INDIANA DEPARTMENT OF TRANSPORTATION
Driving Indiana's Economic Growth

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Mitchell E. Daniels, Jr., Governor
Michael B. Cline, Commissioner

AGENDA

January 20, 2011 Standards Committee Meeting

MEMORANDUM

January 05, 2011

TO: Standards Committee

FROM: Scott Trammell, Secretary

RE: Agenda for the January 20, 2011 Standards Committee Meeting

A Standards Committee meeting is scheduled for 9:00 a.m. on January 20, 2011 in the 9th Floor Conference Center that is located on the north side of the building near the east elevator bank.

The following agenda items are listed for consideration.

A. GENERAL BUSINESS ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

1. Approval of the December 16, 2010 Minutes

B. CONCEPTUAL PROPOSAL ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

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

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

Item No. 01 01/20/11 (2010 SS)	Mr. Strain	page 21
211.03.1	Structure Backfill Types	
727	*BLANK*	
728	*BLANK*	
729	*BLANK*	
730	*BLANK*	
731	*MECHANICALLY STABILIZED EARTH RETAINING WALLS*	
732	*BLANK*	
733	*STEEL BIN-TYPE RETAINING WALL*	
734	*PERMANENT EARTH RETENTION SYSTEM FOR CUT-WALL APPLICATION*	
735	*TEMPORARY WIRE-FACED MECHANICALLY STABILIZED EARTH RETAINING WALLS*	
901.09	*Air Cooled Blast Furnace Slag for Retaining Walls*	
901.10	*Components of MSE Retaining Walls*	
910.07*	~~*Blank*~~*Steel Components of MSE Retaining Walls*	

(*Changes to the 910.07 ~~Steel Drain Pipe~~*Blank* have been approved by the Standards Committee on March 18, 2010 Meeting)

910.08	~~*Blank*~~*Steel Bin-Type Retaining Wall Units*	
918.05*(c)*	*Type III Geogrid for Modular Block Walls*	

Item No. 02 01/20/11 (2010 SS)	Mr. Pankow	page 56
Recurring Special Provision:		
620-R-483	SOUND BARRIER SYSTEMS	

Item No. 03 01/20/11 (2010 SS)	Mr. Strain	page 82
Recurring Special Provision		
731-R-202	MECHANICALLY STABILIZED EARTH RETAINING WALLS	

Item No. 04 01/20/11 (2010 SS)	Mr. Strain	page 85
Standard Drawings:		
707-BPBF-01	FABRICATION TOLERANCES PRESTRESSED BOX BEAM	
707-BPBF-02	FABRICATION TOLERANCES PRESTRESSED I BEAM	
707-BPBF-03	*FABRICATION TOLERANCES PRESTRESSED BULB-TEE BEAM*	
707-BPBF-~~03~~*04*	FABRICATION TOLERANCES GENERAL NOTES	

Item No. 05 01/20/11 (2010 SS)	Mr. Pankow	page 94
707.01	Description	
707.02	Materials	
707.03	General Requirements	
707.04	Steel and Concrete Requirements	
707.04(a)	Reinforcing Bars	
707.04(b)	Prestressing Strands	
707.04(c)	Concrete	
707.04(c)1	Cold Weather Concrete	
707.04(c)2	Hot Weather Concrete	
707.04(c)3	Acceptance Testing	
707.04(c)3a	*Precast, Non-Prestressed Members*	
707.04(c)3b	*Precast, Prestressed Members*	
707.04(d)	Other Requirements	
707.05	Forms	
707.06	Placing and Finishing Cement Concrete	
707.07	Removal of Forms and Curing	
707.07(a)	*Wet Curing without Supplemental Heat*	
707.07(b)	*Accelerated Curing*	
707.08	Handling and Shipping	
707.09	Placing Structural Members	
707.10	Precast Prestressed Concrete Deck Panels	
707.11	Method of Measurement	
707.12	Basis of Payment	
910.01(b)7	Uncoated 7 Wire Strand ~~for Prestressed Concrete~~	

Item No. 06 01/20/11 (2010 SS)	Mr. Strain	page 112
Standard Drawings:		
601-BAGR-01	~~ROADSIDE BRIDGE APPROACH GUARDRAIL~~	
601-BAGR-02	~~MEDIAN BRIDGE APPROACH GUARDRAIL~~	
601-GRBS-01	*GUARDRAIL AT BRIDGE SUPPORT*	
601-MPPG-01	~~MEDIAN PIER PROTECTION GUARDRAIL~~	
601-MPPG-02	~~MEDIAN PIER PROTECTION GUARDRAIL~~	
601-MPPG-03	~~MEDIAN PIER PROTECTION GUARDRAIL~~	
601-MPPG-04	~~MEDIAN PIER PROTECTION GUARDRAIL~~	
601-RPPG-01	~~ROADSIDE PIER PROTECTION GUARDRAIL~~	
601-RPPG-02	~~ROADSIDE PIER PROTECTION GUARDRAIL~~	
601-RPPG-03	~~ROADSIDE PIER PROTECTION GUARDRAIL~~	
601-RPPG-04	~~ROADSIDE PIER PROTECTION GUARDRAIL~~	
601-RPPG-05	~~ROADSIDE PIER PROTECTION GUARDRAIL~~	
Indiana Design Manual:	*(as BACKUP)*	
49-4.02(01)	Barrier Length Needed in Advance of Hazard for Adjacent Traffic	
49-4.02(04)	Length of Need at Outside-Shoulder Bridge ~~Pier~~*Support*	
49-4E(1)	*Minimum Guardrail Length Required In Advance Of Hazard*	
49-4e(10)	*Guardrail Pay Length Approach To Bridge Support Inside Clear Zone*	
49-4e(2)	*Guardrail Configuration For Outside-Shoulder Approach To Bridge*	

49-4e(3)	*Guardrail Configuration And Length Of Need For Median-Shoulder Approach To Bridge*
49-4e(4)	*Guardrail Configuration For Bridge Support Inside Clear Zone, Two-Way Roadway, Single Overhead Structure*
49-4e(5)	*Guardrail Configuration For Bridge Support Inside Clear Zone, Two-Way Roadway, Twin Overhead Structure*
49-4e(6)	*Guardrail Configuration For Bridge Support Inside Clear Zone, One-Way Roadway, Single Overhead Structure, Outside Shoulder*
49-4e(7)	*Guardrail Configuration For Bridge Support Inside Clear Zone, One-Way Roadway, Twin Overhead Structure, Outside Shoulder*
49-4e(8)	*Guardrail Configuration For Bridge Support Inside Clear Zone, One-Way Roadway, Single Overhead Structure, Median Shoulder*
49-4e(9)	*Guardrail Configuration For Bridge Support Inside Clear Zone, One-Way Roadway, Twin Overhead Structure, Median Shoulder*
49-4k	~~Length-Of-Need Requirement For Pier Protection~~
49-8.01(04)	Design Procedure
49-9.02	Bridge-Railing End Protection
49-9a	~~Bridge-Railing-End Protection~~n ~~Requirements~~

Item No. 07 01/20/11 (2010 SS)	Mr. Strain	page 144
109.04(b)	CRI Formal Proposal Requirements	
109.04(C)	Approval of Formal CRI Proposal	

Item No. 08 01/20/11 (2010 SS)	Mr. Pankow	page 147
702.13(h)	Test Beams	

Item No. 09 01/20/11 (2010 SS)	Mr. Pankow	page 150
206.08	Preparation of Foundation Surfaces	
702.02	Classes of Concrete	
702.13(a)	Construction	
702.28	Basis of Payment	
703.06	Placing and Fastening	

Item No. 10 01/20/11 (2010 SS)	Mr. Walker	page 156
203.09	General Requirements	

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

Mr. Strain
Date: 01/20/11

CONCEPTUAL PROPOSAL 1.

Revisions to the Geometric Design Requirements for 4R and 3R Projects
(Chapter 53 and 55 figures)

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Design Manual Figure 59-1E regards required bridge clear-roadway width for a 4R project. It was developed after Manual Chapter 53's figures' data regarding 4R bridge clear-roadway width were developed. There are contradictions between Figure 59-1E and the Chapter 53 figures. The Chapter 53 figures' data is correct, as it is in accordance with the AASHTO Policy on Geometric Design of Highways and Streets. A similar problem exists for Figure 59-1F regarding a 3R project, and the corresponding Chapter 55 figures regarding 3R work.

PROPOSED SOLUTION: Revise the appropriate Chapter 53 and 55 figures as required to complement what is correct in Chapter 59. Eliminate Figures 59-1E and 59-1F from the Manual. Refer to the appropriate Manual chapters and figures in the Chapter 59 text.

FHWA's Keith Hoernschemeyer has concurred in this proposal, 12-06-10.

APPLICABLE STANDARD SPECIFICATIONS: None

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: Revised Figures 53-2 through 53-9, Figures 55-3A through 55-3H, Section 59-1.01(01); Deleted Figures 59-1E and 59-1F.

A markup of Section 59-1.01(01) is attached herewith. The only marked-up figures attached herewith are 53-2 through 53-5; and 55-3B, 3C, and 3D.

APPLICABLE SECTION OF GIFE: None

Submitted By: Randy Strain

Title: Bridge Policy and Standards Engineer, of
Bridge Design, Inspection, Hydraulics, and Technical Support Division

Organization: INDOT

Phone Number: 232-3339

Date: 12-28-10

The affected figures to be deleted are as follows:

Chapter 59: Structure Type and Size
59-1E Bridge Clear-Roadway Width, New Construction or Reconstruction 4R Project
59-1F Bridge Clear-Roadway Width, 3R Project

The affected figures to be revised are as follows:

Chapter 53: Geometric Design Requirements for 4R Project
53-2 Geometric Design Criteria for Rural Arterial
53-3 Geometric Design Criteria for Rural Collector, State Route
53-4 Geometric Design Criteria for Rural Collector, Local-Agency Route
53-5 Geometric Design Criteria for Rural Local Road
53-6 Geometric Design Criteria for Urban Arterial, Four or More Lanes
53-7 Geometric Design Criteria for Urban Arterial, Two Lanes
53-8 Geometric Design Criteria for Urban Collector
53-9 Geometric Design Criteria for Urban Local Street

Chapter 55: Geometric Design Requirements for 3R Project
55-3A Geometric Design Criteria for Rural Arterial
55-3B Geometric Design Criteria for Rural Collector, State Route
55-3C Geometric Design Criteria for Rural Collector, Local-Agency Route
55-3D Geometric Design Criteria for Rural Local Road
55-3E Geometric Design Criteria for Urban Arterial, Four or More Lanes
55-3F Geometric Design Criteria for Urban Arterial, Two Lanes
55-3G Geometric Design Criteria for Urban Collector
55-3H Geometric Design Criteria for Urban Local Street

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM 59-1.01(01) CROSS-SECTION ELEMENTS

59-1.01(01) Cross-Section Elements

Figures 59-1A, 59-1B, 59-1C, and 59-1D each provide schematics of the bridge cross section for a specific highway type. The following will apply to the bridge cross section.

1. Clear-Roadway Width. ~~Figure 59-1E~~ *Chapter Fifty-three's geometric-design-criteria figure for the appropriate functional classification* provides ~~criteria~~ *this information* for a new or reconstructed bridge within the limits of a 4R project. ~~Figure 59-1F~~ *Chapter Fifty-five's geometric-design-criteria figure for the appropriate functional classification* provides ~~criteria~~ *this information* for a bridge within the limits of a 3R project.

   Where it is permitted to have a bridge clear-roadway width that is narrower than the travel lanes plus the effective-usable-shoulder width on each side, a guardrail transition, collinear with the bridge railing, should be provided. Thereafter, the guardrail should be flared at a 30:1 ratio until the guardrail length satisfies the length-of-need requirement or it intersects the approach guardrail.

   For the median shoulders of a divided facility with two or more lanes in each direction, each bridge should have a 5'-8" median-shoulder width where a concrete shape F or type TF-2 railing is used, or a 6'-0" median-shoulder width where another bridge-railing type is used.

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM FIGURE 59-1E BRIDGE CLEAR-ROADWAY WIDTH (NEW CONSTRUCTION/RECONSTRUCTION/4R PROJECT)

4R

2010

Type of Facility	Urban/Rural	Design-Year AADT	Bridge Clear-Roadway Width (1)
State Highway *	Rural	All	(2) Min. 31'-4"
State Highway *	Urban	All	Uncurbed: (2) Min. 31'-4" Curbed: Full Approach Curb-to-Curb Width
Local Agency Arterial *	Rural	All	(2)
Local Agency Arterial *	Urban	All	Uncurbed: (2) Curbed: Full Approach Curb-to-Curb Width
Local Agency Collector (3)	Rural	AADT < 400	Traveled way + 4 ft (2-ft shoulder on each side)
		400 ≤ AADT < 1500	Traveled way + 6 ft (3-ft shoulder on each side)
		1500 ≤ AADT < 2000	Traveled way + 8 ft (4-ft shoulder on each side)
		AADT ≥ 2000	(2)
Local Agency Collector (4) *	Urban	All	Uncurbed: (2) Curbed: Full Approach Curb-to-Curb Width
Local Agency Local Road (5)	Rural	< 400	Traveled way + 4 ft (2-ft shoulder on each side)
		400 ≤ AADT < 2000	Traveled way + 6 ft (3-ft shoulder on each side)
		AADT ≥ 2000	(2)
Local Agency Local Street (4)	Urban	--	Uncurbed: Same as local rural road
		All	Curbed: Full Approach Curb-to-Curb Width

ELIMINATE THIS FIGURE. REFER INSTEAD TO THOSE IN CHAP 53.

SHOWN IN FIG 53-4, BUT THEY DO NOT ADDRESS BRIDGE-RAILING OFFSET.

SHOWN IN FIG. 53-5, BUT THEY DO NOT ADDRESS BRIDGE-RAILING OFFSET.

BRIDGE CLEAR-ROADWAY WIDTH
(New Construction / Reconstruction / 4R Project)

Figure 59-1E

* NO SUCH FUNCTIONAL CLASSIFICATION SHOWN IN CHAP 53 GEOMETRIC-DESIGN-CRITERIA FIGURES.

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM FIGURE 59-1E BRIDGE CLEAR-ROADWAY WIDTH (NEW CONSTRUCTION/RECONSTRUCTION/4R PROJECT)(CONTINUED)

4R

Notes:

ELIMINATE NOTE, AS FIGURE IS BEING ELIMINATED.

(1) *The values shown in the table is the minimum. The value accommodating the shy-line offset per Figure 49-4E is desirable.*

MOVE TO GUARDRAIL EACH CHAP 53 FIGURES BRIDGE-WIDTH NOTE.

(2) *Bridge Clear-Roadway Width. The bridge clear-roadway width is the sum of the following:*

(a) *the approach traveled way width;*

(b) *the approach effective usable-shoulder widths without guardrail; and*

(c) *bridge-railing offsets (see Figure 59-1G).*

The effective-usable-shoulder width is equal to the usable-shoulder width minus 1 ft.

MOVE TO 59-1.01(01) ITEM; TEXT.

Where it is permitted to have a bridge clear-roadway width that is narrower than the travel lanes plus the effective-usable-shoulder width on each side, a guardrail transition, collinear with the bridge railing, should be provided. Thereafter, the guardrail should be flared at a 30:1 ratio until the guardrail length satisfies the length-of-need requirement or it intersects the approach guardrail.

For the median shoulders of a divided facility with two or more lanes in each direction, each bridge will have a 5'-8" median-shoulder width where a concrete shape F or type TF-2 railing is used, or a 6'-0" median-shoulder width where another bridge-railing type is used.

NOT REQ'D PER CH 53.

NOW IN FIG 53-4 NOTE 13 AS MARKED UP HERE.

(3) *Local-Agency Rural Collector Road. The following will apply:*

(a) *These criteria are required for a Federal-aid project.*

(b) *Where the approach roadway width is surfaced (traveled way plus shoulders), such surfaced width will be carried across the structure.*

(c) *The width of each bridge of more than 100 ft length will be analyzed individually. At a minimum, the clear-roadway width of such a bridge will be the width of the traveled way plus a 3-ft shoulder on each side where the AADT > ~~3000~~ 400.*

NOT IN FIG. 53-4 NOTES.

(4) *Local-Agency Urban Street. These criteria are required for a Federal-aid project.*

(5) *Rural Local Road. The following will apply:*

NOT REQ'D PER CH 53

(a) *These criteria are required for a Federal-aid project.*

NOW IN FIG 53-5 NOTE 10 AS MARKED UP, HERE.

(b) *The width of each bridge of more than 100 ft length will be analyzed individually. At a minimum, the clear-roadway width of such a bridge will be the width of the traveled way plus a 2-ft shoulder on each side where the AADT > ~~400~~ 2000.*

Where shoulders are provided, it is desirable to provide (3) full clear-roadway width.

BRIDGE CLEAR-ROADWAY WIDTH
(New Construction / Reconstruction / 4R Project)

Figure 59-1E (Continued)

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM FIGURE 59-1F BRIDGE CLEAR-ROADWAY WIDTH (3R PROJECT)

3R

Type of Facility	Urban/Rural	Design-Year AADT	Bridge Clear-Roadway Width (1)
State Highway *	Rural	All	(2) Minimum 31'-4"
State Highway *	Urban	All	Uncurbed: (2) Minimum 31'-4" Curbed: Full Approach Curb-to-Curb Width
Local Agency * Arterial	Rural	All	(2)
Local Agency * Arterial	Urban	All	Uncurbed: (2) Curbed: Full Approach Curb-to-Curb Width
Local Agency Collector (3)	Rural	AADT < 400	Traveled way + 4 ft (2-ft shoulder on each side)
		400 ≤ AADT < 3000	Traveled way + 6 ft (3-ft shoulder on each side)
		3000 ≤ AADT < 5000	Traveled way + 8 ft (4-ft shoulder on each side)
		AADT ≥ 5000	(2)
Local Agency Collector (4) *	Urban	All	Uncurbed: (2) Curbed: Full Approach Curb-to-Curb Width
Local Agency Local Road (5)	Rural	AADT < 400	Traveled way + 4 ft (2-ft shoulder on each side)
		400 ≤ AADT < 5000	Traveled way + 6 ft (3-ft shoulder on each side)
		AADT ≥ 5000	(2)
Local Agency Local Street (4)	Urban	--	Uncurbed: Same as local rural road
		All	Curbed: Full Approach Curb-to-Curb Width

ELIMINATE THIS FIGURE, REFER INSTEAD TO THOSE IN CHAP 55.

SHOWN IN FIG 55-3C, BUT DO NOT ADDRESS BRIDGE-RAILING OFFSET.

SHOWN IN FIG 55-3D, BUT DO NOT ADDRESS BRIDGE-RAILING OFFSET.

BRIDGE CLEAR-ROADWAY WIDTH
(3R Project)

Figure 59-1F

* NO SUCH FUNCTIONAL CLASSIFICATION SHOWN IN CHAP 55 GEOMETRIC-DESIGN-CRITERIA FIGURES.

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM FIGURE 59-1F BRIDGE CLEAR-ROADWAY WIDTH (3R PROJECT)(CONTINUED)

3R

2010

Notes:

ELIMINATE NOTE, AS FIGURE IS BEING ELIMINATED

(1) *The values given in this table are minimums. The values accommodating shy-line offsets per Figure 49-5F are desirable.*

MOVE TO EACH CHAP 55 FIGURES BRIDGE-WIDTH NOTE.

(2) *Bridge Clear-Roadway Width. The bridge clear-roadway width is the sum of the following:*

- *a. the approach traveled-way width;*
- *b. the approach effective usable-shoulder width without guardrail; and*
- *c. a bridge-railing offset (see Figure 59-1G).*

The effective-usable-shoulder width is equal to the usable-shoulder width minus 1 ft.

MOVE TO 59-1.01(01) ITEM 1 TEXT.

Where it is permitted to have a bridge clear-roadway width that is narrower than the travel lanes plus the effective-usable-shoulder width on each side, a guardrail transition, collinear with the bridge railing, should be provided. Thereafter, the guardrail should be flared at a 30:1 ratio until the guardrail length satisfies the length-of-need requirement or it intersects the approach guardrail.

For the median shoulders of a divided facility with two or more lanes in each direction, each bridge will have a 5'-8" median-shoulder width where a concrete shape F or type TF-2 railing is used, or a 6'-0" median-shoulder width where another bridge-railing type is used.

NOT REQ'D PER CH 55.

NOW IN FIG 55-3C NOTE 9.

(3) *Local Agency Rural Collector Road. The following will apply:*

- *a. ~~These criteria are required for a Federal-aid project.~~*
- *b. Where the approach roadway width is surfaced (traveled way plus shoulders), that surfaced width will be carried across the structure.*
- *c. The width of each bridge of more than 100 ft length will be analyzed individually. At a minimum, the clear-roadway width of such a bridge will be the width of the traveled way plus a 3-ft shoulder on each side where the AADT > 3000.*

NOT IN FIG 55-3H NOTES.

(4) *Local Agency Urban Street. These criteria are required for a Federal-aid project.*

(5) *Rural Local Road. The following will apply:*

NOT REQ'D PER CH 55.

- *a. ~~These criteria are required for a Federal-aid project.~~*
- *b. The width of each bridge of more than 100 ft length will be analyzed individually. At a minimum, the clear-roadway width of such a bridge will be the width of the traveled way plus a 2-ft shoulder on each side ~~where the AADT > 400.~~*

Where shoulders are paved, it is desirable to provide full approach-roadway width across bridge.

NOW IN FIG 55-3D NOTE 9 AS MARKED UP HERE.

BRIDGE CLEAR-ROADWAY WIDTH
(3R Project)

Figure 59-1F (Continued)

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM, GEOMETRIC DESIGN CRITERIA FOR RURAL ARTERIAL, FOOTNOTES TO FIGURE 53-2

GEOMETRIC DESIGN CRITERIA FOR RURAL ARTERIAL
(New Construction or Reconstruction)
Footnotes to Figure 53-2 (continued)

(9) Side Slope. Value is for new construction. See Sections 45-3.0 and 45-8.0 for more information. For a reconstruction project, see Section 49-3.0.

(10) Foreslope. See Sections 49-2.0 and 49-3.0 for the lateral extent of the foreslope in a ditch section.

(11) Ditch Width. A V-ditch should be used in a rock cut. See Section 45-8.0.

(12) Backslope. The backslope for a rock cut will vary according to the height of the cut and the geotechnical requirements. See Section 45-8.0 for typical rock-cut sections.

(13) Structural Capacity (New or Reconstructed Bridge). The following will apply.
- a. HS-25 loading with Alternate Military Loading should be applied for each project with notice to proceed with design beginning September 1, 2004, through December 31, 2005.
- b. A State-highway bridge within 15 mi of a Toll-Road gate must be designed for Toll-Road loading.
- c. A bridge on an Extra-Heavy-Duty Highway must be designed for the Michigan Train truck-loading configuration.
- d. See Chapter Sixty for additional information on the loading configurations.

MAKE THIS CORR. TO ALL 53-_FIG'S

(14) ~~Width~~ Bridge Roadway Width (New or Reconstructed Bridge). See Section 59-1.0 for more information on bridge width.

(15) Vertical Clearance (Arterial Under). Value includes an additional 6-in. allowance for future pavement overlays. Vertical clearance applies from usable edge to usable edge of shoulders.

(16) Vertical Clearance (Arterial Over Railroad). See Chapter Sixty-nine for additional information on railroad clearance under a highway.

(17) Superelevation Rate. See Section 43-3.0 for value of superelevation rate based on design speed and radius.

(18) Horizontal Sight Distance. For a given design speed, the necessary middle ordinate will be determined by the radius and the sight distance which applies at the site. Sometimes, the stopping-sight-distance value for a truck will apply. See the discussion in Section 43-4.0.

(19) Maximum Grade. A grade of 1% or steeper may be used for a downgrade on a one-way roadway.

(20) Intersection Sight Distance. For a left turn onto a 2-lane road: P = Passenger car; SUT = single unit truck. See Figure 46-10G for value for a combination truck.

C 1.01 (01) item 1 ← on bridge clear-roadway width.

Bridge Clear-Roadway Width. The bridge clear-roadway width is the algebraic *sum of the following:*
- *(a) the approach traveled way width;*
- *(b) the approach effective usable-shoulder widths without guardrail; and*
- *(c) bridge-railing offsets (see Figure 59-1G).*

PLACE WHERE APPROPRIATE IN ALL CH. 53-_FIGURES.

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM, GEOMETRIC DESIGN CRITERIA FOR RURAL COLLECTOR, STATE ROUTE, FOOTNOTES TO FIGURE 53-3

GEOMETRIC DESIGN CRITERIA FOR RURAL COLLECTOR, STATE ROUTE
(New Construction or Reconstruction)

Footnotes to Figure 53-3 (continued)

(12) Structural Capacity (New or Reconstructed Bridge). The following will apply.
- a. HS-25 loading with Alternate Military Loading should be applied for each project with notice to proceed with design beginning September 1, 2004, through December 31, 2005.
- b. A State highway bridge within 15 mi of a Toll-Road gate must be designed for Toll-Road loading.
- c. A bridge on an Extra-Heavy-Duty Highway must be designed for the Michigan Train truck-loading configuration.
- d. See Chapter Sixty for additional information on the loading configurations.

(13) Width (New or Reconstructed Bridge). Minimum clear-roadway width is 30 ft. See Section 59-1.0 for more information on bridge width. hss-clr-rdwy-width sum note (1.01 (01) item 1 clear-roadway

(14) Width (Existing Bridge to Remain in Place). Clear width will be at least equal to the approach traveled way width or the table value, whichever is greater.

