INDIANA DEPARTMENT OF TRANSPORTATION

STANDARDS COMMITTEE MEETING

Driving Indiana's Economic Growth

FINAL DRAFT MINUTES

November 20, 2008 Standards Committee Meeting

FINAL DRAFT MINUTES

MEMORANDUM

December 11, 2008

TO: Standards Committee

FROM: Mike Milligan, Secretary

RE: Minutes for the November 20, 2008 Standards Committee Meeting

The Standards Committee meeting was called to order by the Chairman at 9:04 a.m. on November 20, 2008 in the N755 Bay Window Conference Room. The meeting was adjourned at 3:00 p.m.

The following members were in attendance:

Mark Miller, Chairman
Dennis Kuchler*, Constr. Mgmt.
Ron Heustis, Constr. Mgmt.
Carl Tuttle**, Highway Ops.
Ron Walker, Materials Mgmt.
Tom Caplinger, Crawfordsville Dist.
Dave Andrewski, Pvmt. Engineering
Bob Cales, Contract Admin.
John Wright, Roadway Services
Anne Rearick, Structural Services
Joe Novak***, Constr. Mgmt.

** Tom Carrow Proxy for D. Kuchler in afternoon*
*** Proxy for Mike Bowman*
**** Proxy for Jim Keefer*

Also in attendance were the following:

Mike Milligan, Secretary
Ike DeBurger, INDOT
Ben Lawrence, INDOT
Kenny Anderson, INDOT
Tony Zander, INDOT
Youlanda Belew, INDOT
Robert Dirks, FHWA
Mike Byers, IACPA
Bren George, FHWA
Dan Brown, Phend & Brown/APAI
Lloyd Bandy, APAI
Alvin Evans, J.H. Rudolph
Jim Reilmam, INDOT
Brandon Miller, INDOT
Jeff James, INDOT
Mike Prather, INDOT
Tony Uremovich, INDOT
Steve Fisher, INDOT
Elizabeth Dwyre, Parsons Brinckerhoff
Eric Carleton, Independent Conc. Pipe
Brad Cruea, Milestone Contractors/APAI
Derek Merida, Milestone
Bill Knopf, APAI
Paul Berebitsky, ICA

A. GENERAL BUSINESS ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

1. Approval of October 16, 2008 Minutes

ACTION: The Final Draft Minutes were approved as revised.

Motion: Mr. Cales
Second: Mr. Andrewski
Ayes: 10
Nays: 0

Mr. Miller began the meeting by asking if any items would be withdrawn.

Mr. Tuttle said that Items 08-15-17, 08-15-18, and 08-15-22 would be withdrawn.

Mr. Heustis said that Items 08-15-3, 08-15-8, 08-15-9, 08-15-19, and 08-15-20 would be withdrawn. Mr. Heustis asked the Chair if he could quickly discuss his withdrawn items for comment.

Mr. Heustis briefly discussed each of his withdrawn items.

Mr. Miller asked the Committee to forward any comments to Mr. Heustis.

Mr. Miller asked if there were any comments from the Floor.

Derek Merida of Milestone mentioned that unused piling on a project could be returned to the supplier, but the Contractor was charged a 50% restocking fee. Mr. Merida asked if INDOT would consider paying some part of that restocking fee.

B. CONCEPTUAL PROPOSAL ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

1. Overall Improvement to Pay Item Selection 7

This item involves placing the pay item number along with the pay item in the Standard Specifications.

Discussion:

The pay item number can be cross referenced with the applicable specification.

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Pay items that occur in more than one place in the specifications will be easier to track.

This change will affect LES, PES and other Trns*port modules including SiteManager.

ACTION: The Committee directed Mr. Wright to pursue development of this concept. The Committee advised that Mr. Wright organize a task force including representatives from the following:

(a) Estimating Section, Division of Contract Administration.
(b) Pre-Bid Review Section, Division of Contract Administration.
(c) Division of Production Management.
(d) BITS.
(e) Construction Management.

FHWA representatives said they did not need to be involved.

No time constraint was given.

C. RECURRING SPECIAL PROVISIONS PROPOSED ITEMS

Item 08-15-1	Mr. Walker	10
604-R-542	DETECTABLE WARNING ELEMENTS	
Action:	Passed as revised	
Item 08-15-2	Mr. Wright	15
620-R-483	SOUND BARRIER SYSTEMS	
Action:	Passed as revised	
Item 08-15-3	Mr. Heustis	36
701-B-132	PILE DRIVING	
Action:	Withdrawn	

D. STANDARD SPECIFICATIONS AND STANDARD DRAWINGS PROPOSED ITEMS

OLD BUSINESS

Item 08-12-6	Mr. Heustis	38
707	PRECAST AND *PRECAST* PRESTRESSED CONCRETE STRUCTURAL MEMBERS	
Action:	Passed as revised	

NEW BUSINESS

Item 08-15-4	Mr. Kuchler	51
107.08(a)	~~Employee~~ Worker Safety	
107.12	Traffic Control Devices	
Action:	Passed as revised	
Item 08-15-5	Mr. Walker	55
~~203.08.1~~ *(Withdrawn)*	~~Linear Grading~~	
904.01	Aggregates	
904.03(a)	Classification of Aggregates	
Action:	Passed as revised	

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Item 08-15-6	Mr. Walker	60
401.03	Materials	
401.05	Volumetric Mix Design	
401.06	Recycled Materials	
401.14	Spreading and Finishing	
402.08	Recycled Materials	
402.13	Spreading and Finishing	
406.02	Materials	
410.03	Materials	
410.05	SMA Mix Design	
410.06	Recycled Materials	
410.09	Acceptance of Mixtures	
410.14	Spreading and Finishing	
410.20	Appeals	
410.20(a)	~~Mixture~~ *MSG*	
410.20(b)	*Binder Content and Gradation*	
410.20~~(b)~~*(c)*	*BSG of the* Density *Core*	
902.01(a)4	Appeals	
902.01(b)	Asphalt Emulsions	
Action:	Passed as revised	

Item 08-15-7	Mr. Walker	69
501.03	Materials	
501.04	Concrete Mix Design	
501.04(a)	Change in Materials	
501.04(b)	~~Change in Source~~ *Adjustment to Materials*	
501.04*(c)*	*Other Adjustments*	
501.05	Concrete Mix Criteria	
501.06	Trial Batch	
501.07	Lots and Sublots	
501.08	Acceptance	
501.17	~~CMDT Adjustments~~ *Blank*	
502.03~~(a)~~	~~Change in Materials~~	
502.03~~(b)~~	~~Change in Source~~	
502.03~~(c)~~	~~Change in Mixture~~	
502.04(a)	Portland Cement Concrete	
505.01(c)	Exceptions to AASHTO T 121	
506.03	Concrete Mix Design	
506.03(a)	Change in Material	
506.03(b)	*Adjustments to Materials*	
506.03(c)	*Other Adjustments*	
Action:	Passed as revised	

Item 08-15-8	Mr. Heustis	78
Standard Drawing	506-CCPP-01	
Action:	Withdrawn	

Item 08-15-9	Mr. Heustis	81
701	DRIVEN PILING	
Action:	Withdrawn	

Item 08-15-10	Ms. Rearick	101
702.03	Materials	
Action:	Passed as revised	

Item 08-15-11	Ms. Rearick	102
~~711.02~~ *(Withdrawn)*	~~Materials~~	
711.73(b)	Unit Weight Basis	
Action:	Passed as revised	

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Item 08-15-12	Mr. Walker	114
716	TRENCHLESS PIPE INSTALLATION	
Action:	Passed as revised	
Item 08-15-13	Ms. Rearick	121
Standard Drawings	718-UNDR-01, 02, 03, 04, 05, & 07	
Action:	Passed as revised	
Item 08-15-14	Ms. Rearick	128
718.02	Materials	
718.03	Pipe Installations	
718.05	Underdrain Outlets	
Action:	Passed as revised	
Item 08-15-15	Ms. Rearick	130
Standard Drawings	726-BEBP-01, 02, 03, 04	
Action:	Passed as submitted	
Item 08-15-16	Ms. Rearick	135
726	*ELASTOMERIC BEARINGS*	
Action:	Passed as revised	
Item 08-15-17	Mr. Bowman	138
Standard Drawing	802-SNGS-11	
Action:	Withdrawn	
Item 08-15-18	Mr. Bowman	140
802.01	Description	
Action:	Withdrawn	
Item 08-15-19	Mr. Heustis	141
911.01(e)	Untreated Piling	
911.02(c)	Piling	
Action:	Withdrawn	
Item 08-15-20	Mr. Heustis	143
915.01	Steel ~~Shell~~ *Pipe* Encased Concrete Piles And Epoxy Coated Steel ~~Shell~~ *Pipe* Encased Reinforced Concrete Piles	
915.01(a)	General Requirements	
915.01(b)	Fluted Steel ~~Pile Shells~~ *Pipe Piles*	
915.01)c)	Rounded Steel Pipe ~~Shells~~ *Piles*	
915.01(d)	Epoxy Coating for Piles	
915.01(d)1	Prequalification of Organic Coatings for Steel Piles	
915.01(d)1a	Product Data Sheet	
915.01(d)1b	Fingerprint	
915.01(d)1c	Materials Safety Data Sheet	
915.01(d)1d	Laboratory Report	
915.01(d)1d(1)	Tensile Strength and Elongation	
915.01(d)1d(2)	Impact Resistance	
915.01(d)1d(3)	Abrasion Resistance	
915.01(d)1d(4)	Salt Fog	
915.01(d)2	Application	
915.01(d)2a	Surface Preparation	
915.01(d)2b	Coating Application	
915.01(d)2b(1)	Thickness	
915.01(d)2b(2)	Cure	
915.01(d)2b(3)	Continuity of Coating	
915.01(d)3	Certification	
915.02	Steel H Piles and Epoxy Coated Steel H Piles	

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915.03	Wood Piles	
915.03.1	*Pile Tips*	
Action:	Withdrawn	
Item 08-15-21	Ms. Rearick	148
915.04	Elastomeric Bearings	
915.04(a)	Description	
915.04(b)	Materials	
915.04(b)*1*	*Elastomer*	
915.04(b)*2*	*Structural Steel*	
915.04(b)*3*	*Internal Steel Shims*	
915.04(b)*4*	*Threaded Stud*	
915.04(b)*5*	*Side Retainer*	
915.04(c)	Manufacturing Requirements	
915.04(d)	Appearance and Dimensions	
915.04(e)	Quality ~~Assurance~~ *Control*	
915.04(f)	Certification	
Action:	Passed as revised	
Item 08-15-22	Mr. Bowman	155
920.01(b)1	High Mast	
920.01(b)2	Welding	
920.01(b)2a	*Requirements*	
920.01(b)2b	*Inspection*	
920.01(b)2c	*Tower Finish*	
Action:	Withdrawn	

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cc: Committee Members (11)
FHWA (2)

Mr. Wright
Date: 11/20/08

CONCEPTUAL PROPOSAL ITEM

1. OVERALL IMPROVEMENT TO PAY ITEM SELECTION

CONCEPTUAL

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Overall Improvement to Pay Item selection

PROPOSED SOLUTION: Add the Pay Item code number to the Spec Book

APPLICABLE STANDARD SPECIFICATIONS: All

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE: N/A

Submitted By: John Wright on behalf of Team Indiana

Title: Manager of Roadway Services

Organization: INDOT

Phone Number: 232-5147

Date: 10/16/08

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(2) The department will measure Concrete Pavement Continuous Reinforcement, composed of steel bars, by the square yard of pavement with reinforcement incorporated and acceptably completed. The department will not deduct the areas for clearances called for adjacent to the edges of the slab or joints.

415.5 Payment

415.5.1 General

(1) The department will pay for measured quantities at the contract unit price under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
415.0060 - 0199	Concrete Pavement (inch)	SY
415.1080 - 1199	Concrete Pavement HES (inch)	SY
415.5105	Concrete Pavement Continuous Reinforcement	SY

(2) Payment for the Concrete Pavement and Concrete Pavement HES bid items is full compensation for preparing the foundation, unless provided otherwise; for furnishing, hauling, preparing, placing, curing, and protecting the concrete; for measuring opening strength including fabricating and testing cylinders, obtaining and testing cores, and evaluating maturity; for measuring pavement thickness, except as specified in 415.3.18.7; and for filling all core holes. Payment includes jointing and providing tie bars and dowel bars in unhardened concrete. For tie bars and dowel bars provided in concrete not placed under the contract, the department will pay separately under the Drilled Tie Bars and Drilled Dowel Bars bid items as specified in 416.5.

(3) Payment for Concrete Pavement Continuous Reinforcement is full compensation for furnishing and installing reinforcement and for coating.

415.5.2 Adjusting Pay for Thickness

(1) For nonconforming pavement thinner than plan thickness minus 1/8 inch and subject to pay adjustment, as specified in 415.3.18, the department will adjust pay under the Nonconforming Thickness Concrete Pavement administrative item as follows:

FOR PAVEMENT WITH A FINAL THICKNESS THINNER THAN PLAN THICKNESS BY:	PERCENT OF THE CONTRACT UNIT PRICE
> 1/8 inch but <= 1/2 inch	80
> 1/2 inch but <= 3/4 inch	60
> 3/4 inch but <= 1 inch	50

(2) If the department determines that areas of pavement have unacceptable final thickness, as specified in 415.3.18.10, the engineer will direct the contractor to either:

1. Remove and replace with concrete pavement of conforming thickness. The department will pay for the unacceptable area at the full contract price.
2. Leave the concrete in place. The department will not pay for the unacceptable area.

415.5.3 Adjusting Pay for Pavement Crack Repairs

(1) The engineer will allocate responsibility and costs for crack repairs, mobilization for traffic control, and traffic control devices, as specified in CMM 5-35-160. The department will adjust pay under the Crack Repair Concrete Pavement administrative item.

(2) Pay adjustment for crack repair costs, based on the total repair area in a single panel, includes mobilization for the repair work; sawing; removing pavement; furnishing and placing all materials including dowel bars; drilling in tie and dowel bars; and all incidentals. The department will adjust pay for contiguous repair areas in adjacent panels separately. The engineer will compute the pay adjustment for repair costs as the contract unit price for concrete pavement, multiplied by the appropriate multiplier as follows:

FIXED AMOUNT MULTIPLIER PER PANEL FOR FULL OR PARTIAL REPLACEMENT

REPAIR AREA in square yards (m^2)	SHARED REIMBURSEMENT MULTIPLIER	TOTAL REIMBURSEMENT MULTIPLIER
18 (15) or greater	60	120
12 (10) to < 18 (15)	54	108
6 (5) to < 12 (10)	48	96
< 6 (5)	42	84

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The following items require revisions to the Recurring Special Provision for Detectable Warning Elements:

1. The Type S masonry mortar used in the mortar bed may not be compatible with the Type II polymer modifier recommended by the manufacturer. High strength mortar should be required.

2. There are no provisions in the specifications to allow detectable warning elements other than brick and cast iron elements. There are many other elements available that should be allowed if they meet the color and truncated dome requirements designated in the specifications for brick and cast iron elements.

PROPOSED SOLUTION: The following revisions are recommended to be approved and made effective by a Recurring Special Provision.

1. Change the mortar bed material to high-strength mortar

2. Allow other types of detectable warning elements if they meet the color requirements of brick elements, and the truncated dome requirements.

APPLICABLE STANDARD SPECIFICATIONS: 604,905

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: 604-R-542

Submitted By: Ron Walker

Title: Manager, Office of Materials Management

Organization: INDOT

Phone Number: 317-610-7251 x 204

Date: 11-08-08

APPLICABLE SUB-COMMITTEE ENDORSEMENT? None

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REVISION TO RECURRING SPECIAL PROVISION

604-R-542 DETECTABLE WARNING ELEMENTS

(~~Adopted~~ Revised 11-20-08)

The Standard Specifications are revised as follows:

SECTION 604, BEGIN LINE 25, DELETE AND INSERT AS FOLLOWS:

~~The detectable warning elements shall be set in thin set latex modified mortar in accordance with ANSI A108.1 or as recommended by the element manufacturer for outdoor use for adhering brick to concrete.~~

~~*Detectable Warning Elements shall be from the Department's approved list.*~~ *The detectable warning surface in concrete curb ramps shall be selected from the Department's list of approved Detectable Warning Elements in accordance with 905.05.*

The mortar bed material shall be a ~~Type S masonry~~ high-strength mortar in accordance with ASTM C 387. Part of the mix water shall be replaced with a Type II polymer modifier meeting the requirements of ASTM C 1438. The proportioning of water and polymer modifier shall be as recommended by the manufacturer of the polymer modifier.

A type ~~A~~ *C* certification in accordance with 916 ~~for detectable warning elements and thin set latex modified mortar shall be furnished~~ *shall be furnished for the masonry mortar and polymer modifier* prior to use of the materials.

SECTION 604, BEGIN LINE 98, DELETE AND INSERT AS FOLLOWS:

(g) Detectable Warning Elements

~~Detectable warning elements shall be as shown on the plans. They shall be set in a thin set mortar on top of the concrete base. The concrete base shall be cleaned of all materials which might prevent the mortar from adhering to the base. The mortar shall be applied to the concrete in accordance with the manufacturer's recommendations. Where elements smaller than full sized are needed, whole elements shall be cut full depth with an appropriate power saw.~~

~~Brick joints shall be hand tight with a maximum of 1/16 in. (1.5 mm) width.~~

~~The joints between bricks shall be filled with a fine aggregate No. 15 or an equivalent sand. This filling shall be accomplished by repeated brooming of the aggregate across the face of the bricks. Excess aggregate shall then be removed from the surface.~~

Detectable warning elements shall be manufactured or field cut to completely fill the area of the curb ramp as shown on the plans. Elements shall be installed to be level across joints or seams and shall be flush with the edges of adjoining concrete.

Brick elements shall be placed in a mortar setting bed within the hardened concrete block out. The concrete base of the block out shall have a rough textured finish, such as would be produced by a screed or wood float. The depth of the block out shall be

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such that a mortar bed thickness of 3/8 in. minimum to 3/4 in. maximum is achieved for the nominal depth of the element. The hardened concrete base shall be free of all material which might prevent the mortar setting bed from adhering. The concrete base shall be dampened with water, but be surface dry immediately prior to the placing the mortar setting bed. The mortar setting bed shall be laid out the desired thickness, no more than 2 ft ahead of laying the elements. The elements shall be buttered with mortar on the bottom before placement into the setting bed. Elements from various manufacturers shall not be mixed at any individual concrete ramp location

Brick elements shall be laid out in a running or stacked bond pattern with a 1/16 average joint width. The joint width shall not exceed 1/8 in. Whole elements should be laid first, followed by elements cut to size, keeping the number of joints to a minimum. A masonry saw shall be used to produce a clean, accurate, straight cut. The joint between elements shall be completely filled with a dry fine aggregate. The fine aggregate may be obtained from a non-Certified Aggregate Producer, but it shall be natural sand having a gradation where at least 95% of the material passes the No. 4 sieve. Excess fine aggregate shall be removed from the surface of the elements.

Cast iron ~~and other Department approved~~ elements shall be installed in accordance with the manufacturer's recommendations. When required, cutting of ~~cast iron~~ the elements shall be in accordance with the manufacturer's recommendations. Cut edges shall be ground to a smooth shape consistent with the manufactured edges.

~~Other Department a~~Approved elements other than brick or cast iron shall be installed in accordance with the manufacturer's recommendations.

SECTION 905, BEGIN LINE 36, DELETE AND INSERT AS FOLLOWS:

905.05 Detectable Warning Elements

~~Detectable warning bricks used in sidewalk curb ramps shall be in accordance with ASTM C 902, Class SX, type II. The color shall approximate 30109 or 30166 in accordance with Federal Standard No. 595a. The color shall be consistent throughout the brick. The truncated domes shall be as shown on the plans. The minimum dimensions of the brick shall be 2 1/4 in. (60 mm) thick by 3 5/8 in. (90 mm) wide by 7 5/8 in. (195 mm) long. The minimum thickness shall not be measured within the area of the domes.~~

The detectable warning surface in concrete curb ramps shall be constructed using materials from the Departments approved list of Detectable Warning Elements, which is maintained by the Office of Materials Management. An element manufacturer wishing to add a product to the approved list shall comply with Procedure L of ITM 806.

(a) Brick detectable warning elements shall consist of clay, shale, or similarly naturally occurring earthy substance, subjected to heat treatment at elevated temperatures to form bricks or pavers. The dimensions of the element shall be 8 in. in length, 4 in. in width including any spacing lugs. The thickness of the element shall be 2 in., excluding dome height and edge chamfers. The truncated domes on the surface shall be formed integral with the main body of the detectable warning element and be present on the element prior to heat treatment. The size and physical requirements of the elements shall be in accordance with ASTM C 902 for weather and traffic environment classifications Class SX, Type II,

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respectively. The truncated domes may be ground off to meet the cap thickness requirement for compressive strength testing.

*(b) Brick detectable warning elements shall be predominantly red-brown in color and shall be uniform throughout the element. The color will be determined from the average of five color readings for detectable warning elements when measured at the top surface between the raised truncated domes and determined in accordance with ASTM E 1349, CIE Illuminant D65, 10° Standard Observer, using instrument geometry of 45°/0°, and the CIE L*a*b* color system. The tested elements shall be within the limits as follows:*

	Minimum	*Maximum*
*L**	*35.0*	*50.0*
*a**	*6.0*	*36.0*
*b**	*0.0*	*30.0*

The value of a shall not be less than 90% of the value of b*. The color difference of any installed element after one year of exposure or of an individual detectable warning element from the average color for any product or model from a manufacturer shall not be greater than 5.0 ΔE* units. The color shall be uniform throughout the detectable warning elements.*

(c) Cast iron detectable warning elements shall be manufactured from gray iron in accordance with AASHTO M 105, Class 30A as a minimum. The truncated domes shall be as shown on the plans. The tops of the domes and the space between domes shall have a non-slip textured surface. The minimum thickness of the casting shall be 0.300 in. The minimum thickness shall not be measured within the area of integral reinforcing ribs or bracing, domes or the textured surface.

(d) The height tolerance of the truncated domes shall be within 0.18 to 0.26 (3.50 to 6.50 mm). The base diameter, dome top diameter and dome spacing shall be within ± 1/16 in. (± 1.5 mm) of the design value. The design values shall be within the ranges identified in the Standard Drawings. No more than 2 truncated domes per element may be out of tolerance for dimensions.

(e) Detectable warning elements that are not classified as brick in accordance with 905.05(a) or cast iron in accordance with 905.05(c) will be considered. The detectable warning elements shall meet the color requirements of 905.05(b)~~,~~ and the truncated dome requirements of 905.05(d)~~, and be in accordance with Procedure L of ITM 806~~.

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REVISION TO RECURRING SPECIAL PROVISION
604-R-542, CONTINUED.

COMMITTEE COMMENTS:

Mr. Uremovich mentioned that the standard drawings will need revision to agree with revised specification.

The Committee discussed the need for radius guidelines.

Mr. Miller suggested adding a note to the standard drawings addressing radius guidelines.

Mr. Cales said that the Design Manual gives guidance that Detectable Warning Elements should only be used in tangent sections.

Mr. Heustis suggested adding that DWE's shall be from the Department's approved list.

Mr. Heustis and Mr. Milligan will meet to put together exact wording of the Committee's recommended revisions.

Other sections containing specific cross references:

None

Recurring Special Provisions potentially affected:

604-R-542

Motion: Mr. Walker
Second: Mr. Cales
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Standard Sheets potentially affected:

None

Action: Passed as revised

_x_ RSP Effective: February 2009 Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Received FHWA Approval? Yes

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SPECIFICATIONS REVISION

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Need to revise the specification to allow the Masonry industry to bid projects

PROPOSED SOLUTION: re-write the spec

APPLICABLE STANDARD SPECIFICATIONS: section 620

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: 51-9.0

APPLICABLE SECTION OF GIFE: N/A

Submitted By: John Wright

Title: Roadway Services Manager

Organization: INDOT

Phone Number: 232-5147

Date: 10/24/08

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REVISED RECURRING SPECIAL PROVISION

620-R-483 SOUND BARRIER SYSTEMS

(Revised 11-20-08)

The Standard Specifications are revised as follows:

SECTION 620, BEGIN LINE 1, DELETE AND INSERT AS FOLLOWS:

SECTION 620 – ~~BLANK~~ *SOUND BARRIER SYSTEMS*

620.01 Description

This work shall consist of furnishing materials and placement of a sound barrier system and a coping in accordance with 105.03.

620.02 General Design Requirements

The sound barrier system shall be either wall mounted, bridge mounted or ground mounted, and shall consist of wall attachments or post foundations, vertical support posts, and sound barrier panels. For the purposes of this section, "panel" is defined as the reflective or absorptive component mounted between the posts, piers or columns.

All appurtenances behind, in front of, under, over, mounted upon, or passing through the wall, ~~such as~~ including drainage structures, fire hydrant access openings, highway signage, emergency access openings, utilities or other appurtenances shown on the plans, shall be accounted for in the design of the sound barrier system.

If the sound barrier manufacturer needs additional information to complete the design, the Contractor shall be responsible for obtaining such information. The Contractor shall be responsible for field verifying wall locations in areas of all existing traffic poles, utility poles, roadway lighting poles, drainage pipes, underdrain outlets, and bridge expansion joints and all other locations where the sound barrier system may conflict with existing conditions. The wall shall be realigned and designed to box out openings where conflicts occur with ~~the~~ existing light poles and traffic control devices. The Contractor shall establish and account for the existing locations of all underdrain outlets, drainage pipes, and bridge expansion joints in the final wall plans. If the Contractor discovers that overhead utilities will be within 6 ft (2m) of the sound barrier, the Contractor shall notify the Engineer in accordance with 104.02 and 105.16.

The sound barrier wall design shall follow the general dimensions of the wall envelope as shown on the plans. The top of the sound barrier shall be at or above the acoustical profile line shown, unless noted. ~~Overhead utilities that are within 6 ft (2m) from the barrier shall be permanently relocated.~~ Changes in elevation shall be accomplished by stepping the sound barrier sections at the vertical support posts. Steps shall not exceed 3 ft (1 m) vertically unless otherwise specified in the plans. Barrier heights shall be selected in groups of no fewer than three successive panels, except where barriers are to be stepped down for barrier termination. The ends of the sound barrier shall be tapered or stepped down to a height of 8 ft (2.6 m) within the sound barrier end transitions or as shown on the plans. The bottom of ground mounted sound barrier shall be embedded a minimum of 6 in. (150 mm) into the ground. The bottom of wall mounted

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or bridge mounted sound barrier shall follow within 3 in. (75 mm) a profile 6 in. (150 mm) below the top of the existing concrete barrier railing or wall.

Caisson footings, vertical support posts, and connections for ground mounted sound barrier shall be designed as specified by the manufacturer, with minimum post spacing of 15 feet (5 m). Exceptions will be allowed due to site-specific conditions such as access doors, drainage requirements or utility accommodations. These shall be reviewed and approved through the shop drawing process. The foundation design shall use the COM 624P or LPILE Program. The foundation design shall be based on the soil model shown on the plans based on cyclic loading and shall consider the effects of a sloping ground surface. The post deflection shall be limited to L/100, measured from the top of the caisson to the top of the wall. The foundation depth shall not be less than 7.5 ft (2.2 m) and shall not exceed the depth of the soil model except where the Contractor elects to drill deeper borings to extend the model. The foundation diameter shall not be less than 18 in. (450 mm) and shall not be less than 6 in. (150 mm) larger than the diagonal dimension of the post being used. The foundation shall be designed by the sound barrier manufacturer. Vertical support posts shall be attached to caisson footings by means of anchor bolts, or embedded wide flange steel posts.

A sound barrier system shall be selected from those which are on the Department's list of approved Sound Barrier Systems. ~~Approved systems must be on the approved list at the time of letting.~~ The materials used in the fabrication of the sound barrier system shall be the same as those used for approval of the sound barrier system.

The structural design of the sound barrier system shall be in accordance with the AASHTO Guide Specifications for Structural Design of Sound Barriers, except as otherwise directed. The sound barrier system shall be designed to withstand wind pressure as shown on the plans, as applied perpendicular to the barrier, in each direction.

The post spacing for sound barriers mounted on any structure or safety barrier shall be limited to a distance that does not overstress the existing structure or safety barrier. The spacing shall also be limited to a distance that allows the sound barrier to conform to the existing horizontal and vertical alignments. The allowable loads on a structure or barrier will be shown on the plans. If no allowable loads are shown, the Contractor shall contact the project designer for this information.

For barriers to be placed on structures, design calculations must be submitted to the Engineer to demonstrate that structure loading limits will not be exceeded.

All materials shall have a minimum predicted maintenance free structural and acoustical lifespan of 20 years. All colorings and coatings shall have a minimum predicted maintenance free lifespan of 10 years.

The types of acoustic sound barrier systems that are accepted are as follows:

Type 1, single sided absorptive, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90. Type 1 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.80 on the roadway side. Type 1 sound barrier systems shall be tested in accordance with ASTM C 423.

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Material samples for this test shall be provided with the coating applied, so as to determine that the color coating does not inhibit the acoustic performance. The sample shall be mounted in accordance with ASTM E 795, type A.

Type 2, double sided absorptive, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90. Type 2 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.80 on the roadway side, and a minimum noise reduction coefficient of 0.70 on the non-roadway side. Type 2 sound barrier systems shall be tested in accordance with ASTM C 423. To determine that the color coating does not inhibit the acoustic performance, material samples for this test shall be provided with the coating applied. The sample shall be mounted in accordance with ASTM E 795, type A.

Type 3, reflective, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90.

A type 2 barrier system may be substituted for a type 1 barrier system at the contractor's discretion. A type 1 or a type 2 barrier system may be substituted, with written approval, for a type 3 barrier system.

All molded finishes shall have a 1.0 in. (25 mm) minimum relief. All rolled finishes shall have a minimum 0.75 in. (19 mm) relief. Relief is defined by material that is provided in excess of the minimum wall thickness required to meet the Noise Reduction Coefficient required for the absorptive surfaces. Fluted finishes shall be coped at each end to avoid cracking. Each wall shall have the selected finish used throughout the wall on the roadway and non-roadway sides.

Corrugations, ribs, or battens on sound barrier panels shall be oriented vertically when erected. The sound barrier shall be designed to prevent entrapment and ponding of water. The sound barrier shall not be designed with openings promoting the perching or nesting of birds, or the collection of dirt, debris, or water. The sound barrier shall not be designed with hand holds or grips promoting scaling or climbing of the system.

Fire hydrant access points shall be designed with additional reinforcement or bracing and protective coating around the opening as necessary to maintain structural integrity.

Closure plates shall be provided where new sound barrier is constructed adjacent to existing sound barrier. Where bridge mounted walls cross over expansion joints, expansion closure plates shall be used. The wall manufacturer shall provide expansion closure plates for each expansion joint unless directed otherwise. The minimum thickness of closure plates shall be 0.1875 in. (4.5 mm).

The calculations for sound barriers which also retain earth must show that the walls are adequate for earth retention. The earth retention areas shall be shown on the plans. The exposed face of the sound barrier earth retaining panel will match the adjacent panel's color and texture.

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620.02.1 Precast Panel Design Criteria

Base-plated or embedded reinforced precast concrete posts may be substituted for wide flanged steel posts with the approval of the Department. Proposed substitutions for wide flanged steel posts shall be shown on shop drawings submitted for approval.

Support posts must match the adjoining wall in color unless directed by the Engineer. Embedded reinforced precast concrete posts must also match the adjoining wall in texture. Sound barrier systems utilizing stacked panels shall have ship-lapped or tongue and groove horizontal joints or other approved design which blocks the passage of light.

620.02.2 Masonry Design Criteria

Reinforced masonry vertical support posts shall be faced to match the adjoining wall in color and texture unless directed by the Engineer.

Steel support posts shall match the adjoining wall in color unless directed by the Engineer.

620.03 ~~Design Criteria~~ Submittals

~~*Modifications, other than the basic modifications necessary to erect a sound barrier system to an existing bridge, are not included in this contract. The construction of a separate bridge to accommodate a structure mounted sound barrier system is not included in this contract. If such work is necessary, an extra work order may be developed in accordance with 109.05.*~~

~~*The structural design of the sound barrier system shall be in accordance with the AASHTO Guide Specifications for Structural Design of Sound Barriers, except as noted herein.*~~

~~*All materials shall have a minimum predicted maintenance free structural and acoustical lifespan of 20 years. All colorings and coatings shall have a minimum predicted maintenance free lifespan of 10 years.*~~

~~*The types of acoustic sound barrier systems that are accepted are as follows:*~~

~~*Type 1, single sided absorptive, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90. Type 1 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.80 on the roadway side. Type 1 sound barrier systems shall be tested in accordance with ASTM C 423. The ratio of sound absorptive material surface area to total surface area, including posts, shall be greater than 90 percent. Material samples for this test shall be provided with the coating applied, so as to determine that the color coating does not inhibit the acoustic performance. The sample shall be mounted in accordance with ASTM E 795, Type A.*~~

~~*Type 2, double sided absorptive, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90. Type 2 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.80 on the roadway side, and a minimum noise reduction coefficient of 0.70 on the non-roadway side. Type 2 sound barrier systems shall be tested in accordance with*~~

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~~ASTM C 423. The ratio of sound absorptive material surface area to total surface area, including posts, shall be greater than 90 percent. To determine that the color coating does not inhibit the acoustic performance, material samples for this test shall be provided with the coating applied. The sample shall be mounted in accordance with ASTM E 795, Type A.~~

~~A type 2 barrier system may be substituted, with written approval, for a type 1 barrier system.~~

~~Type 3, reflective, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90.~~

~~A type 1 or a type 2 barrier system may be substituted, with written approval, for a type 3 barrier system.~~

~~The sound barrier system shall be designed to withstand wind pressure as shown on the plans, as applied perpendicular to the barrier, in each direction.~~

~~All molded finishes shall have a 1.0 in. (25 mm) minimum relief. Relief is defined by material that is provided in excess of the minimum wall thickness required to meet the Noise Reduction Coefficient required for the absorptive surfaces. Fluted finishes shall be coped at each end to avoid cracking. Each wall shall have the selected finish used throughout the wall on either the roadway or non-roadway sides.~~

~~All rolled finishes shall have a minimum 0.75 in. (19 mm) impression.~~

~~Caisson footings, vertical support posts, and connections for ground mounted sound barrier shall be designed for 15 ft (5 m) post spacing. The foundation design shall use the COM 624P or LPILE Program. The foundation design shall be based on the soil model shown on the plans based on cyclic loading and shall consider the effects of a sloping ground surface. The post deflection shall be limited to L/100, measured from the top of the caisson to the top of the wall. The foundation depth shall not be less than 7.5 ft (2.2 m) and shall not exceed the depth of the soil model except where the Contractor elects to drill deeper borings to extend the model. The foundation diameter shall not be less than 18 in. (450 mm) and shall not be less than 6 in. (150 mm) larger than the diagonal dimension of the post being used. The foundation is to be designed by the sound barrier manufacturer.~~

~~Reinforced masonry vertical support posts shall be faced to match the adjoining wall in color and texture.~~

~~Vertical support posts shall be attached to caisson footings by means of anchor bolts, or embedded wide flange steel posts. Members shall use the minimum wind loads specified in the plans.~~

~~Base plated or embedded reinforced precast concrete posts may be substituted for wide flanged steel posts with the approval of the Department. The approval process will be through the shop drawings approval. Sixteen foot post spacing will be permitted with precast concrete posts.~~

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~~*The post spacing for sound barriers mounted on any structure or barrier shall be limited to a distance that does not overstress the existing structure or barrier. The spacing shall also be limited to a distance that allows the sound barrier to conform to the existing horizontal and vertical alignments. The allowable loads on a structure or barrier will be shown on the plans. If no allowable loads are shown, the Contractor shall contact the project designer for the information.*~~

~~*Fire hydrant access points shall be designed with additional reinforcement or bracing and protective coating around the opening as necessary to maintain structural integrity.*~~

~~*The bottom of ground mounted sound barrier shall be embedded a minimum of 6 in. (150 mm) into the ground. The bottom of wall mounted or bridge mounted sound barrier shall follow within 3 in. (75 mm) a profile 6 in. (150 mm) below the top of the existing concrete barrier railing or wall. Changes in elevation shall be accomplished by stepping the sound barrier sections at the vertical support posts. Steps shall not exceed 3 ft (1 m).*~~

~~*Corrugations, ribs, or battens on sound barrier panels shall be oriented vertically when erected. The sound barrier shall be designed to prevent entrapment and ponding of water. The sound barrier shall not be designed with openings promoting the perching or nesting of birds, or the collection of dirt, debris, or water. The sound barrier shall not be designed with hand holds or grips promoting scaling or climbing of the system.*~~

~~*Sound barrier systems utilizing stacked panels shall have ship-lapped, or tongue and groove horizontal joints or any other design which arrests the passage of light and sound.*~~

~~*The ends of the sound barrier shall be tapered or stepped down to a height of 8 ft (2.6 m) within the sound barrier end transitions or as shown on the plans. Where guardrail energy absorbing terminals are to be attached to sound barrier, the sound barrier shall be designed to meet attachment requirements.*~~

The Contractor shall submit a minimum of three alternative textured finishes for the ~~*roadway side and non-roadway sides of the*~~ *wall to the* ~~*Office of Roadway Services*~~ *Engineer. These shall include the following colors:*

~~*The sound barrier system can incorporate a single or two color combinations. If a two-color combination is used then a designed repetitive pattern shall be used. This repetitive pattern shall be 70/30 or higher favoring one color. The Contractor shall submit at least five different colors and/or color combinations to the Office of Roadway Services from the following colors.*~~

(a) light ~~*and dark*~~ *grey (federal color # 36492),*
(b) light ~~*and dark*~~ *brown (federal color # 30450),*
(c) light ~~*and dark*~~ *tan (federal color # 37769),*
~~*(d) light and dark taupe,*~~
~~*(e) beige,*~~
~~*(f) cream,*~~
~~*(g) coffee,*~~
~~*(h) yellow,*~~

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~~(i) blue~~

~~These~~ The colors ~~will~~ shall be ~~narrowed down to a minimum of at least three colors that will be~~ presented to the public for their input in accordance with 620.0~~6~~5. ~~The color on each face of the same panel may be different. Vertical support posts shall match the sound barrier panel color unless directed by the Engineer. If a two-color pattern is selected, an additional elevation drawing will be required to show the color panel pattern on the final wall. This drawing shall clearly show the different colors by shading or hatchig each similarly colored panel and listing them.~~ The final wall pattern ~~must~~ shall be approved before production of the wall panels may begin.

