INDIANA DEPARTMENT OF TRANSPORTATION

STANDARDS COMMITTEE MEETING

Driving Indiana's Economic Growth

APPROVED MINUTES

January 15, 2009 Standards Committee Meeting

MEMORANDUM

February 25, 2009

TO: Standards Committee

FROM: Mike Milligan, Secretary

RE: Minutes for the January 15, 2009 Standards Committee Meeting

The Standards Committee meeting was called to order by the Chairman at 9:01 a.m. on January 15, 2008 in the N755 Bay Window Conference Room. The meeting was adjourned at 12:13 p.m.

The following members were in attendance:

Mark Miller, Chairman	Dave Andrewski, Pvmt. Engineering
Dennis Kuchler, Constr. Mgmt.	Mike Beuchel*, Contract Admin.
Ron Heustis, Constr. Mgmt.	John Wright, Roadway Services
Mike Bowman, Highway Ops.	Anne Rearick, Structural Serv.
Ron Walker, Materials Mgmt.	Jim Keefer, Constr. Mgmt.
Tom Caplinger, Crawfordsville Dist.	

** Proxy for Bob Cales*

Also in attendance were the following:

Mike Milligan, Secretary	Steve Fisher, INDOT
Jim Reilman, INDOT	Kumar Dave, INDOT
Tom Carrow, INDOT	Paul Berebitsky, ICA
Mir Zaheer, INDOT	Robert Dirks, FHWA
Tony Uremovich, INDOT	

Page No.

A. GENERAL BUSINESS ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

1. Approval of November 20, 2008 Minutes

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

2. Approval of December 18, 2008 Minutes

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

3. Deletion of RSP 728-B-039, Masonry Coating

   Design Memo 09-03 will eliminate coating as a standard design element. RSP 728-B-039 will be archived and will be available if required for individual contracts as a unique special provision.

4. Revised Standards Committee Schedule

   Mr. Heustis distributed a revised Standards Committee submittal and distribution schedule. Members were asked to send comments to Ron Heustis. *(See attachment on last page)*.

5. Section Monuments

A discussion was held concerning the use of copper versus iron pins for survey and section monuments (615 vs E615-SCMN-01). It was decided that there currently isn't a conflict, but this item will be held for further discussion about monuments in general. Tony Uremovich will work on a recommendation to submit within 6 months.

B. CONCEPTUAL PROPOSAL ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

(No items on this agenda)

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

OLD BUSINESS

Items No.08-15-3, 08-15-9, 08-15-19 and 08-15-20	Mr. Heustis	6

Item No.08-15-3
701-B-132 PILE DRIVING

Item No.08-15-9
Standard Drawing 701-BPIL-02 & 04
701 DRIVEN PILING
701-B-154 OVERSIZED PREDRILLED PILE HOLES AND BENTONITE REDUCTION OF GROUT FOR PILE DOWNDRAG

Item No.08-15-19
911.01(e) Untreated Piling
911.02(c) Piling

Item No.08-15-20
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
915.03 Wood Piles
915.03.1 *Pile Tips*
Passed as revised

Item No. 08-15-8 Mr. Heustis 43
Standard Drawing 506-CCPP-01
506.12 Method of Measurement
506.13 Basis of Payment
Passed as revised

NEW BUSINESS

Item No.01 01/15/09 (2008 SS) Mr. Heustis 47
RSP 628-R-552 Pass to be adopted into 2010 book
Passed as submitted

Item No.02 01/15/09 (2008 SS)	Mr. Heustis	60
211-R-543	B BORROW AND STRUCTURE BACKFILL	
731-R-202	MECHANICALLY STABILIZED EARTH RETAINING WALLS	
732-R-310	MODULAR CONCRETE BLOCK RETAINING WALL	
	Passed as revised	
Item No.03 01/15/09 (2008 SS)	Ms. Rearick	96
Standard Drawings	706-BRRW-01 (revised)	
	706-BRRW-02 (becomes 03)	
	706-BRRW-03 (becomes 05)	
	706-BRRW-04 (becomes 07)	
	706-BRRW-05 (becomes 09)	
New Standard Drawings	706-BRRW-02 (new)	
	706-BRRW-04 (new)	
	706-BRRW-06 (new)	
	706-BRRW 08 (new)	
	706-BRRW-10 (new)	
	706-BCBR-01	
	706-BCBR-02	
	706-BCBR-04	
	Passed as revised	
Item No.04 01/15/09 (2008 SS)	Mr. Wright	113
Standard Drawings	802-SBTS-01 thru 19	
802.07(b)1	Trusses	
910.19	Overhead Sign Structures,	
910.19(a)	Aluminum Overhead Sign Structures, Box Truss and Bridge Attached	
910.19(b)	Steel Overhead Sign Structures, Box Truss, Cantilever, Monotube, and Bridge Attached	
	Passed as revised	
Item No.05 01/15/09 (2008 SS)	Mr. Heustis	141
203.28	Basis of Payment	
	Passed as submitted	

cc: Committee Members (11)
FHWA (2)

SPECIFICATIONS REVISION

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Some of the 701 Driven Piling specifications 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: E701-BPIL-02 & E701-BPIL-04

APPLICABLE DESIGN MANUAL SECTION: TBD

APPLICABLE SECTION OF GIFE: new GIFE section 701

APPLICABLE RECURRING SPECIAL PROVISIONS: 701-B-132, 701-B-078 (propose to delete this RSP and incorporate into 701), 701-B-154,

APPLICABLE RECURRING PLAN DETAILS: 701-B-101d -propose to delete current RPD and place enclosed Pile and Driving Equipment Data Form on the Department's website.

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.

Items No.08-15-3, 08-15-9,
08-15-19, 08-15-20
Mr. Heustis
Date: 01/15/09

REVISION TO RECURRING SPECIAL PROVISION

701-B-132 PILE DRIVING

(Revised 01-15-09)

~~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 _____.

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

701-B-132

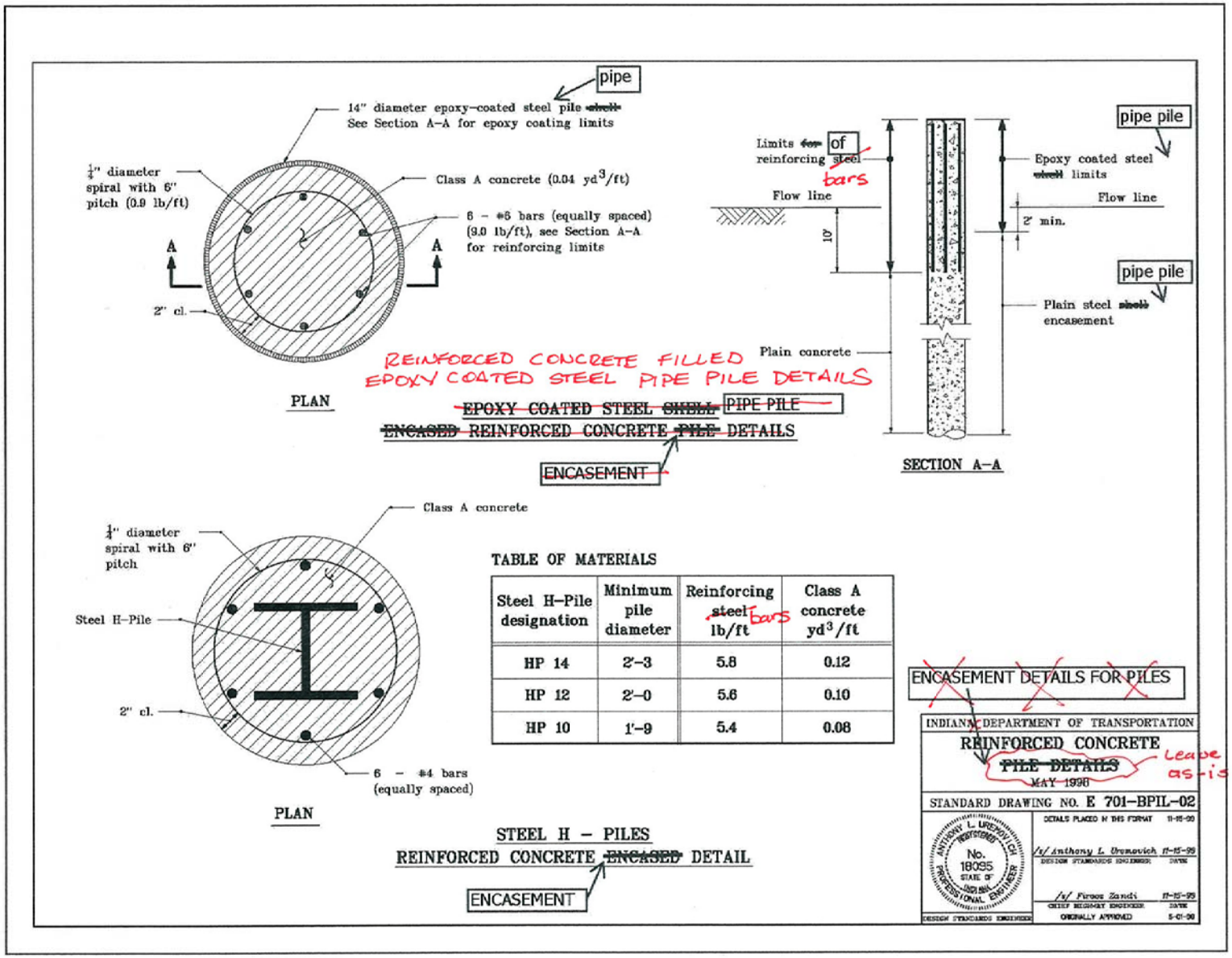
NOTE: The Pile and Driving Equipment Data form will be made available thru the Department's website.

REVISION TO STANDARD DRAWINGS AND 2008 STANDARD SPECIFICATIONS

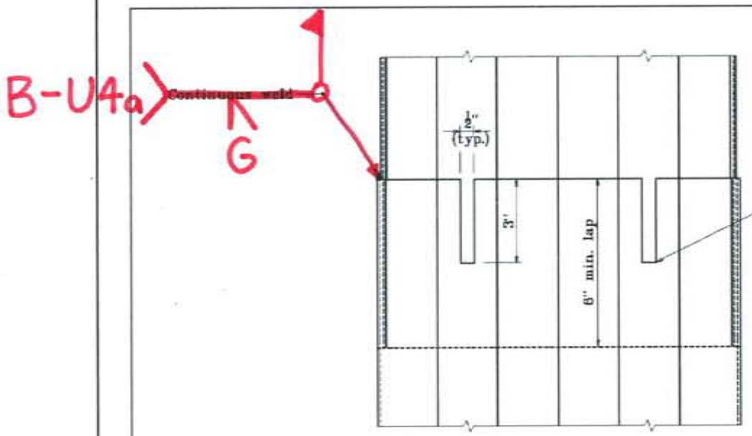
701-BPIL-02 Reinforce Concrete Encasement Details for Pipe
701-BPIL-04 Splicing Pipe Piles in Field

SECTION 701 – DRIVEN PILING

701-B-154 OVERSIZED PREDRILLED PILE HOLES AND BENTONITE GROUT FOR REDUCTION OF PILE DOWNDRAG

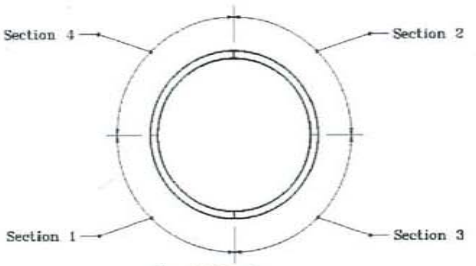


Steel H-Pile designation	Minimum pile diameter	Reinforcing ~~steel~~ bars lb/ft	Class A concrete yd³/ft
HP 14	2'-3	5.8	0.12
HP 12	2'-0	5.6	0.10
HP 10	1'-9	5.4	0.08



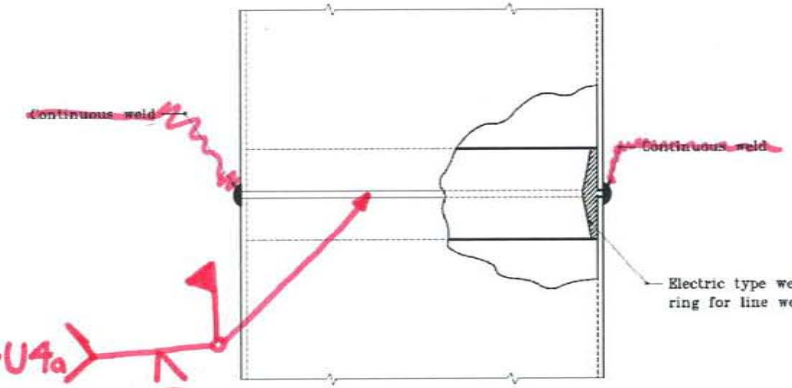
Burn four equally spaced slots in lower section before inserting extension

FOR FLUTED ~~SHELLS~~ PIPE



Completion of Sections 1, 2, 3 & 4 constitutes one pass.

WELDING SEQUENCE



Electric type wedge split chill ring for line welding

FOR ROUNDED PIPE

INDIANA DEPARTMENT OF TRANSPORTATION

SPLICING PILE ~~SHELLS~~ PIPES IN FIELD

SEPTEMBER 1994

STANDARD DRAWING NO. E 701-BPIL-04

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zaidi 11-15-99
CHIEF BRIDGE ENGINEER DATE

ORIGINALLY APPROVED 5-30-54

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

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 specified 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 in accordance with 105.03.

MATERIALS

701.02 Materials

Materials shall be in accordance with the following:

B Borrow	*211*
Concrete Piles	*707*
Conical Pile Tips	*915.01(a)2*
End Plates	*915.01(a)1*
Epoxy Coating for Piles	*915.01(d)*
Pile Shoes	*915.03.1*
Reinforcing Bars	*910.01*
Steel Pipe Piles	*915.01*
Steel H Piles	*915.02*
Structural Concrete	*702*
Timber Piling, Treated	*911.02(c)*
Timber Piling, Untreated	*911.01(e)*

Unless otherwise specified, reinforcing bars may be either plain or epoxy coated.

Steel pipe piles shall consist of a steel pipe which is driven into place and filled with class A concrete.

The Contractor may furnish and drive steel pipe piles with thicker walls 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.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

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 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 is available on the Department's website. 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. Acceptance of pile and driving equipment does not relieve the Contractor of the responsibility to provide equipment suitable for driving the specified piling to the required bearing without damage.

If the method of pile driving approval is in accordance with the dynamic formula shown in 701.05(a), a ~~W~~wave ~~E~~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.

If the driving system requires revision, 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.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

The Contractor shall use the approved pile driving system. No changes shall be made without prior written approval from the Engineer, with the exception that the concrete pile cushion thickness may be increased 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:

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.

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 or approved 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 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 air compressor to 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 combined weights 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.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

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 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 approved open-end diesel hammer. The Contractor shall also provide and maintain in working order an approved device that automatically measures and displays the ram stroke for open-end diesel hammers.

Closed-end double acting diesel hammers shall be equipped with an accurate bounce chamber pressure gauge, ~~in working order, mounted near ground level so as to be read bye~~ easily accessible to 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 c~~Calibration ~~to~~ of actual hammer performance shall be performed ~~a maximum of~~ no more than 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~~ Aids

Pile driving aids such as jets~~,~~ and followers, ~~and prebored holes~~ shall not be used unless specified or approved in writing by the Engineer. If specified or approved, pile driving aids shall be used for installing production piles only after the minimum pile tip elevation 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.

SECTION 701, CONTINUED.

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 shall not be used. 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~~,~~. The helmet shall be axially aligned with the hammer and the pile~~,~~ shall 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 horizontal dimension 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 smolder or 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.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

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 battered piles.

5. Followers

Followers shall only be used if specified or 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 shall only be permitted if specified or approved in writing by the Engineer. 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 5 ft (1.5 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~~ provide suitable sediment control measures for jet water in accordance with the specifications. 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.

7. Collars

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

8. Pile Shoes, End Plates, and Conical Pile Tips

Pile shoes shall be used when specified. End plates or conical pile tips shall be used on pipe piles. Steel pile shoes 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 one of the following methods as specified to ~~in determining~~ determine 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: $R_{ndr} = \sout{0.5[}1.75\sqrt{E}\ x\ (\log 10N) - 100\sout{]}$

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

where R_{ndr} *= The nominal driving resistance in ~~tons~~ kips (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.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

An indicator test piles shall be the first pile driven at each bent and pier 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 of the bottom of the footing before the pile is driven, unless otherwise shown on the plans ~~or otherwise directed~~.

To assess the effects of relaxation and setup, each indicator test pile shall be restruck after the ~~a minimum 24 h waiting period~~ number of hours specified 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 stop immediately and the Office of Geotechnical Engineering shall be notified.

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.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

(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 pile driving analysis, or PDA in accordance with ASTM D 4945. Pile driving analysis will 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. If the contract is a local public agency contract, the Contractor shall perform the pile driving analysis in accordance with ASTM D 4945.

1. Scheduling

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

2. Dynamic Monitoring

The Contractor shall make the steel piles available so that the Engineer 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 Department. The Contractor shall install the transducers before striking the pile. ~~The Contractor shall expect a delay of 1 h per pile for attaching 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.

SECTION 701, CONTINUED.

~~*Unless otherwise directed, t*~~*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 Engineer 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 assist the Engineer with reattachment of dynamic test instruments. ~~*The Contractor shall allow 1 h per pile and shall assist the Engineer with the reattachment of the dynamic test instrument*~~*s. 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*~~ *foundation production pile driving is to begin. The Engineer will provide* ~~*these*~~ *final driving criteria for the indicated foundation first. Once the restrike test for the test pile is complete, the Engineer will run CAPWAP analyses and will provide the final driving criteria* ~~*to be used for the pile and hammer system*~~ *within* ~~*2*~~ *two business* ~~*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*~~ *2 business days 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*~~ *business 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, 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 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.

SECTION 701, CONTINUED.

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 ~~1~~2000 ~~t~~ kips (8900 kN) or 150% of the nominal driving resistance, whichever is less. A minimum of seven days prior to driving the static load test pile or 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 proposed load test and reaction pile driving sequence, 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. Plans for the reaction frame and loading apparatus shall be designed and stamped by a professional engineer and submitted to the 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~~ dimensions 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~~ dimensions 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.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

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.

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 provide all assistance necessary to perform the static load test. 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 will be determined by 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 axial resistance will be determined from the test data in accordance with the Davisson Method as specified in 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 a minimum of 4 1/2 in. in (110 mm) diameter with gradations in accordance with ASTM D1143. 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 static load test, 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.

701.06 Blank

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

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 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. (6 mm) rebound per blow. The Contractor shall stop driving as soon as the Engineer determines that the pile has reached practical refusal.

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.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

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.

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

Pilot holes are prebored, predrilled, or cored. After a pile is driven thru a pilot hole, 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

~~*When specified the Contractor shall prebore holes at pile locations to the depths shown on the plans*~~ *When shown in the plans, the Contractor shall prebore holes at the locations shown and to the depth specified. 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*

SECTION 701, CONTINUED.

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 in writing by the Engineer. 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 minimum diameter of not less than the greatest dimension of the pile cross section plus 4 in. (100 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.

~~When specified, pilot holes for piles used in integral end bent structures shall be predrilled to the elevations shown~~ Pilot holes for end bent piles for structures with integral end bents shall be predrilled to the depth specified in the plans, regardless of the height of new embankment.

3. Cored Hole in Rock

When specified, holes shall 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 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 by a welder qualified in accordance

SECTION 701, CONTINUED.

with 711.32. No pile shall be closer than 4 in. (100 mm) from an edge of the pile 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.

Battered piles shall be installed so that the alignment of the top 10 ft (3 m) of the pile does not vary by more than 3% from the batter rate shown in the plans.

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 by the Contractor. Proposed corrective measures will be subject to approval by the Engineer.

(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. Elevation readings for checking 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 bent with a single row of piles, pile driving shall begin at one end of the bent and proceed toward the opposite end.

(e) Inspection

The Engineer shall be given a minimum of 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 suitable lighting for the inspection of each pipe pile by the Engineer throughout its entire length.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

(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 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 ft (7.5 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~~ ft (4.5 m) from the pile to be filled. All pile driving within the above limits shall be discontinued until the concrete in the last pile cast has cured for a minimum of 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 shall not be used within 20 ft (6 m) 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 shall not be used in integral end bents.

(b) Timber Piles

Timber piles shall not be spliced.

SECTION 701, CONTINUED.

(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.

701.12 Blank

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

The driven length of treated timber piles, untreated timber piles, steel pipe piles, steel H piles, and concrete piles will be measured by the linear foot (meter) to the nearest 0.1 ft (0.03 m). This includes piles used as indicator test piles, dynamic test piles, or static load test piles. Measurement will be made only for the actual number of linear feet (meters) of piling complete in place. For concrete piles, this length will not include extensions or the portion of the pile cutoff to make the extension.

~~*If the actual quantity of driven piling is less than either the plan quantity or the quantity as ordered by the Engineer, the Department will measure to the nearest 0.1 ft (0.03 m) the difference between the actual quantity driven and the plan quantity or the quantity as ordered by the Engineer.*~~

~~*The d*~~*Dynamic pile load test,* ~~*the*~~ *static pile load test, indicator test pile* ~~*restriking*~~ *restrike, dynamic test pile* ~~*restriking*~~ *restrike, pile shoes, and conical pile tips will be measured per each.*

SECTION 701, CONTINUED.

Epoxy coated piles, prebored holes, and cored holes in rock will be measured by the linear foot (meter) complete in place of the diameter specified.

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

701.15 Basis of Payment

All treated timber piles, untreated timber piles, steel pipe piles, steel H piles, and concrete piles driven will be paid for by the linear foot (meter). Payment will be made only for the actual number of linear feet (meters) of piling complete in place. Extensions for concrete piles will be paid for in accordance with 109.05.

Driven piles used as indicator test piles or dynamic test piles that are left in place and subsequently used as production piles will be paid for by the linear foot (meter) as either production indicator test piles or production dynamic test piles. Reaction piles used in a static pile load test that are left in place and subsequently used as a production pile will be paid for by the linear foot (meter) as the type of production pile they represent. Driven piles used as indicator test piles, dynamic test piles, or static load test piles that are not used as production piles will be paid for by the linear foot (meter) as non-production dynamic, indicator, or static test piles respectively.

If the quantity of driven piling is less than the plan quantity or the quantity as ordered by the Engineer, the Department will pay for the difference as piling, furnished but not used. ~~Payment will be made for the material cost of the unused piling as shown on paid invoices provided by the Contractor.~~ The Department will ~~also~~ pay 50% of the cost to re-stock unused piling if the Contractor elects to re-stock piling and provides a paid invoice showing the re-stocking fee. Payment will be made for piling, restock.

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

Prebored holes and cored holes in rock will be paid for at the contract price in linear feet (meters).

Payment will be made under:

Pay Item	***Pay Unit Symbol***
Conical Pile Tip, _____ (pile size), _____ (type)	*EACH*
Cored Hole in Rock, _____ (diameter) in. (mm)	*LFT (m)*

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

Dynamic Pile Load Test ..... *EACH*
Pile, Concrete _____ x _____ ..... *LFT (m)*
size
Pile, Prestressed Concrete _____ x _____ ..... *LFT (m)*
size
Pile, Steel Pipe, _____, _____ ..... *LFT (m)*
pipe wall thickness diameter
Pile, Steel Pipe, Epoxy Coated, _____, _____ ..... *LFT (m)*
pipe wall thickness diameter
Pile, Steel H, Epoxy Coated, HP _____ x _____ ..... *LFT (m)*
size
Pile, Steel H, HP _____ x _____ ..... *LFT (m)*
size
Pile, Steel H, Reinforced Concrete Encased, HP _____ x _____ ..... *LFT (m)*
size
Pile, Timber ..... *LFT (m)*
Pile, Timber, Treated ..... *LFT (m)*
Pile Shoe, _____, _____ ..... *EACH*
pile size type
~~*Piling, Furnished But Not Used* ..... *LFT (m)*~~
Piling, Restock ..... *LS*
Prebored Hole, _____ in. (mm) ..... *LFT (m)*
diameter
Static Pile Load Test, _____ ..... *EACH*
pile size
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*

All costs associated with the dynamic pile load test except the cost of the test pile and test pile restrike shall be included in the cost of the dynamic pile load test.

All costs associated with the static pile load test except the cost of the test pile shall be included in the cost of the static pile load test. The cost of reaction piles used in the static load test and not incorporated into the work as production piles shall be included in the cost of the static load test.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 701, CONTINUED.

The cost of furnishing and placing concrete or B borrow necessary to fill pilot holes, and all necessary incidentals shall be included in the cost of the pay items of this section.

The cost of the following shall be included in the cost of the piling.

(a) predrilling pilot holes;
(b) broken, bent, damaged, or misplaced piles;
(c) concrete filling or concrete encasement;
(d) corrective location or alignment measures;
(e) epoxy coating;
(f) splicing piles and jetted sites;
(g) modifying or replacing pile driving equipment;
(h) redriving piles which have heaved more than 1/4 in. (6 mm);
(i) plain and epoxy coated reinforcing bars;
(j) repairing epoxy coating;
(k) replacing epoxy coated piling;
(l) restriking production piles not shown as test piles;
(m) piles which are not acceptable or damaged during driving;
(n) piles which were not driven in accordance with these specifications;
(o) piles driven with the tops lower than the cutoff elevation;
(p) spudding or jetting of piles;
(q) end plates for pipe piles;
and
(r) all labor, equipment, and necessary incidentals.

No additional payment will be made if the Contractor elects to furnish and drive thicker walled pipe piles than specified.

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

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

The cost of mobilization and demobilization for pile driving operations shall be included in the cost of mobilization and demobilization in accordance with 110.04.

The cost to control sediment in water from jetting operations shall be included in the cost of the piling.

REVISION TO RECURRING SPECIAL PROVISION

701-B-154 OVERSIZED PREDRILLED PILE HOLES AND BENTONITE GROUT FOR REDUCTION OF PILE DOWNDRAG

(Revised 01-15-09)

Description

This work shall consist of pre-drilling pile holes to the elevations and at the location shown on the plans, driving piles, and backfilling with bentonite grout.

Materials

Bentonite grout shall be untreated, sodium bentonite mined in South Dakota or Wyoming, finely ground with not more than 5% retained on the No. 200 (75 µm) sieve. It shall be free of lumps and objectionable materials that would prevent easy mixing into a smooth fluid free of lumps of unmixed bentonite. Calcium bentonite will not be acceptable.

The following are acceptable suppliers of bentonite.

Baroid, Haliburton Services, Houston (281) 871-5900

Local distributors are:
IES Drilling Supply, Pearl City, IL (800) 388-2906
Hughes Supply, Indianapolis, IN (317) 543-3603
Laibe Supply, Indianapolis, IN (317) 231-2250

Cetco, Arlington Heights (847)392-5800

Wyo-ben, Billings MT (406) 652-6351

Local distributors are:
Midsouth Supply, Greenfield, IN (317) 894-2210
Griffin Dewatering, Hammond, IN (219) 931-1662
J Line Pump, Yorkville, IL (630) 553-5100
Pump and Irrigation Supply, Evansville, IN (812) 985-3545

The grout shall be proportioned at 2 lbs (0.907 kg) of pure bentonite powder per 1 gal. (3.785 L) of potable water. Deviations from these proportions require approval of the Engineer.

Construction Requirements

The minimum diameter of the holes shall be 4 in. (100 mm) greater than the maximum cross sectional dimension of the pile. The holes shall be drilled to the elevations shown on the plans. The piles shall then be driven to *the required* ~~full~~ penetration *depth and nominal driving resistance*~~, if practicable, but at least to the specified bearing value~~. If pile sleeves are shown on the plans, the drilled holes shall be sleeved to maintain the opening during the driving of the piles.

Immediately after driving the piles, the annular space between the pile and the permanent casing or the pre-drilled hole shall be filled with the bentonite grout. The grout shall be emplaced at depths shown on the plans or as directed. The method of emplacement will be to fill the entire annular space from the bottom upwards to the top of the pile in one pumping operation using *a* tremie pipe.

REVISION TO RECURRING SPECIAL PROVISION

701-B-154, CONTINUED.

Tremie pipe construction shall include side discharge ports. Termination of the tremie pipe using a tee connection will be acceptable. Tremie pipe may be constructed of polyvinyl chloride, however, joints shall not be glued or cemented.

Method of Measurement

Predrilled pile holes will be measured by the linear foot (linear meter). Bentonite grout will not be measured.

Basis of Payment

Predrilled pile holes will be paid for at the contract unit price per linear foot (linear meter) for oversized predrilled pile holes.

Payment will be made under:

Pay Item	**Pay Unit Symbol**
Predrilled Oversized Pile Holes	LFT (m)

The costs of sleeves and sleeving, maintaining open holes during pile driving, bentonite grout, and placing bentonite grout and all miscellaneous materials and work shall be included in the cost of predrilled oversized pile holes.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 911, BEGIN LINE 106, DELETE AND INSERT AS FOLLOWS:

(e) Untreated Piling

Untreated piles shall be *in accordance with ASTM D 25 and the following. All piling 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 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.~~ *Piles shall be free from reverse bends.* The butts *and tips* shall be sawed square *with the axis of the pile. Alternatively,* ~~and~~ the tips ~~sawed square or~~ *may be* 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 *clean*-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 outside the centerline of the pile at any point by 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 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*)

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 911, CONTINUED.

Piles shall be strapped with at least three straps: one approximately 18 in. (450 mm) from the butt, one approximately 24 in. (600 mm) from the butt, and one approximately 12 in. (300 mm) from the tip. Additional straps shall be provided at approximately 15 ft (4.5 m) centers between the butt and tip. Strapping shall encircle the pile once and be tensioned as tightly as possible. Straps shall be 1 1/4 in. (32 mm) wide, 0.31 in. (8 mm) thick, cold rolled, fully heat treated, high tensile strapping, painted, and waxed, with an ultimate tensile strength of 5,100 psi (35.2 MPa). The strap shall encircle the pile once and shall be crimped with a notch type sealer to furnish a joint yielding 80% of the strap tensile strength. Treated timber piles shall be strapped after treatment.

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~~.

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*.

If necessary to facilitate handling, 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 pipe piles are driven.

The ~~tips~~ *end* of ~~shells~~ *pipe piles* shall be equipped with conical *pile tips* ~~driving points~~ or flat ~~closure~~ *end* plates. *The ~~welders~~ welding used to attach the conical pile tips or flat end plates to the end of pipe piles shall be done by a welder qualified in accordance with 711.32.* ~~Conical driving points shall be of sufficient dimensions to ensure adequate joint and driving strength. The end of the shell 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 and butt welded to the end of the lowest section.~~

1. End Plates

If ~~flat closure~~ *end* plates are used, they shall be flat, 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 end plates shall be designed to ~~meet~~ *complement* the ~~particular cases~~ *size of the pipe pile*. ~~Flat~~ *End* 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.

SECTION 915, CONTINUED.

~~If necessary to facilitate handling, shells 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 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 are driven.~~

2. Conical Pile Tips

Conical pile tips shall be of sufficient dimensions to ensure adequate joint and driving strength. The end of the pipe pile shall have full bearing on the face of the pile tip or against a shoulder inside the pile tip. Unless otherwise permitted, the pile tip shall be conical with a 60 to 90 degrees angle between faces. The pile tip shall be substantially of the same diameter as the end of the pipe pile and butt welded to the end of the lowest section.

(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 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.

SECTION 915, CONTINUED.

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.

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.

SECTION 915, CONTINUED.

(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.

(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.

SECTION 915, CONTINUED.

(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.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 915, CONTINUED.

915.03.1 Pile Shoes

Steel H pile shoes furnished shall be covered by a type C certification in accordance with 916. Pile shoes 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 shoe 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 and the welder shall be qualified in accordance with 711.32.

Timber pile shoes furnished shall be covered by a type C certification in accordance with 916. Pile shoes shall be cast-in-one-piece steel in accordance with ASTM A 27 Grade 65-35 (450-240) Class 2 or Grade 70-36 (485-250) Class 2 and shall be fastened to the piles in accordance with the manufacturer's recommendations.

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.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 915, CONTINUED.

COMMITTEE COMMENTS:

A Construction Memorandum may be required to avoid confusion concerning use of units - kips versus tons.

Other sections containing specific cross references:

Item 08-15-9
203.19 Pg 146
206.06 Pg 172
712.06 Pg 537

Item 8-15-19
911.01(e)
701.02 Pg 427
911.02(c) Pg 803

911.02(c)
915.03 Pg 834
911.02(a) Pg 803
915.03 Pg 834

Item 08-15-20
701.01 Pg 427
701.03 Pg 427
701.09(f) Pg 439
707.02 Pg 490
707.09 Pg 497
711.12 Pg 506

Recurring Special Provisions affected:

701-B-132
701-B-154
701-B-101d

Standard Sheets affected:
701-BPIL-02
701-BPIL-04

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

Action: Passed as revised

_x_ 2010 Standard Specifications Book

___ Create RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

___ Revise RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

Standard Drawing Effective Sept. 1, 2009

___ Create RPD (No. _____)
Effective _____Letting
___ Technical Advisory

GIFE Update Req'd.? Y_x_ N___
By - Revision

Frequency Manual Update Req'd? Y___ N_x_
By - Addition or Revision

Withdrawn ____

Received FHWA Approval? Yes

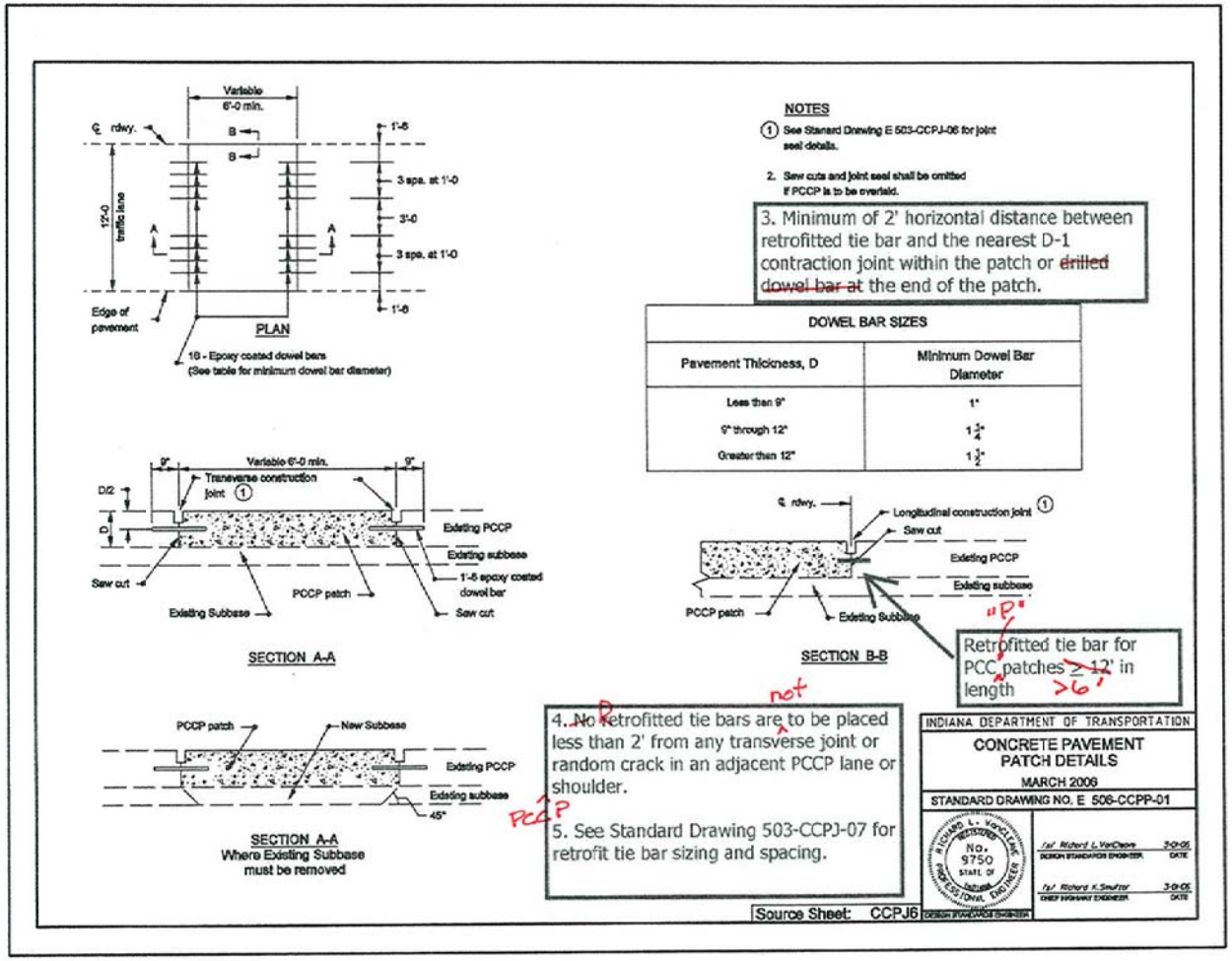
Item No.08-15-8
Mr. Heustis
Date: 01/15/09

REVISION TO STANDARD DRAWING AND 2008 STANDARD SPECIFICATIONS

506-CCPP-01 CONCRETE PAVEMENT PATCH DETAILS

506.12 Method of Measurement
506.13 Basis of Payment

FOR SUBMISSION



REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 506, BEGIN LINE 279, DELETE AND INSERT AS FOLLOWS:

506.12 Method of Measurement

Partial depth patching and full depth patching will be measured by the square yard (square meter).