(15) Vertical Clearance (Collector Under). Value includes an additional 6-in. allowance for future pavement overlays. Vertical clearance applies from usable edge to usable edge of shoulders.

(16) Vertical Clearance (Collector Over Railroad). See Chapter Sixty-nine for additional information on railroad clearance under a highway.

(17) Superelevation Rate. See Section 43-3.0 for value of superelevation rate based on design speed and radius.

(18) Horizontal Sight Distance. For a given design speed, the necessary middle ordinate will be determined by the radius and the sight distance which applies at the site. See Section 43-4.0.

(19) Maximum Grade. For a grade along a longitudinal distance of less than 480 ft (PVT to PVC), a one-way downgrade, or a road with AADT < 400, the maximum grade may be up to 2% steeper than the table value.

(20) Use 12 ft if V = 55 mph.

(21) Intersection Sight Distance. For a left turn onto a 2-lane roadway. P = Passenger car; SUT = single unit truck. See Figure 46-10G for values for a combination truck.

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM, GEOMETRIC DESIGN CRITERIA FOR RURAL COLLECTOR, LOCAL-AGENCY ROUTE, FOOTNOTES TO FIGURE 53-4

GEOMETRIC DESIGN CRITERIA FOR RURAL COLLECTOR, LOCAL-AGENCY ROUTE
(New Construction or Reconstruction)

Footnotes to Figure 53-4 (continued)

(11A) Structural Capacity (New or Reconstructed Bridge). HS-25 loading with Alternate Military Loading should be applied for each project with notice to proceed with design beginning September 1, 2004, through December 31, 2005.

(12) Width (New or Reconstructed Bridge). The following will apply.

a. Where the approach roadway width (travelway plus shoulders) is surfaced, the surfaced width will be carried across the structure.

b. Each bridge longer than 100 ft will be analyzed individually. At a minimum, the roadway width will be the width of travel lanes plus a 3-ft right shoulder and a 3-ft left shoulder for AADT > 400.

c. See Section 59-1.0 for more information on bridge widths.

(13) Width (Existing Bridge to Remain in Place). Clear width will be at least equal to the approach traveled way width or the table value, whichever is greater. For a bridge longer than 100 ft, the value does not apply. The acceptability of such a bridge will be assessed individually.

(14) Vertical Clearance (Collector Under). Value includes an additional 6-in. allowance for future pavement overlays. Vertical clearance applies from usable edge to usable edge of shoulders.

(15) Vertical Clearance (Collector Over Railroad). See Chapter Sixty-nine for additional information on railroad clearance under a highway.

(16) Superelevation Rate. See Section 43-3.0 for value of superelevation rate based on design speed and radius.

(17) Horizontal Sight Distance. For a given design speed, the necessary middle ordinate will be determined by the radius and the sight distance which applies at the site. See Section 43-4.0.

(18) Maximum Grade. For a grade along a longitudinal distance of less than 480 ft (PVT to PVC), a one-way downgrade, or a road with AADT < 400, the maximum grade may be up to 2% steeper than the table value.

(19) Intersection Sight Distance. For a left turn onto a 2-lane roadway: P = Passenger car; SUT = single unit truck. See Figure 46-10G for value for a combination truck.

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM, GEOMETRIC DESIGN CRITERIA FOR RURAL LOCAL ROAD, FOOTNOTES TO FIGURE 53-5

GEOMETRIC DESIGN CRITERIA FOR RURAL LOCAL ROAD
(New Construction or Reconstruction)

FIG 59-1E NOTE 5 b

Footnotes to Figure 53-5 (continued)

(10) Width (New or Reconstructed Bridge). A bridge longer than 100 ft will be analyzed individually. At a minimum, the roadway width will be the width of travel lanes plus a 3-ft right shoulder and a 3-ft left shoulder for AADT > 2000. Where shoulders are paved, it is desirable to provide the full approach-roadway width. See Section 59-1.0 for more information on bridge width.

(1.01 (01) item 1 clear-roadway

(11) Width (Existing Bridge to Remain in Place). Minimum roadway width of 2 ft narrower than the value may be used on a road with few trucks. The clear-roadway width should be at least the same width as the approach travelway. For a one-lane bridge, the width may be 18 ft. For a bridge longer than 100 ft, the value does not apply. The acceptability of each such bridge will be assessed individually.

(12) Vertical Clearance (Local Road Under). Value includes an additional 6-in. allowance for future pavement overlays. Vertical clearance applies from usable edge to usable edge of shoulders.

(13) Vertical Clearance (Local Road Over Railroad). See Chapter Sixty-nine for additional information on railroad clearance under highway.

(14) Superelevation Rate. See Section 43-3.0 for value of superelevation rate based on design speed and radius.

(15) Horizontal Sight Distance. For a given design speed, the necessary middle ordinate will be determined by the radius and the sight distance which applies at the site. See Section 43-4.0.

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM, GEOMETRIC DESIGN CRITERIA FOR RURAL ARTERIAL, 3R PROJECT FOOTNOTES TO FIGURE 53-3A

GEOMETRIC DESIGN CRITERIA FOR RURAL ARTERIAL, 3R PROJECT

Footnotes to Figure 55-3A (Continued)

(8) Structural Capacity (New or Reconstructed Bridge). The following will apply:

a. HS-25 loading with Alternate Military Loading should be applied for each project with notice to proceed with design beginning September 1, 2004, through December 31, 2005.
b. Each State highway bridge within 15 mi of a Toll-Road gate must be designed for Toll-Road loading.
c. Each bridge on an Extra-Heavy-Duty Highway must be designed for the Michigan Train truck loading configuration.
d. See Chapter Sixty for additional information on the loading configurations.

(9) Width (New or Reconstructed Bridge). Width is the minimum for a 3R project. See Section 59-1.0 for additional information on bridge width. On a State highway, the minimum clear roadway width should be 30 ft.

(10) Vertical Clearance (Arterial Under). Value includes an additional 6-in. allowance for a future pavement overlay. Vertical clearance applies from usable edge to usable edge of shoulders.

(11) Vertical Clearance (Existing Bridge). See Section 55-6.02 for additional information on minimum allowable vertical clearance.

(12) Vertical Clearance (Arterial Over Railroad). See Chapter Sixty-nine for additional information on railroad clearance under a highway.

(13) Maximum Grade. A grade that is 1% steeper may be used for a one-way downgrade.

(14) Intersection Sight Distance. For left turn onto a 2-lane road. P = Passenger car; SUT = single unit truck. See Figure 46-10G for value for a combination truck.

Bridge Clear-Roadway Width. The bridge clear-roadway width is the sum of the following:
a. the approach traveled-way width;
b. the approach effective usable-shoulder width without guardrail; and
c. a bridge-railing offset (see Figure 59-1G).

algebraic

PLACE WHERE APPROPRIATE IN ALL CH. 55-3_ FIGURES

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM, GEOMETRIC DESIGN CRITERIA FOR RURAL COLLECTOR, STATE ROUTE, 3R PROJECT, FOOTNOTES TO FIGURE 53-3B

GEOMETRIC DESIGN CRITERIA FOR RURAL COLLECTOR, STATE ROUTE, 3R PROJECT

Footnotes to Figure 55-3B (Continued)

(9) Structural Capacity (New or Reconstructed Bridge). The following will apply:

a. HS-25 loading with Alternate Military Loading should be applied for each project with notice to proceed with design beginning September 1, 2004, through December 31, 2005.
b. Each State highway bridge within 15 mi of a Toll-Road gate must be designed for Toll-Road Loading.
c. Each bridge on an Extra-Heavy-Duty Highway must be designed for the Michigan Train truck loading configuration.
d. See Chapter Sixty for additional information on the loading configurations.

(10) Width (New or Reconstructed Bridge). Width is the minimum for a 3R project. See Section 59-1.0 for additional inform ation on bridge width. The minimum clear-roadway width should be 30 ft.

clear-roadway SR-CL-ROWY-WIDTH SUM NOTE

1.01 (01) item 1

(11) Width (Existing Bridge to Rem ain in Place). Clear width will be at least equal to the approach traveled way width or the value, whichever is greater.

(12) Vertical Clearance (Collector Under). Value includes an additional 6-in. allowan ce for a future pavem ent overlay. Vertical clearance applies from usable edge to usable edge of shoulders.

(13) Vertical Clearance (Existing Bridge). See Section 55-6.02 for additional inform ation on m inimum allowable vertical clearance.

(14) Vertical Clearance (Collector Over Railroad). See Chapter Sixty-nine for additiona l information on railroad clearance under a highway.

(15) Maximum Grade. For a grade less than 500 ft in length (PVT to PVC) , the maximum grade may be up to 2% steeper than the value. For a road with AADT < 400, the maximum grade may also be 2% steeper.

(16) Intersection Sight Distance. For left turn onto a 2-lane road, P = Passenger car; SUT = single unit truck. See Figure 46-10G for value for combination truck.

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM, GEOMETRIC DESIGN CRITERIA FOR RURAL COLLECTOR, LOCAL-AGENCY ROUTE, FOOTNOTES TO FIGURE 53-3C

GEOMETRIC DESIGN CRITERIA FOR RURAL COLLECTOR, LOCAL-AGENCY ROUTE, 3R PROJECT

Footnotes to Figure 55-3C (Continued)

(8A) Structural Capacity (New or Reconstructed Bridge). HS-25 loading with Alternate Military Loading should be applied for each project with notice to proceed with design beginning September 1, 2004, through December 31, 2005. A bridge with an ADTT less than or equal to 1,000 may be designed for HS 25 or HS 20, whichever the LPA elects.

(9) Width (New or Reconstructed Bridge). The following will apply:

a. Where the approach roadway width (travelway plus shoulders) is surfaced, such surfaced width should be carried across each structure.

b. The width of each bridge of more than 100 ft in length will be analyzed individually. At a minimum, the roadway width of such a bridge should be the width of travel lanes plus a 3-ft right shoulder and 3-ft left shoulder.

c. See Section 59-1.0 for more information on bridge width.

RIG. 55-3C NOTE 3

(1.01(01) ITEM 1 (clear-roadway

MAKE THIS CORR IN ALL 55-3_ RIGS.

(10) Structural Capacity (Existing Bridge to Remain in Place). If the AADT ≤ 50, an HS-10 loading is acceptable.

(11) Width (Existing Bridge to Remain in Place). Clear-roadway width should be at least equal to the approach traveled way width or the value, whichever is greater. For a bridge of more than 100 ft in length, the value does not apply. The acceptability of such a bridge will be assessed individually.

(12) Vertical Clearance (Collector Under). Value includes an additional 6-in. allowance for a future pavement overlay. Vertical clearance applies from usable edge to usable edge of shoulders.

(13) Vertical Clearance (Collector Over Railroad). See Chapter Sixty-nine for additional information on railroad clearance under a highway.

(14) Maximum Grade. For a grade of less than 500 ft in length (PVT to PVC), the maximum grade may be 2% steeper than the value. For a road with AADT < 400, the maximum grade may also be 2% steeper.

(15) Intersection Sight Distance. For left turn onto a 2-lane road, P = Passenger car; SUT = single unit truck. See Figure 46-10G for value for a combination truck.

CONCEPTUAL PROPOSAL 1.

BACKUP: IDM, GEOMETRIC DESIGN CRITERIA FOR RURAL LOCAL ROAD, 3R PROJECT, FOOTNOTES TO FIGURE 53-3D

GEOMETRIC DESIGN CRITERIA FOR RURAL LOCAL ROAD, 3R PROJECT

Footnotes to Figure 55-3D (Continued)

(8A) Structural Capacity (New or Reconstructed Bridge). HS-25 loading with Alternate Military Loading should be applied for each project with notice to proceed with design beginning September 1, 2004, through December 31, 2005. A bridge with an ADTT less than or equal to 1,000 may be designed for HS 25 or HS 20, whichever the LPA elects.

FIG. 55-3D NOTE 9

(9) Width (New or Reconstructed Bridge). The width of a bridge of more than 100 ft in length should be analyzed individually. At a minimum, the roadway width of such a bridge will be the width of travel lanes plus a 2-ft right shoulder and 2-ft left shoulder. Where shoulders are paved, it is desirable to provide the full roadway width across the bridge. See Section 59-1.0 for more information on bridge width.

(1.01(01) item 1 clear-roadway

(10) Structural Capacity (Existing Bridge to Remain in Place). If the AADT ≤ 50, an HS-10 loading is acceptable.

(11) Width (Existing Bridge to Remain in Place). A minimum clear-roadway width that is 2 ft narrower than that shown may be used on a road with few trucks. The clear-roadway width should be at least the same width as the approach travelway. For a one-lane bridge, the width may be 18 ft. For a bridge of more than 100 ft in length, the value does not apply. The acceptability of such a bridge will be assessed individually.

(12) Vertical Clearance (Local Under). Value includes an additional 6-in. allowance for a future pavement overlay. Vertical clearance applies from usable edge to usable edge of shoulders.

(13) Vertical Clearance (Local Over Railroad). See Chapter Sixty-nine for additional information on railroad clearance under a highway.

(14) Intersection Sight Distance. For left turn onto a 2-lane road, P = Passenger car; SUT = single unit truck. See Figure 46-10G for value for a combination truck.

SPECIFICATION REVISIONS

REVISIONS TO THE STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Desire to include the longstanding retaining wall recurring special provisions for mechanically stabilized earth retaining walls, steel bin walls, and cut walls in the 2012 spec book.

PROPOSED SOLUTION: Incorporate the retaining wall RSPs in the 2012 spec book and discontinue the respective RSPs. These include provisions for mechanically stabilized earth retaining walls, steel bin walls, cut walls, and temporary wire-faced walls.

APPLICABLE STANDARD SPECIFICATIONS: 211.03.1, 731, 733, 734, 735, 901.09, 901.10, 910.07, 910.08, 918.05.

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: 731-R-202, 732-R-433, 734-R-566

PAY ITEM(S) AFFECTED: Yes (to revise).

Submitted By: Randy Strain

Title: Bridge Policy and Standards Engineer,
Bridge Design, Inspection, Hydraulics, and Technical Support Division.

Organization: INDOT

Phone Number: 2-3339

Date: December 14, 2010

APPLICABLE SUB-COMMITTEE ENDORSEMENT? INDOT Retaining Wall Committee

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 211 – B BORROW AND STRUCTURE BACKFILL
211.03.1 STRUCTURE BACKFILL TYPES

Note: Changes that are shown highlighted in gray have been approved by the Standards Committee on December 17, 2009 Meeting.
Proposed changes shown as: addition - in italics and deletion – as strikethrough.

The Standard Specifications are revised as follows:

SECTION 211, BEGIN LINE 112, INSERT AS FOLLOWS:

(c) Type 3

~~1.~~ *This shall consist of* structure backfill in accordance with 904.05, except only nominal size aggregates 1 in., 1/2 in., No. 4 or No. 30, or coarse aggregate No. 5, No. 8, No. 9, No. 11, or No. 12 shall be used. No slag other than ACBF will be permitted.

A type A certification in accordance with 916 for the additional structure backfill testing described below shall be furnished to the Engineer prior to use. An approved geotechnical laboratory shall be used to perform the tests. One copy of all test results shall also be furnished to the Department's Office of Geotechnical Services.

Structure backfill for all retaining walls shall be in accordance with the following criteria:

Property	*Criteria*	*Test Method*
pH	*5 < pH < 10*	*AASHTO T 289*
Organic Content	*1% max.*	*AASHTO T 267*
Resistivity, min.	*3000 Ω · cm*	*AASHTO T 288*
Permeability, min.	*30 ft/day (9 m/day)*	*AASHTO T 215*

The gradation shall be run on the material used in the permeability test. Testing for permeability shall be performed on the portion that passes the No. 8 (2.36 mm) sieve, using a sample of the material compacted to 95% in accordance with AASHTO T 99, Method C or D. All of the tests listed above shall be run a minimum of once per 2 calendar years per source.

In addition to the criteria above, structure backfill for use in MSE, steel bin-type, cut-wall, and temporary wire-faced retaining wall systems shall also be in accordance with the following criteria:

Property	*Criteria*	*Test Method*
Chlorides	*< 100 ppm*	*AASHTO T 291*
Sulfates	*< 200 ppm*	*AASHTO T 290*
Resistivity	*3000 Ω · cm (min.)*	*AASHTO T 288*

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 211 – B BORROW AND STRUCTURE BACKFILL
211.03.1 STRUCTURE BACKFILL TYPES

If the minimum resistivity exceeds 5000 Ω· cm, the requirement for the testing of chlorides and sulfates may be waived. The resistivity shall be tested at 100% saturation. All of the tests listed above shall be run a minimum of once per 2 calendar years per source.

For MSE, concrete block, or wire-faced retaining walls, testing for the internal friction angle, φ, shall be performed on the portion that passes the No. 8 (2.36 mm) sieve, using a sample of the material compacted to 95% in accordance with AASHTO T 99, Method C or D. The φ of the structure backfill in the wall volume shall not be less than 34° in accordance with AASHTO T 236 or AASHTO T 297 under consolidated drained conditions. Testing for φ is not required if 80% of the materials do not pass the No. 4 (4.75 mm) sieve.

(d) Type 4

~~1.~~ *R~~r~~*emovable flowable backfill in accordance with 213.

(e) Type 5

~~1.~~ *N~~n~~*on-removable flowable backfill in accordance with 213.

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 727 – BLANK
SECTION 728 – BLANK
SECTION 729 – BLANK
SECTION 730 – BLANK
SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

The Standard Specifications are revised as follows:

SECTION 726, AFTER LINE 62, INSERT AS FOLLOWS:

SECTION 727 – BLANK

SECTION 728 – BLANK

SECTION 729 – BLANK

SECTION 730 – BLANK

SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

731.01 Description

This work shall consist of the design, furnishing materials, and placement of MSE retaining walls in accordance 105.03.

731.02 General Design Requirements

An MSE retaining wall shall consist of a non-structural concrete leveling pad, concrete face panels, precast or cast-in-place concrete coping, ground reinforcement elements mechanically connected to each panel, a drainage system if required, and accommodations for appurtenances behind, in front of, under, mounted upon, or passing through the wall. Ground reinforcement shall have sufficient strength, frictional resistance, and quantity as required by design.

The MSE retaining wall system shall be selected from the Department's list of approved retaining wall systems. A retaining wall system manufacturer will be considered for inclusion on the Department's list by following ITM 806, Procedure J. The quantities shown in the Schedule of Pay Items will be the same for each MSE retaining wall system. The MSE retaining wall panels shall be constructed as shown on the panels' working drawings, based on the requirements 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 design of the wall.

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 727 – BLANK
SECTION 728 – BLANK
SECTION 729 – BLANK
SECTION 730 – BLANK
SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

The wall design shall follow the general dimensions of the wall envelope shown on the plans. The working drawings shall show the location of the concrete leveling pad to be at or below the theoretical leveling pad elevation shown on the plans. The top of each face panel shall be at or above the panel elevation shown on the plans.

Where a 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 shown. Cast-in-place concrete will not be an acceptable replacement for panel areas indicated by the wall envelope.

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

Face panels shall be designed to accommodate a differential settlement of 1 linear unit in 100. Face panels of area greater than 32 sq ft (3 m^2) through 64 sq ft (6 m^2) 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 1 typical face panel shape and architectural finish shall be used per contract.

731.03 Design Criteria

The internal stability shall be the responsibility of the Contractor. The design by the Engineer will consider the external stability of the wall mass including the applied bearing pressure, overturning, sliding, and stability of temporary construction slopes. The design for internal stability shall be in accordance with the AASHTO LRFD Bridge Design Specifications.

(a) Geotechnical Considerations

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, crashwall, or slope surcharge, shall be accounted for in the design. The sizes of all structural elements shall be determined such that the design load stresses do not exceed the factored stresses shown in the AASHTO LRFD Bridge Design Specifications.

The φ angle for the internal design of the reinforced backfill shall be assumed to be 34°. The φ angle of the backfill behind the reinforced portion of the MSE volume shall be assumed to be 30°. The φ angle for the internal design of the foundation soils shall be assumed to be 30°. For the external design parameters, such as but not limited to, bearing capacity, sliding, overturning, eccentricity, and global stability, the actual soil strength parameters used shall be obtained from the geotechnical report.

SECTION 727 – BLANK
SECTION 728 – BLANK
SECTION 729 – BLANK
SECTION 730 – BLANK
SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

(b) Height of Wall

The wall limits 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 wall with a level surcharge, 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 where a coping or barrier is not used. For a wall with a sloping surcharge, the top of the wall shall be measured at a point that is 0.3H back from the face where the design height is H and the actual wall height is H. For an abutment face, H shall be defined as the height measured from the top of the leveling pad to the top of the roadway surface.

(c) Ground Reinforcement

The ground reinforcement length shall be the controlling length resulting from the internal or external design. The ground reinforcement shall be the same length from the bottom to the top of each wall section regardless of the type of ground reinforcement used. Differing ground reinforcement elements shall be marked for ease of construction. This element may be used individually or in a prefabricated grouping.

The ground reinforcement for the MSE volume shall be sized using the lesser of the factored loads for each specific connection and each specific reinforcing element. The connection's applied factored load and effective pullout length shall be determined in accordance with the AASHTO LRFD Bridge Design Specifications.

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 4 mils (90 µm) for purpose of calculation of reduced structural section.

The factored applied bearing pressures under the stabilized mass for each reinforcement unit's length shall be shown on the working drawings. It shall not exceed the maximum factored soil bearing resistance shown on the plans. Passive pressure in front of the wall mass shall be assumed to be zero for design purposes.

731.04 Submittals

The Contractor shall submit working drawings and design calculations in accordance with 105.02. Wall construction operations shall not begin until the Contractor receives written notice that the working drawings are approved.

(a) The working drawings shall include all details, dimensions, quantities and cross sections necessary to construct the wall. They shall include, but shall not be limited to, the following:

1. Plan and elevation sheets.

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 727 – BLANK
SECTION 728 – BLANK
SECTION 729 – BLANK
SECTION 730 – BLANK
SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

2. 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 reinforcement units in areas where piling, utility, or other structures are near the wall.

3. An elevation view of the wall which shall include the following:

a. 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.

b. All steps in the leveling pad.

c. The designation as to the type of wall unit.

d. The length of ground reinforcement units.

4. All general notes required for constructing the wall.

(b) Panel details shall show all dimensions necessary to construct the element, all reinforcement in the element, and the location of ground reinforcement connection devices embedded in the panels.

(c) Details for construction of the wall around drainage facilities and the outletting of internal drainage from the MSE volume.

(d) Details of the architectural treatment.

(e) Details for diverting ground reinforcement around obstructions such as piles, catch basins, or utilities.

(f) Details for the connections between the concrete panel and the ground reinforcement.

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

MATERIALS

731.05 Materials
Materials shall be in accordance with the following:

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 727 – BLANK
SECTION 728 – BLANK
SECTION 729 – BLANK
SECTION 730 – BLANK
SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

Admixtures for Concrete *912.03*
Air Cooled Blast Furnace Slag *901.09*
Alignment Pins ..... *910.07(d)*
B Borrow *211.02*
Coarse Aggregate, Class A or Higher, Size No. 8 or 91 ..... *904*
Components of MSE Retaining Walls *901.10*
Concrete, Class A or Class C *702*
Fine Aggregate, Size No. 23 ..... *904*
Fly Ash *901.02*
Geogrid *918.05*
Joint Spacers and Joint Covering ..... *901.10(b)*
Portland Cement ..... *901.01(b)*
Rapid Setting Patch Materials *901.07*
Reinforcing Bars *910.01*
Steel Components *910.07*
Steel Welded Wire Reinforcement, Smooth and Deformed ..... *910.01(b)*
Structure Backfill *211.03.1, 904.05*
Water *913.01*

In the reinforced area of the MSE volume, backfill material shall be structure backfill, type 3, in accordance with 211 except that nominal size aggregate No. 30 shall not be used. The size of structure backfill selected for use in the reinforced area of the MSE volume shall remain the same for that wall volume.

Concrete for the leveling pad and coping shall be class A. Concrete used in openings to accommodate appurtenances behind, in front of, under, mounted upon, or passing through the wall shall be class C.

The Contractor shall supply the MSE retaining wall components listed above, including tie strips, fasteners, bearing pads, and all necessary incidentals, through a manufacturer listed on the Department's list of approved retaining wall systems.

CONSTRUCTION REQUIREMENTS

731.06 General Requirements

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

731.07 Foundation Preparation

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 727 – BLANK
SECTION 728 – BLANK
SECTION 729 – BLANK
SECTION 730 – BLANK
SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

The foundation for the structure shall be graded level for a width equal to or exceeding the length of the ground reinforcement 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 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.

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

731.08 Retaining Wall Excavation

The Contractor shall notify the Engineer a minimum of 7 calendar days or other time as mutually agreed upon before beginning the excavation so that measurements can be taken of the undisturbed ground. Prior to starting excavation operations at the wall site, clearing and grubbing shall be in accordance with 201.03. The area shall be cleared and grubbed to the excavation in accordance with the limits shown on the plans. All timber, stumps, or debris shall be disposed of in accordance with 201.03. Excavation shall include the construction and subsequent removal of all necessary bracing, shoring, sheeting, and cribbing. Excavation shall also include all pumping, bailing, and draining.

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

Where excavation for the wall requires shoring, sheeting, or bracing, the method shall be shown on the working drawings. Excavation operations shall not begin until the Contractor receives notice that the working drawings are approved.