~~Closure plates shall be provided where new sound barrier is constructed adjacent to existing sound barrier. Where bridge mounted walls cross over expansion joints, expansion closure plates shall be used. The wall manufacturer shall provide expansion closure plates for each expansion joint unless directed otherwise. The minimum thickness of closure plates shall be 0.1875 in. (4.5 mm).~~

~~The calculations for the sound barrier earth retaining panels must show that the walls are adequate for earth retention. The earth retention areas shall be shown on the plans. The exposed face of the sound barrier earth retaining panel will match the adjacent panel's color and texture.~~

~~620.04 Submittals~~

The Contractor shall submit one copy of the design computations for approval. If the computations are computer generated, one sample set of hand calculations, for one wall location shall also be submitted. The Contractor shall submit four sets of design drawings for approval after the design computations are approved and before beginning wall construction operations. Design computations and design drawings shall be signed and sealed by a professional engineer.

(a) The design drawings shall include all details, dimensions, quantities and cross sections necessary to construct the sound barrier systems and shall include but shall not be limited to the following:

1. A plan and elevation sheet or sheets for each sound barrier systems location.

2. An elevation view of the sound barrier systems which shall include the elevation at the top of the wall at all horizontal and vertical break points at least every 50 ft (15 m) along the face of the wall.

3. A plan view of the wall that indicates the offsets from the construction centerline to the face of the wall at all changes in horizontal alignment. A plan view and elevation view which detail the placing position.

4. A typical cross section or cross sections showing elevation relationship between ground conditions and the sound barrier systems locations.

5. All general notes required for constructing the wall.

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6. *Each sheet shall show the complete project identification number.*

7. *All horizontal and vertical curve data affecting the wall.*

~~8. *Aggregate pad with No. 8 coarse aggregate shall be included that extends 4 in. (100 mm) outside of each side of the panel and 4 in. (100 mm) below the bottom of the panel.*~~

~~9~~ 8. *A listing of the summary of quantities on the elevation sheet for each wall.*

9. *A list of manufacturer's recommendations with respect to maintenance, including repair of graffiti and other damages.*

(b) *The design computations shall include all structural design calculations, and vertical support post design calculations.*

(c) *For bridge mounted installations, the design weight and mass of the sound barrier and support systems.*

(d) *The detailed plan of aesthetic treatment for the entire sound barrier system, manufacture recommended installation requirements and sequence of construction, manufacturer recommended repair requirements for damage caused by vandalism or graffiti prior to final acceptance, and a detailed bill of materials shall be included with the design drawings.*

~~(e) *The design drawings shall accommodate all existing poles, i.e., utility, traffic, etc., drainage pipes, underdrain outlets, and bridge expansion joints.*~~

MATERIALS

~~620.05~~ 620.04 Materials

Materials shall be in accordance with the following:

Cast-in Place Portland Cement Concrete, Class A 702
Coarse Aggregate, Class D or Higher, Size No. 5.....904
Coarse Aggregate, Class D or Higher, Size No. 8.....904
Coarse Aggregate, Class A or Higher, Size No. 91 904
Fine Aggregate, Size No. 23.....904
Paint.....909.02
Portland Cement .....901.01(b)
Precast Portland Cement Concrete 707
Reinforcing Steel.....910.01
Structural Aluminum Posts .....910.14(d)
Structural Steel.....910
Water.....913.01
Concrete Masonry Units 905.06
Joint Mortar 901.08, 906.03

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620.04.1 Steel

Steel structural components shall be in accordance with ASTM A 36. Structural steel components shall be hot dipped galvanized in accordance with ASTM A 123, coating grade 100 or painted in accordance with 619.11 and 619.12. Exposed surfaces of galvanized components shall be coated in accordance with 619.09(b). The galvanized surfaces shall be prepared using a light brush-off blast cleaning in accordance with SSPC SP7/NACE No. 4. The surface profile shall be 15 to 30 microns in accordance with ASTM D 4417, prior to painting.

All structural steel hardware shall be in accordance with ASTM A 325 and shall be hot dipped galvanized in accordance with ASTM A 153 or shall be made of nonferrous material or stainless steel. All other non-structural fastening devices shall be made of nonferrous metal or stainless steel. Plastic members shall be connected with either screws or bolts. Aluminum members shall be connected with stainless steel fasteners. Anchor bolts shall be of the size shown with a minimum of 10 in. (250 mm) of 7NC threads on the upper end. Anchor bolts shall be in accordance with ASTM F 1554. The threads, nuts, and washers shall be galvanized in accordance with ASTM A 153 or be mechanically galvanized and conform to the coating thickness, adherence, and quality requirements of ASTM A 153, where required.

620.04.2 Filler Material

~~Either m~~Material used to increase sound absorption shall be manufactured in accordance with ASTM C 612. Mineral wool shall have a minimum density of 6 lb/ft^3 (96 kg/m^3), shall absorb less than 1 percent of water when tested in accordance with ASTM C 553, and shall be noncorrosive and nonhygroscopic. The filler material shall be fastened to the sound barrier system so as to prevent sagging when in a saturated condition. Test reports shall be submitted from an appropriate independent agency verifying that the filler material does not sag if separated after saturation and draining of the sound barrier system when in service, and that the acoustic qualities of the material are in accordance with the requirements herein after completion of testing.

620.04.3 Concrete

Solid Portland cement concrete~~,~~ or composite concrete~~, or masonry block~~ shall be coated ~~and/~~or contain an integral pigment, as specified by the manufacturer, and ~~meeting~~ shall meet the specified color requirements. ~~The i~~Integral pigment shall be certified to be in accordance with ASTM C 979 and shall be tested for Accelerated Weathering in accordance with ASTM D 6695. ~~The integral pigment and/or coating shall be tested for Accelerated Weathering.~~ The test panel substrate shall be of the same Portland cement concrete~~,~~ or composite concrete~~, or masonry block~~ material used in the sound barrier system component. Cured coating or integral pigment shall not contain heavy metals that exceed the requirements of 40 CFR 261.24.

Concrete class A for the coping shall be in accordance with the applicable requirements of 702, except the coarse aggregate for pre-cast units may be Size No. 91 in accordance with 904. Reinforcing steel in the coping shall be in accordance with the applicable requirements of 703. The coping may be precast or cast-in-place.

620.04.4 Masonry

Masonry block shall be tested in accordance with ASTM C 90 and as follows:

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(a) The average compressive strength of three units shall be a minimum of ~~4500~~ 3000 psi (~~31~~ 21 MPa) with no single unit being less than ~~4100~~ 2700 psi (~~28~~ 19 MPa).

(b) The units shall be tested for water absorption in accordance with ASTM C 140. The maximum absorption shall be ~~6%~~ 7%.

(c) Joint reinforcement for masonry block systems shall be in accordance with ASTM A 951.

(d) Mortar for masonry block systems shall be in accordance with ASTM C 270; type S, Table 1 proportion requirements.

(e) Portland cement-lime or mortar cement may be used. Masonry cement shall not be used. Grout for masonry shall be in accordance with ASTM C 476.

(f) Aggregate for masonry grout shall be in accordance with ASTM C 404.

Masonry blocks shall be coated or contain an integral pigment, as specified by the manufacturer, and shall meet the specified color requirements. The integral pigment shall be certified to be in accordance with ASTM C 979. The coating or integral pigment shall be tested for Accelerated Weathering in accordance with ASTM D 6695. The test panel substrate shall be of the same masonry blocks used in the sound barrier system component. Cured coating or integral pigment shall not contain heavy metals that exceed the requirements of 40 CFR 261.24.

620.04.5 Certifications

Certifications shall be provided for each of the materials to be supplied for the sound barrier system. Certifications shall be in accordance with a type C in accordance with 916, unless noted otherwise. A type A certification in accordance with 916 shall be provided for compressive strength and absorption test values for masonry block, sampled and tested in accordance with ASTM C 140. All test reports required to substantiate compliance shall be in accordance with the test method/material requirements cited herein. A Department approved laboratory shall conduct the testing.

CONSTRUCTION

~~620.06~~ 620.05 Public Information Meeting

The Contractor is responsible for planning and holding a public meeting to display and discuss the recommended sound barrier wall finishes and colors with the public. The meeting shall be arranged for in a locally available facility in or near the affected areas of the barrier walls at convenient times for the affected areas to review. The Contractor and the wall manufacturer shall be present at the meetings along with representatives from the Department.

The Contractor shall coordinate all meeting activities with the Department's hearings manager. The hearings manager will make all local media contacts two weeks prior to the meeting. The Contractor shall also notify the adjacent property owners and businesses, neighborhood associations, and local planning agencies two weeks prior to

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the meeting. The use of colored flyers with appropriate graphics shall be developed by the Contractor and coordinated with the hearings manager prior to distribution.

Wall colors photos shall be presented for each color in accordance with 620.03 along with photos of each available texture alternative. A minimum of three wall samples of both the roadway side and non-roadway side textures shall be presented. All samples of the wall textures shall be ~~2 ft x 2 ft (0.6 m x 0.6 m)~~ a minimum of 3 square feet (0.27 square meters) in area, with a clearly distinguishable pattern. ~~Each wall shall have the selected color(s) used throughout the entire wall on either the roadway or non-roadway sides.~~

Based on comments received during the meeting, the Department will select the final finishes and colors for each wall. Each wall shall have the selected color used throughout the entire wall on the roadway and the non-roadway sides. The Contractor shall coordinate all sound barrier wall issues with the Engineer prior to ordering any materials.

~~620.07~~ 620.06 Construction Requirements

The sound barrier supplier shall provide technical instruction, guidance in preconstruction activities including the preconstruction conference, and on-site technical assistance during construction. The Contractor is responsible for following installing instructions from the supplier unless otherwise directed in writing by the Engineer.

Clearing and grading shall be in accordance with 201 and 202 as required.

The foundations for ground mounted sound barrier systems shall be constructed as shown on the shop drawings. Holes for footings shall be drained of free water prior to installing any components. Placing concrete shall be in accordance with 702.

The integrity of the sound barrier system continuity shall be such that no ~~gaps~~ light will be visible through any vertical joint between sound barrier panel and vertical support post, through any horizontal joint between sound barrier panels, between the bottom of any ground mounted sound barrier and the adjacent ground, or between the bottom of any wall mounted sound barrier and the top of the adjacent wall. Exceptions may be allowed as necessary for drainage as indicated on the plans.

Sound barrier wall posts shall be placed vertical with a tolerance of 1/2 in. per 10 ft (13 mm per 3 m) on each axis. Sound barrier wall posts shall be placed at the distance indicated on the plans with a tolerance of 1 in. (25 mm) from centerline to centerline. Sound barrier wall posts shall be aligned to within 1 in. (25 mm) when measured from a straight line from the two adjacent posts. Sound barrier wall posts shall be at the height as shown on the plans. The posts shall project above the top sound barrier wall panel by 1.5 in. ± 0.5 in. (37 mm ± 13 mm). The top of the sound barrier wall shall be at or above the acoustical profile. Steel posts embedded in concrete shall have bottom cover of 8 in. ± 4 in. (200 mm ± 100 mm). Field cut steel posts shall be primed with an organic zinc primer and painted in accordance with 619.

After post erection the area shall be backfilled to within 6 in. (150 mm) of the required final grade or as specified in the plans. The aggregate pad shall be placed as required. Positive drainage of the work area shall be maintained.

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An aggregate pad of No. 5 or No. 8 coarse aggregate shall be included that extends 4 in. (100 mm) outside of each side of the panel and 4 in. (100 mm) below the bottom of the panel.

The sound barrier system and sound barrier system components shall be maintained until final acceptance. Elements of the sound barrier system that are damaged or destroyed, including due to graffiti or other vandalism, shall be repaired or replaced as directed by the Engineer. Repairs and repainting shall be conducted in accordance with the manufacturer's guidance and 620.02.

After construction of the sound barrier system the site shall be restored to the original condition with grading, seeding and sodding in accordance with the plans.

620.06.1 Construction Requirements for Precast Panels

Sound barrier wall panels shall be placed in accordance with the plans and centered between adjacent posts. The sound barrier wall panels shall be of sufficient length to span the entire length between posts less 1/2 the width of the smallest retaining flange. ~~All sound barrier wall panels shall be ship-lapped or tongue and groove construction. Panels that are damaged during placement shall be repaired or replaced in accordance with the manufacturer's guidance.~~

Panels may be field cut to facilitate erection in accordance with the manufacturer's recommendation. Field cut panels shall be cut to have the least impact on any patterns present in the textured or colored finish. Field cut panels or other field cut components shall be painted in accordance with the manufacturer's guidance.

620.06.2 Construction Requirements for Masonry

All grouting and reinforcing work for masonry block systems shall be performed by masonry craftworkers holding current International Masonry Institute (IMI) Grouting and Reinforcing Certification. Proof of certification shall be submitted prior to the beginning of work.

~~*The sound barrier system and sound barrier system components shall be maintained during construction. Elements of the sound barrier system that are damaged or destroyed shall be repaired or replaced as directed by the Engineer. Painted surfaces damaged during construction shall be repaired in accordance with the manufacturer's guidance. Repairs shall be in accordance with the manufacturer's guidance.*~~

~~*After construction of the sound barrier system the site shall be restored to the original condition with grading, seeding and sodding in accordance with the plans.*~~

~~620.08~~ 620.07 Acceptance

The Contractor shall submit 2 ft x 2 ft (0.6 m x 0.6 m) sound barrier panel samples or 5 masonry block units in the colors and textures proposed and a 2 ft (0.6 m) sample of painted support post, prior to the approval of the shop plans. Once approved, these ~~The~~ samples will be used as a control sample to verify delivered products meet the aesthetic requirements. The sound barrier system will be accepted for color based on a visual comparison between the control sample and the color of the wall as constructed in place.

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The sound barrier system will be accepted for quality based on a visual inspection of the components of the system by the Engineer. The sound barrier system shall be subject to rejection due to failure to be in accordance with the requirements specified herein. In addition, the following defects may also be sufficient cause for rejection.

(a) Defects that indicate imperfect fabrication

(b) Defects in physical appearance such as cracks, checks, dents, scrapes, chips, stains, or color variations.

The Engineer will determine whether defective sound barrier shall be repaired or shall be cause for rejection. Repair, if permitted, shall be completed by the Contractor and will be approved by the Engineer.

620.07.1 Precast Panels

For precast wall panels, one verification sample will be required for each type of sound barrier system. The sample will be cut from a delivered panel and will be of sufficient size to provide for testing of sound absorption requirements in accordance with ASTM C 423 and for salt scaling resistance in accordance with ASTM C 672 and Item 13 of the Obtaining Approval Section of the Sound Barrier Systems Source Approval Criteria. The verification sample will be randomly selected for testing by the Engineer in accordance with ITM 802. Certification of the sample shall be provided in accordance with 620.04.5. A testing laboratory independent from the manufacturer, supplier, and the Contractor shall perform testing. This independent testing laboratory shall arrange for shipping and testing without the aid of the Contractor. The independent testing laboratory shall submit the test results to the Engineer, with a copy to the Contractor, upon completion. Failed materials will be adjudicated as a failed material in accordance with normal Department practice in accordance with 105.03.

620.07.2 Masonry

For masonry blocks delivered to the site, one verification sample per contract, per source, ~~consisting of five units~~ will be required for testing freeze thaw durability in accordance with ASTM C 1262 Item ~~13~~ 14 in the Obtaining Approval Section of the Sound Barrier Systems Source Approval Criteria. The verification sample will be randomly selected for testing by the Engineer in accordance with ITM 802. A testing laboratory independent from the manufacturer, supplier, and the Contractor shall perform testing. This independent testing laboratory shall arrange for shipping and testing without the aid of the Contractor. The independent testing laboratory shall submit the test results to the Engineer, with a copy to the Contractor, upon completion. Failed materials will be adjudicated as a failed material in accordance with normal Department practice in accordance with 105.03.

~~620.09~~ 620.08 Method of Measurement

Sound barrier panels and sound barrier erection will be measured by the square foot (square meter) of wall surface area. The pay quantity will be based on the ~~neat line~~ limits of the sound barrier envelope as shown on the plans. The vertical and horizontal distance for each section of the wall defines the sound barrier envelope. The vertical distance extends from the elevation at the bottom of the lowest panel to the elevation of the acoustic profile for each section of the wall. The horizontal distance extends from centerline to centerline of adjacent posts for each section of wall. Coping will not be measured.

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~~620.10~~ 620.09 Stockpiling

Partial payment will be made for sound barrier panels stockpiled on the project site or at the Contractor's approved storage location within the State of Indiana. Partial payment will be based on the delivered cost of the sound barrier panels, as verified by invoices that includes freight charges. The Contractor shall furnish the invoices and all required certifications. Partial payment will not exceed 75% of the contract unit price for bridge mounted, ground mounted or wall mounted sound barrier panels. Prior to authorizing the partial payment, verification will be obtained that all required inspection has been made and that the panels are acceptable.

Sound barrier components shall not be stored on the right-of-way unless written permission is given by the Department. Requests for permission to store materials on the right-of-way will not be accepted until after the contract has been awarded.

~~620.11~~ 620.10 Basis of Payment

Wall mounted sound barrier panels, bridge mounted sound barrier panels, ground mounted sound barrier panels, wall mounted sound barrier erection, bridge mounted sound barrier erection, and ground mounted sound barrier erection will be paid for at the contract unit price per square foot (square meter).

The Department may choose to acquire additional precast sound wall panels or masonry blocks in the colors and patterns selected on the project. A maximum of twelve panels of each type would be paid for at the invoice cost of the panels and shall be delivered to the District Office. If the Department elects to acquire additional precast sound wall panels or masonry blocks, the Contractor shall provide the material as extra work in accordance with 104.03. ~~A change order will be processed in accordance with 109.05 and shall be marked as a "Z" (federally non-participating) cost.~~

Payment for all costs associated with the collection of all information not shown on the plans, revisions due to conflicts, sound barrier system details, all additions or incidentals necessary to provide complete plans, any redesigning of plans or details, the public information meetings and public information planning and presentations will be paid for at the contract lump sum price for sound barrier design and layout.

Payment will be made under:

Pay Item	***Pay Unit Symbol***
Sound Barrier Design and Layout	*LS*
Sound Barrier Erection, _____, _____ (mounting type, type**)*	*SFT (m2)*
Sound Barrier Panels, _____, _____ (mounting type, type**)*	*SFT (m2)*

* *Type of sound barrier system: (BM) bridge mounted, (GM) ground mounted, (WM) wall mounted*
** *Type 1, 2, or 3.*

The cost of sound barrier panel materials including vertical support posts, coping, aggregate pad mortar, grout and joint reinforcement for masonry block, fasteners, closures, expansion plates, openings and incidentals shall be included in the cost of the sound barrier panels for the type of sound barrier panels.

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~~The cost of substituting~~ Substituting type 2 wall for type 1 wall or substituting type 1 or type 2 wall for type 3 wall shall be at no cost to the Department.

The cost of services including the testing laboratory, delivery to the testing laboratory, certified testing personnel, and the testing and inspection of the sound barrier panels shall be included in the cost of sound barrier panels for the type of sound barrier panels.

The cost of sampling, shipping and testing of verification samples shall be included in the cost of the sound barrier panels for the type of sound barrier panels.

The cost of the selected texture and selected color shall be included in the cost of the sound barrier panel for the type of sound barrier panels.

The cost of all labor and materials to prepare and erect the sound barrier shall be included in the cost of sound barrier erection for the type of sound barrier panels.

The cost of foundation preparation and construction with associated work shall be included in the cost of sound barrier, ground mounted.

The cost of removal or construction of concrete barrier walls is not included in the cost of sound barrier erection, wall mounted.

~~The cost of delivery of the extra sound barrier panels to the District Offices shall be included in the "Z" item cost of the sound panels for the type of sound barrier panels.~~

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Obtaining Approval

The supplier requesting approval of a sound barrier system and inclusion on the Department's list of approved Sound Barrier Systems shall comply with the following.

1. *The supplier shall send a letter to the office of Materials Management requesting approval of the sound barrier system. The letter shall include supporting documents, all of which shall be bound, organized and include the following, as applicable:*

    (a) a letter requesting approval of sound barrier system
    (b) list of sound barrier system installations
    (c) inspection report of sound barrier system
    (d) list of all materials, specification and manufacturer
    (e) test report of sound transmission loss
    (f) test report of sound absorption average, roadway side
    (g) test report of sound absorption average, non-roadway side
    (h) test report for accelerated weathering
    (i) test report for flame index ~~and smoke index~~
    (j) test report concrete resistance to scaling
    (k) test report steel resistance to corrosion
    (l) test report for filler material

2. *The supplier shall ensure that all tests were performed within two years from the date of submission.*

3. *The supplier shall ensure that all tests were performed on samples selected from a production run of the product.*

4. *The supplier shall ensure that all tests were performed in an accredited independent testing laboratory. Each test report shall be accompanied with proof of accreditation.*

5. *The supplier shall provide evidence of prior construction of a sound wall system of the type to be approved; including location, date, and purchaser.*

6. *The supplier shall submit an inspection report detailing the condition of a sound barrier system of the type to be approved. The inspection report shall identify the location and type of the sound wall system, and provide comments on the structural integrity of each component and the condition of any surface coatings. The inspection report shall be prepared and signed by a registered professional engineer independent from the supplier. The field location of the sound barrier system shall be in an area with a climate similar to Indiana. The sound barrier system shall have been subjected to at least two winters of exposure.*

7. *The supplier shall submit a list of all materials used in the manufacture and construction of the type of sound barrier system to be approved. The list shall include the material specification which each material*

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component meets, and the name of the manufacturer of each material component.

8. *The supplier shall submit a test report that shows the sound barrier system has a sound transmission loss of 20 dbl or greater for each frequency in accordance with ASTM E 90.*

9. *For absorptive wall systems type 1 and 2 the supplier shall submit a test report that shows the sound barrier system has a sound absorption average of 0.80 or greater on the roadway side in accordance with ASTM C 423 with specimens mounted in accordance with ASTM E 795, type A.*

10. *For absorptive wall systems type 2 the supplier shall submit a test report that shows the sound barrier system has a sound absorption average of 0.70 or greater on the non-roadway side in accordance with ASTM C 423 with specimens mounted in accordance with ASTM E 795, type A.*

11. *The supplier shall submit a test report that shows the sound barrier system complies with the accelerated weathering requirements listed below when tested in accordance with ASTM D 6695 cycle 1. Four specimens shall be used in the test, one as a reference, one to be removed from the test and evaluated at 800, 1600 and 2400 hours. The color of the specimens shall be light ~~blue~~ tan, light brown, ~~light green,~~ or light grey. The test report shall include a color photo of each specimen at the time of evaluation. The sample must show:*

    (a) no checking in accordance with ASTM D 660
    (b) no blistering in accordance with ASTM D 714
    (c) no loss of adhesion in accordance with ASTM D 3359
    (d) chalking of 7 or greater in accordance with ASTM D 4214, Method C
    (e) color difference of 5 Δ NBS units or less as compared to the reference sample in accordance with ASTM D 2244

12. *The supplier shall submit a test report that shows the sound barrier system has a flame spread index of 15 or less at 10 minutes, a flame spread index of 25 or less at 30 minutes~~, and a smoke developed index of 10 or less at 10 minutes~~ in accordance with ASTM E 84.*

13. *For precast concrete panel systems, the supplier shall submit a test report that shows the concrete components of the sound barrier system have a mass loss 0.2 lb/1.0 ft^2 (91 g/0.0929 m^2) or less in accordance with ASTM C 672 and as follows. ~~At least three specimens each from a different production run shall be tested. The specimens shall have a testable surface area of 1.00 ft^2 (0.0929 m^2) or more.~~ The specimens shall be from different production runs and shall have a testable surface area of 1.00 ft^2 (0.0929 m^2) or more. The specimens shall be sealed around the edges to retain the salt solution to a depth of at least 1/8 in. (6 mm) over the entire surface. Before the start of the test each specimen shall be brushed clean. After each five cycles of the test all salt solution and all rinse water from each specimen shall be collected. After each five cycles*

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the surface of each specimen shall be thoroughly rinsed to remove all loose particles. The collected liquid shall be filtered and all particles removed. The retained particles shall be dried to a constant mass and the mass determined to the nearest 0.01 lb (1 g). The test report shall indicate the mass of particles after each five cycles and the total mass after 50 cycles for each specimen. The report shall include a color photo of each specimen before and after the test.

14. For masonry block systems, the supplier shall submit a test report that shows the concrete masonry units have a mass loss of one percent material or less in accordance with ASTM C 1262 and as follows. The specimens shall be subjected to 100 cycles of freezing and thawing in a water test solution.

~~14~~ 15. The supplier shall submit a test report that shows the steel components of the sound barrier system comply with the following corrosion requirements when tested in accordance with ASTM D 1654 and salt spray exposure in accordance with ASTM B 117. Four pairs of specimens shall be used in the test, one pair as a reference, one pair to be removed from the test and evaluated at 800, 1600 and 2400 hours. One specimen from each pair shall be scribed and one specimen shall be un-scribed. Scribed specimens shall be evaluated in accordance with procedure A, method 1. Un-scribed specimens shall be evaluated in accordance with procedure B and D. A color photo of each specimen at the time of evaluation shall be provided. The test results must show:

(a) corrosion rating shall not be less than 10
(b) no checking in accordance with ASTM D 660
(c) no blistering in accordance with ASTM D 714
(d) no loss of adhesion in accordance with ASTM D 3359
(e) no other defects in accordance with the above methods

~~15~~ 16. The supplier shall submit a test report that shows the filler material for sound barrier system in a dry and saturated state does not sag, separate, delaminate, deform or otherwise create voids that allow sound to penetrate the component.

Maintaining Approved List

1. *The supplier shall manage the continued approval of their sound barrier system.*

2. *The supplier shall notify the Department of changes in material components.*

3. *The supplier shall ensure that all documents and test reports for their sound barrier system are current.*

4. *Sound barrier systems that have records at the office of Materials Management in compliance with this procedure will be maintained on the Department's list of approved Sound Barrier Systems.*

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REVISED RECURRING SPECIAL PROVISION

620-R-483 SOUND BARRIER SYSTEMS (contd.)

Removal from Approved List

1. *The office of Materials Management is responsible for removing sound barrier systems from the approved list.*

2. *Sound barrier systems that are not in compliance with this procedure will be removed from the approved list.*

3. *Sound barrier systems that exhibit poor field performance as determined by the office of Materials Management will be removed from the approved list in accordance with Department procedures.*

620-R-483

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REVISED RECURRING SPECIAL PROVISION

620-R-483 SOUND BARRIER SYSTEMS (contd.)

COMMITTEE COMMENTS:

Mr. Andrewski noted that this specification discusses ITM's and approved lists, yet we are including that information in the Recurring Special Provision. Mr. Andrewski suggested taking these references out of the Recurring Special Provision now to avoid confusion.

Mr. Miller stated that, for the time being, it is best to keep all information within the Recurring Special Provision.

The Committee discussed concerns about the feasibility of using masonry sound wall on bridges because of vibration, expansion, and contraction.

Ms. Rearick asked about structural review requirements including load ratings and wind loads.

Mr. Wright stated that wind loads are included on project plans.

Ms. Rearick suggested that clear structural review submittal requirements be included in the specification.

Ms. Rearick and Mr. Wright will work out details of structural review submittal requirements and review process.

The revisions concerning the structural review submittal requirements will be published in the minutes.

Other sections containing specific cross references:

None

Recurring Special Provisions potentially affected:

620-R-483

Motion: Mr. Wright
Second: Mr. Kuchler
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Standard Sheets potentially affected:

None

Action: Passed as revised

_x_ RSP Effective: February 2009 Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
___ 20__ Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Received FHWA Approval? Yes

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SPECIFICATIONS REVISION

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Some of the 701 Driven Piling specification are outdated.

PROPOSED SOLUTION: Industry has approached the INDOT Office of Geotechnical Engineering and requested that INDOT consider revising and updating the pile driving specification to reflect a growth in knowledge of techniques and technology upgrades and advancements. The last thorough review on this specification was 12 years ago. This specification also needs to be updated to incorporate LRFD requirements.

APPLICABLE STANDARD SPECIFICATIONS: 701, 911.01(c), 911.02(e), 915.01 - .03

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: TBD

APPLICABLE SECTION OF GIFE: new GIFE section 701

APPLICABLE RECURRING SPECIAL PROVISIONS: 701-B-132

Submitted By: Ron Heustis (for Jim Reilman)

Title: Manager, Office of Construction Technical Support

Organization: INDOT

Phone Number: 317-234-2777

Date: October 24, 2008

APPLICABLE SUB-COMMITTEE ENDORSEMENT? An ad hoc subcommittee was formed consisting of: Jason Bunselmeier, Ike Deburger, Dan Kinder, Bill Ludlow, Scott Ludlow, Derek Merida, Jim Reilman, and Mir Zaheer. This subcommittee endorses this proposal. Since three contractors were represented on the subcommittee, separate solicitation of industry comments was not done.

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Item No. 08-15-3
Mr. Heustis
Date: 11/20/08

REVISION TO RECURRING SPECIAL PROVISION

701-B-132 PILE DRIVING

(Revised 11-20-08)

Attached is the Pile and Driving Equipment Data form as required by 701.04(a). The method for driving the piles will be by the formula specified in _____.

If the method for driving the piles is specified as 701.05(b) and the contract is either a local public agency contract or design-build contract, the Contractor shall include the cost of acquiring the PDA consultant in the cost of the Dynamic Pile Load Test.

The Contractor shall allow a minimum of _____ hours prior to restriking the pile.

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Other sections containing specific cross references:

None

General Instructions to Field Employees
Update Required? Y___ N___
By - Addition or Revision
Frequency Manual
Update Required? Y___ N___
By – Addition or Revision

Recurring Special Provisions potentially affected:

See Above

Standard Sheets potentially affected:

None

Motion: M
Second: M
Ayes:
Nays:

Action: Withdrawn

SPECIFICATIONS REVISION

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The INDOT Technicians performing inspection at the various fabrication facilities have commented that the current 707 specification needs updating. Right now the fabrication facilities do not have to be certified, they just need to be "an approved plant". Also, the mild reinforcing steel used in the manufacturing of beams is allowed to be welded and is being welded, but is not a weldable grade of steel. Other minor issues such as requirements for the temperature of concrete at the time of placement and the size of the cylinders are also not addressed.

PROPOSED SOLUTION: Review the 707 section of the SS. Incorporate NPCA & PCI certification programs into the specification via ITM 814.
Give the fabrication facility the option to either tie or weld the reinforcing cages however, if they are welded, A 706 (weldable reinforcing steel) shall be used.
Other minor issues such as temperature limits on the concrete at time of placement, similar to that contained in 702 were addressed.
(Standards Committee has already passed a proposal to remove information related to strand breaks from the standard drawings and incorporate into the SS. See Items from September 2007, 08-4-3 & 08-4-4.)

APPLICABLE STANDARD SPECIFICATIONS: 707, 910.01(a), 910.01(b)2, 910.01(b)7, 910.01(b)9

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: new GIFE section 707

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Ron Heustis for Jim Reilman (chairman 700 spec subcommittee

Title: Manager, Construction Technical Support

Organization: INDOT

Phone Number: 317-234-2777

Date: October 22, 2008

APPLICABLE SUB-COMMITTEE ENDORSEMENT? 700 Spec Subcommittee. Also have provided Industry an opportunity to review & comment.

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REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 707, BEGIN LINE 1, DELETE AND INSERT AS FOLLOWS:

SECTION 707 – PRECAST AND *PRECAST* PRESTRESSED CONCRETE STRUCTURAL MEMBERS

707.01 Description

This work shall consist of the ~~construction and~~ *fabrication,* furnishing*, and installation* of reinforced *precast* or *precast* prestressed concrete structural members or, if specified, concrete deck panels cast outside the structure, transported to, and incorporated into the structure*, all* in accordance with 105.03.

707.02 Materials

Materials shall be in accordance with the following:

Admixture for Concrete.....*912.03*
Coarse Aggregates, Class A or Higher, Size No. 91.....904
Concrete Curing Materials ~~and Admixtures~~ 912
Concrete Sealers.....909.09, 909.10
Elastomeric Bearings 915.04
Fine Aggregates, Size No. 23.....904
Fly Ash 901.02
Portland Cement.....901.01(b)
Prestressing ~~Steel~~ *Strand*.....910.01(b)7
Reinforcing ~~Steel~~ *Bars* 910.01

Structural steel for steel intermediate diaphragms shall be in accordance with 910.02(a) and shall be galvanized in accordance with ASTM A 123 after cutting, bending, and welding. Bolts for steel intermediate diaphragms shall be 7/8 in. (22 mm) and in accordance with ~~910.02(e)1~~ *910.02(f)*, except they shall be type 1. All bolts, nuts, washers, and similar threaded fasteners shall be galvanized in accordance with ASTM A 123 or may be mechanically zinc coated in accordance with ASTM B 695, class 50.

707.03 General Requirements

Structural members including, *but not limited to* ~~bridge slabs,~~ *concrete deck panels,* box-beams, ~~and~~ I-beams, *U-beams, and bulb-T beams* shall be manufactured in a~~n~~ *Department* approved plant ~~where strict control over manufacturing and curing procedure is maintained at all times~~ *in accordance with ITM 814*. Dimensions and design requirements for structural members shall be as shown on the plans. Lengths and dimension tolerances shall be as shown on the plans or as otherwise specified.

A beam whose dimensions exceed the tolerances shown on the plans will be rejected ~~for shipment to the project site~~. A beam which is to include a field attached curb shall have curb reinforcement located longitudinally within 3/4 in. (20 mm) of the locations shown on the plans.

~~*Wire breaks will be permitted to remain on the prestressed concrete casting bed as follows:*~~

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~~*Number of Strands in Bed*~~	~~*Wire Breaks*~~
~~*19 or Fewer*~~	~~*0*~~
~~*20 through 39*~~	~~*1*~~
~~*40 through 59*~~	~~*2*~~
~~*60 or More*~~	~~*3*~~

~~*The ends of each permitted wire break shall be tied to the strand. If more than the permissible number of wire breaks appears in a particular strand pattern, or if more than one broken wire appears in an individual strand, such strands shall be removed and replaced.*~~

~~*The tolerance for the center of gravity for a prestressing strand group shall be ± 1/4 in. (± 6 mm). The tolerance for the longitudinal position of handling devices shall be ± 6 in. (± 150 mm).*~~

Structural steel diaphragms shall be fabricated and erected in accordance with 711. Steel diaphragms shall include all connection angles, plates, and associated hardware required for a complete installation. The Contractor shall replace, re-galvanize, or repair all damaged galvanized material at the discretion of the Engineer.

If detailed ~~design~~ drawings are not included in the plans, ~~one set of design computations and four sets of detailed~~ shop drawings shall be submitted for approval *in accordance with 105.02*. ~~The submitted drawings shall be 22 in. by 34 in. (560 mm by 860 mm) in overall size. These shop drawings will be reviewed for design features only. The Contractor shall be responsible for dimensions, accuracy, and fit of work.~~ Certified mill test reports shall be furnished for all high tensile ~~steel~~ *strands*. Fabrication shall not begin until the shop drawings are approved.

Prior to the beginning of fabrication, a prefabrication meeting shall be held at the fabrication facility or another agreed upon location. The meeting shall be conducted by the fabricator and attended by the fabricator's production supervisor and quality control inspector, and the Engineer. The fabricator shall take notes of the meeting and distribute copies to all attending parties within five days of the date of the meeting. Items to be discussed at the meeting shall include a minimum of: fabrication and shipping schedule including hours of operation; line of communication between fabricator and Engineer; material test reports; shop drawings; special fabrication methods; fabrication hold points for inspection; final inspection and acceptance of materials; method of shipment. The requirement to hold prefabrication meetings may be waived by the Department, if the Department so chooses.

Where temperature requirements are specified herein, the fabricator shall provide the Department with written verification that the temperature requirements have been met.

CONSTRUCTION REQUIREMENTS

707.04 Steel and Concrete Requirements

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(a) Reinforcing ~~Steel~~ *Bars*

A tight coat of concrete grout *extending 1/2 in. maximum from the top of precast and precast prestressed concrete members* will be permitted *to remain* on ~~stirrups~~ *reinforcing bars* extending from precast *and precast prestressed* members. All loose and flaky material *on these reinforcing bars* shall be removed. *Lap splices shall be in accordance with 703.06. In lieu of tying, reinforcing bars may be welded in accordance with 703.06.*

~~**(b) Welding Reinforcing Steel**~~

~~In lieu of tying, reinforcing steel *bars* except prestressing steel *strands* may be welded in accordance with the following: *703.06.*~~

~~1. Welding will be permitted only at intersections of bars. Splicing of the reinforcing steel by welding will not be permitted. Welds shall have a satisfactory appearance. There are no numerical strength requirements for the completed welds. However, they shall be of such strength as to adequately hold the crossing bars in their true position during the placement of concrete. As low a current as possible shall be used so as to preclude notching and undercutting and still provide a weld of the intended strength. Notching or undercutting of the bars will be cause for rejection of the bars so damaged and the bars shall be replaced as directed.~~

~~2. Welding shall be by the shielded metal-arc process using only electrodes with low hydrogen classifications E7015, E7016, E7018, or E7028 in accordance with AWS A5.1. No minimum preheat or interpass temperature is required, except that welding shall be done only when the base metal temperature is above 35°F (2°C). The low hydrogen electrodes shall be dried for at least 2 h at a temperature between 450°F (232°C) and 500°F (260°C) before they are used. Electrodes shall be stored immediately after drying in a storage oven held at a temperature of at least 250°F (121°C). Electrodes that are not used within 4 h after removal from a drying or storage oven shall be re-dried before use. Electrodes which have been wet shall not be used.~~

~~3. All welding procedures and welders to be employed shall be qualified by tests as prescribed below. Evidence may be accepted of previous qualification of the welding procedures and welders to be employed. The same bar stock and type of welding equipment that is required for fabrication of the steel shall be used in qualifying welding procedures and welders. Welding procedures shall be qualified by preparing and testing two sample welds of each combination of bar size and steel type to be welded at intersections in the construction work. Each sample shall be subjected to a tensile test across the point of the weld. The specimens shall develop the minimum requirements for tensile strength and yield strength of the bar stock. However, failure to be in accordance with the percentage of elongation specified for the steel bars used will not be cause for disqualifying the welding procedure or the welder.~~

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~~4. Welders shall be qualified by preparing and testing samples in the same manner as specified above for qualification of welding procedures. Preparation of welds for qualifying procedures and welders shall be done in the presence of the Engineer. Such inspection shall be requested at least five days in advance. All necessary equipment, personnel, and materials shall be assembled and any experimental work performed so that qualification of welders and welding procedures can be concentrated on a reasonably short and continuous period of time. The cost of qualifying the welders and welding procedures shall be at the expense of the Contractor and will be considered incidental to and included in the pay item for structural members, except that testing of the specimens will be performed by the Department at no expense to the Contractor.~~

(b) Prestressing Strands

The splicing of straight prestressing strands is acceptable provided that the location of the splice does not occur within a concrete member. Splicing of draped strands is not allowed. Spliced prestressing strands shall have the same twist or lap. For single strand tensioning, slippage of the splices should be considered in computing the elongation. For multiple strand tensioning, either all of the strands shall be spliced or not more than 10% of the strands. If all of the strands are spliced the average splice slippage shall be considered in computing the elongation. If 10% or less of the strands are spliced, no slippage allowance shall be required.