D-1 contraction joints and retrofitted tie bars used in PCCP patching will be measured in accordance with 503.07.

PCCP removal, subbase and subgrade excavation when required, subbase and subgrade recompaction, non-vapor barrier bonding agent, *individual* dowel bars, ~~reinforcing bars,~~ chemical anchoring system, concrete, finishing, curing, and sawing and sealing of joints will not be measured for payment.

506.13 Basis of Payment

PCCP patching will be paid for at the contract unit price per square yard (square meter) for the type of patching required.

D-1 contraction joints and retrofitted tie bars used in PCCP patching will be paid for in accordance with 503.08.

Partial depth patches which have been directed to be full depth will be paid for at the contract unit price per square yard (square meter) for PCCP patching, partial depth, plus 80% of the contract unit price per square yard (square meter) for PCCP patching, full depth.

Payment will be made under:

Pay Item	**Pay Unit Symbol**
PCCP Patching, Full Depth	SYS (m2)
PCCP Patching, Partial Depth	SYS (m2)

The cost of PCCP removal, subbase, and subgrade excavation, when required, subbase and subgrade recompaction, non-vapor barrier bonding agent, *individual* dowel bars, ~~reinforcing bars,~~ chemical anchoring system, concrete, finishing and curing, and sawing and sealing of joints shall be included in the cost of PCCP patching.

~~The cost to repair~~ *Repair* or replace*ment of* adjacent PCCP or shoulder damaged by the Contractor shall be ~~included in the cost of PCCP patching~~ *made at no additional cost to the Department*.

REVISION TO 2008 STANDARD SPECIFICATIONS

SECTION 506, CONTINUED.

Other sections containing specific cross references:

506.12
507.09 Pg 329

506.13
507.10 Pg 329

Recurring Special Provisions affected:

Standard Sheets affected:

506-CCPP-01

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

Action: Passed as revised

_x_ 2010 Standard Specifications Book

___ Create RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

___ Revise RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

Standard Drawing Effective Sept. 1, 2009

___ Create RPD (No. _____)
Effective _____Letting
___ Technical Advisory

GIFE Update Req'd.? Y___ N_x_
By - Addition or Revision

Frequency Manual Update Req'd? Y___ N_x_
By - Addition or Revision

Withdrawn ____

Received FHWA Approval? Yes

Item No.01 01/15/09 (2008 SS)
Mr. Heustis
Date: 01/15/09

RECURRING SPECIAL PROVISION

PASS RSP 628-R-552 TO BE ADOPTED INTO THE 2010 BOOK.

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: RSP 628-R-552, Field Office, Field Laboratory, Computer Systems and Office Machines, was approved by the Standards Committee at the April 17, 2008 meeting. However, it was not passed to be adopted into the 2010 SS book. This will cause the existing Field Office spec (section 105.17) to remain in the book, but be immediately superseded by RSP 628-R-552. It will also cause the need for the RSP to be placed in every contract.

PROPOSED SOLUTION: Pass the RSP to be adopted into the 2010 SS book. This will bring the SS book up to date and prevent the need for a RSP for every contract.

APPLICABLE STANDARD SPECIFICATIONS: 105.17

APPLICABLE STANDARD DRAWINGS:

APPLICABLE DESIGN MANUAL SECTION:

APPLICABLE SECTION OF GIFE:

APPLICABLE RECURRING SPECIAL PROVISIONS:628_R-552

Submitted By: Ron Heustis

Title: Manager, Comnstruction Technical Support

Organization: INDOT

Phone Number:

Date: Dec 22, 2008

APPLICABLE SUB-COMMITTEE ENDORSEMENT? None.

REVISION TO RECURRING SPECIAL PROVISIONS

PASS RSP 628-R-552 TO BE ADOPTED INTO THE 2010 BOOK, CONTINUED.

COMMITTEE COMMENTS:

Mr. Heustis commented on new numbering system for agenda items.

This item was passed previously, but was not passed to add to 2010 specifications.

Mr. Caplinger commented that cell phones should be included in the 600 section.

Mr. Heustis recommended changing the RSP for cell phones to a 600 section RSP.

Other sections containing specific cross references:

None

Recurring Special Provisions affected:

628-R-552

Standard Sheets affected:

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

Action: Passed as submitted

_x_ 2010 Standard Specifications Book

___ Create RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

___ Revise RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

Standard Drawing Effective _____

___ Create RPD (No. _____)
Effective _____Letting
___ Technical Advisory

GIFE Update Req'd.? Y___ N_x_
By - Addition or Revision

Frequency Manual Update Req'd? Y___ N_x_
By - Addition or Revision

Withdrawn ____

Received FHWA Approval? Yes

628-R-552 FIELD OFFICE, FIELD LABORATORY, COMPUTER SYSTEMS AND OFFICE MACHINES

(Revised 04-25-08)

The Standard Specifications are revised as follows:

SECTION 105, LINE 593, DELETE AND INSERT AS FOLLOWS:

105.17 ~~Field Office~~ *Blank*

SECTION 105, DELETE LINES 594 THRU 954.

SECTION 106, LINE 168, DELETE AND INSERT AS FOLLOWS:

106.04 ~~Field Laboratory~~ *Blank*

SECTION 106, DELETE LINES 169 THRU 173.

SECTION 628, BEGIN LINE 1, INSERT AS FOLLOWS:

SECTION 628 – FIELD OFFICE, FIELD LABORATORY, COMPUTER SYSTEMS AND OFFICE MACHINES

628.01 Description

This work shall consist of providing the specified facilities, equipment, supplies and services in accordance with 105.03.

628.02 Field Office and Laboratory Requirements

When specified, the Contractor shall provide a field office, computer systems, office machines, field laboratory, services, equipment and supplies for the Department's exclusive use in accordance with the minimum requirements listed below.

(a) Field Office

The field office shall be located as mutually agreed by the Engineer and the Contractor. If a building exists within the limits of the right-of-way that is acceptable as a field office and the building is scheduled to be removed under the terms of the contract, the building may be equipped and furnished as the field office. A building within the right-of-way that is furnished under this specification shall be removed prior to the date of the last work and other acceptable facilities for the field office shall then be provided.

The field office may be a permanent building or a trailer and shall be of the type shown on the Schedule of Pay Items. The building or trailer furnished for the field office shall be in accordance with all applicable state and local codes and applicable IOSHA/OSHA requirements.

The field office shall be complete and ready for use by the Department, including all utility connections and specified computer systems, office machines, internet service, equipment and supplies, prior to the start of work. If the Contractor is unable to provide the permanent field office prior to the start of the work, the Engineer shall be notified in writing and the Contractor and the Engineer will agree on temporary field office arrangements prior to the start of work. A temporary field office will not be accepted by the Department for more than two months, at which time a permanent field office shall be ready for the Department's use.

The field office shall at a minimum be the size listed below for the type field office specified.

1. *Type A – 400 sft (37 m^2)*
2. *Type B – 550 sft (51 m^2)*
3. *Type C – 650 sft (60 m^2)*

Minimum dimensions shall be 8 ft (2.4 m) wide and 7 ft (2.1 m) in height, from floor to ceiling. For a trailer, the calculation of minimum area will be based on the exterior box dimensions.

The office shall have a solid and level floor with no holes, a weatherproof roof and shall be dust-proof, and wind-tight. The field office shall have at least 2 doors for ingress and egress and shall have a minimum of 6 windows for a type A field office and 8 windows for a type B or C field office, not including any windows in the doors.

Each door shall have a satisfactory lock. At least one door must always be able to be unlocked and opened from inside the field office. If a padlock is used to secure a door, it shall be a high security type which is invulnerable to bolt cutters, hacksaws, hammers, or prybars. The padlock shall be mounted in such a manner that locking and unlocking the door is satisfactorily convenient. Installation of additional hardware to protect the lock or use of multiple padlocks on a door will not be permitted. However, additional hardware to receive the padlock will be acceptable. The Contractor shall furnish the number of keys to the office as directed by the Engineer. The Department will maintain a list of all Department personnel who are given keys.

Windows shall be hinged or sliding and have a minimum area of 5 sft (0.45 m^2) each. Windows shall be provided with satisfactory locks and screens. Windows, including windows in the doors, shall be provided with shades, blinds, or other approved coverings.

The field office shall have heating and air-conditioning equipment capable of maintaining a uniform temperature between 68°F and 80°F (20°C and 26°C).

The field office shall have a minimum 100 amp, 120/240 volt electrical service, shall have sufficient receptacles to satisfactorily accommodate all required electrical equipment without the use of extension chords or splitters and shall be provided with satisfactory office type lighting.

The field office shall include a minimum of one separately lockable storage area suitable to store a nuclear density/moisture gauge. The storage area shall have a minimum storage volume of 63 cu ft (1.3 m^3) with a minimum floor area of 9 sft (1 m^2) .

If the field office is a trailer, the trailer shall be securely supported by adequate blocking. The blocking shall provide a foundation to prevent settlement. The trailer shall be secured to the ground with a trailer tie down system that is in accordance with all state and local requirements. Each trailer shall be furnished with steps meeting IOSHA/OSHA requirements at each doorway.

The field office location shall be selected in order to provide satisfactory parking and trash disposal facilities for Department use. Parking spaces shall be either paved or surfaced with compacted aggregate, size No. 53, or other acceptable materials suitable for all-weather usage.

(b) Field Office Equipment and Supplies

The following minimum equipment and supplies shall be furnished for each field office of the type specified.

Office Type	***A***	***B***	***C***
Pencil Sharpener	*1*	*1*	*1*
Broom and Dust Pan	*1*	*1*	*1*
Six-hook Coat Rack	*1*	*1*	*1*
Toilet Facilities	*Yes*	*Yes*	*Yes*
Drinking Water	*Yes*	*Yes*	*Yes*
Fire Extinguishers	*1*	*2*	*2*
First-Aid Kit	*1*	*1*	*1*
Bloodborne Pathogen Kit	*1*	*1*	*1*
Smoke Detector	*1*	*1*	*2*
Carbon monoxide Detector	*1*	*1*	*1*
Shelving	*16 lft (4.9 m)*	*20 lft (6.1 m)*	*24 lft (7.3 m)*
Telephones	*2*	*2*	*3*
Voice Mail	*1*	*1*	*1*
Telephones Lines	*2*	*2*	*2*
File Cabinet Drawers	*4*	*8*	*12*
Office Desks & Office Chairs	*2*	*4*	*4*
Folding Office Tables	*1*	*2*	*2*
Chairs	*4*	*8*	*12*
Drafting Tables	*1*	*1*	*1*
Drafting Stools	*1*	*1*	*1*
Waste Paper Baskets	*2*	*4*	*4*
Cleaning Supplies	*Yes*	*Yes*	*Yes*
Calculators	*1*	*2*	*2*
Paper Shredder	*1*	*1*	*1*
Microwave Oven	*1*	*1*	*1*
Refrigerator/Freezer	*1*	*1*	*1*

The office and the equipment shall be furnished in a condition satisfactory to the Department.

Adequate quantities of basic hygiene and office cleaning supplies shall be provided. These supplies shall include, but are not limited to, hand soap, hand sanitizer, paper towels, toilet paper, window cleaner, all-surface cleaner, toilet disinfectant, toilet brush and a toilet plunger.

Potable drinking water with both hot and cold water capabilities shall be furnished. Drinking cups and paper towels shall be provided.

Fire extinguishers shall be five-pound, Class ABC or higher rated and shall be maintained in a fully charged and operable condition and shall meet all IOSHA/OSHA requirements.

First-aid kits shall meet the requirements of ANSI Z308.1 current at the time of letting.

Shelving shall have a minimum width of 10 in. (250 mm).

At least one telephone shall be a cordless phone having a frequency of at least 900 MHz.

The telephone voice mail system shall be capable of providing both a minimum one minute outgoing message and 30 minute total recording time for incoming messages. It shall have a remote operation feature, which may be used to retrieve, replay, erase, and save messages. An answering machine meeting these requirements may be substituted for the voice mail system.

Filing cabinets shall at a minimum be fire resistant steel filing cabinets with a class D or higher classification established by UL or Safe Manufacturers National Association. Cabinet drawers shall have a filing depth of 25 in. (635 mm). All cabinets shall have a lock and at least four drawers shall be fire proof.

Office desktops shall be at least 48 in. (1220 mm) wide and 25 in. (635 mm) deep. All desks shall contain at least two drawers, one of which shall be provided with a lock.

Folding office tables shall be a minimum size of 30 in. x 60 in. (760 mm x 1520 mm).

Office chairs shall be height adjustable and equipped with castors. Other required chairs may be stackable or folding chairs.

Drafting tables shall contain a tilt top work table for drafting purposes. Dimensions shall be at least 30 in. x 60 in. (760 mm x 1520 mm). The drafting stool shall be proportional to each drafting table.

Supplies to be furnished shall include all items required for proper operation of the required equipment. This includes, but is not limited to, operating manuals and paper supplies.

Calculators shall be electric powered, have a printer and a minimum 12-digit capacity.

The shredder shall have a minimum capacity of 12 sheets (20 lb paper), shall be capable of shredding paper clips and staples and shall include a 5 gallon capacity waste basket.

The microwave oven shall have a minimum 1.0 cu ft capacity with a minimum 1100 watts and shall have digital controls.

The refrigerator/freezer shall have a minimum combined capacity of 12 cu ft.

The field office and all equipment and supplies shall be maintained and replenished in a satisfactory manner during the term of the contract or until released by the Engineer. If the field office or required equipment and supplies are not maintained by the Contractor, the Engineer may withhold partial payments until the field office is operational to the Department's satisfaction.

(c) Field Office Computer System

The Contractor shall provide one field office computer system for the Department's exclusive use for each field office specified. The Contractor has the option to provide either a desktop or a laptop computer system in accordance with the minimum requirements listed below.

1. Field Office Desktop Computer System

a. *Processor – Intel or AMD compatible, 2.0 GHz*
b. *Memory – 1.0 GB, 533 MHz*
c. *Hard Drive – 60 GB, 5400 rpm*
d. *Optical Drive – 24X CD-RW drive*
e. *Ports – Two USB 2.0 compliant ports*
f. *Network/Wireless – Ethernet or wireless card to be compatible with the selected internet and office network connections*
g. *Graphics – Integrated graphics card*
h. *Monitor – 22 in. widescreen digital flat panel*
i. *Keyboard –USB enhanced multimedia keyboard*
j. *Mouse – USB 2-button scroll mouse*

2. Field Office Laptop Computer System

a. *Processor – Intel or AMD compatible, 2.0 GHz*
b. *Memory – 1.0 GB, 533 MHz*
c. *Hard Drive – 60GB, 5400 rpm*
d. *Module Bay Device – 24X CD-RW drive*
e. *Ports – Two USB 2.0 compliant ports*
f. *Network/Wireless – Ethernet or wireless card to be compatible with the selected internet and office network connections*
g. *Graphics – Integrated graphics card*
h. *Display – 15" XWGA LCD panel*
i. *Battery – 9 cell lithium ion*
j. *External Monitor – 22 in. widescreen digital flat panel*
k. *External Keyboard – USB enhanced multimedia keyboard*
l. *External Mouse – USB 2-button scroll mouse*
m. *Miscellaneous – One compatible port replicator with AC adapter, one additional AC adapter, one DC adapter and one padded carrying case*

3. Computer Software

The Contractor shall provide software for the computer system in accordance with the minimum requirements listed below.

a. Operating System Software – Windows XP Professional
b. Productivity Software – Microsoft Office 2003 Small Business and Adobe Acrobat Professional
c. Security Software – McAfee Virus Scan Plus

All software shall include the most current updates and patches at the time the computer system is provided to the Department. The Contractor shall provide for installation of updates and patches for the operating system, productivity and security software during the term of use of the computer system by the Department. Updates and patches shall be provided by an automatic update method.

The Department may install and maintain proprietary software on the computer in order to run the Department's construction management programs.

4. Miscellaneous Computer Requirements

The initial condition of the computer system shall be nearly pristine. All owner installed e-mail accounts, games, spyware, online services, applications, network or other profiles previously set up on the system shall be removed prior to placement in the field office. If the system was provided for a previous Department contract, all software not specified shall be removed prior to placement in the current field office.

The Contractor shall provide an uninterruptible power supply (UPS), minimum 120 VA, 100 Watts and full time surge suppression for each field office computer system specified in the contract.

The Contractor shall provide all cables, connections and software required to connect the field office computer system to the printer and the scanner.

When more than one computer system is specified for a field office, the Contractor shall provide either an Ethernet or wireless office network to allow all computer systems in the field office to access the field office internet service, the printer and the scanner.

The Contractor shall provide appropriate dust covers for all field office desktop computer systems.

The Contractor shall provide all manuals necessary for operation of the computer system and software with the system and shall include all documentation normally furnished with the equipment and software when purchased.

The Department will be utilizing the computer system to run or access Department provided construction management software applications. These applications are known to run on Intel and AMD compatible equipment when using the Windows XP Professional operating system. If the Department experiences problems running these applications due to hardware or software compatibility, the Contractor shall replace the equipment to ensure compatibility to the satisfaction of the Engineer within five business days.

The computer system shall be maintained in good working order. If a portion of the system becomes defective, inoperable, damaged, or stolen, that portion shall be repaired or replaced within five business days after the Contractor is notified by the Engineer. If the computer system and related accessories are not maintained by the Contractor as required, the Engineer may withhold partial payments until the computer system is operational to the Department's satisfaction.

(d) Field Office Internet Service

The Contractor shall provide broadband internet service for the field office. Broadband internet service shall be capable of a minimum average upload speed of 350Kbps unless otherwise approved by the Engineer.

(e) Field Office Machines

The Contractor shall provide a fully operational copier, printer, document scanner and fax machine for the Department's exclusive use in the field office in accordance with the minimum requirements listed herein.

In lieu of separate copier, printer, scanner and fax machines, the Contractor may provide an all-in-one unit that meets all the requirements for any combination of the individual machines being provided. Separate machines shall be provided for those machine functions that are not included in an all-in-one type machine.

1. Copier

The copier shall be a dry ink copier capable of using plain paper and of making full size, black and white copies of letter, legal and ledger US paper size original documents. The copier shall be capable of reducing and increasing copy sizes. The copier shall have a self-feeding paper tray, an automatic document feeder and be capable of producing at least 12 copies per minute.

2. Printer

The printer shall be a laser printer compatible with the computer system provided by the Contractor for use by the Department in the field office. The printer shall be capable of printing single-sided, black and white letter and legal US paper size documents at a rate of 20 pages per minute and capable of automatic duplex printing.

3. Document Scanner

The document scanner shall be compatible with the computer system provided by the Contractor for use by the Department in the field office. The scanner shall be capable of scanning letter and legal size documents and shall have an automatic document feeder and be capable of 600 dpi black and white resolution.

4. Fax Machine

The fax machine shall be connected to one of the required telephone service lines in the field office. The machine shall have an automatic document feeder with a 10 page capacity and be capable of faxing letter and legal size sheets. It shall be able to automatically dial 40 preprogrammed fax numbers and have the capability to program at least 2 groups of numbers. The machine shall have a 2 MB memory, shall be equipped with a telephone handset and be capable of automatic redial.

5. Miscellaneous Office Machine Requirements

The Contractor shall provide letter, legal and ledger size paper, ink cartridges and toner as required by the Engineer for the operation of each piece of equipment provided.

If any office machine becomes defective, inoperable, damaged, or stolen, that machine shall be repaired or replaced within five business days after the Contractor is notified by the Engineer. If any of the office machines are not maintained by the Contractor as required, the Engineer may withhold partial payments until the machine is operational to the Department's satisfaction.

(f) Field Laboratory

The field laboratory shall be located as mutually agreed by the Engineer and the Contractor. The laboratory shall consist of an acceptable building or trailer in accordance with 628.02(a) in which the Department will house and use equipment to perform testing procedures for the contract.

The following equipment and supplies shall be furnished for each field laboratory of the type specified. The equipment and supplies shall meet the requirements of 628.02(a) as applicable.

Laboratory Type	***A***	***B***	***C***
Broom and Dust Pan	*1*	*1*	*1*
Six-hook Coat Rack	*1*	*1*	*1*
Toilet Facilities	*Yes*	*Yes*	*Yes*
Drinking Water	*Yes*	*Yes*	*Yes*
Fire Extinguishers	*1*	*2*	*2*
First-Aid Kit	*1*	*1*	*1*
Bloodborne Pathogen Kit	*1*	*1*	*1*
Smoke Detector	*1*	*1*	*2*
Carbon monoxide Detector	*1*	*1*	*1*
Shelving	*16 lft (4.9 m)*	*20 lft (6.1 m)*	*24 lft (7.3 m)*
Telephones	*1*	*1*	*1*
Voice Mail	*1*	*1*	*1*
Telephones Lines	*1*	*1*	*1*
File Cabinet Drawers	*4*	*4*	*4*
Office Desks & Office Chairs	*1*	*1*	*1*
Folding Office Tables	*1*	*1*	*1*
Chairs	*2*	*2*	*2*
Waste Paper Baskets	*2*	*2*	*2*
Cleaning Supplies	*Yes*	*Yes*	*Yes*

If a field office is provided that is large enough to include the required space for the laboratory, the Engineer may agree to accept the field office for use as both office and laboratory, in which case the equipment and supplies listed for the laboratory will not be required.

If the field laboratory is a separate structure that is located directly adjacent to the field office, the toilet facilities, drinking water, telephones, voice mail/answering machine, telephone lines and cleaning supplies will not be required.

628.03 Additional Computer Systems and Mobile Internet Service

When specified, the Contractor shall provide the following computer systems and internet services for the Department's exclusive use.

(a) Additional Field Office Computer System

The additional field office computer system shall be either a desktop or laptop computer system in accordance with 628.02(c)1 or 628.02(c)2 except that the monitor for a desktop system may be a 19 in. flat panel and the external monitor for a laptop system will not be required. The requirements of 628.02(c)3 and 628.02(c)4 shall apply to each additional field office computer.

(b) Mobile Laptop Computer System

The mobile laptop computer system shall be in accordance with 628.02(c)2 except that the external monitor, integrated graphics card, external keyboard and port replicator with AC adapter will not be required. Mobile laptop computers will be used by the Department for contracts that do not include a field office. The requirements of 628.02(c)3 and 628.02(c)4 shall apply to each mobile laptop computer except that those requirements specifically for a field office computer will not apply.

(c) Mobile Internet Service

The mobile broadband internet service access card will be used by the Department in a laptop computer provided by either the Contractor or the Department.

The card shall connect to the laptop via a type II PC card slot, an express card slot or a USB 2.0 compliant port. The card and service shall be capable of a minimum average upload speed of 350 Kbps. The internet service rate plan shall include unlimited data and time usage with no roaming charge for national domestic use. All software necessary for the operation of the card shall be provided to the Engineer.

The Contractor shall not purchase any card or enter into any service agreement until authorized by the Engineer. The Engineer will provide a minimum of 10 business days notice prior to the date the card will be required.

628.04 Method of Measurement

Field office and field laboratory will be measured by the month for the specified type. Partial months will be rounded up to the next half or whole month. The Department will provide two weeks advanced notice prior to when the facility will be vacated.

If a field laboratory is specified and is included in the same space as the field office, the field laboratory will not be measured for payment.

Additional field office computer system, mobile laptop computer system and mobile internet service will be measured by the month for each system or service provided. Partial months will be rounded up to the next half or whole month. The Department will provide two weeks advanced notice prior to when mobile internet service will no longer be required.

628.05 Basis of Payment

Field office and field laboratory will be paid for at the contract unit price per month, complete in place until released.

Additional field office computer system, mobile laptop computer system and mobile internet service will be paid by the month for each system or service provided.

Payment will be made under:

Pay Item	***Pay Unit Symbol***
Field Laboratory, _____ type	*MOS*
Field Office, _____ type	*MOS*
Field Office Computer System, Additional, _____ qty Each	*MOS*
Mobile Internet Service, _____ qty Each	*MOS*
Mobile Laptop Computer System, _____ qty Each	*MOS*

The cost of all heating, cooling, electrical service, telephone service and other miscellaneous utility bills required for the field office or field laboratory shall be included in the cost of the field office or the field laboratory.

If a field office smaller than the specified type is approved by the Engineer, a new unit price will be established for the smaller field office. The new unit price will be equal to the original contract unit price multiplied by the smaller floor area and divided by the specified floor area.

If a temporary field office is provided in accordance with 628.02, payment will be 65% of the unit price during the time the temporary field office is in use by the Department.

The cost of all materials and labor necessary to setup, secure, maintain and remove the field office, including all required equipment and supplies and any material required to provide parking, shall be included in the cost of the field office.

All costs necessary to provide the field office computer system, including the required software, manuals, peripherals and related equipment, technical support and miscellaneous computer requirements shall be included in the cost of the field office.

All costs necessary to establish, install and maintain field office internet service, including any required hardware, software, fees, monthly charges, setup, installation and technical support shall be included in the cost of the field office.

All costs necessary to provide the copier, printer, document scanner and fax machine, including setup, installation, all required connections to computer systems, technical support and miscellaneous office machine requirements shall be included in the cost of the field office.

All costs necessary to establish and maintain a field office network when one or more additional field office computer systems are specified shall be included in the cost of the field office.

All cost necessary to provide an additional field office computer system, including the required software, manuals, peripherals and related equipment and technical support shall be included in the cost of the additional field office computer.

All costs necessary to provide the mobile laptop computer system, including the required software, manuals, peripherals and related equipment, technical support and miscellaneous computer requirements shall be included in the cost of the mobile laptop computer.

All costs necessary to establish, install and maintain mobile internet service, including required hardware, software, fees, monthly charges, setup, installation and technical support shall be included in the cost of mobile internet service.

Item No.02 01/15/09 (2008 SS)
Mr. Heustis
Date: 01/15/09

REVISION TO RECURRING SPECIAL PROVISIONS

211-R-543 B BORROW AND STRUCTURE BACKFILL
731-R-202 MECHANICALLY STABILIZED EARTH RETAINING WALLS
732-R-310 MODULAR CONCRETE BLOCK RETAINING WALL

211-R-543 B BORROW AND STRUCTURE BACKFILL

(Revised 01-15-09)

The Standard Specifications are revised as follows:

SECTION 211, BEGIN LINE 1, DELETE AND INSERT AS FOLLOWS:

SECTION 211 – B BORROW AND STRUCTURE BACKFILL

211.01 Description

This work shall consist of backfilling excavated or displaced peat deposits; filling up to designated elevations of spaces excavated for structures and not occupied by permanent work; constructing bridge approach embankment; and filling over structures and over arches between spandrel walls, all with special material.

MATERIALS

211.02 Materials

Materials shall be in accordance with the following.

B Borrow	As Defined*
Flowable Backfill	*213*
Geotextile	918.02
Structure Backfill	904

* The material used for special filling shall be of acceptable quality, free from large or frozen lumps, wood, or other extraneous matter and shall be known as B borrow. It shall consist of suitable sand, gravel, crushed stone, ACBF, GBF, or other approved material. The material shall contain no more than 10% passing the No. 200 (75 µm) sieve and shall be otherwise suitably graded. The use of an essentially one-size material will not be permitted unless approved.

Aggregate for end bent backfill shall be No. 8 or No. 9 crushed stone or ACBF, class D or higher.

The Contractor has the option of either providing B borrow or structure backfill from an established CAPP source, or supplying the material from another source. The Contractor has the following options for supplying B borrow or structure backfill from a local site:

(a) the establishment of a CAPP Producer Yard at the local site in accordance with 917; or

(b) use a CAPP Certified Aggregate Technician or a consultant on the Department's list of approved Geotechnical Consultants For Gradation Control Testing.

REVISION TO RECURRING SPECIAL PROVISION

211-R-543, CONTINUED.

For material excavated within the project limits, gradation control testing will be performed by the Department if the Contractor is directed to use the material as B borrow or as structure backfill.

The frequency of gradation control testing shall be one test per 2000 t (2000 Mg) based on production samples into a stockpile or by over the scales measurement, with a minimum of two tests per contract (one in the beginning and one near the mid-point). The sampling and testing of these materials shall be in accordance with applicable requirements of 904 for fine and coarse aggregates. The Contractor shall advise, in writing, the Engineer and the District Materials and Testing Engineer of the plan to measure the material.

~~Where structure backfill is specified, the Contractor may substitute flowable backfill in accordance with 213. However, flowable backfill shall not be placed into or through standing water, unless approved in writing.~~

CONSTRUCTION REQUIREMENTS

211.03 General Requirements

If B borrow or structure backfill is obtained from borrow areas, the items of obtaining the areas, their locations, depths, drainage, and final finish shall be in accordance with 203.

Unless otherwise specified, if excavated material complies with 211.02 and if B borrow or structure backfill is required for special filling, the excavated material shall be used as such. If there is a surplus of this material, such surplus shall be used in embankment. The provisions of 203.19 shall apply to placing this material at structures. All surplus in excess of the directed or specified use on the right-of-way shall be disposed of in accordance with 201.03.

If fill or backfill as described in this specification is within embankment limits, and if it is not required that the entire fill or backfill be of B borrow and placed as such, then that portion above the free-water level shall be placed in accordance with applicable provisions of 203 and compacted to the required density.

If borrow is required outside the specified limits of B borrow, material in accordance with the specifications for B borrow may be furnished at the contract unit price for borrow; however, the quantity of borrow measured for payment outside the limits of structure backfill will not exceed the theoretical quantity of B borrow furnished.

Unless otherwise specified, all spaces excavated for and not occupied by bridge abutments and piers, if within embankment limits, shall be backfilled to the original ground line with B borrow, and placed in accordance with 211.04.

REVISION TO RECURRING SPECIAL PROVISION

211-R-543, CONTINUED.

Where B borrow or structure backfill is required as backfill at culverts, retaining walls, sewers, manholes, catch basins, and other miscellaneous structures, it shall be compacted in accordance with 211.04.

Where specified, aggregate for end bent backfill shall be placed behind end bents and compacted in accordance with 211.04. Prior to placing the aggregate, a geotextile shall be installed in accordance with 616.11.

211.03.1 Structure Backfill Types

The structure backfill type shall be as specified.

Within each of the following structure backfill types, the Contractor shall choose from the listed options for each type:

(a) Type 1

1. *structure backfill in accordance with 904.05*

2. *non-removable or removable flowable backfill in accordance with 213.*

(b) Type 2

1. *crushed stone aggregate or ACBF structure backfill in accordance with 904.05, except No. 30, No. 4 and 2 in. (50 mm) nominal size aggregate shall not be used.*

2. *non-removable or removable flowable backfill in accordance with 213.*

(c) Type 3

1. *structure backfill in accordance with 904.05, except only No. 30 or No. 4 nominal size aggregates, or No. 8, No. 9, or No. 11 coarse aggregate shall be used. No slag other than ACBF will be permitted. ~~ACBF shall be Class A or higher, size No. 8 in accordance with 904.05.~~*

(d) Type 4

1. *removable flowable backfill in accordance with 213.*

(e) Type 5

1. *non-removable flowable backfill in accordance with 213.*

REVISION TO RECURRING SPECIAL PROVISION

211-R-543, CONTINUED.

211.04 Compaction

B borrow and structure backfill *types 1, 2, and 3* shall be compacted with mechanical tamps or vibrators in accordance with the applicable provisions of 203.23 except as otherwise set out herein.

Aggregate for end bent backfill and coarse aggregate No. 8, No. 9, or No. 11 used for structure backfill shall be deposited in layers not to exceed 12 in. (300 mm) loose measurement. Each layer shall be mechanically compacted with a compactor having a plate width of 17 in. (425 mm) or larger that delivers 3000 to 9000 lb (13.3 to 40 kN) per blow. Each lift shall be compacted with two passes of the compactor.

211.05 Embankment for Bridges

When special filling is required, the embankment for bridges shall be constructed using B borrow within the specified limits shown on the plans. All embankment construction details specifically set out in this specification for embankment for bridges shall be considered in accordance with the applicable requirements of 203.

At the time B borrow is being placed for approach embankment, a well compacted watertight dam shall be constructed in level lifts, the details of which are shown on the plans. Except as hereinafter specified for material to be used in constructing the enclosing dam, and for growing vegetation, and unless otherwise provided, the material for constructing bridge approach embankment shall be B borrow compacted by mechanical methods. If approach embankment or shoulders are constructed of material not suitable for growing seed or sod, and if one or both of these is required, then such areas shall, unless otherwise specified, be covered with a layer of clay, loam, or other approved material. This layer shall be approximately 1 ft (0.3 m) thick after being compacted into place.

211.06 B Borrow Around Bents

When specified, B borrow shall be placed around all bents falling within the limits of the approach grade as shown on the plans. Before placing, the surface of the ground on which it is to be placed shall be scarified or plowed as directed. The embankment slope shall be 2:1 on the sides and beneath the structure, and shall be 6:1 from the end of the bridge down to the average ground line, or it may be required to complete the approaches back to the existing grade. An enclosing dam and provisions for growing vegetation shall be constructed in accordance with 211.05.

211.07 Blank

211.08 Spandrel Filling

Unless otherwise specified, spandrel fills for arch structures shall be composed of B borrow. The fill shall be carried up symmetrically in lifts from haunch to crown and simultaneously over all piers, abutments, and arch rings. Compaction shall be in accordance with 211.04.

REVISION TO RECURRING SPECIAL PROVISION

211-R-543, CONTINUED.

211.09 Method of Measurement

B borrow, structure backfill *types 1, 2, or 3*, and aggregate for end bent backfill will be measured by the cubic yard (cubic meter) as computed from the neat line limits shown on the plans, or as adjusted. If cubic yards (cubic meters) are set out as the pay item for B borrow or structure backfill in the Schedule of Pay Items and if neat line limits are not specified for measurement of volume for the material, measurement will be made by the cubic yard (cubic meter) at the loading point in truck beds which have been measured, stenciled, and approved. The B borrow may be weighed and converted to cubic yards (cubic meters) by assuming the weight per cubic foot (mass per cubic meter) to be 90% of the maximum wet density in accordance with AASHTO T 99. The material may be cross sectioned in its original position and again after excavation is complete, and the volume computed by the average end area method. If B borrow is used for backfill in areas where unsuitable material is present or peat excavation has been performed, unless otherwise directed, the B borrow will be cross sectioned, and the volume will be computed by the average end area method.

Structure backfill types 4 or 5 will be measured by the cubic yard (cubic meter) as computed from the neat line limits shown on the plans, or as adjusted. If neat line limits are not shown on the plans, the volume in cubic yards (cubic meters) of flowable backfill furnished and placed as structure backfill type 4 or 5 will be computed from the nominal volume of each batch and a count of the batches. Unused and wasted flowable backfill will be estimated and deducted.

If the material is to be paid for by the ton (megagram), it will be weighed in accordance with 109.01(b).

If the material comes from a wet source such as below water or a washing plant, and weighing is involved in the method of measurement, there shall be a 12 h drainage period prior to the weighing.

Geotextile will be measured in accordance with 616.12.

211.10 Basis of Payment

The accepted quantities of B borrow will be paid for at the contract unit price per cubic yard (cubic meter) or per ton (megagram) as specified, complete in place.

Structure backfill will be paid for at the contract unit price per cubic yard (cubic meter) *of the type specified*, ~~based on the neat line limits shown on the plans or as adjusted for authorized changes,~~ provided the material comes from outside the permanent right-of-way. ~~If the Schedule of Pay Items does not contain a pay item for structure backfill and it is required to backfill pipes or culverts within the project limits, a change order will be generated to establish a unit price.~~

REVISION TO RECURRING SPECIAL PROVISION

211-R-543, CONTINUED.

B borrow material placed outside the neat lines will be paid for as borrow when such B borrow eliminates required borrow material. Otherwise, no payment will be made for backfill material placed outside the neat lines.

Aggregate for end bent backfill will be paid for at the contract unit price per cubic yard (cubic meter), based on the neat line limits shown on the plans or as adjusted by authorized changes.

Geotextile will be paid for in accordance with 616.13.