After the excavation for the wall has been performed, the Contractor shall notify the Engineer. The material beneath the leveling pad shall be compacted in accordance with 203. Concrete for the leveling pad shall not be placed until the Engineer has approved the depth of the excavation and the foundation material. The leveling pad shall be in accordance with 731.07.

731.09 Wall Erection

Concrete face panels shall be handled by means of a lifting device set into the upper edge of each panel. 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.

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 727 – BLANK
SECTION 728 – BLANK
SECTION 729 – BLANK
SECTION 730 – BLANK
SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

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

Plumbness, vertical tolerances, and horizontal alignment tolerances shall not exceed 3/4 in. (19 mm) as 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.

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 uniform size, except as required to top out the wall, to be in accordance with the plan elevations.

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.

The connections of the ground reinforcement to the panels shall be in two elevations for full height panels. The connections shall not be more than 30 in. (760 mm) vertically apart. To prevent out-of-plane rotation, full height face panels shall be connected to the ground reinforcement on at least 3 different points in 2 different planes. However, a preapproved system utilizing a horizontal stabilizing leg to prevent rotation shall require only ground reinforcement attachments in one plane. Partial size panels shall have 3 different connection points, but only one plane shall be attached to the ground reinforcement. Panels located at the top of the wall shall not be attached to the coping or traffic barrier.

Ground reinforcement 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 reinforcement, backfill shall be compacted in accordance with 731.11.

731.10 Joint Spacers and Joint Covering for Wall Panels

Horizontal and vertical joint spacers shall be provided between adjacent face panels to prevent concrete-to-concrete contact and chipping if differential settlement occurs. Panels without an uninterrupted vertical joint shall have a minimum joint thickness of 3/4 in. (19 mm). Joint covering shall be provided and attached to the rear face of the panels.

731.11 Backfill Placement

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 727 – BLANK
SECTION 728 – BLANK
SECTION 729 – BLANK
SECTION 730 – BLANK
SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

Backfill placement shall follow erection of each course of panels and ground reinforcement. All sheeting and bracing shall be removed as the backfilling progresses. Backfill shall be placed so as to avoid damage or disturbance to the wall materials or misalignment of the concrete face panels. All material for backfill shall be subject to approval and shall be free from lumps, wood, or other undesirable material. 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 as shown on the plans.

B borrow and No. 4 size structure backfill shall be compacted to 95% of the maximum dry density in accordance with AASHTO T 99. Density of the B borrow and No. 4 size structure backfill compacted aggregate will be determined in accordance with 203.24(b). Compaction equipment shall be in accordance with 409.03(d). For all other structure backfill material used, compaction shall consist of 4 passes with a vibratory roller and 1 pass with the same roller in static mode. The vibratory roller shall be equipped with a variable amplitude system and a speed control device. It shall 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.

The maximum loose lift thickness shall not exceed 8 in. (200 mm). However, lifts within 3 ft (0.9 m) of the wall 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 (0.9 m) of the back face of the concrete face panels shall be achieved by means of a minimum of 5 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 wall units. 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 reinforcement at the site will be prohibited, unless the cutting is preplanned and detailed on the approved working drawings. Cutting shall be considered only if adequate additional ground reinforcement is provided to produce the required strength shown in the approved calculations. If the ground reinforcement is shortened in the field, the cut ends shall be covered with a galvanized paint or coal tar to prevent corrosion of the metal.

731.12 Method of Measurement

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 727 – BLANK
SECTION 728 – BLANK
SECTION 729 – BLANK
SECTION 730 – BLANK
SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

The measurement of concrete face panels and wall erection will be based on the square foot (square meter) of area contained within the neat line limits of the wall envelope shown on the plans and not that of the wall system supplier.

Concrete leveling pad will be measured by the linear foot (meter). Common excavation will be measured in accordance with 203.27. 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. Geotextile materials will not be measured.

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

731.13 Basis of Payment

The accepted quantities of concrete face panels will be paid for at the contract unit price per square foot (square meter). Wall erection will be paid for at the contract unit price per square foot (square meter). 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 in accordance with 203.28. 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***
Face Panels, Concrete	*SFT (m2)*
Leveling Pad, Concrete	*LFT (m)*
Wall Erection	*SFT (m2)*

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

The cost of all wall materials including concrete face panels, ground reinforcement, tie strips, fasteners, joint materials, precast or cast-in-place concrete coping, repair or replacement of face panels damaged or removed due to backfill placement, and incidentals shall be included in the cost of face panels, concrete.

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

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 727 – BLANK
SECTION 728 – BLANK
SECTION 729 – BLANK
SECTION 730 – BLANK
SECTION 731 – MECHANICALLY STABILIZED EARTH RETAINING WALLS

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

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

370 *The cost of performing the laboratory tests by an approved geotechnical laboratory for structure 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 required geotextile materials shall be included in the cost of the pay items in this section.

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

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 732 - BLANK
SECTION 733 – STEEL BIN-TYPE RETAINING WALL

The Standard Specifications are revised as follows:

SECTION 732 – BLANK

SECTION 733 – STEEL BIN-TYPE RETAINING WALL

733.01 Description

This work shall consist of furnishing materials and placement of steel bin-type retaining walls in accordance with 105.03.

MATERIALS

733.02 Materials

Materials shall be in accordance with the following:

Fasteners.....910.02(g)1
Steel Bin-Type Retaining Wall Units.....910.08
Structure Backfill 211.03.1, 904.05

Backfill material used in the bin-wall sections shall be structure backfill, type 3, in accordance with 211.

The Contractor shall make arrangements to supply the materials listed above, including all necessary incidentals.

CONSTRUCTION REQUIREMENTS

733.03 General

All units shall be fabricated such that units of the same nominal size shall be fully interchangeable. Drilling, punching, or drifting to correct defects in manufacture will not be permitted. Each unit with unauthorized holes shall be replaced. The ends of all stringers and spacers shall be bolted to corner columns by means of connecting channels.

The proper curvature for the face of a wall constructed on a curve shall be obtained through the use of shorter stringers in the front or rear panels of retaining walls as shown on the plans or as otherwise directed.

The wall height and depth may be varied. Two or more retaining wall designs may be incorporated in the same wall by the use of standard split columns to make the connection on the step back.

733.04 Foundation Preparation

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 732 - BLANK
SECTION 733 – STEEL BIN-TYPE RETAINING WALL

The foundation for the structure shall be graded level 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 a vibratory roller weighing not less than 10 t (9 Mg), or with other 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.

733.05 Retaining Wall Excavation

Retaining wall excavation shall be in accordance with 731.08.

733.06 Backfill Placement

The fill material for the interior of the bin and behind the wall shall be structure backfill placed in layers not to exceed 6 in. (150 mm) in thickness. Backfilling behind the wall shall progress with the filling of the bins and shall not be carried ahead of the interior bins. Existing slopes, which are shaped so as to cause a wedge action in the backfill, shall be benched before backfilling.

The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill material shall have placement moisture content between optimum and -3 percentage points of the optimum moisture content. Backfill material with placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniformly acceptable through the entire lift.

Compaction within 3 ft (0.9 m) of the back face of the bins shall be achieved by means of a minimum of 3 passes with a lightweight mechanical tamper, roller, or an alternative vibratory system.

Backfill placement shall otherwise be in accordance with 731.11.

733.07 Method of Measurement

The measurement of steel bin walls will be based on the square foot (square meter) of area contained within the neat line limits of the wall envelope shown on the plans and not that of the wall system supplier. Common excavation will be measured in accordance with 203.27. Structure backfill will be measured in accordance with 211.09. Unsuitable foundation materials, if found, will be measured in accordance with 211.09.

733.08 Basis of Payment

This work will be paid for at the contract unit price per square foot (square meter) for binwall, steel. Common excavation will be paid for in accordance with 203.28. Structure backfill 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:

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTIONS)*

SECTION 732 - BLANK
SECTION 733 – STEEL BIN-TYPE RETAINING WALL

Pay Item ***Pay Unit Symbol***

Binwall, Steel..... SFT (m2)

The cost of furnishing, handling, and installing the steel units, including all materials, bolts, and appurtenances; necessary excavation and structure backfill testing; and all labor, equipment, all necessary incidentals, or replacement of steel units with unauthorized holes, or those damaged and replaced during construction shall be included in the cost of the pay item.

SECTION 734 - PERMANENT EARTH RETENTION SYSTEM FOR CUT-WALL APPLICATION

734.01 Description

This work shall consist of designing and constructing a permanent earth retention system utilizing a cut-wall application in accordance with 105.03. Cut-wall applications refer to a class of earth retention systems in which construction of the system is performed from the top of the wall to the base utilizing either externally or internally stabilized elements or a combination of both. Geotechnical Engineering Circular No. 2 – Earth Retaining Systems, Report No. FHWA-SA-96-038 provides further discussion of cut-wall applications.

734.02 Contractor Design Requirements

The permanent earth retention system utilizing a cut-wall application shall be designed by a professional engineer having experience in the design of at least 3 completed permanent earth retention systems involving cut-wall applications. The permanent earth retention system shall be designed using the procedure described in the AASHTO LRFD Bridge Design Specifications, or in the FHWA report 0-IF-03-017, Soil Nail Walls. The required partial safety factors or allowable strength factors for Service Load Design, SLD, and load and resistance factors for LRFD, shall be in accordance with the above-referenced publications. The minimum factor of safety for SLD global stability or minimum required LRFD global stability shall be in accordance with the above-referenced publications, unless specified otherwise. Structural design of an individual wall element not addressed in the FHWA report shall be designed in accordance with the AASHTO specifications. Geometric data and design criteria including shear strength parameters and unit weights for soil and rock, corrosion protection, internal and external drainage requirements, horizontal and vertical alignment of the wall, and all known site and construction constraints, wall facing, and facing architectural requirements shall be as shown on the plans.

(a) Design Calculations

Design calculations shall include, but not be limited to, the following:

1. *A written summary report which describes the overall design.*

2. *Applicable code requirements and design references.*

3. *Design cross section geometry including soil and rock strata and location, magnitude and direction of design slope, external surcharge loads, and piezometric levels with the most critical slip surface shown along with the minimum calculated SLD factor of safety for global stability or minimum required LRFD global stability soil resistance to load ratio.*

4. *Design criteria including the undrained and drained shear strength parameters and unit weights for soil and rock.*

5. Unit bond resistances for externally and internally stabilized elements.

6. Partial safety factors and strength factors for SLD or load and resistance factors for LRFD used in the design on the pullout resistance, surcharges, unit weights of soil and rock, and all materials proposed for the system including, but not limited to shotcrete, steel and concrete.

7. Seismic design acceleration coefficient.

8. Design calculation sheets with the contract number, designation number, wall location and designation, date of preparation, initials of designer and checker, page number shown on each page, and an index page.

9. Design notes including an explanation of all symbols and computer programs used in the design.

10. Structural design calculations for all temporary and permanent facing and facing connections, including consideration of flexural and shear strength of the facing and all externally stabilized elements, tensile strength of all headed studs, upper cantilever, minimum reinforcement ratio, mechanical splices, welds, built-up sections, and cover and splice requirements.

(b) Working Drawings

The limits of the wall and ground survey data shall be verified before preparing the drawings. Working drawings shall include all details, dimensions, quantities, ground profiles, cross sections necessary to construct the wall, and the following:

1. A plan view of the wall identifying the following:

a. A reference centerline and elevation datum.

b. The offset from the construction centerline to the finished face of the wall at its base and at all changes in horizontal alignment.

c. Beginning and ending stations of the wall.

d. Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned existing utilities, adjacent structures, or other potential interferences.

e. The centerline of each drainage structure or drainage pipe behind, passing through, or passing under the wall.

f. Limit of externally and internally stabilized elements.

g. Subsurface exploratory locations with appropriate reference base lines to fix the locations of the explorations relative to the wall.

2. An elevation view of the wall identifying the following:

a. The elevations at the top of the wall, at all horizontal and vertical break points, and at least every 30 ft (9 m) along the wall.

b. Elevations at the base and top of the wall for casting the facing.

c. Beginning and ending stations of the wall.

d. The distance along the face of the wall to all steps in the base of the wall.

e. All externally and internally stabilized elements as well as vertical and horizontal spacing.

f. The location of drainage elements and permanent facing expansion and contraction joints along the wall length.

g. Existing and finished grade profiles, both behind and in front of the wall.

3. Design parameters and applicable codes.

4. General notes for constructing the wall including sequencing and all special construction requirements, such as dewatering, if required.

5. Horizontal and vertical curve data affecting the wall and control points.

6. Match lines or other details to relate the wall stationing to centerline stationing.

7. A listing of the summary of quantities on the elevation drawing of each wall showing estimated square feet (square meters) of exposed wall face areas and other pay items.

8. Typical sections including staged excavation elevations, wall elements, and corrosion protection details.

9. Typical details of production and test anchors or nails defining the orientation and dimensional relationships of the unbonded and bonded lengths.

10. Details, dimensions, and schedules for all externally and internally stabilized elements, reinforcing bars, steel welded wire reinforcement, bearing plates, headed studs, and attachment devices for pneumatically placed mortar, cast-in-place, or prefabricated facings.

11. Details and dimensions for appurtenances such as barriers, coping, drainage gutters, and fences.

12. Details for constructing the wall around drainage facilities.

13. Details for terminating the wall and adjacent slope construction.

14. Facing finishes, color and architectural treatment requirements for permanent facing elements.

(c) Submittals

The Contractor shall submit working drawings and design calculations in accordance with 105.02.

At least 30 calendar days before the start of the wall construction, the Contractor shall submit a quality control plan, QCP, for approval. The QCP shall include, but not be limited to, personnel qualifications, wall construction procedures and sequencing, a verification testing program, and a performance monitoring program. Work shall not begin until written notice has been received from the Engineer that the QCP has been accepted.

1. Personnel Qualifications

The field superintendent or field foreman shall have supervised the construction of a minimum of 3 completed walls of the same type as that submitted by the Contractor.

2. Verification Testing Program

The program shall include a verification testing program of all production and test anchors and nails. The program shall identify the test locations, the type of test, i.e., proof, performance, or pullout, testing procedures, acceptance criteria, and load and measuring devices to be used.

MATERIALS

734.03 Materials

Materials shall be in accordance with the following:

Geotextile Under Riprap.....918.02
Pneumatically Placed Mortar.....708
Reinforcing Bars.....703
Steel H Piles.....915.02
Steel Pipe Piles.....915.01

Steel Sheet Piling.....910.21
Steel Welded Wire Reinforcement, Smooth and Deformed.....910.01
Structural Concrete.....702
Structural Steel.....910.02
Structure Backfill 904.05
Uncoated 7 Wire Strand.....910.01(b)7

Drainage pipe shall be underdrain pipe in accordance with 715.02(d).

CONSTRUCTION REQUIREMENTS

734.04 General Requirements

Excavation and embankment shall be in accordance with 203.

Welding shall be in accordance with 711.32.

734.05 Performance Monitoring During Construction

The program shall identify points of monitoring interest, in accordance with Geotechnical Engineering Circular No. 2 – Earth Retaining Systems, Report No. FHWA-SA-96-038, and the frequency of monitoring during and following construction of the wall. The program shall also include a baseline survey for points of monitoring interest.

The Contractor shall notify the Engineer if indications of ground movement in the vicinity of the wall, increased size of old cracks, or separation of joints in structures, foundations, streets, or paved or unpaved surfaces are observed. The Contractor shall monitor the performance of the wall and movements of buildings, roads, or other facilities within a distance of 3 times the excavation depth for the wall. If the Engineer determines that the movements exceed those anticipated for construction, the Contractor shall take corrective actions necessary to arrest the movement, or make repairs.

Within 30 days after completion of the work, as-built drawings shall be submitted to the Engineer. Revised design calculations signed by the professional engineer shall be provided for all design changes made during the construction of the permanent earth retention system.

734.06 Performance Monitoring After Construction

Performance monitoring by the Contractor shall be done during construction and for a period of 1 year from the date the Contractor has been relieved of further maintenance, as set out in the final acceptance letter from the Department. The Contractor shall post a warranty bond for the performance monitoring that occurs after the Contractor has been relieved of further maintenance. The Contractor shall make evaluations of the test and monitoring data and performance of the wall at the frequency defined in the approved performance monitoring program. The Contractor, if necessary during the monitoring period or as directed, shall correct deficiencies in the capacities of individual elements or take other corrective measures which may be required to prevent damage or excessive movement of the wall and adjacent facilities. The

Contractor shall submit all test and monitoring data to the Engineer on a weekly basis or as otherwise directed.

734.07 Method of Measurement

Cut wall will be measured by the square foot (square meter) of exposed face area of wall above finished grade shown on the plans.

734.08 Basis of Payment

The accepted quantities of cut wall will be paid for at the contract unit price per square foot (square meter) for cut wall.

Payment will be made under:

Pay Item	***Pay Unit Symbol***
Cut-Wall, No. ____	*SFT (m2)*

The costs of all professional services, labor, excavation, structure backfill, equipment, materials, tests, QCP, and incidentals necessary to design, construct, and monitor the wall including all drainage required by the wall design and all temporary construction facing or permanent facing, if applicable, and correction required by the wall design of deficiencies which may be required to prevent damage or excessive movement of the wall shall be included in the cost of this work. No additional payment will be made for the costs of providing and taking corrective actions.

SECTION 735 – TEMPORARY WIRE-FACED MECHANICALLY STABILIZED EARTH RETAINING WALLS

735.01 Description

This work shall consist of the design, furnishing materials, and placement of temporary wire-faced mechanically stabilized earth retaining walls in accordance with 105.03.

735.02 General Design Requirements

A temporary wire-faced MSE wall shall consist of wire-facing elements, ground reinforcement elements mechanically connected to the wire-facing elements, and a drainage system if required. Concrete face panels will be required for the lower course of the wall if shown on the plans. Ground reinforcement shall have sufficient strength, frictional resistance, and quantity as required by the design.

A temporary wire-faced MSE wall shall be constructed in accordance with the approved plans and panels working drawings based on the requirements herein. The recommendations of the wall system supplier shall meet or exceed the minimum performance requirements included herein.

If appurtenances interfere with connecting ground reinforcement to face panels, back up panels shall be provided.

The top of the wire-facing elements shall be at or above the top of the wall envelope shown on the plans.

The maximum dimensions for wire-face panels shall be limited to 2 ft (0.6 m) vertical and 8 ft (2.4 m) horizontal.

735.03 Design Criteria

The design life of the wall shall be 36 months. The minimum allowable yield stress for reinforcement shall be 65 ksi (448 MPa). The maximum allowable stress in the reduced section after sacrificial steel has been removed at the end of the design life shall be $0.55F_y$ for WWR. The maximum allowable stress may be increased to $0.77F_y$ if the design life does not exceed 36 months. The reduced section of ground reinforcement shall be limited to the allowable stress shown above at the end of the 36-month design life.

The connections of the ground reinforcing steel to the wire-facing shall not be more than 24 in. (600 mm) apart vertically.

The design shall otherwise be in accordance with 731.02 and 731.03.

735.04 Submittals

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTION)*

SECTION 735 – TEMPORARY WIRE-FACED MECHANICALLY STABILIZED EARTH RETAINING WALLS

The Contractor shall submit working drawings and design calculations in accordance with 105.02. Wall construction operations shall not begin until the Contractor receives written notice that the working drawings are approved.

(a) The working drawings shall include all details, dimensions, quantities and cross sections necessary to construct the wall. They shall include, but shall not be limited to, that listed in 731.04(a) and (b).

(b) Wire-facing details shall show all dimensions necessary to construct the element, all wire in the element, and the location of ground reinforcing system devices attached to the wire-facing.

MATERIALS

735.05 Materials

Materials shall be in accordance with the following:

Admixtures for Concrete	*912.03*
Air Cooled Blast Furnace Slag	*901.09*
Alignment Pins	*910.07(d)*
B Borrow	*211.02*
Coarse Aggregate, Class A or Higher, Size No. 8 or 91	*904*
Components of MSE Retaining Walls	*901.10*
Concrete, Class A	*702*
Fine Aggregate, Size No. 23	*904*
Fly Ash	*901.02*
Geotextile for Underdrains	*918.03*
Joint Spacers and Joint Covering	*901.10(b)*
Portland Cement	*901.01(b)*
Rapid Setting Patch Materials	*901.07*
Reinforcing Bars	*910.01*
Steel Components	*910.07*
Steel Welded Wire Reinforcement, Smooth	*910.01(b)5*
Water	*913.01*

Backfill material used in the temporary wire-faced MSE-wall volume shall be structure backfill, type 3 in accordance with 211 with the exception that nominal size aggregate No. 30 shall not be used.

All retention fabric or filter cloth shall be geotextile for use with underdrains.

The Contractor shall supply the MSE retaining wall components described above, including wire-facing, concrete face panels, retaining strips or mesh, tie strips, fasteners, earth-

retention materials, drainage system components, and all necessary incidentals, through a manufacturer shown on the Department's list of approved retaining wall systems.

CONSTRUCTION REQUIREMENTS

735.06 General Requirements

Foundation preparation shall be in accordance with 731.07. Retaining wall excavation shall be in accordance with 731.08.

735.07 Wall Erection

The wall system components shall be constructed in accordance with the wall system supplier's recommendations and construction manual.

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.

Ground reinforcement 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 reinforcement, backfill shall be placed and compacted in accordance with 731.11.

Where shown on the plans, backing mats shall be placed behind the wire-facing.

Where shown on the plans, galvanized screens with openings not exceeding ½ in. (13 mm) shall be placed behind the wire-facing to retain the earth.

735.08 Method of Measurement

The measurement of temporary wire-facing and temporary wall erection will be based on the square foot (square meter) of area contained within the neat line limits of the wall envelope shown on the plans and not that of the wall system supplier.

Common excavation will be measured in accordance with 203.27. 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.

Drainage of the backfill including piping, aggregates, and geotextile materials will not be measured.

735.09 Basis of Payment

The accepted quantities of temporary wire-facing and temporary wall erection will be paid for at the contract unit price per square foot (square meter). Common excavation will be paid for in accordance with 203.28. 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.

REVISION TO THE STANDARD SPECIFICATIONS *(PROPOSED NEW SECTION)*

SECTION 735 – TEMPORARY WIRE-FACED MECHANICALLY STABILIZED EARTH RETAINING WALLS

Payment will be made under:

Pay Item	***Pay Unit Symbol***
Temporary Wall Erection	*SFT (m2)*
Temporary Wire-Facing	*SFT (m2)*

The cost of all MSE retaining wall components including wire-facing elements, concrete face panels, ground reinforcing, tie strips, fasteners, soil retention materials, repair or replacement of wire-facing elements damaged or removed due to backfill placement, and incidentals shall be included in the cost of temporary wire-facing.

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

The cost of labor and materials required to provide for the drainage of the backfill including piping, aggregates, or geotextile materials shall be included in the cost of temporary wire-facing.

The cost of performing the laboratory tests by an approved geotechnical laboratory for structure 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.

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

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 901 – PCC MATERIALS
901.09 AIR COOLED BLAST FURNACE SLAG FOR RETAINING WALLS
901.10 COMPONENTS OF MSE RETAINING WALLS

The Standard Specifications are revised as follows:

SECTION 901, AFTER LINE 608, INSERT AS FOLLOWS:

901.09 Air Cooled Blast Furnace Slag for Retaining Walls

If ACBF or coarse aggregate is used, and soil, B borrow, structural backfill, or coarse aggregate is to be placed above the ACBF or coarse aggregate, a single layer of geotextile shall be placed on top of the ACBF or coarse aggregate in accordance with 616.11. A type C certification in accordance with 916 for the geotextile materials shall be furnished to the Engineer prior to use.

ACBF shall be in accordance with the pH, chlorides, sulfates, organic content, resistivity, and permeability requirements of structure backfill as listed in 211.03.1. It shall also be in accordance with ITM 212. Total sulfates shall also be determined in accordance with EPA 376.1, using the 100 mL pH water samples obtained during the ITM 212 test, and shall not exceed 400 ppm. The ACBF shall have a maximum corrosion rate as follows if tested in accordance with ASTM G 59.

(a) Zinc corrosion rate, first 2 years .....15 µm/yr/side
(b) Zinc corrosion rate, to depletion .....4 µm/yr/side
(c) Carbon-steel corrosion rate.....12 µm/yr/side

901.10 Components of MSE Retaining Walls

(a) PCC Components

1. Face Panels

Precast concrete face panels shall be produced from a source listed on the Department's List of Certified Precast Concrete Producers, in accordance with ITM 813. Concrete shall have a compressive strength equal to or greater than 4000 psi (27.5 MPa) at 28 days.

The target water cementitious ratio for the concrete mix design shall not exceed 0.435. The cement content and target water cementitious ratio of the concrete mix design shall be sufficient to obtain the specified minimum 28 day compressive strength. Approved air entraining admixture and chemical admixture types A, B, C, D, or E may be used.