Wire breaks will be permitted to remain on the prestressed concrete casting bed as follows:

Number of Strands in Bed	*Wire Breaks*
19 or Fewer	*0*
20 through 39	*1*
40 through 59	*2*
60 or More	*3*

The ends of each permitted wire break shall be tied to the strand. If more than the permissible number of wire breaks appears in a particular strand pattern, or if more than one broken wire appears in an individual strand, such strands shall be removed and replaced.

The tolerance for the center of gravity for a prestressing strand group shall be ± 1/4 in. (± 6 mm). The tolerance for the longitudinal position of handling devices shall be ± 6 in. (± 150 mm).

(c) Concrete

Concrete shall be air entrained and in accordance with the applicable requirements of 702.05. *The concrete shall have a minimum temperature of 50°F (10°C) and a maximum temperature of 90°F (32°C) at the time of placement.* Chemical admixture types A, D, F, or G shall be used in combination with an air entraining admixture. *A* ~~H~~*h*igh range water reducing, HRWR, ~~and~~ *or* high range water reducing retarding, HRWRR, admixture system~~s~~ ~~may~~ *shall* be used. Chemical admixture types B, C, and E will be permitted only with written permission. Admixtures, other than air-entraining admixtures, shall not be used with air-entrained cement. The cement content of

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the mixed concrete shall be sufficient to obtain the specified minimum 28 day compressive strength. The total of portland cement and other cementitious materials shall not exceed 800 lb/cyd (475 kg/m^3). Slump shall be no less than 2 in. (50 mm) nor more than 5 in. (125 mm) for concrete without chemical admixtures or concrete containing chemical admixture types A and D.

Concrete containing admixture type F, G, or admixture systems shall have a slump no less than 3 in. (75 mm) nor more than 7 ~~8~~ in. (175 ~~200~~ mm). The amount of time from mixing to placement and consolidation shall be a maximum of 30 min. The concrete shall not be retempered with additional amounts of chemical admixture types F or G after the initial mixing has been completed.

1. Cold Weather Concrete

Cold weather concrete shall be in accordance with 702.11 except that two minimum-maximum recording-type thermometers shall be provided in the enclosure.

2. Hot Weather Concrete

When it is necessary to fabricate concrete structural members during times of hot weather the mix water may be chilled or an appropriate amount of ice may be added to the concrete mix in order to produce concrete of the temperature specified ~~in 707.04(c)~~ herein.

3. Acceptance Testing

Acceptance of precast and precast prestressed members will be based on tests for slump, air content, and compressive strength. The 28 day compressive strength shall be equal to or greater than the specified concrete compressive strength. Test cylinders for acceptance shall be molded and field cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39. The fabricator shall make a minimum of two 6 in. dia. x 12 in. test cylinders per member cast. The fabricator may elect to make additional cylinders for acceptance testing prior to 28 days. The 28 day compressive strength of the concrete for each structural member will be determined by the average strength of two cylinders representing that member. The strength of any individual cylinder for a member shall not be lower than 95% of the specified concrete compressive strength. The fabricator may elect to make and test additional cylinders for acceptance at an earlier age in lieu of the 28 day requirement.

All molds, facilities, labor, and materials necessary to prepare and cure the test specimens shall be furnished.

(d) Other Requirements

The fabricator shall control prestressing operations and shipment of structural members through the use of compressive strength test cylinders that are molded and field cured in accordance with ASTM C 31.

Precast concrete members which are not prestressed shall have a minimum compressive strength of 4500 psi (31 MPa) in 28 days. P*recast p*restressed members shall be in accordance with the following unless otherwise shown on the plans:

1. Maximum water/cement*itious* ratio in pounds (kilograms) of water per pound (kilogram) of cement*itious material* shall be ~~0.400~~ *0.420*.

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2. Minimum 28 day compressive strength of concrete shall be 5000 psi (34.5 MPa).

3. Minimum compressive strength of concrete at time of prestressing shall be 4000 psi (27.6 MPa).

4. Initial tension of prestressing ~~steel~~ *strands* shall be as shown on the plans.

Inspection of the precast *prestressed* member during manufacture and checking and testing aggregates, cement, concrete, and steel specimens will be performed. All specimens shall be furnished without cost to the Department. ~~Notification shall be made as soon as reinforcing steel is available for sampling and testing, and also at least five days in advance of the beginning of the manufacture of the precast member. This i~~Inspection, checking, and testing performed by the Department will not relieve the Contractor or ~~his manufacturers~~ *the fabricator* from performing their own *quality control* inspection, testing, and checking as necessary to maintain ~~strict~~ *quality* control over the manufacturing, handling, and curing procedure. ~~By means of a mechanical recording device, a~~ *A* permanent record of the *force applied to and measured elongation obtained* ~~to~~ *for* each *prestressing* strand ~~of prestressing steel~~ and the identification of the strand and unit to which the record applies shall be provided. *This record shall be certified that it accurately represents the force applied and measured elongation by the fabricator's production supervisor and provided to the Engineer prior to shipment.*

707.05 Forms

Structural members shall be manufactured in steel forms which are unyielding*, smooth,* mortar-tight, and of sufficient rigidity to prevent distortion due to pressure of the concrete. They shall be so designed that the finished concrete is in accordance with the required dimensions and contours. The design of the forms shall take into account the effect of vibration of the concrete as it is placed. Forms shall be filleted at all sharp corners and shall be given a bevel or draft at all projections to ensure easy removal. Exposed edges of curbs shall be beveled or edged. Forms shall be set and maintained true to the lines designated until the concrete is sufficiently hardened or for periods hereinafter specified. Interiors of forms shall be treated with an approved formulated form coating which allows them to be released without adhering, discoloring, or otherwise damaging the concrete. Form coating materials shall not come in contact with reinforcing *bars* or prestressing ~~steel~~ *strands*.

707.06 Placing and Finishing Cement Concrete

The temperature of the prestressing strands and forms shall be monitored between the time of the application of prestressing force and the placement of the concrete. During hot weather, approved means shall be undertaken to cool the prestressing strands and forms immediately prior to placement of the concrete.

Concrete, during and immediately after depositing, shall be consolidated with vibrators and suitable spading tools. Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. The vibrators used may be internal, external, or a combination of both. Internal vibration shall be of sufficient duration and intensity to consolidate thoroughly, but shall not be continued so as to cause segregation. Vibration shall not be continued at any one point so that localized areas of grout are formed.

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The entire operation of depositing and consolidating the concrete shall be conducted so that the concrete will be smooth, dense, and free from any honeycomb or pockets of segregated aggregates. The concrete in each member shall be placed in one continuous operation. The outside vertical faces of facia girders and the exposed face and top of the curb section shall be finished in accordance with 702.21.

Voids in prestressed concrete box beams shall be vented during beam production until after the initial concrete set, then sealed before the beams are shipped.

The tops of all beams and the outside faces *and bottom flanges* of the fascia beams shall be sealed ~~with an approved concrete sealer~~ in accordance with 709.

707.07 Removal of Forms and Curing

Side forms may be removed when no distortion, slump, or misalignment of the concrete will result. Precast members which are not prestressed shall remain on the bottom supporting forms for the span until the concrete has reached a strength of at least 2,000 psi (13.8 MPa) as evidenced by test cylinders made and cured in the same manner as the slab.

Curing may be done by wet curing or by accelerated curing.

When wet curing is used, the exposed surfaces of the members shall be covered by two layers of wet burlap and the burlap shall be kept wet. Additional curing of precast or *precast* prestressed units will not be required provided the minimum specified ultimate strength can be obtained.

When accelerated curing of the concrete is used, it shall be done by low pressure steam or radiant heat curing. Insulated blankets may be used to reduce heat and moisture loss subject to maintaining a 50°F (10°C) minimum temperature. The heat shall always be applied at a controlled rate following the initial set of the concrete, and an effective method of retaining the heat and moisture in the concrete shall be used during the curing cycle.

Curing shall be in a suitable enclosure to minimize heat and moisture loss. Except to maintain a minimum temperature of 50°F (10°C), heat shall not be applied until the concrete has attained its initial set. The time of initial set may be determined by ASTM C 403. When the initial set is not determined by ASTM C 403, the initial application of heat shall be from 2 to 4 h after final placement. If retarders are used, this time shall be increased to 4 to 6 h.

During the initial application of radiant heat or live steam, the ambient temperature within the curing enclosure shall increase at an average rate not exceeding 40°F/h (5°C/h) until the curing temperature is reached. Neither the maximum temperature within the enclosure nor the maximum temperature on the surface of the concrete shall exceed 160°F (71°C). The maximum curing temperature shall be held until the concrete has reached the minimum required strength for moving precast *and precast prestressed* units. *In discontinuing the steam application, the air temperature inside the enclosure shall decrease at a rate not to exceed 70°F/h (20°C/h) until the temperature has reached 20°F (7°C) above the temperature of the air to which the member will be exposed. Time and temperature recording thermometers shall be provided and used to verify compliance with the stated heating and cooling rates.* Detensioning should be

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accomplished immediately after accelerated curing has been discontinued*, provided the member has met or exceeded the specified release strength. When multiple members are cast in the same bed, all members shall meet or exceed the specified release strength prior to detensioning*. Additional curing of precast or *precast* prestressed units will not be required provided the minimum specified ultimate strength can be obtained.

Radiant heat may be applied by means of pipes circulating steam, hot oil or hot water, or by electric heating elements. When steam is used, the jets shall be positioned so that they do not discharge directly on the concrete, forms, or test cylinders. ~~the~~ *The* steam shall be at 100% relative humidity to prevent loss of moisture and to provide moisture for proper hydration of the cement.

During the period of initial set of the member and during the accelerated curing by radiant heat, the concrete shall be kept wet by the method outlined above for wet curing.

~~A recording thermometer shall be provided and used to verify compliance with the temperature requirements.~~

Approval shall be obtained before curing is done by any means other than those outlined above.

707.08 Handling and Shipping

~~The precast~~ *Precast and precast prestressed* members shall not be subjected to excessive abuse which produces crushing or undue marring of the concrete. All members damaged during handling, storing, transporting, or erecting shall be replaced. Unless ~~some other method is~~ *otherwise* approved, precast *and precast prestressed* members shall be handled with a suitable hoisting device provided with a spreader sling. The spreader shall be of sufficient length to prevent horizontal forces being produced in the member due to lifting and shall be equipped with leads and hooks at each end. The girders shall be lifted by the devices shown on the plans. *Proposed* ~~A~~*a*lternate lifting devices and procedures shall be *approved prior to use and shown on the shop drawings* ~~at the owner's or supplier's option, and must be approved prior to use~~. *If any other method of handling is used, it shall be shown on the shop drawings and approved prior to use.* If the method produces horizontal forces in the precast *or precast prestressed* member, sufficient ~~steel~~ reinforcement shall be added to compensate for them.

The members shall remain in an upright position at all times and shall be supported as indicated herein when in storage and during transportation to the construction site.

In storage, ~~I beams, box beams, and slabs~~ *all members* shall be fully supported across their width on battens not less than 4 in. (100 mm) wide with one being placed at each end at the centerline of the bearing. The supports of the members while in storage shall be maintained in a level position so no twisting occurs.

~~The precast~~ *Precast* members shall not be shipped nor used until the concrete *compressive strength* reaches a ~~strength~~ *minimum* of 4,500 psi (31 MPa) for members which are not prestressed and 5,000 psi (34.5 MPa) for members which are prestressed ~~as evidenced by test cylinders made at the time of casting and cured in the same manner as~~

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~~the precast members which they represent. If they are shipped prior to 28 days, additional test cylinders shall be made to ensure adequate 28 day results in case of earlier failure~~.

During transportation, the members shall be supported with truck bolsters or battens no less than 4 in. (100 mm) wide which are padded with no less than 1/2 in. (13 mm) of rubber. The ends of I-beams shall extend no more than the depth of the beam and not more than 3.5 ft (1 m) beyond the supports. The ends of box-beams shall extend no more than 1 1/2 times their depth and not more than 3 ft (0.9 m) beyond the supports. The ends of slabs shall extend no more than the depth of the beam beyond the supports. Supports of cantilever beams shall be as shown on the plans. Trucks with double bolsters will be permitted, provided the beams are fully seated on the outer bolsters and the inner bolsters are no more than 8 ft (2.4 m) from the ends of the beams. Wood blocks or other suitable material shall be placed under the tie chains to prevent chipping the concrete.

707.09 Placing Structural Members

Erection of ~~the~~ precast *prestressed structural members* ~~deck~~ shall commence at the centerline and proceed out to the curb, one member at a time. As each member is placed, the transverse tie bars, if shown on the plans, shall be inserted and secured. Any shifting of the members shall be done while they are held free of the supports by the hoisting device. The use of a steel pinch bar will not be permitted. Members shall be set to proper line and grade with uniform bearing on bridge seats, mortar joints, or bearing pads as required on the plans. When required, members shall be secured to the pier or bent with dowel rods. Holes for dowels shall be filled with mortar at fixed ends and with crack or joint filler at expansion ends. Longitudinal keyway joints shall be cleaned. A coat of cement mortar shall be scrubbed on the surface. The joint shall be filled with a non-shrinking grout composed of one part portland cement, two parts No. 23 fine aggregate, and an approved non-shrinking additive or a non-shrink, non-metallic cementation grout in accordance with ASTM C 1107. All bolts or drains shown on the plans as necessary or desirable to be placed in the concrete shall be placed by the methods and at the locations shown on the plans. Necessary tie rods, tie bolts, and hardware for tying members together shall be furnished.

Dowel holes shall not be grouted nor concrete or the forming ~~therefore~~ *thereof*, be placed in floor slabs, diaphragms, or shear keys prior to receipt of complete documentation of the acceptability of the members and bearing pads, including the satisfactory laboratory reports and certifications in accordance with 915.04(e). Neither the members, nor the bearings will be considered incorporated into the work, and neither will be paid for until this documentation is accomplished satisfactorily.

Railing, when required, shall be of the type shown on the plans. The component parts shall be in accordance with 706, unless otherwise indicated on the plans. Other precast or *precast* prestressed structural members shall be placed in the structure in accordance with the plans and the specifications or special provisions indicated for the type of structure being built.

Cranes or other heavy erection equipment may be operated on the precast or *precast* prestressed members only if approved in writing and if a proposed operating procedure is submitted showing loading, distribution of loads, resulting stresses, and that the design of the members is satisfactory to permit. However, such approval shall not relieve the Contractor of any damage from this operation.

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707.10 Precast Prestressed Concrete Deck Panels

Precast prestressed concrete deck panels shall be designed as a non-composite section to support the dead load of the panel, reinforcement, plastic concrete, and a construction load of 50 lb/ft^2 (2.4 kPa).

When the Contractor elects to use precast prestressed deck panels, ~~T~~*t*he panel shall be designed as a composite section with ~~the~~ class C concrete to support the live load. The Contractor shall revise the area of top longitudinal reinforcing ~~steel~~ *bars in the deck* over interior supports for negative moment to be equal to the total area of top and bottom longitudinal reinforcing ~~steel~~ *bars*.

Shop drawings ~~and design computations~~ shall be submitted in accordance with ~~707.03~~ *105.02*. Design computations ~~for deck panels~~ shall be submitted ~~for approval~~ *only* for total slab thickness*es* greater than 8 in. (200 mm) or clear spans in excess of 7.5 ft (2.3 m). Design shall be in accordance with *either the AASHTO Standard Specifications for Highway Bridges or* the AASHTO ~~Standard~~ *Load Resistance Factor Design Bridge Design* Specifications ~~for Highway Bridges~~ *as shown on the plans*. Details such as type, size, and location of the reinforcing ~~steel~~ *bars*, the prestressing strands, welded wire ~~fabric~~ *reinforcement*, and concrete shall be as shown on the plans.

The concrete for deck panels shall be placed in accordance with 702.20. The concrete shall be vibrated to prevent honeycombs and voids, especially at the corners and edges of the panels. The tops of the deck panels shall be broom or wire brush finished in the direction of the prestressing strands. The corrugations formed shall be uniform in appearance and shall not be more than 1/4 in. (6 mm) in depth. The coarse aggregate shall not be displaced when preparing the roughened surface.

707.11 Method of Measurement

Precast or *precast* prestressed concrete structural members will be measured by the linear foot (meter) ~~along the top of each member or by the square foot (square meter) of top surface of each member~~. ~~*Precast prestressed concrete deck panels will be measured by the linear foot (meter) along the centerline of the deck panel that is parallel to the centerline of the structure.*~~ Railing will be measured in accordance with 706.05 if specified as a pay item. Structural steel for intermediate diaphragms will not be measured.

When the Contractor elects to use precast prestressed concrete deck panels, ~~*concrete deck*~~ *the panels will not be measured* ~~*separately*~~ *for payment.*

707.12 Basis of Payment

The accepted quantities of precast or *precast* prestressed concrete structural members will be paid for at the contract unit price per linear foot (meter) ~~or per square foot (square meter)~~ for structural member, concrete, of the type and size specified. ~~*Precast prestressed concrete deck panels will be paid for at contract unit price per linear foot (meter) of the size specified.*~~ Precast or *precast* prestressed concrete structural members for which the type and size is not shown in the Schedule of Pay Items will be paid for at the contract lump sum price for structural members, concrete.

~~*The cost of precast prestressed deck panels shall be included in the cost of class C concrete.*~~

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Railing will be paid for in accordance with 706.06 when specified as a pay item.

Payment will be made under:

Pay Item	**Pay Unit Symbol**
Structural Member, Concrete, ____, ____ (type, size)	LFT (m) ~~SFT (m2)~~
~~*Structural Member, Concrete Deck Panel, ____ (size)*~~	~~*LFT (m)*~~

Reinforcing ~~steel~~ *bars*, elastomeric bearing pads, *modifications to bearing pads,* bearing beams required for box beams, bearing assemblies required for I-beams, bulb-T beams, *U-beams,* and box beams, bearing plates, expanded polystyrene, threaded reinforcing bars, threaded inserts in facia beams, hex bolts, sealer on the outside face *and bottom flange* of ~~facia~~ ~~*fascia*~~ facia beams and on the tops of all beams, and necessary incidentals shall be included in the cost of ~~this work~~ *the pay items of this section. The cost for providing all molds, facilities, labor, and materials necessary to prepare and cure the test specimens required for work in this section shall be included in the cost of the pay items in this section.*

No payment will be made for *removing and replacing prestressing strands due to excessive wire breakage, or* replacing precast or *precast prestressed* members damaged during handling, storing, transporting or erecting.

When the Contractor elects to use precast prestressed concrete deck panels, the cost of the panels shall be included in the cost of class C concrete in superstructure.

The cost of railing shall be included in the cost of ~~this work~~ *the pay items of this section* if such railing is not specified as a pay item.

The cost of all materials, including galvanizing, labor, and equipment for furnishing and installing steel intermediate diaphragms shall be included in the cost of structural member, concrete of the type and size specified.

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SECTION 707, CONTINUED.

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Other sections containing specific cross references:

702.13(f) Pg 459
707.10 Pg 497

Recurring Special Provisions potentially affected:

~~None~~ New 707-B-180

Motion: Mr. Heustis
Second: Ms. Rearick
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Standard Sheets potentially affected:

None

Action: Passed as revised

_x_ RSP Effective: February 2009 Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Received FHWA Approval? Yes

SPECIFICATION REVISIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Current 107 specification contains outdated language concerning flagger apparel and when use of a hand signal flag is permitted. This information is not consistent with the MUTCD. Specification also needs to be updated to comply with 23 CFR 634 - Worker Visibility Rule.

PROPOSED SOLUTION: Update specification to remove conflicts with MUTCD and to be in accordance with 23 CFR 634 - Worker Visibility Rule.

APPLICABLE STANDARD SPECIFICATIONS: 107

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: Part 8 - Work Zone Traffic Control

APPLICABLE SECTION OF GIFE: Section 1-4, 2002 GIFE, Section 107, Revised GIFE

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Dennis Kuchler for Mike Milligan, Specifications Engineer.

Title: State Construction Engineer

Organization: Division of Construction Management

Phone Number: 317-232-5502

Date: October 23, 2008

APPLICABLE SUB-COMMITTEE ENDORSEMENT? 100 Specification Subcommittee

Dennis Kuchler, Co-Chair, State Construction Engr., INDOT, Const. Mgmt.
Steve Thieroff, Co-Chair, INDOT, Field Engr., Div. of Const. Mgmt.
Paul Berebitsky, Indiana Construction Association
Bob Cales, INDOT, Director, Contract Administration
Tony DeSimone, FHWA, Transportation Engineer
Ron Heustis, INDOT, Mgr., Const. Tech. Support, Const. Mgmt.
Von Luhmann, INDOT, Seymour Dist. Const. Project Engineer
Mike Milligan, INDOT, Spec. Engr., Div. of Const. Mgmt.
Jack Riggs, INDOT, Claims Administrator Attorney
Don Thornton, INDOT, Crawfordsville Dist. Const. Area Engr.
David Unkefer, FHWA, Engineering Services Team Leader

Also reviewed by Pat McCarty, Work Zone Traffic Control, Calvin Lee, ICA

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REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 107, BEGIN LINE 240, DELETE ANDINSERT AS FOLLOWS:

(a) ~~Employee~~ *Worker* Safety

All workers within the rights-of-way ~~of a Federal aid highway~~ who are exposed either to traffic or construction equipment within the work area shall wear high visibility safety apparel in accordance with 23 CFR 634.

If a trench, 5 ft (1.5 m) or more in depth, is constructed on a project, the requirements for trench safety systems as specified in OSHA regulations 29 CFR 1926, Subpart P, shall be performed. Unless otherwise specified, trench safety systems work will not be paid for separately, but the cost thereof shall be included in the cost of the pay item covering the trench excavation work.

SECTION 107, BEGIN LINE 430, DELETE AS FOLLOWS:

Sufficient barricades, supplemented by watchers or flaggers when necessary, shall be provided continuously to protect any and all parts of the work and to promote safe and orderly movement of traffic. When a road is closed or posted for official detour but is still usable by local traffic, barricades and road closure sign assemblies, in addition to the closure barricades, required at the beginning and end of the portion of such road being detoured, shall be erected at the site of bridge removals, pipe removals, or other high hazard locations. Such barricades shall be located within 150 ft (50 m) of the removal location. These barricades shall be of the type shown on the plans, and in accordance with 801.07. Such barricades shall extend from shoulder to shoulder, or to the limit of area that is readily traversable by a motor vehicle, as directed. During non-working hours, no opening shall exist in the barricades. The road closure sign assembly shall be placed at or near the center of the roadway. If these requirements are violated, operations shall be suspended until adequate measures are taken for full compliance. ~~Flaggers or watchers shall wear a flagger's vest while directing traffic. Official law enforcement officers in uniform will not be required to wear a vest. The vest shall be furnished and be made of a durable fluorescent material, flame orange color, with two vertical reflective stripes on both the front and back. It shall be kept clean and provide maximum visibility at all times.~~ The use of hand signaling flags will not be permitted except for emergency ~~and single flagger~~ situations. The "Stop"/"Slow" paddle shall be required as a primary hand signaling device to control traffic through work areas. The "Stop"/"Slow" paddle shall be in accordance with section 6E.03 of the MUTCD, except it shall be at least 24 in. (610 mm) wide.

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REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 107, CONTINUED.

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Other sections containing specific cross references:

107.12
101.01 Pg 2
105.14 Pg 46
801.03 Pg 605
801.18 Pg 628
804.01 Pg 641
805.03 Pg 645
808.08 Pg 680

Recurring Special Provisions potentially affected:

~~None~~ New 107-C-220

Motion: Mr. Kuchler
Second: Mr. Walker
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? Yes
By - Addition or Revision
Frequency Manual
Update Required? No
By – Addition or Revision

Standard Sheets potentially affected:

None

Action: Passed as revised

_x_ RSP Effective: February 2009 Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Received FHWA Approval? Yes

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The following Aggregate items require revisions to sections 203 and 904:

1. Linear Grading -- A Unique Special Provision has been included in some contracts that designates a requirement that RAP be used for wedging at the outside edge of a shoulder, wedging behind guardrails to obtain the required backup for the posts, and median filling required for paving and placement of concrete mediam barriers. With the increased value of the RAP due to escalating binder prices, No. 53 and No.73 aggregates should be allowed as options for these linear grading applications. 203.08.1 should include an option of soil, RAP, No. 53 aggregate, or No. 73 aggregate for use as linear grading.

2. Steel Slag -- The specifications restrict the use of steel slag in encapsulated applications because of the continued expansion of the lime in the material. We have placed a test section using steel slag in a HMA Intermediate mixture in 2007 that was evaluated for expansion throughout 2008 until recently removed. An initial test was conducted on the steel slag used in the mixture prior to construction to verify that the potential for expansion of the material had met a limiting value. No detrimental effects were observed in the HMA test section. The Autoclave Disruption test in accordance with ITM 219 is used to measure the calcium oxide and magnesium oxide deleterious materials in steel slag which have the potential to expand. Use of steel slag in Base and Intermediate mixtures should be allowed if the material is tested to verify compliance with the deleterious content measured by ITM 219.

Also, no restrictions should be required for RAP containing steel slag as any expansion of this material has already taken place.

3. AASHTO T 103 -- 904.03 (a) currently indicates that the Water Freeze and Thaw Soundness test in accordance with AASHTO T 103, Procedure A and the Brine Freeze and Thaw Soundness test may be used at the option of the Engineer. The Water Freeze and Thaw Soundness test is routinely used to evaluate the soundness of aggregates and the Sodium Sulfate Soundness test and Brine Soundness tests are used less often. As such, the Water Freeze and Thaw soundness test should be indicated in the specifications as the primary test and the note should indicate that the Sodium Sulfate Soundness and Brine Freeze and Thaw Soundness tests may be conducted at the discretion of the Engineer.

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PROPOSED SOLUTION: The following revisions are recommended to be authorized and made effective by a Recurring Special Provision.

1. Revise the linear grading specification to allow soil, RAP, No. 53 coarse aggregate, or No. 73 coarse aggregate to be used for this application.
2. Revise the steel slag specification to allow this material to be used in HMA Base and Intermediate mixtures if the deleterious content is determined to be less than 4.0 %. Also, allow RAP with steel slag to be used in all applications allowing RAP in 401, 402, and 410.
3. Revise the Classification of Aggregates table in 904 to indicate that the Water Freeze and Thaw test in accordance with AASHTO T 103, Procedure A, is the primary soundness test conducted and the Sodium Sulfate and Brine Freeze and Thaw tests may be done at the discretion of the Engineer.

APPLICABLE STANDARD SPECIFICATIONS: 203, 904

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: Section 13

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Ron Walker

Title: Manager, Office of Materials Management

Organization: INDOT

Phone Number: 317-610-7251 x 204

Date: 11-06-08

APPLICABLE SUB-COMMITTEE ENDORSEMENT? These specification revisions are recommended by the INDOT/IMAA Technical Committee.

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REVISION TO 2008 STANDARD SPECIFICATIONS

~~SECTION 203, BEGIN LINE 166, DELETE AND INSERT AS FOLLOWS:~~

~~**203.08.1 Linear Grading**~~

~~Linear grading shall consist of:~~

~~(a) earth, *soil, RAP, No. 53 coarse aggregate, or No. 73 coarse aggregate* at the outside edge of a shoulder once the pavement has been resurfaced, widened, or replaced.~~

~~(b) earth, *soil, RAP, No. 53 coarse aggregate, or No. 73 coarse aggregate* behind guardrail to obtain the required earth backup for the posts.~~

~~(c) *Mmedian* earth *soil, RAP, No. 53 coarse aggregate, or No. 73 coarse aggregate* filling required for paving and placement of concrete median barrier.~~

~~These types of earthwork *linear grading* will not require benching.~~

SECTION 904, BEGIN LINE 65, DELETE AND INSERT AS FOLLOWS:

Steel furnace (SF) slag ~~shall~~ ~~only~~ *may* be used in aggregate shoulders, HMA surface or SMA surface mixtures, dumped riprap, and snow and ice abrasives. *SF slag coarse aggregate may be used in HMA base and HMA intermediate mixtures if the deleterious content is less than 4.0 % when tested in accordance with ITM 219. RAP with steel slag may be used in accordance with 401.06, 402.08 and 410.06.*

FINAL DRAFT

SECTION 904,BEGIN LINE 205, DELETE AND INSERT AS FOLLOWS:

(a) Classification of Aggregates

Characteristic Classes	AP	AS	A	B	C	D	E	F
Quality Requirements								
Freeze and Thaw Beam Expansion, % Max. (Note 1)	.060							
Los Angeles Abrasion, %, Max. (Note 2)	40.0	30.0	40.0	40.0	45.0	45.0	50.0	
Freeze and Thaw, AASHTO T 103, Procedure A, % Max (Note 3)	*12.0*	*12.0*	*12.0*	*12.0*	*16.0*	*16.0*	*20.0*	*25.0*
Sodium Sulfate Soundness, %, Max. (Note 3)	12.0	12.0	12.0	12.0	16.0	16.0	20.0	25.0
Brine Freeze and Thaw Soundness, %, Max. (Note ~~4~~*3*)	30	30	30	30	40	40	50	60
Absorption, % Max. (Note ~~5~~*4*)	5.0	5.0	5.0	5.0	5.0			
Additional Requirements								
Deleterious, %, Max.								
Clay Lumps and Friable Particles	1.0	1.0	1.0	1.0	2.0	4.0		
Non-Durable (Note ~~6~~*5*)	4.0	4.0	4.0	4.0	6.0	8.0		
Coke					(See	Note ~~7~~*6*)		
Iron					(See	Note ~~7~~*6*)		
Chert (Note ~~8~~*7*)	3.0	3.0	3.0	5.0	8.0	10.0		
Weight per Cubic Foot for Slag, (lbs), Min.	75.0		75.0	75.0	70.0	70.0	70.0	
(Mass per Cubic Meter for Slag, (kg))	(1200)		(1200)	(1200)	(1120)	(1120)	(1120)	
Crushed Particles, % Min. (Note ~~9~~*8*)								
Asphalt Seal Coats			70.0	70.0				
Compacted Aggregates			20.0	20.0	20.0	20.0		

Notes:

1. Freeze and thaw beam expansion shall be tested and re-tested in accordance with ITM 210.
2. Los Angeles abrasion requirements shall not apply to BF.
3. Aggregates may, at the option of the Engineer, ~~be subjected to 50 cycles of freezing and thawing in accordance with AASHTO T 103, Procedure A, and may~~ be accepted~~, provided they do not have a loss greater than specified for~~ *by the* Sodium Sulfate Soundness *or Brine Freeze and Thaw Soundness requirements.*

~~4. Brine freeze and thaw soundness requirements are subject to the conditions stated in Note 3.~~

~~5~~*4*. Absorption requirements apply only to aggregates used in PCC and HMA mixtures except they shall not apply to BF. When crushed stone coarse aggregates from Category I sources consist of production from ledges whose absorptions differ by more than two percentage points, the absorption test will be performed every three months on each size of material proposed for use in PCC or HMA mixtures. Materials having absorption values between 5.0 and 6.0 that pass AP testing may be used in PCC. If variations in absorption preclude satisfactory production of PCC or HMA mixtures, independent stockpiles of materials will be sampled, tested, and approved prior to use.

~~6~~*5*. Non-durable particles include soft particles as determined by ITM 206 and other particles which are structurally weak, such as soft sandstone, shale, limonite concretions, coal, weathered schist, cemented gravel, ocher, shells, wood, or other objectionable material. Determination of non-durable particles shall be made from the total weight (mass) of material retained on the 3/8 in. (9.5 mm) sieve. Scratch Hardness Test shall not apply to crushed stone coarse aggregate.

~~7~~*6*. ACBF and SF coarse aggregate shall be free of objectionable amounts of coke, iron, and lime agglomerates.

~~8~~*7*. The bulk specific gravity of chert shall be based on the saturated surface dry condition. The amount of chert less than 2.45 bulk specific gravity shall be determined on the total weight (mass) of material retained on the 3/8 in. (9.5 mm) sieve for sizes 2 through 8, 43, 53, and 73 and on the total weight (mass) of material retained on the No. 4 (4.75 mm) sieve for sizes 9, 11, 12, and 91.

~~9~~*8*. Crushed particle requirements apply to gravel coarse aggregates used in compacted aggregates, and seal coats except seal coats used on shoulders. Determination of crushed particles shall be made from the weight (mass) of material retained on the No. 4 (4.75 mm) sieve in accordance with ASTM D 5821.

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REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 904, CONTINUED.

COMMITTEE COMMENTS:

There was a long discussion about linear grading and whether 303 pay items belong under ~~303~~ 203.08.1.

The Committee decided that a separate shoulder wedge section needs to be added to the Specifications to address this.

Other sections containing specific cross references:

203.08.1
None

904.01
403.04 Pg 2555
404.10 Pg 257
616.13 Pg 389
710.02 Pg 505
904.02(g) Pg 723

904.03(a)
904.03 Pg 724
904.04(d) Pg 731

Recurring Special Provisions potentially affected:

~~None~~ New 904-R-560

Motion: Mr. Walker
Second: Mr. Heustis
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Standard Sheets potentially affected:

None

Action: Passed as revised

_x_ RSP Effective: February 2009 Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Received FHWA Approval? Yes

FINAL DRAFT MINUTES

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The following HMA items require revisions to sections 401, 402, 406, 410, and 902:

1. Fibers -- The reference to fibers used in open graded mixtures should be revised since MP 8 is being adopted as a full standard as AASHTO M 325 in the 2008 AASHTO Standard Specifications.

2. Open graded mixtures -- The purpose of the open graded mixture is to allow drainage within the pavement structure. Additional stiffness of the asphalt is needed to prevent draindown of the asphalt and as such more expensive modified binders are used. Adding fibers to the mixture will stiffen the asphalt so that there will not be any significant draindown. If fibers are added, reducing the upper temperature classification by one grade may be done and would significantly reduce the cost of open graded mixtures.

3. RAP -- Restrictions on the type of coarse aggregate in HMA surface mixtures are required because this material has the greatest effect on the skid resistance capabilities of the mixture. Using RAP in all surface mixtures could be allowed if the RAP contained only fine aggregate size material. Recent developments in the procedures for processing and screening RAP with high vibration screens has allowed RAP to be fractionated into several sizes of material. Allowing up to 15 % RAP in ESAL category 3, 4, or 5 surface mixtures should be allowed if the RAP is 100 % passing the 3/8 in. sieve and 95-100 % passing the No.4 sieve. This size of RAP will contain approximately 6-7 % asphalt and therefore would reduce the amount of virgin asphalt required in the mixture by approximately 1 %.

Also we currently do not allow RAP in open graded mixtures. Advancements in processing RAP would allow specific sizes such as -3/4 in. + 1/2 in. size RAP material to be made. Since the volumetric mixture acceptance tests apply to open graded mixtures and the RAP size can be controlled, the restriction on the use of RAP in open graded mixtures should be removed.

4. Matching HMA lanes -- 401,14 currently requires that HMA courses greater than 165 lb/syd placed under traffic be brought up even with each adjacent lane at the end of each work day. This requirement results in lost production due to the time necessary to back up the paving operation at midday. The FHWA guidance for this application is 220 lb/syd. Using the 220 lb/syd criteria would allow increased production for courses 165 lb/syd to 220 lb/syd.

5. SS-1h -- SS-1h asphalt in accordance with AASHTO M 140 has successfully been used as a tack coat in other states and is comparable to the currently allowed AE-T and AE-PMT performance. This material should be allowed as an alternative to AE-T and AE-PMT for tack coat applications.

6. SMA -- The revisions to section 410 are being made to be consistent with the comparable requirements of QC/QA HMA mixtures in accordance with 401 and the above-noted proposed revisions to 401. Also, a backup plate sample will be obtained for an appeal mixture sample instead of taking a core so that an accurate maximum specific gravity test value may be obtained.

7. PG Binder Appeals -- The basis of the appeal is required to be the complete AASHTO M 320 test results for only the specific sublot in question. The backup sample for the failing sublot will be tested if the appeal is accepted and the appeal sample will be used for the final acceptance of the lot.

PROPOSED SOLUTION: The following revisions are recommended to be authorized and made effective by a Recurring Special Provision.

1. Reference AASHTO M 325 for fibers
2. Reduce the grade of PG binder if fibers are used in open graded mixtures
3. Allow 15 % RAP in all Category 3,4, and 5 surface mixtures and restrict the size of RAP. Also, allow RAP in open graded mixtures.

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4. Require matching adjacent HMA lanes at the completion of each work day for mixtures greater than 220 lb/syd.
5. Allow SS-1h to be used as an alternative to AE-T and AE-PMT for tack coat applications.
6. Revise 410 to make this section consistent with 401 and require a backup plate sample for mixture appeals.
7. Require only the backup asphalt sample in the sublot tested to be used for an appeal.

APPLICABLE STANDARD SPECIFICATIONS: 401, 402, 406, 410, 902

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: Chapter 52

APPLICABLE SECTION OF GIFE: Section 13

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Ron Walker

Title: Manager, Office of Materials Management

Organization: INDOT

Phone Number: 317-610-7251 x 204

Date: 11-06-08

APPLICABLE SUB-COMMITTEE ENDORSEMENT? These specification revisions are recommended by the INDOT/APAI Technical Committee.

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REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 401, BEGIN LINE 19, DELETE AND INSERT AS FOLLOWS:

401.03 Materials

Materials shall be in accordance with the following:

Asphalt Materials
PG Binder.....902.01(a)
Coarse Aggregates 904
Base Mixtures – Class D or Higher
Intermediate Mixtures – Class C or Higher
*Surface Mixtures – Class B or Higher
Fibers.....AASHTO ~~MP 8~~ *M 325*
Fine Aggregates 904
*Surface aggregate requirements are listed in 904.03(d).

