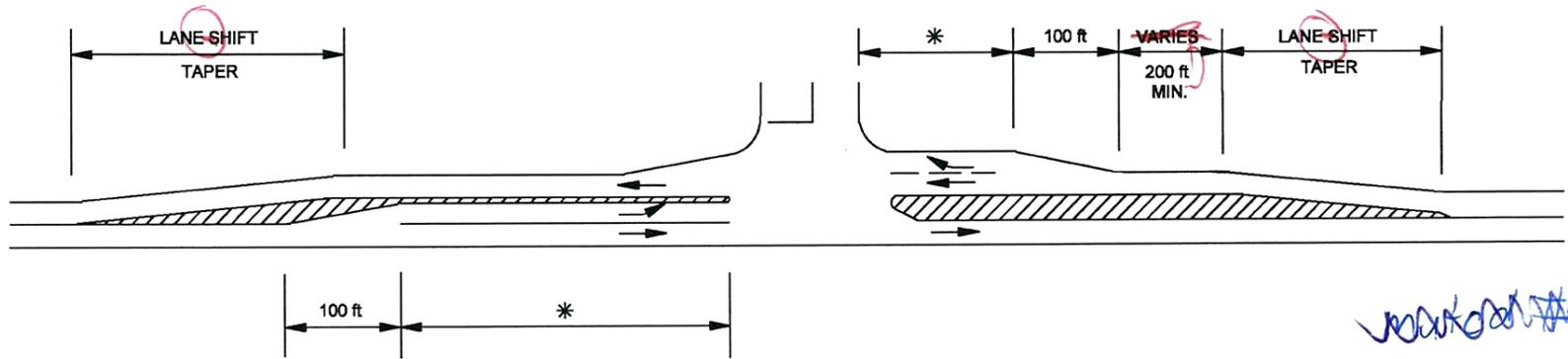
The loop wire is continuously wound in the loop saw slot for the required numbers of turns (4 turns shown)

<b>INDIANA DEPARTMENT OF TRANSPORTATION</b>	
<b>TRAFFIC SIGNAL LOOP INSTALLATION</b>	
<b>DRAFT</b>	
<b>STANDARD DRAWING NO. E 805-SGLI-06</b>	
DESIGN STANDARDS ENGINEER	/s/ XXXXXXXXXXXX DESIGN STANDARDS ENGINEER      DATE  /s/ XXXXXXXXXXXX CHIEF HIGHWAY ENGINEER      DATE

REVISION TO THE STANDARD DRAWINGS

REVISION TO FIGURE 46-4M CHANNELIZED LEFT-TURN LANE FOR 2-LANE HIGHWAY

10



Design Speed (mph)	Lane Shift Taper Rates
20	5-40:1
25	6-45:1
30	8-20:1
35-40	10-25:1 → 13:1
45	13-45:1
50	15-50:1
55	18-60:1
60	20-65:1
65-70	23-70:1
70-75	25-75:1

\* See Section 46-4.02 for minimum turn lane lengths.

CHANNELIZED LEFT-TURN LANE FOR 2-LANE HIGHWAY  
Figure 46-4M

REVISION TO THE STANDARD DRAWINGS

REVISION TO FIGURE 76-2B LONGITUDINAL TAPER RATE AND LENGTH

(E)

Design Speed (mph)	Merging Taper Rate
20	10:1
25	<del>10</del> 15:1
30	<del>15</del> 20:1
35	25:1
40	35:1
45	45:1
50	50:1
55	<del>55</del> 60:1
60	<del>60</del> 65:1
65	<del>65</del> 70:1
70	<del>70</del> 75:1

Taper Type		Minimum Taper Length
Upstream	Merging Taper (Lane Drop)	$L$
	Lane-Shift Taper	$\frac{1}{2} L$
	Shoulder Taper	$\frac{1}{3} L$
	Two-Way Traffic Taper	100 ft
Downstream		50 ft / lane <sup>2</sup>

Notes:

1. Taper Length,  $L =$  ~~Taper Rate~~ <sup>Merging</sup>  $\times$  Offset Distance
2. The desirable length is 100 ft / lane.
3. Figure 76-2C illustrates the various types of taper lanes.