Ground- reinforcement connection hardware and reinforcing bar lifting devices shall be set in place and secured prior to beginning casting, in accordance with the dimensions and tolerances shown on the working drawings.

a. Production Control Testing and Inspection

The manufacturer shall provide for all testing and inspection services during each day's production of the panels. The frequency of production control testing shall be based on a lot of

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 901 – PCC MATERIALS
901.09 AIR COOLED BLAST FURNACE SLAG FOR RETAINING WALLS
901.10 COMPONENTS OF MSE RETAINING WALLS

50 panels, or fraction thereof, for each day's production. Sampling and testing of the plastic concrete shall be in accordance with 505.01, or the ASTM equivalent. A minimum of one water cementitious ratio, and slump, air content, and relative yield tests shall be run per production lot, per day. A minimum of two 6 in. x 12 in. (150 mm x 300 mm) cylinders shall be cast per day's production lot for compressive strength determination. Cylinders shall be cured in the same manner as the panels they represent. Relative yield, air content, and slump of the concrete shall be in accordance with 702.05. Compressive strength shall be determined in accordance with AASHTO T 22 or ASTM C 39, with lot acceptance based on the average of 2 cylinders tested at an age no greater than 28 days. Panels shall not be shipped until the compressive strength meets or exceeds the 28 day requirement.

If the cylinder test results do not satisfy the requirements described herein, and additional cylinders for testing are not available, the manufacturer may core the panels. The wall manufacturer shall randomly select 2 panels from the lot for coring in accordance with AASHTO T 24 or ASTM C 42. The wall manufacturer shall obtain 1 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 manufacturer shall fill the core holes with equivalent concrete materials or rapid-setting patch 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 manufacturer's recommendations. Compressive strength testing shall be performed on the cores. If the average strength test results from the cores satisfy or exceed the requirements described herein, the production lot panels may be shipped.

b. 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 from one manufacturer shall be used throughout the casting operation.

c. Curing

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

d. Removal of Forms

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

e. 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 screeded to eliminate open pockets of aggregate and surface distortions in excess of 1/4 in. (6 mm).

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 901 – PCC MATERIALS
901.09 AIR COOLED BLAST FURNACE SLAG FOR RETAINING WALLS
901.10 COMPONENTS OF MSE RETAINING WALLS

f. Tolerances

All panels shall be manufactured within the tolerances as follows.

(1) 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).

(2) Panel Squareness

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

(3) 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. (8 mm).

g. Compressive Strength Verification

Verification of the panels' compressive strengths will be conducted by the Engineer. The frequency of verification testing will be 1 test for every 750 panels per manufacturer with a minimum of 1 test per contract. One panel will be randomly selected and 2 locations will be selected for coring. The Contractor shall obtain two 4 in. (100 mm) cores on the backside of the panel without coring completely through the panel, in the presence of the Engineer. The Contractor shall refill the core holes with rapid setting patch 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 manufacturer's recommendations.

The Engineer will test the cores in accordance with AASHTO T 24. The verification test results will be averaged and shall be in accordance with 901.10(a)1a. If the initial verification test results do not satisfy the requirements described herein, the Engineer will randomly select 2 different panels for additional verification testing. If the additional verification tests satisfy the requirements described herein, no further action is required. If the test results still do not satisfy the requirements described herein, 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 105.03. The Engineer will conduct verification testing until 3 consecutive dates of production satisfy the strength requirements described herein. The Contractor or wall manufacturer shall make arrangements so that panels from 3 consecutive dates of production are accessible for coring. Installation of panels may resume once acceptable verification testing results are achieved.

h. Rejection

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 901 – PCC MATERIALS
901.09 AIR COOLED BLAST FURNACE SLAG FOR RETAINING WALLS
901.10 COMPONENTS OF MSE RETAINING WALLS

Units shall be subject to rejection due to their failure to be in accordance with the requirements specified above. The following defects may result in rejection.

(1) Defects which indicate imperfect molding.

(2) Defects which indicate honeycombed or open-texture concrete.

(3) 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 manner which is acceptable to the Engineer. Repair to concrete surfaces that are to be exposed to view after completion of construction shall be subject to approval.

i. Marking

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

j. Handling, Storage, and Shipping

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

2. Coping

The coping may be precast or cast-in-place.

(b) Joint Spacers and Joint Covering

The horizontal and vertical joint spacers shall include compression blocks, pins, or other manufacturer-recommended materials to provide a uniform joint.

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

A letter certifying that the joint spacers and joint cover adhesive material supplied is in accordance with the manufacturer's recommendations shall be provided prior to use of the materials.

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 910 – METAL MATERIALS
910.07 STEEL DRAIN PIPE
910.08. BLANK

Note: Change to the **910.07 ~~Steel Drain Pipe~~*Blank*** has been approved by the Standards Committee on March 18, 2010 Meeting

The Standard Specifications are revised as follows:

SECTION 910, LINE 470, DELETE AND INSERT AS FOLLOWS:

910.07 ~~*Blank*~~*Steel Components of MSE Retaining Walls*

(a) Backing Mats, Clevis Connector, Connector Bar, and Wire-Facing

1. Backing Mats

Backing mats shall be smooth steel welded wire reinforcement in accordance with 910.01(b)5. Galvanization, if required, shall be in accordance with ASTM A 123, coating grade 55, or ASTM B 695, class 55. The Engineer will test samples in accordance with ASTM A 185.

2. Clevis Connector

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, ASTM A 123, coating grade 55, or ASTM B 695 class 55.

A type A certification in accordance with 916 shall be furnished for the clevis connector. The results of the tension, bend, and coating adhesion tests, and measurements of coating thickness and average weight of the coating, shall be included on the certification for the clevis connector.

3. Connector Bar

The connector bar, if used, shall be fabricated of cold drawn steel wire in accordance with ASTM A 884, and galvanized, if so shown on the plans, in accordance with ASTM A 123, coating grade 55, or ASTM B 695 class 55.

A type A certification in accordance with 916 shall be furnished for the connector bars. The results of the coating adhesion test and the measurements of coating thickness, average weight of the coating, and coating flexibility, shall be included on the certification for the connector bar.

4. Wire-Facing

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 910 – METAL MATERIALS
910.07 STEEL DRAIN PIPE
910.08. BLANK

Wire-facing shall be smooth steel WWR in accordance with 910.01(b)5. Galvanization, if required, shall be in accordance with ASTM A 123, coating grade 55, or ASTM B 695, class 55. All wire-facing shall be handled, stored, and shipped so as to eliminate the danger of excessive bending stresses. The Engineer will test samples in accordance with ASTM A 185.

(b) Ground Reinforcement

The ground reinforcement shall be either 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 2 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 undeformed section to the deformed section as required to produce the pullout resistance.

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.

Ground reinforcement units shall be hot rolled from bars to the required shape and dimensions. Physical and mechanical properties of the units 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 ground reinforcing units and tie strips shall be in accordance with ASTM A 123, coating grade 85 or ASTM B 695 class 80. All ground reinforcement units and tie strips will be inspected to ensure that they are true to size and free from defects which can 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. The results of the yield strength, coating thickness, and coating adhesion tests shall be shown on the certification.

(c) Fasteners

Fasteners shall consist of 1/2 in. (13 mm) diameter, bolts, nuts, and washers and shall otherwise be in accordance with 910.02(f)1 with the exception that the hardware shall be coated in accordance with ASTM A 153, class C or ASTM B 695, class 55.

The supplier shall provide a certificate of compliance with all requirements for high strength bolts, nuts, and washers used in the assembly of MSE retaining walls. The certification, in addition to complying with the applicable requirements of 916, shall include the lot number and heat number on the shipping package and indicate when or where all testing was performed.

(d) Alignment Pins

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 910 – METAL MATERIALS
910.07 STEEL DRAIN PIPE
910.08. BLANK

The rods used to align the face panels during construction shall be ¾ in. (19 mm) diameter and 12 in. (300 mm) in length. The rods shall be mild steel, polyvinyl chloride, or fiberglass. A type C certification in accordance with 916 shall be furnished for the alignment pins.

910.08. ~~Blank~~*Steel Bin-Type Retaining Wall Units*

Wall units shall consist of adjoining closed face cells filled with structure backfill to form a gravity-type retaining structure. The cells shall be constructed of members in accordance with AASHTO M 218 (M 218M) that are bolted together. The necessary bolts and appurtenances shall be furnished for complete assembly of the units into a continuous closed face wall of connected bins.

Working drawings shall be submitted in accordance with 105.02.

The units shall present a uniform workmanlike appearance once assembled. The base metal shall be not less than 16 gage (1.6 mm).

The steel sheets shall be galvanized on both sides in accordance with ASTM A 123, coating grade 85. All sheets 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 for the bin-wall sheets shall be furnished prior to use. The results of the steel yield strength and coating adhesion tests, and measurement of the coating thickness, shall be shown on the certification.

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 918 – SOIL FABRICS
918.05 GEOGRID

The Standard Specifications are revised as follows:

SECTION 918, AFTER LINE 118, INSERT AS FOLLOWS:

(c) Type III Geogrid for Modular Block Walls

PROPERTY	*TEST METHOD*	*UNIT*	*VALUE*
Open Area	*COE CWD 2215*	*percent*	*50 < % < 80*
Ultimate Strength, MD, min.	*ASTM D 6637*	*lb/ft (N/m)*	*1500 (21,890)**
Long Term Design Strength, Allowable, LTDS-MD, min.	*GRI-GG4*	*lb/ft (N/m)*	*1000 (14,600)***

* *Minimum Average Roll Value: property value calculated as average minus 2 standard deviations.*

$$LTDS = \frac{T_{ult}}{(RF_{CR})(RF_{IR})(RF_{D})}$$

Where:

T_{ult} = *Ultimate strength*
RF_{CR} = *Reduction factor for creep*
RF_{ID} = *Reduction factor for installation damage*
RF_{D} = *Reduction factor for durability*

** *Geogrid material shall be of high-density polyethylene, HDPE; polypropylene, PP; or polyester, PET, polymers. The minimum reduction factors are as follows:*

RF_{CR} = *2.6 for HDPE, 4.0 for PP, 1.6 for PET*
RF_{ID} = *1.10*
RF_{D} = *1.10*

Independent laboratory test results for creep test in accordance with ASTM D 5262 shall be submitted. Geogrid shall have an adequate open aperture to establish proper interlock between geogrid and backfill material.

COMMENTS AND ACTION

REVISION TO 211.03.1 STRUCTURE BACKFILL TYPES
ADDED SECTIONS 727, 728, 729, 730, 731, 732, 733, 734, 735, 901.09, 901.10,
REVISION TO 910.07, 910.08 and 918.05(c)

Motion: Second: Ayes: Nays:	Action: ____ Passed as Submitted ____ Passed as Revised ____ Withdrawn
Standard Specifications Sections affected: 211.03.1 pg 195; SECTION 700 – STRUCTURES; 901 pg 752; 910.07 and 910.08 pg 829; 918.05 pg 903 Recurring Special Provision with same affected sections: 731-R-202, 732-R-433, 734-R-566 Standard Sheets affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	____ 20__ Standard Specifications Book ____ Revise List of Pay Items ____ 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 ___ By ____ Addition or ____ Revision Frequency Manual Update Req'd? Y__N__ By ____ Addition or ____ Revision Received FHWA Approval? ____

Mr. Pankow
Date: 01/20/11

SPECIFICATIONS REVISIONS

REVISION TO THE RECURRING SPECIAL PROVISION

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: During preparation of markups for new business agenda item 01 for the December 16, 2010 Standards Committee Meeting, it was discovered that there were changes approved to the sound barrier systems recurring special provision (620-R-483) on November 20, 2008 and on May 21, 2009 that have not been incorporated into the sound barrier system RSP. Also, changes to the sound barrier systems RSP are necessary to complement the changes done by new business agenda item 01 from the December 16, 2010 Standards Committee Meeting.

PROPOSED SOLUTION: Update the sound barrier systems recurring special provision (620-R-483) to include the changes previously approved by the Standards Committee at the November 20, 2008 and on May 21, 2009 meetings. Also incorporate the necessary changes to the sound barrier system RSP due to the changes from new business agenda item 01 from the December 16, 2010 Standards Committee Meeting.

APPLICABLE STANDARD SPECIFICATIONS: None

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: 620-R-483

PAY ITEMS AFFECTED: None

Submitted By: Greg Pankow

Title: State Construction Engineer

Organization: INDOT

Phone Number: 2-5502

Date: December 13, 2010

APPLICABLE SUB-COMMITTEE ENDORSEMENT: None

REVISION TO THE RECURRING SPECIAL PROVISION

RSP 620-R-483 SOUND BARRIER SYSTEMS SHOWN WITH PREVIOUSLY APPROVED CHANGES BY THE STANDARDS COMMITTEE (UPDATED DRAFT).

Note: Changes that are shown highlighted in gray have been approved by the Standard Committee on November 20, 2008 and on May 21, 2009

620-R-483 SOUND BARRIER SYSTEMS

(Revised 05-21-09)

The Standard Specifications are revised as follows:

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

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

620.01 Description

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

620.02 General Design Requirements

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

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

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

The sound barrier wall design shall follow the general dimensions of the wall envelope as shown on the plans. The top of the sound barrier shall be at or above the acoustical profile line shown, unless noted. Changes in elevation shall be accomplished by stepping the sound barrier sections at the vertical support posts. Steps shall not exceed 3 ft (0.9 m) vertically unless otherwise specified in the plans. Barrier heights shall be selected in groups of no fewer than three successive panels, except where barriers are

REVISION TO THE RECURRING SPECIAL PROVISION

RSP 620-R-483 SOUND BARRIER SYSTEMS SHOWN WITH PREVIOUSLY APPROVED CHANGES BY THE STANDARDS COMMITTEE (UPDATED DRAFT).

to be stepped down for barrier termination. The ends of the sound barrier shall be tapered or stepped down to a height of 8 ft (2.6 m) within the sound barrier end transitions or as shown on the plans. The bottom of ground mounted sound barrier shall be embedded a minimum of 6 in. (150 mm) into the ground. The bottom of wall mounted or bridge mounted sound barrier shall follow within 3 in. (75 mm) a profile 6 in. (150 mm) below the top of the existing concrete barrier railing or wall.

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

A sound barrier system shall be selected for the type specified from those which are on the Department's list of approved Sound Barrier Systems. The materials used in the fabrication of the sound barrier system shall be the same as those used for approval of the sound barrier system.

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

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

When sound barriers are to be installed on a bridge structures, design calculations shall be submitted to the Engineer that demonstrate structure loading limits, as shown on the plans, will not be exceeded.

REVISION TO THE RECURRING SPECIAL PROVISION

RSP 620-R-483 SOUND BARRIER SYSTEMS SHOWN WITH PREVIOUSLY APPROVED CHANGES BY THE STANDARDS COMMITTEE (UPDATED DRAFT).

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

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

Type 1, single sided absorptive, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90. Type 1 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.70 on the roadway side. Type 1 sound barrier systems shall be tested in accordance with ASTM C 423. Material samples for this test shall be provided with the coating applied, so as to determine that the color coating does not inhibit the acoustic performance. The sample shall be mounted in accordance with ASTM E 795, type A.

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

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

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

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

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

REVISION TO THE RECURRING SPECIAL PROVISION

RSP 620-R-483 SOUND BARRIER SYSTEMS SHOWN WITH PREVIOUSLY APPROVED CHANGES BY THE STANDARDS COMMITTEE (UPDATED DRAFT).

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

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

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

(a) Precast Panel Design Criteria

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

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

(b) Masonry Design Criteria

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

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

620.03 Submittals

The Contractor shall submit a minimum of three alternative textured finishes for the wall to the Engineer. These shall include the following colors:

(a) light grey (federal standard ~~595,~~ color 36492),
(b) light brown (federal standard ~~595,~~ color 30450),
(c) light tan (federal standard ~~595,~~ color 37769),

REVISION TO THE RECURRING SPECIAL PROVISION

RSP 620-R-483 SOUND BARRIER SYSTEMS SHOWN WITH PREVIOUSLY APPROVED CHANGES BY THE STANDARDS COMMITTEE (UPDATED DRAFT).

The ~~patterns and~~ colors will be presented to the public for their input in accordance with 620.05. The final wall pattern and color will be approved before production of the wall panels may begin.

The Contractor shall submit one copy of the design calculations for approval. If the calculations are computer generated, one sample set of hand calculations, for one wall location shall also be submitted. Calculations for sound barriers on bridge structures shall include an analysis of the bridge structure that demonstrates the additional loads imposed by the sound barrier, including dead load and wind load, will not exceed the structural capacity of the bridge. The Contractor shall submit four sets of design drawings for approval after ~~the~~ design calculations are approved and before beginning wall construction operations. Design calculations and design drawings shall be signed and sealed by a professional engineer. Design calculations and drawings shall meet the following minimum requirements:

(a) Design calculations shall include all structural design calculations and vertical support post design calculations.

(b) Design calculations for bridge mounted installations shall include the design unit weight and mass of the sound barrier and support systems.

(c) Design calculations for bridge mounted installations shall demonstrate that the structural loading limits of the structure, as shown on the plans, will not be exceeded.

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

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

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

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

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

REVISION TO THE RECURRING SPECIAL PROVISION

RSP 620-R-483 SOUND BARRIER SYSTEMS SHOWN WITH PREVIOUSLY APPROVED CHANGES BY THE STANDARDS COMMITTEE (UPDATED DRAFT).

5. All general notes required for constructing the wall.

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

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

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

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

10. Typical sections and elevation views for bridge mounted installations.

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

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

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

MATERIALS

620.04 Materials

Materials shall be in accordance with the following:

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

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Water 913.01
Concrete Masonry Units 905.06
Joint Mortar 901.08, 906.03

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

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

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

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

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

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

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

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

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

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

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

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

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

CONSTRUCTION

620.05 Information for Public Input

Colored flyers with appropriate graphics shall be developed by the Contractor and furnished to the Department.

Wall color photos shall be submitted for each color in accordance with 620.03 along with photos of each available texture alternative. A minimum of three wall samples of the non-roadway side textures shall be presented. All samples of the wall textures shall be a minimum of 3 square feet (0.27 square meters) in area, with a clearly distinguishable pattern.

Based on comments received, the Department will select the final finishes and colors for each wall. Each wall shall have the selected color used throughout the entire

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wall on the roadway and the non-roadway sides. The Contractor shall coordinate all sound barrier wall issues with the Engineer prior to ordering any materials.

620.06 Construction Requirements

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

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

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

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

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

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

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

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

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

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

(a) Construction Requirements for Precast Panels

Sound barrier wall panels shall be placed in accordance with the plans and centered between adjacent posts. The sound barrier wall panels shall be of sufficient length to span the entire length between posts less 1/2 the width of the smallest retaining flange.

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

(b) Construction Requirements for Masonry

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

620.07 Acceptance

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

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

(a) Defects that indicate imperfect fabrication

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

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

620.08 Method of Measurement

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

620.09 Basis of Payment

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

The Department may choose to acquire additional precast sound wall panels or masonry blocks in the colors and patterns selected on the project. A maximum of twelve panels of each type would be paid for at the invoice cost of the panels and shall be delivered to the District Office. If the Department elects to acquire additional precast sound wall panels or masonry blocks, the Contractor shall provide the material as extra work in accordance with 104.03.

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

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

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Payment will be made under:

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

* *Type of sound barrier system: (BM) bridge mounted, (GM) ground mounted, (WM) wall mounted*

** *Type 1, 2, or 3.*

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

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

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

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

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

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

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Note: Proposed new changes have shown highlighted in gray.

620-R-483 SOUND BARRIER SYSTEMS

(Revised 05-21-09)

The Standard Specifications are revised as follows:

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

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

620.01 Description

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

620.02 General Design Requirements

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

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

If the sound barrier manufacturer needs additional information to complete the design, the Contractor shall be responsible for obtaining such information. The Contractor shall be responsible for field verifying wall locations in areas of all existing traffic poles, utility poles, roadway lighting poles, drainage pipes, underdrain outlets, and bridge expansion joints and all other locations where the sound barrier system may conflict with existing conditions. The wall shall be realigned and designed to box out openings where conflicts occur with existing light poles and traffic control devices. The Contractor shall establish and account for the existing locations of all underdrain outlets, drainage pipes, and bridge expansion joints in the final wall plans. If the Contractor discovers that overhead utilities will be within 6 ft (~~2~~ 1.8 m) of the sound barrier, the Contractor shall notify the Engineer in accordance with 104.02 and 105.16.

The sound barrier wall design shall follow the general dimensions of the wall envelope as shown on the plans. The top of the sound barrier shall be at or above the acoustical profile line shown, unless noted. Changes in elevation shall be accomplished by stepping the sound barrier sections at the vertical support posts. Steps shall not exceed 3 ft (0.9 m) vertically unless otherwise specified in the plans. Barrier heights shall be selected in groups of no fewer than ~~three~~3 successive panels, except where barriers are to be stepped down for barrier termination. The ends of the sound barrier shall be

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tapered or stepped down to a height of 8 ft (~~2.6~~2.4 m) within the sound barrier end transitions or as shown on the plans. The bottom of ground mounted sound barrier shall be embedded a minimum of 6 in. (150 mm) into the ground. The bottom of wall mounted or bridge mounted sound barrier shall follow within 3 in. (75 mm) a profile 6 in. (150 mm) below the top of the existing concrete barrier railing or wall.

Caisson footings, vertical support posts, and connections for ground mounted sound barrier shall be designed as specified by the manufacturer, with minimum post spacing of 15 ~~feet~~ft (~~5~~4.5 m). Exceptions will be allowed due to site-specific conditions such as access doors, drainage requirements or utility accommodations. These shall be reviewed and approved through the ~~shop~~working drawing process. The foundation design shall use the COM 624P or LPILE Program. The foundation design shall be based on the soil model shown on the plans based on cyclic loading and shall consider the effects of a sloping ground surface. The post deflection shall be limited to L/100, measured from the top of the caisson to the top of the wall. The foundation depth shall not be less than 7.5 ft (~~2.2~~2.3 m) and shall not exceed the depth of the soil model except where the Contractor elects to drill deeper borings to extend the model. The foundation diameter shall not be less than 18 in. (450 mm) and shall not be less than 6 in. (150 mm) larger than the diagonal dimension of the post being used. The foundation shall be designed by the sound barrier manufacturer. Vertical support posts shall be attached to caisson footings by means of anchor bolts, or embedded wide flange steel posts.

A sound barrier system shall be selected for the type specified from those which are on the Department's list of approved Sound Barrier Systems. The materials used in the fabrication of the sound barrier system shall be the same as those used for approval of the sound barrier system.

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

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

When sound barriers are to be installed on a bridge structure, design calculations shall be submitted to the Engineer that demonstrate structure loading limits, as shown on the plans, will not be exceeded.

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

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

Type 1, single sided absorptive, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90. Type 1 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.70 on the roadway side. Type 1 sound barrier systems shall be tested in accordance with ASTM C 423. Material samples for this test shall be provided with the coating applied, so as to determine that the color coating does not inhibit the acoustic performance. The sample shall be mounted in accordance with ASTM E 795, type A.

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

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

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

All molded finishes shall have a 1~~.0~~ in. (25 mm) minimum relief. All rolled finishes shall have a minimum 0.75 in. (19 mm) relief. Relief is defined by material that is provided in excess of the minimum wall thickness required to meet the Noise Reduction Coefficient required for the absorptive surfaces. Fluted finishes shall be coped at each end to avoid cracking.

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

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

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

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

(a) Precast Panel Design Criteria

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

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

(b) Masonry Design Criteria

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

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

620.03 Submittals

The Contractor shall submit a minimum of ~~three~~3 alternative textured finishes for the wall to the Engineer. These shall include the following colors:

(a) light grey (federal standard 595, color number 36492)~~,~~
(b) light brown (federal standard 595,color number 30450)~~,~~
(c) light tan (federal standard 595,color number 37769)~~,~~

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The colors will be presented to the public for their input in accordance with 620.05. The final wall pattern and color will be approved before production of the wall panels may begin.

The Contractor shall submit ~~one copy of the~~ design calculations ~~for approval~~ in accordance with 105.02. ~~If the calculations are computer generated, one sample set of hand calculations, for one wall location shall also be submitted.~~ Calculations for sound barriers on bridge structures shall include an analysis of the bridge structure that demonstrates the additional loads imposed by the sound barrier, including dead load and wind load, will not exceed the structural capacity of the bridge. The Contractor shall submit ~~four sets of design~~working drawings ~~for approval~~in accordance with 105.02 after design calculations are approved and before beginning wall construction operations. ~~Design calculations and design drawings shall be signed and sealed by a professional engineer.~~ Design calculations and working drawings shall meet the following minimum requirements.

(a) Design calculations shall include all structural design calculations and vertical support post design calculations.

(b) Design calculations for bridge mounted installations shall include the design unit weight and mass of the sound barrier and support systems.

(c) Design calculations for bridge mounted installations shall demonstrate that the structural loading limits of the structure, as shown on the plans, will not be exceeded.

(d) ~~Design~~Working drawings shall include all details, dimensions, quantities, and cross sections necessary to construct the sound barrier systems and shall include but not be limited to the following:

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

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

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

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

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

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

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

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

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

10. *Typical sections and elevation views for bridge mounted installations.*

(e) ~~Design~~Working drawings shall include a detailed plan of aesthetic treatment for the entire sound barrier system, manufacturer-recommended installation requirements and sequence of construction, manufacturer-recommended repair requirements for damage caused by vandalism or graffiti prior to final acceptance, and a detailed bill of materials.

MATERIALS

620.04 Materials

Materials shall be in accordance with the following:

Cast-in-Place Portland Cement Concrete, Class A 702
Coarse Aggregate, Class A or Higher, Size No. 91 904
Coarse Aggregate, Class D or Higher, Size No. 5.....904
Coarse Aggregate, Class D or Higher, Size No. 8.....904
Concrete Masonry Units 905.06
Fine Aggregate, Size No. 23.....904
Joint Mortar .....901.08, ~~906.03~~907.12
Paint 909.02
Portland Cement .....901.01(b)
Precast Concrete.....707
Reinforcing ~~Steel~~Bars.....910.01
Structural Aluminum Posts .....910.14(d)
Structural Steel.....910
Water 913.01

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

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

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

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

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

(a) The average compressive strength of ~~three~~3 units shall be a minimum of 3000 psi (21 MPa) with no single unit being less than 2700 psi (19 MPa).