SECTION 401, BEGIN LINE 97, INSERT AS FOLLOWS:

The percent draindown of open graded mixtures shall not exceed 0.30% in accordance with AASHTO T 305. Open graded mixtures may incorporate fibers. *The binder for open graded mixtures containing fibers may be reduced by one temperature classification, 6°C, for the upper temperature classification. The fiber type and minimum dosage rate shall be in accordance with AASHTO M 325.*

SECTION 401, BEGIN LINE 150, DELETE AND INSERT AS FOLLOWS:

~~Recycled materials shall not be used in ESAL Category 3, 4, or 5 surface mixtures or open graded mixtures.~~ *A maximum of 15.0% RAP or 3.0% ARS by weight (mass) of the total mixture may be used in ESAL category 3, 4, or 5 surface mixtures and open graded mixtures. The recycled material for the ESAL category 3, 4, or 5 surface mixtures shall be 100% passing the 3/8 in. (9.5 mm) sieve and 95 to 100% passing the No. 4 (4.75 mm) sieve.*

SECTION 401, BEGIN LINE 320, DELETE AND INSERT AS FOLLOWS:

Planned HMA courses greater than ~~165 lb/syd (90 kg/m²)~~ *220 lb/syd (120 kg/m²)* placed under traffic, shall be brought up even with each adjacent lane at the end of each work day. Planned HMA courses less than or equal to ~~165 lb/syd (90 kg/m²)~~ *220 lb/syd (120 kg/m²)* shall be brought forward concurrently, within practical limits, limiting the work in one lane to not more than one work day of production before moving back to bring forward the adjacent lane. Traffic shall not be allowed on open graded mixtures.

SECTION 402, BEGIN LINE 118, DELETE AND INSERT AS FOLLOWS:

~~Recycled materials may be used in all mixtures except type C and type D surface mixtures.~~ *A maximum of 15.0% RAP or 3.0% ARS by weight (mass) of the total mixture may be used in type C and D surface mixtures provided the recycled material is 100% passing the 3/8 in. (9.5 mm) sieve and 95% to 100% passing the No. 4 (4.75 mm) sieve.*

SECTION 402, BEGIN LINE 125, DELETE AND INSERT AS FOLLOWS:

~~The binder low temperature classification for mixtures containing greater than 15.0% and up to 25.0% RAP shall be -28°C, and the binder high temperature classification may be reduced by 6°C.~~ *Mixtures containing 15.0% or less RAP shall use the same grade of binder as specified. The binder for mixtures containing greater than*

FINAL DRAFT MINUTES

15.0% and up to 25.0% RAP shall be reduced by one temperature classification, 6°C, for both the upper and lower temperature classifications.

SECTION 402, BEGIN LINE 204, DELETE AND INSERT AS FOLLOWS:

Planned HMA courses greater than ~~165 lb/syd (90 kg/m²)~~ *220 lb/syd (120 kg/m²)* placed under traffic shall be brought up even with each adjacent lane at the end of each work day. Planned HMA courses less than or equal to ~~165 lb/syd (90 kg/m²)~~ *220 lb/syd (120 kg/m²)* shall be brought forward concurrently, within practical limits, limiting the work in one lane to not more than one work day of production before moving back to bring forward the adjacent lane. Traffic shall not be allowed on open graded mixtures.

SECTION 406, BEGIN LINE 9, INSERT AS FOLLOWS:

406.02 Materials

The type and grade of asphalt material shall be in accordance with the following:

Asphalt Emulsion, AE-T, AE-PMT, *SS-1h*.....902.01(b)
PG Asphalt Binder, PG 64-22.....902.01(a)

SECTION 410, BEGIN LINE 19, DELETE AND INSERT AS FOLLOWS:

410.03 Materials

Materials shall be in accordance with the following:

Asphalt Materials
PG Binder, PG 76-22, PG 70-22.....902.01(a)
Coarse Aggregates, Class AS.....904
~~Stabilizing Additive .....AASHTO MP 8~~
Fibers ..... AASHTO M 325
Fine Aggregates (sand, mineral filler) 904

SECTION 410, BEGIN LINE 44, DELETE AND INSERT AS FOLLOWS:

410.05 SMA Mix Design

The DMF shall be determined for each mixture from a SMA mix design by a design laboratory selected from the Department's list of approved Mix Design Laboratories. A SMA mixture shall be designed in accordance with ~~the respective AASHTO references as listed below~~ *AASHTO M 325 and R 35*.

~~Standard Practice for Designing~~
~~Stone Matrix Asphalt (SMA).....AASHTO MP 8~~

~~Standard Practice for Mixture Conditioning~~
~~of Hot-Mix Asphalt (HMA).....AASHTO R 30~~

~~Standard Specification for Designing~~
~~Stone Matrix Asphalt (SMA).....AASHTO MP 8~~

~~Determining the Plastic Limit and Plasticity~~
~~Index of Soils .....AASHTO T 90~~

~~Maximum Specific Gravity and Density of~~
~~Bituminous Paving Mixtures .....AASHTO T 209~~

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~~Resistance of Compacted Asphalt Mixture to Moisture Induced Damage.....AASHTO T 283~~

~~Determination of Draindown Characteristics in Uncompacted Asphalt Mixtures .....AASHTO T 305~~

~~Method for Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor.....AASHTO T 312~~

~~Method for Viscosity Determination of Asphalt Binder Using Rotational Viscometer.....AASHTO T 316~~

SECTION 410, BEGIN LINE 121, DELETE AND INSERT AS FOLLOWS:

410.06 Recycled Materials

~~Mainline surface shall not contain recycled materials.~~ *Recycled materials may consist of reclaimed asphalt pavement, RAP, or asphalt roofing shingles, ARS, or a blend of both. RAP shall be the product resulting from the cold milling or crushing of an existing HMA pavement. The recycled material shall be 100% passing the 3/8 in. (9.5 mm) sieve and 95% to 100% passing the No. 4 (4.75 mm) sieve when entering the HMA plant. ARS shall consist of waste from a shingle manufacturing facility. No tear-off materials from roofs will be allowed. ARS shall be stockpiled separately from other materials.*

Recycled materials may be used as a substitute for a portion of the new materials required to produce mainline surface. When only RAP is used in the mixture, the RAP shall not exceed 15.0% by weight (mass) of the total mixture. When only ARS is used in the mixture, the ARS shall not exceed 3.0% by weight (mass) of the total mixture. For substitution or use, 1.0% of ARS is considered equal to 5.0% RAP. The percentages of recycled materials shall be as specified on the DMF.

The combined aggregate properties of a mixture with recycled materials shall be determined in accordance with ITM 584 and shall be in accordance with 904. Gradations of the combined aggregates shall be in accordance with 410.05.

Mixtures containing RAP shall use the same grade of binder as specified.

SECTION 410, BEGIN LINE 136, DELETE AND INSERT AS FOLLOWS:

410.09 Acceptance of Mixtures

Acceptance of mixtures for binder content, ~~moisture,~~ and gradation for each lot will be based on tests performed by the Engineer. The Engineer will randomly select the location(s) within each sublot for sampling in accordance with ITM 802. *An acceptance sample will consist of one plate sample at the random location. A backup sample will consist of one plate sample located 2 ft (0.6 m) towards the center of the mat from the acceptance sample.*

Samples from each location shall be obtained from each sublot from the pavement in accordance with ITM 580. *The Engineer will take immediate possession of the samples.*

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A maximum specific gravity sample and a binder content and gradation sample will be obtained from the plate sample in accordance with ITM 587. The binder content will be determined in accordance with ITM 586 or ITM 571 as directed by the Engineer and the gradation will be determined in accordance with AASHTO T 30. The maximum specific gravity will be determined in accordance with AASHTO T 209, Section 9.5.1. ~~The second sample shall be located from the random sample by offsetting 1 ft (0.3 m) transversely towards the center of the mat and will be used for the moisture sample~~. The test results of the sublots will be averaged and shall meet the requirements for tolerances from the JMF for each sieve and binder content.

SECTION 410, BEGIN LINE 240, DELETE AND INSERT AS FOLLOWS:

Planned SMA courses greater than ~~165 lb/syd (90 kg/m^2)~~ *220 lb/syd (120 kg/m^2)* placed under traffic, shall be brought up even with each adjacent lane at the end of each work day. Planned SMA courses less than or equal to ~~165 lb/syd (90 kg/m^2)~~ *220 lb/syd (120 kg/m^2)* shall be brought forward concurrently, within practical limits, limiting the work in one lane to not more than one work day of production before moving back to bring forward the adjacent lane.

SECTION 410, BEGIN LINE 404, DELETE AND INSERT AS FOLLOWS:

410.20 Appeals

If the QC test results do not agree with the acceptance test results, a request, along with the QC test results, may be made in writing for additional testing. ~~The basis of the appeal shall include applicable QC test results showing acceptable quality results and shall be submitted within seven calendar days of receipt of the Department's written results for that sublot. Acceptable QC test results are defined as QC test results resulting in less pay adjustment to the contract than that determined by the Department. If an appeal is granted, appeal cores shall be taken within seven calendar days after written notification unless otherwise directed. Within one work day of appeal coring operations the Contractor shall clean, dry, and refill the core holes with SMA or HMA surface materials~~*~~. The request for a~~Additional testing may ~~include~~ be requested for one or more of the following tests: binder content, gradation, or MSG of the mixture samples and bulk specific gravity of the density cores. The appeal request shall be submitted within seven calendar days of receipt of the Department's written results for that sublot. The sublot and specific test~~(s)~~s shall be specified at the time of the appeal request. Only one appeal request per sublot is permitted. Upon approval of the appeal, the Engineer will perform additional testing.*

~~The results of the appeal cores will replace the initial test results for a sublot(s) or lot and be used as the basis for acceptance.~~ *The appeal results will replace all previous test result~~(s)~~s for acceptance of mixture in accordance with 410.09 and density in accordance with 410.16. The results will be furnished to the Contractor. The backup mixture samples or density cores will be tested in accordance with the following:*

(a) ~~Mixture~~ *MSG*

~~Upon approval for the additional testing, the Contractor shall take cores in accordance with ITM 580. The core location will be within 1.0 ft (0.3 m) longitudinally of the sample tested using the same transverse offset.~~ *The backup maximum specific gravity sample will be dried in accordance with ITM 572 and tested in accordance with AASHTO T 209, section 9.5.1.*

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(b) Binder Content and Gradation

The backup binder content and gradation sample will be prepared and tested in accordance with the test methods that were used for acceptance.

~~(b)~~ ***(c) BSG of the* Density *Core***

Cores shall be taken within seven calendar days unless otherwise directed. Additional core locations will be determined by adding 1.0 ft (0.3 m) longitudinally of the cores tested using the same transverse offset. ~~Each sublot density will be calculated using the average bulk specific gravity of the cores obtained for that sublot and the average MSG of the lot.~~ *The cores will be dried in accordance with ITM 572 and tested in accordance with AASHTO T 166, Method A. The Contractor shall clean, dry, and refill the core holes with SMA or HMA surface materials within one work day of the coring operations.*

SECTION 902, BEGIN LINE 65, DELETE AND INSERT AS FOLLOWS:

4. Appeals

If the Contractor does not agree with the acceptance test results for the lot, a request may be made in writing for additional testing. The appeal shall be submitted within ~~30~~ *15* calendar days of receipt of the Department's written results. The basis of the appeal shall include complete AASHTO M 320 test results for the specific sublot in question ~~plus test values from all other sublots for the parameters being disputed~~. *The appeal results will replace all previous test results for acceptance of the lot.*

~~If an appeal is accepted, the Department will randomly select two additional sublot samples if available from the lot in question. The additional sublot samples if available and the backup sample will be tested in an AASHTO accredited laboratory for the failing test parameters. The backup and additional test results for each test will be averaged. The average value for each test will be considered the final lot value. The Contractor will be notified in writing of the additional test results, the final lot values, and the appeal conclusions.~~

~~If the appeal is not accepted, the Department will respond to the Contractor stating the grounds for the denial.~~

SECTION 902, AFTER LINE 122, INSERT AS FOLLOWS:

SS-1h is a slow setting, hard penetration type, intended for tack coats.

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SECTION 902, BEGIN LINE 125, INSERT AS FOLLOWS:

Characteristic [1] [2]	AASHTO Test Method	RS-2	HFRS-2	AE-90	AE-90S	AE-T	*SS-1h*	AE-150	AE-150L	AE-PL	AE-PMT [6]	AE-PMP [6]
Test on Emulsion												
Viscosity, Saybolt Furol at 25°C, min.	T 72			50			*20*	50				20+
Viscosity, Saybolt Furol at 25°C, max.	T 72					100	*100*		100	115	100	
Viscosity, Saybolt Furol at 50°C, min.	T 72	75	75		50			75				
Viscosity, Saybolt Furol at 50°C, max.	T 72	400	400					300				
Demulsibility w/35 mL, 0.02N CaC12, %, min.	T 59	50	50		30							
Demulsibility w/50 mL, 0.10N CaC12, %, min.	T 59			75		75					25+	25+
Oil Distillate by Distillation, mL/100 g Emul [3]	T 59	4.0	4.0	4.0	3.0	4.0	*4.0*	7.0	7.0	3.0	3.0	3.0
Residue by Distillation, %, min.	T 59	68	68	68	65 [5]	54	*57*	68	60	30		
Residue by Distillation, % max.	T 59					62			65			
Sieve Test, %, max.	T 59	0.10	0.10	0.10	0.10	0.10	*0.10*	0.10	0.10	0.10	0.10	0.10
Penetrating Ability, mm, min.	902.02(w)									6		
Stone Coating Test, %	902.02(t)3a			90				90	90			
Settlement, %, max.	T 59	5	5	5								
Storage Stability, %, max.	T 59				1							
Asphalt Content by Distillation at 204°C, %, min.											54	45
Asphalt Content by Distillation at 204°C, %, max.											62	
Tests on Residue												
Penetration (0.1 mm) at 25°C, 100g, 5 s, min. [4]	T 49	100	100	100	90	50	*40*				50	300+
Penetration (0.1 mm) at 25°C, 100g, 5 s, max. [4]	T 49	200	200	200	150	200	*90*				200	
Penetration (0.1 mm) at 25°C, 50g, 5 s, min. [4]	T 49							100	100			
Penetration (0.1 mm) at 25°C, 50g, 5 s, max. [4]	T 49							300	300			
Ductility at 25°C, mm, min.	T 51	400	400	400		400	*400*					
Solubility in Org. Sol., %, min.	T 44	97.5	97.5	97.5	97.5	97.5	*97.5*	97.5	97.5	97.5	97.5	97.5
Float Test at 50°C, s, max. [4]	T 50											
Float Test at 60°C, s, min. [4]	T 50		1200	1200	1200	1200		1200	1200			
Force Ratio	T 300				0.3							
Elastic Recovery, at 4°C	T 301				58							
Polymer Content by Infrared											1.5+	1.5+

Notes:
(1) Broken samples or samples more than 10 days old will not be tested.
(2) Combined percentage of the residue and oil distillate by distillation shall be at least 70% (note the different units – ml for oil and % for residue).
(3) Oil distillate shall be in accordance with ASTM D 396, table 1, grade no. 1
(4) The Engineer may waive the test.
(5) Maximum temperature to be held for 15 minutes 200 ± 5°C.
(6) Asphalt shall be polymerized prior to emulsification.

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REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 902, CONTINUED.

COMMITTEE COMMENTS:

Mr. Milligan will rewrite 410 to make wording consistent with 401.

The Committee decided the Department's Legal staff should review revisions related to allowing a 2" (220 lb/syd) difference between lays at the end of a day's paving.

Note: The Legal staff has reviewed revisions and concurs with revisions.

Other sections containing specific cross references:

401.05
304.05 Pg 211
401.04 Pg 222
401.06 Pg 227
402.05 Pg 243
715.12 Pg 553
718.02 Pg 568

402.13
403.07 Pg 253

410.05
410.04 Pg 267
410.09 Pg 270
410.19(a) Pg 276

410.09
410.16 Pg 273
410.19(a) Pg 276

410.20
410.09 Pg 271

902.01(b)
403.02 Pg 252
404.02 Pg 254
405.02 Pg 258
406.02 Pg 259
407.02 Pg 260
408.02 Pg 261
507.02 Pg 325

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Recurring Special Provisions potentially affected:

400-R-553

Standard Sheets potentially affected:

None

Motion: Mr. Walker
Second: Mr. Cales
Ayes: 10
Nays: 0

Action: Passed as revised

_x_ RSP Effective: February 2009 Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Received FHWA Approval? Yes

FINAL DRAFT MINUTES

SPECIFICATION REVISIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The following Concrete items require revisions to sections 501, 502, and 506:

1..AP No. 8 aggregate -- An omission in the Standards Specifications should be corrected to allow an aggregate with a gradation identified in the QCP to be used in PCCP

2. Mix Design Changes -- The requirements for conducting a trial batch because of the material and source changes to the concrete mix design for production, CMDP, have resulted in delays to contracts and is a very expensive and time consuming process. Requiring verification of the the mixture properties during production by both the Contractor and INDOT and requiring the necessary subsequent documentation of the changes will expedite the process, be less expensive, and provide the tracking of the mix designs that may be needed for future use on other contracts. These revisions are necessary for sections 501, 502, and 506.

3. Trial Batch -- The requirements for how a trial batch may be conducted, the requirements for acceptance of the trial batch, and the criteria for concrete mixtures that do not require a trial batch are not clearly designated in 501. Trial batches should be allowed for concrete produced at a plant or batched in a laboratory, and the specific acceptance criteria stated. Concrete with a higher cement content and lower water/cementitious ratio than required by 501 should be allowed to be used without a trial batch.

4.Lots and sublots -- Clarification is required for the lots and sublots in 501 when multiple mix designs are used for one pay item. Regardless of the number of mix designs, the sublots and lots are numbered and sampled consecutively as if only one mix design was used for the pay item.

5. Water/cementitious ratio frequency -- The frequency for determining water/cementitious ratio does not match the frequency manual requirement for this determination. The frequency should be revised to one water/cementitious ratio determination per two lots.

6. AASHTO T 121 -- The strike-off plate is required for the Unit Weight determination in accordance with AASHTO T 121 and the strike-off bar or strike-off plate are allowed for the Air Content by the Pressure Method in accordance with AASHTO T 152. A more accurate determination of the unit weight can be obtained using the strike-off plate and the device should be used for this test.

PROPOSED SOLUTION: The following revisions are recommended to be approved and made effective by a Recurring Special Provision.

1. Allow an alternate gradation to be used in lieu of No. 8 aggregate if identified in the QCP
2. Designate requirements for mix design material and source changes in 501, 502, and 506
3. Designate requirements for trial batch acceptance and mixtures that do not require a trial batch
4. Clarify the sublot and lot designations when multiple mix designs are used for one pay item
5. Revise the frequency of water/cementitious determinations
6. Remove the exception to AASHTO T 121 that allows the strike-off bar when determining the unit weight.

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APPLICABLE STANDARD SPECIFICATIONS: 501, 502, 506

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: Section 8

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Ron Walker

Title: Manager, Office of Materials Management

Organization: INDOT

Phone Number: 317-610-7251 x 204

Date: 11-08-08

APPLICABLE SUB-COMMITTEE ENDORSEMENT? These specification revisions are recommended by the INDOT/ACPA Technical Committee.

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REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 501, BEGIN LINE 27, INSERT AS FOLLOWS:

Coarse Aggregate, Class AP, Size No. 8*…….. ...904

SECTION 501, BEGIN LINE 53, DELETE AND INSERT AS FOLLOWS:

~~The CMDS is used to conduct a trial batch in accordance with 501.06. Upon completion of the trial batch, the Contractor shall document the adjustments to the CMDS and submit the concrete mix design trial, CMDT, to the DMTE for approval. The CMDT shall be submitted a minimum of three work days prior to production to the DMTE utilizing the Department furnished spreadsheet. Production shall not commence without an approved CMDT. Both the Contractor's and the Engineer's tests will be included in the CMDT submittal.~~

~~The CMDT is used to start production. The CMDT can be adjusted in accordance with 501.17 and will be documented as a concrete mix design for production, CMDP. The CMDP shall be submitted by the end of the second lot to the DMTE utilizing the Department's spreadsheet. Production shall stop upon the end of the first sublot of the third lot if the CMDP is not received by the DMTE.~~

~~(a) Change in Materials~~

~~A change in a CMDP to any of the following requires a new CMDS.~~

~~1. cement source, except for type I~~
~~2. cement types for IA, IIIA, ISA, IP-A, IS, II, III, IP, ISM~~
~~3. admixture type~~
~~4. pozzolan source or type~~
~~5. aggregate material~~

~~(b) Change in Source~~

~~A change in a CMDP to any of the following requires a new CMDT.~~

~~1. cement source, type~~
~~2. admixture source utilizing the same type~~
~~3. aggregate source~~

~~When changes in the CMDP are in accordance with 501.04(b), the new CMDT shall be verified on the first sublot of production in accordance with 501.06, except the DMTE will use the acceptance test results for verification. The CMDT will be documented as a CMDP after verification. Production may continue until flexural strength tests are completed as long as all other properties are in accordance with 501.05. If the flexural strength is not in accordance with 501.05, production shall stop. All PCCP constructed with the new CMDT will be adjudicated as a failed material in accordance with normal Department practice in accordance with 105.03. No CMDT adjustments in accordance with 501.17 will be allowed. The CMDP shall be submitted to the DMTE utilizing the Department furnished spreadsheet by the end of the second lot. Production shall stop upon the end of the first sublot of the third lot if the CMDP is not received by the DMTE.~~

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~~A CMDP from a previous contract may be submitted for use on additional contracts.~~

The CMDS is used to conduct a trial batch in accordance with 501.06. Upon completion of the ~~trail~~ trial batch, the Contractor shall submit the concrete mix design for production, CMDP. The CMDP shall be submitted to the DTE utilizing the Department furnished spreadsheet a minimum of three work days prior to production. Production shall not commence without an approved CMDP. Both the Contractor's and Engineer's test results from the trial batch will be included in the CMDP submittal.

A CMDP may be changed or adjusted in accordance with the following:

(a) Change in Materials

A change in a previously approved CMDP, for a given contract, to any of the following shall be submitted to the DTE as a CMDS, referencing the original CMDP.

1. *cement source or type*
2. *pozzolan source or type*
3. *coarse aggregate source or type*
4. *admixture type~~(s)~~*

A trial batch shall be conducted in accordance with 501.06, or verification of the new CMDS may be made during the first day of production by tests conducted by the Contractor and the Engineer. Acceptance test results may be used for the Engineer's verification tests. Production may continue until flexural strength tests are completed, provided all other properties are in accordance with 501.06. The test results shall be submitted to the DTE utilizing the Department spreadsheet no later than one day after the flexural strength test results are complete. If the flexural strength is not in accordance with 501.06, production shall stop and all PCCP constructed with the new CMDS will be adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.

(b) Adjustments to Materials

An adjustment in a previously approved CMDP, for a given contract, to any of the following shall be submitted to the DTE as a CMDS, referencing the original CMDP.

1. *admixture source*
2. *admixture product of the same type and from the same source designated in the original CMDP*
3. *fine aggregate source*
4. *target unit weight due to change in aggregate properties*
5. *fine to total aggregate ratio in excess of ± 3 % from the value designated by the original CMDP*
6. *increase in cement content from the amount designated in the original CMDP*

The new CMDS shall be submitted to the DTE utilizing the Department spreadsheet a minimum of one work day prior to production. A trial batch or verification testing is not required for approval. Production shall not commence without an approved CMDP.

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(c) Other Adjustments

Other adjustments in an approved CMDP, for a given contract, to any of the following will be permitted and DTE notification and approval prior to use is not required.

1. *admixture dosage rate*
2. *fine aggregate to total aggregate ratio within ± 3 % of the value designated by the original CMDP*

An approved CMDP from a previous contract may be used on additional contracts. The CMDP shall be submitted to the DTE for review and approval prior to use.

SECTION 501, BEGIN LINE 99, DELETE AND INSERT AS FOLLOWS:

501.05 Concrete Mix Criteria

The CMD shall produce workable concrete mixtures having the following properties:

~~Minimum portland cement content ..... 440 lbs/yd^3 (260 kg/m^3)~~

Minimum portland cement content..... 400 lbs/yd^3 (240 kg/m^3)

SECTION 501, BEGIN LINE 141, DELETE AND INSERT AS FOLLOWS:

501.06 Trial Batch

A trial batch shall be produced and tested by the Contractor's certified technician to verify that the CMDS ~~or CMDT~~ meets the concrete mix criteria. *Concrete produced at a plant* ~~The concrete~~ shall be batched within the proportioning tolerances of 508.02(b). *Concrete batched in a laboratory shall be in accordance with ASTM C 192.* The Engineer will test the trial batch and provide the Contractor with the results. The trial batch shall be of sufficient quantity to allow the Contractor and the Engineer to perform all required tests from the same batch. Trial batch concrete shall not be used for more than one test, except the concrete used for the unit weight (mass) may be used to conduct the air content test. *The air content shall be 5.0% to 10.0%. The plastic unit weight (mass) shall be within ± 3.0% from the target plastic unit weight of the CMDS. The water/cementitious ratio shall be within ± 0.030 of the target value of the CMDS and shall not exceed 0.450. The flexural strength shall be determined by averaging a minimum of two beam breaks and shall be a minimum of 570 psi (4000 kPa).*

~~The target unit weight (mass) and water/cementitious ratio of the plastic concrete shall be determined by the trial batch. The flexural strength shall be determined by averaging a minimum of two beam breaks.~~

Test results shall be added to the *Department spreadsheet* ~~CMDS or CMDT~~ and submitted to the D~~M~~TE in accordance with 501.04. *Adjustments to the target unit weight (mass) and the target water/cementitious ratio may be made.*

A trial batch is not required for a CMDS that has any of the following criteria:

(a) mimimum cement content of 564 lbs/yd^3 (335 kg/m^3) and a target water/~~cementitious~~ cement ratio of 0.420

(b) class C concrete in accordance with 702 using Class AP coarse aggregate

FINAL DRAFT MINUTES

SECTION 501, BEGIN LINE 165, DELETE AND INSERT AS FOLLOWS:

Lots and sublots will be *numbered and* tested ~~on the CMD's~~ for a given pay item~~.~~ ~~Lots and sublots~~ *regardless of the number of CMD's used and* will be closed out at the end of the paving season *or construction phase*.

SECTION 501, LINE 180, DELETE AND INSERT AS FOLLOWS:

Test or Determination	Frequency	Test Method	Precision
7-Day Flexural Strength	Two beams per sublot	AASHTO T 97	1 psi (10 kPa)
Air Content	One per sublot	AASHTO T 152 or ASTM C 173	0.1
Unit Weight	One per sublot	AASHTO T 121	1
Water/Cementitious Ratio	On~~e~~ per *two lots* ~~week~~	ITM 403	0.001
Thickness	Two per sublot	ITM 404	0.1

SECTION 501, BEGIN LINE 290, DELETE AS FOLLOWS:

501.17 ~~CMDT Adjustments~~ ***Blank***

~~The target water/cementitious ratio and target unit weight may be adjusted during the first lot of each year's production or as a result of fluctuations in fine or coarse aggregate specific gravities.~~

~~Adjustments to the dosage amount of admixtures will be permitted; however, a new CMDS will be required for the addition or deletion of an admixture.~~

~~The fine aggregate to total aggregate ratio may be adjusted by ±3% within the limits of 501.05.~~

SECTION 502, BEGIN LINE 40, DELETE AND INSERT AS FOLLOWS:

~~**(a) Change in Materials**~~

~~A change in a CMDP to any of the following requires a new CMDS.~~

~~1. cement type~~
~~2. admixture type~~
~~3. pozzolan type~~
~~4. aggregate material~~

~~**(b) Change in Source**~~

~~A change in a CMDP to any of the following requires a new CMDS.~~

~~1. cement source~~
~~2. admixture source~~
~~3. pozzolan source~~
~~4. aggregate source~~

~~**(c) Change in Mixture**~~

~~A change in a CMDP to any of the following requires a new CMDS.~~

~~1. proportions of aggregates by weight (mass) exceeding ± 2%~~
~~2. addition or deletion of an admixture~~

Any of the following changes or adjustments to an existing CMDP shall require a new CMDS to be submitted to the DTE.

FINAL DRAFT MINUTES

(a) cement source or type
(b) pozzolan source or type
(c) aggregate source or type
(d) admixture source or type
(e) addition or deletion of an admixture
(f) proportioning of the concrete in accordance with 502.04 as follows:

1. cement content or cement reduction
2. pozzolan to cement substitution ratio
3. target water/cementitious ratio
4. proportion of aggregate by weight (mass) exceeding ± 2 %

A CMDP in accordance with 501.05 ~~may be used upon the approval of the DMTE. A~~ *or a* CMDP in accordance with 502.04 from a previous contract may be submitted for approval ~~of~~ *to* the D~~M~~TE.

SECTION 502, BEGIN LINE 77, DELETE AND INSERT AS FOLLOWS:

~~Maximum substitution of fly ash for portland cement..... 20%~~
Maximum cement reduction for fly ash replacement..... 20%
Fly Ash/portland cement substitution ratio..... 1.25 by weight (mass)
~~Maximum substitution of GGBFS for portland cement..... 30%~~
Maximum cement reduction for GGBFS replacement..... 30%

SECTION 505, BEGIN LINE 52, DELETE AND INSERT AS FOLLOWS:

(c) Exceptions to AASHTO T 121

The exceptions to AASHTO T 121 for determining the unit weight of concrete shall be as follows.

~~1. A strike-off bar in accordance with AASHTO T 152 may be used in lieu of a strike-off plate.~~

~~2~~ *1.* Weight (mass) shall be determined to the nearest 0.01 lb (0.005 kg).

SECTION 506, BEGIN LINE 44, DELETE AND INSERT AS FOLLOWS:

~~The CMDS is used to conduct a trial batch in accordance with 506.05. Upon completion of the trial batch, the Contractor shall submit results of the concrete mix design trial to the DMTE for approval a minimum of three work days prior to production utilizing the Department provided spreadsheet. The DMTE will approve the submission as a CMDP, and production may commence. Both the Contractor's and the Engineer's tests will be included in the CMDS submittal.~~

~~**(a) Change in Material**~~

~~A change in a CMDP to any of the following requires a new CMDS.~~

~~1. cement type~~
~~2. admixture type~~
~~3. aggregate material~~

~~**(b) Change in Source**~~

~~A change in a CMDP to any of the following requires a new CMDS.~~

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~~1. cement source~~
~~2. admixture source~~
~~3. aggregate source~~

~~Verification of the new CMDS will be conducted during production including sampling and testing within the first 10 cyd (8 m^3), for the following.~~

~~1. cement source, type I only~~
~~2. admixture source, air entraining admixtures only~~

~~A new CMDP will be issued upon approval of test verification by the DMTE.~~

~~(c) Change in Mixture~~
~~A change in a CMDP to any of the following requires a new CMDS.~~

~~1. proportions of aggregates by weight (mass) exceeding ± 2%~~
~~2. addition or deletion of an admixture~~

~~A CMDP in accordance with 506.04 in the current or previous calendar year may be substituted for use upon the approval of the DMTE.~~

The CMDS is used to conduct a trial batch in accordance with 506.06. Upon completion of the trail batch, the Contractor shall submit the concrete mix design for production, CMDP. The CMDP shall be submitted to the DTE utilizing the Department furnished spreadsheet a minimum of three work days prior to production. Production shall not commence without an approved CMDP. Both the Contractor's and Engineer's test results from the trial batch will be included in the CMDP submittal.

A CMDP may be changed or adjusted in accordance with the following:

(a) Change in Materials
A change in a previously approved CMDP, for a given contract, to any of the following shall be submitted to the DTE as a CMDS, referencing the original CMDP.

1. *cement source or type*
2. *pozzolan source or type*
3. *coarse aggregate source or type*
4. *admixture type(s)*

A trial batch shall be conducted in accordance with 506.05, or verification of the new CMDS may be made during the first day of production by tests conducted by the Contractor and the Engineer. Production may continue until flexural strength tests are completed, provided all other properties are in accordance with 506.04. The test results shall be submitted to the DTE utilizing the Department spreadsheet no later than one day after the flexural strength test results are complete. If the flexural strength is not in accordance with 506.04, production shall stop and all PCCP patching constructed with the new CMDS will be adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.

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(b) Adjustments to Materials

An adjustment in a previously approved CMDP, for a given contract, to any of the following shall be submitted to the DTE as a CMDS, referencing the original CMDP.

1. *admixture source*
2. *admixture product of same type and from same source designated in the original CMDP*
3. *fine aggregate source*
4. *fine to total aggregate ratio in excess of ± 3 % from the value designated by the original CMDP*
5. *Increase in cement content from amount designated in the original CMDP.*

The new CMDS shall be submitted to the DTE utilizing the Department spreadsheet a minimum of one work day prior to production. A trial batch or verification testing is not required for approval. Production shall not commence without an approved CMDP.

(c) Other Adjustments

Other adjustments in previously approved CMDP, for a given contract, to any of the following will be permitted and DTE notification and approval prior to use is not required.

1. *admixture dosage rate*
2. *fine aggregate to total aggregate ratio within ± 3 % of the value designated by the original CMDP*

An approved CMDP, from another contract in the current or previous calendar year may be used on additional contracts. The CMDP shall be submitted to the DTE for review and approval prior to use.

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REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 506, CONTINUED.

FINAL DRAFT MINUTES

Other sections containing specific cross references:

501.04
501.06 Pg 282

501.05
501.04 Pg 279
501.04(b) Pg 280
501.08 Pg 282
501.17 Pg 285
502.03(c) Pg 297

501.06
501.04 Pg 280
501.04(b) Pg 280
501.08 Pg 282

501.17
501.04 Pg 280
501.04(b) Pg 280

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Recurring Special Provisions potentially affected:

~~None~~ New 500-R-559

Standard Sheets potentially affected:

None

Motion: Mr. Walker
Second: Mr. Tuttle
Ayes: 10
Nays: 0

Action: Passed as revised

_x_ RSP Effective: February 2009 Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Received FHWA Approval? Yes

SPECIFICATION REVISIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Mike Koch (Area Engineer, Fort Wayne) called Tom Carrow (co-chairman, "500" subcommittee for concrete pavements) with a question regarding how large a full-depth concrete patch must be before retrofitted tie bars are necessary. There is presently no guidance on this subject in the SS, the Standard Drawings, or the RSP's. It was suggested by Mr. Koch that 10' be used as a maximum length of a PCCP patch before the tie bars are specified. Tom Carrow concurs. Without a standardization of this maximum length, field personnel are left to guess where tie bars are necessary, as their locations are not typically spelled out in contract plans for patching contracts. Standard Drawing 503-CCPJ-08 already details size and spacing necessary for continuous applications (mainline and shoulder pavement); and Drawing 506-CCPP-01 gives many details specific to PCCP patching, but neither address this issue.

PROPOSED SOLUTION: Enclosed.

APPLICABLE STANDARD SPECIFICATIONS: 506

APPLICABLE STANDARD DRAWINGS: shown above

APPLICABLE DESIGN MANUAL SECTION:

APPLICABLE SECTION OF GIFE:

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Tom Carrow

Title: Co-chairman, "500" subcommittee on Rigid Pavements

Organization: INDOT Construction Management

Phone Number: 317-232-5085

Date: October 24, 2008

APPLICABLE SUB-COMMITTEE ENDORSEMENT? 500

FINAL DRAFT MINUTES

Item No. 08-15-8
Mr. Heustis
Date: 11/20/08

REVISION TO 2008 STANDARD DRAWING

506-CCPP-01 CONCRETE PAVEMENT PATCH DETAILS

FINAL DRAFT MINUTES

Other sections containing specific cross references:

None

General Instructions to Field Employees
Update Required? Y___ N___
By - Addition or Revision
Frequency Manual
Update Required? Y___ N___
By - Addition or Revision

Recurring Special Provisions potentially affected:

None

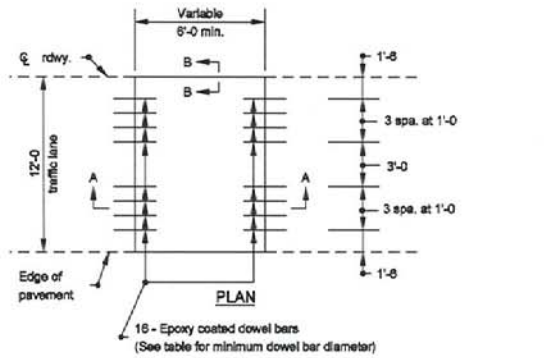
Standard Sheets potentially affected:

See Above

Motion: M
Second: M
Ayes:
Nays:

Action: Withdrawn

FOR SUBMISSION

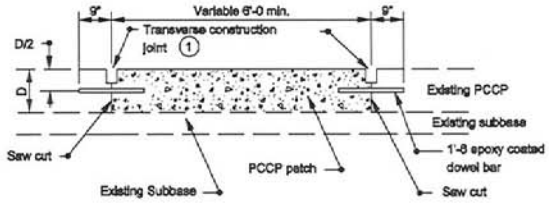


NOTES

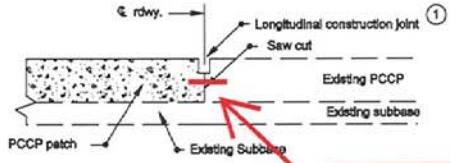
1. See Stanard Drawing E 503-CCPJ-06 for joint seal details.
2. Saw cuts and joint seal shall be omitted if PCCP is to be overlaid.

3. Minimum of 2' horizontal distance between retrofitted tie bar and the nearest D-1 contraction joint within the patch or drilled dowel bar at the end of the patch.

DOWEL BAR SIZES	
Pavement Thickness, D	Minimum Dowel Bar Diameter
Less than 9"	1"
9" through 12"	$1\frac{1}{4}$"
Greater than 12"	$1\frac{1}{2}$"

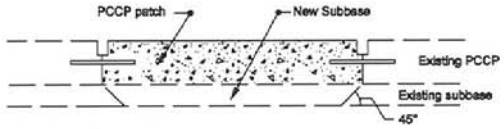


SECTION A-A



SECTION B-B

Retrofitted tie bar for PCC patches ≥ 12' in length



SECTION A-A
Where Existing Subbase must be removed

4. No retrofitted tie bars are to be placed less than 2' from any transverse joint or random crack in an adjacent PCCP lane or shoulder.