~~Flowable backfill which is substituted for structure backfill will be paid for as structure backfill.~~

If topsoil, loam, or other suitable material in accordance with 211.05 is used for expediting the growth of seed or sod, it will be paid for at the contract unit price per cubic yard (cubic meter) for borrow, unless otherwise provided.

Payment will be made under the following:

Pay Item	**Pay Unit Symbol**
Aggregate For End Bent Backfill	CYS (m3)
B Borrow	CYS (m3)
	TON (Mg)
Structure Backfill, *Type* ____	CYS (m3)

No payment will be made under this section for material obtained within the excavation limits of the project if the Contractor is directed to use the material as B borrow or structure backfill in a pipe trench, culvert, construction of an embankment or fill, or if the Contractor uses the material for its own convenience. Material obtained from within the excavation limits of the project and which the Contractor is directed to use as B borrow or structure backfill for other purposes including replacement of undercut areas, support for a MSE wall, and end bent fill will be paid for at the contract unit price of $5.00 per cubic yard ($6.50 per cubic meter) for B borrow/structure backfill handling.

The cost of disposal of excavated material shall be included in the cost of the pay items in this section.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202 MECHANICALLY STABILIZED EARTH RETAINING WALLS

(Revised 01-15-09)

The Standard Specifications are revised as follows:

SECTION 731, BEGIN LINE 1, INSERT AS FOLLOWS:

SECTION 731 - MECHANICALLY STABILIZED EARTH RETAINING WALLS

731.01 Description

This work shall consist of furnishing materials and placement of mechanically stabilized earth retaining walls in accordance 105.03.

The Contractor shall perform the necessary work to verify that the foundation is at the correct elevation, that the wall is constructed to the correct alignment, and that the work is in accordance with the specified tolerances. The checking of alignments and tolerances shall include verifying that the plumbness of the face panels is in accordance with 731.10 over the entire height of the wall. Alignment shall be checked at each layer of panels after the backfill behind the panels has been compacted, and the results shall be recorded.

731.02 General Design Requirements

The mechanically stabilized earth wall shall consist of a non-structural leveling pad, concrete face panels, coping, ground reinforcement elements mechanically connected to each panel, and an external drainage system. Ground reinforcement shall have sufficient strength, frictional resistance, and quantity as required by design.

The mechanically stabilized earth retaining walls system is to be selected from the Department's list of approved Retaining Wall Systems. A Retaining Wall System manufacturer may be included on the Department's list by following procedure J of ITM 806. The quantities shown in the Schedule of Pay Items will be the same for all mechanically stabilized earth wall systems. All mechanically stabilized earth walls shall be constructed in accordance with the approved plans and panel shop drawings based on the requirements herein. The recommendations of the wall system suppliers shall not override the minimum performance requirements contained herein.

If the wall manufacturer needs additional information to complete the design, the Contractor shall be responsible for obtaining such information.

All appurtenances behind, in front of, under, mounted upon, or passing through the wall such as drainage structures, utilities, or other appurtenances shown on the plans shall be accounted for in the stability design of the wall.

The mechanically stabilized earth wall design shall follow the general dimensions of the wall envelope shown on the plans. The plans will locate the leveling pad at or below the theoretical leveling pad. The top of the face panel shall be at or above the top of the panel elevation shown on the plans.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

Where coping or barrier is utilized, the wall face panel shall extend up into the coping or barrier a minimum of 2 in. (50 mm). The top of the face panels may be level or sloped to meet the top of the face panel line noted. Cast-in-place concrete will not be an acceptable replacement for panel areas noted by the wall envelope.

Where walls or wall sections intersect with an included angle of 130 degrees or less, a vertical corner element separate from the standard panel face shall abut and interact with the opposing standard panels. The corner element shall have ground reinforcement connected specifically to that panel and shall be designed to preclude lateral spread of the intersecting panels.

Face panels shall be designed to accommodate differential settlement of 1 linear unit in 100. Face panels of greater than 32 sq ft (3.0 m^2) up through 64 sq ft (6.0 m^2) in area shall be designed to accommodate differential settlement of 1 linear unit in 200. Where shown on the plans, slip joints to accommodate excessive or differential settlement shall be included.

Only one face-panels shape and size shall be used for a project that is part of a contract with multiple projects or contracts with MSE walls.

731.03 Design Criteria

The design by the manufacturer shall consider the internal and the external stability of the wall mass including the applied bearing pressure, overturning, sliding, and stability of temporary construction slopes. The design shall be in accordance with the design, construction, and commentary divisions of the AASHTO Standard Specifications for Highway Bridges, unless specified otherwise herein. The analysis of settlement, bearing capacity, and overall slope stability will be the responsibility of the Engineer.

The theoretical failure plane within the soil mass shall be analyzed so that the soil stabilizing component extends sufficiently beyond the failure plane to stabilize the material. External loads which affect the internal stability such as those applied through piling, bridge footings, traffic, and slope surcharge, shall be accounted for in the design. The size of all structural elements shall be determined such that the design load stresses do not exceed the allowable stresses found in the AASHTO Standard Specifications for Highway Bridges, unless otherwise shown on the plans.

The maximum allowable yield stress for reinforcement shall be not exceed the manufacturer's recommendation.

The phi (φ) angle for the internal design of the reinforced backfill shall be assumed to be 34 degrees. The φ angle of the backfill behind the mechanically stabilized earth mass shall be assumed to be 30 degrees.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

The wall shall be defined by the wall envelope as shown on the plans. For design purposes, the height of wall H shall be measured from the theoretical top of the leveling pad to the top of the wall. For a level surcharge situation, the top of the wall shall be measured to the top of the coping or to the gutter line of the traffic barrier. The top of the wall shall be the theoretical top of the face panels only when a coping or barrier is not used. For an abutment face, the design height H shall be defined as the height measured from the top of the leveling pad to the top of the roadway surface. For a wall with a sloping surcharge the top of the wall shall be measured at a point 0.3H back from the face where the design height is H and the actual wall height is H.

For aesthetic considerations and to make differential settlement unnoticeable, the panels shall be erected such that the horizontal site line is discontinuous at every other panel. This shall be accomplished by starting erection with the lower panel level of each wall by alternating full height and half height panels. Panels above the lowest level shall be of a standard size except as required to top out the wall to be in accordance with the plan elevations.

The connections of the ground reinforcing steel to the panels shall be in two elevations for standard panels. The connections shall not be more than 30 in. (750 mm) apart vertically. To prevent out-of-plane rotation, standard face panels shall be connected to ground reinforcement on at least three different points in two different planes. However, preapproved systems utilizing a horizontal stabilizing leg to prevent rotation shall only require ground reinforcement attachments in one plane. Partial panels shall have three different connection points, but only one plane shall be attached to ground reinforcement. Panels, which are located at the top of the wall, shall not be attached to the coping or the traffic barrier.

The ground reinforcement shall be the same length from the bottom to the top of each wall section whether bar mats, grids, or strips steel are used. Differing ground reinforcement elements shall be clearly marked for ease of construction. This element may be used individually or in a prefabricated grouping. The minimum length of the ground reinforcement shall be 0.7H, but not shorter than 8 ft (2.5 m), in accordance with the AASHTO Standard Specifications for Highway Bridges for an abutment on a spread footing.

The ground reinforcement for the mechanically stabilized earth volume shall be sized using the lesser of the allowable forces for each specific connection and each specific reinforcing element. The connection's allowable force shall be taken as 2/3 of the connection test load at the allowable pullout deformation limit of 1/2 in. (13 mm) or one half of the ultimate load, whichever is less.

The ground reinforcement length shall be as required for internal design or as shown on the plans. The length shall exceed the minimum noted as required for design consideration. One hundred percent of the ground reinforcement, which is designed and placed in the reinforced earth zone shall be connected to the face panels.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

For mats, grids, or strip steel, the minimum zinc coating thickness shall be 2 oz/sq ft (610 g/m^2). Such thickness shall be assumed to be 86 µm for purpose of calculation of reduced structural section.

The design contact pressures under the stabilized mass for each reinforcement length shall be clearly indicated on the shop drawings and shall not exceed the maximum allowable soil bearing capacity shown on the plans. Passive pressure in front of the wall mass will be assumed to be zero for design purposes.

731.04 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 eight 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 wall and shall include but shall not be limited to the following:

1. A plan and elevation sheet or sheets for each wall.

2. An elevation view of the wall 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, all steps in the leveling pads, the designation as to the type of panel, the length of soil reinforcing systems, the distance along the face of the wall to where changes in length of the soil reinforcing systems occur, and an indication of the original and final ground lines and maximum bearing pressures.

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 and connection of all steel ground reinforcing elements in areas where piling, utility, or other structures are near the wall.

4. A typical cross section or cross sections showing elevation relationship between ground conditions and proposed grades, as well as the drainage system.

5. All general notes required for constructing the wall.

6. All horizontal and vertical curve data affecting the wall.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

7. *A listing of the summary of quantities on the elevation sheet for each wall.*

(b) All panel details shall show all dimensions necessary to construct the element, all reinforcing steel in the element, and the location of soil reinforcing system devices embedded in the panels.

(c) The details for construction of walls around drainage facilities and the out-letting of internal drainage from the backfill zone.

(d) All details of the architectural treatment.

(e) The details for diverting strips or mesh around obstructions such as piles, catch basins, and other utilities shall be submitted for approval.

(f) The details for each connection between the concrete panel and the mesh or strip.

(g) Determination of the φ angles for reinforced materials and retained materials.

Design calculations and shop drawings shall be submitted to the Engineer for review and approval.

MATERIALS

731.05 Materials

The Contractor shall make arrangements to purchase the materials described herein, including concrete face panels, retaining strips or mesh, tie strips, fasteners, joint materials, and all necessary incidentals, from a mechanically stabilized earth wall system manufacturer on the Department's list of approved ~~R~~retaining ~~W~~wall ~~S~~systems.

Materials shall be in accordance with the following:

B Borrow	*211.02*
Coarse Aggregate, Class A or Higher, Size No. 8 or 91	*904*
Concrete Admixtures	*912.03*
Concrete, Class A	*702*
Fine Aggregate, Size No. 23	*904*
Fly Ash	*901.02*
Geotextile	*913.18*
Portland Cement	*901.01(b)*
Rapid Set Patching Materials	*901.07*

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

Reinforcing Steel.....910.01
Structure Backfill ~~*~~ 904.05
Water.....913.01

~~* No slags other than ACBF will be permitted. ACBF shall be Class A or Higher, Size No. 8 in accordance with 904.~~

Backfill material used in the mechanically stabilized earth wall volume shall be structure backfill, type 3 in accordance with 211.

The internal friction or φ angle of the structure backfill in the reinforced soil mass shall be not less than 34 deg in accordance with AASHTO T 236 or AASHTO T 297 under consolidated drained conditions. Testing for the φ angle ~~and permeability~~ shall be performed on the portion finer than No. 8 (2.36 mm) sieve, using a sample of the material compacted to 95% in accordance with AASHTO T 99, methods C, or D. No testing for the φ angle is required when 80% of the materials are greater than No. 4 (4.75 mm) sieve. An approved geotechnical laboratory shall perform the tests.

Structure backfill criteria shall be as follows:

Property	*Criteria*	*Test Method*
pH	*5 < pH < 10*	*AASHTO T 289*
Chlorides	*< 100 ppm*	*AASHTO T 291*
Sulfates	*< 200 ppm*	*AASHTO T 290*
Organic Content	*1 % max.*	*AASHTO T 267*
~~Resistively~~ Resistivity	*3000 Ω × cm (min.)*	*AASHTO T 288*
Permeability & Gradation	*30 ~~m~~ ft/day (~~100 ft~~ 9 m/day) (min.)*	*AASHTO T 215 AASHTO T11 & T27*

~~* Permeability may be reduced to 30 ft/day (10 m/day) when any portion of the pavement structure is not directly above the MSE wall ground reinforcement envelope.~~

If the minimum resistivity exceeds 5000 Ω × cm, the requirement of the testing for ~~C~~chlorides and ~~S~~sulfates may be waived. The resistivity shall be tested at 100% saturation. The gradation shall be run on the material used in the permeability test. All of the above tests shall be run a minimum of once per two calendar years per source.

ACBF shall be in accordance with the pH, ~~C~~chlorides, ~~S~~sulfates, ~~O~~organic ~~C~~content, ~~R~~resistivity and ~~P~~permeability requirements of structural backfill as noted above and ITM 212. Total sulfides shall also be determined in accordance with EPA 376.1, using the 100 mL pH water samples obtained during ITM 212, and shall not exceed 400 ppm. The ACBF shall have a maximum corrosion rate as follows for steel and zinc when tested in accordance with ASTM G 59.

1. *Zinc Corrosion Rate First 2 years.....15 µm/yr/side*
2. *Zinc corrosion to depletion.....4 µm/yr/side*

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

3. Carbon steel rate.....12 µm/yr/side

If ACBF or coarse aggregate No. 8's are used, and soil, B borrow, structural backfill, or coarse aggregate No. 53's are to be placed above the ACBF or No. 8 aggregate, a single layer of geotextile shall be placed on top of the ACBF aggregate in accordance with 616.10. A type C certification in accordance with 916 for the geotextile materials shall be furnished to the Engineer prior to use.

The structure backfill shall be supplied in accordance with 904 and a type A certification in accordance with 916 for the above additional testing of the structure backfill shall be furnished to the Engineer prior to use. One copy of all test results performed by the Contractor, which are necessary to demonstrate compliance with the specifications, shall also be furnished to the Department's Geotechnical Section. An approved geotechnical laboratory shall perform the tests.

(a) Concrete Face Panels

Concrete shall be in accordance with the applicable requirements of 702. Concrete shall have a compressive strength equal to or greater than 4000 psi (27.5 MPa) at 28 days.

Retarding agents, accelerating agents, or additives containing chloride shall not be used without approval. Air-entraining and slump requirements shall be in accordance with 702.05.

Ground reinforcement connecting hardware and rebar lifting devices shall be set in place and secured prior to beginning casting, in accordance with the dimensions and tolerances shown on the design drawings.

1. Testing and Inspection

Acceptability of the panels will be determined on the basis of compressive strength tests and visual inspection. The panels shall be considered acceptable regardless of curing age when compressive test results indicate that the compressive strength is in accordance with 731.05(a). The wall manufacturer of the panels shall provide for all testing and inspection services during the production of the panels. Services shall be completed by a Department approved testing laboratory. An American Concrete Institute certified concrete field testing technician, grade 1, shall be present during production of the face panels to direct all sampling and testing.

2. Casting

The panels shall be cast on a flat area, with the front face of the form at the bottom, and the back face at the upper part. Tie strip guides shall be set on the rear face. The concrete in each unit shall be placed without interruption and shall be consolidated as necessary to prevent the formation of segregation or cleavage planes. Clear form oil of one manufacture shall be used throughout the casting operation.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

3. Curing

The panels shall be cured for a sufficient length of time such that the concrete develops the specified compressive strength.

4. Removal of Forms

The forms shall remain in place until they may be removed without damage to the unit.

5. Concrete Finish

The concrete surface for the front panel face shall have a surface finish produced from contact with the form. The rear face of the panel shall be roughly screeded to eliminate open pockets of aggregate and surface distortions in excess of 1/4 in. (6 mm).

6. Tolerances

All panels shall be manufactured within the tolerances as follows:

a. Panel Dimensions

Lateral position of tie strips shall be within 1 in. (25 mm). All other dimensions shall be within 3/16 in. (5 mm).

b. Panel Squareness

Squareness, as determined by the difference between the two diagonals, shall not exceed 1/2 in. (13 mm).

c. Panel Surface Finish

Surface defects on smooth formed surfaces measured on a length of 5 ft (1.5 m) shall not exceed 1/8 in. (3 mm). Surface defects on textured finished surfaces measured on a length of 5 ft (1.5 m) shall not exceed 5/16 in. (5 mm).

7. Compressive Strength

Acceptance of the concrete panels with respect to compressive strength will be determined on the basis of production lots. A production lot is defined as 50 panels.

Frequency of production control testing will consist of a minimum of one test per production lot but not less than one test per day. The wall manufacturer will sample the concrete in accordance with AASHTO T 141 and prepare a minimum of two cylinders in accordance with AASHTO T 23. Curing of the cylinders shall be in the same manner as the panels are cured.

When the average results of two cylinders tested in accordance with AASHTO T 22, meet or exceeds the requirements of 731.05(a), the production lot panels or those panels represented by a day's testing may be shipped.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

When the cylinder test results are less than the requirements of 731.05(a) and additional cylinders for testing are not available, the manufacturer may core the panels. The wall manufacture will randomly select two panels from the lot for core testing in accordance with AASHTO T 24. The wall manufacture shall obtain one core on the backside of each panel with a device that produces uniform test samples without coring completely through the panel. Coring shall not be located within 6 in. (150 mm) of the panel fasteners or the edges of the panels and shall avoid the panel's reinforcing steel. The wall manufacture shall fill the core holes with equivalent concrete materials or rapid set patching materials and trowel to produce a smooth finish. Excess material removed during troweling shall not be reused. If rapid set patching material is used, mixing and curing shall be in accordance with the manufacture's recommendations. If the average strength test results from the cores meet or exceed the requirements of 731.05(a), the production lot panels may be shipped.

A type A certification in accordance with 916 shall be furnished for each shipment prior to use of the panels. All cylinder or core test results, including the age of the cylinders or cores at the time of testing, shall be included on the certification for each production lot.

Verification of compressive strengths of the panels will be conducted by the Engineer. The frequency of verification testing will be one test for every 750 panels per manufacturer with a minimum of one test per contract. One panel will be randomly selected and two locations selected for coring. The Engineer will obtain two 4 in. (100 mm) cores on the backside of the panel without coring completely through the panel. The Contractor shall refill the core holes with rapid set patching materials and trowel to produce a smooth finish. Excess material removed during troweling shall not be reused. Mixing and curing of the patching materials shall be in accordance with the manufacture's recommendations.

The Engineer will test the cores in accordance with AASHTO T 24. The verification test results will be averaged and compared to the manufacturer's results reported on the certification. If the initial verification test results do not meet the requirements of 731.05(a), the Engineer will randomly select two different panels for additional verification testing. If the additional verification tests meet the requirements of 731.05(a), no further action is required. If the test results still do not meet the requirements of 731.05(a), installation of panels shall cease and the Engineer will conduct an investigation. Panels manufactured on the same dates as the panels cored for verification tests that have already been installed will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03. The Engineer will conduct verification testing until three consecutive dates of production meet the strength requirements of 731.05(a). The Contractor or wall manufacturer shall make arrangements so that panels from three consecutive dates of production are accessible for coring. Installation of panels may resume once acceptable verification testing results are achieved.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

8. Rejection

Units shall be subject to rejection due to failure to be in accordance with the requirements specified above. In addition, the following defects may be sufficient cause for rejection:

a. *Defects which indicate imperfect molding*

b. *Defects which indicate honeycombed or open texture concrete*

c. *Defects in the physical characteristics of the concrete, such as broken or chipped concrete, or color variations or dunnage marks on the front face due to excessive form oil or other reasons.*

The Engineer will determine whether spalled, honeycombed, chipped, or otherwise defective concrete shall be repaired or be cause for rejection. Repair of concrete, if permitted, shall be completed in a satisfactory manner. Repair to concrete surfaces that are to be exposed to view after completion of construction shall be subject to approval.

9. Marking

The place and date of manufacture, and production lot number shall be clearly scribed on the rear face of each panel.

10. Handling, Storage, and Shipping

All panels shall be handled, stored, and shipped so as to eliminate the danger of chipping, cracks, fractures, and excessive bending stresses. Panels in storage shall be supported on firm blocking located immediately adjacent to tie strips to avoid bending the tie strips.

(b) Concrete Leveling Pad

Concrete, Class A, for the leveling pad shall be in accordance with the applicable requirements of 702.

(c) Concrete Coping

Concrete, Class A, for the coping shall be in accordance with the applicable requirements of 702. Reinforcing steel in the coping shall be in accordance with the applicable requirements of 703. The coping may be precast or cast-in-place.

(d) Reinforcing Mesh, Clevis Connector, and Connector Bar

The reinforcing mesh shall be shop fabricated of cold drawn steel wire in accordance with ASTM A 82 and shall be welded into the finished mesh fabric in accordance with ASTM A 185. Galvanization shall be in accordance with ASTM A 123.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

Clevis connectors, if used, shall be attached to the alignment templates using the bars provided with the forms. The vertical and horizontal alignment of the connectors shall be +1/8 in. (+3 mm). The holes inside the loops shall be free of all concrete and debris, loose or otherwise.

The clevis connector shall be fabricated of cold drawn steel wire in accordance with ASTM A 82 and welded in accordance with ASTM A 884. Loops shall be galvanized in accordance with ASTM A 153 Class B-3 or ASTM A 123.

The connector bar, if used, shall be fabricated of cold drawn steel wire in accordance with ASTM A 884 and galvanized in accordance with ASTM A 123.

A type A certification in accordance with 916 for reinforcing mesh, clevis connector, and connector bars shall be furnished prior to use of the materials.

(e) Ground Reinforcement

The ground reinforcement may be a deformed steel strip or a welded wire grid. The grid or strip used shall be consistent with that used in the pullout test and shall be consistent throughout the project.

The grid shall consist of not less than two longitudinal wires, perpendicular to the wall, welded to equally spaced cross ribs capable of developing passive pressure with the fill. The deformed strip shall be of constant width. The strip thickness shall vary only from the standard undeformed section to the standard deformed section as required to produce the pullout resistance.

All longitudinal wires of each welded wire grid shall be of the same diameter. All transverse wires of each welded wire grid shall be of the same diameter, but not necessarily the same as the longitudinal wire diameter.

The face panel edges shall be configured to conceal the joints. All horizontal and vertical joints shall be covered with a joint cover to prevent backfill leakage while passing water.

Reinforcing strips shall be hot rolled from bars to the required shape and dimensions. Physical and mechanical properties of the strips shall be in accordance with ASTM A 572 Grade 65 (A 572M Grade 450). Tie strips shall be shop fabricated with hot rolled steel in accordance with the minimum requirements of ASTM A 570 Grade 50 (A 709M Grade 345). Galvanization for reinforcing strips and tie strips shall be in accordance with ASTM A 123 and the minimum zinc coating thickness shall be 2 oz/sq ft (0.64 L/m^2). All reinforcing strips and tie strips will be inspected to ensure that they are true to size and free from defects which may impair their strength and durability.

A type A certification in accordance with 916 shall be furnished for ground reinforcement prior to use of the materials.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

(f) Reinforcing Steel

Mill certificates for reinforcing steel as shown on the plans shall be furnished for approval. All reinforcing steel shall be in accordance with ASTM A 615 Grade 60 (A 709M Grade 400).

A type A certification in accordance with 916 shall be furnished for reinforcing steel prior to use of the materials.

(g) Fasteners

Fasteners shall consist of 1/2 in. (13 mm) diameter, hexagonal cap screw bolts and nuts, which shall be galvanized and in accordance with ASTM A 325 (A 325M).

A type A certification in accordance with 916 shall be furnished for fasteners prior to use of the materials.

(h) Alignment Pins

The rods used to align the face panels during construction shall be 3/4 in. (19 mm) diameter, 12 in. (300 mm) long. The rods shall be mild steel, polyvinyl chloride, or fiberglass. A sample shall be submitted prior to use to the Materials and Tests Division for approval.

(i) Joint Materials

Bearing pads shall be rubber, neoprene, polyvinyl chloride, or polyethylene, and of the type and grade recommended by the supplier of the mechanically stabilized earth wall system.

The joint cover shall be either a non-woven needle punch polyester geotextile or a woven monofilament polypropylene. The joint cover shall be attached to the rear face of the panels with a suitable adhesive.

Horizontal and vertical joints shall be provided between adjacent face panels to prevent concrete-to-concrete contact and chipping when differential settlement occurs. The horizontal and vertical joints shall contain compression blocks, pins, or other approved means as recommended by the manufacturer to provide a uniform joint. Panels without an uninterrupted vertical joint shall have a minimum joint thickness of 3/4 in. (19 mm).

A type A certification in accordance with 916 for joint materials shall be furnished prior to use of the materials.

CONSTRUCTION REQUIREMENTS

731.06 General Requirements

The wall manufacturer representative shall provide technical instruction, guidance in pre-construction activities including the preconstruction conference, and on-site technical assistance to the Contractor during construction.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

731.07 Foundation Preparation

The foundation for the structure shall be graded level for a width equal to or exceeding the length of the reinforcing strips or as shown on the plans. Prior to wall construction, the foundation, if not in rock, shall be compacted in accordance with 203. The base of the wall excavation shall be proofrolled with an approved compacting equipment. If unsuitable foundation material is encountered, it shall be removed and replaced with B borrow in accordance with 211.02 and compacted in accordance with 211.04.

At each foundation level, an unreinforced concrete leveling pad shall be provided as shown on the plans. The leveling pad shall be cured in accordance with 702.22 a minimum of 12 h before placement of concrete face panels.

731.08 Retaining Wall Excavation

This work shall consist of the excavation of material whose removal is necessary for the construction of the mechanically stabilized earth walls in accordance with the plans, the requirements herein, or as directed. Excavation shall include the construction and subsequent removal of all necessary bracing, shoring, sheeting, cribbing, an all pumping, bailing, and draining.

Prior to starting excavation operations at the wall site, clearing and grubbing shall be in accordance with 201.03. The Contractor shall clear and grub the area to the excavation in accordance with the limits shown on the plans. All timber, stumps, and debris shall be disposed of in accordance with 201.03.

The Contractor shall notify the Engineer a sufficient time before beginning the excavation so that measurements may be taken of the undisturbed ground.

Where necessary for safety, the excavation shall be shored or braced in accordance with State and local safety standards. Excavation and related work shall be performed such that no portion of the wall is endangered by subsequent operations.

Where excavation for the wall is adjacent to a traveled way, the method for shoring, sheeting, or bracing the excavation opening shall be approved before beginning the excavation. The Contractor shall submit five copies of drawings in accordance with 206.09 showing details of the proposed method of excavation protection.

After the excavation for each wall location has been performed, the Contractor shall notify the Engineer. Concrete for the leveling pad shall not be placed until the Engineer has approved the depth of the excavation and the foundation material.

All sheeting and bracing shall be removed as the backfilling progresses.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

All material for backfill shall be subject to approval and shall be free from large or frozen lumps, wood, or other undesirable material. All backfill shall be compacted in accordance with 203.

731.09 Wall Erection

Concrete face panels shall be handled by means of a lifting device set into the upper edge of the panels. Panels shall be placed in successive horizontal lifts in the sequence shown on the plans as backfill placement proceeds. As backfill material is placed behind the panels, the panels shall be maintained in vertical position by means of temporary wooden wedges placed in the joint at the junction of the two adjacent panels on the external side of the wall. External bracing will be required for the initial lift.

Panels placed in contact with the ground or covered by standing water shall have face discoloration removed by means of a chemical wash. Panels shall be stored on blocking to minimize contact with the ground or being covered by standing water.

Plumbness, vertical tolerances, and horizontal alignment tolerances shall not exceed 3/4 in. (19 mm) when measured with a 10 ft (3 m) straightedge. The maximum allowable offset in panel joints shall be 3/4 in. (19 mm). For a wall of over 10 ft (3 m) height, the overall plumbness from top to bottom of the wall shall not exceed 0.05 in./ft (4 mm/m) of wall height.

Ground reinforcing shall be placed normal to the face of the wall, unless otherwise shown on the plans or as directed. Prior to placement of the ground reinforcing strips, backfill shall be compacted in accordance with 731.10.

731.10 Backfill Placement

Backfill placement shall closely follow erection of each course of panels and ground reinforcing. Backfill shall be placed so as to avoid damage or disturbance to the wall materials or misalignment of the concrete face panels. Wall materials that become damaged or disturbed during backfill placement shall be removed and replaced or corrected as directed. All misalignment or distortion of the concrete face panels due to placement of backfill outside the limits described herein shall be corrected as directed.

The work shall also include B borrow backfilling above a theoretical 1:1 slope behind the ground reinforcement in accordance with the details shown on the plans.

Structure backfill shall be compacted to 95% of the maximum dry density in accordance with AASHTO T 99. Compaction equipment shall be in accordance with 409.03(d). Density of the compacted aggregate will be determined in accordance with 203.24(b). If No. 8 backfill materials are used, compaction shall consist of four passes with a vibratory roller, and one pass with the same roller in static mode. A vibratory roller shall be equipped with a variable amplitude system, a speed control device, and have a minimum vibration frequency of 1000 vibrations per min. A roller in accordance with 409.03(d)4 may be used. All displacement or rutting of the aggregate shall be repaired prior to placing subsequent material.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

The maximum loose lift thickness shall not exceed 8 in. (200 mm) except that lifts 3 ft (1 m) from the wall or closer shall not exceed 5 in. (125 mm) in loose thickness. This lift thickness shall be decreased if necessary, to obtain the specified density.

Compaction within 3 ft (1 m) of the back face of the concrete face panels shall be achieved by means of a minimum of five passes with a lightweight mechanical tamper, roller, or an alternative vibratory system.

At the end of each day's operation, the last level of backfill shall be sloped away from the concrete face panels. In addition, surface runoff from adjacent areas shall not be permitted to enter the wall construction site.

Cutting or altering of the basic structural section of ground reinforcing at the site will be prohibited, unless the cutting is preplanned and detailed on the approved design drawings. Cutting shall only be considered if adequate additional ground reinforcing is provided to produce the required strength shown in the approved calculations. If the grid or strip is shortened in the field, the cut ends shall be covered with a galvanized paint or Bitumastic 50 coal tar to prevent corrosion of the metal.

731.11 Method of Measurement

Concrete face panels and wall erection will be measured by the square foot (square meter) of wall surface area. The concrete leveling pad will be measured by the linear foot (meter). Common excavation will be measured by the cubic yard (cubic meter) in accordance with 203.27 to the neat lines shown on the plans. Structure backfill and B borrow will be measured in accordance with 211.09 to the neat lines shown on the plans. Unsuitable foundation materials, if found, will be measured in accordance with 211.09. Geotextile materials if used in accordance with 731.05 will not be measured.

The measurement of concrete face panels, and wall erection will be based on the neat line limits of the wall envelope as shown on the plans and not that of the wall system supplier. The wall envelope limits will be considered to be the vertical distance from the top of the leveling pad to the top of the coping, and the horizontal distance from the beginning to the end of the leveling pad.

Precast or cast-in-place concrete coping will not be measured. Drainage of the backfill including piping, aggregates and geotextile materials will not be measured.

731.12 Stockpiled Concrete Face Panels

Partial payment will be made for panels and ground reinforcement stockpiled on the project site or at the Contractor's approved storage location. Partial payment will be based on the delivered cost of the wall panels, as verified by invoices that include freight charges. The Contractor shall furnish the invoices and Type A certification. The partial payment will not exceed 75% of the contract unit price for concrete face panels. Prior to construction, the Engineer will verify that the panels are in accordance with 731.05(a).

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

731.13 Basis of Payment

Concrete face panels and wall erection will be paid for at the contract unit price per square foot (square meter). The concrete leveling pad, complete and in place, will be paid for at the contract unit price per linear foot (meter) for leveling pad. Common excavation will be paid for at the contract unit price per cubic yard (cubic meter) in accordance with 203.28 to the neat lines shown on the plans. Structure backfill and B borrow will be paid for at the contract unit price per cubic yard (cubic meter) in accordance with 211.10. Unsuitable foundation materials will be paid for in accordance with 211.10.

Payment will be made under:

Pay Item	***Pay Unit Symbol***
Face Panels, Concrete	*SFT (m2)*
Leveling Pad, Concrete	*LFT (m)*
Wall Erection	*SFT (m2)*

The cost of services including the testing laboratory, certified testing personnel, and the testing and inspection of the concrete panels shall be included in the cost of concrete face panels.

The cost of all mechanically stabilized earth wall materials including concrete face panels, ground reinforcing, tie strips, fasteners, joint materials, concrete coping, repair or replacement of face panels damaged or removed due to backfill placement, and incidentals shall be included in the cost of concrete face panels.

The cost of all labor and materials required to prepare the wall foundation, place the ground reinforcing, and erect the concrete face panels shall be included in the cost of wall erection.

The cost of labor and materials required to provide for the drainage of the backfill including piping, aggregates, and geotextile materials shall be included in the cost of concrete face panels.

The cost of refilling and refinishing of the core holes from verification coring shall be included in the cost of concrete face panels.

The cost of performing the laboratory tests by an approved geotechnical laboratory for structural backfill or ACBF slag shall be included in the cost of the pay items in this section.

The cost of all labor and materials for geotextile materials, used, shall be included in the cost of the pay items in this section.

REVISION TO RECURRING SPECIAL PROVISION

731-R-202, CONTINUED.

The cost of cutting, altering, and recoating of the ground reinforcing at the site shall be included in the cost of wall erection.

731-R-202

REVISION TO RECURRING SPECIAL PROVISION

732-R-310 MODULAR CONCRETE BLOCK RETAINING WALL

(Revised 01-15-09)

SECTION 732, BEGIN LINE 1, INSERT AS FOLLOWS:

SECTION 732 - MODULAR CONCRETE BLOCK RETAINING WALL

732.01 Description

This work shall consist of furnishing materials and placement of modular block wall units with or without ground reinforcement in accordance with 105.03.

The Contractor shall perform the necessary work to verify that the foundation is at the correct elevation, that the wall is constructed to the correct alignment, and that the work is in accordance with the specified tolerances. The checking of alignments and tolerances shall include verifying that the plumbness of the modular block wall units is in accordance with 732.09 over the entire height of the wall. Alignment shall be checked at each layer of modular block wall units after the backfill behind the modular block wall units has been compacted, and the results shall be recorded.

732.02 General Design Requirements

The modular block wall shall consist of an aggregate leveling pad, concrete modular block wall units and when specified, ground reinforcement elements that are to be mechanically connected to the facing units. Ground reinforcement shall have sufficient strength, frictional resistance, and quantity as required by design.

All modular block wall units shall be constructed in accordance with the approved plans and shop drawings based on the requirements herein. The recommendations of the wall system supplier shall not override the minimum performance requirements shown herein.

If the wall manufacturer needs additional information to complete the design, the Contractor shall be responsible for obtaining such information.

All appurtenances behind, in front of, under, mounted upon, or passing through the wall such as drainage structures, utilities, or other appurtenances shown on the plans shall be accounted for in the stability design of the wall.

The modular block wall design shall follow the general dimensions of the wall envelope shown on the plans. The plans will locate the leveling pad at or below the theoretical leveling pad. The top of the modular block wall unit shall be at or above the top of the wall elevation shown on the plans.

The top of the modular block wall shall be designed to prevent the removal of the top course of blocks.

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

Cast-in-place concrete will not be an acceptable replacement for any modular block wall unit within the areas noted by the wall envelope.

Modular block wall units shall be designed to accommodate differential settlement of 1 linear unit in 100. Where shown on the plans, slip joints to accommodate excessive or differential settlement shall be included.

732.03 Design Criteria

The design by the manufacturer shall be in accordance with the requirements for the internal and the external stability of the wall mass, the bearing pressure, and overturning. The design shall be in accordance with the applicable requirements of the AASHTO Standard Specifications for Highway Bridges unless otherwise specified herein. The analysis of settlement, sliding, bearing capacity, and overall slope stability will be the responsibility of the Engineer.

External loads which affect the internal stability shall be accounted for in the design. The size of all structural elements shall be determined such that the design load stresses do not exceed the allowable stresses found in the AASHTO Standard Specifications for Highway Bridges, unless otherwise shown on the plans.

The maximum standard modular block wall unit face area shall be 1 sq ft (0.09 m^2). The minimum depth of modular block wall units shall be 9 in. (225 mm).

The phi (ϕ) angle for the internal design of the volume shall be assumed to be 34 degrees. The (ϕ) angle of the backfill behind the modular block earth mass shall be assumed to be 30 degrees. Before construction begins, the structure backfill selected shall be tested by the Contractor to confirm compliance with the frictional requirement. The wall supplier shall be furnished a copy of the testing results for the backfill. The friction angle of the foundation soils shall be assumed to be 30 degrees.

The wall shall be defined by the wall envelope shown on the plans. For design purposes, the height of wall H shall be measured from the theoretical top of the leveling pad to the top of the wall. For a level surcharge situation, the top of the wall shall be measured to the top of the coping or to the gutter line of the traffic barrier. The top of the wall shall be the theoretical top of the modular block wall units only when a coping or barrier is not used. For an abutment face, the design height H shall be defined as the height measured from the top of the leveling pad to the top of the roadway surface. For a wall with a sloping surcharge the top of the wall shall be measured at a point 0.3H back from the face where the design height is H and the actual wall height is H.