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

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

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

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

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

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

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

CONSTRUCTION

620.05 Information for Public Input

Colored flyers with appropriate graphics shall be developed by the Contractor and furnished to the Department.

Wall color photos shall be ~~submitted~~provided for each color in accordance with 620.03 along with photos of each available texture alternative. A minimum of ~~three~~3 wall samples of the non-roadway side textures shall be ~~presented~~provided. All samples of the wall textures shall be a minimum of 3 ~~square feet~~sq ft (0.27 ~~square meters~~m^2) in area, with a ~~clearly~~ distinguishable pattern.

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

620.06 Construction Requirements

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

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

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

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

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

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

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

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

The sound barrier system and sound barrier system components shall be maintained until final acceptance. Elements of the sound barrier system that are damaged or destroyed, including due to graffiti or other vandalism, shall be repaired or

replaced as directed by the Engineer. Repairs and repainting shall be conducted in accordance with the manufacturer's guidance and 620.02.

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

(a) Construction Requirements for Precast Panels

Sound barrier wall panels shall be placed in accordance with the plans and centered between adjacent posts. The sound barrier wall panels shall be of sufficient length to span the entire length between posts less 1/2 the width of the smallest retaining flange.

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

(b) Construction Requirements for Masonry

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

620.07 Acceptance

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

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

(a) Defects that indicate imperfect fabrication

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

REVISION TO THE RECURRING SPECIAL PROVISION

PROPOSED REVISION TO RSP 620-R-483 SOUND BARRIER SYSTEMS
(INCLUDES PREVIOUSLY APPROVED CHANGES, SEE PAGE 57)

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

620.08 Method of Measurement

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

620.09 Basis of Payment

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

The Department may choose to acquire additional precast sound wall panels or masonry blocks in the colors and patterns selected on the project. A maximum of ~~twelve~~12 panels of each type would be paid for at the invoice cost of the panels and shall be delivered to the District Office. If the Department elects to acquire additional precast sound wall panels or masonry blocks, the Contractor shall provide the material as extra work in accordance with 104.03.

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

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

Payment will be made under:

REVISION TO THE RECURRING SPECIAL PROVISION

PROPOSED REVISION TO RSP 620-R-483 SOUND BARRIER SYSTEMS
(INCLUDES PREVIOUSLY APPROVED CHANGES, SEE PAGE 57)

Pay Item ***Pay Unit Symbol***

Sound Barrier Design and Layout ..... LS
Sound Barrier Erection, _____, _____.....SFT (m2)
mounting type, type***
Sound Barrier Panels, _____, _____.....SFT (m2)
mounting type, type***

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

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

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

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

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

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

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

COMMENTS AND ACTION

RSP 620-R-483 SOUND BARRIER SYSTEMS

Motion: Second: Ayes: Nays:	Action: ____ Passed as Submitted ____ Passed as Revised ____ Withdrawn
Standard Specifications Sections affected: NONE Recurring Special Provision with same affected sections: 620-R-483 SOUND BARRIER SYSTEMS Standard Sheets affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	____ 20__ Standard Specifications Book ____ Revise List of Pay Items ____ 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 ___ By ____ Addition or ____ Revision Frequency Manual Update Req'd? Y__N__ By ____ Addition or ____ Revision Received FHWA Approval? ____

SPECIFICATIONS REVISIONS

REVISION TO THE RECURRING SPECIAL PROVISION

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The responsibility for certain parameters is in error.

PROPOSED SOLUTION: Make corrections to the current RSP as shown in the attachment.

APPLICABLE STANDARD SPECIFICATIONS: None

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION:

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: 731-R-202 MECHANICALLY STABILIZED EARTH WALLS

Submitted By: Randy Strain

Title: Bridge Policy and Standards Engineer,
Bridge Design, Inspection, Hydraulics, and Technical Support Division.

Organization: INDOT

Phone Number: 2-3339

Date: December 15, 2010

APPLICABLE SUB-COMMITTEE ENDORSEMENT? INDOT Retaining Wall Committee

REVISION TO THE RECURRING SPECIAL PROVISION

REVISION TO THE 731-R-202 MECHANICALLY STABILIZED EARTH WALLS

Note: Only affected section of the Recurring Special Provision shown and proposed changes highlighted in gray.
Basis for Use: As determined by Project Designer.

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 AASHTO ~~Standard Specifications for Highway Bridges~~ LRFD Bridge Design Specifications, unless specified otherwise herein. The analysis of settlement, bearing capacity, and overall slope stability ~~shall~~ will be the responsibility of the ~~manufacturer~~ Engineer.

COMMENTS AND ACTION

RSP 731-R-202 MECHANICALLY STABILIZED EARTH WALLS

Motion: Second: Ayes: Nays:	Action: ____ Passed as Submitted ____ Passed as Revised ____ Withdrawn
Standard Specifications Sections affected: NONE Recurring Special Provision affected NONE Standard Sheets affected: 731-R-202 MECHANICALLY STABILIZED EARTH WALLS Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	____ 20__ Standard Specifications Book ____ Revise List of Pay Items ____ 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 ___ By ____ Addition or ____ Revision Frequency Manual Update Req'd? Y__N__ By ____ Addition or ____ Revision Received FHWA Approval? ____

SPECIFICATIONS REVISION

REVISIONS TO THE STANDARD DRAWINGS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: We have no standardized prestressed-concrete bulb-tee members fabrication tolerances

PROPOSED SOLUTION: Show them on a new standard drawing, based on Prestressed Concrete Institute recommendations (backup 1). Also, make editorial corrections to the existing drawings for box-beams and AASHTO I-beams, such that all details are consistent, and revise General Notes as applicable.

APPLICABLE STANDARD SPECIFICATIONS: None

APPLICABLE STANDARD DRAWINGS: Existing 707-BPBF-01 for box beams and -02 for I-beams. Change existing -03, General Notes, to -04, so that the new bulb-tee beams information can be placed onto -03.

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: None

Submitted By: Randy Strain

Title: Bridge Policy and Standards Engineer, of
Bridge Design, Inspection, Hydraulics, and Technical Support Division

Organization: INDOT

Phone Number: 232-3339

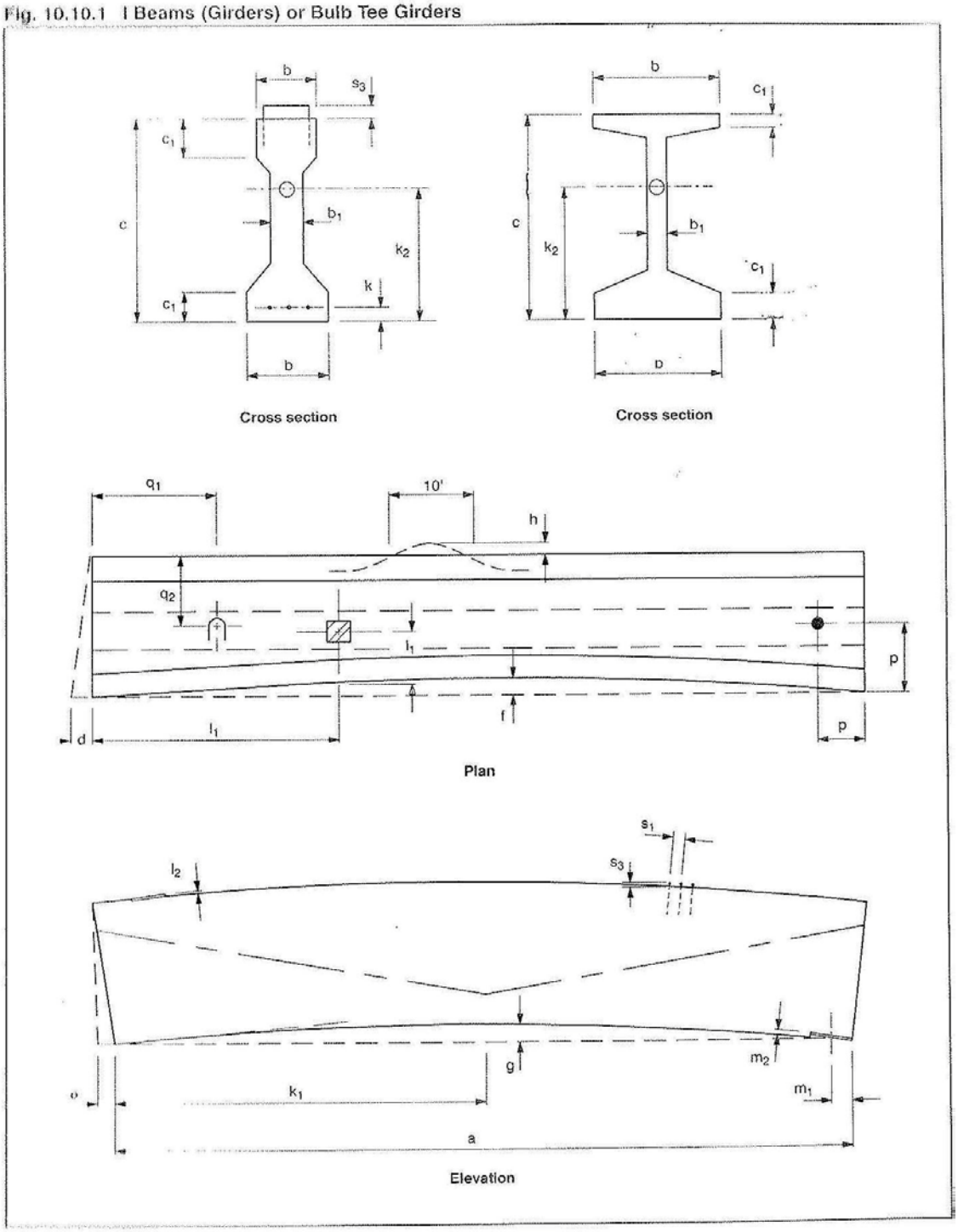
Date: 12-09-10

REVISION TO THE STANDARD DRAWINGS

BACKUP 1. PRESTRESSED CONCRETE INSTITUTE, PCI, RECOMMENDATIONS FOR TOLERANCES

PCI

Fig. 10.10.1 I Beams (Girders) or Bulb Tee Girders



REVISION TO THE STANDARD DRAWINGS

BACKUP 1. PRESTRESSED CONCRETE INSTITUTE, PCI, RECOMMENDATIONS FOR TOLERANCES (CONTINUED)

PCI

10.10 I Beams (Girders) or Bulb Tee Girders

a = Length ..... ±¼ in. per 25 ft. length, ±1 in. maximum [±6 mm per 7.5 m length, ±25 mm maximum]

b = Width (overall) ..... +⅜ in., −¼ in. [10 mm, −6 mm]

b_1 = Web width ..... +⅜ in., −¼ in. [+10 mm, −6 mm]

c = Depth (overall) ..... +½ in., −¼ in. [+13 mm, −6 mm]

c_1 = Flange depth ..... ±¼ in. [±6 mm]

d = Variation from specified plan end squareness or skew ..... ±⅛ in. per 12 in. width, ±½ in. maximum [±3 mm per 300 mm width, ±13 mm maximum]

e = Variation from specified elevation end squareness or skew ..... ±3⁄16 in. per 12 in. depth, ±1 in. maximum [±5 mm per 300 mm, ±25 mm maximum]

f = Sweep ..... ⅛ in. per 10 ft. length [3 mm per 3 m length]

g = Camber variation from design camber ..... ±⅛ in. per 10 ft. [±3 mm per 3 m] ..... ½ in. [13 mm] maximum up to 80 ft. [24 m] length ..... 1 in. [25 mm] maximum for length greater than 80 ft. [24 m]

h = Local smoothness of any surface ..... ¼ in. in 10 ft. [6 mm in 3 m]

k = Location of strand*
Individual ..... ±¼ in. [±6 mm]
Bundled ..... ±½ in. [±13 mm]

k_1 = Location of harp points for harped strands from design location ... ±20 in. [±510 mm]

k_2 = Location of post-tensioning duct ..... ±¼ in. [±6 mm]

l_1 = Location of embedment ..... ±1 in. [±25 mm]

l_2 = Tipping and flushness of embedment ..... ±¼ in. [±6 mm]

m_1 = Location of bearing assembly ..... ±⅝ in. [±16 mm]

m_2 = Tipping and flushness of bearing assembly ..... ±⅛ in. [±3 mm]

p = Location of inserts for structural connections ..... ±½ in. [±13 mm]

q_1 = Location of handling device parallel to length of member ..... ±6 in. [±150 mm]

q_2 = Location of handling device transverse to length of member ..... ±1 in. [±25 mm]

s_1 = Longitudinal spacing of stirrups ..... ±2 in. [±50 mm]

s_2 = Longitudinal spacing of stirrups within dist. "c" from member ends ... ±1 in. [±25 mm]

s_3 = Stirrup projection from beam surface ..... ±¼ in., −½ in. [±6 mm, −13 mm]

* The location of harped strand at the end of the beam may be controlled to ±½ in. [±13 mm] providing that calculations show that such a variation will not result in unacceptable stresses at any design load condition.

REVISION TO THE STANDARD DRAWINGS

BACKUP 1. PRESTRESSED CONCRETE INSTITUTE, PCI, RECOMMENDATIONS FOR TOLERANCES (CONTINUED)

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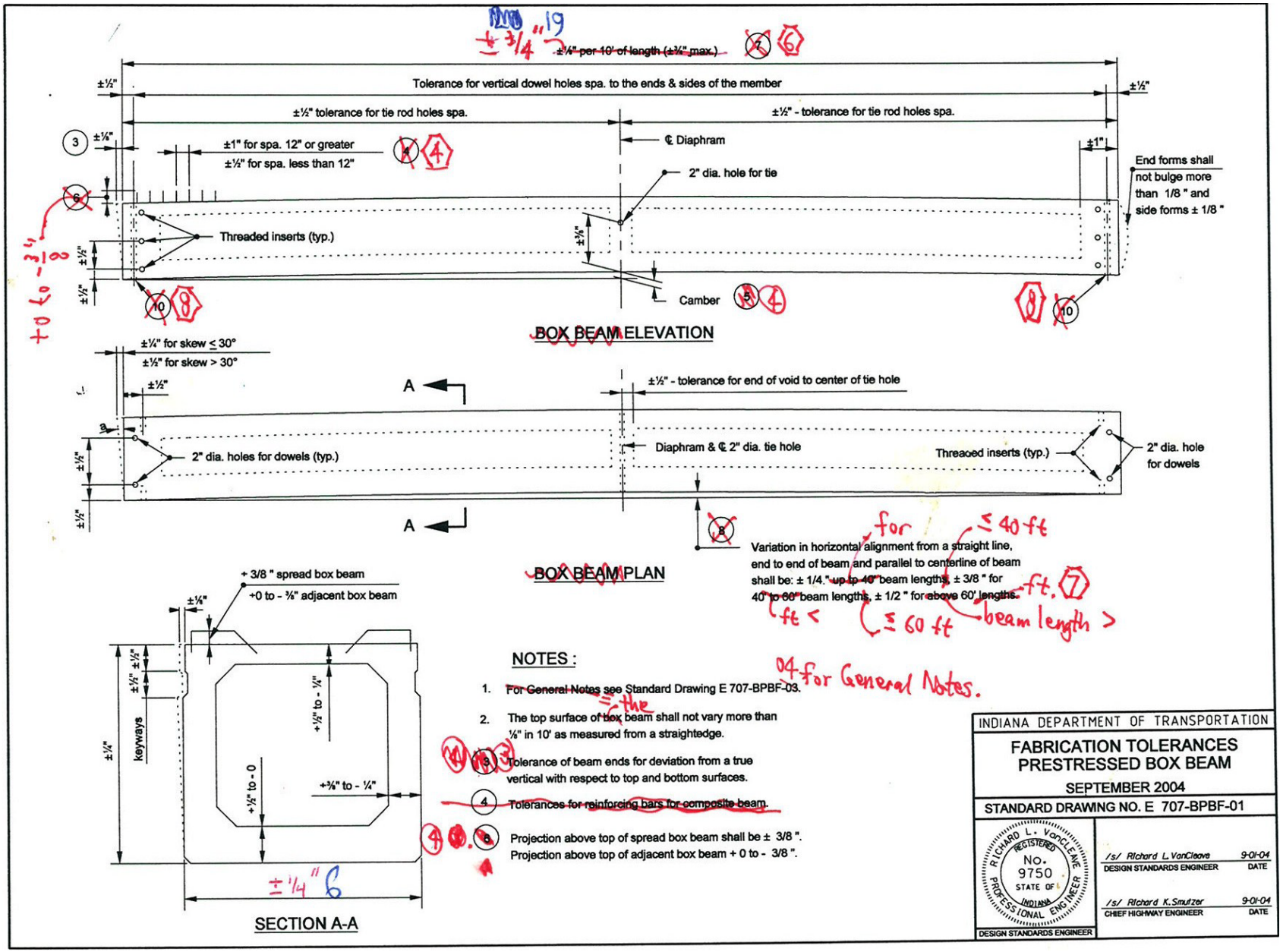
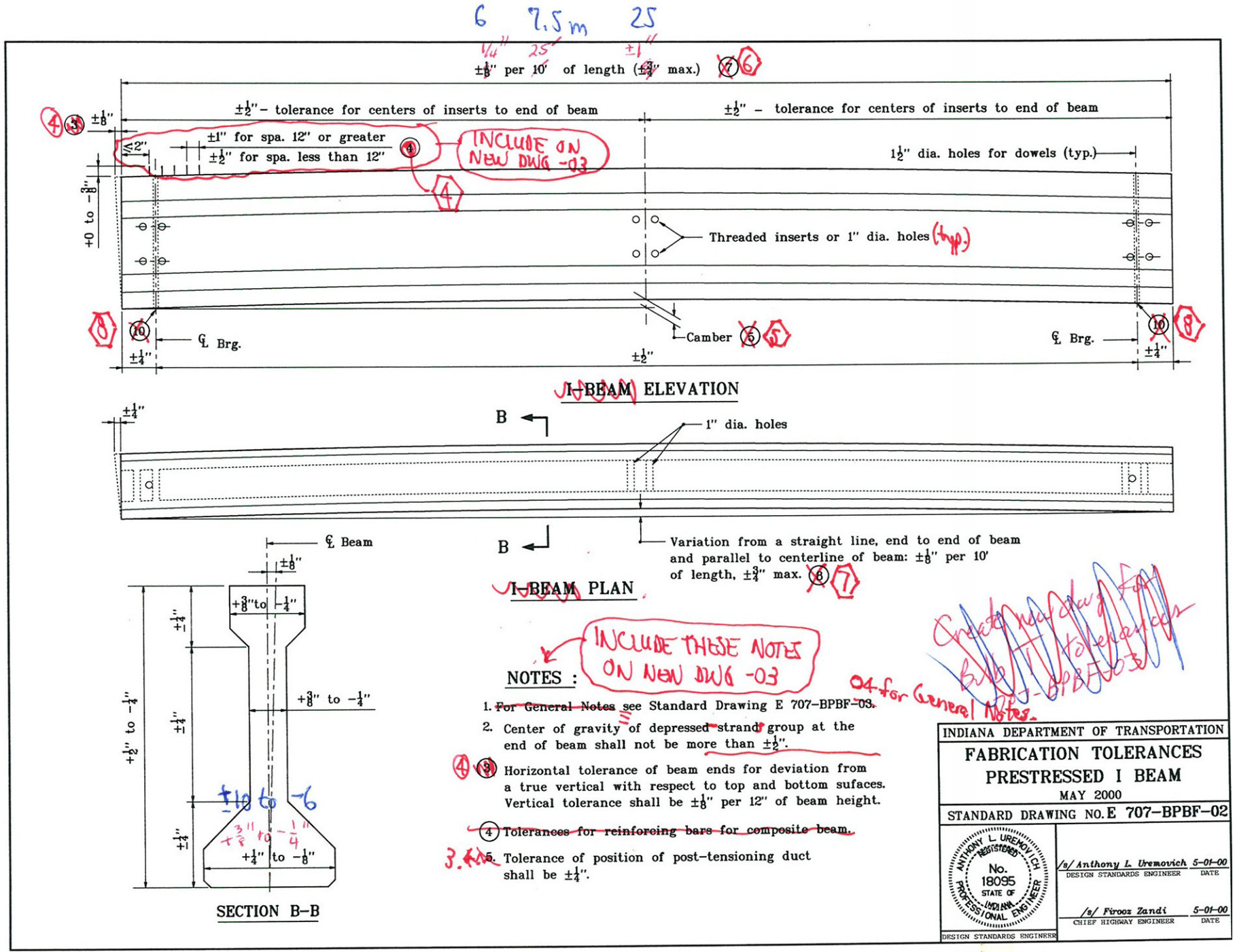
REVISION TO THE STANDARD DRAWINGS

STANDARD DRAWING 707-BPBF-01 FABRICATION TOLERANCES PRESTRESSED BOX BEAM



REVISION TO THE STANDARD DRAWINGS

STANDARD DRAWING 707-BPBF-02 FABRICATION TOLERANCES PRESTRESSED I BEAM



NOTES :

1. For General Notes see Standard Drawing E 707-BPBF-03.
2. Center of gravity of depressed strand group at the end of beam shall not be more than ±½".
3. Horizontal tolerance of beam ends for deviation from a true vertical with respect to top and bottom sufaces. Vertical tolerance shall be ±⅛" per 12" of beam height.
4. Tolerances for reinforcing bars for composite beam.
5. Tolerance of position of post-tensioning duct shall be ±¼".

INDIANA DEPARTMENT OF TRANSPORTATION

FABRICATION TOLERANCES PRESTRESSED I BEAM

MAY 2000

STANDARD DRAWING NO. E 707-BPBF-02

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

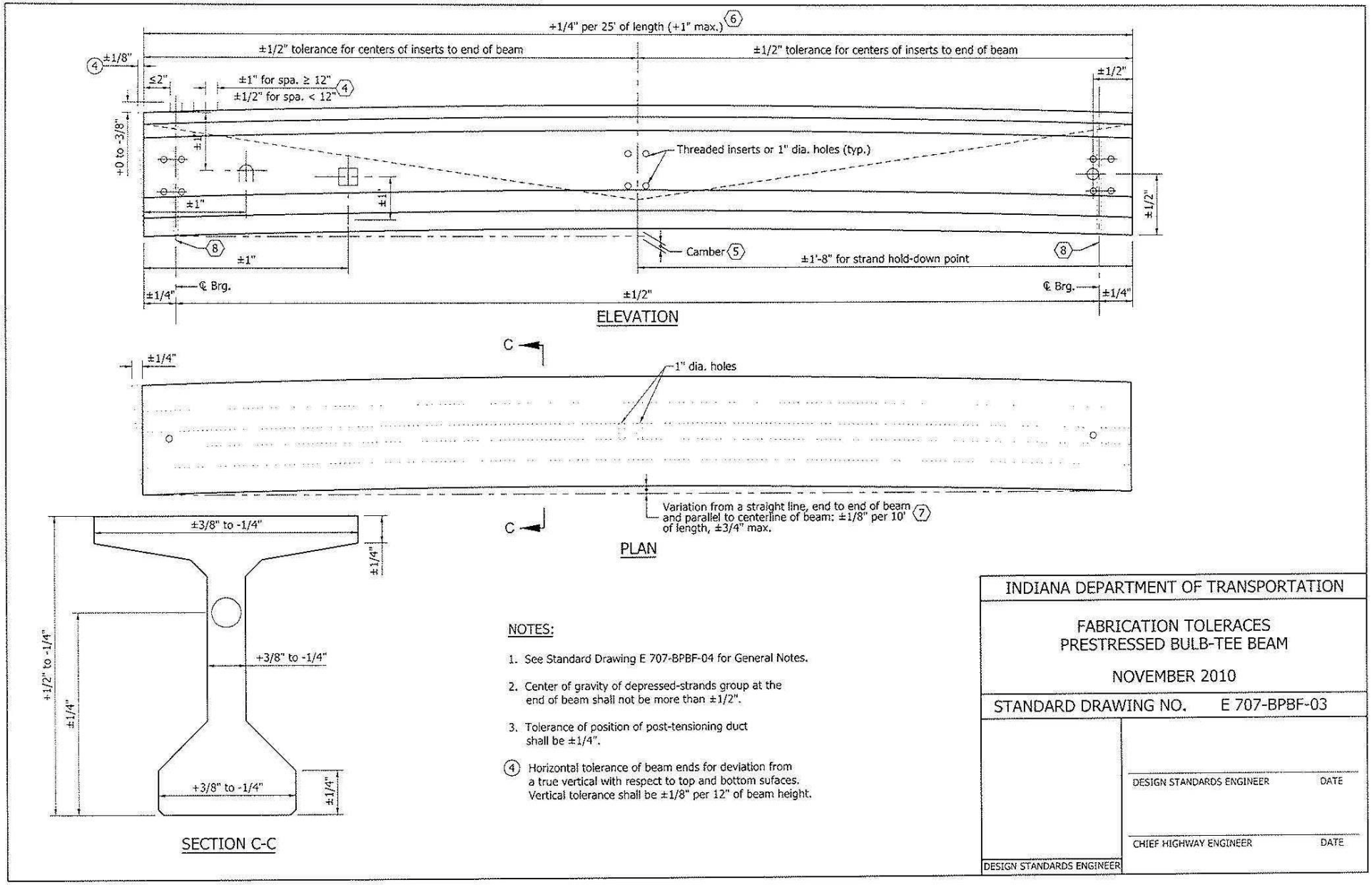
DESIGN STANDARDS ENGINEER

/s/ Anthony L. Uremovich 5-01-00
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 5-01-00
CHIEF HIGHWAY ENGINEER DATE

REVISION TO THE STANDARD DRAWINGS

PROPOSED NEW STANDARD DRAWING 707-BPBF-03 FABRICATION TOLERANCES PRESTRESSED BULB-TEE BEAM



NOTES:

1. See Standard Drawing E 707-BPBF-04 for General Notes.
2. Center of gravity of depressed-strands group at the end of beam shall not be more than ±1/2".
3. Tolerance of position of post-tensioning duct shall be ±1/4".