5. See Standard Drawing 503-CCPJ-07 for retrofit tie bar sizing and spacing.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE PAVEMENT PATCH DETAILS

MARCH 2006

STANDARD DRAWING NO. E 506-CCPP-01

RICHARD L. VONCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER DESIGN STANDARDS ENGINEER

/s/ Richard L. VonCleave 3-01-06
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 3-01-06
CHIEF HIGHWAY ENGINEER DATE

Source Sheet: CCPJ6

Ad Hoc Committee notes on retrofitted tie bar spacing in PCC Patches

In Attendance:

Mike Koch, AE, Fort Wayne
Pankaj Patel, Central Office Pavement Design
Tom Duncan, FHWA
Tom Carrow, Field Engineer – Construction Management

The following was agreed to in our meeting dated October 1, 2008:

1) Any PCC patch greater than or equal to 12' in length shall have retrofitted tie bars.

2) There shall be a minimum of 2' of horizontal distance between a retrofitted tie bar and the nearest D-1 joint or drilled dowel bar at the end of the patch.

3) No tie bars may be placed within 2' of any transverse joint or random crack in an adjacent PCC lane or shoulder.

4) Horizontal tie bar spacing for patches greater than 12' in length shall be in accordance with Standard Drawing 503-CCPJ-08.

It was also agreed that the language in the second paragraph of 506.10(b) needs to be reworded. Much discussion was had about potentially rewording this paragraph, but it was also agreed that making these changes would not fit within the scope of this committee's directive. It will be explored further, but not in conjunction with this group.

Summary assembled by Tom Carrow on October 1, 2008

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, DELETE LINES 1 THROUGH 779.

SECTION 701, AFTER LINE 780, INSERT AS FOLLOWS:

SECTION 701 – DRIVEN PILING

701.01 Description

This work shall consist of furnishing and driving foundation piles of the type and dimensions designated including cutting off or building up foundation piles when required. This work shall also consist of providing test piles and performing loading tests when required. Piling shall be installed at the location and to the tip elevation, the penetration depth, and nominal driving resistance shown on the plans, and shall otherwise be in accordance with 105.03.

MATERIALS

701.02 Materials

Materials shall be in accordance with the following:

Epoxy Coating for Piles .....915.01(d)
Pile Tips 915.03.1
Prestressed Concrete Piles 707
Reinforcing Bars 910.01
Steel Encased Concrete Piles.....915.01
Steel H Piles 915.02
Structural Concrete.....702
Timber Piling, Treated.....911.02(c)
Timber Piling, Untreated.....911.01(e)

Reinforcing bars within steel pipe piles and in the reinforced concrete pile encasement may be either plain or epoxy coated.

The Contractor may furnish and drive thicker walled steel pipe piles than specified.

701.03 Handling of Epoxy Coated Piles

Epoxy coated piles shall be protected at all times from damage to the epoxy coating. Damage to epoxy coated piles shall be repaired in accordance with 915.01(d). Epoxy coated piles will be rejected if the total area of repair to the coating exceeds 2% of the total coated surface area.

CONSTRUCTION REQUIREMENTS

701.04 Equipment for Driving Piles

(a) Approval of Pile Driving Equipment

All pile driving equipment including the pile driving hammer, hammer cushion, helmet or pile drive head, pile cushion, and other appurtenances furnished by the Contractor shall be in working condition and approved in writing by the Engineer prior

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to delivery of the pile driving equipment to the job site. All pile driving equipment shall be sized such that the piles can be driven to the length required without damage. Approval of pile driving equipment does not relieve the Contractor of the responsibility to drive piles, free of damage, to the required nominal driving resistance and, if specified, the minimum tip elevation shown on the plans. Pile driving equipment will be subject to satisfactory performance during production.

The Contractor shall submit to the Office of Geotechnical Engineering, a completed Pile and Driving Equipment Data Form at least 15 calendar days prior to driving piles. A copy shall also be furnished to the Engineer. The Pile and Driving Equipment Data Form will be included in the Proposal book.

If the method of pile driving approval is in accordance with the dynamic formula shown in 701.05(a), a Wave Equation analysis is not required. The alternate method will be used to determine if the pile driving equipment is acceptable for use.

If the nominal driving resistance is to be determined by the dynamic pile load test in accordance with 701.05(b) or the static load test in accordance with 701.05(c), the Engineer will use wave equation analysis for driving system approval. To be approved, the proposed driving system shall obtain the nominal driving resistance between the specified blow count range of 30 and 120 blows per foot, and shall maintain driving stresses below the specified driving stress limits for the pile type being driven. If wave equation predicted driving stresses are greater than specification limits or the wave equation blow count for the nominal driving resistance is outside the specified blow count range, the Contractor shall modify or replace the proposed equipment until subsequent wave equation analyses indicate the piles can be driven to the nominal driving resistance within the allowable blow count range and within driving stress limits.

The Contractor will be notified of the acceptance of the proposed pile driving system within 15 calendar days of the receipt of the Pile and Driving Equipment Data Form. If the driving system needs revising, the Contractor will be notified of the acceptance of the revised driving system within seven calendar days of receipt of a revised Pile and Driving Equipment Data Form.

The Contractor shall use the approved system. No variations in the pile driving system will be permitted without written approval from the Engineer, with the exception of increasing the concrete pile cushion thickness to control driving stresses. A change in the pile driving system will only be considered after the Contractor has submitted a new Pile and Driving Equipment Data Form. The Contractor will be notified of the acceptance of a proposed change in driving equipment within three work days of receipt of the Pile and Driving Equipment Data Form. If the Engineer determines the Contractor's hammer is not functioning properly and is unable to drive the piles to the required penetration depth or nominal driving resistance, the hammer shall be removed from service.

1. Wave Equation Analysis Method

For the pile driving equipment to be acceptable, the driving stresses predicted by the wave equation analysis shall not exceed the values where pile damage impends. These limiting values shall be calculated as follows:

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a. *The maximum compressive and tensile driving stresses for steel piles = $0.9F_y$.*

b. *The maximum compressive driving stress for prestressed concrete piles = $(0.85f'_c - f_{pe})$ where f_{pe} is the effective prestress value.*

c. *The maximum tensile driving stress, psi (MPa), for prestressed concrete piles = $3\sqrt{f'_c} + f_{pe}$, where f'_c and f_{pe} are expressed in psi*

$0.25\sqrt{f'_c} + f_{pe}$, *where f'_c and f_{pe} are expressed in MPa).*

d. *The effective prestress, f_{pe}, shall be obtained from the approved shop drawings.*

e. *The maximum driving stress, psi (kPa) for timber piles shall not exceed $3F_{co}$, where F_{co} is the base resistance of wood in compression parallel to the grain, in psi (kPa).*

2. Alternate Method

If the alternate method is used, the energy of the pile driving equipment shall be rated by the manufacturer at or above the appropriate minimum manufacturer's rated hammer energy for the corresponding nominal driving resistance as shown in the table below. The table below will be used as the basis of approval of pile driving equipment for the alternate method. This approval does not relieve the Contractor of the obligation to provide equipment suitable for driving the specified pile to the required bearing without damage.

ALTERNATE METHOD
MINIMUM PILE HAMMER REQUIREMENTS

Nominal Driving Resistance		*Minimum Manufacturer's Rated Energy*	
tons	*(kilonewtons)*	*ft·lbs*	*(joules)*
≤ 90	*(≤ 800)*	*12,000*	*(16 500)*
91 - 150	*(801 - 1 340)*	*21,000*	*(28 500)*
151 - 210	*(1 341 - 1 870)*	*26,750*	*(36 500)*
211 - 270	*(1 871 - 2 400)*	*37,600*	*(51 000)*
271 - 300	*(2 401 - 2 670)*	*42,000*	*(57 000)*
> 300	*(> 2 670)*	*Wave Equation Analysis required*	

The minimum rated energies do not account for losses and inefficiencies in the pile driving system. If the hammer selected cannot satisfy the minimum criteria in the above table, a wave equation analysis shall be submitted by the Contractor for approval.

(b) Pile Hammers

Piles may be driven with air, steam, diesel, or hydraulic hammers. Gravity hammers, vibratory hammers, and other pile driving methods shall be used only if specified in the contract documents or in writing by the Engineer.

1. Gravity Hammers

Gravity or drop hammers shall be used to drive timber piles only. The ram shall have a weight (mass) of between 2,000 and 3,500 lbs (900 and 1590 kg). The height of drop shall not exceed 12 ft (3.6 m). The weight (mass) of gravity hammers shall not be

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less than the combined weight (mass) of the helmet and pile. All gravity hammers shall be equipped with hammer guides and helmet to ensure concentric impact on the drive head.

2. Single or Double Acting Steam and Air Hammers

The plant and equipment furnished for steam and air hammers shall have sufficient capacity to maintain, under working conditions, the volume and pressure specified by the manufacturer of the hammer. The hose connecting the compressor with the hammer shall be at least the minimum size recommended by the manufacturer. The plant and equipment shall be equipped with accurate chamber pressure gauges which are easily accessible to the Engineer. If wave equation analysis is not used for pre-approval, the weight of the striking parts of air and steam hammers shall not be less than one third the weight of the drive head and pile being driven. The striking parts shall not weigh less than 2,800 lbs (1 270 kg). Proximity switches and an electronic readout device shall be provided prior to driving piling.

3. Diesel Hammers

Open-end or single acting diesel hammers shall be equipped with a device such as graduated rings or grooves on the ram, or a graduated scale or jump stick, extending above the ram cylinder, to permit the Engineer to visually determine hammer stroke at all times during pile driving operations. The Contractor shall provide the Engineer a chart from the hammer manufacturer equating stroke, blows per minute, and potential energy for the open-end diesel hammer to be used. The Contractor shall also provide and maintain in working order an approved device to automatically determine and display ram stroke for open-end diesel hammers.

Closed-end double acting diesel hammers shall be equipped with a bounce chamber pressure gauge, in working order, mounted near ground level so as to be read by the Engineer. The Contractor shall provide the Engineer a calibrated chart equating bounce chamber pressure to either equivalent energy or stroke for the closed-end diesel hammer to be used. This calibration to actual hammer performance shall be performed a maximum of 90 days prior to the beginning of the work.

4. Hydraulic Hammers

The power plant furnished for hydraulic hammers shall have sufficient capacity to maintain at the hammer, under working conditions, the volume and pressure specified by the manufacturer of the hammer. Hydraulic hammers shall also be equipped with a controlled variable stroke system and a readout device to measure ram energy. The plant and equipment shall be equipped with accurate pressure and velocity gauges and an energy readout device which are easily accessible to the Engineer.

5. Vibratory Hammers

Except for pile lengths which have been evaluated from load test piles, the nominal driving resistance of the piles driven with vibratory hammers shall be verified by redriving the first pile driven in each group of 10 or fewer piles with an impact hammer of suitable energy to measure the nominal driving resistance before driving the remaining piles in the group. All piles which rely on point bearing capacity shall be redriven with an impact hammer.

(c) Pile Driving Appurtenance

Pile driving aids such as jets, followers, and prebored holes shall not be used unless specified. If specified, pile driving aids shall be used for installing production piles

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only after the pile tip elevation for safe support of the nominal driving resistance is established by means of load testing or indicator test piles conventionally driven in accordance with 701.05. The Contractor shall perform all extra load tests or extra work required to drive indicator test piles as determined by the Engineer.

1. Hammer Cushion

All impact pile driving equipment, except gravity hammers, shall be equipped with a suitable thickness of hammer cushion material to prevent damage to the hammer or pile and to ensure uniform driving behavior. Impact hammers designed such that a hammer cushion is not required are excluded from this requirement. Hammer cushions shall be made of durable, manufactured materials, provided in accordance with the hammer manufacturer's guidelines. Wood, wire rope, or asbestos hammer cushions will not be permitted. A striker plate, as recommended by the hammer manufacturer, shall be placed on the hammer cushion to ensure uniform compression of the cushion material. The condition of the hammer cushion shall be checked with the Engineer when beginning pile driving at each structure or after each 100 h of pile driving, whichever is less. A hammer cushion whose thickness has been reduced to less than 75% of the original thickness shall be replaced.

2. Helmet

Piles driven with impact hammers shall have an adequate helmet that adequately distributes the hammer blow uniformly and concentrically to the pile head, be axially aligned with the hammer and the pile, be guided by the leads, and not be free-swinging. The helmet shall fit around the pile head and prevent transfer of torsional forces during driving while maintaining proper alignment of hammer and pile.

For steel and timber piling, the pile heads shall be cut squarely. For timber piles, the least inside helmet or hammer base horizontal dimension shall not exceed the pile head diameter by more than 2 in. (50 mm). If the timber pile diameter slightly exceeds the least helmet or hammer base dimension, the pile head shall be trimmed to fit the helmet.

A helmet as recommended by the manufacturer shall be provided to hold the axis of the pile in line with the axis of the hammer. The pile head shall be plane and perpendicular to the longitudinal axis of the pile to prevent eccentric impacts from the drive head.

3. Pile Cushion

The heads of concrete piles shall each be protected with a pile cushion made of plywood, hardwood, or composite plywood and hardwood materials. The use of manufactured pile cushion materials shall be by the hammer manufacturer's recommendation. The pile cushion dimensions shall equal or exceed the cross sectional area of the pile top, and shall be sized to fit the dimensions of the pile cap. The minimum pile cushion thickness placed on the pile head prior to driving shall be either as recommended by wave equation analysis or not less than 4 in. (100 mm) if the dynamic formula is used. A new pile cushion shall be provided for each pile. The pile cushion shall be replaced if, during the driving of the pile, the cushion is either compressed more than one-half the original thickness or begins to burn. Pile cushions shall be protected from weather and kept dry prior to use. Pile cushions shall not be soaked in liquid unless approved by the Engineer.

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A used pile cushion in acceptable condition shall be used for restrike tests. The used pile cushion shall be the same pile cushion from the end of initial driving on that pile unless the condition of that pile cushion is no longer within specification limits. If the original pile cushion is not within specification limits, a used cushion of similar thickness as the end of drive pile cushion shall be used.

4. Leads

Piles shall be supported in line and position with leads while being driven. Pile driver leads shall be constructed in a manner that affords freedom of movement of the hammer while maintaining alignment of the hammer and the pile to ensure concentric impact for each blow. Leads may be either fixed or swinging type. Swinging leads, when used, shall be fitted with a pile gate at the bottom of the leads. The leads shall be adequately embedded in the ground, or the pile shall be constrained in a structural frame such as a template to maintain alignment. The leads shall be of sufficient length to make the use of a follower unnecessary, and shall be designed as to permit proper alignment of batter piles.

5. Followers

Followers shall only be used if approved in writing by the Engineer. If a follower is permitted, the first pile in each bent and every tenth pile driven thereafter shall be driven full length without a follower, to verify that adequate pile length is being attained to develop the nominal driving resistance. The follower and pile shall be held and maintained in equal and proper alignment during driving. The follower shall be of such material and dimensions to permit the piles to be driven to the required penetration depth determined necessary from the driving of the full length piles.

The final position and alignment of the first two piles installed with followers in each substructure unit shall not exceed more than 3 in. (75 mm) from the locations shown on the plans before additional piles are installed.

6. Jets

Jetting will not be permitted for the installation of concrete piles unless otherwise specified. The Contractor shall determine the number of jets and the volume and pressure of water at the jet nozzles necessary to freely erode the material adjacent to the pile without affecting the lateral stability of the final in-place pile. The Contractor shall be responsible for all damage to the site caused by unapproved or improper jetting operations. If jetting is specified, the jetting plant shall have sufficient capacity to permit installation to the required elevation, location, and alignment in accordance with 701.09(b). Unless otherwise directed, external jet pipes shall be removed once the pile tip is 10 ft (3.0 m) above the prescribed tip elevation, depending on soil conditions. The pile shall then be driven to the nominal driving resistance with an impact hammer. The Contractor shall control, treat if necessary, and dispose of all jet water in accordance with 108.04. Where practical, all piles in a pile group shall be jetted to the required penetration depth before beginning pile driving. Where large pile groups or pile spacing and batter make this impractical, restrike tests on a select number of previously driven piles shall be performed to check nominal driving resistance after jetting operations are completed.

Upon completion of driving a jetted pile, all voids around the pile shall be filled with B borrow and saturated with water.

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7. Collars

Where timber piles are used, collars, bands, or other devices shall be provided to protect piles against splitting and brooming.

8. End Treatments for Piles

Pile shoes shall be used if specified by the Engineer or in the contract documents to protect all types of piles if hard driving or obstructions are expected.

End plates or conical pile tips shall be used on pipe piles. Steel pile tips shall be used on H piles if specified.

If shoes are required on timber piles, the tips of timber piles shall conform to the approved steel shoes to ensure a firm uniform contact and prevent local stresses concentrations in the timber.

701.05 Nominal Driving Resistance of a Driven Pile

The Engineer will use the following methods in determining the nominal driving resistance of a driven pile as shown in the Contract Information book.

(a) Dynamic Formula

The nominal driving resistance will be determined by means of a dynamic formula. Piles shall be driven to the penetration depth necessary to obtain the nominal driving resistance. The nominal driving resistance, as shown on the plans, can be calculated from the formula as follows:

English: $R_{ndr} = 0.5[1.75 \sqrt{E} (\log 10N) - 100]$

Metric: $R_{ndr} = 6.7 \sqrt{E} (\log 10N) - 445$

where R_{ndr} *= The nominal driving resistance in tons (kilonewtons)*

E = The manufacturer's rated energy in foot pounds (joules) at the field observed ram stroke and not reduced for efficiency

log 10N = Logarithm to the base 10 of the quantity 10 multiplied by N, where N is the number of hammer blows per 1 in. (25 mm) at final penetration.

If shown on the plans, the first pile driven at each bent and pier shall be an indicator test pile and shall be driven to the plan tip elevation or to the nominal driving resistance whichever occurs first. All indicator test piles shall be driven with impact hammers unless otherwise directed. The length of indicator test piles shall be greater than the estimated length of production piles in order to provide for variation in soil conditions. Precast concrete and treated timber test piles shall be a minimum of 10 ft (3.0 m) longer than the estimated length of piling shown on the plans. Steel piles shall be provided such that additional 10 ft (3.0 m) of driving will not require an additional splice.

The driving equipment used for driving indicator test piles shall be identical to that proposed for use on the production piling and shall be subject to approval. The Contractor shall excavate the ground at each indicator test pile location to the elevation

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of the bottom of the footing before the pile is driven, unless shown on the plans or otherwise directed.

To assess the effects of relaxation and setup, each indicator test pile shall be restruck after a minimum 24 h waiting period unless otherwise approved. The hammer shall be warmed up before driving begins by applying at least 20 blows to another fixed object. The maximum amount of penetration required during restrike shall be 3 in. (75 mm), or the total number of hammer blows shall be 20, whichever occurs first. If the indicator test pile does attain the nominal driving resistance upon restriking, the penetration resistance attained during initial driving shall be used to establish the adequacy of production piles. If the nominal driving resistance is not attained upon restriking, the Contractor shall redrive the indicator test pile until it achieves the nominal driving resistance and repeat the restrike procedure described above. If the nominal driving resistance is still not obtained, pile driving shall immediately stop and the Office of Geotechnical Engineering will be contacted.

A record of driving indicator test piles, which includes the number of hammer blows per 1 ft (0.3 m) for the entire driven length, the as-driven length, cutoff elevation, penetration, and all other pertinent information will be kept by the Engineer. The penetration resistance at various hammer strokes versus nominal driving resistance relationship will be determined based on the driving of representative indicator test piles.

If indicator piles are not shown on the plans, all piles shall be driven to the nominal driving resistance and restriking is not required.

(b) Dynamic Pile Load Test

Dynamic monitoring will be performed for the purpose of obtaining the nominal driving resistance, pile driving stresses, pile integrity, and pile driving system performance. Dynamic monitoring will be conducted by the pile driving analysis, or PDA, consultant in accordance with ASTM D 4945. The PDA consultant will be acquired by the Department. The pile driving analysis shall be performed on the first pile driven. The length of the pile used in the dynamic pile load test shall be a minimum of 10 ft (3.0 m) greater than the estimated length of production piles in order to provide for variation in soil conditions. The Contractor shall assist the Department in obtaining dynamic measurements with the PDA during initial pile driving and during pile restrikes. If a static load test is required, the dynamic pile load test shall be performed on the same pile as the pile used in the static load test. The restrike for the dynamic pile load test on a static load test pile shall be performed within 48 hours of completion of the static load test.

1. Scheduling

The Contractor shall give notice to the Engineer at least 7 calendar days before the scheduled date of driving piles to be monitored. The Contractor shall confirm the driving date 3 working days prior to the scheduled driving date.

2. Dynamic Monitoring

The Contractor shall make the steel piles available so that the PDA consultant can predrill the required instrument attachment holes prior to the Contractor placing the pile in the leads. Each pile to be tested shall be instrumented with force and acceleration transducers provided by the PDA consultant. The Contractor shall install the transducers before striking the pile. The Contractor shall expect a delay of 1 h per pile for attaching

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the dynamic monitoring equipment to the pile. The pile driving may have to be temporarily interrupted for the transducers to be adjusted or replaced, or for the monitoring results assessed.

Prior to placement in the leads, the Contractor shall make each designated concrete or timber pile available for taking of wave speed measurements and for predrilling the required instrument attachment holes. When wave speed measurements are made, the piling shall be in a horizontal position and not in contact with other piling. Predriving wave speed measurements will not be required for steel piles. The Contractor shall mount the instruments near the head of the pile after the pile is placed in the leads.

Unless otherwise directed, the Contractor shall drive the test pile to the minimum tip elevation and to the penetration depth at which the dynamic test equipment indicates that the nominal driving resistance shown on the plans and in accordance with 701.04(a) has been achieved. The Contractor may reduce the driving energy transmitted to the pile by using additional cushions or reducing the energy output of the hammer in order to maintain stresses below the values shown in 701.04(a)1. If non-axial driving is indicated by the dynamic test equipment measurements, the Contractor shall immediately realign the hammer system. Upon determination by the Engineer that valid data have been secured, the Contractor shall assist the PDA consultant with the removal of the instrumentation from the pile.

3. Restrike

The Contractor shall wait the specified minimum time period prior to the restriking of a dynamic load test pile. The Contractor shall allow 1 h per pile and shall assist the PDA consultant with the reattachment of the dynamic test instruments. The hammer shall be warmed up before restriking begins by applying at least 20 blows to another pile or other fixed object. The maximum amount of penetration required during restrike will be 3 in. (75 mm), or the total number of hammer blows will be 20, whichever occurs first. If the pile does not achieve the required nominal driving resistance during restrike, the Engineer will either accept the tip elevation or specify additional pile penetration and testing.

The Contractor shall indicate at which substructure location production pile driving is to begin. The PDA consultant will provide these final driving criteria first. Once the restrike test for the test pile is complete, the PDA consultant will run CAPWAP analyses and will provide the Office of Geotechnical Engineering with final driving criteria to be used for the pile and hammer system. The final driving criteria for the substructure location specified by the Contractor will then be provided to the Contractor within 2 work days of the restrike test. Production piles driven prior to receipt of the final driving criteria shall be done at the Contractor's risk. Final driving criteria for additional structures will be provided within 48 hours of the restrike test excluding Sundays and holidays or, when multiple test piles are restruck the same day, at a rate of one substructure location per work day in the order requested by the Contractor.

(c) Static Load Test

A static load test shall be conducted on a non-production test pile at the location shown on the plans. The test pile axial deflection in compression shall be verified by performing actual loading tests of the designated static load test pile in accordance with ASTM D 1143-07, Quick Load Test Method, with loads applied by hydraulic jack. The test shall be continued until either plunging failure is achieved or the capacity of the

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loading system is reached. The nominal pile resistance will be determined from the settlement versus load curve generated by the incremental loading in accordance with 701.05(c)1.

The top elevation of all test piles shall be determined immediately after driving and again just before load testing to check for heave. A pile which heaves more than 1/4 in. (6 mm) shall be redriven, or jacked, to the original elevation prior to testing. The Contractor shall wait 36 h between the driving of a load test pile and the commencement of the load testing unless otherwise specified.

The Contractor shall provide complete protection at all times for the pile, supports, and reference beam from wind, direct sunlight, frost action, or other disturbances. The Contractor shall maintain an air temperature in the immediate vicinity of the test pile and reference beam of not less than 50°F (10°C) and shall provide adequate lighting for the duration of the test.

No production piles shall be driven until completion of the static pile load test unless approved by the Engineer. Reaction piles shall be driven prior to driving the static load test pile.

1. Load Test Procedure

The Contractor shall furnish and construct a suitable reaction frame or load platform to provide a load on the pile having a capacity of 1000 t (8900 kN) or 150% of the nominal driving resistance, whichever is less. A minimum of five days prior to construction of the reaction frame or load platform, the Contractor shall submit, for review and approval, detailed scale drawings for the reaction frame or load platform and loading apparatus including the distances between the load test pile and all reaction piles and reference beam supports. The submittal shall also include a scaled profile drawing of the loading apparatus detailing the ground surface elevation, the pile cutoff elevation, and the dimensions and locations of all bearing plates, the jack, the load cell, the spherical bearing plate, and the reaction beam or platform. The reaction frame and loading apparatus shall be designed and stamped by a professional engineer. The submittal shall include calibration certifications for the hydraulic jacks, load cell, pressure gauges, and hydraulic pumps conducted within 30 days of the load test. If required by the Engineer, the jack, load cell, and pressure gauge shall be recalibrated after the load test. The loading apparatus shall be constructed to allow the various increments of the load to be placed gradually, without causing vibration to the test pile. If the approved method requires the use of tension or reaction piles, the reaction piles, if feasible, shall be of the same type and diameter as the production piles, and when possible shall be driven in the location of permanent piles. Reaction piles that are the same type and diameter as the production piles and are driven in the location of permanent piles will be considered permanent piles. Timber or tapered piles installed in permanent locations shall not be used as tension piles. The primary method of determining the applied load shall be from a calibrated load cell. Incremental loads of 5% of the nominal driving resistance shall be placed on the pile at 5 min intervals until continuous jacking is required to maintain the incremental load or the capacity of the load frame is reached. While performing the load test, the Contractor shall provide OSHA approved safety equipment and follow OSHA safety procedures. Support for the load test plates, jack, and ancillary devices shall be provided to prevent them from falling in the event of a release of load due to hydraulic failure, test pile failure, or other cause.

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The Contractor shall furnish the hydraulic pump, load cell, spherical bearing plate, and two reference beams. Each reference beam shall be a W or M section, of minimum length of 20 ft (6 m), and a weight (mass) of 5 to 20 lb/ft (7.5 to 30 kg/m) unless otherwise approved. The Engineer will conduct the static load test and will provide the gauges to measure movement of the test pile. The Contractor shall assist in performing the static load test by operating the pump, reading the gauges, etc. The Contractor shall furnish and install telltale rods encased in a lubricated pipe in the test pile prior to the static load test.

If the nominal pile resistance of a pile from the load settlement curve does not equal or exceed the nominal driving resistance shown on the plans, the Contractor shall redrive the pile to an adequate nominal driving resistance. The increase in nominal driving resistance shall be determined by the PDA. The pile shall be load tested again after the appropriate waiting period. Load tests shall be repeated as many times as necessary until the pile carries the required load. The pile resistance will be determined from the test data in accordance with section 10.7.3.8.2 of the AASHTO Load Resistance Factor Design Bridge Design Specifications.

2. Hydraulic Jacks, Pressure Gauges, and Load Cell

Hydraulic jacks and pressure gauges shall be used for the superimposed load. The jacks, pressure gauges, load cell, and hydraulic pumps shall be calibrated with each other within the last 30 days by an independent laboratory. When a jack, pressure gauge, load cell, and hydraulic pump are calibrated, they shall be calibrated and used as a unit. All calibration checks shall be within 5% of the applied load if calibrated as a unit. Changing one of the four components shall require recalibration prior to use. Pressure gauges shall be of the size that provides ease of reading: approximately 4 1/2 in. (110 mm) diameter with gradations in accordance with ASTM D1143-07. Hydraulic jacks shall have a nominal load capacity exceeding the maximum anticipated jack load by at least 20%. The jack, pump, and any hoses, pipes, fittings, gauges, or transducers used shall be rated to a safe pressure corresponding to the nominal jack capacity. The Contractor shall provide copies of the most recent calibration certification a minimum of 5 days prior to the Static Load Test.

3. General Requirements

On completion of the load testing, a test pile or anchor pile which is not a part of the finished structure shall be removed or cut off at least 1 ft (0.3 m) below either the bottom of footing or the finished ground elevation if not located within the footing area.

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701.07 Piling Length

The lengths of piles shown on the plans and in the Schedule of Pay Items are estimated lengths and are for bidding purposes only. The Contractor shall provide the actual length of piles necessary to obtain the nominal driving resistance and penetration depth required as determined from results obtained from driving representative test piles or other pertinent data. There will be expected variations in final tip elevations due to differences in nominal pile driving resistance. The final tip elevation of each pile will be determined during the driving operation. If minimum tip elevations are specified, the Contractor shall drive piles to a penetration depth that satisfies this requirement in addition to the nominal driving resistance. If no penetration depth or minimum tip elevation is specified, the pile shall be driven a minimum of 10 ft (3.0 m) below the

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bottom of the footing elevation. The Contractor shall also furnish satisfactory evidence as to the identification, such as heat numbers for steel piles, of all portions of a built-up pile.

The limits of the epoxy coated steel pipe portion of the pile, and the limits of the reinforced concrete shall be as shown on the plans.

701.08 Nominal Driving Resistance of Production Piles

Piles shall be driven to the penetration depth necessary to obtain the nominal driving resistance, as determined by 701.05. For acceptance, the Engineer will record the number of hammer blows per 12 in. of pile movement for the last 12 in. of driving. Production piles shall also attain the minimum pile tip elevation, if a minimum pile tip elevation is shown on the plans.

Practical refusal will be defined as 20 blows per inch (25 mm) of penetration with the hammer operated at its maximum fuel or energy setting, or at a reduced fuel or energy setting recommended by the Engineer based on pile installation stress control and less than 1/4 in. rebound per blow. The Contractor shall stop driving as soon as the Engineer determines that the pile has reached practical refusal.

Jetting or other methods shall not be used to facilitate pile penetration unless shown on the plans. The nominal driving resistance of jetted piles shall be based on impact driving penetration resistance after the jet pipes have been removed. Jetted piles not attaining the nominal driving resistance at the ordered length shall be spliced and driven with an impact hammer until the nominal driving resistance is achieved in accordance with the driving criteria in 701.05.

The required nominal driving resistance of piles driven with followers will only be considered acceptable if the piles with followers attain the same tip elevation as the full length piles driven without followers, installed in accordance with 701.04(c)5.

The required nominal driving resistance of piles driven with vibratory hammers shall be based on the driving resistance recorded during impact driving after the vibratory equipment has been removed from the first pile in each group of 10 piles. Vibrated piles not attaining the nominal driving resistance at the ordered length shall be spliced and driven with an impact hammer until the nominal driving resistance is achieved in accordance with the driving criteria in 701.05. Once the nominal driving resistance is attained, the remaining 9 piles in the group shall be installed to similar penetration depths with similar vibratory hammer power consumption and rate of penetration as the first pile.

701.09 Preparation and Driving

For steel and timber piling, the pile heads shall be plane and perpendicular to the longitudinal axis of the pile before the helmet is attached. The pile heads shall be protected with a hammer cushion.

Precast concrete pile heads shall be flat, smooth, and perpendicular to the longitudinal axis of the pile. Prestressing strands shall be cut off below the surface of the end of the pile. The pile head shall be chamfered on all sides. The heads of all concrete piles shall be protected with a pile cushion.

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Approval of a pile hammer relative to driving stress damage will not relieve the Contractor of responsibility for piles damaged due to misalignment of the leads, failure of hammer cushion or cushion material, failure of splices, malfunctioning of the pile hammer, improper construction methods, etc. Piles damaged for such reasons will be rejected and shall be replaced if the Engineer determines that the damage impairs the strength of the pile.

(a) Pilot Holes

After a pile is driven, all voids around the pile shall be filled with B borrow. Water shall be added to the hole to saturate the final placement of B borrow.

If the Engineer determines that preboring or predrilling has disturbed the nominal driving resistance of previously installed piles, those piles that have been disturbed shall be restored by means of redriving or other approved remedial measures. Redriving or other remedial measures shall be instituted after the preboring or predrilling operations in the area have been completed.

1. Preboring

If stated in the contract documents, the Contractor shall prebore holes at pile locations to the depths shown on the plans. Prebored holes shall be 2 in. smaller than the diameter or diagonal of the pile cross section that is sufficient to allow penetration of the pile to the specified penetration depth. If subsurface obstructions, such as boulders or rock layers, are encountered, the hole diameter may be increased to the least dimension which is adequate for pile installation.

Augering, wet-rotary drilling, spudding, or other methods of preboring shall be used only when specified or approved. The procedures shall be carried out so as not to impair the nominal driving resistance of the piles already in place or the safety of existing adjacent structures.

Except for end bearing piles, preboring shall be stopped at least 5 ft (1.5 m) above the pile tip elevation shown on the plans. The pile shall be driven with an impact hammer to the specified penetration resistance. Where piles are to be end-bearing on rock or hardpan, preboring may be carried to the surface of the rock or hardpan. The piles shall then be driven with an impact hammer to ensure proper seating.

2. Predrilling

Before driving piles for the end bents, holes to receive the piling shall be predrilled or spudded through the new embankment height to the original ground elevation if the new embankment is 10 ft (3.0 m) or more in height. If the new embankment is less than 10 ft (3.0 m) in height, predrilling is not required. The hole shall have a diameter of not less than the greatest dimension of the pile cross section plus 6 in. (150 mm). If the new embankment in the area of the end bents is to be constructed of sand, gravel, or other permeable material in which a predrilled hole would not remain open, the piling shall be driven before the embankment is constructed.

3. Cored Hole in Rock

Holes may be required to be cored into rock to accommodate pile placement. The approach grade shall be completed before coring is begun. Holes of the diameter shown on the plans shall then be predrilled through the embankment into solid rock to the elevations shown on the plans or as otherwise directed. The piles shall be driven to

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practical refusal at the bottom of the cored holes. The holes in cored rock shall then be filled with concrete. Predrilled holes through embankment shall be filled with B borrow as described above.

(b) Location and Alignment Tolerance

A maximum deviation of 1 1/2 in. (38 mm) in any direction from the plan position will be permissible in pile trestle bents and exposed pile bents. A maximum deviation of 6 in. (150 mm) in any direction will be permitted for a foundation pile in footings for piers or abutments. The tendency of concrete or steel piles to twist or rotate shall be prevented and corrected. Piles to be swaybraced shall be aligned as necessary so that the swaybracing may be properly welded to the piles. No pile shall be nearer than 4 in. (100 mm) from an edge of the cap. Pulling laterally on installed piles to correct misalignment, or splicing a properly aligned section on a misaligned section shall not be done unless approved by the Engineer. The pile head at cutoff elevation shall be within 2 in. (50 mm) of plan elevation for bent caps supported by piles.

Piles driven at integral end bents shall be installed so that the axial alignment of the top 10 ft (3 m) of the pile is within 2% of the specified alignment.

If the location or alignment tolerances are exceeded, the extent of overloading shall be investigated. If the Engineer determines that corrective measures are necessary, such corrective measures shall be designed and constructed. Proposed corrective measures will be subject to approval.

(c) Heaved Piles

The Contractor shall take an elevation reading on each pile in a foundation immediately after each pile in that foundation has been driven and again after all piles in that foundation have been driven. Level readings for checking on pile heave shall continue until the Engineer determines that such checking is no longer required. All piles which have heaved more than 1/4 in. (6 mm) shall be redriven to the required resistance or penetration. If pile heave is detected for pipe piles, the piles shall be redriven to original position prior to filling with concrete. A hammer-pile cushion system shall be submitted and approved prior to redriving pipe piles which have been filled with concrete.

(d) Installation Sequence

The order of placing individual piles within a pile group shall begin from the center of the group and proceed outward in both directions unless an alternate installation sequence is approved in writing. For a single row of piles in a bent, the order of placing individual piles shall begin at one end and proceed toward the other end.

(e) Inspection

The Engineer shall be given 24 h notice before driving piling. No pile shall be driven except in the presence of the Engineer.

Prior to placing concrete in driven pipe piles, the Contractor shall supply a light for the inspection of each pipe throughout its entire length.

(f) Pouring Concrete

After all water and other foreign substances have been removed from the pipe piles and the final approval given, reinforcing bars, if specified, shall be placed, and the

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pipe piles shall be filled with class A concrete in the presence of the Engineer. Concrete shall be deposited into pipe piles in a stream with a cross-sectional area that is no more than approximately 50% of the area of the pipe pile to prevent air pockets from forming. At a minimum, concrete shall be vibrated in the upper 25 to 30 ft (7.5 to 9.0 m) of the pipe piles. Concrete shall not be placed in pipe piles until all pile driving has progressed beyond a radius of 15 feet (4.5 m) from the pile to be concreted. All pile driving within the above limits shall be discontinued until the concrete in the last pile cast has set for at least 48 h.

701.10 Unsatisfactory Piles

The method used in driving piles shall not subject the piles to excessive or undue abuse which produces deformation of the steel, injurious splitting, splintering, and brooming of the wood, or crushing and spalling of the concrete. All piles damaged during driving due to internal defects, improper driving, being driven out of its proper location, or being driven below the designated cutoff elevation shall be corrected as directed.

Piles which have been bent, or otherwise damaged, during installation shall be considered unsatisfactory unless the nominal driving resistance is proven by load tests performed by the Contractor. If such tests indicate inadequate pile resistance, corrective measures such as the use of the bent piles at reduced pile resistance, installation of additional piles, strengthening of the bent piles, or replacement of the bent piles shall be done as approved by the Engineer.

A concrete pile will be considered defective if a visible crack appears around the entire periphery of the pile or if a defect is observed, as determined by the Engineer.

701.11 Splicing Piles

Full length piles shall be placed in the leads if practical. However, if splicing is necessary, the following methods shall be used.

(a) Steel Piles

Splicing of steel piles shall be made as shown on the plans. For H piles, a mechanical splice or quick splice shall not be used within 20 ft. of the ground surface unless it is proven that the splice can transfer the full pile strength in compression, tension, and bending. Splices for pipe piles shall be watertight. All work shall be done with approved methods and materials and by welders qualified in accordance with 711.32. There shall not be more than two splices exposed to view in each length of piling after driving is completed. A mechanical splice or quick splice shall not be used in integral end bents. The final driven location of splices on adjacent piles shall be located at different penetration depths.