Modular block wall units shall be dry stacked in a running bond configuration. Vertically adjacent units shall be connected with an approved shear connections.

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

The ground reinforcement shall be the same length from the bottom to the top of each modular block wall section. Differing ground reinforcement elements shall be clearly marked for ease of construction. The minimum length of the ground reinforcement shall be 8 ft (2.5 m) or 0.7H for a wall without sloping surcharges, 0.7H for a wall with sloping surcharges, or in accordance with the AASHTO Standard Specifications for Highway Bridges for an abutment on a spread footing.

The ground reinforcement for modular block wall sections shall be sized using the lesser of the allowable forces for each specific connection and each specific reinforcing element. The connection's allowable force shall be taken as 2/3 of the connection test load at the allowable pullout deformation limit of 1/2 in. (13 mm) or one half of the ultimate load, whichever is less.

The ground reinforcement length shall be as required for internal design or as shown on the plans. The length shall exceed the minimum noted as required for design consideration. One hundred percent of the ground reinforcement, which is designed and placed in the reinforced earth volume shall extend to and shall be connected to the modular block wall units.

Where the presence of opposing walls limits the length of ground reinforcing, the design shall account for the reduced length and internal and external stability calculations shall be made to check for adequate factor of safety.

The actual applied bearing pressures under the stabilized mass for each reinforcement length shall be clearly indicated on the shop drawings and shall be equal to or less than the maximum allowable soil pressure shown on the plans. Passive pressure in front of the wall mass will be assumed to be zero for design purposes.

732.04 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 eight 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 wall and shall include, but shall not be limited to, the following:

1. A plan and elevation sheet or sheets for each wall

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

2. *An elevation view of the wall 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, all steps in the leveling pads, the designation as to the type of modular block wall unit, the length of ground reinforcement, the distance along the face of the wall to where changes in length of the ground reinforcement occur, and an indication of the original and final ground lines and maximum bearing pressures.*

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 and connection of all ground reinforcing elements in areas where piling, utility, or other structures are near the wall.*

4. *A typical cross section or cross sections showing elevation relationship between ground conditions and proposed grades*

5. *All general notes required for constructing the wall*

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

7. *A listing of the summary of quantities on the elevation sheet for each wall*

(b) *All modular block wall unit shall show all dimensions necessary to construct the element and the location of soil reinforcing system devices embedded in the units.*

(c) *The details for construction of walls around drainage facilities.*

(d) *All details of the architectural treatment.*

(e) *The details for diverting ground reinforcement around obstructions such as piles, catch basins, landscape plantings where the bottom of the root ball extends below the top level of ground reinforcement, and other utilities shall be submitted for approval.*

(f) *The details for mechanical connection between the modular block wall unit and the ground reinforcement.*

Design calculations and shop drawings shall be submitted to the Engineer for review and approval.

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

MATERIALS

732.05 Materials

The Contractor shall make arrangements to supply the materials described herein, including concrete modular block wall units, fasteners, joint materials, ground reinforcement, and all necessary incidentals.

Materials shall be in accordance with the following:

B Borrow	*211.02*
Coarse Aggregate, Class A or Higher, Size No. 8 or 91*	*904*
*Concrete Admixtures***	*912.03*
Concrete	*702*
Fine Aggregate, Size No. 23	*904*
Fly Ash	*901.02*
Geogrid, Type I	*913.21*
Geotextile	*913.18*
Portland Cement	*901.01(b)*
*Structure Backfill ~~**~~*	*904.05*
Water	*913.01*

* *Coarse aggregate No. 8 used as drainage fill shall consist of 100% crushed stone.*

~~** *No slags other than ACBF will be permitted. ACBF shall be Class A or Higher, Size No. 8 in accordance with 904.*~~

*** *Admixtures in accordance with ASTM C 1372 may be used for the modular block if approved by the Engineer.*

Backfill material used in the modular block wall volume shall be structure backfill, type 3 in accordance with 211.

The internal friction or ϕ angle of the structure backfill in the reinforced backfill shall be not less than 34 deg in accordance with AASHTO T 236 or AASHTO T 297 under consolidated drained conditions. Testing for the ϕ angle ~~and permeability~~ shall be performed on the portion finer than No. 8 (2.36 mm) sieve, using a sample of the material compacted to 95% in accordance with AASHTO T 99, methods C, or D. No testing for the ϕ angle is required when 80% of the materials are greater than No. 4 (4.75 mm) sieve. An approved geotechnical laboratory shall perform the tests.

Structure backfill criteria shall be as follows:

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

Property	*Criteria*	*Test Method*
pH	*5 < pH < 10*	*AASHTO T 289*
~~*Chlorides*~~	~~*< 100 ppm*~~	~~*AASHTO T 291*~~
~~*Sulfates*~~	~~*< 200 ppm*~~	~~*AASHTO T 290*~~
Organic Content	*1 % max.*	*AASHTO T 267*
~~*Resistively*~~	~~*3000 Ω - cm (min.)*~~	~~*AASHTO T 288*~~
Permeability & Gradation	*30 ~~m~~ ft/day (~~100 ft~~ 9 m/day) (min.)*	*AASHTO T 215 AASHTO T11 & T27*

~~*If the minimum resistivity exceeds 5000 Ω - cm, the requirement of the testing for Cchlorides and Ssulfates may be waived. The resistivity shall be tested at 100% saturation. The gradation shall be run on the material used in the permeability test.*~~ *All of the above tests shall be run a minimum of once per two calendar years per source.*

ACBF shall be in accordance with the pH, ~~chlorides, sulfates, and O~~organic ~~C~~content, ~~resistivity~~, and permeability requirements of ~~structural~~ structure backfill as noted above, and in ITM 212. ~~Total sulfides shall also be determined in accordance with EPA 376.1, using the 100 mL pH water samples obtained during ITM 212, and shall not exceed 400 ppm.~~

If ACBF or coarse aggregate No. 8's (2.36 mm) are used, and soil, B borrow, structural backfill, or coarse aggregate No. 53's are to be placed above the ACBF or No. 8 (2.36 mm) aggregate, a single layer of geotextile shall be placed on top of the ACBF or No. 8 (2.36 mm) aggregate in accordance with 616.10. A type C certification in accordance with 916 for the geotextile materials shall be furnished to the Engineer prior to use.

The structure backfill shall be supplied in accordance with 904 and a type A certification in accordance with 916 for the above additional testing of the structure backfill shall be furnished to the Engineer prior to use. One copy of all test results performed by the Contractor, which are necessary to demonstrate compliance with the specifications, shall also be furnished to the Department's Geotechnical Section. An approved geotechnical laboratory shall perform the tests.

(a) Concrete Modular Block Wall Units

Concrete modular block retaining wall units shall be in accordance with ASTM C 1372 and shall have a minimum compressive strength of 4000 psi (27.5 MPa) at 28 days. Modular block wall units utilizing type I or II cement will be considered acceptable for placement in the wall when 7-day strengths exceed 3500 psi (24.1 MPa).

Retarding agents, accelerating agents, coloring pigments, or additives containing chloride shall not be used without approval.

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

1. Testing and Inspection

a. Material properties shall be in accordance with the requirements of 732.05 in lieu of Section 4.

b. Table 1, "Strength and Absorption Requirements", shall be modified to require that the average compressive strength, when sampled and tested in accordance with ASTM C 140, of a three CMU compressive strength sample shall be 4000 psi (27.5 MPa) with no individual unit less than 3500 psi (24.1 MPa). Maximum absorption shall be 6%.

c. The modular block wall unit's compressive strength shall be considered acceptable regardless of curing age when compressive test results indicate that the compressive strength is in accordance with 732.05(a).

d. Freeze-thaw durability testing shall be completed in accordance with Section 8.3 by a laboratory approved by the Department. Test results shall have been completed in accordance with ASTM C 1372 and be within 12 months prior to delivery. A type A certification in accordance with 916 for the freeze-thaw durability testing shall be submitted to the Engineer prior to use of the blocks.

e. Sampling and testing of the manufacturer's production lots will be conducted by the Engineer in accordance with ASTM C 140. If the compressive strength test result does not meet the requirements of 732.05(a), the production lot units may not be used. The manufacturer may resample the same production lot in the presence of the Engineer for retesting. The Engineer will test the additional samples in accordance with ASTM C 140. If the retested samples meet the requirements of 732.05(a), the production lot may be used. If the retested samples do not meet the requirements of 732.05(a), all the units from the production lot may not be used.

2. Rejection

Units shall be subject to rejection due to failure to be in accordance with the requirements specified above. In addition, the following defects may be sufficient cause for rejection.

a. Defects which indicate imperfect molding

b. Defects which indicate honeycombed or open texture concrete

REVISION TO RECURRING SPECIAL PROVISION
732-R-310, CONTINUED.

c. Defects in the physical characteristics of the concrete, such as broken or chipped concrete, or color variations or dunnage marks on the front face due to excessive form oil or other reasons.

The Engineer will determine whether spalled, honeycombed, chipped, or otherwise defective concrete shall be repaired or be cause for rejection. Repair of concrete, if permitted, shall be completed in a satisfactory manner. Repair to concrete surfaces, which are to be exposed to view after completion of construction shall be subject to approval.

3. Marking

The date of manufacture, the production lot number, and the place mark shall be clearly scribed on the rear face of each unit or on each shipping pallet.

4. Handling, Storage, and Shipping

All modular block wall units shall be handled, stored, and shipped so as to eliminate the danger of chipping, cracks, fractures, and excessive bending stresses.

(b) Aggregate Leveling Pad

Aggregate for the leveling pad shall be compacted aggregate No. 53 and shall be in accordance with the applicable requirements of 303.

(c) Ground Reinforcement

The ground reinforcement shall be geogrid. The ground reinforcement used shall be consistent with that used in the pullout test and shall be consistent throughout the project.

A type A certification in accordance with 916 for geogrids shall be submitted to the Engineer prior to use of the materials.

(d) Backfill Material

Backfill material used in the modular block wall structure volume shall be structure backfill. B borrow shall be placed behind the reinforcement and the structure backfill.

A type A certification in accordance with 916 for the structure backfill shall be furnished prior to use of the materials. One copy of all test results performed by the Contractor, which are necessary to demonstrate compliance with the specifications, shall be furnished to the Engineer.

Drainage fill used behind the modular block wall, as shown on the plans shall be coarse aggregate No. 8 (2.36 mm) in accordance with 904.02.

CONSTRUCTION REQUIREMENTS

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

732.06 General Requirements

The wall supplier representative shall provide technical instruction, guidance in pre-construction activities including the preconstruction conference, and on-site technical assistance to the Contractor during construction.

732.07 Foundation Preparation

The foundation for the structure shall be graded level for the width shown on the plans. Prior to wall construction, the foundation, if not in rock, shall be compacted in accordance with 203. The base of the wall excavation shall be proofrolled with an approved compacting equipment. If unsuitable foundation material is encountered, it shall be removed and replaced with B borrow in accordance with 211.02 and compacted in accordance with 211.04.

At each foundation level, an aggregate leveling pad shall be provided as shown on the plans.

732.08 Retaining Wall Excavation

This work shall consist of the excavation of material whose removal is necessary for the construction of the modular block wall sections in accordance with the plans and the requirements herein. Excavation shall include the construction and subsequent removal of all necessary bracing, shoring, sheeting, cribbing, all pumping, bailing, and draining.

Prior to starting excavation operations at the wall site, clearing and grubbing shall be in accordance with 201.03. The Contractor shall clear and grub the area for the excavation in accordance with the limits shown on the plans. All timber, stumps, and debris shall be disposed of in accordance with 201.03.

The Contractor shall notify the Engineer a sufficient time before beginning the excavation so that measurements may be taken of the undisturbed ground.

Where necessary for safety, the excavation shall be shored or braced in accordance with State and local safety standards. Excavation and related work shall be performed such that no portion of the wall is endangered by subsequent operations.

Where excavation for the wall is adjacent to a traveled way, the method for shoring, sheeting, or bracing the excavation opening shall be approved before beginning the excavation. The Contractor shall submit five copies of drawings in accordance with 206.09 showing details of the proposed method of excavation protection.

After the excavation for each wall location has been performed, the Contractor shall notify the Engineer. The aggregate leveling pad shall not be placed until the Engineer has approved the depth of the excavation and the foundation material.

All sheeting and bracing shall be removed as the backfilling progresses.

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

All material for backfill shall be subject to approval and shall be free from large or frozen lumps, wood, or other undesirable material. All backfill shall be compacted in accordance with 203.

732.09 Wall Erection

Modular block wall units shall be placed in successive horizontal lifts in the sequence shown on the plans as backfill placement proceeds. As backfill material is placed behind the units, the units shall be maintained in vertical position.

Modular block wall units placed in contact with the ground or covered by standing water shall have face discoloration removed by means of a chemical wash. Modular block wall units shall be stored to minimize contact with the ground or being covered by standing water.

Horizontal alignment tolerances shall not exceed 3/4 in. (19 mm) when measured with a 10 ft (3 m) straightedge.

Ground reinforcement shall be placed normal to the face of the wall, unless otherwise shown on the plans and shall be constructed in accordance with 214.04. Backfill shall be compacted in accordance with 732.10.

732.10 Backfill Placement

Backfill placement shall closely follow erection of each course of modular block wall units with or without ground reinforcement. Backfill shall be placed so as to avoid damage or disturbance to the wall materials or misalignment of the modular block wall units. Wall materials that become damaged or disturbed during backfill placement shall be removed and replaced or corrected as directed. All misalignment or distortion of the modular block wall units due to placement of backfill outside the limits described herein shall be corrected as directed.

The work shall also include backfilling beyond the theoretical length of the ground reinforcement in accordance with the details shown on the plans and the disposal of surplus of unsuitable excavated materials as permitted.

Structure backfill shall be compacted to 95% of the maximum dry density in accordance with AASHTO T 99. Compaction equipment shall be in accordance with 409.03(d). Density of the compacted aggregate will be determined in accordance with 203.24(b). If No. 8 backfill materials are used, compaction shall consist of four passes with a vibratory roller, and one pass with the same roller in static mode. A vibratory roller shall be equipped with a variable amplitude system, a speed control device, and have a minimum vibration frequency of 1000 vibrations per min. A roller in accordance with 409.03(d)4 may be used. All displacement or rutting of the aggregate shall be repaired prior to placing subsequent material.

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

The maximum loose lift thickness shall not exceed 8 in. (200 mm) except that lifts 3 ft (1 m) from the wall or closer shall not exceed 5 in. (125 mm) in loose thickness. This lift thickness shall be decreased if necessary, to obtain the specified density.

Compaction within 3 ft (1 m) of the back face of the modular block wall units shall be achieved by means of a minimum of five passes with a lightweight mechanical tamper, roller, or vibratory system.

At the end of each day's operation, the last level of backfill shall be sloped away from the modular block wall units. In addition surface runoff from adjacent areas shall not be permitted to enter the wall construction site.

Cutting or altering of the basic structural section of the ground reinforcing at the site will be prohibited, unless the cutting is preplanned and detailed on the approved design drawings. Cutting shall only be considered if adequate additional ground reinforcement is provided to produce the required ground reinforcement strength shown in the approved calculations.

732.11 Method of Measurement

Modular block wall units with or without ground reinforcement will be measured by the square yard (square meter) of wall surface area. Erection of Modular block wall units will be measured by the square yard (square meter) of wall surface area. Common excavation will be measured by the cubic yard (cubic meter) in accordance with 203.27 to the neat lines shown on the plans. Structure backfill and B borrow will be measured in accordance with 211.09. Unsuitable foundation materials, if found, will be measured in accordance with 211.09.

The measurement for concrete modular block wall units and wall erection will be based on the neat line limits of the wall envelope shown on the plans and not that of the wall system supplier. The wall envelope limits will be considered to be the vertical distance from the top of the leveling pad to the top of the wall, and the horizontal distance from the beginning to the end of the leveling pad.

Clearing and grubbing, excavation, compacted aggregate No. 53, and compacted aggregate No. 8 will not be measured. Geotextile materials if used in accordance with 732.05 will not be measured.

732.12 Stockpiled Modular Block Units

Partial payment may be made for block wall units stockpiled on the project site or at the Contractor's approved storage location. Partial payment will include the delivered cost of the units, as verified by invoices that include freight charges. The Contractor shall furnish the invoices. The partial payment will not exceed 75% of the contract unit price for modular block wall with or without ground reinforcement. Prior to authorizing partial payment, the Engineer will verify that the units are in accordance with 732.05(a).

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

732.13 Basis of Payment

Modular block wall units with or without ground reinforcement will be paid for at the contract unit price per square yard (square meter) of wall surface area. Erection of Modular block wall units will be paid for by the square yard (square meter) of wall surface area. Common excavation will be paid for at the contract unit price per cubic yard (cubic meter) in accordance with 203.28 to the neat lines shown on the plans. Structure backfill and B borrow will be paid for in accordance with 211.10. Unsuitable foundation materials will be paid for in accordance with 211.10.

Payment will be made under:

Pay Item	***Pay Unit Symbol***
Modular Block Wall	*SYS (m2)*
Modular Block Wall with Ground Reinforcement	*SYS (m2)*
Modular Block Wall Erection	*SYS (m2)*

The cost of aggregate and geotechnical testing shall be included in the cost of wall.

The cost of modular blocks including ground reinforcing, fasteners, repair or replacement of units damaged or removed due to backfill placement, and incidentals shall be included in the cost of modular block wall with ground reinforcement.

The cost of all labor and materials required to prepare the wall foundation, place the ground reinforcing, and erect the modular block units shall be included in the cost of wall erection.

The cost of performing the laboratory tests by an approved geotechnical laboratory for structural backfill or ACBF slag shall be included in the cost of modular block wall with or without ground reinforcement.

The cost of all labor and materials for geotextile materials shall be included in the cost of other structural backfill.

The cost of cutting or altering the ground reinforcing at the site shall be included in the cost of modular block wall with ground reinforcement.

The cost of all modular block wall materials including modular block wall units, compressive strength retesting if required, and incidentals shall be included in the cost of the concrete modular block wall with or without ground reinforcement.

The cost of clearing and grubbing, compacted aggregate No. 53, compacted aggregate No. 8, ground reinforcement, or replacement materials damaged during backfill placement if required, shall be included in the cost of wall erection.

REVISION TO RECURRING SPECIAL PROVISION

732-R-310, CONTINUED.

The cost of retesting or replacing failed modular block wall units will be included in the cost of the concrete modular block wall with or without ground reinforcement.

732-310

COMMITTEE COMMENTS:

RSP's need revision because of Type II backfill requirements for MSE walls and modular block walls.

Mr. Miller asked Tony Uremovich, Wall Committee Chair, if RSP's 731-R-202 MSE Wall and 732-R-310 block wall were ready for the 2010 SS book. Mr. Uremovich said the Wall Committee believes these RSP's are ready for inclusion the 2010 book. Mr. Reilman commented that there may not be enough time to revise these RSP's for inclusion in the book. Mr. Miller asked if there were concerns putting RSP's in the 2010 book.

Mr. Heustis suggested the Wall Committee prepare these RSP's for eventual inclusion in the standard specifications. (i.e. QCP to ITM, Materials to 900 Section.

RSP 211-R-543 will be revised and incorporated into the 2010 Specification Book.

Other sections containing specific cross references:

None

Recurring Special Provisions affected:

211-R-543
731-R-202
732-R-310

Standard Sheets affected:

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

Action: Passed as revised

___ 20__ Standard Specifications Book

___ Create RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

_x_ Revise RSP's (No. 211-R-543, 731-R-202, 732-R-310)
Effective April 1, 2009 Letting
RSP Sunset Date: _____

** Issue Construction Memorandum*

Standard Drawing Effective _____

___ Create RPD (No. _____)
Effective _____Letting
___ Technical Advisory

GIFE Update Req'd.? Y___ N_x_
By - Addition or Revision

Frequency Manual Update Req'd? Y___ N_x_
By - Addition or Revision

Withdrawn ____

Received FHWA Approval? Yes

Item No.03 01/15/09 (2008 SS)
Ms. Rearick
Date: 01/15/09

REVISED AND NEW STANDARD DRAWINGS

SPECIFICATION REVISIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: We received comments that the current moment slab was over-reinforced and not cost effective. The details for the Concrete-pavement moment slab used adjacent to or atop a mechanically-stabilized-earth retaining wall were not in accordance with AASHTO Load Factor Design requirements. The Research Division has determined that the current reinforcing amount is excessive. Our Office concurs. Also, details for use of moment slab with truck-height railing are not standardized.

PROPOSED SOLUTION: Correct standard drawings for common-height railing for more cost-effective, yet structurally adequate, moment-slab reinforcement requirements. Develop standard details for so-reinforced moment slab with truck-height railing.

APPLICABLE STANDARD SPECIFICATIONS: Current requirements for this work in 706.03.1, 706.05, and 706.06 are unaffected by this change.

APPLICABLE STANDARD DRAWINGS: Existing drawings for moment slab with common-height railing to be revised and renumbered as follows:

706-BRRW-01 number unchanged
706-BRRW-02 becomes -03
706-BRRW-03 becomes -05
706-BRRW-04 becomes -07
706-BRRW-05 becomes -09.

New drawings for moment slab with truck-height railing are 706-BRRW-02, -04, -06, and -08.
A new drawing showing General Notes is 706-BRRW-10.

Existing standard drawings 706-BCBR-01, -02, and -04 for concrete bridge railings are being revised to identify the common- and truck-height railings by a type designation.

APPLICABLE DESIGN MANUAL SECTION: Proposed new Part V Section 49-5.07. Design Memorandum 05-34 regarding this work is unaffected by this change. The appropriate portions of the memo will become the new Manual section.

APPLICABLE SECTION OF GIFE: Unknown

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Anne Rearick

Title: Structural Services Office manager

Organization: INDOT

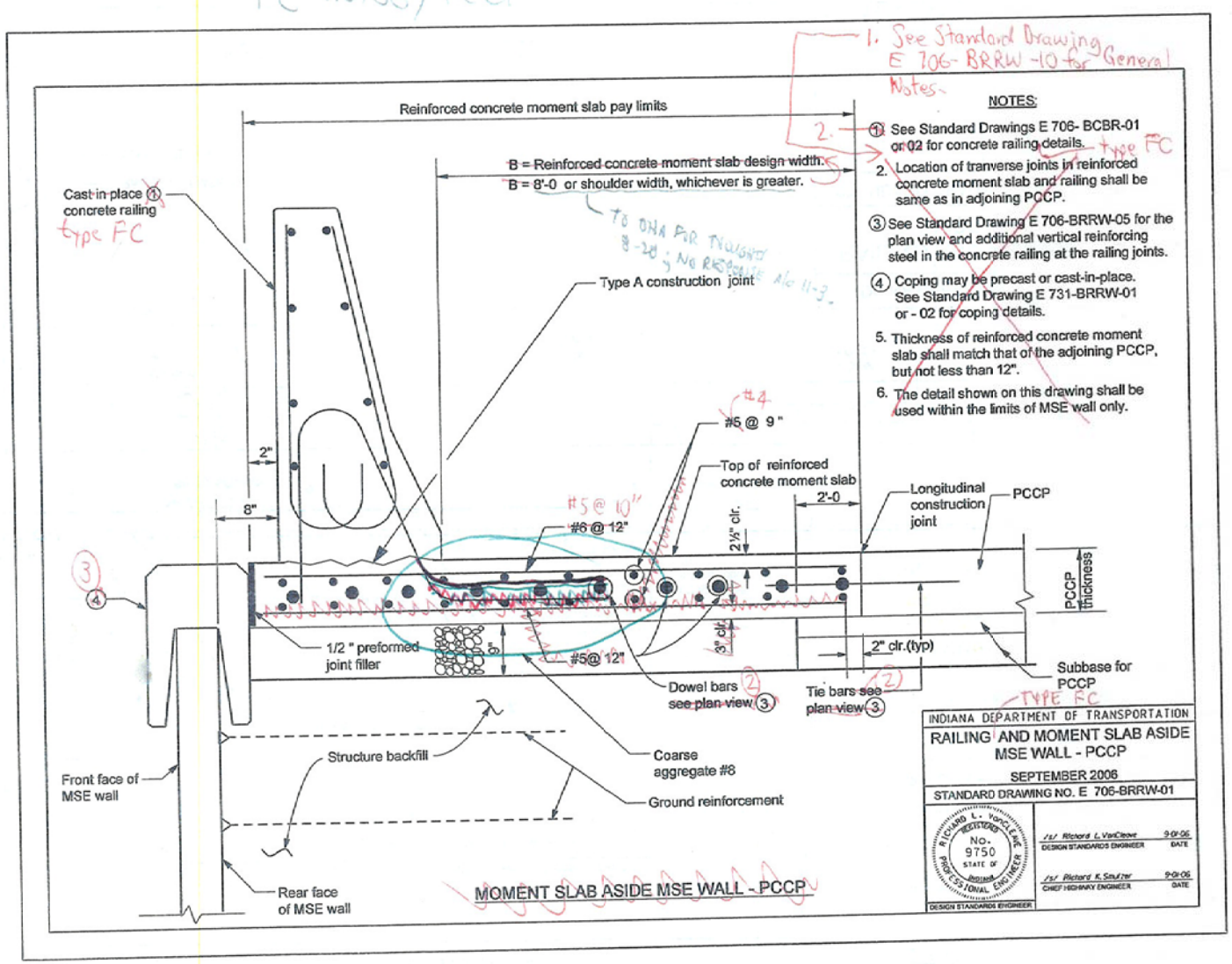
Phone Number: 232-5152

Date: 11-10-08

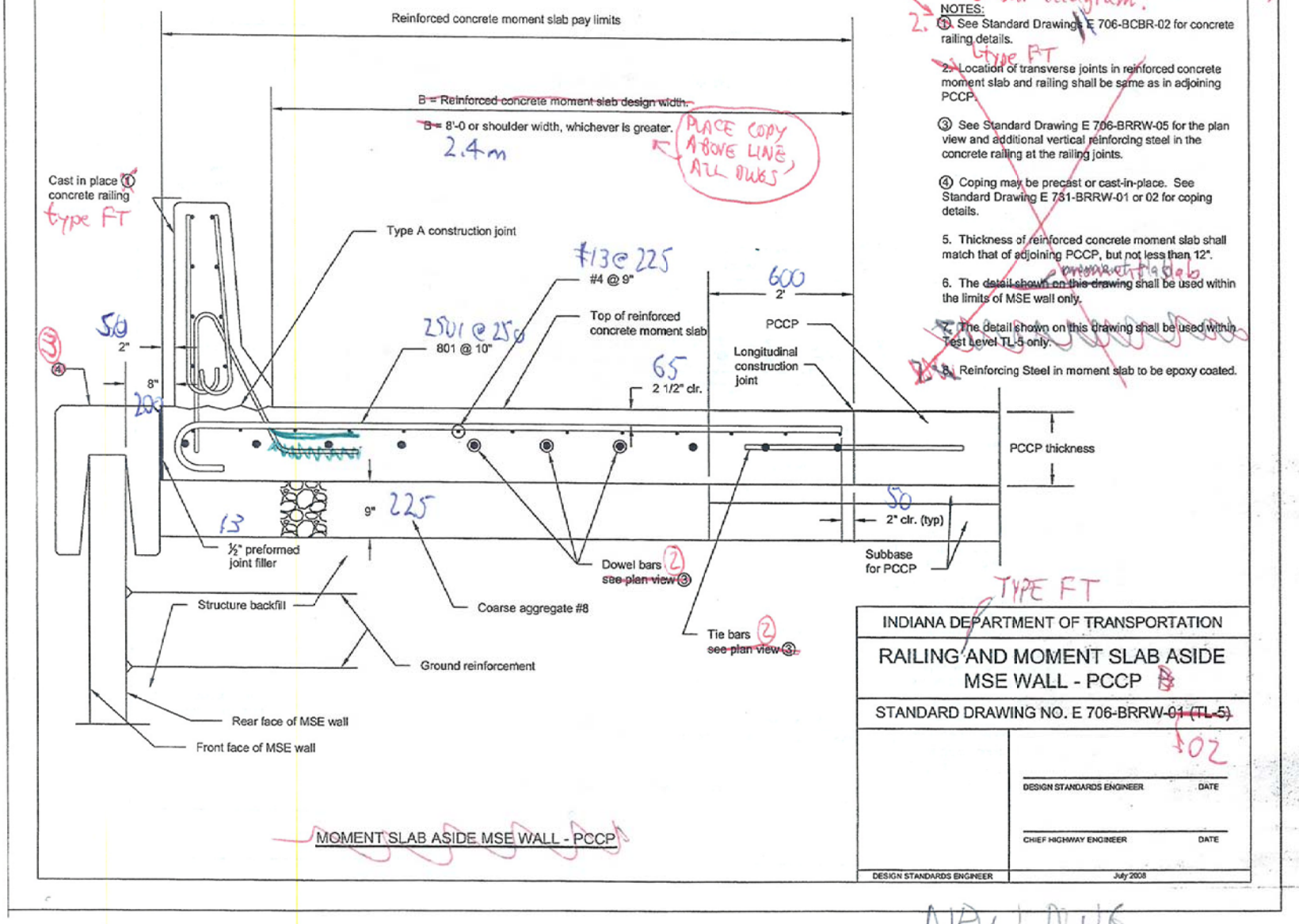
APPLICABLE SUB-COMMITTEE ENDORSEMENT? Research Division

FC ASIDE / PCCP

* HANDOUT @ MTG.



FT ASIDE / PCCP



1. See Standard Drawing E 706-BRRW-10 for General Notes and bar diagram.

NOTES:

(1) See Standard Drawings E 706-BCBR-02 for concrete railing details.

2. Location of transverse joints in reinforced concrete moment slab and railing shall be same as in adjoining PCCP.

(3) See Standard Drawing E 706-BRRW-05 for the plan view and additional vertical reinforcing steel in the concrete railing at the railing joints.

(4) Coping may be precast or cast-in-place. See Standard Drawing E 731-BRRW-01 or 02 for coping details.

5. Thickness of reinforced concrete moment slab shall match that of adjoining PCCP, but not less than 12".

6. The detail shown on this drawing shall be used within the limits of MSE wall only.

7. The detail shown on this drawing shall be used within Test Level TL-5 only.

8. Reinforcing Steel in moment slab to be epoxy coated.

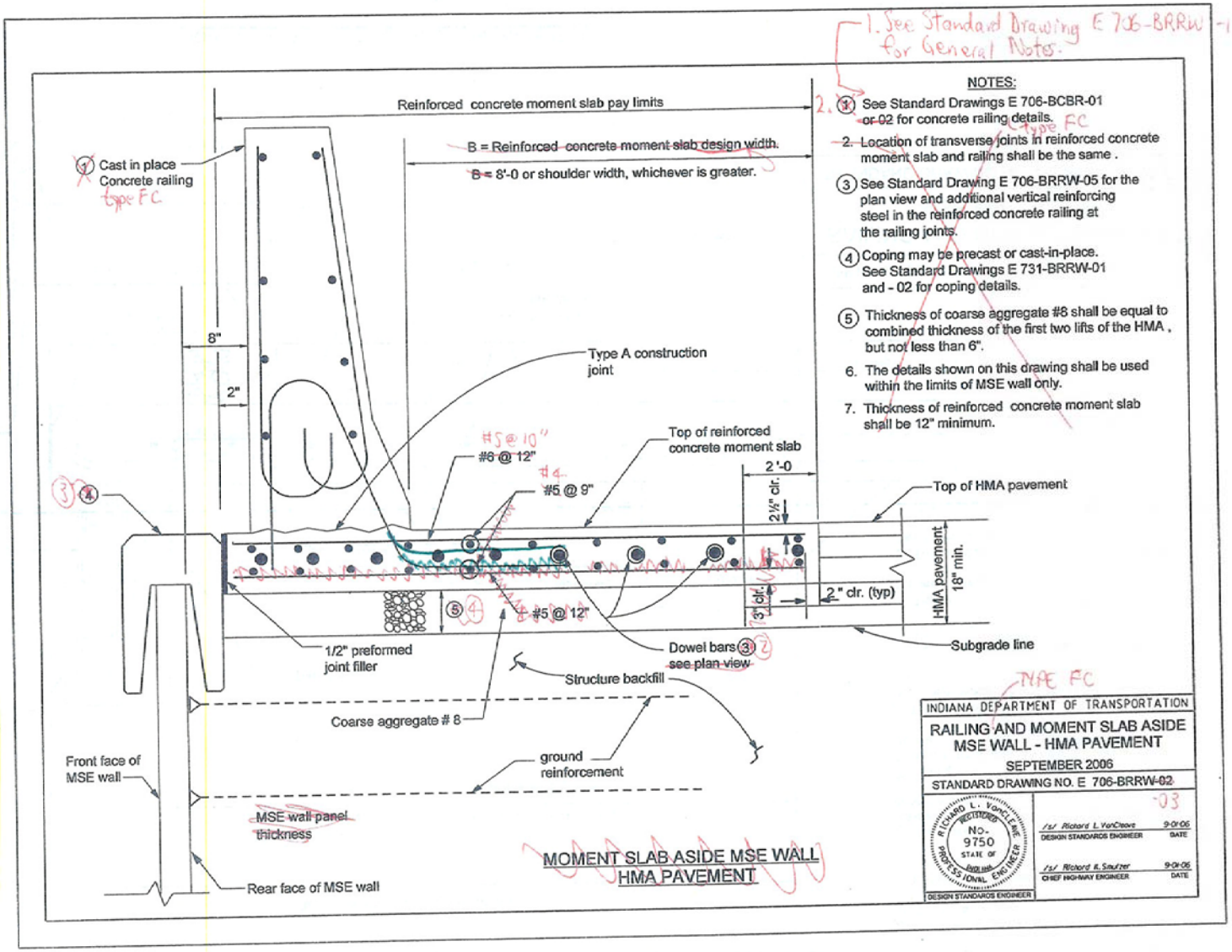
Type FT

INDIANA DEPARTMENT OF TRANSPORTATION	
RAILING AND MOMENT SLAB ASIDE MSE WALL - PCCP B	
STANDARD DRAWING NO. E 706-BRRW-01 ~~(TL-5)~~	
	DESIGN STANDARDS ENGINEER DATE CHIEF HIGHWAY ENGINEER DATE
DESIGN STANDARDS ENGINEER	July 2008

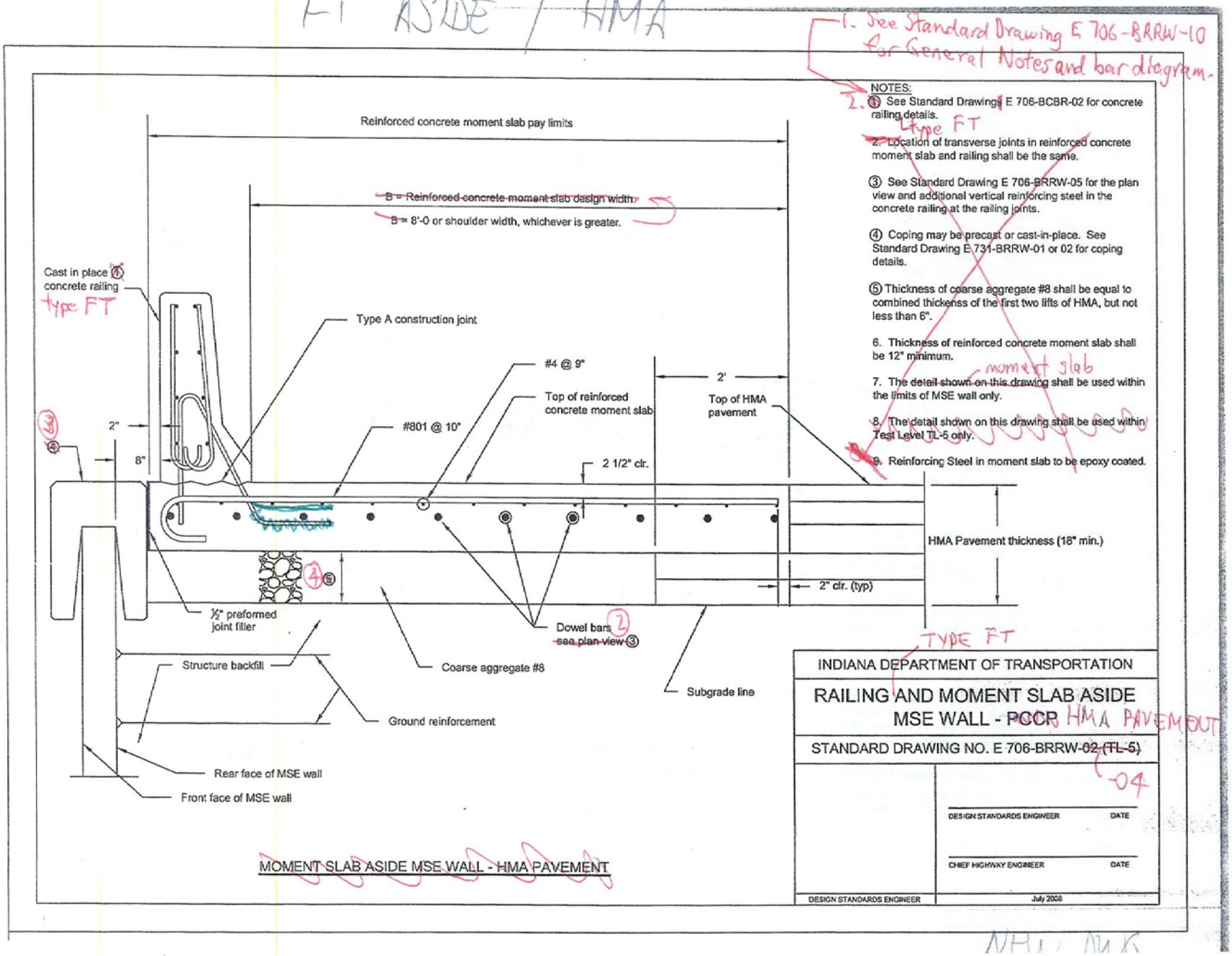
102

NIPU / MIG

FC ASIDE / HMA


Reinforced concrete moment slab pay limits
B = Reinforced concrete moment slab design width.
B = 8'-0 or shoulder width, whichever is greater.
1 Cast in place Concrete railing type FC
8"
2"
Type A construction joint
#5 @ 10"
#6 @ 12"
#4
#5 @ 9"
Top of reinforced concrete moment slab
2'-0
2½" clr.
Top of HMA pavement
HMA pavement 18" min.
2" clr. (typ)
3" clr.
#5 @ 12"
1/2" preformed joint filler
Dowel bars 3 see plan view
Subgrade line
Structure backfill
Coarse aggregate # 8
ground reinforcement
Front face of MSE wall
MSE wall panel thickness
Rear face of MSE wall
MOMENT SLAB ASIDE MSE WALL
HMA PAVEMENT
1. See Standard Drawing E 706-BRRW-1 for General Notes.
NOTES:
1 See Standard Drawings E 706-BCBR-01 or 02 for concrete railing details.
2. Location of transverse joints in reinforced concrete moment slab and railing shall be the same .
3 See Standard Drawing E 706-BRRW-05 for the plan view and additional vertical reinforcing steel in the reinforced concrete railing at the railing joints.
4 Coping may be precast or cast-in-place. See Standard Drawings E 731-BRRW-01 and - 02 for coping details.
5 Thickness of coarse aggregate #8 shall be equal to combined thickness of the first two lifts of the HMA , but not less than 6".
6. The details shown on this drawing shall be used within the limits of MSE wall only.
7. Thickness of reinforced concrete moment slab shall be 12" minimum.
INDIANA DEPARTMENT OF TRANSPORTATION
RAILING AND MOMENT SLAB ASIDE MSE WALL - HMA PAVEMENT
SEPTEMBER 2006
STANDARD DRAWING NO. E 706-BRRW-02
-03
RICHARD L. VONCLEAVE REGISTERED NO. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER
DESIGN STANDARDS ENGINEER
/s/ Richard L VonCleave 9-01-06
DESIGN STANDARDS ENGINEER DATE
/s/ Richard A. Saufzer 9-01-06
CHIEF HIGHWAY ENGINEER DATE

FT ASIDE / HMA



MOMENT SLAB ASIDE MSE WALL - HMA PAVEMENT

1. See Standard Drawing E 706-BRRW-10 for General Notes and bar diagram.

NOTES:

① See Standard Drawings E 706-BCBR-02 for concrete railing details.