(4) Horizontal tolerance of beam ends for deviation from a true vertical with respect to top and bottom sufaces. Vertical tolerance shall be ±1/8" per 12" of beam height.

INDIANA DEPARTMENT OF TRANSPORTATION

FABRICATION TOLERACES
PRESTRESSED BULB-TEE BEAM

NOVEMBER 2010

STANDARD DRAWING NO. E 707-BPBF-03

DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER

REVISION TO THE STANDARD DRAWINGS

STANDARD DRAWING 707-BPBF-~~0304~~ FABRICATION TOLERANCES GENERAL NOTES

GENERAL NOTES

These notes are for fabrication tolerances for precast prestressed concrete members as shown on Standard Drawing No. E 707-BPBF-01 for box beams and on Standard Drawing No. E 707-BPBF-02 for I-beams.

1. Tolerances shown are maximum permissible varations from the dimensions shown on the plans or shop drawings. Tolerances are not to be considered cumulative. Longitudinal tolerances are based on design length. Casting length shall be adjusted to compensate for shrinkage and plastic flow.

(5) (5) Variation of camber shall not be more than 1" on one span nor more than 1/2" between adjacent members to be measured at time of erection.

Permitted camber variation from design camber is as follows:
I-beams and girders, bulb-tee girders: ±1/8" per 10'-0" length with ±1/2" maximum for member length of 80'-0" or less
±1" maximum for member length of greater than 80'-0"
Box beams: ±1/8" per 10'-0" length with ±1/2" maximum

(6) (7) Length of beam tolerance shall be checked after the final curing phase and within three days prior to shipping.

(7) (8) Horizontal alignment tolerance shall be checked immediately after removal of forms and strand release and prior to removal from bed.

2. 9. End stirrup bars shall not be more than 2" from the end of the beam.

(8) (10) At concrete bearing area, deviation from plane surface when tested in all directions of the plane surface with a steel straightedge shall not be more than ±1/16.

3. 11. Mild reinforcing steel concrete cover tolerance shall be -1/8" to +3/8".

(4) Tolerances for reinforcing bars for composite beams.

INDIANA DEPARTMENT OF TRANSPORTATION

FABRICATION TOLERANCES
GENERAL NOTES

SEPTEMBER 2009 04

STANDARD DRAWING NO. E 707-BPBF-03

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

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/01/09
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/09
CHIEF HIGHWAY ENGINEER DATE

COMMENTS AND ACTION

707-BPBF-01 FABRICATION TOLERANCES PRESTRESSED BOX BEAM
707-BPBF-02 FABRICATION TOLERANCES PRESTRESSED I BEAM
707-BPBF-03 FABRICATION TOLERANCES PRESTRESSED BULB-TEE BEAM
707-BPBF-~~03~~*04* FABRICATION TOLERANCES GENERAL NOTES

Motion: Second: Ayes: Nays:	Action: ____ Passed as Submitted ____ Passed as Revised ____ Withdrawn
Standard Specifications Sections affected: NONE Recurring Special Provision affected: Standard Sheets affected: 707-BPBF-01; 707-BPBF-02; 707-BPBF-03. Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	____ 20__ Standard Specifications Book ____ Revise List of Pay Items ____ 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 ___ By _____ Addition or _____ Revision Frequency Manual Update Req'd? Y___N___ By _____ Addition or _____ Revision Received FHWA Approval? ____

SPECIFICATIONS REVISIONS

REVISION TO THE STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The 707 precast prestressed structural member specification needs updating to better clarify curing requirements, acceptance testing, and other minor items.

PROPOSED SOLUTION: Incorporate the proposed changes into the 707 specification section.

APPLICABLE STANDARD SPECIFICATIONS: 707 Precast and Prestressed Concrete Structural Members

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: None

PAY ITEMS AFFECTED: None

Submitted By: Greg Pankow

Title: State Construction Engineer

Organization: INDOT

Phone Number: 2-5502

Date: December 17, 2010

APPLICABLE SUB-COMMITTEE ENDORSEMENT: An ad hoc committee consisting of Charles Bersch, Bob Dahman, Dave Hamilton, Tommy Nantung, Greg Pankow, Jim Reilman, Perry White, and Tony Zander were involved with the proposed changes. Industry was also sent a copy for their review.

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 707 – PRECAST AND PRESTRESSED CONCRETE STRUCTURAL MEMBERS

Note: Changes that are shown highlighted in gray have been approved by the Standard Committee on November 20, 2008 and on June 18, 2009

The Standard Specifications are revised as follows:

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

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

707.01 Description

This work shall consist of ~~the~~ fabricati~~on~~ng, furnishing, and install~~ation~~ing ~~of~~ reinforced precast or precast prestressed concrete structural members or, if specified, concrete deck panels cast outside the structure, transported to, and incorporated into the structure, all in accordance with 105.03.

707.02 Materials

Materials shall be in accordance with the following:

Admixtures for Concrete	912.03
Backer Rod	*906.02(b)*
Coarse Aggregates, Class A or Higher, Size No. 91*	904
Concrete Curing Materials	912
Concrete Sealers	909.09, 909.10
Elastomeric Bearings	915.04
Fine Aggregates, Size No. 23	904
Fly Ash	901.02
Ground Granulated Blast Furnace Slag	*901.03*
PCC Sealer/Healer	*901.06*
Portland Cement	901.01(b)
~~Prestressing Strand~~	~~910.01(b)7~~
Reinforcing Bars	910.01
Silica Fume	*901.04*
Uncoated 7 Wire Strand	*910.01(b)7*

* *The maximum size of coarse aggregate shall be two-thirds of the spacing between individual reinforcing bars, bundles of bars, prestressing strands, or post-tensioning ducts.*

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

Tensioning rods and steel plates used with adjacent prestressed-concrete box beams shall be in accordance with ASTM A 706, Grade 36 (A 706M, Grade 250). Nuts used with such tensioning rods shall be heavy hex in accordance with ASTM A 563 (A 563M). Grout used with such beams shall be non-shrink in accordance with ASTM C 1107.

707.03 General Requirements

All precast non-prestressed structural members shall be produced from a source listed on the Department's List of Certified Precast Concrete Producers, in accordance with ITM 813. ~~S~~*All precast prestressed s*tructural members including, but not limited to, concrete deck panels, box-beams, I-beams, U-beams, and bulb-T beams shall be manufactured in a Department-approved plant in accordance with ITM 814.

Dimensions and design requirements for structural members shall be as shown on the plans. Lengths and dimension tolerances shall be as shown on the plans or as otherwise specified.

A beam whose dimensions exceed the tolerances shown on the plans will be rejected. A beam which is to include a field attached curb shall have curb reinforcement located longitudinally within 3/4 in. (~~20~~*19* mm) of the locations shown on the plans.

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

If detailed drawings are not included in the plans, ~~shop~~*working* drawings shall be submitted for approval in accordance with 105.02. Certified mill test reports shall be furnished for all ~~high tensile~~*prestressing* strands. ~~Fabrication shall not begin until the shop drawings are approved.~~

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

Prior to the beginning of fabrication, a prefabrication meeting shall be held at the fabrication facility or another agreed upon location. The meeting shall be conducted by the ~~fabricator~~*Contractor* and attended by the fabricator's production supervisor and quality control inspector, and the Engineer. The ~~fabricator~~*Contractor* shall take notes of the meeting and distribute copies to all attending parties within ~~five~~5 days of the date of the meeting. Items to be discussed at the meeting shall include a minimum of: fabrication and shipping schedule including hours of operation; line of communication between ~~fabricator~~*Contractor* and Engineer; material test reports; ~~shop~~*working* drawings; special fabrication methods; fabrication hold points for inspection; final inspection and acceptance of materials; method of shipment. The

requirement to hold prefabrication meetings may be waived by the Department, if the Department so chooses.

A type A field office in accordance with 628 shall be provided at any facility that fabricates precast prestressed structural members for the Department's exclusive use. In lieu of a field office, a work area and the following items in accordance with 628 for the exclusive use by the Department shall be provided on the property where the structural members are being fabricated.

(a) office desktop
(b) office chair
(c) broadband internet service
(d) telephone
(e) fax machine
(f) copier
(g) filling cabinet.

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

CONSTRUCTION REQUIREMENTS

707.04 Steel and Concrete Requirements

(a) Reinforcing Bars

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

(b) Prestressing Strands

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

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

Number of Strands in Bed	Wire Breaks
19 or ~~F~~*f*ewer	0
20 through 39	1
40 through 59	2
60 or ~~M~~*m*ore	3

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

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

(c) Concrete

Concrete shall be air entrained and in accordance with the applicable requirements of 702.05. The concrete shall have a minimum temperature of 50°F (10°C) and a maximum temperature of 90°F (32°C) at the time of placement. ~~C~~*When a c*hemical admixture type~~s~~ A, D, F, or G *is used, it* shall be used in combination with an air entraining admixture. A high range water reducing, HRWR, or high range water reducing retarding, HRWRR, admixture system ~~shall~~*may* be used. Chemical admixture types B, C, and E will *only* be ~~permitted only~~ *allowed* with *prior* written permission. ~~Admixtures, other than air-entraining admixtures, shall not be used with air-entrained cement.~~ *Air-entraining cement will not be permitted.* The cement content of the mixed concrete shall be sufficient to obtain the specified minimum 28-day compressive strength. The total of portland cement and other cementitious materials shall *be a minimum of 564 lbs/cu yd (335 kg/m^3) and shall* not exceed 800 lbs/c*u* yd (475 kg/m^3). *Silica fume may be added in an amount not to exceed 5% of the total cementitious material.* ~~Slump shall be no less than 2 in. (50 mm) nor more than 5 in. (125 mm) for concrete without chemical admixtures or concrete containing chemical admixture types A and D.~~

When a type A, D, or E admixture is not used, or if a type B or C chemical admixture is used, slump shall be no less than 1 in. (25 mm) or more than 3 in. (75 mm). When concrete admixtures type A, D, or E is used, slump shall be no less than 2 in. (50 mm) or more than 5 in. (125 mm). When ~~C~~*c*oncrete containing admixture type F, G, or admixture systems *is used, the concrete* shall have a slump no less than 3 in. (75 mm) ~~n~~or more than 7 in. (175 mm). The amount of time from mixing to placement and consolidation shall be a maximum of 30 min. The concrete shall not be retempered with additional amounts of chemical admixture types F or G after the initial mixing has been completed.

1. Cold Weather Concrete

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

2. Hot Weather Concrete

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

3. Acceptance Testing

Acceptance of precast and precast prestressed members will be based on tests for slump, air content, and compressive strength. *All slump, air content, and compressive strength tests shall be performed in the presence of the Engineer. Compressive strength shall be obtained from test cylinders described herein.* The 28-day compressive strength shall be equal to or greater than the specified concrete compressive strength.

Test cylinders for acceptance shall be molded and field cured in accordance with ASTM C 31~~ and tested in accordance with ASTM C 39~~. *All test cylinders shall receive the same curing conditions as the structural member which they represent.* ~~The fabricator shall make a minimum of two 6 in. dia. by 12 in. test cylinders per member cast. The fabricator may elect to make additional cylinders for acceptance testing prior to 28 days. The 28 day compressive strength of the concrete for each structural member will be determined by the average strength of two cylinders representing that member. The strength of any individual cylinder for a member shall not be lower than 95% of the specified concrete compressive strength. The fabricator may elect to make and test additional cylinders for acceptance at an earlier age in lieu of the 28 day requirement.~~

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

Test cylinders shall be tested with a compression testing machine that is in accordance with ASTM C 39. The Contractor shall submit a certificate of calibration for the machine to the Engineer.

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

a. Precast, Non-Prestressed Members

When fabricating precast non-prestressed members, a minimum of three 6 in. diameter x 12 in. test cylinders shall be made per member cast. The 28-day compressive strength of the concrete for each member will be determined by the average strength of the 3 test cylinder set representing that member. The strength of any individual cylinder from a set representing a structural member shall not be less than 90% of the specified concrete compressive strength. The fabricator may elect to make additional three-cylinder sets for acceptance testing prior to 28 days.

b. Precast, Prestressed Members

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 707 – PRECAST AND PRESTRESSED CONCRETE STRUCTURAL MEMBERS

When fabricating precast prestressed members, a minimum of nine 6 in. diameter x 12 in. test cylinders shall be made per member cast. One third of the test cylinders shall be made from each of 3 separate batches or loads of concrete used in casting each structural member. Slump and air content measurements shall be obtained each time test cylinders are made. The Contractor may make additional sets of 3 cylinders for acceptance testing prior to 28 days. Test cylinders shall be identified by use of Department-marked cylinder identification tags which shall be inserted a maximum of 3/8 in. (10 mm) into the top of each freshly molded cylinder. The cylinder number, a unique structural member identification number, temperature, air content, and slump of the concrete represented by each cylinder shall be referenced to the numbers on the cylinder identification tags and provided to the Engineer at the end of each day on which cylinders are molded.

A test cylinder set shall consist of 1 cylinder from each of the 3 separate batches of concrete. One test cylinder set shall be tested and used to determine when the precast prestressed member has met or exceeded the required strength for detensioning of the prestressing bed. The second test cylinder set is an optional set and may be tested at the Contractor's discretion to either determine if the required strength for detensioning of the prestressing bed has been met or exceeded, or if the required 28-day compressive strength has been met or exceeded prior to 28 days elapsing. The Engineer will accept the results of the optional cylinder strength tests, in place of either the detensioning strength tests or the 28-day compressive strength tests, if the results equal or exceed either of the respective compressive strength requirements. If the optional set of test cylinders does not meet or exceed the 28-day compressive strength requirements, the remaining test cylinder set shall be tested at 28 days of age to determine the acceptability of the compressive strength of the concrete. All 3 test cylinders in a test cylinder set shall be tested within 15 min of each other. The Department will remove cylinder identification tags prior to the Contractor testing the cylinders.

The 28-day compressive strength of the concrete for each structural member will be determined by the average strength of the 3 test cylinders representing that member. The strength of any individual cylinder from a three-cylinder set representing a structural member shall not be less than 90% of the specified concrete compressive strength.

Coring of precast prestressed members shall not be performed. Precast prestressed members that have been cored will not be accepted. Compressive strength results obtained from cores will not be considered for acceptance of precast prestressed members. Compressive strength results that are for test cylinders that exceed 28 days in age or results from test cylinders that do not have the Department-marked cylinder identification tag intact will not be accepted.

(d) Other Requirements

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

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

1. Maximum water/cementitious ratio in pounds (kilograms) of water per pound (kilogram) of cementitious material shall be 0.420.

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

3. Minimum compressive strength of concrete at time of prestressing shall be 4000 psi (~~27.6~~*28* MPa).

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

Inspection of the precast prestressed member during manufacture and checking and testing aggregates, cement, concrete, and steel specimens ~~will~~*shall* be performed. All specimens shall be furnished without cost to the Department. Inspection, checking, and testing performed by the Department will not relieve the Contractor or the fabricator from performing their own quality control inspection, testing, and checking as necessary to maintain quality control over the manufacturing, handling, and curing procedure. A permanent record of the force applied to and measured elongation obtained for each prestressing strand and the identification of the strand and ~~unit~~*member* to which the record applies shall be provided. This record shall be certified that it accurately represents the force applied and measured elongation by the fabricator's production supervisor and provided to the Engineer prior to shipment.

707.05 Forms

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

707.06 Placing and Finishing Cement Concrete

The temperature of the prestressing strands and forms shall be monitored between the time of the application of prestressing force and the placement of the concrete. During hot

weather, approved means shall be undertaken to cool the ~~prestressing strands and~~ forms immediately prior to placement of the concrete.

When abutment anchorage set-ups where prestressing strands are anchored to abutments that are independent from the form, thermal adjustments shall be made if the temperature of the prestressing strands at the time of tensioning differs by more than 25°F (15°C) from the temperature of the concrete mixture during placement. This requirement will not apply to self-stressing beds.

Void boxes, inserts, and attachments shall be formed of approved material and shall be securely fastened in order to maintain the proper position during concrete placement and consolidation. All voids shall have weep holes or otherwise be vented during beam production until after curing, then sealed before the beams are shipped. If a structural member contains a void that has moved or shifted from its planned position, the member will not be accepted.

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

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

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

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

707.07 Removal of Forms and Curing

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

Curing shall be in a suitable enclosure to minimize heat and moisture loss and insulated blankets may be used. The concrete in the form shall be maintained at a minimum temperature of 50°F (10°C) during the entire curing cycle. Curing for precast or precast prestressed members

shall be done by wet curing without supplemental heat or by accelerated curing. Test cylinders representing the concrete in the member shall be cured in the same manner in the same enclosure as the member they represent. During the period of initial set of the member and during the accelerated curing by radiant heat, the concrete shall be kept wet by the method outlined below for wet curing without supplemental heat.

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

Side forms may be removed when no distortion, slump, or misalignment of the concrete will result. Precast members which are not prestressed shall remain on the bottom supporting forms for the span until the concrete has reached a strength of at least 2000 psi (14 MPa) as evidenced by test cylinders made and cured in the same manner as the slab.

(a) Wet Curing without Supplemental Heat

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

When wet curing *without supplemental heat* is used, the exposed surfaces of the members shall be covered by two layers of wet burlap and the burlap shall be kept wet *to ensure that free water is present at all times*. Additional curing of precast or precast prestressed ~~units~~*members* will not be required provided the minimum specified ultimate strength can be obtained.

In precast prestressed concrete structural members, wet curing without supplemental heat shall continue until such time as the compressive strength of the concrete reaches or exceeds the strength specified for transfer of prestress or detensioning. At this point wet curing is considered to have concluded. Detensioning shall be performed within 6 hours after wet curing has concluded. In precast non-prestressed members, wet curing without supplemental heat shall continue until such time as the compressive strength of the concrete reaches the strength specified for stripping of forms.

(b) Accelerated Curing

When accelerated curing of the concrete is used, it shall be done by low pressure steam or radiant heat curing. ~~Insulated blankets may be used to reduce heat and moisture loss subject to maintaining a~~*A* ~~50°F (10°C) minimum temperature. The heat shall always be applied at a controlled rate following the initial set of the concrete, and an effective method of retaining the heat and moisture in the concrete shall be used during the curing cycle.~~ *Radiant heat may be applied by means of pipes circulating steam, hot oil or hot water, or by electric heating elements. When steam is used, the jets shall be positioned so that they do not discharge directly on the concrete, forms, or test cylinders. The steam shall be at 100% relative humidity to prevent loss of moisture and to provide moisture for proper hydration of the cement.*

~~Curing shall be in a suitable enclosure to minimize heat and moisture loss.~~ Except to maintain a minimum *concrete* temperature of 50°F (10°C), heat shall not be applied until the

concrete has attained ~~its~~ initial set. The time of initial set may be determined by ASTM C 403. When the initial set is not determined by ASTM C 403, the initial application of heat shall be ~~from 2 to~~*a minimum of* 4 h after final *concrete* placement. If retarders are used, this time shall be increased to ~~4 to~~*a minimum of* 6 h *after final concrete placement. Heat shall always be applied at a controlled rate following the initial set of the concrete, and an effective method of retaining the heat and moisture in the concrete shall be used during the entire curing cycle.*

~~During the initial application of radiant heat or live steam, the ambient temperature within the curing shall increase at an average rate not exceeding 40°F/h (5°C/h) until the curing temperature is reached. Neither the maximum temperature within the enclosure nor the maximum temperature on the surface of the concrete shall exceed 160°F (71°C). The maximum curing temperature shall be held until the concrete has reached the minimum required strength for moving precast and precast prestressed. In discontinuing the steam application, the air temperature inside the enclosure shall decrease at a rate not to exceed 70°F/h (20°C/h) until the temperature has reached 20°F (7°C) above the temperature of the air to which the member will be. Time and temperature recording thermometers shall be provided.and used to verify compliance with the stated heating and cooling rates. units. Detensioning should be accomplished immediately after accelerated curing has been discontinued, provided the member has met or exceeded the specified release strength. When multiple members are cast in the same bed, all members shall meet or exceed the specified release strength prior to detensioning. Additional curing of precast or precast prestressed units will not be required provided the minimum specified ultimate strength can be obtained.~~

During the initial application of radiant heat or live steam, the temperature measured in the concrete shall increase at an average rate not exceeding 36°F/h (20°C/h). The maximum concrete temperature shall not exceed 158°F (70°C). A minimum of one time and temperature recording device, capable of recording temperatures in degrees Fahrenheit or Celsius at intervals not exceeding 15 minutes, shall be provided per structural member. A minimum of 2 time and temperature recording devices shall be provided per contiguous form group and common heat source. The time and temperature recording devices shall be located at the portion of the structural member likely to experience the maximum temperature during curing.

The curing temperature shall be sustained until the concrete has reached the minimum required strength for detensioning the structural members.

As the application of heat is discontinued, the concrete temperature shall decrease at a rate not to exceed 50°F/h (28°C/h). When the concrete temperature has reached 40°F (22°C) or less above the ambient temperature outside the curing enclosure, accelerated curing is considered to have concluded. Detensioning shall be performed within 6 hours after accelerated curing has concluded, provided the member has met or exceeded the specified release strength. A thermometer shall be provided to monitor ambient air temperatures. This thermometer does not have to have recording capabilities.

The time and temperature recording devices shall be used to verify compliance with the heating and cooling rates contained herein.

When multiple members are cast in the same bed, all members shall meet or exceed the specified release strength prior to detensioning. Additional curing of precast or precast prestressed members will not be required provided the minimum specified ultimate strength can be obtained.

When prestressing strands are incorporated into concrete, torches or other devices that produce excessive amounts of heat, as determined by the Engineer, shall not be used to cut off prestressing strands. The ends of the concrete structural member where prestressing strands have been cut to be flush with the end of the member shall be coated with bituminous mastic sealant in accordance with 907.11. All prestressing strands that are exposed and protrude from the end of the beam shall be protected from rusting by use of a material that is not considered detrimental to bonding with concrete.

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

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

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

707.08 Handling and Shipping

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

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

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

Precast members shall not be shipped nor used until the concrete compressive strength reaches a minimum of ~~4,500~~*4500* psi (31 MPa) for members which are not prestressed and ~~5,000~~*5000* psi (34.5 MPa) for members which are prestressed.

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

707.09 Placing Structural Members

Erection of precast prestressed structural members shall commence at the centerline and proceed out to the curb, one member at a time. As each member is placed, the transverse tie bars, if shown on the plans, shall be inserted and secured. Any shifting of the members shall be done while they are held free of the supports by the hoisting device. The use of a steel pinch bar will not be permitted. Members shall be set to proper line and grade with uniform bearing on bridge seats, mortar joints, or bearing pads as required on the plans. When required, members shall be secured to the pier or bent with dowel rods. Holes for dowels shall be filled with mortar at fixed ends and with crack or joint filler at expansion ends. Longitudinal keyway joints shall be cleaned. A coat of cement mortar shall be scrubbed on the surface. The joint shall be filled with a non-shrinking grout composed of ~~one~~*1* part portland cement, ~~two~~*2* parts No. 23 fine aggregate, and an approved non-shrinking additive or a non-shrink, non-metallic cementation grout in accordance with ASTM C 1107. All bolts or drains shown on the plans as necessary or desirable to be placed in the concrete shall be placed by the methods and at the locations shown on the plans. Necessary tie rods, tie bolts, and hardware for tying members together shall be furnished.

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

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

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

After adjacent prestressed-concrete box beams are in place, the transverse tensioning rods shall be preliminarily tightened as shown on the plans. The rods shall be final tensioned as shown on the plans. The final tensioning shall yield 20,000 psi (138 MPa) as developed by means of a torque of 19 lb/ft (271 N/m). The tensioning-rod recesses and longitudinal joints between beams shall be filled with grout.

707.10 Precast Prestressed Concrete Deck Panels

Precast prestressed concrete deck panels shall be designed as a non-composite section to support the dead load of the panel, reinforcement, plastic concrete, and a construction load of 50 lb/ft^2 (2.4 kPa). ~~The panel shall be designed as a composite section with the class C concrete to support the live load. The Contractor shall revise the area of top longitudinal reinforcement over interior supports for negative moment to be equal to the total area of top and bottom longitudinal reinforcement.~~

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

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

The concrete for deck panels shall be placed in accordance with 702.20. The concrete shall be vibrated to prevent honeycombs and voids, especially at the corners and edges of the panels. The tops of the deck panels shall be broom or wire brush finished in the direction of the prestressing strands. The corrugations formed shall be uniform in appearance and shall not be

more than 1/4 in. (6 mm) in depth. The coarse aggregate shall not be displaced when preparing the roughened surface.