(b) Timber Piles

Timber piles shall not be spliced.

(c) Concrete Piles

Full length concrete piles shall be used where practical. If splicing is necessary, concrete splice details shall conform to the contract documents. Mechanical splices including drive-fit splices may also be used if the splice can transfer the full pile strength in compression, tension and bending.

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701.13 Cut-Off Lengths

The tops of all steel pile shall be cut off at the elevation shown on the plans. All unused cut-off lengths shall become the property of the Contractor and shall be removed from the project site.

The length of timber pile above the elevation of cut-off shall be sufficient to permit the complete removal of all material injured by driving. Immediately after making final cut-off on treated timber foundation piles, the cut area shall be given an application of copper napthenate until visible evidence of further copper napthenate penetration has ceased. The copper naphthenate solution shall have minimum 2.0% copper metal.

Timber piling supporting timber structures where the piles are cut off, but not concrete capped, shall be treated with an application of copper naphthenate as described above. A layer of saturated building felt or fiberglass cloth which overlaps the side of the pile at least two inches shall be securely fastened and completely covered with 20 gauge thick galvanized metal or aluminum sheeting. All cuts, injuries, and holes, which occur from removal of nails or spikes that penetrate the treating zone as well as bolt holes for connections, shall be treated by applying coal-tar roof cement in accordance with ASTM D 5643.

701.14 Method of Measurement

Piles, epoxy coated piles, indicator or dynamic test piles used as production piles, prebored holes to facilitate driving, and cored holes in rock will be measured by the linear foot (meter) complete in place. Treated and untreated timber piles will be measured by the linear foot (meter) furnished and by the linear foot (meter) driven. Dynamic pile load test, static pile load test, indicator test pile restriking, dynamic test pile restriking, and pile tips will be measured per each.

Encasement, class A concrete filling, reinforcing bars, epoxy coating, reaction piles if not used as production piles, splices, drilling, cleaning of drilled holes, drilling fluids, sealing materials, and casing will not be measured for payment. Predrilling, jetting, followers, spudding, or other methods used to facilitating pile driving will not be measured for payment.

701.15 Basis of Payment

The accepted quantities of steel pipe encased concrete piles, epoxy coated steel pipe encased reinforced concrete piles, steel H piles, epoxy coated steel H piles, reinforced concrete encased steel H piles, concrete piles, prebored holes to facilitate driving, and cored holes in rock will be paid for at the contract unit price per linear foot (meter) for the thickness and diameter, or size specified, complete in place. Indicator test piles and dynamic test piles incorporated into the finished structure as production piles will be paid for at the contract unit price per linear foot (meter). Indicator test piles, dynamic test piles, and static load test piles not incorporated into the finished structure will be paid for by the linear foot, complete in place. The accepted quantities of furnished timber piles will be paid for at the contract unit price per linear foot (meter). The accepted quantities of driven timber piles will be paid for at the contract unit price per linear foot (meter). The dynamic pile load test, static pile load test, test pile restriking, and pile tips will be paid for at the contract unit price per each for the pile size or designation specified.

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(a) Timber Piles Furnished

Timber foundation piles including piles used as test piles, but not including test piles driven outside the limits of the structure, will be paid for at the contract unit price per linear foot (meter) for pile, timber, furnished, for the length of accepted piles actually placed in the leads, except as follows. For all timber piles delivered to the project on written orders and accepted but not used because of unforeseen foundation conditions or a change in plans, payment will be made at 50% of the contract unit price for timber piles furnished. Such piling shall remain the property of the Contractor, and shall be removed from the project site before the completion of the work.

(b) Timber Piles Driven

Timber piles driven, complete in place and accepted, including test piles, will be paid for at the contract unit price per linear foot (meter) for pile, timber, driven. Payment will be made only for actual number of linear feet (meters) of piling left in place.

(c) Epoxy Coated Piles

Epoxy coated piles may be furnished and driven at lengths greater than those shown on the plans. Additional lengths of such epoxy coated piles left in place and accepted will be paid for as steel pipe encased piles or steel H piles.

Payment will be made under:

Pay Item	***Pay Unit Symbol***
Cored Hole in Rock, _____ in. (mm) *diameter*	*LFT (m)*
Dynamic Pile Load Test	*EACH*
Pile, Concrete _____ x _____ *size*	*LFT (m)*
Pile, Concrete, Steel Pipe Encased, _____, _____ *pipe wall thickness diameter*	*LFT (m)*
Pile, Reinforced Concrete, Steel Pipe Encased, *Epoxy Coated, _____, _____* *pipe wall thickness diameter*	*LFT (m)*
Pile, Steel H, Epoxy Coated, HP _____ x _____ *size*	*LFT (m)*
Pile, Steel H, HP _____ x _____ *size*	*LFT (m)*
Pile, Steel H, Reinforced Concrete Encased, HP _____ x _____ *size*	*LFT (m)*
Pile, Timber, Driven	*LFT (m)*
Pile, Timber, Furnished	*LFT (m)*
Pile, Timber, Treated, Driven	*LFT (m)*
Pile, Timber, Treated, Furnished	*LFT (m)*
Pile Tip, _____, _____ *pile size type*	*EACH*
Prebored Hole, _____ in. (mm) *diameter*	*LFT (m)*
Static Pile Load Test, _____ *pile size*	*EACH*

FINAL DRAFT MINUTES

Test Pile, Dynamic, _____, Non-Production ..... LFT (m)
pile size
Test Pile, Indicator, _____, Non-Production..... LFT (m)
pile size
Test Pile, Static Load, _____, Non-Production ..... LFT (m)
pile size
Test Pile, Dynamic, Production ..... LFT (m)
Test Pile, Indicator, Production..... LFT (m)
Test Pile, Dynamic, Restrike ..... EACH
Test Pile, Indicator, Restrike..... EACH

Excepting the cost of the test pile and test pile restrike, all other costs associated with the dynamic pile load test shall be included in the cost of the dynamic pile load test.

Excepting the cost of the test pile, all other costs associated with the static pile load test shall be included in the cost of the static pile load test.

The cost of predrilling holes shall be included in the cost of the piling.

The cost of furnishing, driving, placing piles, concrete or B borrow necessary to fill cored or prebored holes, and all necessary incidentals shall be included in the cost of this work.

The cost of the following shall be included in the cost of steel pipe encased piles or steel H piles.

(a) amounts cut off;
(b) broken, bent, damaged, or misplaced piles;
(c) concrete filling;
(d) corrective location or alignment measures;
(e) epoxy coating;
(f) furnishing or splicing steel encased piles;
(g) modifying or replacing pile driving equipment;
(h) redriving piles which have heaved more than 1/4 in. (6 mm);
(i) reinforcing bars;
(j) repairing epoxy coating;
(k) replacing epoxy coated piling;
(l) restriking production piles not shown as test piles;
(m) pipe piles which are not acceptable or damaged during driving;
(n) pipe piles which were not driven in accordance with these specifications; and
(o) splicing of jetted sites.

No payment will be made for pipe piles or H-piles delivered to the project site but not used due to unforeseen foundation conditions or a revision in the plans. Such pipe piles or H piles shall remain the property of the Contractor and shall be removed from the project site before completion of the work. No additional payment will be made if the Contractor elects to furnish and drive thicker walled pipe piles than specified.

FINAL DRAFT MINUTES

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

The cost of reaction piles used in the static load test shall be included in the cost of the static load test. The reaction piles will not be paid for as production piles, even if used as production piles.

The cost of timber cut-off piling; piling which is not driven in accordance with these specifications; piling which was not ordered or is not acceptable; broken, split, or misplaced piles; piles driven with tops lower than the cutoff elevation; and all labor, equipment, and necessary incidentals shall be included in the cost of the pile, timber, driven. Such cost shall not include the cost of furnishing the piles.

The cost of spudding or jetting of concrete piles to obtain the desired penetration shall be included in the cost of concrete piling.

An increase in size of cap to satisfy edge distance requirements, when approved, shall be at no additional cost to the Department.

FINAL DRAFT MINUTES

Other sections containing specific cross references:

203.19 Pg 146
206.06 Pg 172
712.06 Pg 537

Recurring Special Provisions potentially affected:

701-B-132

Motion: M
Second: M
Ayes:
Nays:

General Instructions to Field Employees
Update Required? Y___ N___
By - Addition or Revision
Frequency Manual
Update Required? Y___ N___
By - Addition or Revision

Standard Sheets potentially affected:

None

Action: Withdrawn

PROPOSAL TO ITEMS 08-15-10, 08-15-11, 08-15-16, 08-15-21

SPECIFICATION REVISIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Elastomeric bearing devices are currently standardized only for prestressed-concrete I beams and box beams. There are no standardized devices for prestressed-concrete bulb-tee beams or structural-steel members. These must be independently designed and fabricated each time for each such structure.

PROPOSED SOLUTION: Develop elastomeric-bearing-devices standard details for bulb-tee and structural-steel members. Also, make the currently standardized devices complement those to be newly standardized. Develop a dedicated Standard Specifications section to construction requirements for this work. Revise the Standard Specifications' materials requirements as required for this work. Develop a design policy for this work.

Conceptual proposal was passed by the Standards Committee on Sept. 11, 2008.

APPLICABLE STANDARD SPECIFICATIONS: Revised 702.03, 711.02, 711.73, proposed 726, revised 915.04.

APPLICABLE STANDARD DRAWINGS: Existing 707-BEBP-01, -02, -03 to be deleted. New 726-BEBP-01,
-02, -03, and -04 to supersede them.

APPLICABLE DESIGN MANUAL SECTION: Part 6, Sec. 67-4.03 and 67-4.04

APPLICABLE SECTION OF GIFE: Unknown

APPLICABLE RECURRING SPECIAL PROVISIONS: 726-B-044

Submitted By: Anne Rearick

Title: Structural Services Office manager

Organization: INDOT

Phone Number: 232-5152

Date: 10-27-08

APPLICABLE SUB-COMMITTEE ENDORSEMENT? Yes, by ad-hoc subcommittee of Ken Anderson, Bob Knowles, Elizabeth Zurawska, and Tony Uremovich.

FINAL DRAFT MINUTES

Item No. 08-15-10
Ms. Rearick
Date: 11/20/08

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 702, AFTER LINE 38, INSERT AS FOLLOWS:

Elastomeric Bearings ..... ~~726~~, *915.04*

FINAL DRAFT MINUTES

Other sections containing specific cross references:

None

Recurring Special Provisions potentially affected:

None

Motion: Ms. Rearick
Second: Mr. Walker
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Standard Sheets potentially affected:

726-BEBP-01, 02, 03, and 04

Action: Passed as revised

___ RSP Effective: _____ Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Withdrawn ____

Received FHWA Approval? Yes

Item No. 08-15-11
Ms. Rearick
Date: 11/20/08

REVISION TO 2008 STANDARD SPECIFICATIONS

~~SECTION 711, LINE 12, INSERT AS FOLLOWS:~~

~~Elastomeric Bearings .....726, 915.04~~

SECTION 711, BEGIN LINE 1222, DELETE AND INSERT AS FOLLOWS:

The costs of drilling holes for anchor bolts, *elastomeric bearings,* fabrication, erecting falsework, welding material, Charpy V-Notch toughness tests, and necessary incidentals shall be included in the costs of the pay items *in this section.*

FINAL DRAFT MINUTES

Other sections containing specific cross references:

None

Recurring Special Provisions potentially affected:

None

Motion: Ms. Rearick
Second: Mr. Walker
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Standard Sheets potentially affected:

726-BEBP-01, 02, 03, and 04

Action: Passed as revised

___ RSP Effective: _____ Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Withdrawn ____

Received FHWA Approval? Yes

INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

Design Memorandum No. 08-__
Technical Advisory

October 27, 2008 DRAFT

TO: **All Design, Operations, and District Personnel, and Consultants**

FROM: _____
Anthony L. Uremovich
Design Resources Engineer
Production Management Division

SUBJECT: **Bridge Elastomeric Bearing Pads and Assemblies**

REVISES: ***Indiana Design Manual*** **Sections 67-4.03 and 67-4.04**

EFFECTIVE: **_____, 2008, Letting**

FINAL DRAFT MINUTES

Standardized elastomeric bearing pads used for AASHTO prestressed-concrete I-beams and prestressed-concrete spread and adjacent box beams have been redesigned based on the AASHTO *LRFD Bridge Design Specifications, 4th Edition - 2007*, including 2008 Interims, Design Method A. All bearing-pad dimensions are increased by more than 20% due to an increase in the allowable concrete strength in the prestressed elements. New standardized elastomeric expansion bearing pads have been developed for use with prestressed-concrete bulb-tee beams. New standardized elastomeric expansion bearing assemblies have been developed for use with structural-steel members. The thickness of each internal elastomeric layer is now ½ in. (13 mm). The thickness of each external elastomeric layer is now 9/32 in. (7 mm) to better accommodate rotation. The internal-shim thickness is 12 gage, or 0.1046 in. (2.657 mm).

I. <u>Existing Standard Elastomeric Bearing Pads Redesigned</u>

A. AASHTO Prestressed-Concrete I-Beam. Elastomeric bearing pads are designated as Type 1, 2, 3, or 4 for this type of member. The details are shown on new INDOT *Standard Drawing* 726-BEBP-01.

Elastomeric bearing pads for use with this type of member are not separate pay items. They should be shown on the plans with their size designation. The identification to be shown on the plans is as follows:

Elastomeric Bearing Pad, Type 1
Elastomeric Bearing Pad, Type 2
Elastomeric Bearing Pad, Type 3
Elastomeric Bearing Pad, Type 4

B. Prestressed-Concrete Box Beam. Elastomeric bearing pads are designated as Type 5, 6, or 7, and shape A or B, for this type of member. The details are shown on new INDOT *Standard Drawing* 726-BEBP-01.

Elastomeric bearing pads for use with this type of member are not separate pay items. They should be shown on the plans with their size and shape designations. The identification to be shown on the plans is as follows:

Elastomeric Bearing Pad, Type 5-A
Elastomeric Bearing Pad, Type 6-A
Elastomeric Bearing Pad, Type 7-A
Elastomeric Bearing Pad, Type 5-B
Elastomeric Bearing Pad, Type 6-B
Elastomeric Bearing Pad, Type 7-B

II. New Standard Elastomeric Bearing Pads for Prestressed-Concrete Bulb-Tee Beams

Elastomeric bearing pads are designated as Type T, and shape 1, 2, 3, or 4, for this type of member. The details are shown on new INDOT *Standard Drawing* 726-BEBP-02.

Elastomeric bearing pads for use with prestressed-concrete bulb-tee beams are not separate pay items. They should be shown on the plans with the size and shape designations. The identification to be shown on the plans is as follows:

Elastomeric Bearing Pad, Type T1
Elastomeric Bearing Pad, Type T2
Elastomeric Bearing Pad, Type T3

FINAL DRAFT MINUTES

Elastomeric Bearing Pad, Type T4

III. New Standard Elastomeric Bearing Assemblies for Steel Beams or Girders

Elastomeric bearing assemblies are designated as Type S, with bearing-area designation 1, 2, 3, 4, 5, 6, or 7, and effective-elastomer-thickness designation a or b, for this type of member. The details are shown on new INDOT *Standard Drawings* 726-BEBP-03 and -04.

Elastomeric bearing assemblies for use with structural-steel members are not separate pay items. They should be shown on the plans with the bearing-area and effective-elastomer-thickness designations. The identification to be shown on the plans is as follows:

Elastomeric Bearing Assembly, Type S1-a
Elastomeric Bearing Assembly, Type S1-b
Elastomeric Bearing Assembly, Type S2-a
Elastomeric Bearing Assembly, Type S2-b
Elastomeric Bearing Assembly, Type S3-a
Elastomeric Bearing Assembly, Type S3-b
Elastomeric Bearing Assembly, Type S4-a
Elastomeric Bearing Assembly, Type S4-b
Elastomeric Bearing Assembly, Type S5-a
Elastomeric Bearing Assembly, Type S5-b
Elastomeric Bearing Assembly, Type S6-a
Elastomeric Bearing Assembly, Type S6-b
Elastomeric Bearing Assembly, Type S7-a
Elastomeric Bearing Assembly, Type S7-b

IV. Design Parameters

The design of a bearing device is governed by the basic parameters as follows:

1. dead-load plus live-load reaction (impact not included);

2. expansion length, or distance from fixed support to expansion support; and

3. grade percentage due to nonparallel surfaces, considering dead-load rotation, profile grade of member, and camber of member.

The design of a bearing pad for a prestressed-concrete box beam is also governed by whether beams are spread or adjacent. For a spread box beam, pad shape A or B may be

FINAL DRAFT MINUTES

used. For an adjacent interior box beam, pad shape A should be used. For the outside edge under an adjacent exterior box beam, pad shape B should be used.

V. Determining Standard Bearing-Device Type

The procedure for determining the applicable standard elastomeric bearing device is the same for each structural-member type.

1. Step 1: Determine the Required Bearing Device Type. Determine the dead-load plus live-load reaction, and calculate the maximum expansion length for the bridge at the support for which the device is located. Then enter Figure 08-__A, B, C, or D, Elastomeric Bearing Pad or Assembly Types, Properties and Allowable Values, for the appropriate structural-member type, with the reaction and maximum expansion length. The required bearing-device size is that which corresponds to the reaction and expansion-length values shown in the figure which are less than or equal to those determined. If the reaction or expansion length is greater than the figure's value, use the next larger device size. If the reaction or expansion length is greater than the maximum value shown on the figure, the pad must be designed as described in Section VII below.

2. Step 2: Check Compressive Stress due to Total Load Associated with Rotational Deflection. The rotational deflection, θ_S, is the sum of the total service-load rotation due to imposed loads about the transverse axis, θ_X, or about the longitudinal axis, θ_Z, initial lack of parallelism due to grade, θ_G, and the rotation due to uncertainties, θ_U.

   The rotation of the beam due to imposed loads, θ_X or θ_Z, should be the value, in radians, determined in the dead-load-plus-live-load analysis from the beam design about the transverse x-axis or about the longitudinal z-axis.

   The total service-load rotation due to lack of parallelism, θ_G, in radians, should be determined from Equation 08-__.1 as follows:

$$\theta_G = \left| \arctan\left(\frac{El.1 - El.2}{L_e} \right) \right| \qquad \text{[Equation 08-__.1]}$$

Where: $El.$ 1 = Bridge seat elevation of one support, feet (meters)
$El.$ 2 = Bridge seat elevation of adjacent support feet, (meters)
L_e = Span length between the two centerlines of bearings along the bridge seat, feet (meters)

FINAL DRAFT MINUTES

The rotation due to uncertainties, θ_U, should be taken as 0.005 rad (AASHTO *LRFD Specifications* Article 14.4.2.1) in any direction unless an approved quality control plan justifies a smaller value.

The values of $\theta_{S,X}$ or $\theta_{S,Z}$ can be obtained from the equations as follows:

$$\theta_{S,X} = \theta_X + \theta_G + \theta_U \qquad \text{(Equation 08-__.2)}$$

$$\theta_{S,Z} = \theta_Z + \theta_G + \theta_U \qquad \text{(Equation 08-__.3)}$$

The value of $\theta_{S,X}$ or $\theta_{S,Z}$ should be incorporated into the appropriate equation below to determine the service-load compressive stress due to total load, σ_S.

$$\sigma_S = 0.5GS\left(\frac{L}{h_{rt}}\right)^2\left(\frac{\theta_{S,X}}{n}\right) \qquad \text{[AASHTO } LRFD \text{ Equation 14.7.6.3.5d-1]}$$

$$\sigma_S = 0.5GS\left(\frac{W}{h_{rt}}\right)^2\left(\frac{\theta_{S,Z}}{n}\right) \qquad \text{[AASHTO } LRFD \text{ Equation 14.7.6.3.5d-2]}$$

Where L,W, S, h_{rt}, and n are as indicated in Figure 08-__A, B, C, or D, for the appropriate structural-member type. G should be taken as 0.165 ksi (1.138 MPa).

If σ_S is greater than the allowable compressive stress, σ_{TL}, shown in Figure 08-__A, B, C, or D, the initial lack of parallelism should be accounted for by providing a beveled recess in the bottom of the beams at the supports, a tapered plate, or other method of minimizing the rotation of the bearing.

VI. Information to be Shown on Plans

Bearing-devices locations and types should be shown on the substructure details. Types and quantities information should be shown on the Structure Data sheet.

VII. <u>Designing a Nonstandardized Elastomeric Bearing Pad or Checking a Standardized Elastomeric Bearing Pad</u>

An elastomeric bearing pad not shown on the INDOT *Standard Drawings* may be used if its parameters check, or its design is in accordance with AASHTO *LRFD Bridge Design Specifications* Section 14.7.6. The *Specifications* define certain limitations in terms of allowable stresses, movements, or minimum dimensions. These limitations are as follows:

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1. Shear Modulus. The shear modulus, *G*, of the elastomer at 73°F (23°C) for a durometer hardness of 55 ± 5 on the Shore A scale is 0.112 ksi (0.78 MPa) minimum to 165 ksi (114 MPa) maximum.

   The design of an elastomeric bearing pad should include, but should not be limited to, the consideration of increased *G* at a temperature below 73°F (23°C); see *LRFD* Article 14.6.3.1.

2. Design Shear Force. The elastomer with the lowest temperature tolerance should be used. The total elastomer thickness should be sufficient to resist twice the design shear force.

3. Relationship of Device Dimensions. Both the width and the length of the pad should be at least three times the total elastomer thickness.

4. Stress Due to Dead Load Plus Live Load without Impact. This stress should be less than or equal to the lesser of 1 ksi (7 MPa) or *G* times *S*.

5. Rotational Deflection. Sufficient elastomer thickness should be provided to prevent a liftoff condition on the leading edges of the pad.

6. Anchorage. The pad or assembly should be secured against seismic or other extreme-event resistant anchorage to defy the horizontal movement in excess of that accommodated by shear in the pad, unless it is intended to act as a fuse as required by AASHTO *LRFD* 14.7.6.3.8. The calculations are performed in the strength-limit state. The load modifiers for ductility (*LRFD* 1.3.3), redundancy (*LRFD* 1.3.4), and importance (*LRFD* 1.3. 5) must be accounted for.

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Maximum $DL + LL$ Reaction, (kip)	Maximum Expansion Length, (ft)	Bearing-Pad Type	W (in.)	L (in.)	Area (in.^{2})	Shape Factor, S	h_{ri} (in.)	Number of Internal Elastomeric Layers, n	Allowable Compressive Stress, σ_{TL} (psi)
99	199	**1**	14	10.5	147	6.00	2.0625	3	675
114	247	**2**	14	11.5	161	6.31	2.5625	4	710
152	247	**3**	18	11	198	6.83	2.5625	4	768
259	295	**4**	24	12	288	8.00	3.0625	5	900

ELASTOMERIC BEARING PAD TYPES, PROPERTIES, AND ALLOWABLE VALUES FOR AASHTO I-BEAMS

Figure 08-__A

Maximum $DL + LL$ Reaction, (kip)	Maximum Expansion Length, (ft)	Bearing-Pad Type	W (in.)	L (in.)	Area (in.^{2})	Shape Factor, S	h_{ri} (in.)	Number of Internal Elastomeric Layers, n	Allowable Compressive Stress, σ_{TL} (psi)
200	247	**5A**	22	11	242	7.33	2.5625	4	825
170	247	**6A**	22	10	220	6.88	2.5625	4	773
142	253	**7A**	22	9	198	6.39	2.0625	3	719
97	247	**5B**	12	12	144	6.00	2.5625	4	675
85	247	**6B**	12	11	132	5.74	2.5625	4	646
74	199	**7B**	12	10	120	5.45	2.0625	3	614

ELASTOMERIC BEARING PAD TYPES, PROPERTIES, AND ALLOWABLE VALUES FOR BOX BEAMS

Figure 08-__B

Maximum $DL + LL$ Reaction, (kip)	Maximum Expansion Length, (ft)	Bearing-Pad Type	W (in.)	L (in.)	Area (in.^{2})	Shape Factor, S	h_{ri} (in.)	Number of Internal Elastomeric Layers, n	Allowable Compressive Stress, σ_{TL} (psi)
245	295	**T1**	23	12	276	7.89	3.0625	5	887
315	344	**T2**	23	14	322	8.70	3.5625	6	979
262	461	**T3**	23	17	391	8.23	4.7812	7	926
458	518	**T4**	24	19	456	8.93	5.3750	8	1005

ELASTOMERIC BEARING PAD TYPES, PROPERTIES, AND ALLOWABLE VALUES FOR INDIANA BULB-TEE MEMBERS

Figure 08-__C

Maximum $DL + LL$ Reaction, (kip)	Maximum Expansion Length, (ft)	Bearing-Assembly Type	W (in.)	L (in.)	Area (in.^{2})	Shape Factor, S	h_{ri} (in.)	Number of Internal Elastomeric Layers, n	Allowable Compressive Stress, σ_{TL} (psi)
46	93	**S1-a**	11	8	88	4.63	1.5625	2	521
46	122	**S1-b**	11	8	88	4.63	2.0625	3	521
62	93	**S2-a**	12	9	108	5.14	1.5625	2	579
62	122	**S2-b**	12	9	108	5.14	2.0625	3	579
83	122	**S3-a**	13	10	130	5.65	2.0625	3	636
83	152	**S3-b**	13	10	130	5.65	2.5625	4	636
118	152	**S4-a**	15	11	165	6.35	2.5625	4	714
118	182	**S4-b**	15	11	165	6.35	3.0625	5	714
148	152	**S5-a**	16	12	192	6.86	2.5625	4	771
148	182	**S5-b**	16	12	192	6.86	3.0626	5	771
230	182	**S6-a**	20	13	260	7.88	3.0625	5	886
230	211	**S6-b**	20	13	260	7.88	3.5625	6	886
289	211	**S7-a**	20	15	300	8.57	3.5625	6	964
289	241	**S7-b**	20	15	300	8.57	4.0625	7	964

ELASTOMERIC BEARING ASSEMBLY TYPES, PROPERTIES, AND ALLOWABLE VALUES FOR STRUCTURAL-STEEL MEMBERS

Figure 08-__D

SPECIFICATION REVISIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The current specification does not place sufficient restrictions on the application of trenchless pipe installation for higher risk methods or situations. In at least two instances, problems were experienced during construction that resulted in damage to, or the threat of damage to, roadways. The current specification includes a number of provisions which constitute Quality Control Plan, QCP, requirements, but the provisions are not sufficiently detailed and are scattered throughout the specification. Trenchless methods and equipment are evolving, and the current specification does not cover all current/evolving methods in detail. The current specification includes detailed requirements for cellular grout, which are now addressed in Cellular Grout 725.

PROPOSED SOLUTION: Rewrite the specification to make it more detailed and to address specifics of trenchless pipe installation. QCP requirements will be placed in the ITM for QCP to make it easier for the Contractor to prepare a sufficiently detailed document, and easier for the Engineer to review it. Limit the applicability of the specification to the installation methods most widely used and accepted. In this way, the QCP requirements may be tailored to methods currently widely used. Provide a detailed submittal method for technologies not covered by the specifications. Delete the Cellular Grout description and refer to 725.

APPLICABLE STANDARD SPECIFICATIONS: 716

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: Part 4, Chapter 28

APPLICABLE SECTION OF GIFE: 716 of New GIFE

APPLICABLE RECURRING SPECIAL PROVISIONS:N/A

Submitted By: Mir Zaheer through Ron Walker

Title: Geotechnical Engineer Team Leader

Organization: INDOT Office Of Geotechnical Engineering

Phone Number: 317-610-7251, ext. 224

Date: October 17, 2008

APPLICABLE SUB-COMMITTEE ENDORSEMENT? Trenchless Pipe Committee (Ad Hoc)Committee membership consists of INDOT, Industry, and Academia.

The members are as follows:

Mir Zaheer,INDOT, Office of Geotech. Engr.
Youlanda Belew,INDOT, Office of Geotech. Engr.
Stanley Graves,Veolia Water
Dan Liotti, Midwest Mole, Inc.
Tom Struewing, ATC Associates, Inc.
Erdogan Sener, IUPUI, Const. Engr. Mgmt. Technology
Elizabeth Dwyre, Parsons Brinkerhoff
Mike Milligan,INDOT, Div. of Const. Mgmt.
Dr. Tom Iseley,IUPUI, Const. Engr. Mgmt. Technology

FINAL DRAFT MINUTES

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 716, DELETE LINES 1 THROUGH 185.

SECTION 716, AFTER LINE 186, INSERT AS FOLLOWS:

SECTION 716 – TRENCHLESS PIPE INSTALLATION

716.01 Description

This work shall consist of installing pipes underground using construction techniques that eliminate open cutting of the pavement or of the ground ~~all~~ in accordance with 105.03. This specification addresses auger boring, guided boring, horizontal directional drilling using a reamer diameter up to and including 24 in. (600 mm), pipe jacking, and pipe ramming, as defined below.

Installations by means of directional drilling which require a reamer larger than 24 in. (600 mm), microtunneling, or other tunneling methods, may be utilized if approved by the Engineer. The Contractor shall submit a detailed proposal prepared by a professional engineer for installations other than auger boring, guided boring, horizontal directional drilling using a reamer diameter less than 24 in. (600 mm), pipe jacking, and pipe ramming.

The following definitions apply to trenchless pipe installation.

(a) Auger Boring

Technique for forming a bore from a drive shaft to a reception shaft, by means of a rotating cutting head. Spoil is removed back to the drive shaft by helically wound auger flights rotating in a steel casing.

(b) Carrier Pipe

The tube which carries the product being transported and which may pass through casings at highway or railroad crossings. It may be made of steel, concrete, clay, plastic, ductile iron, or other materials.

(c) Casing Pipe

A pipe installed as external protection to a carrier pipe.

(d) Drive Shaft

Excavation from which trenchless technology equipment is launched. It may incorporate a thrust wall to spread reaction loads to the soil.

(e) Guided Boring

A trenchless tunneling method that utilizes small diameter pilot tubes that are installed and steered through the ground utilizing a slanted face at the cutting head containing a target with light emitting diodes, LEDs, and a camera mounted theodolite located in the shaft to achieve high accuracy in line and grade. The hole is enlarged to the same outside diameter of the final product pipe after the installation of the pilot tubes, which is then jacked into place.

FINAL DRAFT MINUTES

(f) Horizontal Directional Drilling

A steerable system for the installation of pipes, conduits, or cables in a shallow arc using a surface launched drilling rig.

(g) Microtunneling

A remote controlled trenchless construction method that simultaneously installs pipes as the soil is excavated. This method provides continuous support of the excavation face with slurry pressure to balance groundwater and earth pressures.

(h) Pipe Jacking

A system of directly installing pipes behind a shield machine by means of hydraulic jacking from a drive shaft such that the pipes form a continuous string in the ground.

(i) Pipe Ramming

A non-steerable system of forming a bore by driving an open ended steel casing using a percussive hammer from a drive shaft. The soil may be removed from the casing by augering, jetting, or compressed air.

(j) Reception Shaft

Excavation into which trenchless technology equipment is driven and recovered following the installation of the pipe.

(k) Response Levels

Pre-established levels of instrument readings of settlement or of other monitored behavior such as lateral movement or vibrations, which trigger the implementation of mitigative measures. Response levels consist of the initial review level, at which mitgative measures must be implemented, and the alert level, at which construction must be halted and actions taken to ensure the alert level will not be exceeded in subsequent construction.

(l) Spoils

Earth, rock, or other materials displaced by a tunnel or casing, and removed as the tunnel or casing is installed.

MATERIALS

716.02 Materials

Materials shall be in accordance with the following.

Clay Pipe, Extra Strength 907.08
Polyvinyl Chloride Pipe 907.23
Reinforced Concrete Pipe 907.02
Smooth Wall Polyethylene Pipe 907.21
Steel Pipe.....908.11
Water.....913.01
Cellular Grout.....725

FINAL DRAFT MINUTES

Concrete pipe installed by means of pipe jacking shall be class IV or stronger except class III may be used with a minimum concrete compressive strength of 5,000 psi (34.5 MPa). Concrete pipe for pipe jacking ~~and~~ shall have tongue and groove joints. All reinforced concrete pipes shall have steel reinforcement concentric with the pipe wall. Where required to resist jacking forces, additional reinforcement shall be provided at the ends of the pipe.

Steel pipe used as a carrier pipe shall have the following minimum wall thickness. Steel pipe used as a casing pipe, but not used as a carrier pipe, shall be selected by the Contractor to have minimum wall thickness sufficient to resist jacking forces. For installations where the casing is not used as a carrier but only as a casing for a carrier pipe, the thickness of the casing shall be determined by the Contractor.

Outside Diameter, in. (mm)	*Wall Thickness, in. (mm)*
18 (450) or less	*1/4 (6)*
19 – 20 (475 – 500)	*5/16 (8)*
21 – 26 (525 – 650)	*3/8 (10)*
27 – 30 (675 – 750)	*1/2 (13)*
31 – 42 (775 – 1050)	*1/2 (13)*
43 – 48 (1075 – 1200)	*9/16 (15)*

CONSTRUCTION REQUIREMENTS

716.03 General Requirements

The Contractor shall submit a Quality Control Plan, QCP, in accordance with ITM 803. The QCP shall be submitted to the Engineer for review and acceptance, at least 14 calendar days prior to the start of the operations.

Where ground water is known or anticipated, and where the technique selected for trenchless pipe installation does not provide positive support at the trenchless excavation face, such as by slurry support in microtunneling, then trenchless pipe installation shall not proceed without dewatering in advance of trenchless pipe installation. A dewatering system of sufficient capacity to handle the flow shall be maintained at the site until its operation can be safely halted. The dewatering system shall be equipped with screens or filter media sufficient to prevent the displacement of fines.

Where the use of explosives is necessary for performing the work, their use shall be in accordance with 107.13.

Bentonite or other suitable lubricants may be applied to the outside surface of the pipe to reduce frictional forces.

Joints in steel pipe shall be watertight. Where welded joints are utilized, they shall be welded in accordance with 711.32. Joints in concrete pipe or other jacking pipe materials including clay pipe shall be designed to withstand the additional forces that are created in the joints during the installation process. The joints in concrete pipe or other pipe-jacking materials shall be protected with a resilient material around the

FINAL DRAFT MINUTES

circumference of the pipe. Resilient material shall also be used between the pipe and the thrust ring.

Pavement or ground surface heave or settlement resulting in damage to pavement, existing utilities, or structures above the installation will not be permitted. To confirm if heave or settlement is occurring, the Contractor shall undertake surface monitoring. The plan for monitoring the surface including response levels shall be included in the Contractor's QCP.

Installations shall have a bored hole essentially the same diameter as the outside of the installed pipe. If voids develop or if the bored diameter is greater than the outside diameter of the pipe by more than 1 in. (25 mm), grouting shall be used to fill such voids. The Contractor's QCP shall address the method of grouting and proposed grout materials.

When the installation is 4 in. (100 mm) or larger and the casing is used as the carrier pipe, a visual or a video inspection shall be performed using a high resolution, high sensitivity color video camera and recording equipment. The pipe shall be cleaned of debris prior to the inspection. Cleaning shall be accomplished by means of water jetting or other approved methods.

The camera and recording equipment shall be specifically designed for continuous viewing and recording of detailed images of the interior wall of pipes and transitions of the specified sizes. The equipment shall include sufficient lighting to view the entire periphery of the pipe. The equipment shall have appropriate attachments to maintain a position in the center of the pipe and an electronic counter to continuously record the location of the equipment in the pipe. A copy of the video inspection shall be submitted to the Engineer.

All sections of pipe found to be damaged or where joint failure is evident shall be repaired or replaced as approved by the Engineer ~~or removed and replaced at no expense to the Department~~.

If an obstruction is encountered during installation which stops the forward progress of the pipe, and it becomes evident that it is impossible to advance the pipe, the Engineer shall be notified. For installations utilizing tunnel shields or tunnel-boring machines or other methods that allow access to the face, the obstruction shall be removed in accordance with the QCP. For installations utilizing methods that do not allow access to the face, at the direction of the Engineer, the pipe shall be abandoned in place and filled with grout or other approved materials.

Where a gravity-flow carrier pipe is placed inside a casing pipe, the gravity-flow carrier pipe shall be shimmed to proper line, elevation, and grade and then the void between the two pipes shall be grouted with cellular grout.

Upon completion of the installation of the pipe, all excavated areas not occupied by the pipe shall be backfilled and compacted with suitable material in accordance with 203.

FINAL DRAFT MINUTES

716.04 Method of Measurement

Pipe installed by means of trenchless installation methods will be measured by the linear foot (meter) along the center line of the pipe installed.

716.05 Basis of Payment

Pipe installed by means of trenchless installation methods will be paid for by the linear foot (meter) for pipe installation, trenchless, of the size specified, complete and in place including all incidentals.

~~*Repairs or replacement of damaged pipe will be done at no expense to the Department.*~~

Removal of boulders, concrete, or other obstructions will be paid in accordance with 104.03.

Payment will be made under:

Pay Item	***Pay Unit Symbol***
Pipe Installation, Trenchless, _____ size	*LFT (m)*

The cost of the ~~QC plan~~ QCP, excavating and backfilling of the drive shaft and reception shaft, video inspection, camera and recording equipment, bentonite or other lubricant, grout, and the casing if installed shall be included in the cost of pipe installation, trenchless.

If a partial installation has to be abandoned in place and filled with grout due to the encountering of an obstruction, the abandoned work will be paid for at 75% of the contract unit price of the pipe installed.

No payment will be made to repair or replace sections of pipe that have been damaged or show evidence of joint failure.

FINAL DRAFT MINUTES

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 716, CONTINUED.

FINAL DRAFT MINUTES

Other sections containing specific cross references:

None

Recurring Special Provisions potentially affected:

None

Motion: Mr. Walker
Second: Mr. Wright
Ayes: 9
Nays: 0

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Standard Sheets potentially affected:

None

Action: Passed as revised

___ RSP Effective: _____ Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Received FHWA Approval? Yes

SPECIFICATION REVISONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: In February 2008, Pay Limit information was removed from Standard Drawing E 718-UNDR-01 and placed in the Standard Specifications. For consistency, General Notes on E 718-UNDR-07 should be revised to place appropriate information in the Standard Specifications.