LONGITUDINAL TAPER RATE AND LENGTH FOR LANE RESTRICTION

Figure 76-2B

COMMENTS AND ACTION

REVISION TO 801-TCDV-03 MERGING OR SHIFTING TAPER  
 REVISION TO 805-SGCO-04A SIGNAL INDICATION MOUNTED ON STEEL POLE  
 REVISION TO 805-SGCO-04B SIGNAL INDICATION MOUNTED ON WOOD POLES  
 REVISION TO 805-SGLI-02 TRAFFIC SIGNAL LOOP INSTALLATION  
 REVISION TO 805-SGLI-06 TRAFFIC SIGNAL LOOP INSTALLATION  
 REVISION TO FIGURE 46-4M CHANNELIZED LEFT-TURN LANE FOR 2-LANE HIGHWAY  
 REVISION TO FIGURE 76-2B LONGITUDINAL TAPER RATE AND LENGTH

<p>Motion:          Second:          Ayes:          Nays:</p>	<p>Action:  <input type="checkbox"/> Passed as Submitted  <input type="checkbox"/> Passed as Revised  <input type="checkbox"/> Withdrawn</p>
<p>Standard Specifications Sections affected:          NONE</p>	<p><input type="checkbox"/> 20 Standard Specifications Book  <input type="checkbox"/> Create RSP (No. ___)          Effective ___ Letting          RSP Sunset Date: ___</p>
<p>Recurring Special Provision cross-references:          NONE</p>	<p><input type="checkbox"/> Revise RSP (No. ___)          Effective ___ Letting          RSP Sunset Date: ___</p>
<p>Standard Sheets affected:          801-TCDV-03          805-SGCO-04A          805-SGCO-04B          805-SGLI-02          805-SGLI-06</p>	<p>Standard Drawing Effective ___  <input type="checkbox"/> Create RPD (No. ___)          Effective ___ Letting  <input type="checkbox"/> Technical Advisory</p>
<p>Design Manual Sections affected:          FIGURE 46-4M,          FIGURE 76-2B.</p>	<p>GIFE Update Req'd? Y ___ N ___          By ___ Addition or ___ Revision</p>
<p>GIFE Sections cross-references:          NONE</p>	<p>Frequency Manual Update Req'd? Y ___ N ___          By ___ Addition or ___ Revision</p>
	<p>Received FHWA Approval? ___</p>

RECURRING PLAN DETAILS

REVISION TO THE RECURRING PLAN DETAILS

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PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Guardrail transition TGS-1 approach to a bridge with three-beam side-mounted railing's post spacing is in error. Recurring Plan Detail E 706-B-140d, page 3 of 3, shows the distance from the bridge joint to the first bridge-railing post to be 6 in. maximum. Anchor bolts are required to connect the railing posts to the bridge coping. The bolts must be embedded 2'-10" into the bridge deck. For a structure of greater than 9 deg skew, the inside end of the anchor bolt for the post closest to the joint will penetrate the bridge approach.

PROPOSED SOLUTION: Change the 6-in. max. dimension to a range of 9 in. through 3'-1/2". This range will permit this anchor bolt's embedment into the bridge slab for up to a 45-deg skew, but it will also keep the post spacing at a maximum of 6'-3".