Type FT

2. Location of transverse joints in reinforced concrete moment slab and railing shall be the same.

③ See Standard Drawing E 706-BRRW-05 for the plan view and additional vertical reinforcing steel in the concrete railing at the railing joints.

④ Coping may be precast or cast-in-place. See Standard Drawing E 731-BRRW-01 or 02 for coping details.

⑤ Thickness of coarse aggregate #8 shall be equal to combined thickenss of the first two lifts of HMA, but not less than 6".

6. Thickness of reinforced concrete moment slab shall be 12" minimum.

moment slab

7. The detail shown on this drawing shall be used within the limits of MSE wall only.

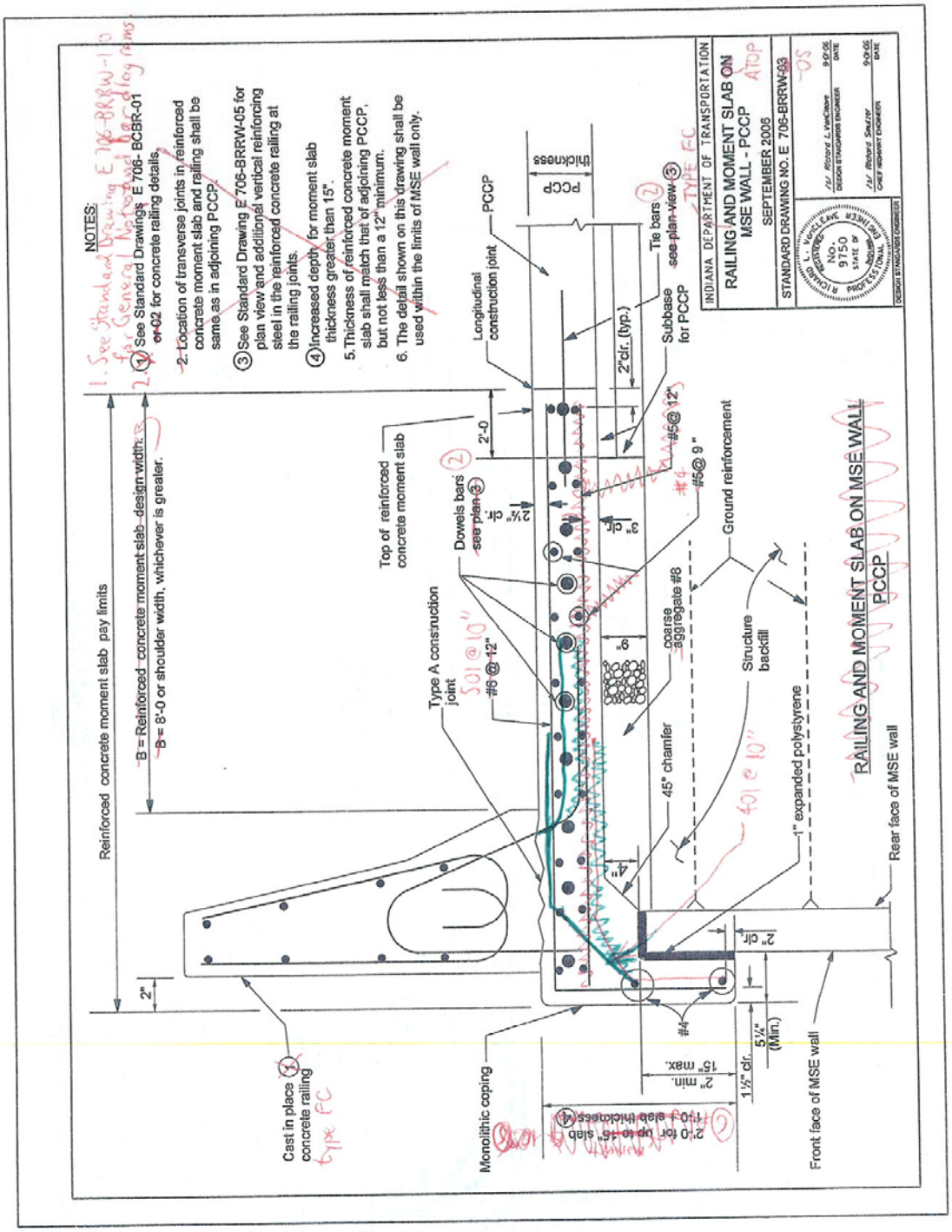
8. The detail shown on this drawing shall be used within Test Level TL-5 only.

9. Reinforcing Steel in moment slab to be epoxy coated.

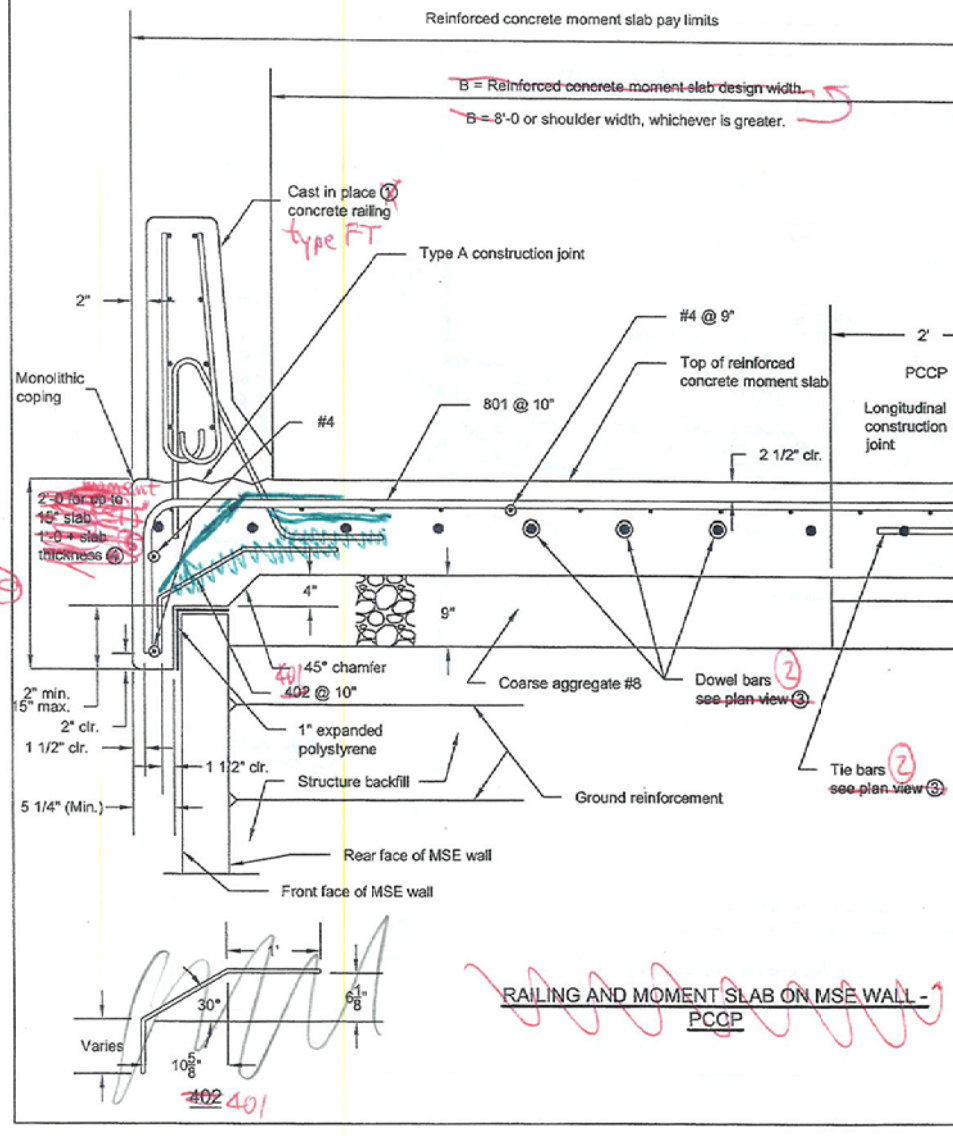
TYPE FT

INDIANA DEPARTMENT OF TRANSPORTATION	
RAILING AND MOMENT SLAB ASIDE MSE WALL - ~~PCCR~~ HMA PAVEMENT	
STANDARD DRAWING NO. E 706-BRRW-02 ~~(TL-5)~~ -04	
	DESIGN STANDARDS ENGINEER DATE CHIEF HIGHWAY ENGINEER DATE
DESIGN STANDARDS ENGINEER	July 2008

NHI MUK


NOTES:
1. See Standard Drawing E 706-BRRW-10 for General Notes and Key Plans.
2. See Standard Drawings E 706-BCBR-01 or 02 for concrete railing details.
3. See Standard Drawing E 706-BRRW-05 for plan view and additional vertical reinforcing steel in the reinforced concrete railing at the railing joints.
4. Increased depth for moment slab thickness greater than 15".
5. Thickness of reinforced concrete moment slab shall match that of adjoining PCCP, but not less than a 12" minimum.
6. The detail shown on this drawing shall be used within the limits of MSE wall only.
Reinforced concrete moment slab pay limits
B = Reinforced concrete moment slab design width.
B = 8'-0 or shoulder width, whichever is greater.
Top of reinforced concrete moment slab
Dowels bars see plan
Type A construction joint
#6 @ 12"
Longitudinal construction joint
PCCP
Tie bars see plan view
Subbase for PCCP
2'clr. (typ.)
#5@ 12"
#5@ 9"
Ground reinforcement
coarse aggregate #8
Structure backfill
45° chamfer
1" expanded polystyrene
Rear face of MSE wall
Front face of MSE wall
Monolithic coping
Cast in place concrete railing
2'-0 for up to 15" slab thickness
15" max.
12" min.
1½" clr.
5¼" (Min.)
#4
2" clr.
2"
INDIANA DEPARTMENT OF TRANSPORTATION
RAILING AND MOMENT SLAB ON MSE WALL - PCCP
SEPTEMBER 2006
STANDARD DRAWING NO. E 706-BRRW-03
RAILING AND MOMENT SLAB ON MSE WALL
PCCP

FT ATOP / PCCP



RAILING AND MOMENT SLAB ON MSE WALL - PCCP

1. See Standard Drawing E 706-BRRW-10 for General Notes and bar diagrams.

NOTES:

① See Standard Drawings E 706-BCBR-01 or 02 for concrete railing details. Type FT

2. Location of transverse joints in reinforced concrete moment slab and railing shall be same as in adjoining PCCP.

③ See Standard Drawing E 706-BRRW-05 for the plan view and additional vertical reinforcing steel in the concrete railing at the railing joints.

④ Increased Depth for moment slab thickness greater than 15".

5. Thickness of reinforced concrete moment slab shall match that of adjoining PCCP, but not less than 12".

6. The detail shown on this drawing shall be used within the limits of MSE wall only.

7. The detail shown on this drawing shall be used within Test Levels TL-5 only.

8. Reinforcing Steel in moment slab to be epoxy coated.

TYPE FT

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING AND MOMENT SLAB ASIDE MSE WALL - PCCP ATOP

STANDARD DRAWING NO. E 706-BRRW-03 (TL-5) -06

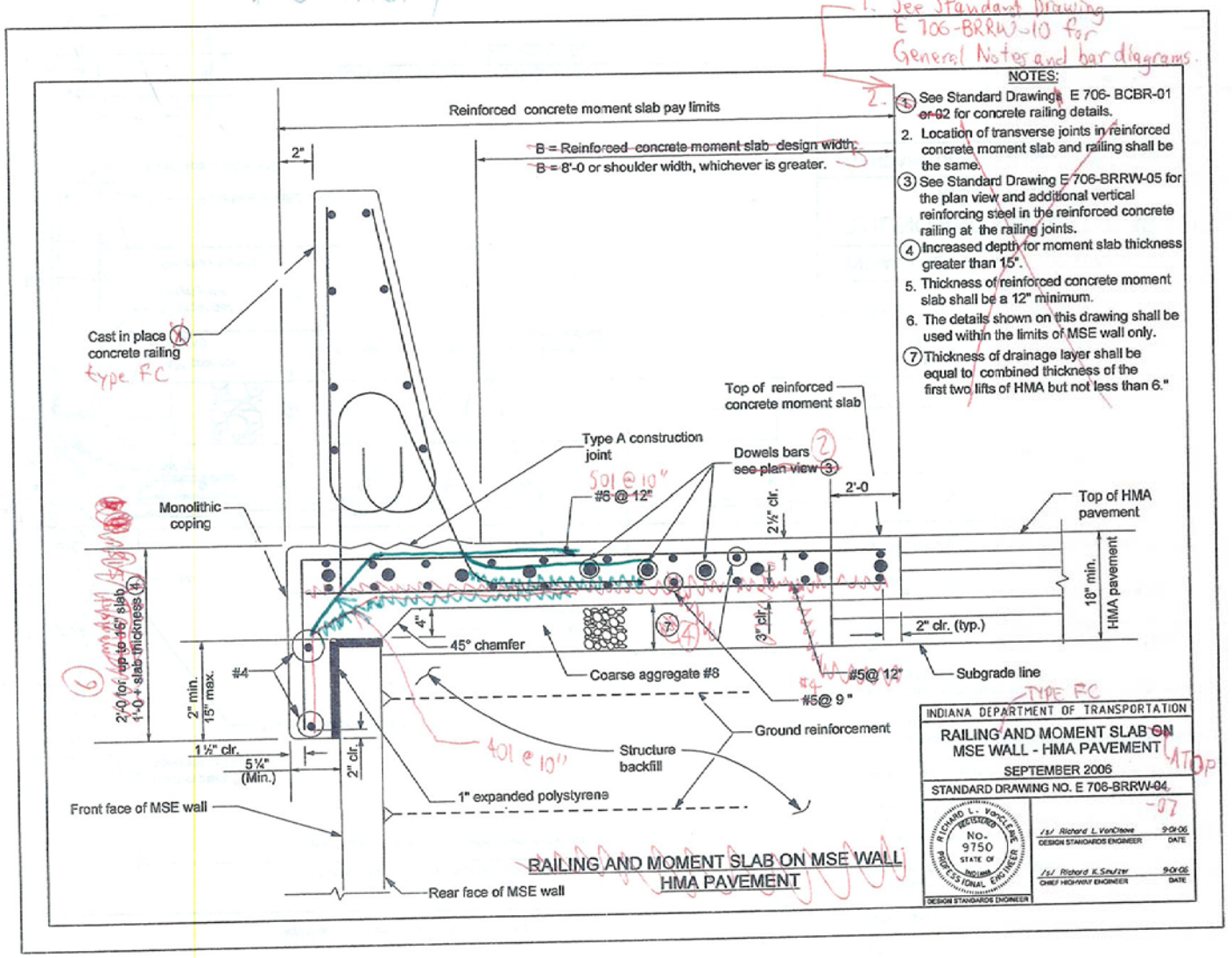
DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

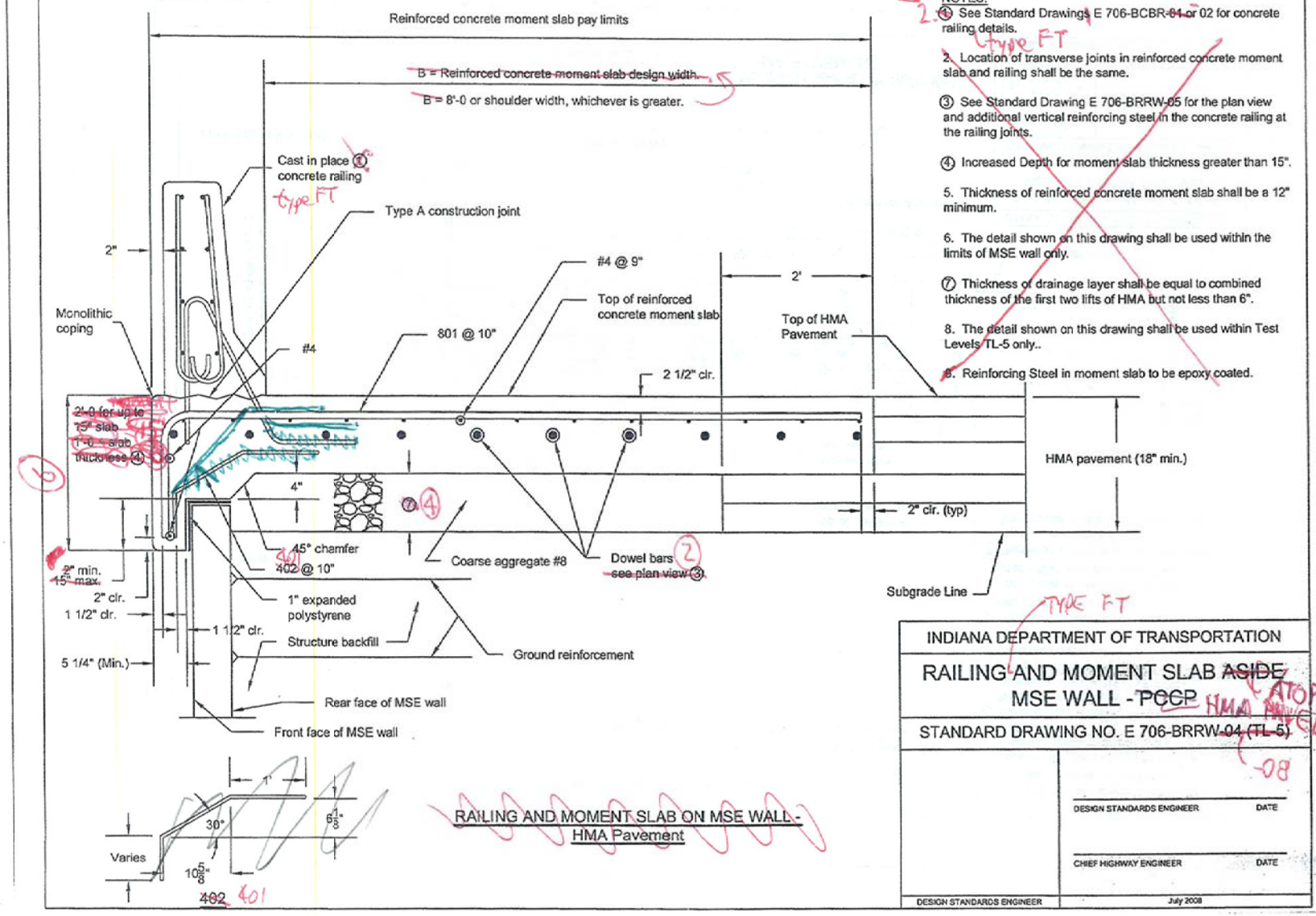
DESIGN STANDARDS ENGINEER July 2008

NEW DWG

FC ATOP / HMA


1. See Standard Drawing E 706-BRRW-10 for General Notes and bar diagrams.
NOTES:
1. See Standard Drawings E 706- BCBR-01 or 02 for concrete railing details.
2. Location of transverse joints in reinforced concrete moment slab and railing shall be the same.
3. See Standard Drawing E 706-BRRW-05 for the plan view and additional vertical reinforcing steel in the reinforced concrete railing at the railing joints.
4. Increased depth for moment slab thickness greater than 15".
5. Thickness of reinforced concrete moment slab shall be a 12" minimum.
6. The details shown on this drawing shall be used within the limits of MSE wall only.
7. Thickness of drainage layer shall be equal to combined thickness of the first two lifts of HMA but not less than 6."
Reinforced concrete moment slab pay limits
B = Reinforced concrete moment slab design width.
B = 8'-0 or shoulder width, whichever is greater.
2"
Cast in place concrete railing
type FC
Top of reinforced concrete moment slab
Type A construction joint
Dowels bars see plan view
#6 @ 12"
2'-0
2½" clr.
Top of HMA pavement
Monolithic coping
2'-0 for up to 15" slab
1'-0" + slab thickness
4"
45° chamfer
7
3" clr.
2" clr. (typ.)
16" min.
HMA pavement
#4
2" min.
15" max.
Coarse aggregate #8
#5@ 12"
#5@ 9"
Subgrade line
1½" clr.
5¼" (Min.)
2" clr.
Structure backfill
Ground reinforcement
1" expanded polystyrene
Front face of MSE wall
Rear face of MSE wall
RAILING AND MOMENT SLAB ON MSE WALL
HMA PAVEMENT
INDIANA DEPARTMENT OF TRANSPORTATION
RAILING AND MOMENT SLAB ON MSE WALL - HMA PAVEMENT
SEPTEMBER 2006
STANDARD DRAWING NO. E 706-BRRW-04
TYPE FC
ATOP
-07
RICHARD L. VONCLEAVE REGISTERED NO. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER
DESIGN STANDARDS ENGINEER
/s/ Richard L VonCleave 9-01-06
DESIGN STANDARDS ENGINEER DATE
/s/ Richard K Snyder 9-01-06
CHIEF HIGHWAY ENGINEER DATE

FT ATOP / HMA



RAILING AND MOMENT SLAB ON MSE WALL - HMA Pavement

1. See Standard Drawing E 706-BRRW-10 for General Notes and bar diagrams.

NOTES:

(1) See Standard Drawings E 706-BCBR-01 or 02 for concrete railing details.

2. Location of transverse joints in reinforced concrete moment slab and railing shall be the same.

(3) See Standard Drawing E 706-BRRW-05 for the plan view and additional vertical reinforcing steel in the concrete railing at the railing joints.

(4) Increased Depth for moment slab thickness greater than 15".

5. Thickness of reinforced concrete moment slab shall be a 12" minimum.

6. The detail shown on this drawing shall be used within the limits of MSE wall only.

(7) Thickness of drainage layer shall be equal to combined thickness of the first two lifts of HMA but not less than 6".

8. The detail shown on this drawing shall be used within Test Levels TL-5 only..

9. Reinforcing Steel in moment slab to be epoxy coated.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING AND MOMENT SLAB ~~ASIDE~~ MSE WALL - ~~PCCP~~ HMA

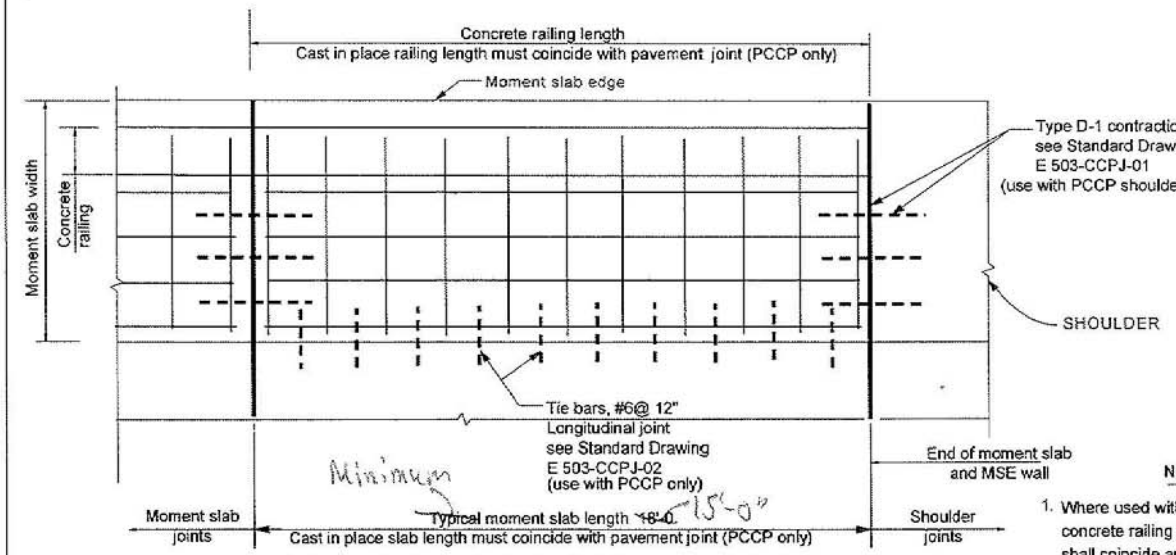
STANDARD DRAWING NO. E 706-BRRW-~~04~~ (TL-5)

DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER July 2008

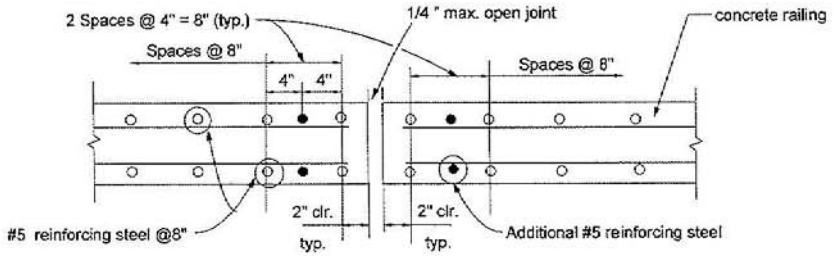
MOM SLAB JTS



PLAN - REINFORCED CONCRETE MOMENT SLAB JOINTS

NOTES:

1. Where used with HMA mainline pavement, concrete railing and moment slab lengths shall coincide and be spaced at 18 ft.



PLAN - CONCRETE RAILING ADDITIONAL VERTICAL STEEL

INDIANA DEPARTMENT OF TRANSPORTATION

MOMENT SLAB JOINTS

SEPTEMBER 2006

STANDARD DRAWING NO. E 706-BRRW-05

RICHARD L. VANCLEAVE REGISTERED NO. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

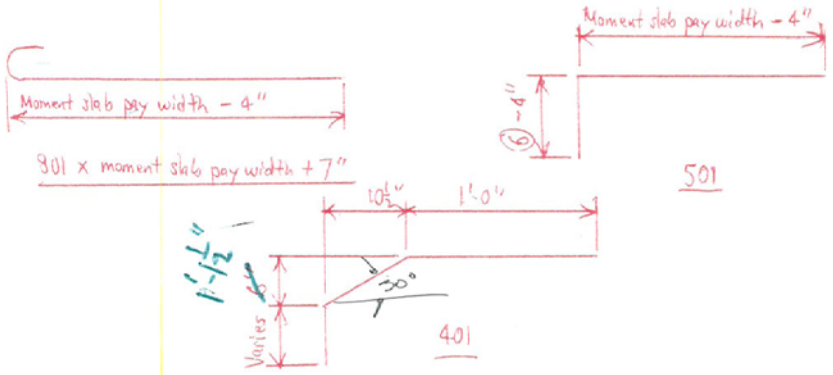
DESIGN STANDARDS ENGINEER

/s/ Richard L VanCleave 9-01-06
DESIGN STANDARDS ENGINEER DATE

/s/ Richard Smutzer 9-01-06
CHIEF HIGHWAY ENGINEER DATE

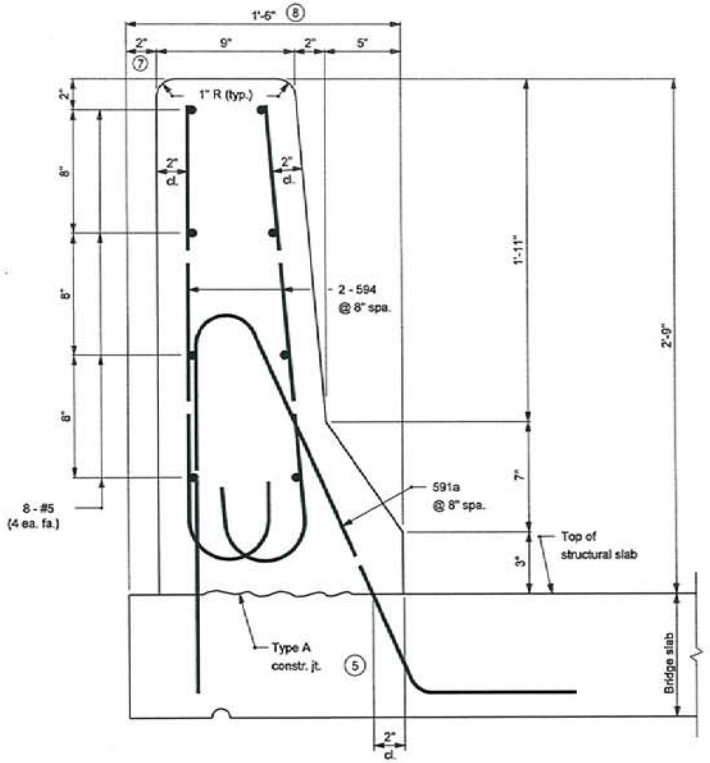
GENERAL NOTES:

1. The locations of the transverse joints in the moment slab and the railing shall be the same.
2. See Standard Drawing E 706-BRRW-09 for plan view and ~~additional reinforcing~~ bars in the railing at the railing joints.
3. The coping by be precast or cast in place. See Standard Drawing E 731-BRRW-01 for coping details.
4. The thickness of the coarse aggregate No. 8 shall be equal to the combined thicknesses of the first two lifts of HMA, but not less than 6 in.
5. The moment-slab thickness shall match that of adjoining PCCP, but shall not be less than 12 in., regardless of pavement type.
6. For moment slab thicker than 15 in., this shall be moment-slab thickness plus 12 in.
7. The moment slab shall be used only within the limits of the MSE wall.
8. Reinforcing bars in the moment slab shall be epoxy coated.



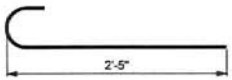
INDIANA DEPARTMENT OF TRANSPORTATION	
RAILING TYPE FT AND MOMENT SLAB AT MSE WALL AUGUST 2008	
STANDARD DRAWING NO. E-706-BRRW-10	
	/s/ XXXXXXXXX 01/01/06 DESIGN STANDARDS ENGINEER DATE
DESIGN STANDARDS ENGINEER	/s/ XXXXXXXXX 01/01/06 CHIEF HIGHWAY ENGINEER DATE

FC

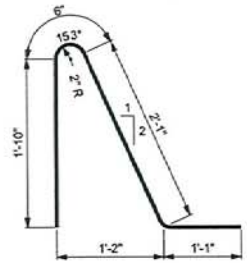


NOTE

1. See Standard Drawing E 706-BCBR-04 for General Notes.



594 x 3'-0"



591a x 5'-6"

BRIDGE RAILING TYPE FC

INDIANA DEPARTMENT OF TRANSPORTATION

~~COMMON 33" HEIGHT~~
~~CONCRETE BRIDGE RAILING~~

MARCH 2005

STANDARD DRAWING NO. E 706-BCBR-01

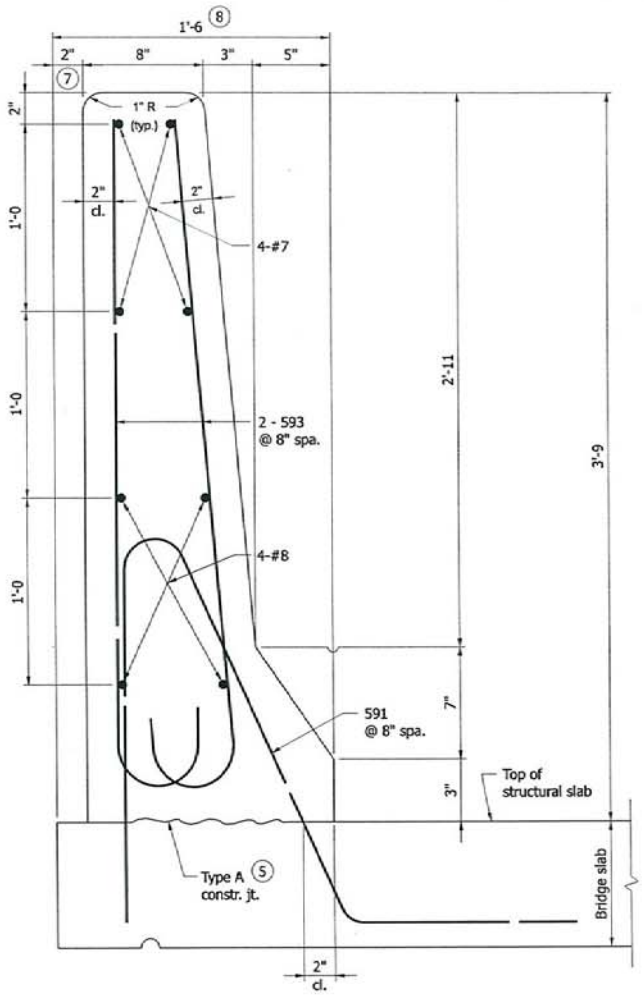
REGISTERED RICHARD L. VONCLEAVE No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER
DESIGN STANDARDS ENGINEER

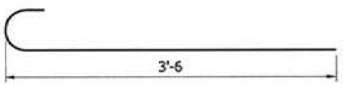
/s/ Richard L VonCleave 3-01-05
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 3-01-05
CHIEF HIGHWAY ENGINEER DATE

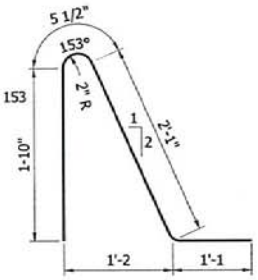
-01

FT





593 x 4'-1"



591a x 5'-6"

NOTES:

1. See Standard Drawing E 706-BCBR-04 for General Notes.

BRIDGE RAILING TYPE RT

INDIANA DEPARTMENT OF TRANSPORTATION

~~TRUCK 45" HEIGHT~~
~~CONCRETE BRIDGE RAILING~~

SEPTEMBER 2007

STANDARD DRAWING NO. E 706-BCBR-02

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/04/07
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/04/07
CHIEF HIGHWAY ENGINEER DATE

-02

FC OR FT - NOTES

GENERAL NOTES:

1. See Standard Drawing E 703-BRST-01 for bar bending details and reinforcing bar notes.
2. Reinforcing steel in bridge railing to be epoxy coated.
3. Minimum lap for #5 bars is 1'-11".
4. Concrete in bridge railing to be class C.
5. See Standard Drawing E 724-BJTS-01 for construction joint type A.
6. Concrete bridge railings shall be built monolithically and continuous from end support to end support. A joint shall be provided between the bridge railing and railing transition at the end of the bridge slab as shown on Standard Drawing E 706-CBRT-01.
7. For twin structures or other structures which are placed side by side, this dimension shall be reduced to 0 on the median side.
8. For twin structures or other structures which are placed side by side, this dimension shall be reduced to 1'-4" on the median side.