PROPOSED SOLUTION: Remove specification related information from General Notes on Standard Drawing E 718-UNDR-07 and place in appropriate part of 718. Revise Standard Drawings E 718-UNDR-01, E 718-UNDR-02, E 718-UNDR-03, E 718-UNDR-04, E 718-UNDR-05 and E 718-UNDR-07 to reflect changes.

APPLICABLE STANDARD SPECIFICATIONS: 718

APPLICABLE STANDARD DRAWINGS: E 718-UNDR-01, E 718-UNDR-02, E 718-UNDR-03, E 718-UNDR-04, E 718-UNDR-05, E 718-UNDR-07

APPLICABLE DESIGN MANUAL SECTION: Part V, Chapter 52

APPLICABLE SECTION OF GIFE: Old GIFE Sections 4.14, 4.15, 4.20. New GIFE Section 718.

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Anne Rearick, PE

Title: Manager, Structural Services

Organization: INDOT, Div. of Production Mgmt., Structural Services

Phone Number: 317-232-5152

Date: October 17, 2008

APPLICABLE SUB-COMMITTEE ENDORSEMENT? INDOT Pipe Committee

Ron Walker, Manager, Office of Materials Management
Kenny Anderson, Materials Services Engineer, OMM
Bob Dahman, Fort Wayne District Testing Engineer
Merril Dougherty, Hydraulics Engineer, Structural Services
Roland Fegan, Greenfield District Const. Area Engineer
Bob Knowles, Field Support Engineer, OMM
Mike Milligan, Division of Construction Management
Mark Miller, Chief Engineer & Director, Div. Const. Mgmt.
Tommy Nantung, Research and Development
Jim Reilman, Construction Field Engineer
Tom Rueschhoff, Utilities and Railroads
Todd Tracy, Office of Materials Management
John Wright, Manager, Roadway Services

Also sent to Paul Berebitsky of ICA for Review by Industry.

FINAL DRAFT MINUTES

Item No. 08-15-13
Ms. Rearick
Date: 11/20/08

REVISION TO 2008 STANDARD DRAWINGS

718-UNDR-01 Underdrain Details
718-UNDR-02 Underdrain Details
718-UNDR-03 Outlet Protector, Type 1
718-UNDR-04 Outlet Protector, Type 2
718-UNDR-05 Outlet Protector, Type 3
718-UNDR-07 Underdrain Notes

FINAL DRAFT MINUTES

Other sections containing specific cross references:

None

Recurring Special Provisions potentially affected:

None

Motion: Ms. Rearick
Second: Mr. Heustis
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

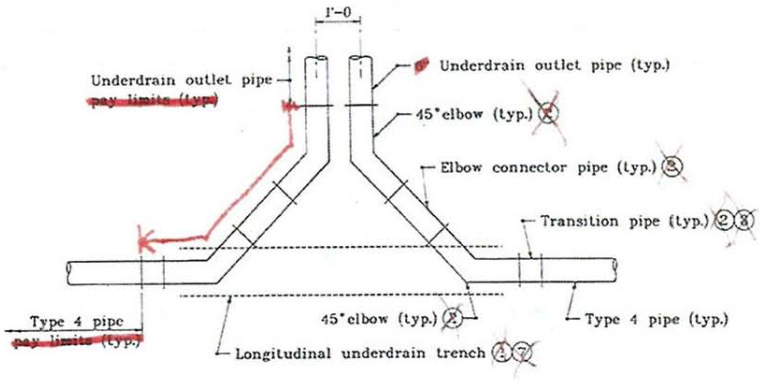
Standard Sheets potentially affected:

See Above

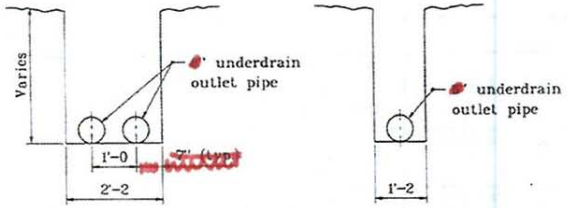
Action: Passed as revised

___ RSP Effective: _____ Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
___ 20__ Standard Specifications Book
_X_ 2010 Standards Edition
(Effective September 1, 2009)
___ Technical Advisory

Received FHWA Approval? Yes



TWIN OUTLET DETAIL–PLAN VIEW

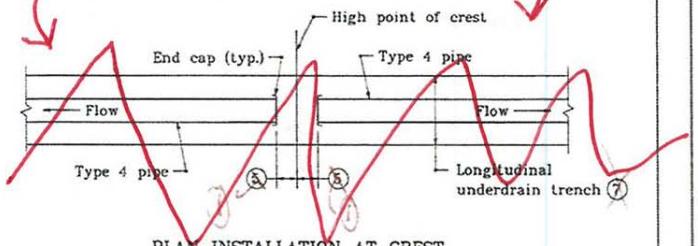


TWIN OUTLET DETAIL

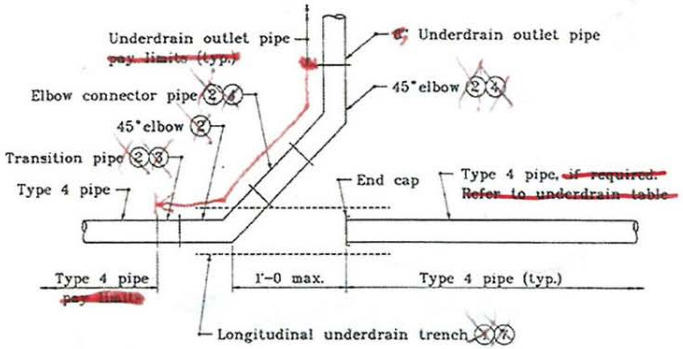
SINGLE OUTLET DETAIL

OUTLET TRENCH DETAILS

remove detail



PLAN–INSTALLATION AT CREST



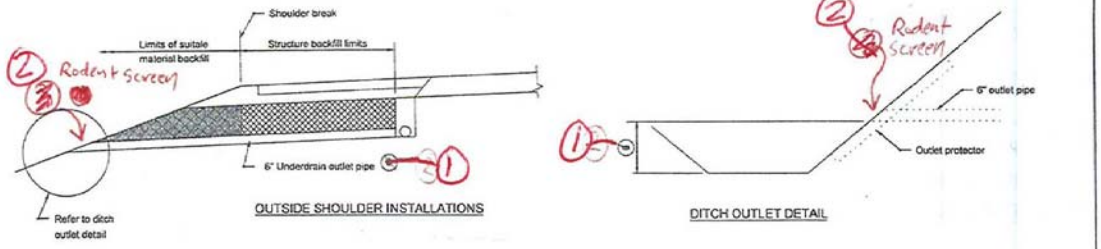
SINGLE OUTLET DETAIL–PLAN VIEW

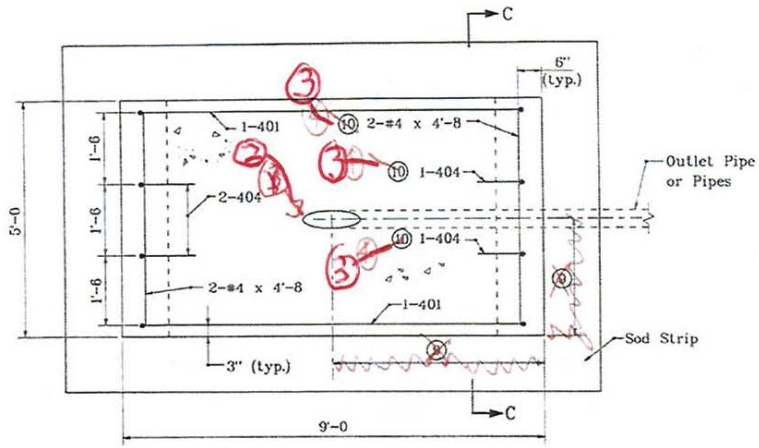
See

NOTE:

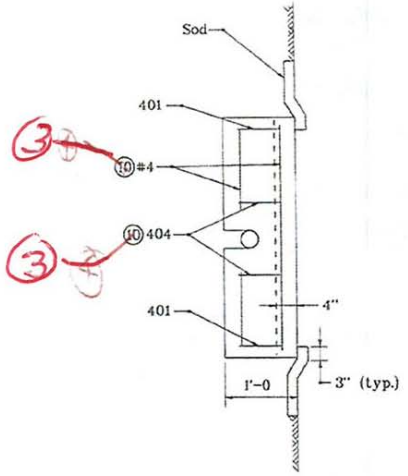
1. Standard Drawing E 718-UNDR-07 for General Notes ~~pertaining to this sheet.~~

INDIANA DEPARTMENT OF TRANSPORTATION	
UNDERDRAIN DETAILS JANUARY 2000	
STANDARD DRAWING NO. E 718-UNDR-01	
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER DESIGN STANDARDS ENGINEER	/s/ Anthony L. Uremovich 1-03-00 DESIGN STANDARDS ENGINEER DATE /s/ Firooz Zandi 1-03-00 CHIEF HIGHWAY ENGINEER DATE

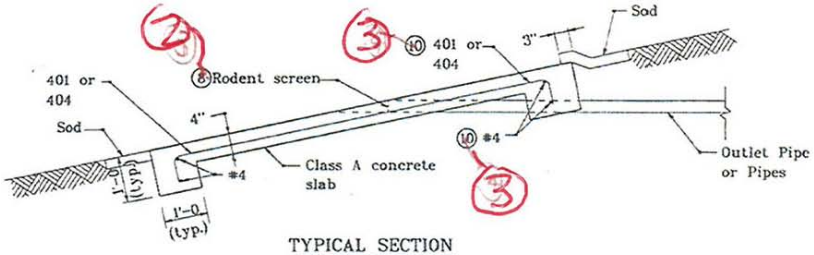

Shoulder break
Limits of suitale material backfill
Structure backfill limits
Rodent Screen
6" Underdrain outlet pipe
Refer to ditch outlet detail
OUTSIDE SHOULDER INSTALLATIONS
Rodent Screen
6" outlet pipe
Outlet protector
DITCH OUTLET DETAIL
Structure backfill limits
Limits of suitable material backfill
1'-0
Suitable material cap (match HMA shoulder depth)
Rodent Screen
6" Underdrain outlet pipe
Refer to ditch outlet detail
MEDIAN SHOULDER INSTALLATIONS
Inlet, catch basin or similar structure wall
Drainage structure outlet pipe
Rodent screen
Type 4 pipe or 6" outlet pipe
6" (min.)
PVC Connection
DRAINAGE STRUCTURE OUTLET DETAIL
HMA for underdrains (match existing shld. depth)
Existing HMA shoulder
New HMA shoulder, refer to typical cross sections
6" underdrain outlet pipe or pipes
Structure backfill
RETROFIT UNDERDRAIN OUTLET DETAIL (UNDER PAVED SHOULDER)
See
NOTE:
1. Standard Drawing E 718-UNDR-07 for General Notes
INDIANA DEPARTMENT OF TRANSPORTATION
UNDERDRAIN DETAILS
MARCH 2003
STANDARD DRAWING NO. E 718-UNDR-02
ANTHONY L. URMANICH REGISTERED NO. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER
DESIGN STANDARDS ENGINEER
DESIGN STANDARDS ENGINEER
3-03-03
DATE
CHIEF HIGHWAY ENGINEER
3-03-03
DATE



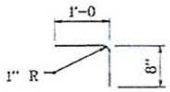
PLAN VIEW



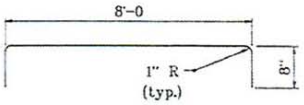
SECTION C-C



TYPICAL SECTION



404 x 1'-8

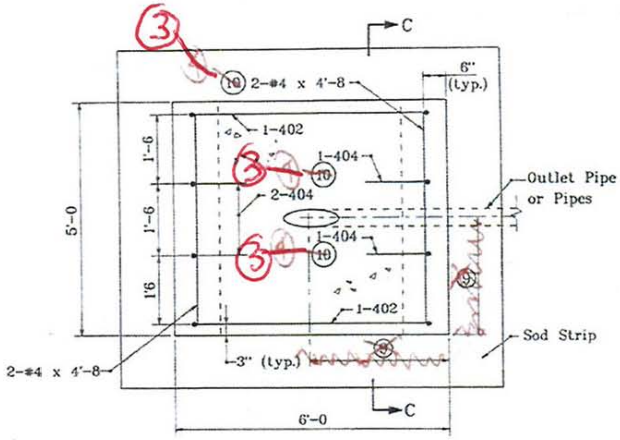


401 x 9'-4

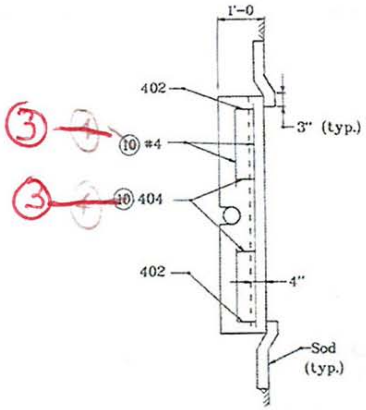
NOTE:

1. See Standard Drawing E 718-UNDR-07 for General Notes. ~~pertaining to this sheet.~~

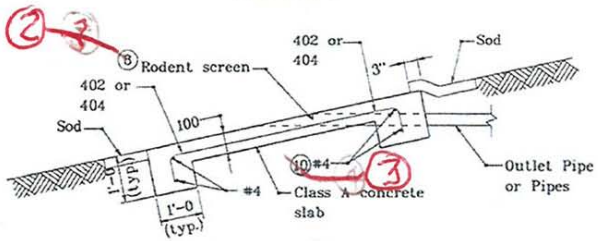
INDIANA DEPARTMENT OF TRANSPORTATION	
OUTLET PROTECTOR, TYPE 1	
JANUARY 2000	
STANDARD DRAWING NO.E 718-UNDR-03	
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER — DESIGN STANDARDS ENGINEER	/s/ Anthony L. Uremovich 1-03-00 — DESIGN STANDARDS ENGINEER — DATE /s/ Donald W. Lucas 1-03-00 — CHIEF HIGHWAY ENGINEER — DATE



PLAN VIEW



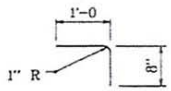
SECTION C-C



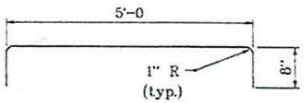
TYPICAL SECTION

NOTE:

1. See Standard Drawing E 718-UNDR-07 for General Notes ~~pertaining to this sheet~~.

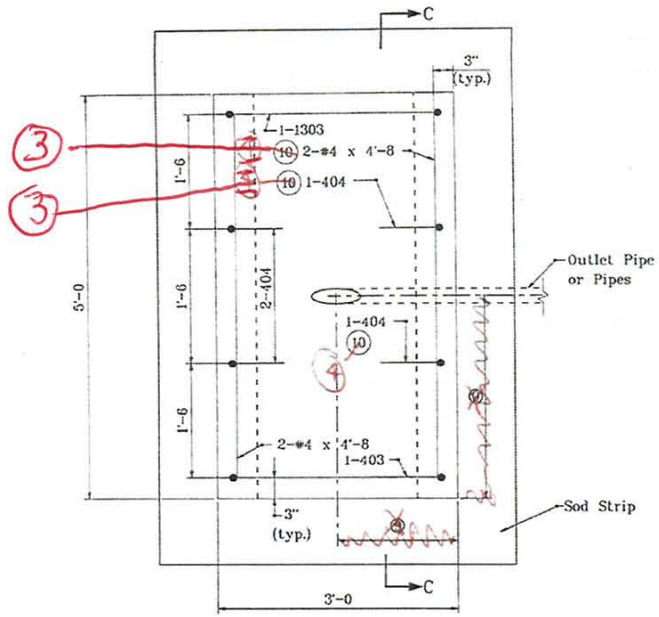


404 x 1'-8

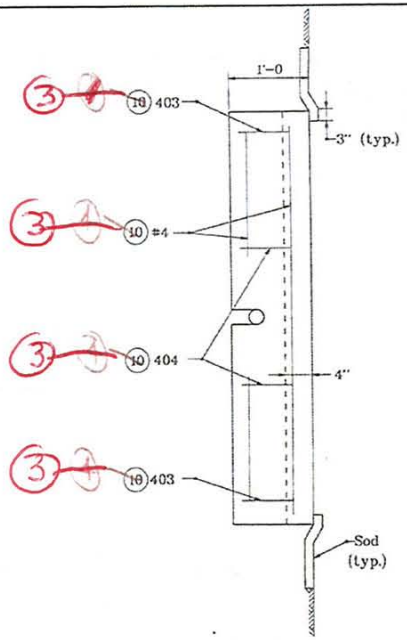


402 x 6'-4

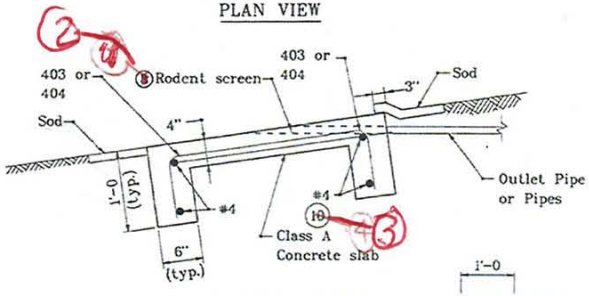
INDIANA DEPARTMENT OF TRANSPORTATION	
OUTLET PROTECTOR, TYPE 2 JANUARY 2000	
STANDARD DRAWING NO.E 718-UNDR-04	
ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER DESIGN STANDARDS ENGINEER	/s/ Anthony L. Urenovich 1-03-00 DESIGN STANDARDS ENGINEER DATE /s/ Donald W. Lucas 1-03-00 CHIEF HIGHWAY ENGINEER DATE



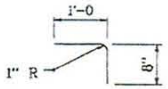
PLAN VIEW



SECTION C-C



TYPICAL SECTION



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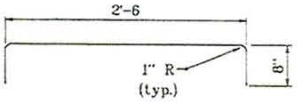


403 x 3'-10

NOTE:

1. See Standard Drawing E 718-UNDR-07 for General Notes pertaining to this sheet.

INDIANA DEPARTMENT OF TRANSPORTATION

OUTLET PROTECTOR, TYPE 3

JANUARY 2000

STANDARD DRAWING NO.E 718-UNDR-05

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Anthony L. Urenovich 1-03-00
DESIGN STANDARDS ENGINEER DATE

/s/ Donald W. Lucas 1-03-00
CHIEF HIGHWAY ENGINEER DATE

GENERAL NOTES

TO 718.03 ✓ CONST.

1. Longitudinal underdrain trenches shall be cut continuously across all twin outlet areas and all single outlet areas that have an adjacent run of Type 4 pipe. These pipeless portions of longitudinal underdrain trench shall be backfilled with aggregate for underdrains.

TO 718.02 — MAT.

2. Transition pipe, 45°elbows, and elbow connector pipe shall be the same material as the underdrain outlet pipe.

TO 718.05 ✓ CONST.

3. If Type 4 pipe and underdrain outlet pipe are different sizes, an increaser of the same material as the underdrain outlet pipe shall be installed between the transition pipe and 45°elbow.

✓ CONST.

4. If a single outlet pipe is skewed 45°, only one 45°elbow is required. The second 45°elbow and elbow connector pipe are not required.

5. ~~If underdrain run limits are not shown on Underdrain Table, use 6'.~~

1 ~~2~~

6. If underdrain outlet pipe elevations are not shown on Underdrain Table, the minimum outlet pipe slope shall be 0.3% and the minimum freeboard between the outlet pipe outfall and the ditch line shall be 1'-0 for median ditches and 2'-0 for side ditches.

TO 718.02 CONST.

7. The Type 4 pipe shall be installed in the longitudinal underdrain trench such that a minimum 2" clearance exists between the pipe and the trench wall.

2 ~~3~~

8. See Standard Drawing E 718-UNDR-06 for rodent screen details.

TO 718.05 ✓ CONST.

9. The outlet pipe or pipes shall be located as close as possible to the center of the outlet protector.

10. The #4 transverse bars in the upslope lug may be field cut to accomodate the outlet pipe or pipes. The 404 bars in the upslope lug may be moved to accomodate the outlet pipe or pipes.

~~4~~ 3

APPROXIMATE OUTLET PROTECTEOR QUANTITIES			
TYPE	CONCRETE, CLASS A (cys)	REINFORCING ~~STEEL~~ BARS (lb)	SODDING (sys)
1	0.8	29	4.9
2	0.6	25	4.0
3	0.3	22	3.2

INDIANA DEPARTMENT OF TRANSPORTATION

UNDERDRAIN NOTES

JANUARY 2001

STANDARD DRAWING NO.E 718-UNDR-07

ANTHONY L. URSEMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Anthony L. Ursemovich 1-02-01
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 1-02-01
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 718, AFTER LINE 20, INSERT AS FOLLOWS:

Transition pipes, 45 degree elbows, ~~and~~ elbow connector pipes, and increasers shall be of the same material as the underdrain outlet pipe.

SECTION 718, BEGIN LINE 33, DELETE AND INSERT AS FOLLOWS:

718.03 Pipe Installation

Trenches shall be excavated to the dimensions and grade shown on the plans. *Each longitudinal underdrain trench shall be cut continuously across all twin outlet areas and all single outlet areas. Such pipeless portions of the trench shall be backfilled with aggregate for underdrains.* Pipes shall be secured to ensure that the *pipe's* required grade and horizontal alignment ~~of the pipe~~ are maintained. Perforated pipe shall be placed with the perforations down. The pipe sections shall be joined securely with the appropriate couplings, fittings, or bands. *The pipe shall be installed in the underdrain trench such that a minimum clearance of 2 in. (50 mm) exists between the pipe and the trench walls.* Aggregate for underdrains shall be placed in a manner which minimizes contamination. HMA for underdrains shall be placed and compacted separately from mainline mixtures. HMA for underdrains may be placed in one lift and shall be compacted with equipment in accordance with 409.03(d).

If plain end concrete pipe is being laid, no joint width shall ~~not~~ exceed 1/4 in. (6 mm).

SECTION 718, BEGIN LINE 57, INSERT AS FOLLOWS:

718.05 Underdrain Outlets

If the underdrain pipe and the outlet pipe are of different sizes, an increaser of the same material as the outlet pipe shall be installed between the transition pipe and the 45 degree elbow. If a single outlet pipe is to be skewed at 45 degree, a second 45 degree elbow and an elbow-connector pipe are not required.

The outlet pipe or pipes shall be located as close as possible to the center of the outlet protector.

After the outlet pipe installation, the trench shall be backfilled as shown on the plans. Structure backfill shall not extend into the limits of the underdrain trench. The trench outside the limits of structure backfill shall be filled with materials suitable for growing vegetation. Aggregate and stabilized materials removed from an existing shoulder shall not be used as backfill and shall be disposed of in accordance with 206.07. At the time of installation, a rodent screen shall be placed on the outlet pipe or the ends of the underdrain pipe when located in inlets or catch basins.

FINAL DRAFT MINUTES

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 718, CONTINUED.

FINAL DRAFT MINUTES

Other sections containing specific cross references:

718.02
719.02 Pg 571

Recurring Special Provisions potentially affected:

None

Motion: Ms. Rearick
Second: Mr. Heustis
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Standard Sheets potentially affected:

718-UNDR-01, 02, 03, 04, 05, 06, 07

Action: Passed as revised

___ RSP Effective: _____ Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Received FHWA Approval? Yes

Item No. 08-15-15
Ms. Rearick
Date: 11/20/08

PROPOSED NEW STANDARD DRAWINGS

726-BEBP-01 Bridge Elastomeric Bearing Pads Type 1 to 7
For Prestressed I-Beams & Box Beams

726-BEBP-02 Bridge Elastomeric Bearing Pads Type T-1 to T-4
For Prestressed Bult-Tee Beams

726-BEBP-03 Bridge Elastomeric Bearing Pads Type S – For Steel Beams

726-BEBP-04 Elastomeric Bearing Pads Type S

FINAL DRAFT MINUTES

Other sections containing specific cross references:

None

Recurring Special Provisions potentially affected:

726-B-044

Motion: Ms. Rearick
Second: Mr. Andrewski
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? No
By - Addition or Revision
Frequency Manual
Update Required? No
By - Addition or Revision

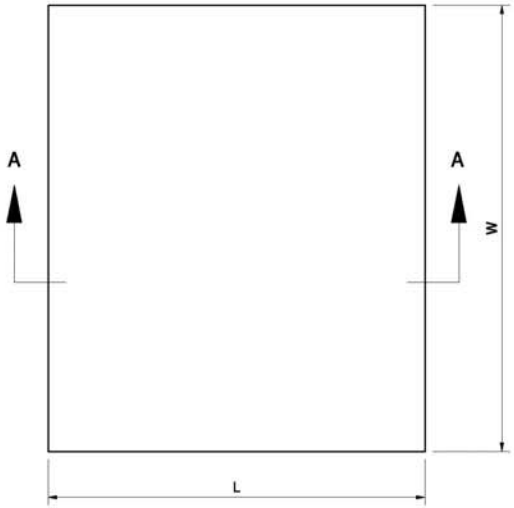
Standard Sheets potentially affected:

See Above

Action: Passed as submitted

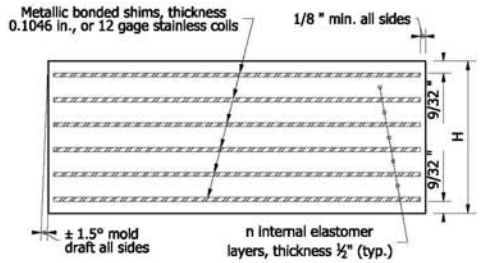
___ RSP Effective: _____ Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
___ 20__ Standard Specifications Book
_x_ 2010 Standards Edition
(Effective September 1, 2009)
___ Technical Advisory

Received FHWA Approval? Yes



ELASTOMERIC BEARING PAD

PLAN



SECTION A - A

NOTES:

1. The rectangular Elastomeric Bearing Pad shall be placed with L dimension parallel to longitudinal bridge axis.
2. h_{rt} is defined as the summation of all internal elastomer thickness plus the two external layers thickness.

TABLE OF DIMENSIONS

Bearing Designation	Bearing Width W	Bearing Length L	Number of Internal Elastomer Layers n	h_{rt}	Number of Steel Shims n_s	Bearing Total Thickness H
TYPE 1	14"	10 ½"	3	2 1/16"	4	2 15/32"
TYPE 2	14"	11 ½"	4	2 9/16"	5	3 3/32"
TYPE 3	18"	11"	4	2 9/16"	5	3 3/32"
TYPE 4	24"	12"	5	3 1/16"	6	3 11/16"
TYPE 5A	22"	11"	4	2 9/16"	5	3 3/32"
TYPE 6A	22"	10"	4	2 9/16"	5	3 3/32"
TYPE 7A	22"	9"	3	2 1/16"	4	2 15/32"
TYPE 5B	12"	12"	4	2 9/16"	5	3 3/32"
TYPE 6B	12"	11"	4	2 9/16"	5	3 3/32"
TYPE 7B	12"	10"	3	2 1/16"	4	2 15/32"

INDIANA DEPARTMENT OF TRANSPORTATION

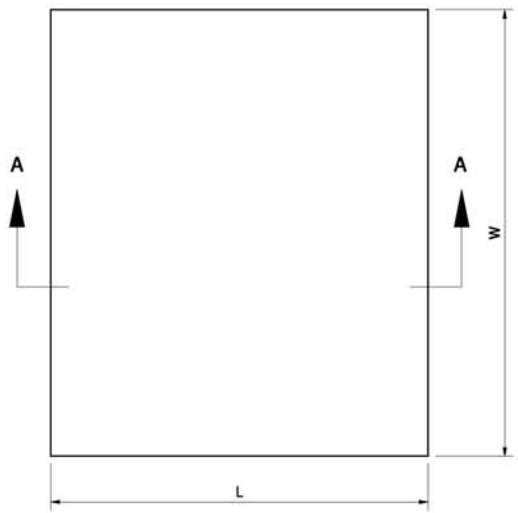
BRIDGE ELASTOMERIC BEARING PADS
TYPE 1 to 7
FOR PRESTRESSED I-BEAMS & BOX BEAMS
SEPTEMBER 2008

STANDARD DRAWING NO. E-726-BEBP-01

/s/ XXXXXXXXX 01/01/06
DESIGN STANDARDS ENGINEER DATE

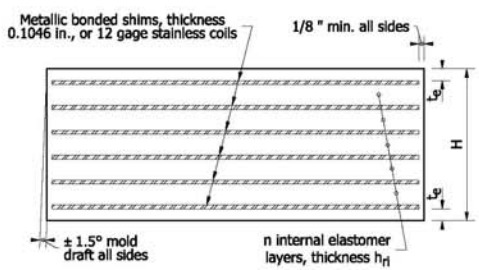
/s/ XXXXXXXXX 01/01/06
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER



ELASTOMERIC BEARING PAD

PLAN



SECTION A - A

NOTES:

1. The rectangular Elastomeric Bearing Pad shall be placed with L dimension parallel to longitudinal bridge axis.
2. h_{rt} is defined as the summation of all internal elastomer thickness plus the two external layers thickness.

TABLE OF DIMENSIONS

Bearing Designation	Bearing Width W	Bearing Length L	Internal Elastomer Thickness h_{ri}	Number of Internal Elastomer Layers n	External Elastomer Thickness t_e	h_{rt}	Number of Steel Shims n_s	Bearing Total Thickness H
T1	23"	12"	½"	5	9/32"	3 1/16"	6	3 11/16"
T2	23"	14"	½"	6	9/32"	3 9/16"	7	4 5/16"
T3	23"	17"	19/32"	7	5/16"	4 25/32"	8	5 5/8"
T4	24"	19"	19/32"	8	5/16"	5 3/8"	9	6 5/16"

INDIANA DEPARTMENT OF TRANSPORTATION

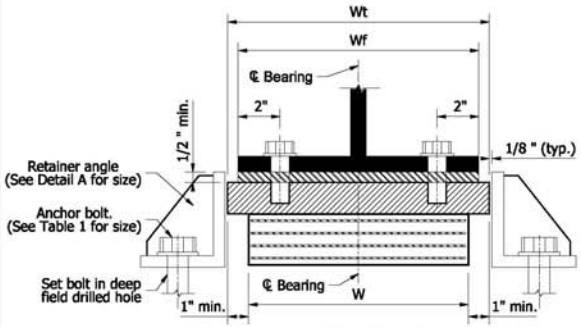
BRIDGE ELASTOMERIC BEARING PADS
TYPE T-1 to T-4
FOR PRESTRESSED BULB-TEE BEAMS
SEPTEMBER 2008

STANDARD DRAWING NO. E-726-BEBP-02

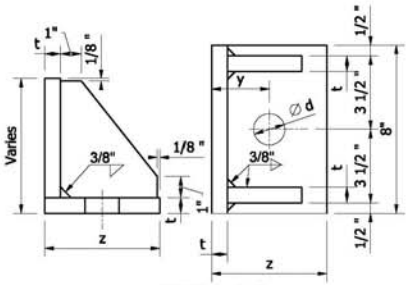
/s/ XXXXXXXXX 01/01/06
DESIGN STANDARDS ENGINEER DATE

/s/ XXXXXXXXX 01/01/06
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER



CROSS SECTION THROUGH ASSEMBLY



DETAIL A ③

NOTES:

1. The bearing plate size shall be calculated as follows:
   Lt = L + 1" Wt = Wf + 2" or Wt = W + 2" whichever is greater.

② The shim thickness is 0.1046 in., which corresponds to 12 gage stainless coils.

③ Equivalent rolled angle shape with stiffeners may be used in lieu of welded plates.

④ Minimum dimension required is 1 1/2 " + flange thickness + 1/3" (for shim plate).

⑤ Minimum thickness 1 1/2"

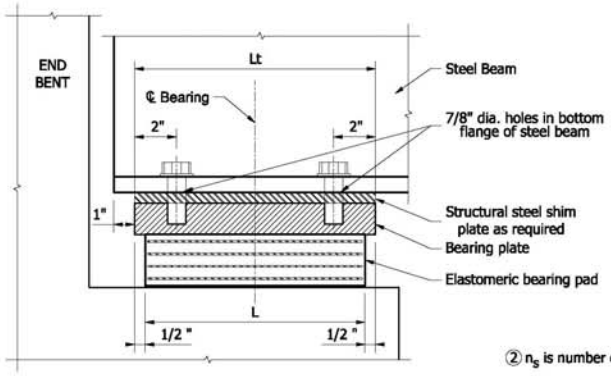
6. See standard drawing E-726-BEBP-04 for Table of Dimensions.

TABLE 1

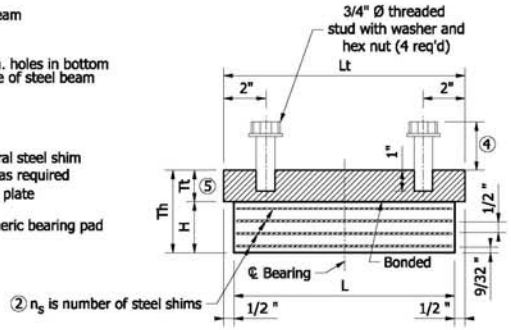
ANCHOR BOLT SIZE		
BEARING SIZE		BOLT SIZE
S1	11" x 8"	1" x 12"
S2	12" x 9"	1" x 12"
S3	13" x 10"	1" x 12"
S4	15" x 11"	1 1/4" x 15"
S5	16" x 12"	1 1/4" x 15"
S6	20" x 13"	1 1/2" x 18"
S7	20" x 15"	1 1/2" x 18"

TABLE 2

BOLT DIA.	y	z	t	d
1"	2 1/8"	4"	1/2"	1 1/8"
1 1/4"	2 1/4"	4 3/4"	1/2"	1 3/8"
1 1/2"	2 3/4"	5 1/2"	3/4"	1 5/8"



LONGITUDINAL SECTION THROUGH ASSEMBLY



BEARING ASSEMBLY

INDIANA DEPARTMENT OF TRANSPORTATION	
BRIDGE ELASTOMERIC BEARING PADS TYPE S - FOR STEEL BEAMS SEPTEMBER 2008	
STANDARD DRAWING NO. E-726-BEBP-03	
	/s/ XXXXXXXXX 01/01/06 DESIGN STANDARDS ENGINEER DATE
	/s/ XXXXXXXXX 01/01/06 CHIEF HIGHWAY ENGINEER DATE
DESIGN STANDARDS ENGINEER	

TABLE OF DIMENSIONS - TYPE S BEARINGS FOR STEEL BEAMS

Bearing Designation	Bearing Width W	Bearing Length L	Number of Internal Elastomer Layers n	h_{rt} ①	Number of Steel Shims n_s	Bearing Total Thickness H
S1-A	11"	8"	2	1 9/16"	3	1 27/32"
S1-B	11"	8"	3	2 1/16"	4	2 7/16"
S2-A	12"	9"	2	1 9/16"	3	1 27/32"
S2-B	12"	9"	3	2 1/16"	4	2 7/16"
S3-A	13"	10"	3	2 1/16"	4	2 7/16"
S3-B	13"	10"	4	2 9/16"	5	3 1/32"
S4-A	15"	11"	4	2 9/16"	5	3 1/32"
S4-B	15"	11"	5	3 1/16"	6	3 5/8"
S5-A	16"	12"	4	2 9/16"	5	3 1/32"
S5-B	16"	12"	5	3 1/16"	6	3 5/8"
S6-A	20"	13"	5	3 1/16"	6	3 5/8"
S6-B	20"	13"	6	3 9/16"	7	4 7/32"
S7-A	20"	15"	6	3 9/16"	7	4 7/32"
S7-B	20"	15"	7	4 1/16"	8	4 13/16"

NOTES:

① h_{rt} is defined as the summation of all internal elastomer thicknesses plus the external elastomer thicknesses.

2. See Standard Drawing E 726-BEBP-03 for Type S bearing assembly details.

INDIANA DEPARTMENT OF TRANSPORTATION

ELASTOMERIC BEARING PADS
TYPE S

AUGUST 2008

STANDARD DRAWING NO. E 726-BEBP-04

/s/ XXXXXXXXX 01/01/06
DESIGN STANDARDS ENGINEER DATE

/s/ XXXXXXXXX 01/01/06
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER

SECTION 726, BEGIN LINE 1, INSERT AS FOLLOWS:

SECTION 726 -- ELASTOMERIC BEARINGS

726.01 Description

This work shall consist of furnishing and installing elastomeric bearings in accordance with ~~these specifications and~~ 105.03. Elastomeric bearings shall include plain bearings consisting of elastomer only, and laminated bearings consisting of layers of elastomer restrained at their interfaces by bonded laminates.

MATERIALS

726.02 Materials

The materials shall be in accordance with the following:

Anchor Bolts.....910.02(f)
Elastomer.....915.04
Grout.....707.09
Side Retainers.....910.02(a)
Shim and Fill Plates.....910.02(a)
Threaded Studs and Hex Nuts.....910.02(b)

CONSTRUCTION REQUIREMENTS

726.03 Construction Requirements

Elastomeric bearings without external load plates may be placed directly on a concrete or steel surface provided the surface is flat to within a tolerance of 0.005 of the nominal dimension for steel reinforced bearings or 0.01 of the nominal dimension for other types. Bearings shall be installed on surfaces that are horizontal to within 0.01 rad. All lack of parallelism between the top of the bearing and the underside of the girder that exceeds 0.01 rad shall be corrected by grouting or as otherwise directed.

The elastomer or the bond shall not be subjected to temperatures higher than 390ºF (200ºC).

Immediately prior to setting bearings, the concrete and metal surfaces that are to be in contact shall be cleaned.

Anchor-bolt holes shall be drilled to the required depth and the bolts set in portland-cement grout. The location of the anchor bolts shall consider variation from the mean temperature of the superstructure at the time of setting and anticipated lengthening of the bottom flange due to dead load of setting.

726.04 Method of Measurement

Elastomeric bearing pads will not be measured for payment.

FINAL DRAFT MINUTES

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 726, CONTINUED.

726.05 Basis of Payment

Elastomeric bearing pads will not be paid for separately. The cost of the pads, side retainers, anchor bolts, shim plates, and other incidentals shall be included in the cost of the structural member.

FINAL DRAFT MINUTES

COMMITTEE COMMENTS:

Mr. Milligan will look for a better material reference for grout under 726.02.

The first paragraph of 726.03 needs some investigation to find measurable and more realistic guidelines concerning the placement of beams on the bearings. The wording is in accordance with AASHO LRFD specifications and will remain as written.

Concerning the fourth paragraph of 726.03, a table needs to be developed to show where bolt is set depending on the temperature of the superstructure at time of placement. Ms. Rearick will investigate this further.