APPLICABLE STANDARD SPECIFICATIONS: none

APPLICABLE STANDARD DRAWINGS: Recurring Plan Detail 706-B-140d

APPLICABLE DESIGN MANUAL SECTION: 61-6.04

APPLICABLE SECTION OF GIFE: 5.25

Submitted By: Anne Rearick

Title: Manager, Office of Structural Services

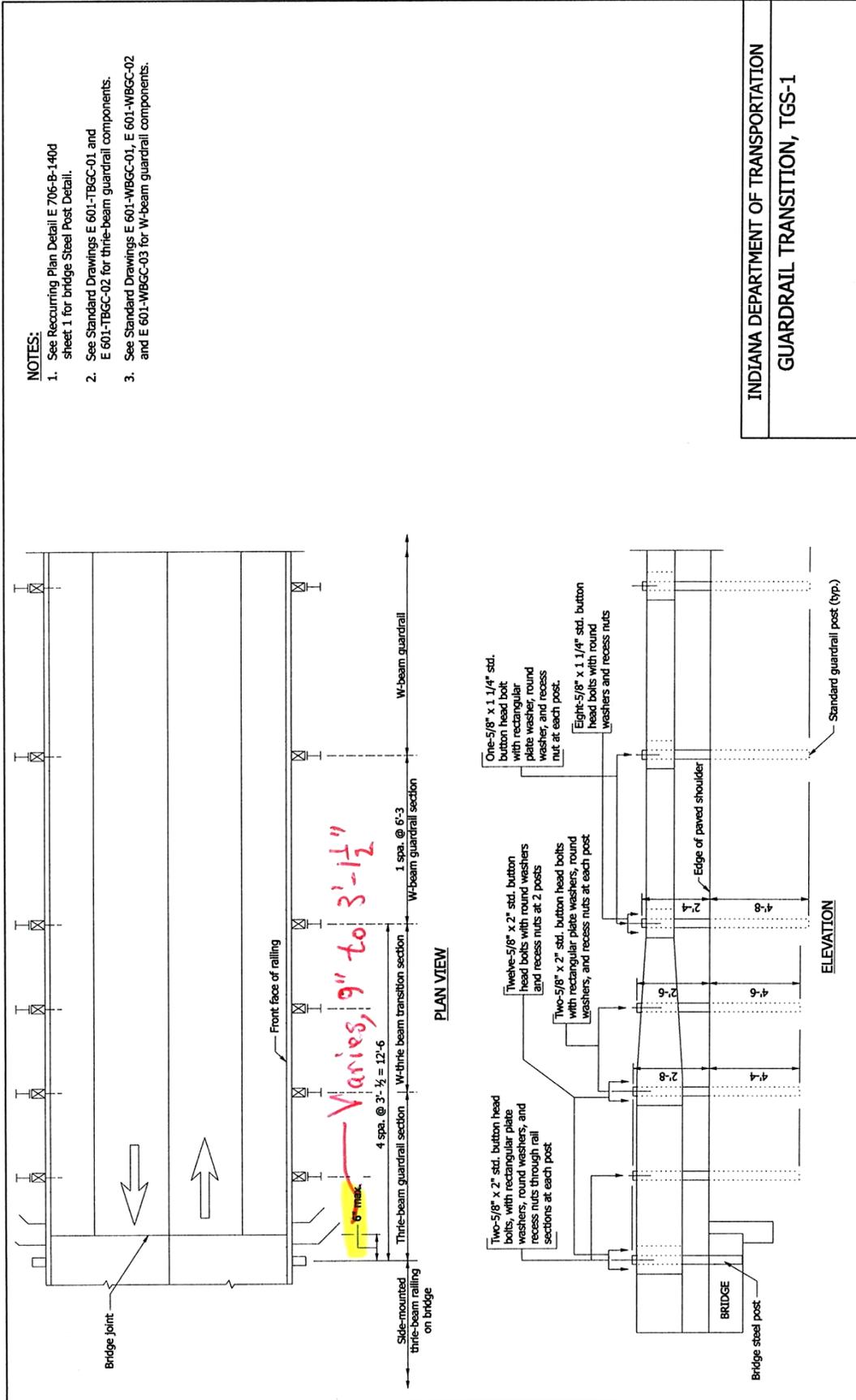
Organization: INDOT

Phone Number: 232-6775

Date: 3-31-10

REVISION TO THE RECURRING PLAN DETAILS

PROPOSED REVISION TO RECURRING PLAN DETAILS 706-B-140d GUARDRAIL  
 TRANSITION, TGS-1 (PAGE 3)



**NOTES:**

1. See Recurring Plan Detail E 706-B-140d sheet 1 for bridge Steel Post Detail.
2. See Standard Drawings E 601-TBGC-01 and E 601-TBGC-02 for three-beam guardrail components.
3. See Standard Drawings E 601-WBGC-01, E 601-WBGC-02 and E 601-WBGC-03 for W-beam guardrail components.

R-7-25-05

INDIANA DEPARTMENT OF TRANSPORTATION  
 GUARDRAIL TRANSITION, TGS-1

COMMENTS AND ACTION

REVISION TO RECURRING PLAN DETAILS PROPOSED REVISION TO RECURRING PLAN  
 DETAILS 706-B-140d GUARDRAIL TRANSITION, TGS-1 (PAGE 3)

Motion: Second: Ayes: Nays:	Action: <input type="checkbox"/> Passed as Submitted <input type="checkbox"/> Passed as Revised <input type="checkbox"/> Withdrawn
Standard Specifications Sections affected:	<input type="checkbox"/> 20 Standard Specifications Book
NONE  Recurring Plan Details affected:	<input type="checkbox"/> Create RSP (No. ___) Effective ___ Letting RSP Sunset Date: ___
706-B-140d GUARDRAIL TRANSITION, TGS-1	<input type="checkbox"/> Revise RSP (No. ___)
Standard Sheets affected:  NONE	Effective ___ Letting RSP Sunset Date: ___
Design Manual Sections affected:  IDM 61-6.04	Standard Drawing Effective ___ <input type="checkbox"/> Create RPD (No. ___) Effective ___ Letting <input type="checkbox"/> Technical Advisory
GIFE Sections cross-references:  Section 5.25	GIFE Update Req'd.? Y ___ N ___ By ___ Addition or ___ Revision
	Frequency Manual Update Req'd? Y ___ N ___ By ___ Addition or ___ Revision
	Received FHWA Approval? ___