707.11 Method of Measurement

Precast or precast prestressed concrete structural members will be measured by the linear foot (meter). Railing will be measured in accordance with 706.05 if specified as a pay item. Structural steel for intermediate diaphragms will not be measured.

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

707.12 Basis of Payment

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

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

Payment will be made under:

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

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

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

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

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 707 – PRECAST AND PRESTRESSED CONCRETE STRUCTURAL MEMBERS

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

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

The cost of time and temperature recording devices and their monitoring shall be included in the cost of the structural members.

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The cost of a field office or of providing the field office items listed herein shall be included in the cost of the pay items of this section.

REVISION TO STANDARD SPECIFICATIONS

SECTION 910 – METAL MATERIALS
910.01(b)7 UNCOATED 7 WIRE STRAND FOR PRESTRESSED CONCRETE

The Standard Specifications are revised as follows:

SECTION 910, BEGIN LINE 81, DELETE AS FOLLOWS:

7. Uncoated 7 Wire Strand ~~for Prestressed Concrete~~

Uncoated 7 wire strand ~~for prestressed concrete~~ shall be in accordance with ASTM A 416. The strand shall have the minimum tensile strength and initial tension shown on the plans.

Uncoated 7 wire strand shall be covered by a type A certification in accordance with 916. The certification shall include the lot number, size, cross-sectional area, yield strength, breaking strength, strand composition, modulus of elasticity, and a load-elongation curve for each size of strand supplied.

COMMENTS AND ACTION

SECTION 707 – PRECAST AND PRESTRESSED CONCRETE STRUCTURAL MEMBERS
910.01(b)7 UNCOATED 7 WIRE STRAND FOR PRESTRESSED CONCRETE

Motion: Second: Ayes: Nays:	Action: ____ Passed as Submitted ____ Passed as Revised ____ Withdrawn
Standard Specifications Sections affected: SECTION 707 begin pg 521; 910.01(b)7 pg 820. Recurring Special Pr ovision with same affected sections: 206-B-113 GENERAL BRIDGE REQUIREMENTS Standard Sheets affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	____ 20__ Standard Specifications Book ____ Revise List of Pay Items ____ 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 ___ By ____ Addition or ____ Revision Frequency Manual Update Req'd? Y___N___ By ____ Addition or ____ Revision Received FHWA Approval? ____

SPECIFICATION REVISIONS

REVISION TO THE STANDARD DRAWINGS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Information regarding guardrail length and placement approaching a bridge is now on Standard Drawings, and instead belongs in Design Manual. Some current information is also duplicated, and sometimes contradictory.

PROPOSED SOLUTION: Delete Standard Drawings listed below; add Standard Drawing listed below; revise appropriate Design Manual text and add and delete figures as listed below. Retain detail now on Standard Drawing 601-MPPG-02.

FHWA's Keith Hoernschemeyer has concurred in this proposal, 12-17-10.

APPLICABLE STANDARD DRAWINGS: Delete existing 601-BAGR-01 and -02;
601-MPPG-01 through -04;
601-RPPG-01 through -05.
Add new 601-GRBS-01.

AFFECTS TOWARD DELETION OF STANDARD DRAWINGS:

New Figure	Configuration	Based on Existing Standard Drawing to be Deleted
49-4E(1)	min gdrl lgth	601-BAGR-01, bottom half, or Table BAGR-1
	"	601-MPPG-02, Table MPPG-1
	"	601-MPPG-02, Table MPPG-2
	"	601-RPPG-03, Table RPPG-1
	"	601-RPPG-03, Table RPPG-2
49-4E(2)	2W-BR-OS	601-BAGR-01, top half
49-4E(3)	1W-BR-MS	601-BAGR-02
49-4E(4)	2W-SO-OS	601-RPPG-04
49-4E(5)	2W-TO-OS	601-RPPG-05
49-4E(6)	1W-SO-OS	601-RPPG-01
49-4E(7)	1W-TO-OS	601-RPPG-02
49-4E(8) detail (a)	1W-SO-MS	601-MPPG-04
49-4E(8) detail (b)	"	601-MPPG-01, bottom half
49-4E(9) detail (a)	1W-TO-MS	601-MPPG-03
49-4E(9) detail (b)	"	New detail, not based on an existing standard drawing
49-4E(10)	gdrl pay lgth	Not based on an existing standard drawing

1W = one way roadway; 2W = two-way roadway
BR = bridge on roadway; SO = single overpass; TO = twin overpasses
MS = median shoulder; OS = outside shoulder

SPECIFICATION REVISIONS

REVISION TO THE STANDARD DRAWINGS

AFFECTS TOWARD NEW STANDARD DRAWING:

The detail shown on Standard Drawings 601-MPPG-02, 601-RPPG-03, and 601-RPPG-06 will be retained as a standard detail, now on new Standard Drawing 601-GRBS-01.

Standard Drawings 601-RPPG-01 and -02 Note 4 regarding rectangular plate washers is also addressed on new Standard Drawing 601-GRBS-01.

APPLICABLE DESIGN MANUAL SECTIONS:

Revise 49-4.02(01) Barrier Length of Need in Advance of Hazard for Adjacent Traffic,
49-4.02(04) Length of Need at Outside-Shoulder Bridge Pier
49-8.01(04) Design Procedure, and
49-9.02 Bridge-Railing End Protection.
Add new Manual Figures 49-4E(1) through 49-4E(10).
Delete existing Manual Figures 49-4K and 49-9A.

Copy to be deleted is overstruck. Copy to be added is italic.

APPLICABLE STANDARD SPECIFICATIONS: None

APPLICABLE SECTION OF GIFE: None

Submitted By: Randy Strain

Title: Bridge Policy and Standards Engineer, of
Bridge Design, Inspection, Hydraulics, and Technical Support Division

Organization: INDOT

Phone Number: 232-3339

Date: 12-28-10

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM 49-4.02(01), 49-4.02(04), 49-8.01(04) AND 49-9.02

49-4.02(01) Barrier Length Needed in Advance of Hazard for Adjacent Traffic

4. Minimum Length of Barrier. ~~If the design speed is 50 mph or higher, the required length in advance of the hazard for adjacent or opposing traffic will be the greater of the calculated length or 100 ft where GRET type I is used. Otherwise such length will be the greater of the calculated length or 50 ft.~~

~~If the design speed is 45 mph or lower, the required length of guardrail in advance of the hazard for adjacent traffic will be the greater of the calculated length or 50 ft.~~ *The minimum guardrail length required in advance of a hazard should be as shown in Figure 49-4E(1).*

5. *Guardrail Configuration at Approach to Bridge or Support. See the following figures to determine the guardrail configuration and minimum pay length for each situation listed below.*

49-4E(2)	*Guardrail Configuration for Outside-Shoulder Approach to Bridge*
49-4E(3)	*Guardrail Configuration for Median-Shoulder Approach to Bridge*
49-4E(4)	*Guardrail Configuration for Bridge Support Inside Clear Zone, Two-Way Roadway, Single Overhead Structure*
49-4E(5)	*Guardrail Configuration for Bridge Support Inside Clear Zone, Two-Way Roadway, Twin Overhead Structures*
49-4E(6)	*Guardrail Configuration for Bridge Support Inside Clear Zone, One-Way Roadway, Single Overhead Structure, Outside Shoulder*
49-4E(7)	*Guardrail Configuration for Bridge Support Inside Clear Zone, One-Way Roadway, Twin Overhead Structure, Outside Shoulder*
49-4E(8)	*Guardrail Configuration for Bridge Support Inside Clear Zone, One-Way Roadway, Single Overhead Structures, Median Shoulder*
49-4E(9)	*Guardrail Configuration for Bridge Support Inside Clear Zone, One-Way Roadway, Twin Overhead Structures, Median Shoulder*
49-4E(10)	*Guardrail Pay Length for Approach to Bridge Support*

The L_{ET} portion of a guardrail end treatment type OS or MS, shown on Figures 49-4E(2) through 49-4E(9), should be considered as part of the guardrail length of need as described in Section 49-8.01(04) item 2.

49-4.02(04) Length of Need at Outside-Shoulder Bridge ~~Pier~~ *Support*

1. ~~Pier~~ *Support* Located ≤ 16 ft from Edge of Travel Lane. The ~~pier~~ *support*-protection barrier must be attached to the upstream traffic end of the ~~pier~~ *support*. The minimum required barrier length is shown in Figure ~~49-4K, Length of Need Requirement for Pier Protection, and described below~~ *49-4E(1), Minimum Guardrail Length Required in Advance of Hazard.*

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM 49-4.02(01), 49-4.02(04), 49-8.01(04) AND 49-9.02

~~a. If the pier end is located outside the clear zone and the design speed ≥ 50 mph, the minimum required length is 100 ft.~~

~~b. If the pier end is located outside the clear zone and the design speed ≤ 45 mph, the minimum required length is 50 ft.~~

~~c.~~ *a.* If the ~~pier~~ *support* end is located inside the clear zone and the design speed ≥ 50 mph, the ….

~~d.~~ *b.* If the ~~pier~~ *support* end is located inside the clear zone and the design speed ≤ 45 mph, the ….

49-8.01(04) Design Procedure

2. Relationship Between GRET and Guardrail Length of Need. *Some GRETs can function as typical guardrail as described below.*

a. GRET Type OS. A 37.5-ft portion of the downstream end of a GRET type OS can function as typical guardrail ~~and can~~, *so therefore should* be considered as part of the length of need in advance of the obstruction. Therefore, where GRET type OS is warranted, the pay length for the guardrail run is equal to the required length of need for the guardrail minus 37.5 ft.

b. GRET Type MS. A 12.5-ft portion of the downstream end of a GRET type MS can function as typical guardrail ~~and can~~, *so therefore should* be considered as part of the length of need in advance of the obstruction. Therefore, where GRET type MS is warranted, the pay length for the guardrail run is equal to the required length of need for the guardrail minus 12.5 ft.

GRET type I or II cannot function as typical guardrail, so no portion of it should be considered as part of the guardrail length of need.

These reduced pay lengths are to be reflected in the guardrail lengths shown on the plans.

49-9.02 Bridge-Railing End Protection

The AASHTO LRFD Bridge Design Specifications require*s* that each bridge-railing end *should* be protected from direct collision by traffic. The type and ~~the amount~~ *extent* of protection required are determined based on the location of the bridge-railing end relative to the clear zone. ~~and~~ *The*

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM 49-4.02(01), 49-4.02(04), 49-8.01(04) AND 49-9.02

minimum extent of protection should be ~~in accordance with Figure 49-9A, Bridge Railing End Protection Requirements~~ *as shown in Figure 49-4E(1), Minimum Guardrail Length Required in Advance of Hazard. Conditions in an urban area can preclude the protection as shown in Figure 49-4E(1). See LRFD Bridge Design Specifications Article 13.7.1.2 and its Commentary for other options.*

The required length of bridge-approach guardrail, including the guardrail transition, for both shoulders of a 2-lane, 2-way highway, or the outside shoulders of a divided highway is based on the clear-zone requirement for the roadway and the design speed. The calculated length is rounded up to the nearest whole multiple of 6.25 ft. The length shown ~~herein~~ *in Figure 49-4E(1)* is that required to protect the end of the bridge railing only and should be considered the minimum requirement. All hazards adjacent to the bridge-railing end should be considered where bridge-approach-guardrail length is ~~computed~~ *to be determined.*

REVISION TO THE STANDARD DRAWINGS

601-RPPG-03 ROADSIDE PIER PROTECTION GUARDRAIL (PROPOSED TO DELETE)

DELETE THIS STD DWG

GENERAL NOTES

1. This drawing shall be used where W-beam guardrail is specified along the outside shoulder of a multi-lane divided roadway to shield the piers of overhead structures.
2. The details on this drawing are typical guardrail layouts for shielding the piers of single or tandem overhead structures. The required length of guardrail shall be determined in accordance with Tables RPPG-1 and RPPG-2, and shall be as shown on the plans.
3. Dimensions and details not shown on this drawing shall be as shown on the plans.

NOTES ARE DESIGN-RELATED

VARIATION OF TABLE DATA TO NEW IDM FIG. 49-4E(1)

TABLE RPPG-1

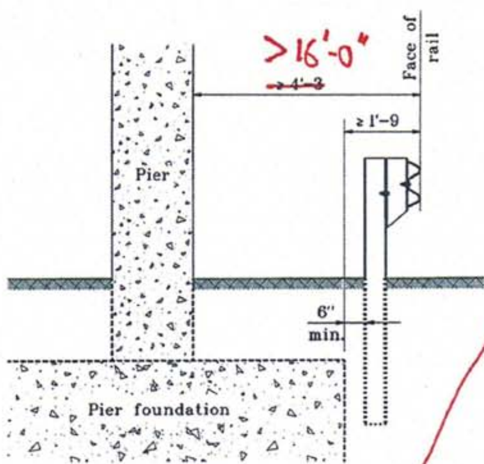
Outside (Right Side) Shoulder Pier Approach Guardrail Lengths at Piers/Frame Bents ≤ 16' from Pavement Edge

Design Speed (mph)	Pier End Inside Clear Zone	Pier End Outside Clear Zone	Guardrail Pay Length (ft.)
	Required Minimum Length (ft.) in Advance of the Pier/Frame Bent End		
≥ 50	>of the rounded calculated length of need or 100'	100'	Required minimum length minus 25' for GP transition
<50	>of the rounded calculated length of need or 50'	50'	

TABLE RPPG-2

Outside (Right Side) Shoulder Pier Approach Guardrail Lengths at Piers/Frame Bents > 16' from Pavement Edge

Design Speed (mph)	Pier End Inside Clear Zone	Pier End Outside Clear Zone	Guardrail Pay Length (ft.)
	Required Minimum Length (ft.) in Advance of the Pier/Frame Bent End		
≥ 50	>of the rounded calculated length of need or 100'	100'	Required minimum length plus length to shield pier face
< 50	>of the rounded calculated length of need or 50'	50'	



Guardrail to Pier Clearance

VARIATION OF THIS DETAIL TO NEW STD DWG E 601-GRBS-01

INDIANA DEPARTMENT OF TRANSPORTATION

ROADSIDE PIER PROTECTION GUARDRAIL

SEPTEMBER 1997

STANDARD DRAWING NO. E 601-RPPG-03

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

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

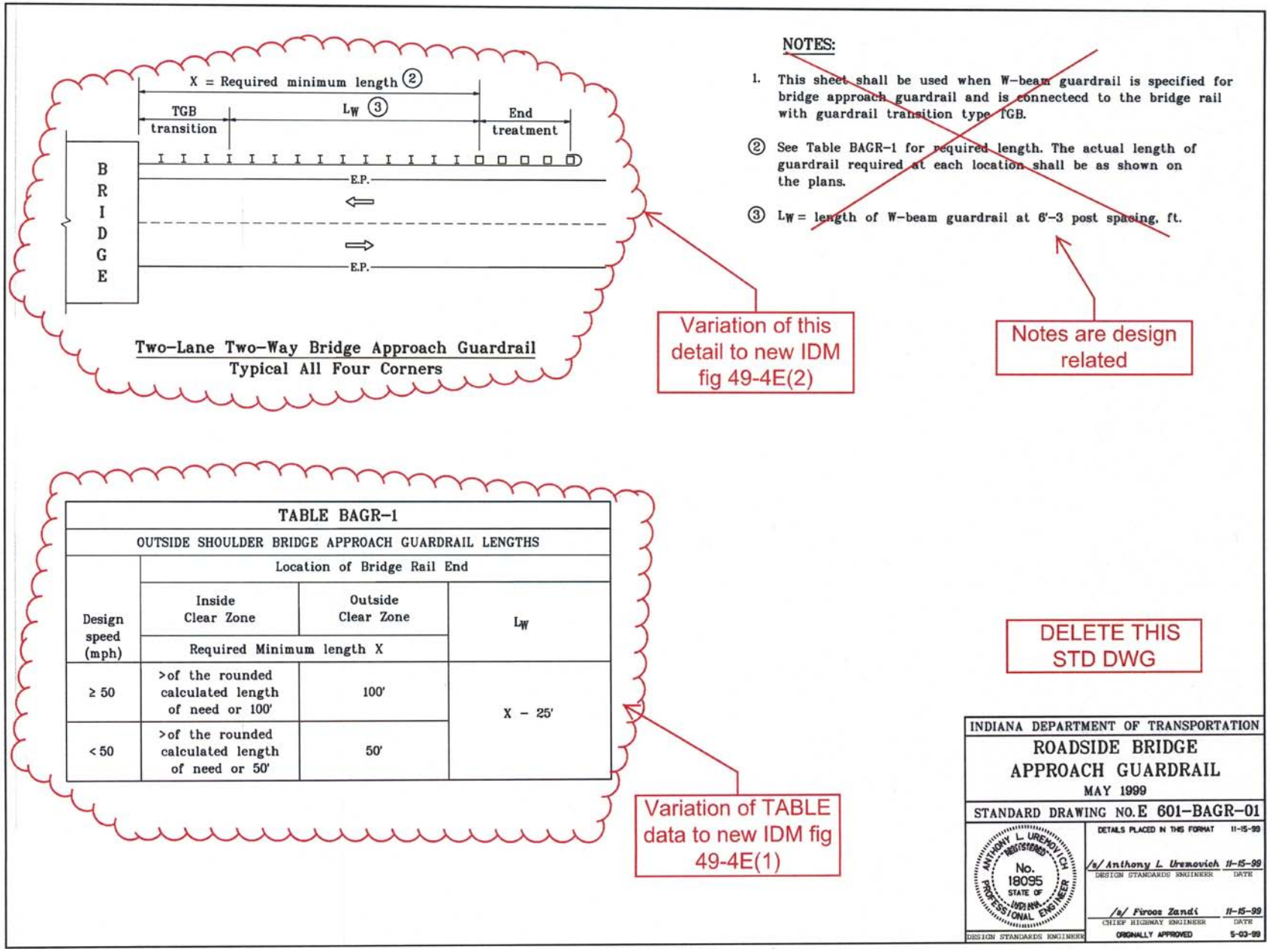
/s/ Anthony L. Uremovich 9-03-99
DESIGN STANDARDS ENGINEER DATE

/s/ [illegible] 9-03-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 9-01-97

REVISION TO THE STANDARD DRAWINGS

601-BAGR-01 ROADSIDE BRIDGE APPROACH GUARDRAIL (PROPOSED TO DELETE)



REVISION TO THE STANDARD DRAWINGS

601-MPPG-02 MEDIAN PIER PROTECTION GUARDRAIL (PROPOSED TO DELETE)

GENERAL NOTES

1. This drawing shall be used where W-beam guardrail is specified along the median side shoulder of a multi-lane divided roadway to shield the piers of tandem overhead structures.
2. The details on this drawing are typical guardrail layouts for shielding the piers of tandem overhead structures. The required length of guardrail shall be determined in accordance with Tables MPPG-1 and MPPG-2, and shall be as shown on the plans.
3. Dimensions and details not shown on this drawing shall be as shown on the plans.

VARIATION OF TABLE DATA TO NEW IDM FIG 49-4E (1)

NOTES ARE DESIGN-RELATED

TABLE MPPG-1

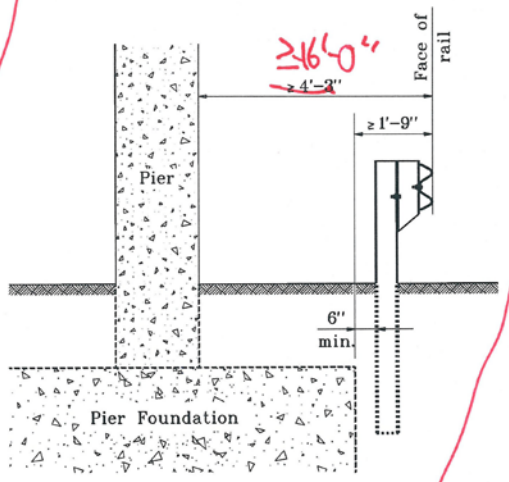
Outside (Right Side) Shoulder Pier
Approach Guardrail Lengths at Piers/Frame Bents
≤ 16' from Pavement Edge

Design speed mph	Pier End Inside Clear Zone	Pier End Outside Clear Zone	Guardrail Pay Length (ft)
	Required Minimum Length (ft) in Advance of the Pier/Frame Bent End		
≥ 50	>of the rounded calculated length of need or 100	100	Required minimum length minus 25' for GP transition
< 50	>of the rounded calculated length of need or 50	50	

TABLE MPPG-2

Outside (Right Side) Shoulder Pier
Approach Guardrail Lengths at Piers/Frame Bents
> 16' from Pavement Edge

Design speed mph	Pier End Inside Clear Zone	Pier End Outside Clear Zone	Guardrail pay length (ft)
	Required Minimum Length (ft) in Advance of the Pier/Frame Bent End		
≥ 50	>of the rounded calculated length of need or 30	100	Required minimum length plus length to shield pier face
< 50	>of the rounded calculated length of need or 15	50	



Guardrail to Pier Clearance

VARIATION OF THIS DETAIL TO NEW STD DWG E 601-GRBS-01

INDIANA DEPARTMENT OF TRANSPORTATION
MEDIAN PIER
PROTECTION GUARDRAIL
SEPTEMBER 1997
STANDARD DRAWING NO. E 601-MPPG-02

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

DETAILS PLACED IN THIS FORMAT 11-15-99
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 9-01-97

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4E(1)MINIMUM GUARDRAIL LENGTH REQUIRED IN ADVANCE OF HAZARD (DRAFT)

Design Speed (mph)	With GRET Type OS, MS, or II (ft)	With GRET Type I (ft)
≥ 50	50	100
≤ 45	50	50

MINIMUM GUARDRAIL LENGTH REQUIRED IN ADVANCE OF HAZARD

Figure 49-4E(1)

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4K LENGTH-OF-NEED REQUIREMENT FOR PIER PROTECTION

Design Speed (mph)	Pier End Inside Clear Zone	Pier End Outside Clear Zone
	Required Minimum Length	
≥ 50	Calculated Length of Need or 100 ft, whichever is greater	100 ft
≤ 45	Calculated Length of Need or 50 ft, whichever is greater	50 ft

LENGTH-OF-NEED REQUIREMENT FOR PIER PROTECTION

Figure 49-4K

DELETE, AS TABLE DATA RESEMBLE, SO ARE THEREFORE SUPERSEDED, BY DATA IN NEW FIG 49-4E(1)

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-9A BRIDGE-RAILING-END PROTECTION REQUIREMENTS

Design Speed, mph	With Guardrail End Treatment Type I	With Guardrail End Tmt. Type OS or MS
≥ 50	Length of Need or 100 ft, whichever is greater	Length of Need or 50 ft, whichever is greater
≤ 45	Length of Need or 50 ft, whichever is greater	Length of Need or 50 ft, whichever is greater

Note: This is the minimum bridge-approach guardrail length, including guardrail-transition length.

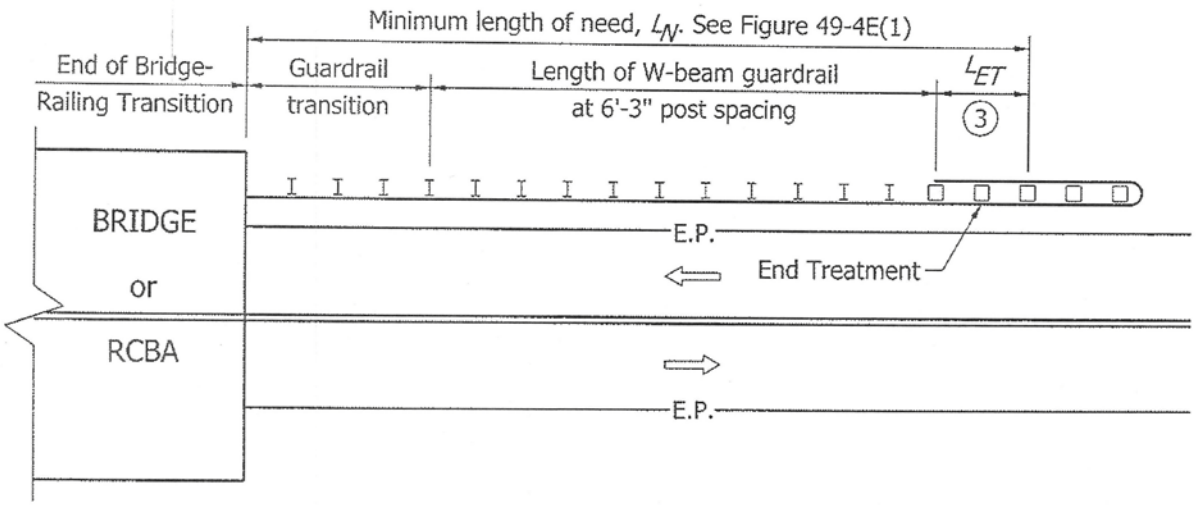
BRIDGE-RAILING-END PROTECTION REQUIREMENTS

Figure 49-9A

DELETE, AS TABLE DATA RESEMBLE, SO ARE THEREFORE SUPERSEDED, BY DATA IN NEW RIG 49-4E(1)

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4E(2) GUARDRAIL CONFIGURATION FOR OUTSIDE-SHOULDER APPROACH TO BRIDGE (DRAFT)



NOTES:

1. For a two-lane two-way roadway, this configuration should be used at all four corners.
2. For a one-way roadway, this configuration should be used only on the upstream-approach's outside shoulder. Guardrail is required on the downstream side only if there is a hazard to be shielded.