The final determinations of the revisions above will be published in the Minutes.

Other sections containing specific cross references:

None

Recurring Special Provisions potentially affected:

726-B-044

Motion: Ms. Rearick
Second: Mr. Walker
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? Y___ N___
By - Addition or Revision
Frequency Manual
Update Required? Y___ N___
By - Addition or Revision

Standard Sheets potentially affected:

726-BEBP-01, 02, 03, and 04

Action: Passed as revised

___ RSP Effective: _____ Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Withdrawn ____

Received FHWA Approval? Yes

SPECIFICATION REVISIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED:
Standard Drawing for Sign Identification Marking (802-SNGS-11) states that sheet for this should be reflectorized white background with black letters. 802.01 states that-"All signs shall be marked for Identification as shown on plans. The marking shall consist of a type II sheeting material, with a class I adhesive, shown on the Department's List of approved Sign sheeting Materials". The approved material list does not have white color in Type II sheet. Also, Type II reflective sheet has less life than Sign face.

PROPOSED SOLUTION: To keep the life of the Identification marking reflective sheet the same as of Sign face, revise 802.01 to use reflective sheet type III or higher in place of type II. Revise Standard Drawing E 802-SNGS-11 to reflect changes to specification.

APPLICABLE STANDARD SPECIFICATIONS: 802.01

APPLICABLE STANDARD DRAWINGS: 802-SNGS-11

APPLICABLE DESIGN MANUAL SECTION:

APPLICABLE SECTION OF GIFE:

APPLICABLE RECURRING SPECIAL PROVISIONS:

Submitted By: Mike Bowman, P.E.

Title: Director, Highway Operations Division

Organization: INDOT, Highway Operations Division

Phone Number: 317-232-5508

Date: 10-24-2008

APPLICABLE SUB-COMMITTEE ENDORSEMENT? Revision was sent to District Traffic Engineers for review. Revision was also sent to Paul Berebitsky, ICA, for Industry review.

FINAL DRAFT MINUTES

Item No. 08-15-17
Mr. Bowman
Date: 11/20/08

REVISION TO STANDARD DRAWING

802-SNGS-11 SIGN IDENTIFICATION MARKING

FINAL DRAFT MINUTES

Other sections containing specific cross references:

None

General Instructions to Field Employees
Update Required? Y___ N___
By - Addition or Revision
Frequency Manual
Update Required? Y___ N___
By - Addition or Revision

Recurring Special Provisions potentially affected:

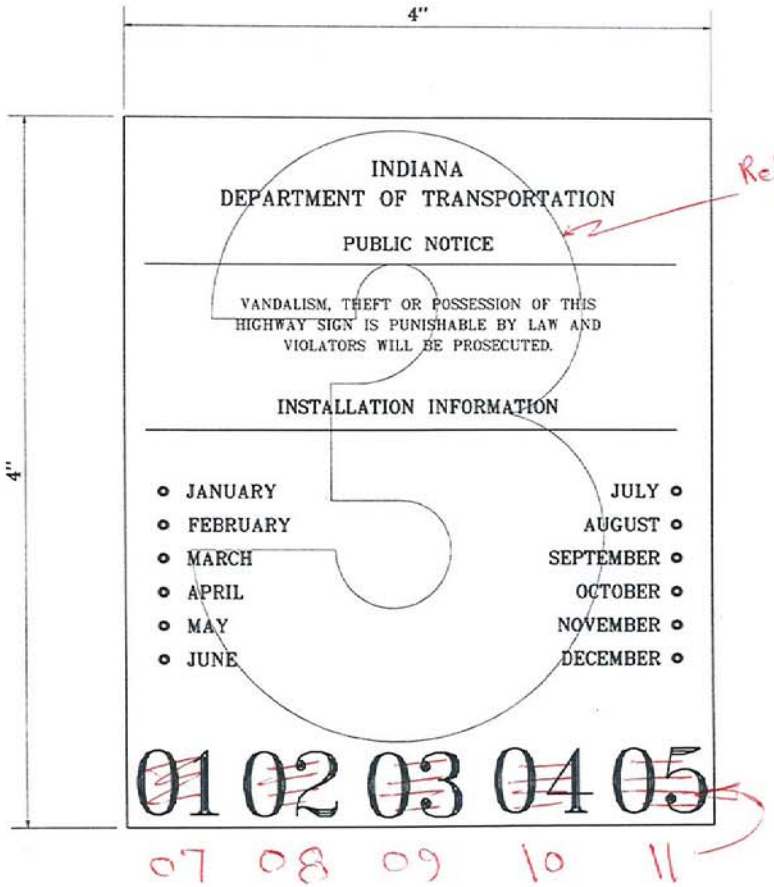
None

Standard Sheets potentially affected:

See Above

Motion: M
Second: M
Ayes:
Nays:

Action: Withdrawn



Replacing 3 by 8

NOTES:

1. Height of lettering shall be $\frac{1}{8}$ in. to $\frac{1}{4}$ in. The height of the dates along the bottom shall be $\frac{1}{2}$ in.
2. Copy shall be black on ~~reflectorized~~ white ~~background~~. Reflective sheet Type III or higher
3. The number of dates along the bottom need not be five, and the first date need not be ~~01~~ 07 However, the installation date shall be shown.
4. The month and year of installation shall be punched by a $\frac{1}{4}$" minimum diameter hole.
5. The overlay number to be of colored transparent sheeting to indicate the last digit of the year of installation.

The decade of installation shall be indicated by color of transparent sheeting :

2000 – 2009 Blue
2010 – 2019 Red
2020 – 2029 Brown
2030 – 2039 Orange

INDIANA DEPARTMENT OF TRANSPORTATION	
SIGN IDENTIFICATION MARKING MARCH 2002	
STANDARD DRAWING NO. E 802-SNGS-11	
ANTHONY L. UREKOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER DESIGN STANDARDS ENGINEER	/s/ Richard L. VanCleave 3-01-02 DESIGN STANDARDS ENGINEER DATE /s/ Richard K. Smutzer 3-01-02 CHIEF HIGHWAY ENGINEER DATE

Item No. 08-15-18
Mr. Bowman
Date: 11/20/08

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 802, BEGIN LINE 13, DELETE AND INSERT AS FOLLOWS:

All signs shall be marked for identification as shown on the plans. The marking shall consist of a *reflective sheet* type ~~II~~ *III or higher* ~~sheeting material~~, with a class I adhesive, shown on the Department's list of approved Sign Sheeting Materials. It shall be applied to the back of the sign on the lower corner closest to the nearest edge of pavement and shall not be covered by the sign's supports.

FINAL DRAFT MINUTES

Other sections containing specific cross references:

None

General Instructions to Field Employees
Update Required? Y___ N___
By - Addition or Revision

Frequency Manual
Update Required? Y___ N___
By - Addition or Revision

Recurring Special Provisions potentially affected:

None

Standard Sheets potentially affected:

802-SNGS-11

Motion: M
Second: M
Ayes:
Nays:

Action: Withdrawn

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 911, BEGIN LINE 106, DELETE AND INSERT AS FOLLOWS:

(e) Untreated Piling

Untreated piles shall be cut from white or red oak, dense southern yellow pine, fir, or cypress, ~~preference given~~ *preferred* in the order ~~named~~ *listed*. ~~Subject to approval, t~~*T*hey may be of other species*, subject to approval,* which can withstand driving without showing excessive brooming or splitting.

All piling shall have been cut from sound, solid, live trees. The *piling* shall contain no ring shakes, dote, or unsound knots. Sound knots will be permitted provided the diameter of the knot does not exceed 4 in. (100 mm) or 1/3 of the diameter of the pile where it occurs, whichever is ~~the~~ smaller. ~~Any~~ *All pile containing* defects, or combination of defects, which impair the strength of the pile ~~will~~ *shall* not be ~~permitted~~ *used*. The piles shall be free from twist of grain exceeding 1/2 of the circumference in any 20 ft (6.1 m) of length. The butts shall be sawed square and the tips sawed square or tapered to a point of not less than 16 in.^{2} (10 300 mm^2) with the tip so formed that the centerline of the pile passes through the tip.

Unless otherwise specified, all piles shall be peeled before driving by removing all ~~the~~ rough bark and at least 80% of the inner bark. No strip of the inner bark remaining on the pile shall be more than 3/4 in. (19 mm) wide. ~~and t~~*T*here shall be at least 1 in. (25 mm) of barkfree surface between ~~any~~ two such strips. Not less than 80% of the surface on ~~any~~ one circumference shall be clean wood. Piles shall be cut above the ground swell, and shall have a uniform taper from butt to tip. All knots shall be trimmed flush with the body of the pile.

A line drawn from the center of the tip to the center of the butt shall not ~~fall~~ *appear* outside the center of the pile at ~~any~~ *a* point more than 1% of the length of the pile. In short bends, the distance from the center of the pile to a line stretched from the center of the pile above the bend to the center of the pile below the bend shall not exceed 4% of the length of the bend, ~~but in no case~~ *or* more than 2 1/2 in. (63 mm). Piles shall be free from reverse bends.

After peeling, piles shall have diameters as indicated below unless otherwise approved or required.

	Diameter – Inches (mm)		
Length of Pile	Tip Minimum	3' (0.9 m) from Butt, Minimum	Butt Maximum
Less than 20 ft (6.1 m)	8 (200)	11 (~~279~~ *280*)	20 (~~508~~ *510*)
20 ft (6.1 m) and less than 40 ft (12.2 m)	8 (200)	12 (305)	20 (~~508~~ *510*)
40 ft (12.2 m) and less than 60 ft (18.3 m)	7 (~~178~~ *180*)	13 (330)	20 (~~508~~ *510*)
60 ft (18.3 m) and more	6 (~~152~~ *150*)	13 (330)	20 (~~508~~ *510*)

FINAL DRAFT MINUTES

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 911, BEGIN LINE 164, DELETE AND INSERT AS FOLLOWS:

(c) Piling

Wood piling, before treatment, shall be in accordance with 911.01(e) except piles shall be southern yellow pine, red oak, or coast region douglas fir. The outer and inner bark shall be removed before treatment. Unless otherwise specified, piling shall be treated with ~~creosote~~ *a preservative* in accordance with the applicable ~~provisions~~ *requirements* of *AWPA* Standards ~~C14~~*U1* and ~~C2~~*T1* ~~of the AWPA Standards~~.

FINAL DRAFT MINUTES

Other sections containing specific cross references:

911.01(e)
701.02 Pg 427
911.02(c) Pg 803
915.03 Pg 834

911.02(c)
701.02 Pg 427
911.02(a) Pg 803
915.03 Pg 834

General Instructions to Field Employees
Update Required? Y___ N___
By - Addition or Revision
Frequency Manual
Update Required? Y___ N___
By - Addition or Revision

Recurring Special Provisions potentially affected:

701-B-132

Standard Sheets potentially affected:

None

Motion: M
Second: M
Ayes:
Nays:

Action: Withdrawn

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 915, BEGIN LINE 1, DELETE AND INSERT AS FOLLOWS:

SECTION 915 – BRIDGE PILES AND BEARINGS

915.01 Steel ~~Shell~~ *Pipe* Encased Concrete Piles and Epoxy Coated Steel ~~Shell~~ *Pipe* Encased Reinforced Concrete Piles

(a) General Requirements

Steel ~~shell~~ *pipe* encased concrete piles and epoxy coated steel ~~shell~~ *pipe* encased reinforced concrete piles, as designated herein, shall consist of fluted steel, or rounded straight seamed, spiral seamed, or seamless steel pipes which, after being driven are filled with class A concrete. The steel ~~shell~~ *pipe* encasement shall be uncoated unless an epoxy coating, in accordance with 915.01(d) is specified.

~~Steel pile shells~~ *Pipe piles* shall be of the diameter and minimum wall thickness shown on the plans. All sections shall be one *cylindrical*, integral piece~~, substantially cylindrical,~~ except as otherwise required for end sections of the outside diameter specified. All ~~steel pile shells~~ *pipe piles* shall be of sufficient strength to withstand driving to the required penetration *depth* and ~~bearing~~ *nominal driving resistance*.

The tips of ~~shells~~ *pipe piles* shall be equipped with conical driving points or flat closure plates. Conical driving points shall be of sufficient dimensions to ensure adequate joint and driving strength. The end of the ~~shell~~ *pipe pile* shall have full bearing on the face of the point or against a shoulder inside the point. Unless otherwise permitted, the point shall be conical with a 60 to 90 degrees angle between faces. The point shall be substantially of the same diameter as the end of the ~~shell~~ *pipe pile* and butt welded to the end of the lowest section.

If flat closure plates are used, they shall be non-reinforced and ~~of~~ a minimum thickness of 3/4 in. (19 mm) for ~~shells~~ *pipe piles* 12 ~~3/4~~ in. (~~324~~ *305* mm) outside diameter ~~and~~ *or* smaller, and 1 in. (25 mm) thick for ~~shells 14~~ *pipe piles greater than 12* in. (~~356~~ *305* mm) *outside diameter up to and including 14 in. (355 mm)*. For ~~shells~~ *pipe piles* larger than 14 in. (~~356~~ *355* mm) outside diameter, the plates shall be designed to ~~meet~~ *complement* the ~~particular cases~~ *size of the pipe pile*. Flat plates shall have a diameter approximately 1/2 in. (13 mm) greater than the *outside* diameter of the ~~shell~~ *pipe pile* and be fillet welded to the ~~shell~~ *pipe pile*, using two passes or beads.

If necessary to facilitate handling, ~~shells~~ *pipe piles* may be furnished in sections to be welded in the field to form the final integral lengths required.

The manufacturer shall provide a mill certification showing heat numbers and test results for the specified tests. Each *pipe* pile shall be stenciled to show the diameter, wall thickness, and heat numbers for the verification of the certifications. The certifications shall be delivered before the ~~pile shells~~ *pipe piles* are driven.

(b) Fluted Steel ~~Pile Shells~~ *Pipe Piles*

Fluted steel ~~pile shells~~ *pipe piles* shall have a minimum tensile strength of 50,000 psi (345 MPa) when tested in accordance with ASTM A 370. Test specimens for

FINAL DRAFT MINUTES

determination of tensile strength shall be taken longitudinally adjacent to the crest of the flute. The diameter of fluted steel ~~shells~~ *pipe piles* shall be measured from crest to crest of flutes.

A sufficient taper will be allowed to permit no less than 6 in. (150 mm) telescoping at the joints. The lowest section shall taper approximately 1 in. ~~(25 mm)~~ in 4 ft (*25 mm in* 1.2 m) from an 8 in. (203 mm) tip to the specified diameter of the upper end. ~~Flutted steel pile shells~~ *Fluted steel pipe piles* with a taper of 1 in. ~~(25 mm)~~ in 7 ft (*25 mm in* 2.1 m) on the lowest section of long piles may be used provided a minimum of approximately 5 ft (1.5 m) of the top of the pile below cutoff elevation is the full diameter as shown on the plans.

(c) Rounded Steel Pipe ~~Shells~~ *Piles*

Rounded steel pipe ~~shells~~ *piles*, except for end finish, shall be in accordance with ASTM A 252, grade 2 or 3. Welded pipe may be welded with straight or spiral seams.

(d) Epoxy Coating for Piles

Only powdered epoxy resin from the Department's list of approved Coating Materials shall be used for the epoxy coating of steel ~~pile shells~~ *pipe piles* and steel H piles.

The patching or repair material shall be compatible with the coating and shall be made available by the coating manufacturer. The material shall be suitable for repairs made to coated areas damaged during fabrication or handling.

The coating color shall contrast with the color of iron oxide. All coated piles furnished for a structure shall be the same color. The patching or repair material shall also be the same color as the original coating material.

1. Prequalification of Organic Coatings for Steel Piles

The coating product shall be a 100% solids, heat curable, thermosetting, dry powdered epoxy coating. Coating manufacturers who request to have their product added to the Department's list of approved Epoxy Coatings for steel shall supply the information as follows.

a. Product Data Sheet

A product data sheet which shall specify the method of surface preparation, the thermal treatments before and after coating application, the coating application procedure, and the product name and description of the patching material *shall be provided*.

b. Fingerprint

The fingerprint shall include the method of test, such as infrared spectroscopy or thermal analysis, and a generic description of the product.

c. Materials Safety Data Sheet

Current materials safety data sheets shall be supplied for the product and the patching material.

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d. Laboratory Report

A dated laboratory report ~~which~~ shall ~~substantiate~~ *be provided which substantiates* full compliance with the following test requirements.

(1) Tensile Strength and Elongation

The tensile strength and elongation of the coating material shall be tested in accordance with ASTM D 2370 with a rate of elongation of 10% to 20% min. The minimum tensile strength shall be 8,000 psi (56 MPa). The minimum elongation shall be 5%.

(2) Impact Resistance

The impact resistance of the coating shall be tested in accordance with ASTM G 14 using a 5/8 in. (16 mm) diameter tip, and a 12 mil (~~0.03 mm~~ *30 µm*) minimum coating thickness of a 1/8 in. (3.2 mm) thick panel at 73°F (23°C). Three tests shall be performed. The minimum acceptable value shall be 80 Lbf·in. (9.0 N·m) of impact with no visible breaks in the coating.

(3) Abrasion Resistance

The abrasion resistance of the coating shall be tested ~~by means of a Tabor Abraser or its equivalent, using CS-10 wheels and a 2.2 lb (1000 g) load~~ *in accordance with the Annex to ASTM A 972*. ~~The minimum allowable mass loss shall not exceed 100 mg per 1000 cycles.~~

(4) Salt Fog

The weathering resistance of the coating shall be tested by means of a salt spray cabinet following ASTM B 117 for 1000 h. The coating shall not blister or exhibit corrosion, discoloration, or loss of adhesion away from the scribed area.

2. Application

The application of the epoxy coating shall be at an enclosed plant, equipped with environmental controls and automated blasting equipment. This equipment shall facilitate surface preparation and coating application in accordance with the manufacturer's recommendations and in accordance with additional requirements set out herein. The application process shall be performed by a continuous, balanced system where cleaning of the surface and application of the coating are performed at the same rate.

a. Surface Preparation

The pile surface shall be blast cleaned in conformance with SSPC-SP-10, Near White Metal Blast. The cleaning media shall produce an anchor pattern profile of 2 mils (50 µm) minimum. ~~Any~~ *All* raised slivers, scabs, laminations or bristles of steel remaining on the newly cleaned surface shall be removed by *means of* abrasive sanders. All traces of grit and dust from the blasting shall be removed.

b. Coating Application

The coating shall be applied immediately to the cleaned surface and before visible oxidation of the surface occurs. The coating shall be applied in accordance with the manufacturer's recommendations. The recommendations shall address the equipment required for proper application, the number of coats of epoxy, cure time between coats, cure time before placing in service, and ~~any~~ *all* other information needed by the Department to ensure proper performance of the material.

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(1) Thickness

Thickness of the cured coating shall be measured on a representative number of piles from each production lot by the same method required by ASTM G 12 for measurement of film thickness of pipeline coatings on steel. The minimum coating thickness for fusion bonded epoxy shall be 8.0 mils (200 µm) for individual measurements and 12 mils (300 µm) for the average.

(2) Cure

The coating film shall be cured and post cured in accordance with the manufacturer's recommendations. A representative proportion of each production lot shall be checked by the coating applicator using a method found most effective for measuring cure to ensure that the entire production lot is in a fully cured condition.

(3) Continuity of Coating

After cure, the epoxy coating shall be checked by the applicator for continuity of coating and shall be free from holes, voids, contamination, cracks, and damaged areas. There shall not be more than two holidays, which are pinholes not visually discernable, in ~~any~~ *each* linear foot of the coated pile. A holiday detector *in accordance with ASTM A 972* shall be used in accordance with the manufacturer's instructions to check the coatings for holidays. ~~A 67 1/2 volt Tinker and Rasor Model M-1 detector or its equivalent shall be used.~~

3. Certification

Material furnished under this specification shall be covered by a type C certification in accordance with 916. In addition, a certificate of compliance prepared by the applicator shall be furnished for each shipment of coated piles. The certificate of compliance shall state that the piles have been coated in accordance with the manufacturer's requirements; that thickness, continuity, and flexibility tests of the coating have been performed; and that the test results ~~comply~~ *are in accordance* with the requirements outlined herein. Test results shall be retained by the applicator and made available for inspection upon request for a period of seven years.

915.02 Steel H Piles and Epoxy Coated Steel H Piles

Steel H piles and epoxy coated steel H piles shall be of the shape and dimensions shown on the plans or as otherwise specified. The steel shall be in accordance with ASTM A 572, grade 50. Steel H piling shall be handled in the same manner ~~and with the same care~~ as required in 711.56. The piles shall be uncoated unless an epoxy coating, in accordance with 915.01(d), is specified.

The manufacturer shall provide a mill certification showing heat numbers and test results for the specified tests. Each H pile shall be stenciled to show the manufacturer's name, the specifications, size and mass of section, and heat numbers for verification of the certification. The certification shall be submitted at the time of delivery of the piles.

915.03 Wood Piles

Wood piles shall be in accordance with 911.01(e) or 911.02(c) as specified.

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SECTION 915, CONTINUED.

915.03.1 Pile Tips

Steel H pile tips furnished shall be covered by a type C certification in accordance with 916. Pile tips shall be cast-in-one-piece steel in accordance with ASTM A 148 Grade 80-50 (grade 550-345) and shall be fastened to the piles by welding in accordance with the manufacturer's recommendations. They shall have sufficient flange and continuous web vertical back-ups to assure proper alignment and fitting to the pile. Either the pile tip or the outside of each flange of the pile shall be beveled 45 degrees. E70XX welding rods shall be used. All welds shall be made in the flat position.

The soil or rock bearing surfaces of the shoes shall be sloped downward towards the web a minimum of 15 degrees but not to exceed 45 degrees to the horizontal under the flanges. The sloped surfaces of the shoes shall terminate so as to form a flat surface not exceeding one third of the flange width. The surfaces may have individual or continuous cutting teeth.

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Other sections containing specific cross references:

701.01 Pg 427
701.03 Pg 427
701.09(f) Pg 439
707.02 Pg 490
707.09 Pg 497
711.02 Pg 506

General Instructions to Field Employees
Update Required? Y___ N___
By - Addition or Revision
Frequency Manual
Update Required? Y___ N___
By - Addition or Revision

Recurring Special Provisions potentially affected:

701-B-132

Standard Sheets potentially affected:

None

Motion: M
Second: M
Ayes:
Nays:

Action: Withdrawn

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SECTION 915, BEGIN LINE 192, DELETE AND INSERT AS FOLLOWS:

915.04 Elastomeric Bearings

(a) Description

Elastomeric bearings as herein specified shall include plain bearings, consisting of elastomer only, and laminated bearings, consisting of layers of elastomer restrained at their interfaces by bonded laminates. The ~~grade of the material~~ *bearing type* shall be as shown on the plans.

(b) Materials

1. Elastomer

Elastomeric bearing pads shall be made from elastomeric materials and shall be steel-reinforced as shown on the plans. They shall be in accordance with Articles 18.1 and 18.2 of the AASHTO LRFD Bridge Construction Specifications~~, Articles 18.1 and 18.2,~~ and AASHTO M 251 with the exception that Table X1 is not applicable. The elastomer portion of the elastomeric compound shall be 100% virgin natural polyisoprene known as natural rubber, or 100% virgin *poly*chloroprene known as neoprene. The cured compound shall be in accordance with Table A for natural rubber, or Table B for neoprene, depending on which type is furnished. ~~Compounds of nominal hardness between the values shown may be used and the test requirements interpolated. When test specimens are cut from the finished product, a ± 15% variation in tensile strength and ultimate elongation will be allowed.~~

SECTION 915, DELETE LINES 209 THROUGH 214.

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SECTION 915, AFTER LINE 215, INSERT AS FOLLOWS:

TABLE A

POLYISOPRENE, OR NATURAL RUBBER, QUALITY CONTROL TESTS

PHYSICAL PROPERTIES		
ASTM D 2240	*Hardness (Shore A Durometer)*	*55 ± 5*
ASTM D 412	*Tensile Strength, Min., ksi (MPa)*	*2.25 (15.5)*
	Ultimate Elongation, Min. %	*375*
HEAT RESISTANCE		
ASTM D 573, 70 h,@ 158ºF (70ºC)	*Change in Durometer Hardness, Max. Points*	*10*
	Change in Tensile Strength, Max. %	*-25*
	Change in Ultimate Elongation, Max. %	*-25*
COMPRESSION SET		
ASTM D 395, Method B	*22 h @ 158ºF (70ºC), Max.%*	*25*
OZONE		
ASTM D 1149	*25 ppm ozone in air by volume, 20% strain, 100ºF ± 2ºF (38ºC ± 1ºC), 48 h mounting procedure, D 518, Procedure A*	*No Cracks*
LOW-TEMPERATURE BRITTLENESS		
ASTM D 746, Procedure B	*Grades 0 & 2*	
	Grade 3, Brittleness @ -40ºF (-40ºC)	*No Failure*
INSTANTANEOUS THERMAL STIFFENING		
ASTM D 1043	*Grades 0 & 2, Tested @ -32ºC*	*Stiffness at test temperature shall not exceed 4 times the stiffness measured at 74ºF (23ºC).*
	Grade 3, Tested @ -40ºF (-40ºC)	
LOW-TEMPERATURE CRYSTALLIZATION		
Quad Shear Test as Described	*Grade 3, 14 Days @ -15ºF (-26ºC)*	*Stiffness at test time and temperature shall not exceed 4 times the stiffness measured at 74ºF (23ºC) with no time delay. The stiffness shall be measured with a quad shear test rig in an enclosed freezer unit. The test specimens shall be taken from a randomly selected bearing. A ±25% strain cycle shall be used. A complete cycle of strain shall be applied within a period of 100 s. The first 0.75 cycle of strain shall be discarded. The stiffness shall be determined by the slope of the force deflection curve for the next 0.50 cycle of loading.*

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TABLE B
POLYCHLOROPRENE, OR NEOPRENE, QUALITY CONTROL TESTS

PHYSICAL PROPERTIES		
ASTM D 2240	Hardness (Shore A Durometer)	55 ± 5
ASTM D 412	Tensile Strength, Min., ksi (MPa)	2.25 (15.5)
	Ultimate Elongation, Min. %	375
HEAT RESISTANCE		
ASTM D 573, 70 h,@ 212ºF (100ºC)	Change in Durometer Hardness, Max. Points	15
	Change in Tensile Strength, Max. %	-15
	Change in Ultimate Elongation, Max. %	-40
COMPRESSION SET		
ASTM D 395, Method B	22 h @ 212ºF (100ºC), Max.%	35
OZONE		
ASTM D 1149	25 ppm ozone in air by volume, 20% strain, 100ºF ± 2ºF (38ºC ± 1ºC), 48 h mounting procedure, D 518, Procedure A	No Cracks
LOW-TEMPERATURE BRITTLENESS		
ASTM D 746, Procedure B	Grade 3, Brittleness @ -40ºF (-40ºC)	No Failure
INSTANTANEOUS THERMAL STIFFENING		
ASTM D 1043	Grade 3, Tested @ -40ºF (-40ºC)	Stiffness at test temperature shall not exceed 4 times the stiffness measured at 74ºF (23ºC).
LOW-TEMPERATURE CRYSTALLIZATION		
Quad Shear Test as Described	Grade 3, 14 Days @ -15ºF (-26ºC)	Stiffness at test time and temperature shall not exceed 4 times the stiffness measured at 74ºF (23ºC) with no time delay. The stiffness shall be measured with a quad shear test rig in an enclosed freezer unit. The test specimens shall be taken from a randomly selected bearing. A ±25% strain cycle shall be used. A complete cycle of strain shall be applied within a period of 100 s. The first 0.75 cycle of strain shall be discarded. The stiffness shall be determined by the slope of the force deflection curve for the next 0.50 cycle of loading.

The bond strength, determined in accordance with ASTM D 429 Method B, shall be at least 40 lb/in. (7 N/mm).

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The adhesion failure, determined in accordance with ASTM D 429 Method B, shall be at least R-80. The adhesion-failure requirement will be waived if the bond strength is at least 80 lb/in. (14 N/mm).

2. Structural Steel

Structural steel ~~shim~~ spacer plates and other steel components, including anchor bolts, shall be galvanized in accordance with AASHTO M ~~232~~ 111.

3. Internal Steel Shims

Internal steel shims shall be rolled hot and cold steel and shall be in accordance with AISI 1015 through 1025, ~~ASTM A 366 (ASTM A 366M), or ASTM A 569 (ASTM A 569M)~~ ASTM A 1008 (A 1008M), or ASTM A 1011 (A 1011M) grade 36 or higher.

4. Threaded Stud

Threaded studs, where required, shall be in accordance with ~~AASHTO M 164 (AASHTO M 164M)~~ ASTM A 307 (A 307M) and mechanically zinc coated in accordance with AASHTO M 298, class 50.

5. Side Retainer

Side retainers shall be made from plates or rolled mild steel in accordance with ASTM A 36 (ASTM A 36M).

(c) Manufacturing Requirements

Plain bearings may be molded individually, cut from previously molded strips or slabs, or extruded and cut to length. Cut edges shall be at least as smooth as ANSI B 46.1 No. 250 finish. Unless otherwise shown on the plans, all components of a laminated bearing shall be molded together into an integral unit. ~~Edges of the non-elastic laminations shall be covered by a minimum of 1/8 in. (3 mm) of elastomer except at laminate restraining devices and around holes that shall be entirely closed on the finished structure.~~ Air bubbles within the elastomeric material shall be cause for rejection.

~~Each bearing pad shall be marked permanently to show the manufacturer and the month and year of fabrication.~~

Laminated elastomeric bearings shall be individually molded to the required size. Corners and edges may be rounded with a radius at the corners not exceeding 3/8 in. (10 mm) and a radius at the edges not exceeding 1/4 in. (6 mm).

Steel shims shall be sandblasted and cleaned and protected against contaminants until fabrication is completed.

Bearings designed as a single unit shall be built as a single unit.

Each reinforced bearing shall be marked with indelible ink or flexible paint. The marking shall consist of the orientation, the order number, lot number, bearing identification number, and elastomer type and grade number. Unless otherwise specified, the marking shall be on a face that is visible after erection of the bridge.

(d) Appearance and Dimensions

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SECTION 915, DELETE LINES 230 THROUGH 259.

SECTION 915, AFTER LINE 260, DELETE AND INSERT AS FOLLOWS:

The edges of the embedded steel laminates, including around holes, shall be covered with 1/8 to 1/4 in. (3 to 6 mm) of elastomer. All other dimension tolerances shall be in accordance with AASHTO M 251.

(e) Quality ~~Assurance~~ *Control*

The mechanical properties of the *materials and of the* finished bearing*s* shall be ~~determined by laboratory test by the manufacturer~~ *in accordance with the AASHTO LRFD Bridge Construction Specifications, Article 18.2.5, and AASHTO M 251, with the exception that the tables in 915.04(b)1 shall be used.* ~~The following values shall be used for control of laboratory testing of full size bearings.~~

1. Compressive strain of a layer of an elastomeric bearing shall not exceed 7% at 800 psi (5.5 MPa) average unit pressure or at the design dead load plus live load pressure if so indicated on the plans.

2. The shear resistance of the bearing shall not exceed ~~30 psi (207 kPa) for 50 durometer,~~ 40 psi (276 kPa) for ~~60~~ *55* durometer, ~~or 50 psi (345 kPa) for 70 durometer,~~ Table A compounds; nor ~~50 psi (345 kPa) for 50 durometer,~~ 75 psi (517 kPa) for ~~60~~ *55* durometer, ~~or 110 psi (758 kPa) for 70 durometer,~~ Table B compounds at 25% strain of the total effective rubber thickness after an extended four day ambient temperature of -20°F (-29°C). ~~Unless otherwise specified, the shear resistance test will be waived.~~

(f) Certification

Material furnished under this specification shall be covered by a type B certification in accordance with 916. *The results of the following tests shall be provided on the type B certification.*

Test	*ASTM, or INDOT Std. Spec.*
Ultimate Tensile Strength	*D 412*
Ultimate Elongation	*D 412*
Hardness (Durometer)	*D 2240*
Tensile Strength and Elongation on Oven-aged Material	*D 573 and D 412*
Hardness on Oven-aged Material	*D 573 and D 2240*
Compression Set	*D 395, Method B*
Ozone Resistance	*D 1149*
Adhesion	*D 429, Method B*
Brittleness	*D 746, Procedure B*
Compressive Strain	*915.04(e)1*
Shear Resistance	*915.04(e)2*

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REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 915, CONTINUED.

In addition, one bearing pad from each type to be furnished for the structure will be required for laboratory testing. However, ~~when~~ *if* shapes A and B of ~~any~~ *a given* type are required, only shape A need be furnished for testing. The material may be sampled prior to shipment to the project *site*, provided suitable arrangements can be made through the *Office of* Materials ~~and Tests Division~~ *Management*. Materials not previously sampled and approved for use shall be sampled after delivery to the project *site*. Samples shall be furnished at least 30 days before date of use.

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Other sections containing specific cross references:

707.02 Pg 490
707.09 Pg 497
711.02 Pg 506

Recurring Special Provisions potentially affected:

726-B-044

Motion: Ms. Rearick
Second: Mr. Walker
Ayes: 10
Nays: 0

General Instructions to Field Employees
Update Required? No

Frequency Manual
Update Required? No

Standard Sheets potentially affected:

726-BEBP-01, 02, 03, and 04

Action: Passed as revised

___ RSP Effective: _____ Letting
RSP Sunset Date: _____
___ RPD Effective: _____ Letting
_x_ 2010 Standard Specifications Book
___ 20__ Standards Edition
___ Technical Advisory

Withdrawn ____

Received FHWA Approval? Yes

SPECIFICATION REVISIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Weathering steel in high mast towers keep rusting with time and it has been observed, that as excessive rusting takes place at the bottom of the towers, it is not safe and causes failure to the towers.

PROPOSED SOLUTION In order to use the galvanized steel in place of the weathering steel in high mast lighting towers, I am proposing the following changes in our 2008 Standard Specifications. Changes being proposed are only in the material of poles, welding procedure, inspection and finishing of the poles. I am keeping the existing bottom latching system as it is. Please note that the changes being proposed are only for section 920.01 lines 223 to 265 pages 861 to 862 of the 2008 Indiana Standard Specifications.

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

APPLICABLE STANDARD DRAWINGS: 807-LTHM 01-04 (no changes needed)

APPLICABLE DESIGN MANUAL SECTION: 78.7

APPLICABLE SECTION OF GIFE:

APPLICABLE RECURRING SPECIAL PROVISIONS:

Submitted By: Lalit Garg through Mike Bowman

Title: HE-2

Organization: INDOT

Phone Number: 317-232-5241

Date: 10.20.08

APPLICABLE SUB-COMMITTEE ENDORSEMENT?

I have discussed this with Steve Bates from Techlite Corporation and he has got the design prepared from Barry N. Sladek, PE, Valmont Industries, Inc. He has submitted the design for Indiana Department of Transportation, High Mast Towers based on 2001 AASHTO, 90 MPH wind velocity, 50 Year mean Recurrence and Fatigue Category 1. Valmont is a leading industry in this field. I have discussed this with Mr. Jim Wild from Union Metal also.

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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).~~

~~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.~~

The poles shall be a low deflection tapered shaft having polysided or circular cross sections. The pole shaft cross section at the top shall be not less than 7.5 in. (190 mm) in diameter. The shaft cross section at the bottom shall not be greater than that which is compatible with the base plate bolt circle specified, and shall not be less than 24 in. (600 mm) in diameter for new installations. The minimum wall thickness of the bottom portion of the tower shaft shall be 0.2391 in. (3 gauge).

All tower shaft components shall be fabricated from high strength, low alloy, steel according to 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).

Galvanized steel poles shall be thoroughly cleaned and galvanized according to AASHTO M 111. Each tower shaft shall be constructed of not more than the following welded or slip fitted sections.

Tower Height Feet (Meters)	*Maximum Number of Sections*
130 (40), 140 (43), 150 (46), 160 (49)	*4*
90 (27), 100 (30), 110 (33), 120 (36)	*3*
80 (24)	*2*

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 pre-fitted and match marked at the factory and shall be

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shipped disassembled for assembly at the job site. Slip joints shall be marked to ensure the 1.5 times diameter insertion is provided.

Hardware shall be stainless steel in accordance with ASTM A 276, type 304 or 305, except where otherwise specified.

~~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.~~

2. Welding

~~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 711.32.~~

a. Requirements

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

Welds shall be smooth and thoroughly cleaned of flux and spatter and be according to the AWS. Minimum preheats for welds shall be 100°F (65°C) for seams, and 225°F (110°C) for circumferential welds.

Circumferential welds, including top flange welds, shall be full penetration welds.

Longitudinal welds shall have a minimum of 60% penetration, except the longitudinal welds on both the male and female shaft sections shall be full penetration welds within a distance of two diameters of overlap joints.

All full penetration welds shall be inspected for soundness by the ultrasonic method and all partial penetration welds shall be inspected by the magnetic particle method.

Welded procedure specifications for seams and circumferential welds shall be qualified according to Section 4, Part B of AWS D1.1. Charpy V-Notch (CVN) impact specimens shall be tested according to table III-1 (note 2) of Appendix III for minimum values of 25 ft·lbs at 40°F (34 J at 4°C). Fillet weld procedures shall be tested according to table 4.04 of AWS D1.1.

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REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 920, CONTINUED.

b. Inspection

In addition to manufacturer's own welding inspection, the Contractor shall have welding inspected by an independent certified welding inspector (CW). The selected inspector shall be approved by the Engineer before any inspection is permitted. The NDE inspector(s) shall be independent non-destructive testing inspector(s), certified as level II in RT, UT, and/or MT as applicable.

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

The independent welding inspector shall send the test results directly to the concerned Department's District Traffic Engineer.

c. Tower Finish

Galvanized steel towers shall be hot-dip galvanized including the hand hole, handhole door, base plate, mounting plate and all other elements welded to the shaft according to AASHTO M 111.

FINAL DRAFT MINUTES

Other sections containing specific cross references:

920.01(b)1
920.01(b)5 Pg 863

920.01(b)2
None

Recurring Special Provisions potentially affected:

None

General Instructions to Field Employees
Update Required? Y___ N___
By - Addition or Revision
Frequency Manual
Update Required? Y___ N___
By - Addition or Revision

Standard Sheets potentially affected:

807-LTHM 01 thru 04

Motion: M
Second: M
Ayes:
Nays:

Action: Withdrawn