INDIANA DEPARTMENT OF TRANSPORTATION

~~TRUCK 45" HEIGHT~~

CONCRETE BRIDGE RAILING

SEPTEMBER 2007

STANDARD DRAWING NO. E 706-BCBR-04

RICHARD L. VANCLEAVE REGISTERED NO. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/04/07
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/04/07
CHIEF HIGHWAY ENGINEER DATE

-04

REVISED AND NEW STANDARD DRAWINGS

COMMITTEE COMMENTS:

Tony Uremovich handed out corrections to Standard Drawing E706-BRRW 01 thru 08 and E706-BRRW-10.

Based on question by Mr. Kuchler concerning bar bending diagrams appearing on several drawings, Mr. Uremovich will remove diagrams from other drawings and keep on E 706-BRRW-10.

Ms. Rearick brought up payment for reinforcing bars. Department pays for bars separately on bridge rails, but not on moment slabs.

Committee decided to deal with payment concerns later. Mr. Miller asked for calculated cost savings. Ms. Rearick will provide this. *(See attached MSE Barrier Rail Cost Summary sheet).*

Other sections containing specific cross references:

None

Recurring Special Provisions affected:

None

Standard Sheets affected:

706-BRRW-01
706-BRRW-02
706-BRRW-03
706-BRRW-04
706-BRRW-05
706-BCBR-01
706-BCBR-02
706-BCBR-04

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

Action: Passed as revised

___ 20__ Standard Specifications Book

___ Create RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

___ Revise RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

Standard Drawing Effective Sept. 1, 2009

___ Create RPD (No. _____)
Effective _____Letting
___ Technical Advisory

GIFE Update Req'd.? Y___ N_x_
By - Addition or Revision

Frequency Manual Update Req'd? Y___ N_x_
By - Addition or Revision

Withdrawn ____

Received FHWA Approval? Yes

MSE Barrier Rail Cost Summary (For standard 8 ft shoulder and 12" thick slab)		
	MSE Barrier Rail	**Cost ($/LF)**
Current INDOT Standard Details	E-706-BRRW-01	$188
	E-706-BRRW-02	$180
	E-706-BRRW-03	$183
	E-706-BRRW-04	$175
Proposed Standard Details	Moment Slab Aside MSE Wall - PCCP (TL-3, TL-4)	$153
	Moment Slab Aside MSE Wall - PCCP (TL-5)	$177
	Moment Slab Aside MSE Wall - HMA (TL-3, TL-4)	$145
	Moment Slab Aside MSE Wall - HMA (TL-5)	$169
	Moment Slab on MSE Wall - PCCP (TL-3, TL-4)	$148
	Moment Slab on MSE Wall - PCCP (TL-5)	$174
	Moment Slab on MSE Wall - HMA (TL-3, TL-4)	$140
	Moment Slab on MSE Wall - HMA (TL-5)	$166

Item No.04 01/15/09 (2008 SS)
Mr. Wright
Date: 01/15/09

REVISION TO 2008 STANDARD SPECIFICATIONS AND NEW STANDARD DRAWINGS

SPECIFICATION REVISIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Box Truss Standards need to be updated to conform to 2008 AASHTO fatique design changes.

PROPOSED SOLUTION: Revise Standard Drawings for Box Trusses; Revise section 802 and 910; Issue a Design Memorandum to provide guidance to designers.

APPLICABLE STANDARD SPECIFICATIONS: 802, 910.19, 910.20

APPLICABLE STANDARD DRAWINGS: New 802-SBTS-01 to 19

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE:N/A

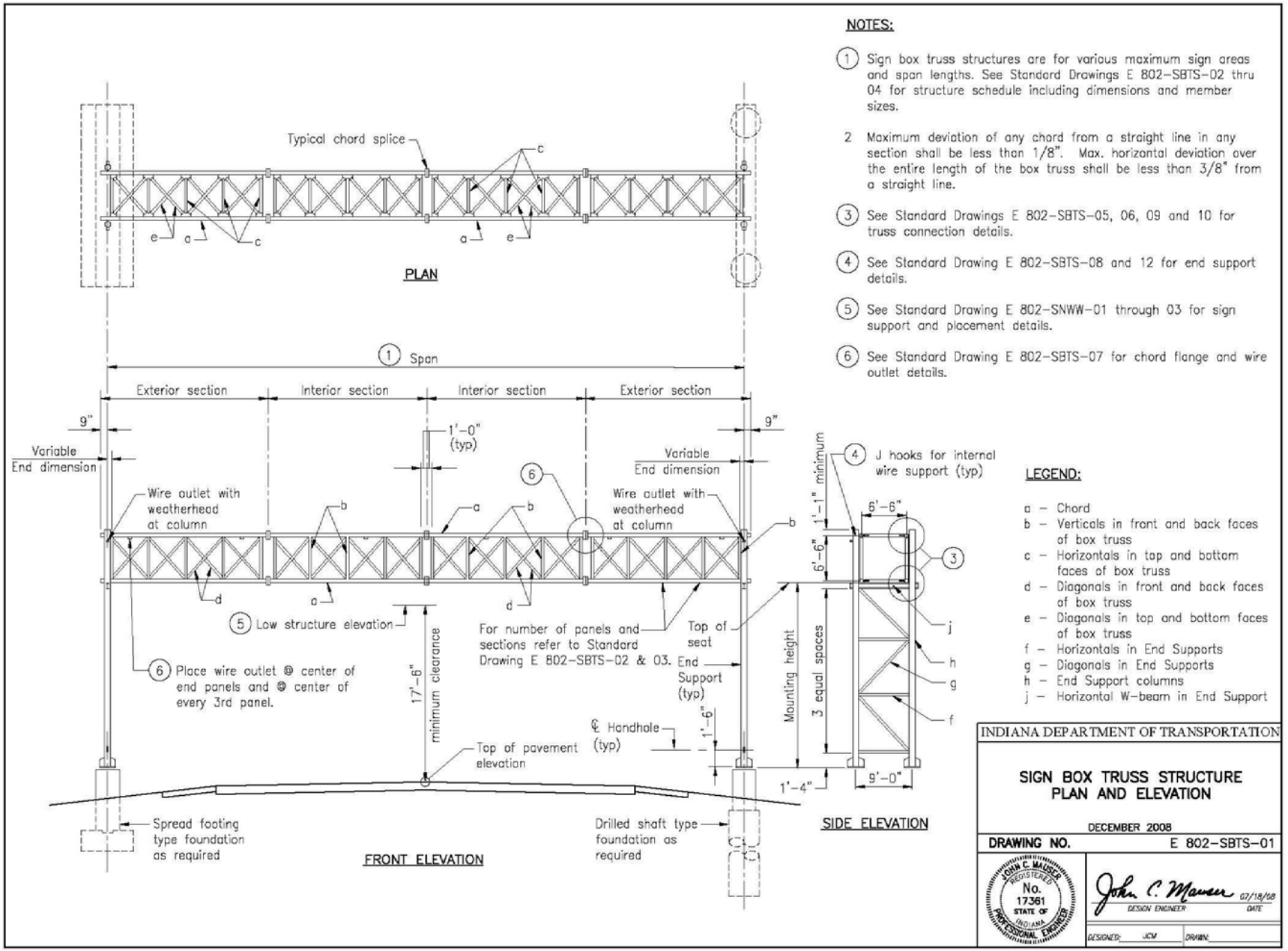
Submitted By: John Wright

Title: Roadway Services Manager

Organization: INDOT

Phone Number: 232-5147

Date: 11/20/08


NOTES:
1 Sign box truss structures are for various maximum sign areas and span lengths. See Standard Drawings E 802-SBTS-02 thru 04 for structure schedule including dimensions and member sizes.
2 Maximum deviation of any chord from a straight line in any section shall be less than 1/8". Max. horizontal deviation over the entire length of the box truss shall be less than 3/8" from a straight line.
3 See Standard Drawings E 802-SBTS-05, 06, 09 and 10 for truss connection details.
4 See Standard Drawing E 802-SBTS-08 and 12 for end support details.
5 See Standard Drawing E 802-SNWW-01 through 03 for sign support and placement details.
6 See Standard Drawing E 802-SBTS-07 for chord flange and wire outlet details.
Typical chord splice
PLAN
1 Span
Exterior section
Interior section
Interior section
Exterior section
9"
Variable End dimension
1'-0" (typ)
Wire outlet with weatherhead at column
5 Low structure elevation
6 Place wire outlet @ center of end panels and @ center of every 3rd panel.
For number of panels and sections refer to Standard Drawing E 802-SBTS-02 & 03.
17'-6" minimum clearance
Top of pavement elevation
℄ Handhole (typ)
Top of seat
End Support (typ)
Mounting height
3 equal spaces
1'-6"
1'-4"
Spread footing type foundation as required
Drilled shaft type foundation as required
FRONT ELEVATION
4 J hooks for internal wire support (typ)
1'-1" minimum
6'-6"
9'-0"
SIDE ELEVATION
LEGEND:
a – Chord
b – Verticals in front and back faces of box truss
c – Horizontals in top and bottom faces of box truss
d – Diagonals in front and back faces of box truss
e – Diagonals in top and bottom faces of box truss
f – Horizontals in End Supports
g – Diagonals in End Supports
h – End Support columns
j – Horizontal W-beam in End Support
INDIANA DEPARTMENT OF TRANSPORTATION
SIGN BOX TRUSS STRUCTURE PLAN AND ELEVATION
DECEMBER 2008
DRAWING NO. E 802-SBTS-01
JOHN C. MAURER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER
DESIGN ENGINEER
07/18/08
DESIGNED: JCM
DRAWN:

DIMENSIONS FOR SIGN BOX TRUSSES (34' thru 85')

SPAN	EXTERIOR SECTIONS					INTERIOR SECTIONS			
SPAN–TRUSS LENGTH, (FT)	NO. OF SECTIONS	NO. OF PANELS PER SECTION	VARIABLE END DIMEN.	PANEL LENGTH	SECTION LENGTH	NO. OF SECTIONS	NO. OF PANELS PER SECTION	PANEL LENGTH	SECTION LENGTH
34	1	6	6"	5'–6"	35'–6"	0			
35	1	6	6"	5'–8"	36'–6"	0			
36	2	3	6"	5'–6"	18'–9"	0			
37	2	3	6"	5'–8"	19'–3"	0			
38	2	3	6"	5'–10"	19'–9"	0			
39	2	3	6"	6'	20'–3"	0			
40	2	3	6"	6'–2"	20'–9"	0			
41	2	3	6"	6'–4"	21'–3"	0			
42	2	3	6"	6'–6"	21'–9"	0			
43	2	4	6"	5'	22'–3"	0			
44	2	4	6"	5'–1 1/2"	22'–9"	0			
45	2	4	6"	5'–3"	23'–3"	0			
46	2	4	6"	5'–4 1/2"	23'–9"	0			
47	2	4	6"	5'–6"	24'–3"	0			
48	2	4	6"	5'–7 1/2"	24'–9"	0			
49	2	4	6"	5'–9"	25'–3"	0			
50	2	4	6"	5'–10 1/2"	25'–9"	0			
51	2	4	6"	6'	26'–3"	0			
52	2	4	6"	6'–1 1/2"	26'–9"	0			
53	2	4	6"	6'–3"	27'–3"	0			
54	2	4	6"	6'–4 1/2"	27'–9"	0			
55	2	4	6"	6'–6"	28'–3"	0			
56	2	5	5 1/4"	5'–3 3/4"	28'–9"	0			
57	2	5	6 1/4"	5'–4 3/4"	29'–3"	0			
58	2	5	6"	5'–6"	29'–9"	0			
59	2	5	5 3/4"	5'–7 1/4"	30'–3"	0			
60	2	5	5 1/2"	5'– 8 1/2"	30'–9"	0			
61	2	5	6 1/2"	5'–9 1/2"	31'–3"	0			
62	2	5	6 1/4"	5'–10 3/4"	31'–9"	0			
63	2	5	6"	6'	32'–3"	0			
64	2	5	5 3/4"	6'–1 1/4"	32'–9"	0			
65	2	5	5 1/2"	6'–2 1/2"	33'–3"	0			
66	2	5	5 1/4"	6'–3 3/4"	33'–9"	0			
67	2	5	5"	6'–5"	34'–3"	0			
68	2	5	6"	6'–6"	34'–9"	0			
69	2	4	6"	5'–4"	23'–7"	1	4	5'–4"	23'–4"
70	2	4	6"	5'–5"	23'–11"	1	4	5'–5"	23'–8"
71	2	4	6"	5'–6"	24'–3"	1	4	5'–6"	24'
72	2	4	6"	5'–7"	24'–7"	1	4	5'–7"	24'–4"
73	2	4	6"	5'–8"	24'–11"	1	4	5'–8"	24'–8"
74	2	4	6"	5"–9"	25'–3"	1	4	5"–9"	25'
75	2	4	6"	5'–10"	25'–7"	1	4	5'–10"	25'–4"
76	2	4	6"	5'–11"	25'–11"	1	4	5'–11"	25'–8"
77	2	4	6"	6'	26'–3"	1	4	6'	26'
78	2	4	6"	6'–1 "	26'–7"	1	4	6'–1 "	26'–4"
79	2	4	6"	6'–2"	26'–11"	1	4	6'–2"	26'–8"
80	2	4	6"	6'–3"	27'–3"	1	4	6'–3"	27'
81	2	4	6"	6'–4"	27'–7"	1	4	6'–4"	27'–4"
82	2	4	6"	6'–5"	27'–11"	1	4	6'–5"	27'–8"
83	2	4	6"	6'–6"	28'–3"	1	4	6'–6"	28'
84	2	5	5 3/4"	5'–7 3/4"	30'–5 1/2"	1	4	5'–7 3/4"	24'–7"
85	2	5	6 1/2"	5'–8 1/2"	30'–10"	1	4	5'–8 1/2"	24'–10"

NOTES:

1. All panels on a truss shall be the same length. The minimum panel length is 5'–0" and the maximum is 6'–6".
2. A single interior unit shall have an even number of panels to maintain the pattern of the vertical diagonals.
3. Use minimum number of sections for each truss. Keep the maximum section length at 35'–6".
4. See Standard Drawing E 802–SBTS–03 for required camber.

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE
TABLE OF DIMENSIONS
SPANS 34' thru 85'

DECEMBER 2008

DRAWING NO. E 802–SBTS–02

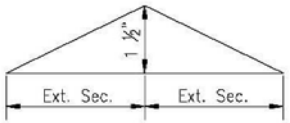
JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

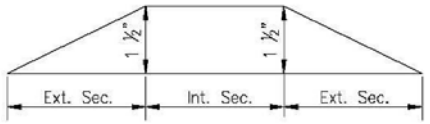
DESIGNED: JCM DRAWN:

DIMENSIONS FOR SIGN BOX TRUSSES (86' thru 130')

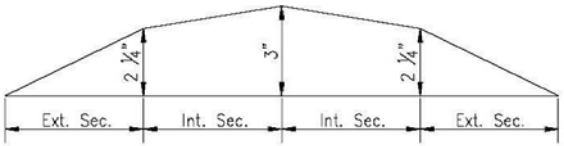
SPAN	EXTERIOR SECTIONS					INTERIOR SECTIONS			
SPAN-TRUSS LENGTH, (FT)	NO. OF SECTIONS	NO. OF PANELS PER SECTION	VARIABLE END DIMEN.	PANEL LENGTH	SECTION LENGTH	NO. OF SECTIONS	NO. OF PANELS PER SECTION	PANEL LENGTH	SECTION LENGTH
86	2	5	5 1/2"	5'-9 1/2"	31'-2"	1	4	5'-9 1/2"	25'-2"
87	2	5	6 1/4"	5'-10 1/4"	31'-6 1/2"	1	4	5'-10 1/4"	25'-5"
88	2	5	7"	5'-11"	31'-11"	1	4	5'-11"	25'-8"
89	2	5	6"	6'	32'-3"	1	4	6'	26'
90	2	5	5"	6'-1"	32'-7"	1	4	6'-1"	26'-4"
91	2	5	5 3/4"	6'-1 3/4"	32'-11 1/2"	1	4	6'-1 3/4"	26'-7"
92	2	5	6 1/2"	6'-2 1/2"	33'-4"	1	4	6'-2 1/2"	26'-10"
93	2	5	5 1/2"	6'-3 1/2"	33'-8"	1	4	6'-3 1/2"	27'-2"
94	2	5	6 1/4"	6'-4 1/4"	34'-1/2"	1	4	6'-4 1/4"	27'-5"
95	2	5	5 1/4"	6'-5 1/4"	34'-4 1/2"	1	4	6'-5 1/4"	27'-9"
96	2	5	6"	6'-6"	34'-9"	1	4	6'-6"	28'
97	2	4	6"	5'-7 1/2"	24'-9"	2	4	5'-7 1/2"	24'-6"
98	2	4	6"	5'-8 1/4"	25'	2	4	5'-8 1/4"	24'-9"
99	2	4	6"	5'-9"	25'-3"	2	4	5'-9"	25'
100	2	4	6"	5'-9 3/4"	25'-6"	2	4	5'-9 3/4"	25'-3"
101	2	4	6"	5'-10 1/2"	25'-9"	2	4	5'-10 1/2"	25'-6"
102	2	4	6"	5'-11 1/4"	26'	2	4	5'-11 1/4"	25'-9"
103	2	4	6"	6'	26'-3"	2	4	6'	26'
104	2	4	6"	6'-3/4"	26'-6"	2	4	6'-3/4"	26'-3"
105	2	4	6"	6'-1 1/2"	26'-9"	2	4	6'-1 1/2"	26'-6"
106	2	4	6"	6'-2 1/4"	27'	2	4	6'-2 1/4"	26'-9"
107	2	4	6"	6'-3"	27'-3"	2	4	6'-3"	27'
108	2	4	6"	6'-3 3/4"	27'-6"	2	4	6'-3 3/4"	27'-3"
109	2	4	6"	6'-4 1/2"	27'-9"	2	4	6'-4 1/2"	27'-6"
110	2	4	6"	6'-5 1/4"	28'	2	4	6'-5 1/4"	27'-9"
111	2	4	6"	6'-6"	28'-3"	2	4	6'-6"	28'
112	2	5	6"	5'-3"	28'-6"	2	5	5'-3"	28'-3"
113	2	5	7"	5'-3 1/2"	28'-9 1/2"	2	5	5'-3 1/2"	28'-5 1/2"
114	2	5	5 1/2"	5'-4 1/4"	28'-11 3/4"	2	5	5'-4 1/4"	28'-9 1/4"
115	2	5	6 1/2"	5'-4 3/4"	29'-3 1/4"	2	5	5'-4 3/4"	28'-11 3/4"
116	2	5	5"	5'-5 1/2"	29'-5 1/2"	2	5	5'-5 1/2"	29'-3 1/2"
117	2	5	6"	5'-6"	29'-9"	2	5	5'-6"	29'-6"
118	2	5	5"	5'-6 1/2"	29'-10 1/2"	2	5	5'-6 1/2"	29'-8 1/2"
119	2	5	5 1/2"	5'-7 1/4"	30'-2 3/4"	2	5	5'-7 1/4"	30'-1/4"
120	2	5	6 1/2"	5'-7 3/4"	30'-6 1/4"	2	5	5'-7 3/4"	30'-2 3/4"
121	2	5	5"	5'-8 1/2"	30'-8 1/2"	2	5	5'-8 1/2"	30'-6 1/2"
122	2	5	6"	5'-9"	31'	2	5	5'-9"	30'-9"
123	2	5	7"	5'-9 1/2"	31'-3 1/2"	2	5	5'-9 1/2"	30'-11 1/2"
124	2	5	5 1/2"	5'-10 1/4"	31'-5 3/4"	2	5	5'-10 1/4"	31'-3 1/4"
125	2	5	6 1/2"	5'-10 3/4"	31'-9 1/4"	2	5	5'-10 3/4"	31'-5 3/4"
126	2	5	5"	5'-11 1/2"	31' -11 1/2"	2	5	5'-11 1/2"	31'-9 1/2"
127	2	5	6"	6'	32'-3"	2	5	6'	32'
128	2	5	7"	6'-1/2"	32'-6 1/2"	2	5	6'-1/2"	32'-2 1/2"
129	2	5	5 1/2"	6'-1 1/4"	32'-8 3/4"	2	5	6'-1 1/4"	32'-6 1/4"
130	2	5	6 1/2"	6'-1 3/4"	33'-1/4"	2	5	6'-1 3/4"	32'-8 3/4"



CAMBER DIAGRAM (2 Section Truss)



CAMBER DIAGRAM (3 Section Truss)



CAMBER DIAGRAM (4 Section Truss)

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE
TABLE OF DIMENSIONS
SPANS 86' thru 130'

DECEMBER 2008

DRAWING NO. E 802-SBTS-03

JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN:

SIGN BOX TRUSS SCHEDULE

TRUSS TYPE	MAX. SIGN AREA	MAX. SPAN	MAX. MOUNTING HEIGHT	TRUSS MEMBERS										END SUPPORT MEMBERS						
				CHORD		VERTICAL		HORIZONTAL		VERTICAL DIAGONAL		HORIZONTAL DIAGONAL		HORIZONTAL		DIAGONAL		COLUMN		W-BEAM
			H	a		b		c		d		e		f		g		h		j
				DIA.	THK	DIA.	THK	DIA.	THK	DIA.	THK	DIA.	THK	DIA.	THK	DIA.	THK	DIA.	THK	
	SQ. FT.	FT.	FT.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	
A	500	130	28' - 6"	6.00	0.250	2.50	0.250	2.50	0.188	3.00	0.375	4.00	0.375	2.00	0.220	5.00	0.375	14.00	0.500	W 8 x 58
B	700	100	28' - 6"	6.50	0.375	2.50	0.188	2.00	0.188	3.00	0.500	4.00	0.375	2.00	0.220	7.00	0.375	14.00	0.500	
C		130	28' - 6"	7.00	0.375	2.50	0.250	2.50	0.188	3.00	0.500	4.00	0.500	2.00	0.220	8.00	0.500	14.00	0.593	
D	900	100	28' - 6"	7.00	0.375	2.50	0.250	2.50	0.188	3.00	0.500	4.00	0.500	2.00	0.220	8.00	0.500	18.00	0.500	
E		130	28' - 6"	7.00	0.500	2.50	0.250	2.50	0.25	3.00	0.500	4.00	0.500	2.00	0.220	8.00	0.593	18.00	0.562	W 10 x 68

NOTES:

1. See Standard Drawings E 802-SBTS-01 thru 03, and E 802-SBTS-05 for dimensions and members locations.
2. See Standard Drawings E 802-SBTS-12 & 13 for base plate and anchor bolt details.
3. See Standard Drawing E 802-SBTS-03 for camber diagram.
4. See Standard Drawing E 802-SBTS-16 thru 19 for foundation details.

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE
TRUSS SCHEDULE

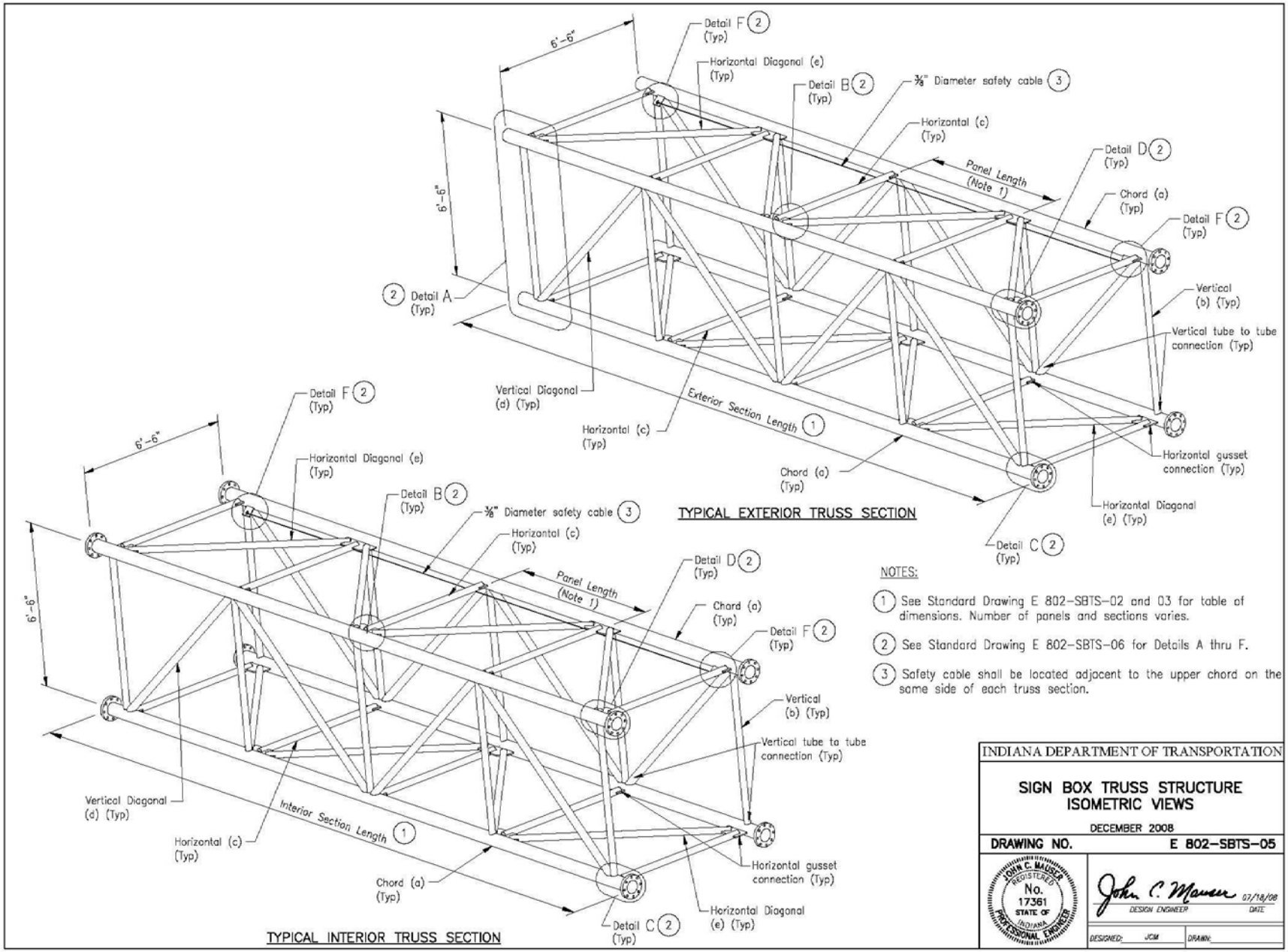
DECEMBER 2008

DRAWING NO. E 802-SBTS-04

JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN:



NOTES:

1. See Standard Drawing E 802-SBTS-02 and 03 for table of dimensions. Number of panels and sections varies.
2. See Standard Drawing E 802-SBTS-06 for Details A thru F.
3. Safety cable shall be located adjacent to the upper chord on the same side of each truss section.

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE ISOMETRIC VIEWS

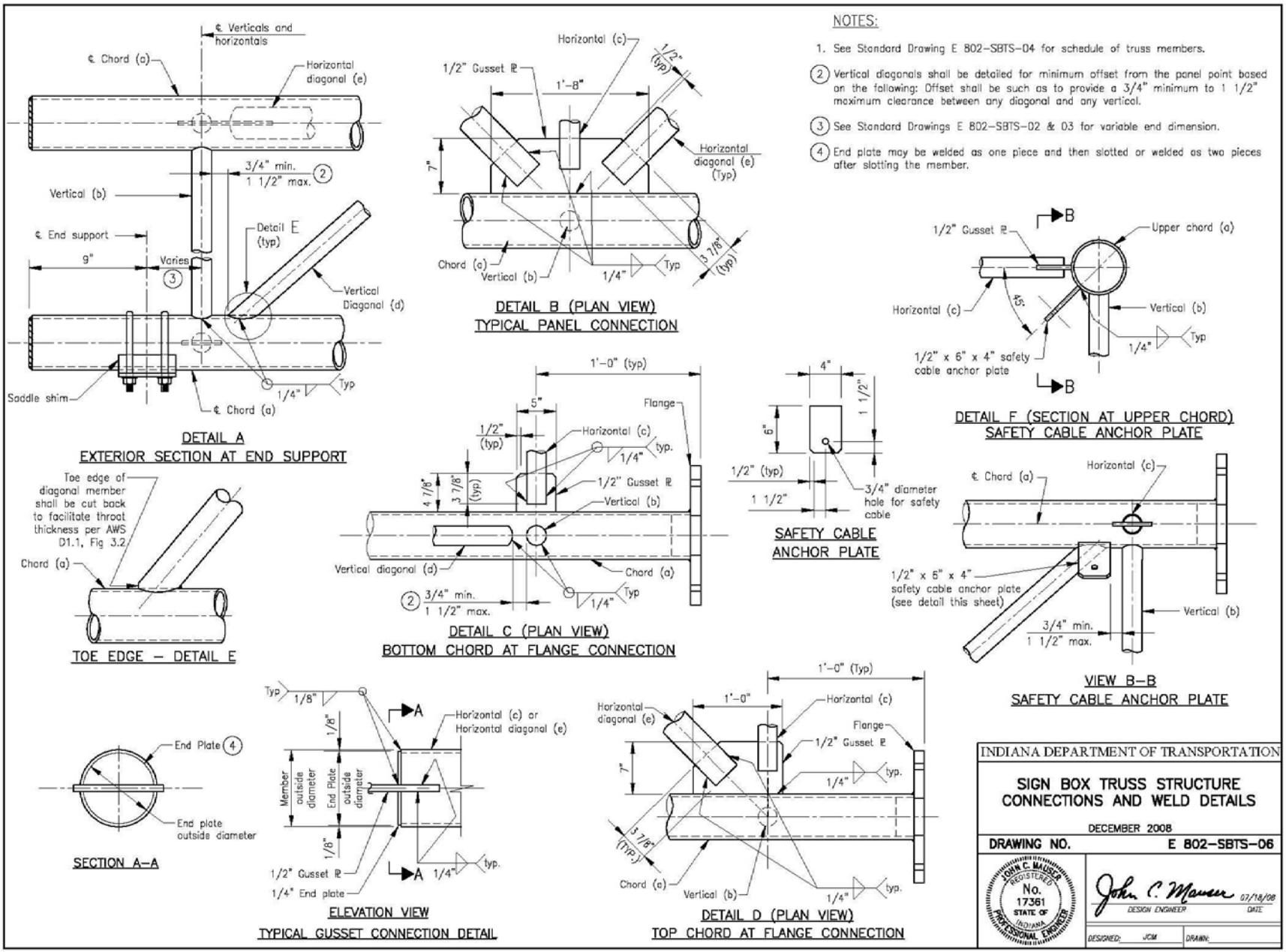
DECEMBER 2008

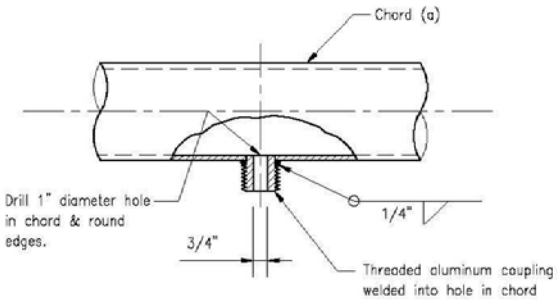
DRAWING NO. E 802-SBTS-05

JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

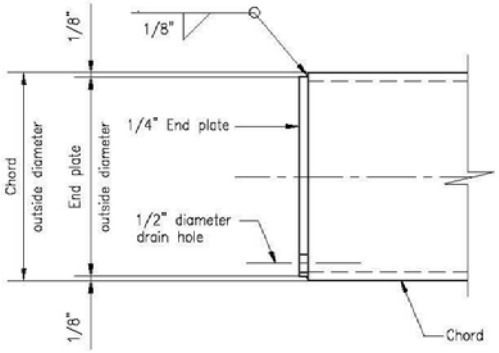
John C. Mauser 07/18/08
DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN:

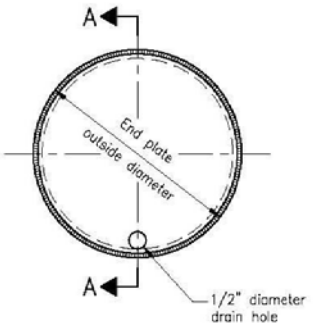

NOTES:
1. See Standard Drawing E 802-SBTS-04 for schedule of truss members.
2. Vertical diagonals shall be detailed for minimum offset from the panel point based on the following: Offset shall be such as to provide a 3/4" minimum to 1 1/2" maximum clearance between any diagonal and any vertical.
3. See Standard Drawings E 802-SBTS-02 & 03 for variable end dimension.
4. End plate may be welded as one piece and then slotted or welded as two pieces after slotting the member.
℄ Verticals and horizontals
℄ Chord (a)
Horizontal diagonal (e)
3/4" min.
1 1/2" max.
Vertical (b)
℄ End support
9"
Varies
Detail E (typ)
Vertical Diagonal (d)
Saddle shim
℄ Chord (a)
1/4"
Typ
DETAIL A
EXTERIOR SECTION AT END SUPPORT
Horizontal (c)
1/2" Gusset PL
1'-8"
1/2" (typ)
7"
Horizontal diagonal (e) (Typ)
Chord (a)
Vertical (b)
1/4"
Typ
3 7/8" (typ)
DETAIL B (PLAN VIEW)
TYPICAL PANEL CONNECTION
B
1/2" Gusset PL
Upper chord (a)
Horizontal (c)
45°
Vertical (b)
1/4"
Typ
1/2" x 6" x 4" safety cable anchor plate
B
DETAIL F (SECTION AT UPPER CHORD)
SAFETY CABLE ANCHOR PLATE
Toe edge of diagonal member shall be cut back to facilitate throat thickness per AWS D1.1, Fig 3.2
Chord (a)
TOE EDGE – DETAIL E
1'-0" (typ)
5"
1/2" (typ)
Flange
Horizontal (c)
typ.
1/4"
1/2" Gusset PL
Vertical (b)
4 7/8"
3 7/8" (typ)
Vertical diagonal (d)
Chord (a)
2 3/4" min.
1 1/2" max.
1/4"
Typ
DETAIL C (PLAN VIEW)
BOTTOM CHORD AT FLANGE CONNECTION
4"
1 1/2"
6"
1/2" (typ)
1 1/2"
3/4" diameter hole for safety cable
SAFETY CABLE ANCHOR PLATE
℄ Chord (a)
Horizontal (c)
1/2" x 6" x 4" safety cable anchor plate (see detail this sheet)
Vertical (b)
3/4" min.
1 1/2" max.
VIEW B-B
SAFETY CABLE ANCHOR PLATE
End Plate 4
End plate outside diameter
SECTION A-A
Typ
1/8"
A
Horizontal (c) or Horizontal diagonal (e)
Member outside diameter
End Plate outside diameter
1/8"
1/2" Gusset PL
1/4" End plate
A
1/4"
typ.
ELEVATION VIEW
TYPICAL GUSSET CONNECTION DETAIL
1'-0" (Typ)
1'-0"
Horizontal diagonal (e)
Horizontal (c)
Flange
1/2" Gusset PL
7"
typ.
1/4"
3 7/8" (TYP)
Chord (a)
Vertical (b)
1/4"
typ.
DETAIL D (PLAN VIEW)
TOP CHORD AT FLANGE CONNECTION
INDIANA DEPARTMENT OF TRANSPORTATION
SIGN BOX TRUSS STRUCTURE CONNECTIONS AND WELD DETAILS
DECEMBER 2008
DRAWING NO. E 802-SBTS-06
JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER
John C. Mauser 07/18/08
DESIGN ENGINEER DATE
DESIGNED: JCM DRAWN:



WIRE OUTLET DETAIL

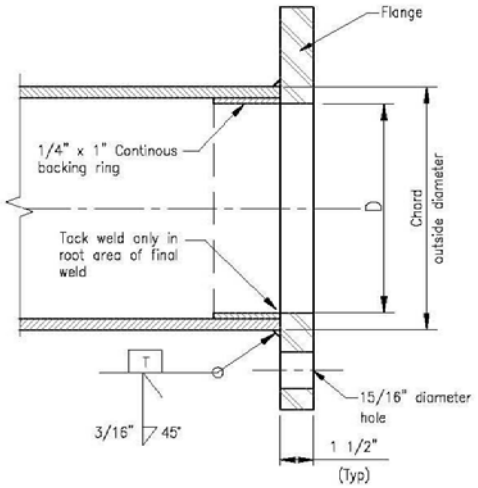


SECTION A–A

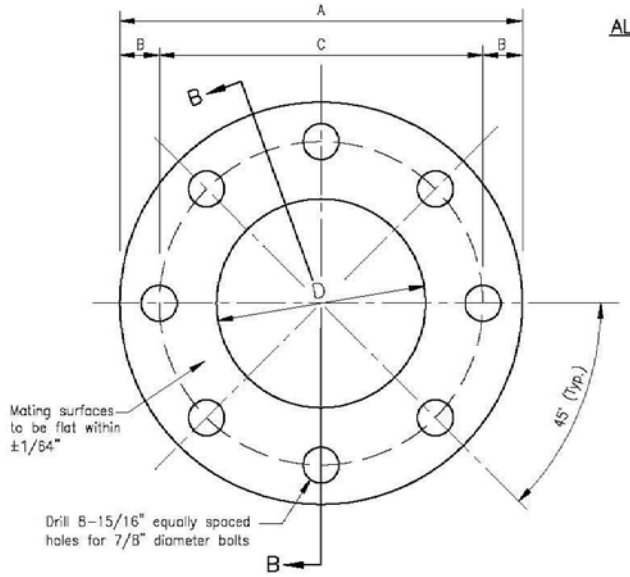


END VIEW

ALUMINUM CHORD END DETAILS



SECTION B–B



FLANGE DETAILS

NOTES:

1. See Standard Drawing E 802–SBTS–01 for chord splice locations and wire outlets.

TABLE OF FLANGE DIMENSIONS					
TRUSS CHORD Outside Diameter	BOLT SIZE	DIMENSION (INCHES)			
		A	B	C	D
6" x 1/4"	7/8"	11"	1"	9"	5"
6 1/2" x 3/8"	7/8"	12"	1"	10"	5 1/4"
7" x 3/8"	7/8"	12"	1"	10"	5 3/4"
7" x 1/2"	7/8"	12"	1"	10"	5 1/2"

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE
ALUMINUM CHORD DETAILS

DECEMBER 2008

DRAWING NO. E 802–SBTS–07

JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN:

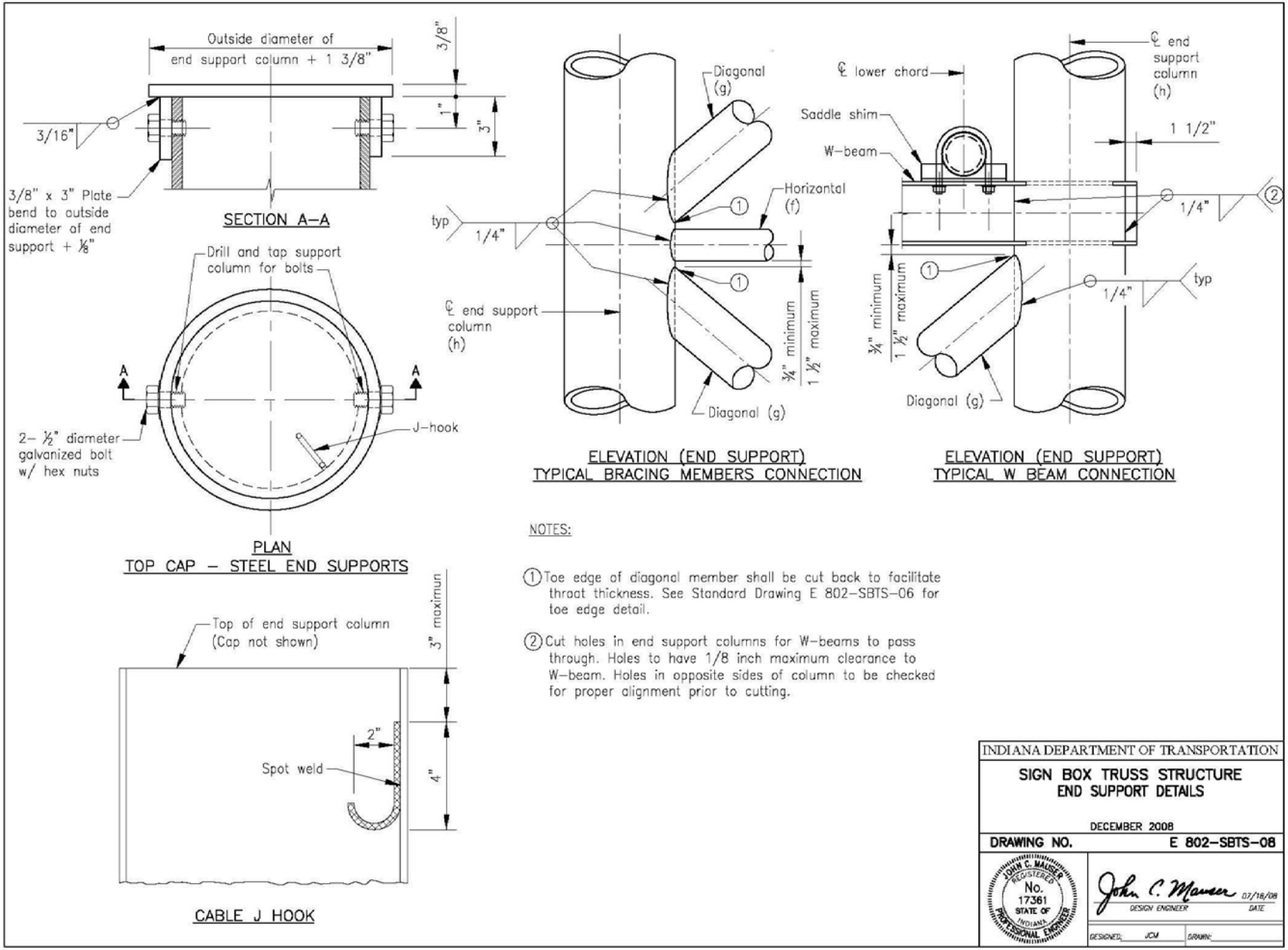

Outside diameter of
end support column + 1 3/8"
3/8"
1"
3"
3/16"
3/8" x 3" Plate
bend to outside
diameter of end
support + ⅛"
SECTION A–A
Drill and tap support
column for bolts
A
A
2– ½" diameter
galvanized bolt
w/ hex nuts
J–hook
PLAN
TOP CAP – STEEL END SUPPORTS
Top of end support column
(Cap not shown)
3" maximum
2"
Spot weld
4"
CABLE J HOOK
Diagonal
(g)
typ
1/4"
Horizontal
(f)
℄ end support
column
(h)
¾" minimum
1 ½" maximum
Diagonal (g)
ELEVATION (END SUPPORT)
TYPICAL BRACING MEMBERS CONNECTION
℄ lower chord
℄ end
support
column
(h)
Saddle shim
W–beam
1 1/2"
1/4"
typ
¾" minimum
1 ½" maximum
Diagonal (g)
ELEVATION (END SUPPORT)
TYPICAL W BEAM CONNECTION
NOTES:
① Toe edge of diagonal member shall be cut back to facilitate throat thickness. See Standard Drawing E 802–SBTS–06 for toe edge detail.
② Cut holes in end support columns for W–beams to pass through. Holes to have 1/8 inch maximum clearance to W–beam. Holes in opposite sides of column to be checked for proper alignment prior to cutting.
INDIANA DEPARTMENT OF TRANSPORTATION
SIGN BOX TRUSS STRUCTURE
END SUPPORT DETAILS
DECEMBER 2008
DRAWING NO. E 802–SBTS–08
JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER
John C. Mauser 07/18/08
DESIGN ENGINEER DATE
DESIGNED: JCM DRAWN:

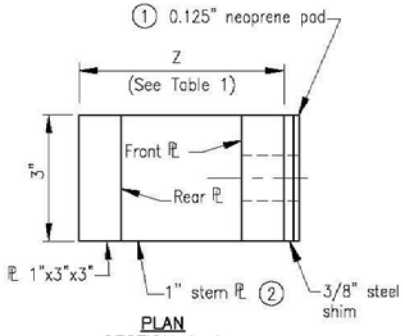
TABLE 1 - SPACER ASSEMBLY DIMENSIONS

TRUSS TYPE	END SUPPORT COLUMN (h) SIZE (O.D.)	Z	D	L
	IN	IN.	IN.	IN.
A	14	4 1/2	6 1/16	24.0
B	14	4 1/4	6 9/16	24.0
C	14	4	7 1/16	24.0
D	18	2	7 1/16	26.0
E	18	2	7 1/16	26.0

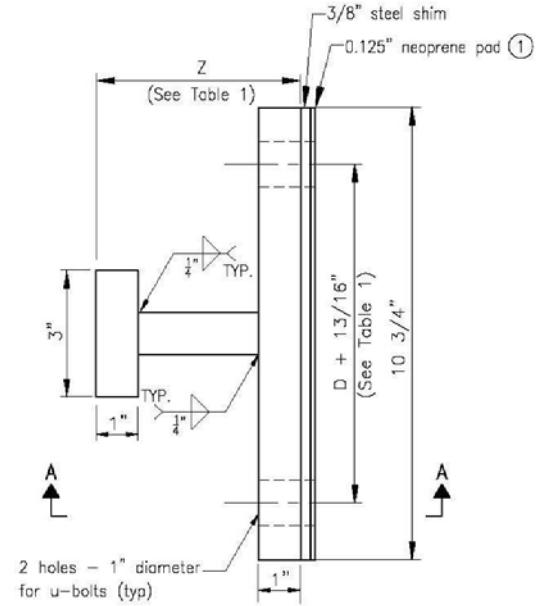
NOTES:

(1) Provide isolation from steel dissimilar metal as required.

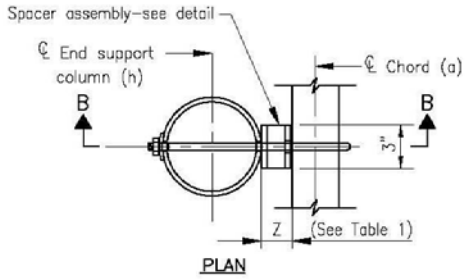
(2) For truss type D and E the 1" stem plate is not required. Fillet weld front and rear plates together.



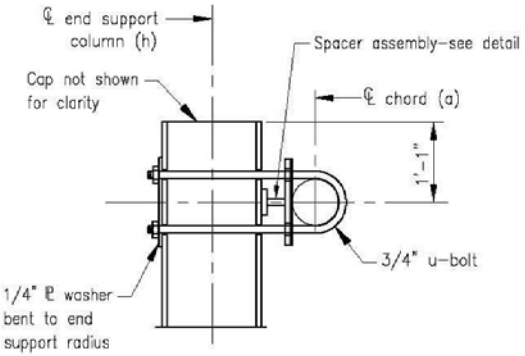
PLAN
SECTION A–A



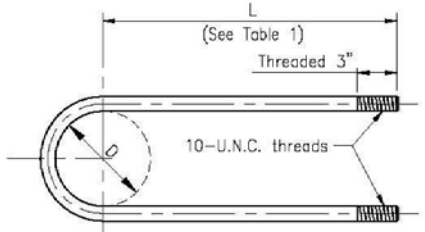
ELEVATION
END SUPPORT SPACER ASSEMBLY DETAIL



PLAN



SECTION B–B
UPPER CHORD CONNECTION DETAILS



3/4" DIA. STAINLESS STEEL U–BOLT DETAIL

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE
TRUSS CONNECTION DETAILS

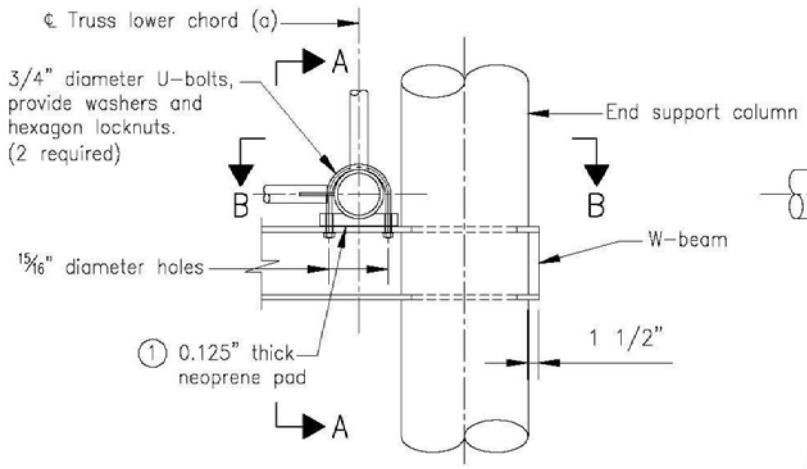
DECEMBER 2008

DRAWING NO. E 802–SBTS–09

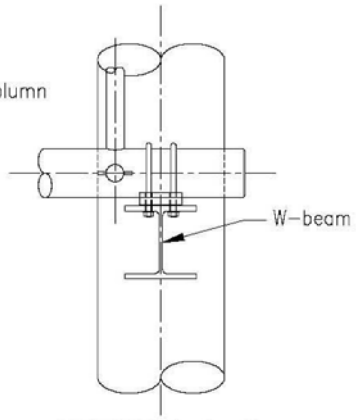
JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN:



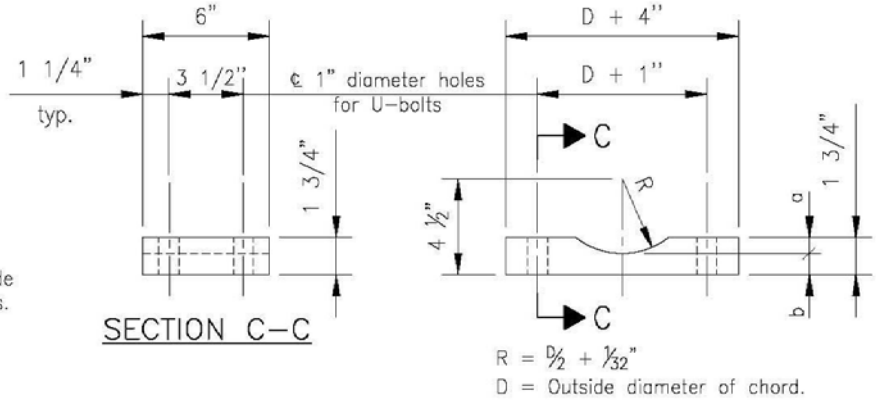
DETAIL A



SECTION A–A

NOTES:

1. Provide neoprene pads at all chord to W-beam bearing surfaces.

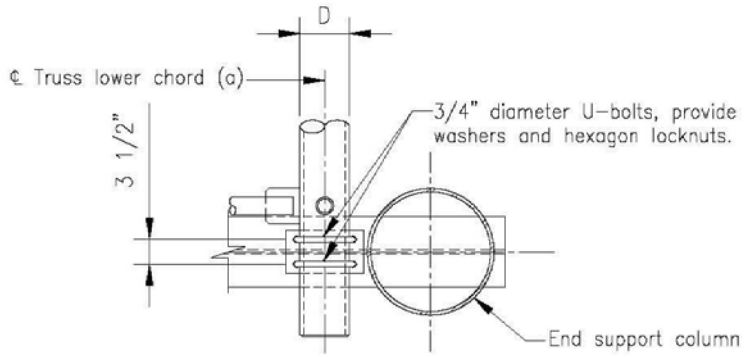


SECTION C–C

$R = D/2 + 1/32"$

D = Outside diameter of chord.

SADDLE SHIM DETAIL



SECTION B–B
LOWER CHORD CONNECTION DETAIL

Truss Chord Outside Diameter D	a	b
6"	9/32"	1 15/32"
6 1/2"	17/32"	1 7/32"
7"	25/32"	31/32"

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE
TRUSS CONNECTION DETAILS

DECEMBER 2008

DRAWING NO. E 802-SBTS-10

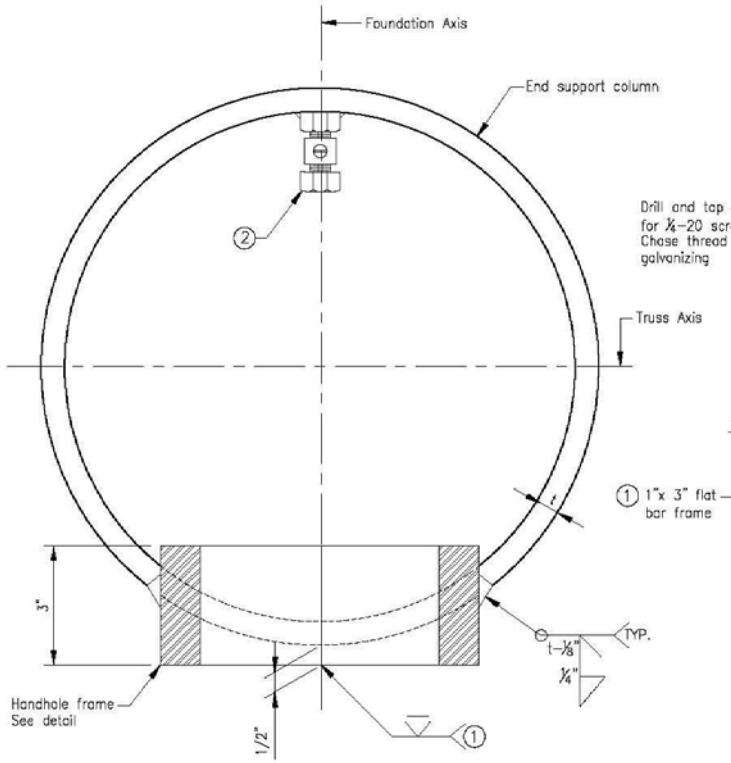
JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

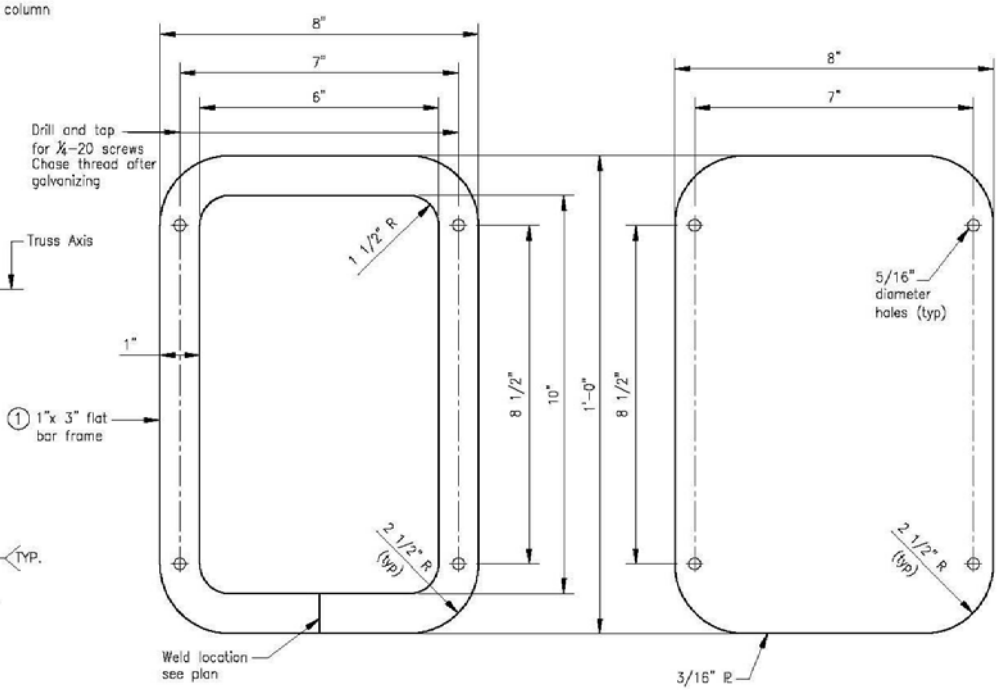
DESIGNED: JCM DRAWN: REM

NOTES:

1. In lieu of fabricated handhole frame as shown, frame may be cut from 3" plate (rolling direction vertical).
2. See Standard Drawing E 802-SNWR-03 for grounding post details. Graunding post to be placed on far side of support directly opposite center of handhole.
3. See Standard Drawing E 802-SBTS-12 for handhole locations.



PLAN



HANDHOLE FRAME DETAIL

HANDHOLE COVER

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE
STEEL END SUPPORT HANDHOLE DETAILS

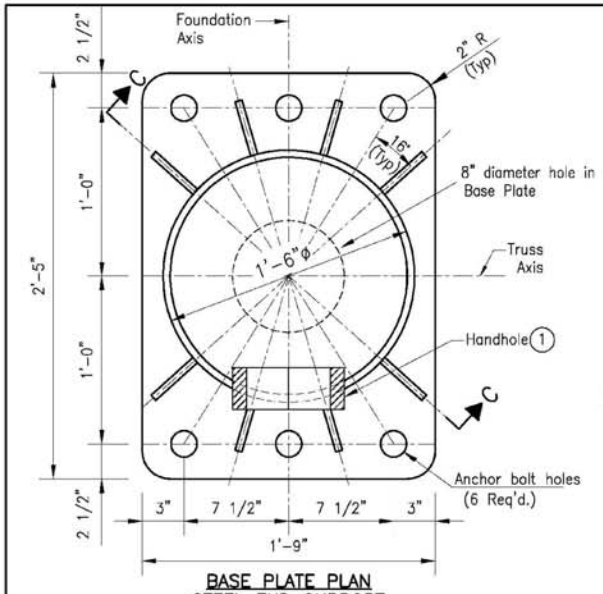
DECEMBER 2008

DRAWING NO. E 802-SBTS-11

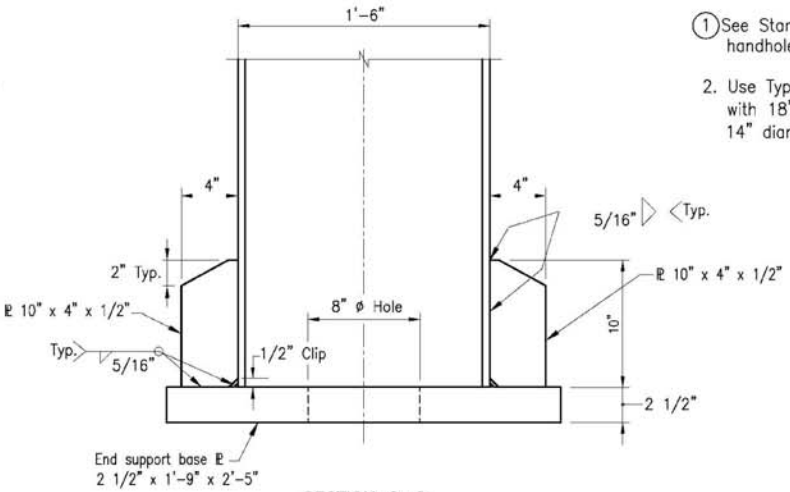
JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN: MBW



BASE PLATE PLAN
STEEL END SUPPORT
TYPE A

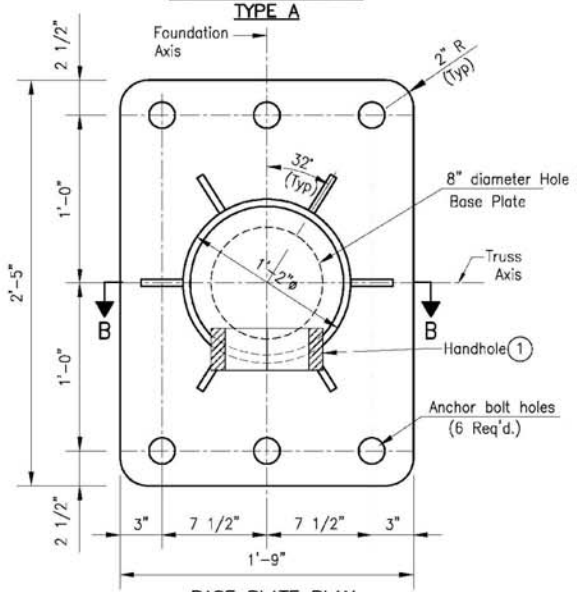


SECTION C–C

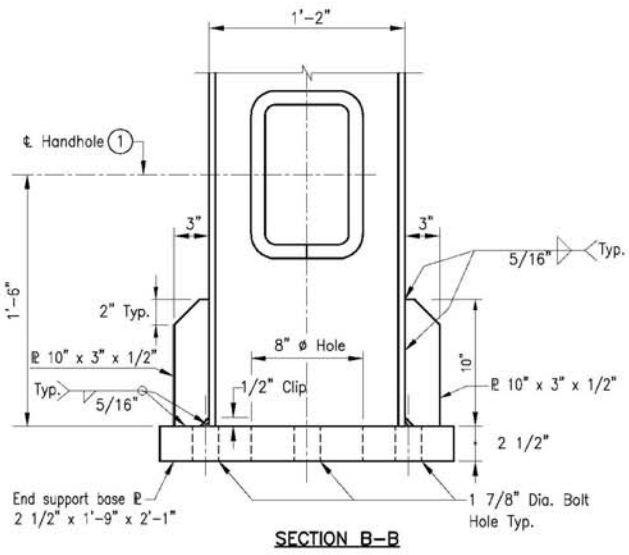
NOTES:

(1) See Standard Drawing E 802–SBTS–11 for handhole details.

2. Use Type A Base Plate for End Supports with 18" diameter columns and Type B for 14" diameter columns.



BASE PLATE PLAN
STEEL END SUPPORT
TYPE B



SECTION B–B

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE
STEEL END SUPPORT BASE DETAILS

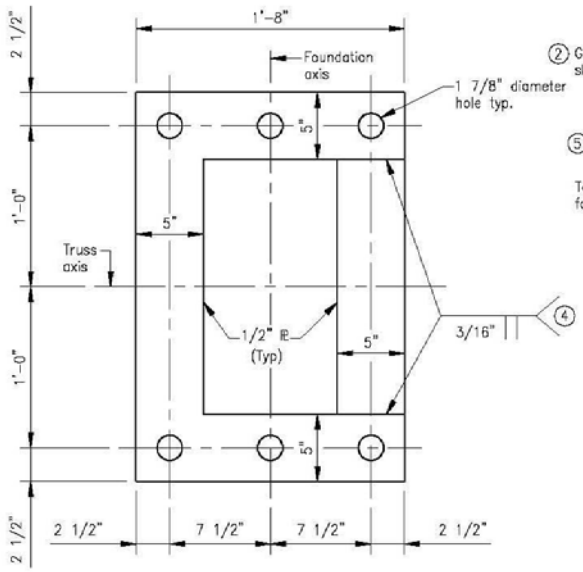
DECEMBER 2008

DRAWING NO. E 802–SBTS–12

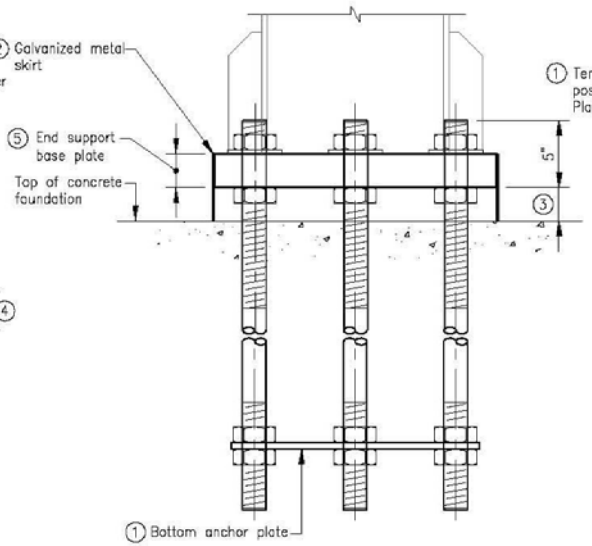
JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

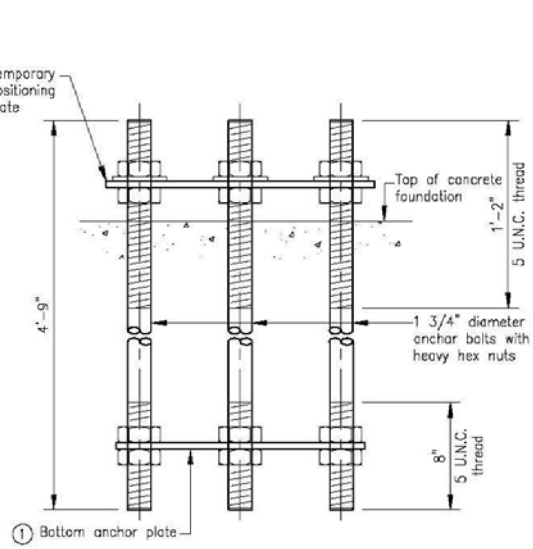
DESIGNED: JCM DRAWN: MBW



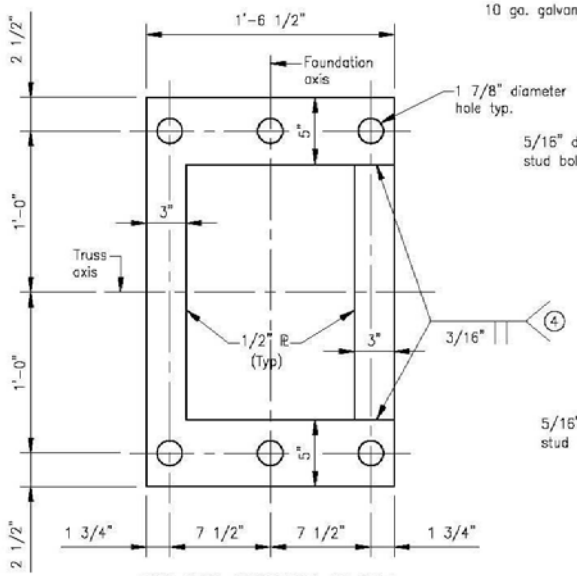
TEMPORARY POSITIONING PLATE



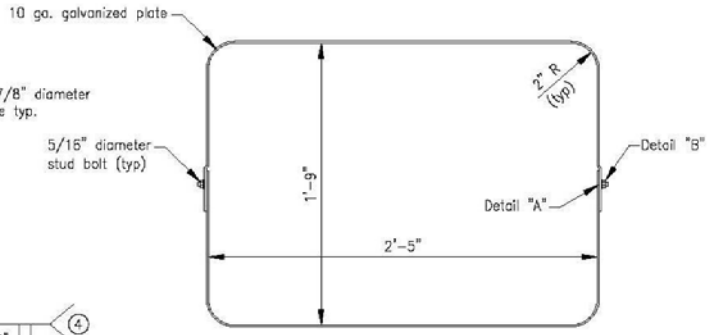
ANCHOR BOLT DETAILS
AFTER CONCRETE PLACEMENT



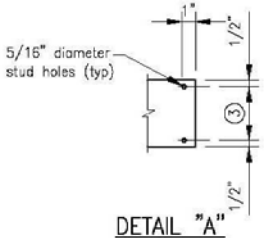
ANCHOR BOLT DETAILS
BEFORE CONCRETE PLACEMENT



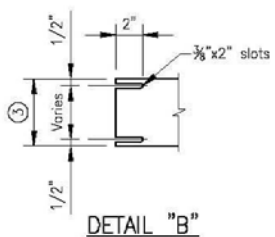
BOTTOM ANCHOR PLATE



SKIRT DETAIL



DETAIL "A"



DETAIL "B"

NOTES:

1. Use temporary positioning plate and bottom anchor plate for all foundations. Temporary positioning plate should be removed after placing concrete.
2. Secure galvanized metal skirt to base plate after erection as show in skirt detail.
3. Minimum base plate gap is 2 1/2" and can be increased up to 5 1/2". Metal skirt width shall be at least 1 1/2" more than the actual gap.
4. Optionally may use four separate bars. Weld to maintain angles and shapes as shown.
5. For end support base plate details see Standard Drawing E 802-SBTS-12.

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE STEEL END SUPPORT BASE DETAILS

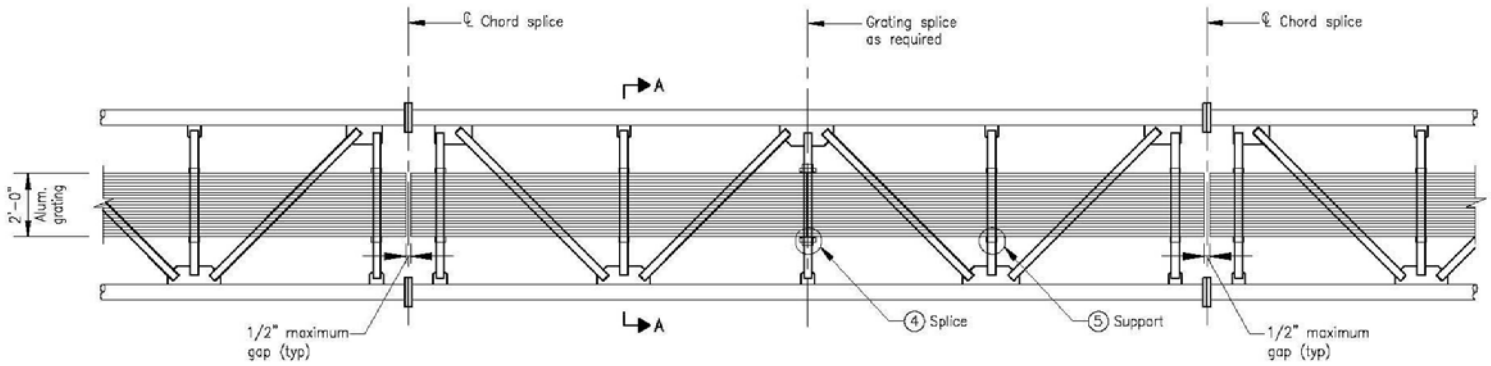
DECEMBER 2008

DRAWING NO. E 802-SBTS-13

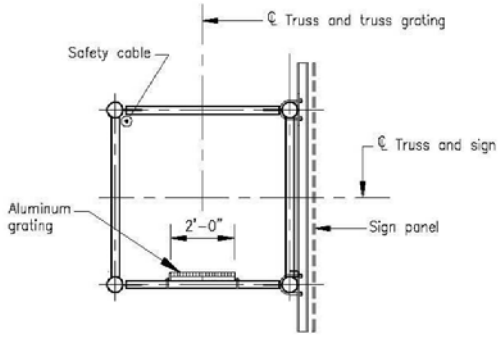
JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN: MSW



WALKWAY GRATING PLAN



SECTION A–A

Notes:

1. See Standard Drawing E 802–SNWW–02 for additional aluminum grating requirements.
2. Grating shall run full length center to center of end support frames plus 9" each end.
3. Grating width is nominal and may vary ± ½" based on available standard widths.

④ Grating can be spliced on any of the horizontals within a section as needed. See Detail 2 on Standard Drawing E 802–SBTS–15 for typical grating splice detail.

⑤ See Detail 1 on Standard Drawing E 802–SBTS–15 for typical grating support detail.

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE
INTERIOR WALKWAY GRATING PLAN

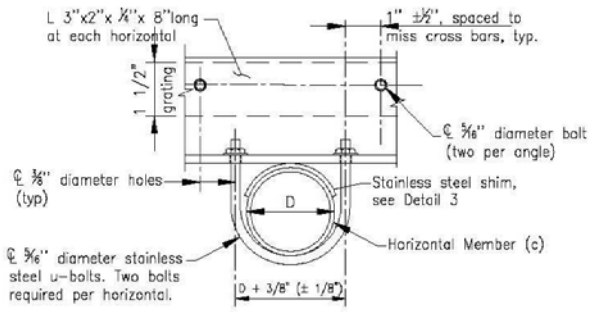
DECEMBER 2008

DRAWING NO. E 802–SBTS–14

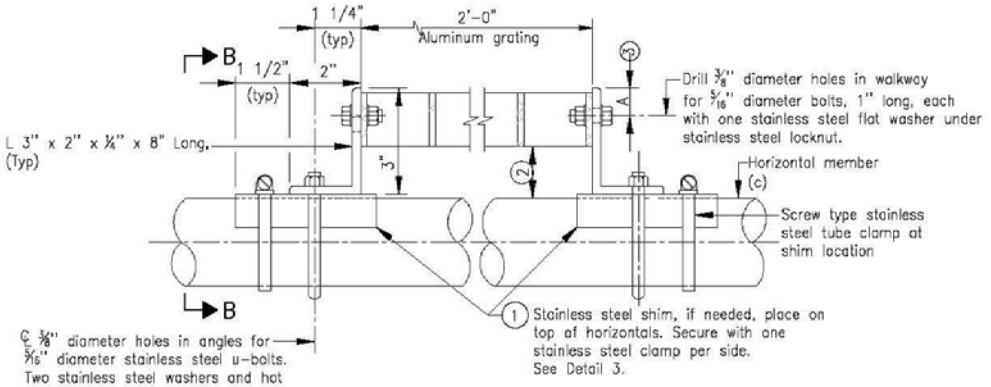
JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN: MSW



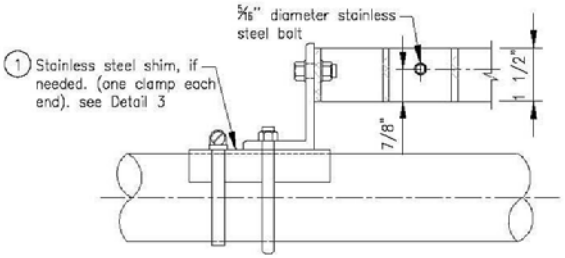
SECTION B–B



GRATING SUPPORT DETAIL 1

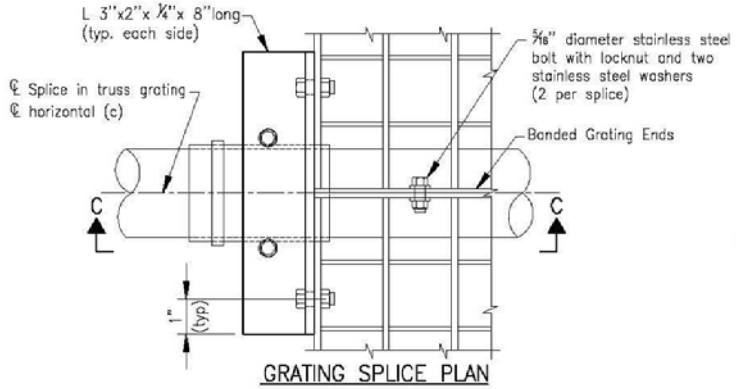
(Continuous Truss grating)

TABLE 1	
HORIZONTAL MEMBER OUTSIDE DIAMETER	A (IN)
2"	3/4
2 1/2"	1/2



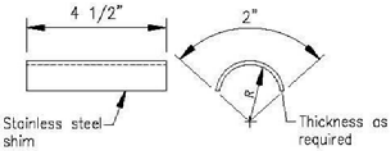
SECTION C–C

(Details not shown same as Detail 1)



GRATING SPLICE PLAN

DETAIL 2



ELEVATION END VIEW

SHIM –DETAIL 3

R = bend to match tube (approximately)

NOTES:

1. Stainless steel shims shall be placed as shown in Details 1 and 2 if needed to compensate for alignment variations between horizontal and horizontal diagonals. Thicker shims may be used subject to shims performing properly.
2. Tube to grating gap may vary from 1 1/4" to 1 1/2", max. to align walkway, allow for camber, etc.
3. See Table 1 for A dimensions.

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE
INTERIOR WALKWAY GRATING DETAILS

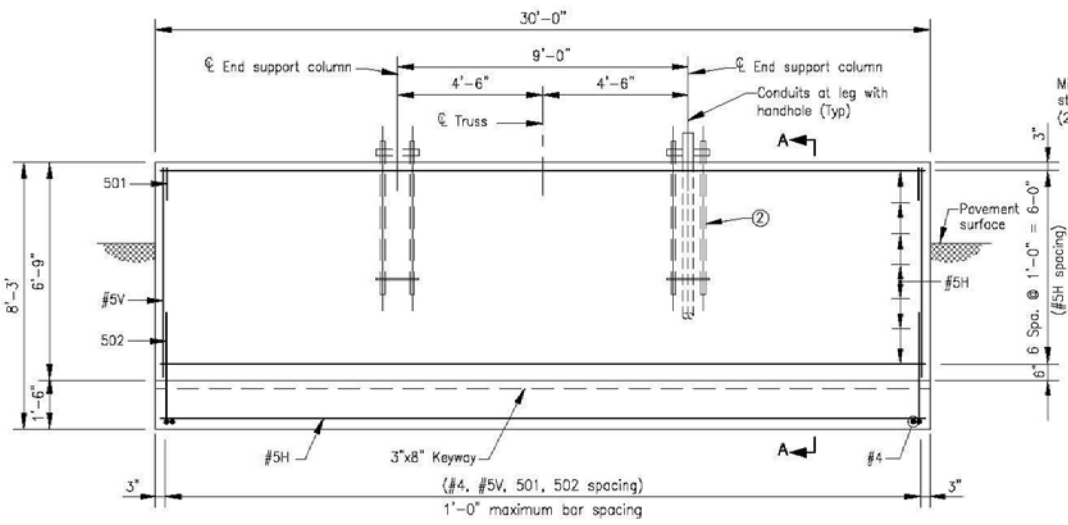
DECEMBER 2008

DRAWING NO. E 802-SBTS-15

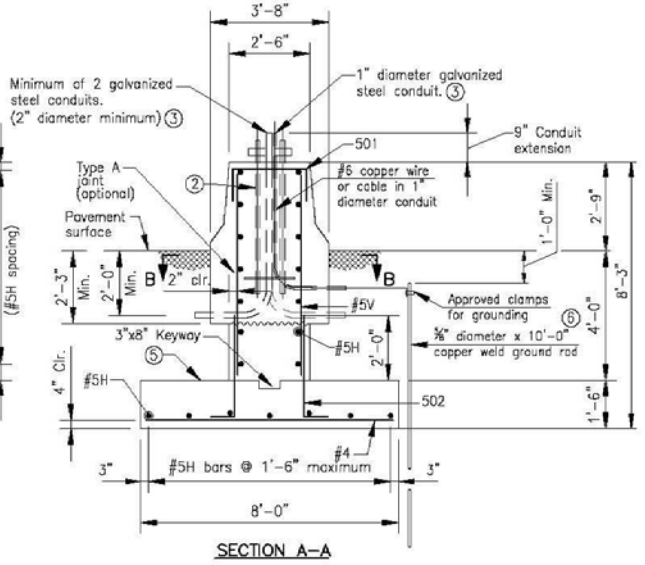
JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 07/18/08
DESIGN ENGINEER DATE

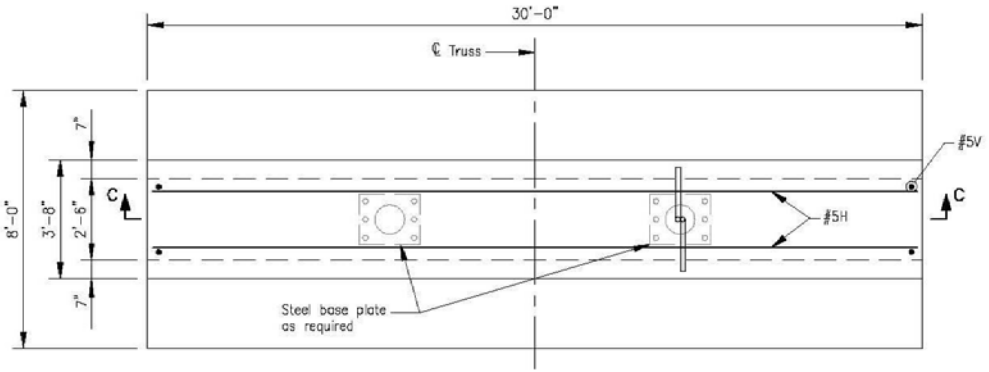
DESIGNED: JCM DRAWN:



SECTION C–C



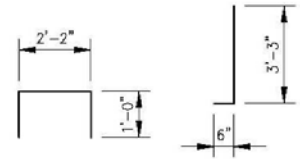
SECTION A–A



SECTION B–B

Notes:

1. See Standard Drawing E 602–CCMB–03 for barrier wall width transition.
2. See Standard Drawing E 802–SBTS–13 for anchor bolts.
3. Thread and cap both ends of steel conduit.
4. See Standard Drawing E 802–SBTS–19 for reinforcing schedule.
5. The top of the footing shall be a minimum of 4'–0" below the pavement or ground surface.
6. Only one ground rod per structure is required.



501 x 4'–2" 502 x 3'–9"

Legend:

H = Horizontal bar

V = Vertical bar

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE FOUNDATION AT 33" CONCRETE BARRIER WALL

DECEMBER 2008

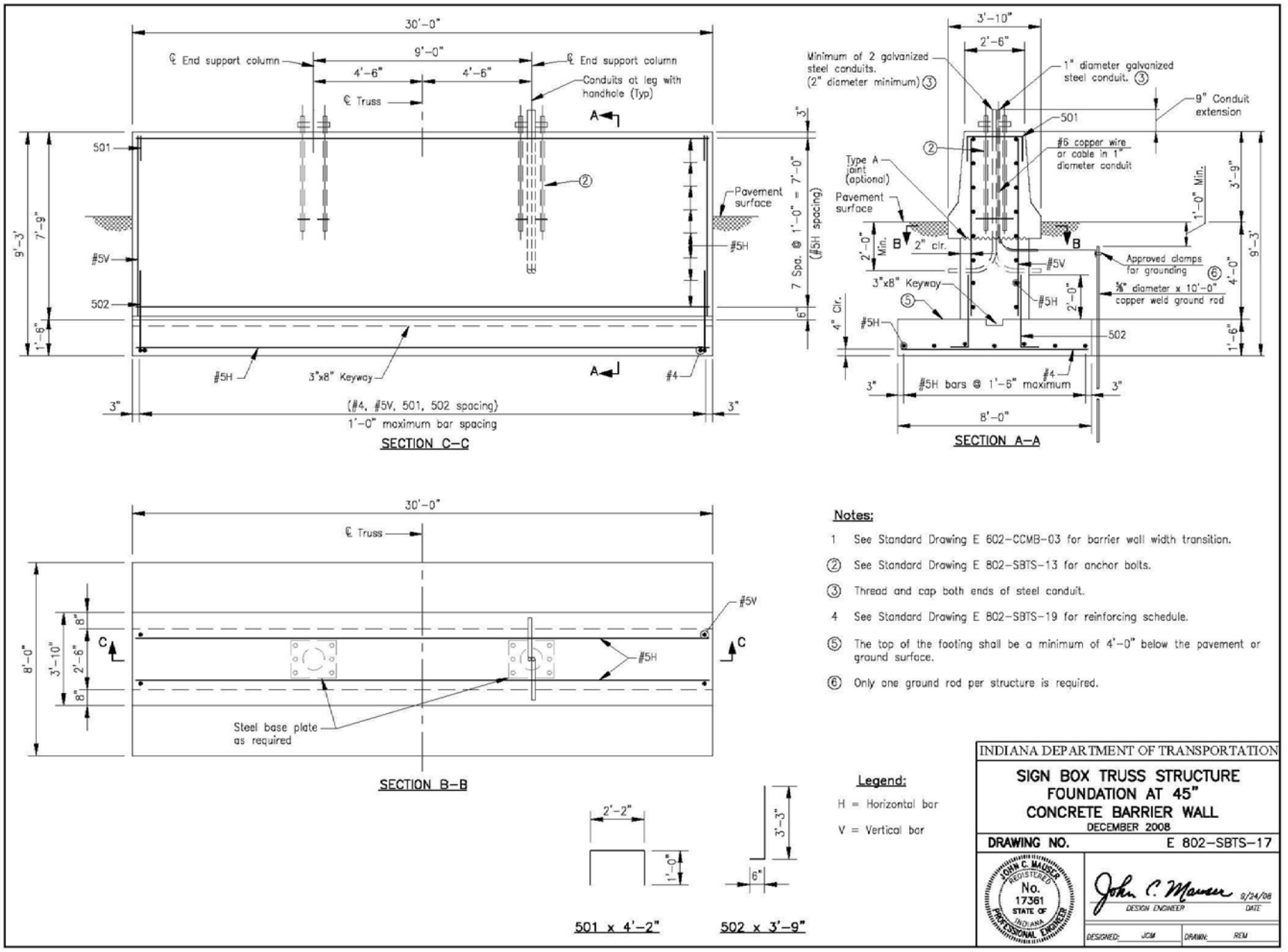
DRAWING NO. E 802–SBTS–16

JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 9/24/08

DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN: REM



Notes:

1. See Standard Drawing E 602-CCMB-03 for barrier wall width transition.
2. See Standard Drawing E 802-SBTS-13 for anchor bolts.
3. Thread and cap both ends of steel conduit.
4. See Standard Drawing E 802-SBTS-19 for reinforcing schedule.
5. The top of the footing shall be a minimum of 4'-0" below the pavement or ground surface.
6. Only one ground rod per structure is required.

Legend:

H = Horizontal bar

V = Vertical bar

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE FOUNDATION AT 45° CONCRETE BARRIER WALL

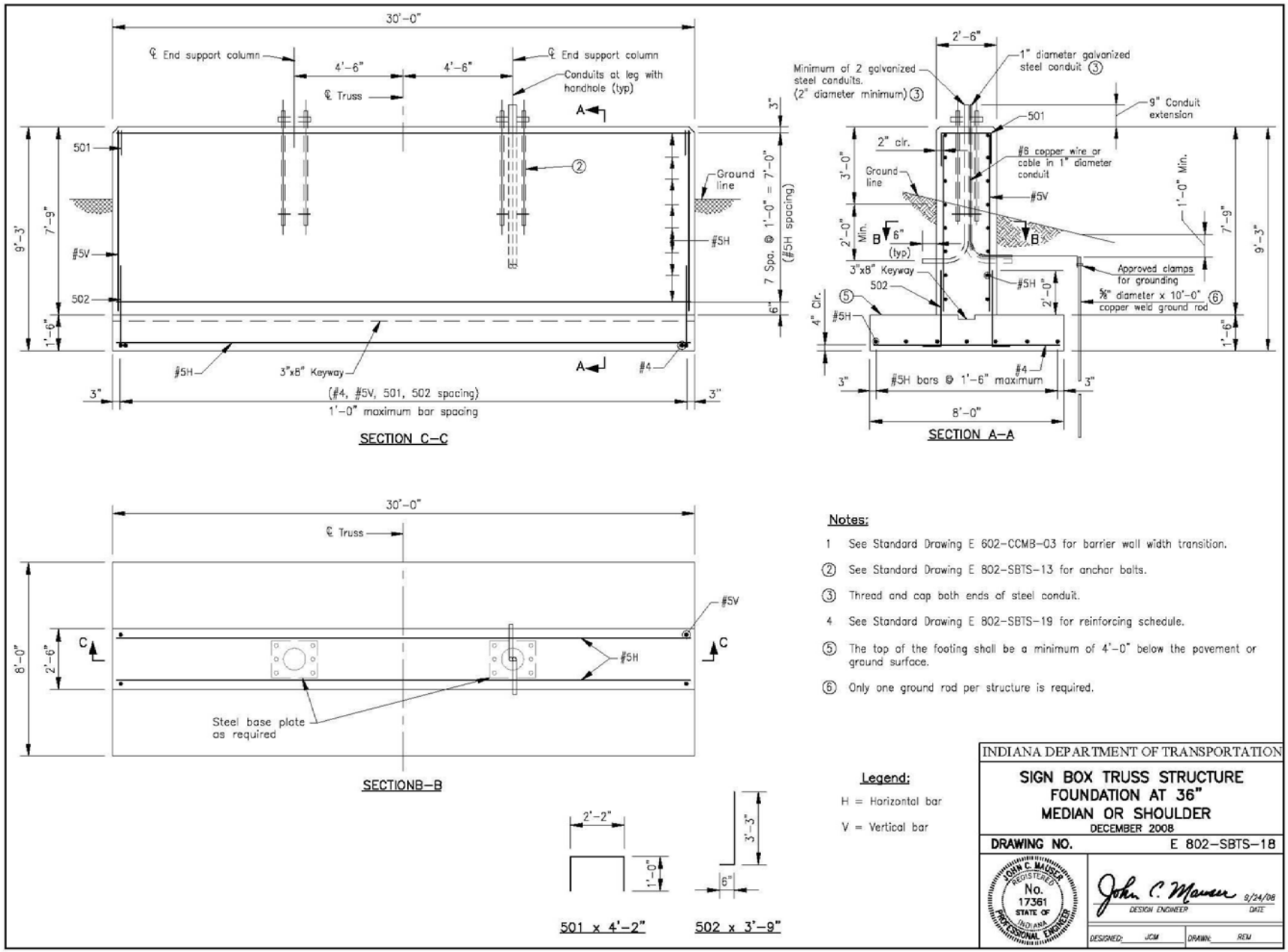
DECEMBER 2008

DRAWING NO. E 802-SBTS-17

JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 9/24/08
DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN: REM



Notes:

1. See Standard Drawing E 602-CCMB-03 for barrier wall width transition.
2. See Standard Drawing E 802-SBTS-13 for anchor bolts.
3. Thread and cap both ends of steel conduit.
4. See Standard Drawing E 802-SBTS-19 for reinforcing schedule.
5. The top of the footing shall be a minimum of 4'-0" below the pavement or ground surface.
6. Only one ground rod per structure is required.

Legend:

H = Horizontal bar

V = Vertical bar

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE FOUNDATION AT 36" MEDIAN OR SHOULDER

DECEMBER 2008

DRAWING NO. E 802-SBTS-18

JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 9/24/08

DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN: REM

FOUNDATION AT 33" CONCRETE BARRIER WALL			
EPOXY COATED REINFORCING			
SIZE & MARK	NO. OF BARS	LENGTH (FT. & IN.)	WEIGHT (LBS.)
#4	31	7 ' - 8 "	
TOTAL #4			159
501	31	4 ' - 2 "	
502	62	3 ' - 9 "	
#5V	62	6 ' - 6 "	
#5H	21	29 ' - 8 "	
TOTAL #5			1447
TOTAL EPOXY COATED REINFORCING			1606
CONCRETE			
CONCRETE , CLASS "A" (CYS)			35.8
MISCELLANEOUS			
SURFACE SEAL (SYS)			27.6

FOUNDATION AT 45" CONCRETE BARRIER WALL			
EPOXY COATED REINFORCING			
SIZE & MARK	NO. OF BARS	LENGTH (FT. & IN.)	WEIGHT (LBS.)
#4	31	7 ' - 8 "	
TOTAL #4			159
501	31	4 ' - 2 "	
502	62	3 ' - 9 "	
#5V	62	7 ' - 6 "	
#5H	23	29 ' - 8 "	
TOTAL #5			1574
TOTAL EPOXY COATED REINFORCING			1733
CONCRETE			
CONCRETE , CLASS "A" (CYS)			37.6
MISCELLANEOUS			
SURFACE SEAL (SYS)			34.3

FOUNDATION AT 36" MEDIAN OR SHOULDER			
EPOXY COATED REINFORCING			
SIZE & MARK	NO. OF BARS	LENGTH (FT. & IN.)	WEIGHT (LBS.)
#4	31	7 ' - 8 "	
TOTAL #4			159
501	31	4 ' - 2 "	
502	62	3 ' - 9 "	
#5V	62	7 ' - 6 "	
#5H	23	29 ' - 8 "	
TOTAL #5			1574
TOTAL EPOXY COATED REINFORCING			1733
CONCRETE			
CONCRETE , CLASS "A" (CYS)			34.9
MISCELLANEOUS			
SURFACE SEAL (SYS)			28.3

INDIANA DEPARTMENT OF TRANSPORTATION

SIGN BOX TRUSS STRUCTURE SPREAD FOOTING QUANTITIES

DECEMBER 2008

DRAWING NO. E 802-SBTS-19

JOHN C. MAUSER REGISTERED No. 17361 STATE OF INDIANA PROFESSIONAL ENGINEER

John C. Mauser 9/24/08
DESIGN ENGINEER DATE

DESIGNED: JCM DRAWN: REM

REVISION TO 2008 STANDARD SPECIFICATIONS AND NEW STANDARD DRAWINGS

SECTION 802, AFTER LINE 134, INSERT AS FOLLOWS:

Vertical truss members and vertical diagonals shall be machined to provide a snug tube-to-tube fit to the chord along the entire edge before welding. Horizontal truss members and horizontal diagonals shall be slotted for the dimensions shown on the plans and welded to the gusset plates. They shall be sealed against water penetration.

Chord plates shall be machined from solid rounds. Mating surfaces shall be flat within 1/64 in. (0.4 mm). Flanges shall be given an additional finish if necessary to ensure contact between plates.

The cap bolts used to attach the top caps of end-support columns shall be located so as to miss the J hook.

The camber shown on the plans is for fabrication only. It shall be measured with the truss fully supported. The allowable camber tolerance is 25% of the specified camber value.

REVISION TO 2008 STANDARD SPECIFICATIONS AND NEW STANDARD DRAWINGS

SECTION 910, BEGIN LINE 1163, DELETE AND INSERT AS FOLLOWS:

910.19 Overhead Sign Structures

The complete structure with signs in place shall be able to withstand wind pressure in accordance with AASHTO ~~specifications for the Design and Construction of Structural Supports for Highway Signs~~ *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*. The structure shall be designed to resist ~~movement by the wind which might contribute to the~~ fatigue of the material *in accordance with the AASHTO specifications*.

SECTION 910, BEGIN LINE 1187, DELETE AND INSERT AS FOLLOWS:

(a) Aluminum Overhead Sign Structures, Box Truss and Bridge Attached

Extruded tubes shall be of aluminum in accordance with ASTM B 221 (B 221M), B 241 (B 241M), or B 429, alloy 6061-T6. ~~Anchor base castings shall be of aluminum in accordance with ASTM B 26 (B 26M) or B 108, alloy 356.0-T6.~~ All other castings shall be of aluminum in accordance with ASTM B 26 (B 26M), alloy 356.0-T6. Plates shall be of aluminum in accordance with ASTM B 209 (B 209M), alloy 6061-T6. Plates shall be free of sharp edges and irregularities.

Welding material and procedures shall be in accordance with *803 and* applicable AWS provisions.

Bolts, nuts, screws, and flat washers shall be passivated type 304 stainless steel. Bolts and screws shall be in accordance with ASTM A 193 (A 193M), grade B8. Hexagon nuts and washers shall be in accordance with ASTM A 194 (A 194M), grade 8. ~~*Where h*~~*High strength bolts,* ~~*are indicated on the plans*~~ *nuts and washers for chord splice connections,* ~~*bolts and nuts*~~ *shall be in accordance with 910.02(f) and shall be galvanized in accordance with AASHTO M 232.*

The J hook shall consist of one 3/8-in. (10-mm) steel bar in accordance with ASTM A 307. It shall be spot welded to the inside of the end-support member. The J hook shall be hot-dip galvanized prior to welding or in the final assembly with the support column.

Neoprene pads shall be ultraviolet rated.

The safety cable shall be in accordance with 922.06(b).

Anchor bolts*, nuts and washers* shall be in accordance with ASTM ~~A 307~~ *F 1554, Grade 36*. A hexagon nut, leveling nut, and flat washer ~~in accordance with ASTM A 307, grade A,~~ shall be furnished with each anchor bolt. ~~Threaded~~ *Top* ends of anchor bolts and associated hardware*, as shown on the plans,* shall be coated in accordance with ASTM A 153 or be mechanically galvanized and conform to the coating thickness, adherence, and quality requirements of ASTM A 153, class C.

REVISION TO 2008 STANDARD SPECIFICATIONS AND NEW STANDARD DRAWINGS

Certified proof of the qualifications for a minimum of two welders shall be presented after the contract is awarded and before fabrication is started. This certification shall be from a commercial or public testing laboratory and qualifications shall be based on welding of aluminum alloy, 6061-T6 with consumable electrode type welding using aluminum alloy ~~ER4043~~ *ER5356* filler material. Welders shall qualify by passing the requirements of "Procedure and Performance Tests of Qualification Standard for Welding Procedures, Welders, and Welding Operations", latest edition, formulated by the Boiler and Pressure Vessel Committee of the American Society of Mechanical Engineers.

SECTION 910, BEGIN LINE 1227, DELETE AND INSERT AS FOLLOWS:

(b) Steel Overhead Sign Structures, Box Truss, Cantilever, Monotube, and Bridge Attached

Steel sections used for upright members, cross beams, or horizontal members shall be either tapered or constant cross section tubular members as specified herein. The tubular members may be either circular or multi-sided.

Box truss and bridge attached structures shall be fabricated from constant cross section tubular steel in accordance with ASTM A 53, type E or S, grade B *(minimum yield strength of 35,000 psi)*. Constant cross section tubular steel with greater yield strength may be used, with written approval. However, structural dimensions must remain as shown on the plans. Structures shall be galvanized after fabrication in accordance with ASTM A 123.

SECTION 910, BEGIN LINE 1266, DELETE AND INSERT AS FOLLOWS:

Gusset, flange, and base plates shall be in accordance with ASTM A 36 (A 36M) and shall be galvanized after fabrication in accordance with ASTM A 123. Base plates for upright poles shall develop the full strength of the poles. Castings for the vertical pole top and horizontal arm and cap shall be in accordance with ASTM A 126 and shall be galvanized with a minimum coating of 2 oz/sq ft (610 g/m^2). Bolts *and nuts*, except anchor bolts, ~~and nuts~~ shall be in accordance with ASTM A ~~307~~ *325, Type 1* ~~*or high-strength bolts as shown on the plans*~~. Two nuts for use in plumbing upright poles shall be furnished with each anchor bolt. ~~Anchor bolts, except for box truss structures, shall be in accordance with ASTM A 675, grade 90 (A 675M, grade 620); ASTM A 576 modified to 55,000 psi (379 MPa) minimum yield strength; or ASTM A 307, grade A modified to 55,000 psi (379 MPA) minimum yield strength.~~ Anchor bolts for ~~box truss~~ *overhead steel* structures shall be in accordance with 910.19(a). Steel bolts, nuts, washers, and ~~threaded~~ *the top* ends of anchor bolts shall be coated in accordance with ASTM A 153 or be mechanically galvanized and conform to the coating thickness, adherence, and quality requirements of ASTM A 153, class C. Welding shall be in accordance with 711.32.

INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

Design Memorandum No. 08-__
Technical Advisory

November, 2008

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

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

SUBJECT: **Overhead Box Truss Sign Structures and foundations**

NEW STANDARDS
DRAWINGS: **INDOT Standards drawings October 2008 No E 802-SBTS-01 to 19**

SUPERCEDES: **INDOT Standards drawings to 2005 No 802-SNOH-01 to 16 and INDOT Standards drawing March 2003 No 802-SNBF-01 to 07**

EFFECTIVE: **_____, 2009, Letting**

The Overhead Box Truss Structures and their foundations have been redesigned based on the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaries, an*d *Traffic Signals, 4th Edition,* including 2006 Interims. All box trusses are aluminum while all end support columns are steel. Standard Design Types: A, B, C, D, and E are provided for certain combinations. New and redesigned, box truss structures have been developed for use with certain combinations of sign areas, spans lengths and heights.

I. <u>Overhead Box Trusses</u>

All aluminum standard box trusses are designated as:

Overhead Box Truss Structure, Type A

Overhead Box Truss Structure, Type B
Overhead Box Truss Structure, Type C
Overhead Box Truss Structure, Type D
Overhead Box Truss Structure, Type E

Standard designs Type A to Type E are provided for combinations of maximum sign areas of 500, 700 and 900 sft and maximum spans of 100 ft and 130 ft. They are built up from Exterior Sections and Interior Sections and their number varies depending on the required spans length Minimum number of sections shall be used for each truss keeping the maximum section length 35'-6". A single Interior Section in a truss shall have an even number of panels to maintain the pattern of vertical diagonals. All standard box truss width has been established at 6'-6". All panels on the truss shall be the same length; the minimum panel length for all trusses is 5'-0 and maximum 6'-6". The details are shown on INDOT *Standard Drawings* 802-SBTS-series.

If a particular structure does not fit within the parameters of any of the standards Type A-E a special design shall be provided by the designer.

II. Overhead Box Truss Supports

End Support Members are steel tubes spaced 9'-0. The required sections of steel tubes are tabulated and depend on maximum sign area and span of the truss. Maximum mounting heights assumed for calculation is 28'-6". The details are shown on new INDOT *Standard Drawing*s.

III. Spread Footing

Spread footing design is provided for 33" and 45" Concrete Barrier and 36" Median or Shoulder Barrier for allowable soil bearing pressure: 1500, 2500, 3500 psf. If the allowable gross soil bearing capacity is less than 1500 psf, the designer shall provide a special foundation design and submit design calculations for review and approval. The results of calculations for soil bearing pressures above 3500 psf are not controlled by the bearing capacity of the soil but for overturning stability and require special design. The details of standard footings are shown on new INDOT *Standard Drawings* 802-SBTS-series.
The designer shall request a geotechnical investigation at the preliminary field check for each project requiring box trusses.

IV. Design Parameters

Structure Design

The overhead sign truss structures and their supports are design using allowable stress (ASD) approach in accordance with ASSHTO Specification and the following design parameters:

90 mph wind

50 years service life

Wind Importance Factor Ir = 1

Gust Effect Factor G = 1.14

Drag Coefficients, Cd:

The sign height is assumed as 20 ft but length varies based on the sign area under consideration.

Signs Cd = 1.2, based on L/W = 5 (where L is longer dimension of the attached sign)

Truss members Cd = varies 1.1 to 1.2 as in Table 3-6, Section 3 of Specs

Fatigue Category I – Truck and Natural Wind gust loads only

Fatigue Importance Factor, $I_f = 1$

Overhead sign structures were analyzed for four loads: dead, wind, ice and fatigue.

Dead load for the materials used is as follow:

Aluminum – 169 lbs/ft^3

Steel - 490 lbs//ft^3

Traffic message sign - 2.48 lb/ft (aluminum extruded panels (12" typical)

The most common spans for sign trusses are 80', 100', and 130', five different sign areas are identified as most often used; 500, 600, 700, 800, and 900 sft, and two mounting heights are most often needed 26'-6" and 28'-6". However, the changes in member sizes were not significant enough to keep all the different design in use. The final design and analysis is performed for

3 sign areas: 500, 700 900 sft

Two spans lengths: 100, 130 ft

One mounting height: 28'-6"

Gusset plates have been used at the horizontal and horizontal diagonal member connections to the chords where the calculations indicate the critical fatigue stress range for the member sizes used.

The interior walkway is added to all the box trusses with the maximum weight of 5 psf.

Maximum stresses in the members were checked against the allowable stresses for two locations of the sign: sign located nearest to the column and sign located at the center of

the span. Those two locations are considered the worst loading conditions for checking columns, chords and bracing members.

V. Determining Standard Footing Item

Standard spread footing should be shown on the plans using the following pay item format:

Box Truss Sign Structure Foundation, _____.....EACH
TYPE

The pay item names should be one of the following designations: 33" Concrete Barrier Wall, 45" Concrete Barrier Wall, and 36" Median or Shoulder.
These three foundations will cover all type of box trusses to 130' span and a maximum of 900 square foot.

REVISION TO 2008 STANDARD SPECIFICATIONS AND NEW STANDARD DRAWINGS

Other sections containing specific cross references:

None

Recurring Special Provisions affected:

None

Standard Sheets affected:

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

Action: Passed as revised

_x_ 2010 Standard Specifications Book

_x_ Create RSP (No. 802-T-172)
Effective April 2009 Letting
RSP Sunset Date: _____

___ Revise RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

Standard Drawing Effective September 2009

_x_ Create RPD (No. 802-T-172d)
Effective April 2009 Letting
___ Technical Advisory

GIFE Update Req'd.? Y___ N_x_
By - Addition or Revision

Frequency Manual Update Req'd? Y___ N_x_
By - Addition or Revision

Withdrawn ____

Received FHWA Approval? Yes

Item No.05 01/15/09 (2008 SS)
Mr. Heustis
Date: 01/15/09

REVISION TO 2008 STANDARD SPECIFICATIONS AND NEW STANDARD DRAWINGS

SECTION 203, BEGIN LINE 1124, DELETE AND INSERT AS FOLLOWS:

If there is no pay item for rock excavation and such is encountered, it will be paid for at ~~ten times the contract unit price per cubic yard (cubic meter) for common excavation or $100.00~~ *$125.00* per cu yd (~~$130.80~~ $*163.50* per m^3) for quantities less than *or equal to* 100 cu yd (76 m^3). ~~or $80.00 per cu yd ($104.60 per m^3) for~~ *For* quantities greater than 100 cu yd (76 m^3) ~~but less than 200 cu yd (159 m^3), whichever is greater~~ *pay will be determined in accordance with 104.03*.

Other sections containing specific cross references:

None

Recurring Special Provisions affected:

None

Standard Sheets affected:

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

Action: Passed as submitted

_x_ 2010 Standard Specifications Book

___ Create RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

___ Revise RSP (No. _____)
Effective _____Letting
RSP Sunset Date: _____

Standard Drawing Effective _____

___ Create RPD (No. _____)
Effective _____Letting
___ Technical Advisory

GIFE Update Req'd.? Y___ N_x_
By - Addition or Revision

Frequency Manual Update Req'd? Y___ N_x_
By - Addition or Revision

Withdrawn ____

Received FHWA Approval? Yes

HANDOUT OF REVISED STANDARDS COMMITTEE SCHEDULE

INDOT Standards Committee
Schedule of Meetings, Submittals and Distributions

Revised 01/08/09

Std Comm Mtg Date	Agenda Items Due (-24 days)	Agenda Distributed & Published (-17days)	First Draft Minutes Distributed (+6 days)	Comments Due for Draft Minutes (+13 days)	Final Draft Minutes Distributed (+21 days)	Approved Minutes Published (+35-42 days)
12/18/08	11/21/08	11/27/08	12/24/08	12/31/08	01/08/09	01/22/09
01/15/09	12/29/08	01/08/09	01/22/09	01/28/09	02/05/09	02/26/09
02/19/09	01/26/09	02/02/09	02/25/09	03/04/09	03/12/09	03/26/09
03/19/09	02/23/09	03/02/09	03/25/09	04/01/09	04/09/09	04/23/09
04/16/09	03/23/09	03/30/09	04/22/09	04/29/09	05/07/09	05/28/09
05/21/09	04/27/09	05/04/09	05/27/09	06/03/09	06/11/09	06/25/09
06/18/09	05/26/09	06/01/09	06/24/09	07/01/09	07/09/09	07/23/09
07/16/09	06/22/09	06/29/09	07/22/09	07/29/09	08/06/09	08/27/09
08/20/09	07/27/09	08/03/09	08/26/09	09/02/09	09/10/09	09/24/09
09/17/09	08/24/09	08/31/09	09/23/09	09/30/09	10/08/09	10/22/09
10/15/09	09/21/09	09/28/09	10/21/09	10/28/09	11/05/09	11/25/09
11/19/09	10/26/09	11/02/09	11/25/09	12/02/09	12/10/09	12/24/09
12/17/09	11/23/09	11/30/09	12/23/09	12/30/09	01/07/10	01/28/10
01/21/10	12/28/09	01/04/10	01/27/10	02/03/10	02/11/10	02/25/10
02/18/10	01/25/10	02/01/10	02/24/10	03/03/10	03/11/10	03/25/10
03/18/10	02/22/10	03/01/10	03/24/10	03/31/10	04/08/10	04/22/10
04/15/10	03/22/10	03/29/10	04/21/10	04/28/10	05/06/10	05/27/10
05/20/10	04/26/10	05/03/10	05/26/10	06/02/10	06/10/10	06/24/10
06/17/10	05/24/10	05/31/10	06/23/10	06/30/10	07/08/10	07/22/10
07/15/10	06/21/10	06/28/10	07/21/10	07/28/10	08/05/10	08/26/10
08/19/10	07/26/10	08/02/10	08/25/10	09/01/10	09/09/10	09/23/10
09/16/10	08/23/10	08/30/10	09/22/10	09/29/10	10/07/10	10/28/10
10/21/10	09/27/10	10/04/10	10/27/10	11/03/10	11/11/10	11/25/10
11/18/10	10/25/10	11/01/10	11/24/10	12/01/10	12/09/10	12/23/10
12/16/10	11/22/10	11/29/10	12/22/10	12/29/10	01/06/11	01/28/11

Note 1: Agenda items must be accompanied by a Proposal sheet and must be submitted to the Division of Construction Management Data Specialist by the Agenda Items Due date for inclusion in the agenda

Note 2: May meetings are the last opportunity for approval of items to be included in September lettings as Recurring Special Provisions

Notes 3: Shaded dates are exceptions to regular schedule