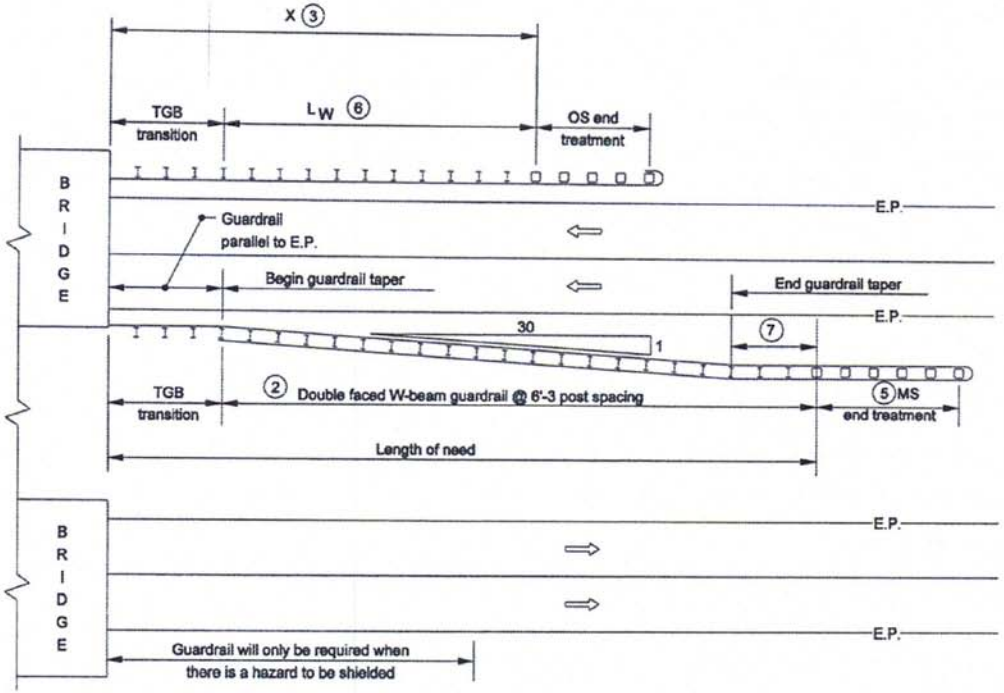
③ The L_{ET} portion of a guardrail end treatment type OS should be considered as part of L_N as described in Section 49-8.01(04) Item 2.

GUARDRAIL CONFIGURATION FOR OUTSIDE-SHOULDER APPROACH TO BRIDGE

Figure 49-4E (2)

REVISION TO THE STANDARD DRAWINGS

601-BAGR-02 MEDIAN BRIDGE APPROACH GUARDRAIL (PROPOSED TO DELETE)



Multi-Lane Divided Bridge Approach Guardrail

NOTES:

1. This drawing shall be used when W-beam guardrail is specified for bridge approach guardrail and is connected to the bridge rail with guardrail transition type TGB.
2. See Table B-1-2 for required length. The actual length of guardrail required at each location shall be as shown on the plans.
3. See Standard Drawing E 601-BAGR-01 for Table B-1-1 for required minimum length X.
4. Explanation for Table B-1-2:
   20 = clear zone, ft.
   132 = req'd length of double faced guardrail at 6'-3 post spacing, ft.
5. See alternate placement detail on Standard Drawing E 601-GRET-07.
6. L_W = length of W-beam guardrail at 6'-3 post spacing, ft.
7. Transition rail as required for MS unit.

TABLE B-1-2

MEDIAN SHOULDER BRIDGE APPROACH GUARDRAIL LENGTHS, ft

Median Slopes	DESIGN SPEED (mph)			
	50	55	60	110
Flatter than 6:1	(4) 20 / 152	22 / 176	29 / 221	30 / 256
6:1	20 / 152	24 / 185	32 / 231	34 / 273
5:1	24 / 169	26 / 193	36 / 243	38 / 286

VARIATIONS OF DETAIL, NOTES, AND TABLE TO NOW IDM FIG. 49-4E (3)

DELETE THIS STD DWG

INDIANA DEPARTMENT OF TRANSPORTATION

MEDIAN BRIDGE APPROACH GUARDRAIL

MARCH 2005

STANDARD DRAWING NO. E 601-BAGR-02

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

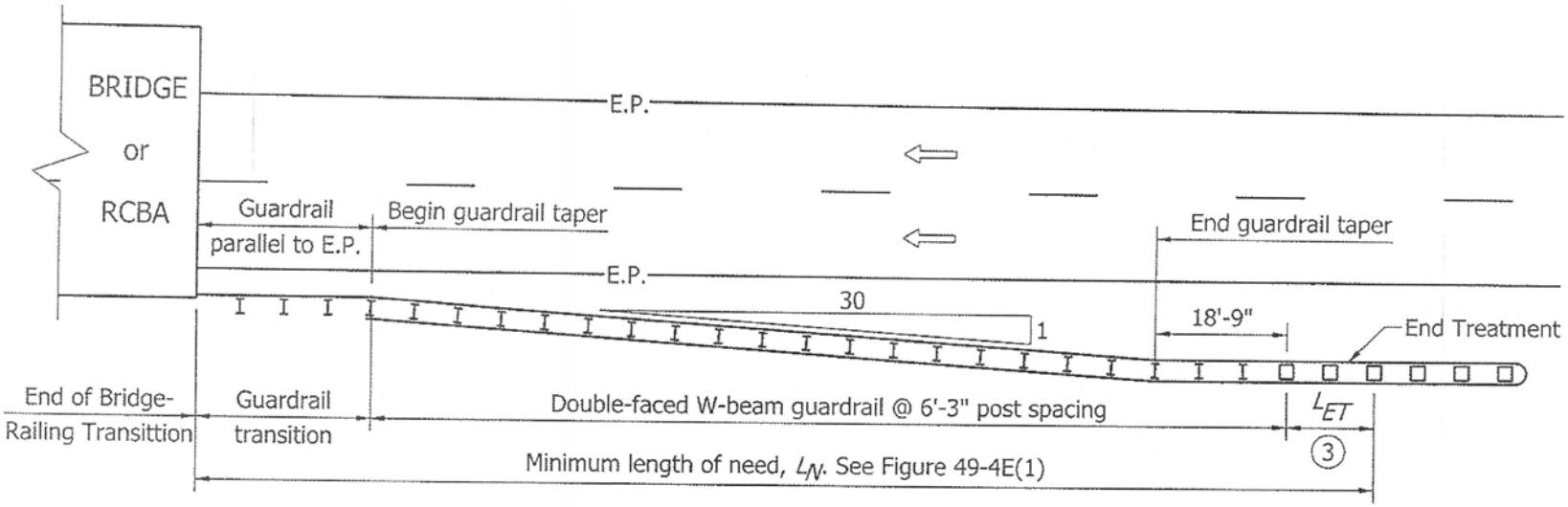
DESIGN STANDARDS ENGINEER

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

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

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4E(3) GUARDRAIL CONFIGURATION AND LENGTH OF NEED FOR MEDIAN-SHOULDER APPROACH TO BRIDGE (DRAFT)



Median Slope	DESIGN SPEED (mph)			
	≤ 50	55	60	65
Flatter than 6:1	20 / 150	22 / 175	29 / 225	30 / 250
6:1	20 / 150	24 / 188	32 / 238	34 / 275
5:1	24 / 175	26 / 200	36 / 250	38 / 300

NOTES:

1. For a one-way roadway, this configuration should be used only on the upstream-approach's median shoulder. Guardrail is required on the downstream side only if there is a hazard to be shielded.

2. In the fractional values in the table, the numerator represents the clear-zone width, (ft). The denominator represents L_N (ft).

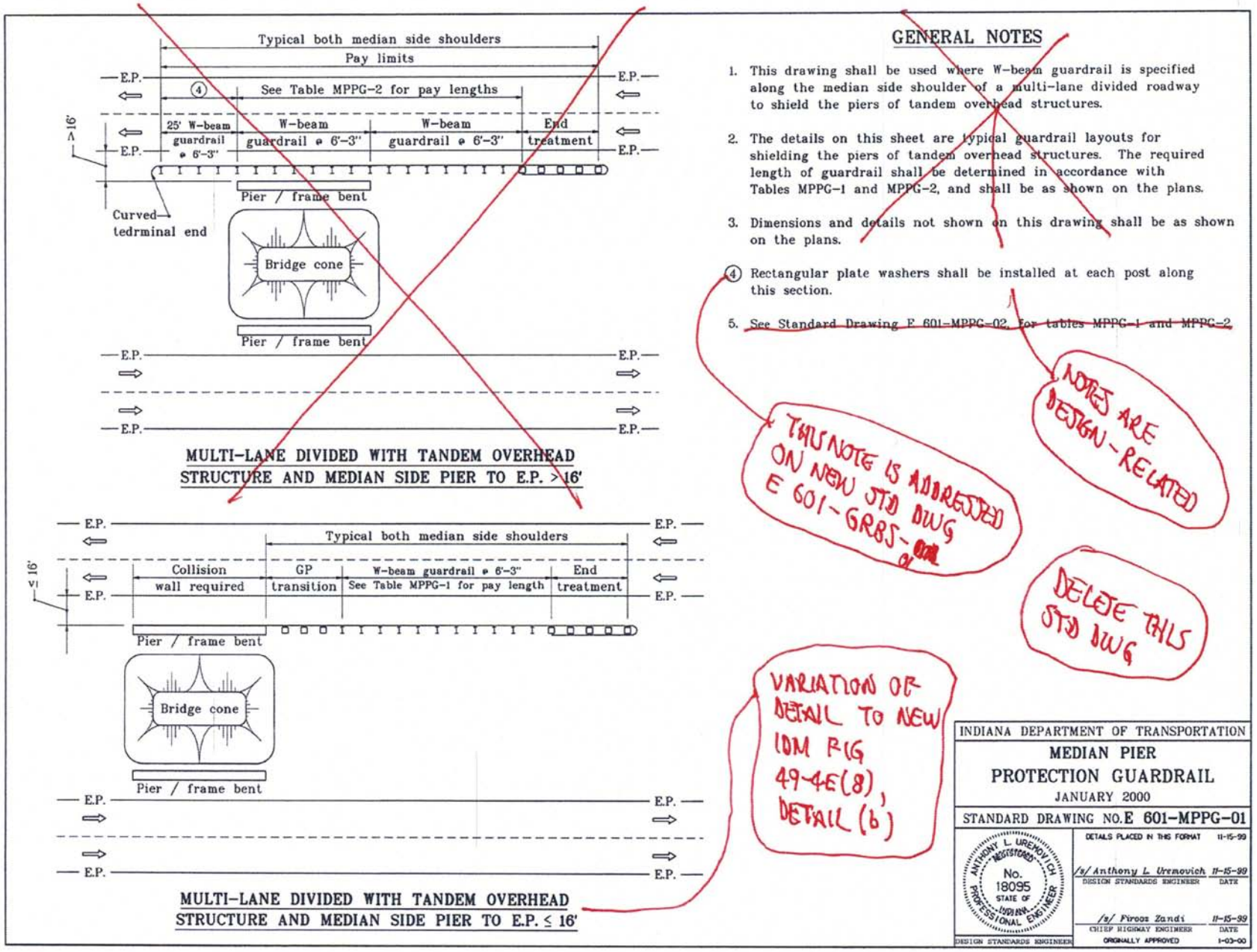
(3) The L_{ET} portion of a guardrail end treatment type MS should be considered as part of L_N as described in Section 49-8.01(04) Item 2.

GUARDRAIL CONFIGURATION AND LENGTH OF NEED FOR MEDIAN-SHOULDER APPROACH TO BRIDGE

Figure 49-4E (3)

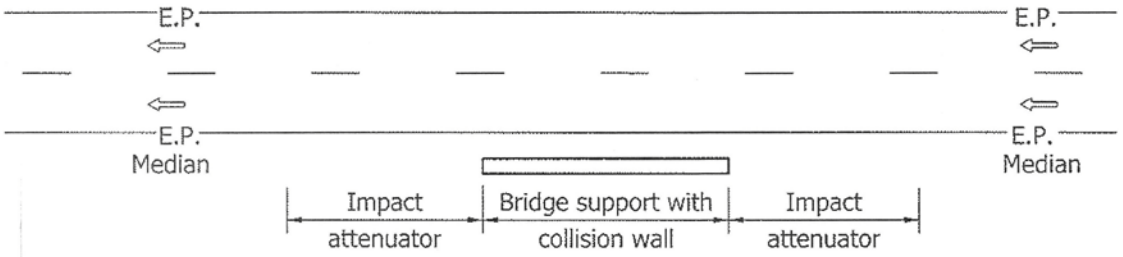
REVISION TO THE STANDARD DRAWINGS

601-MPPG-01 MEDIAN PIER PROTECTION GUARDRAIL (PROPOSED TO DELETE)

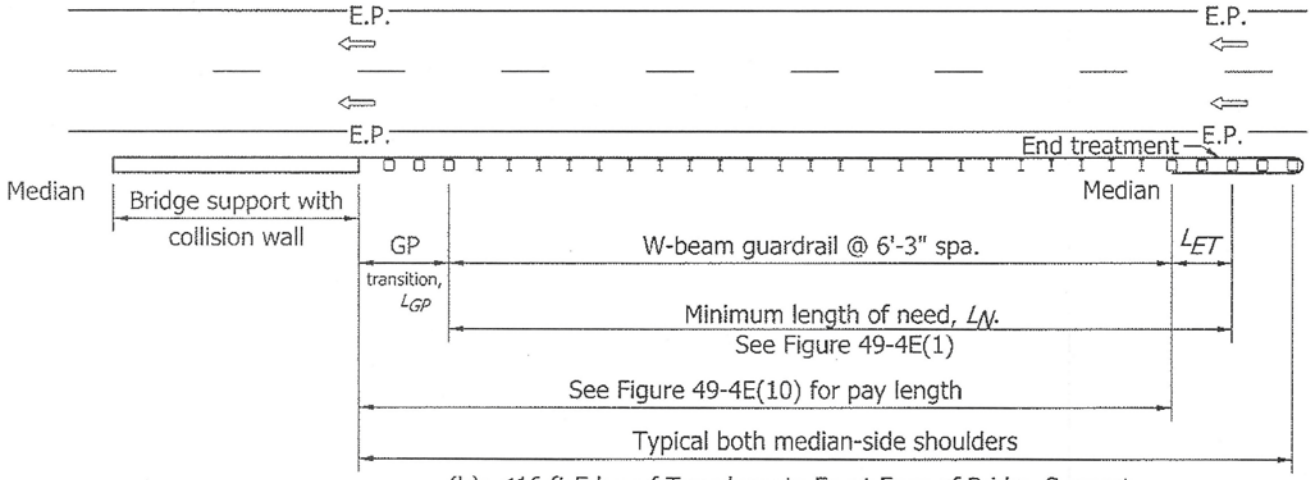


REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4E(8) GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, ONE-WAY ROADWAY, SINGLE OVERHEAD STRUCTURE, MEDIAN SHOULDER (DRAFT)



(a): >16 ft Edge of Travelway to Front Face of Bridge Support



(b): ≤16 ft Edge of Travelway to Front Face of Bridge Support

GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, ONE-WAY ROADWAY, SINGLE OVERHEAD STRUCTURE, MEDIAN SHOULDER

Figure 49-4E (8)

REVISION TO THE STANDARD DRAWINGS

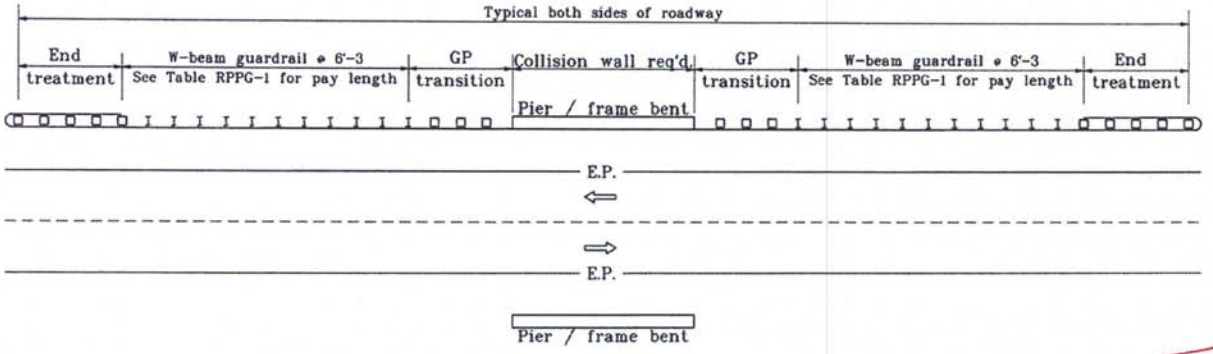
601-RPPG-04 ROADSIDE PIER PROTECTION GUARDRAIL (PROPOSED TO DELETE)

DELETE THIS STD DWG

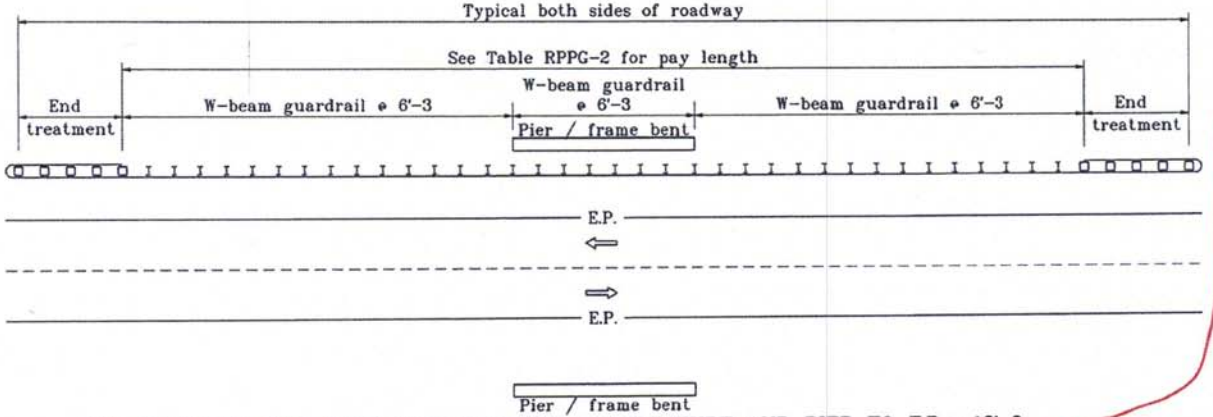
GENERAL NOTES

1. This drawing shall be used where W-beam guardrail is specified along a two-lane two-way roadway to shield the piers of overhead structures.
2. The details on this drawing are typical guardrail layouts for shielding the piers of a single overhead structure. The required length of guardrail shall be determined in accordance with Tables RPPG-1 and RPPG-2, and shall be as shown on the plans.
3. Dimensions and details not shown on this drawing shall be as shown on the plans.
4. See Standard Drawing E 601-RPPG-03 for tables RPPG-1 and RPPG-2.

NOTES ARE DESIGN-RELATED



TWO-LANE TWO-WAY WITH SINGLE OVERHEAD STRUCTURE AND PIER TO E.P. ≤ 16'-0



TWO-LANE TWO-WAY WITH SINGLE OVERHEAD STRUCTURE AND PIER TO E.P. > 16'-0

VARIATIONS OR DETAILS TO NEW IDM R16 49-4E(4)

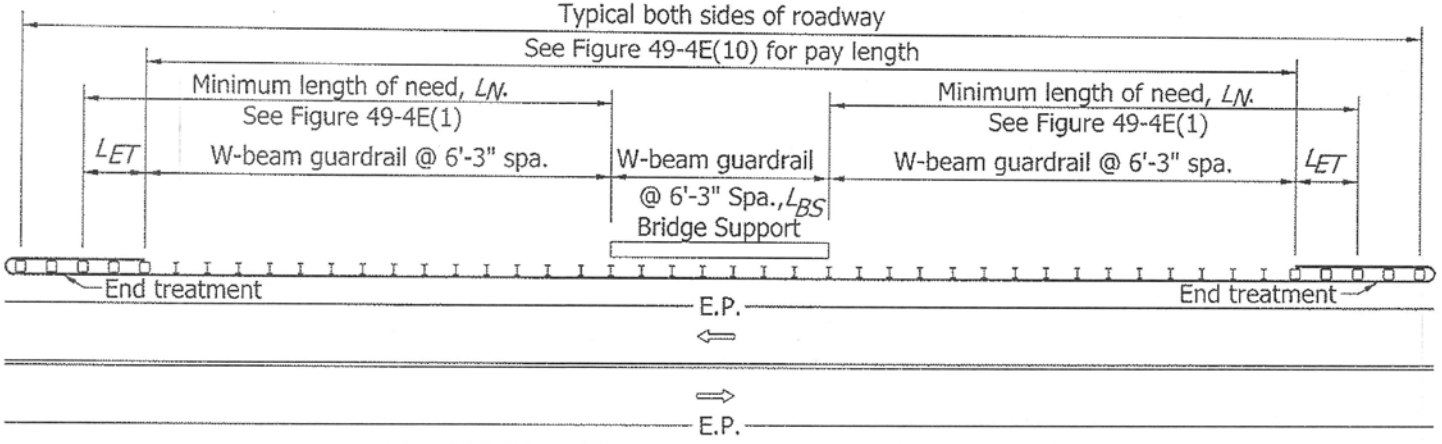
INDIANA DEPARTMENT OF TRANSPORTATION
ROADSIDE PIER PROTECTION GUARDRAIL
APRIL 1995
STANDARD DRAWING NO. E 601-RPPG-04

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

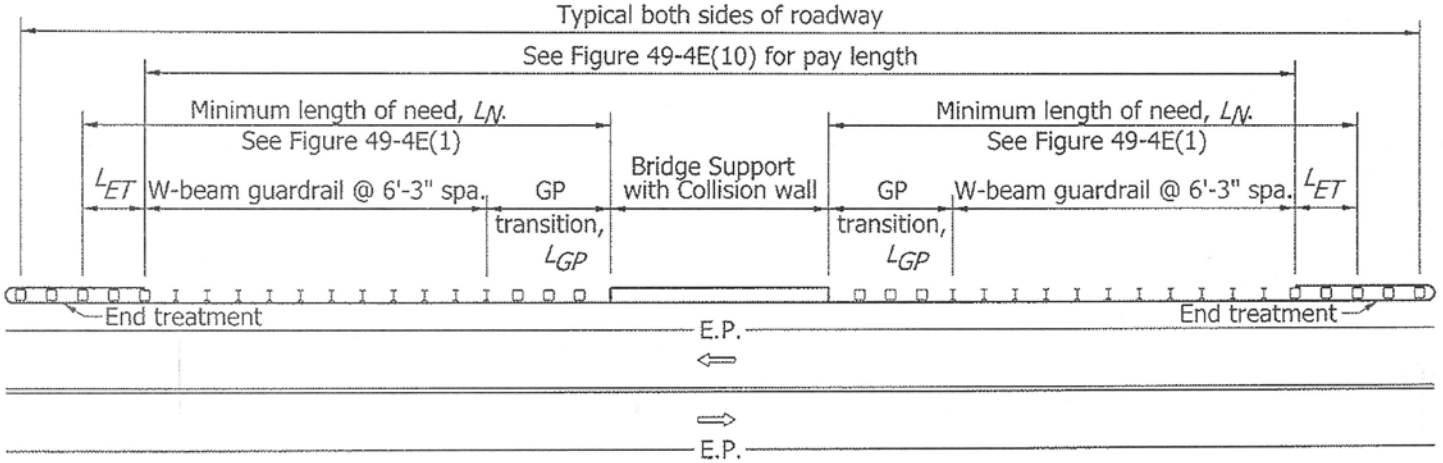
DETAILS PLACED IN THIS FORMAT 11-15-99
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 4-03-95

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4E(4) GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, TWO-WAY ROADWAY, SINGLE OVERHEAD STRUCTURE (DRAFT)



(a): >16 ft Edge of Travelway to Front Face of Bridge Support



(b): ≤16 ft Edge of Travelway to Front Face of Bridge Support

GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, TWO-WAY ROADWAY, SINGLE OVERHEAD STRUCTURE

Figure 49-4E (4)

REVISION TO THE STANDARD DRAWINGS

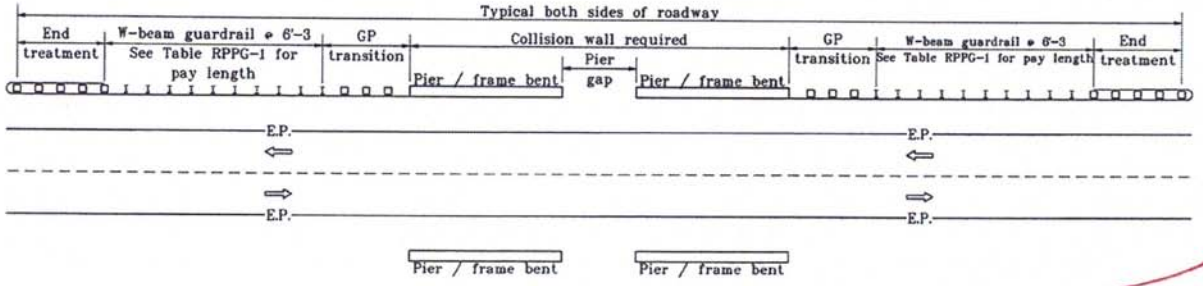
601-RPPG-05 ROADSIDE PIER PROTECTION GUARDRAIL (PROPOSED TO DELETE)

DELETE THIS STD DWG

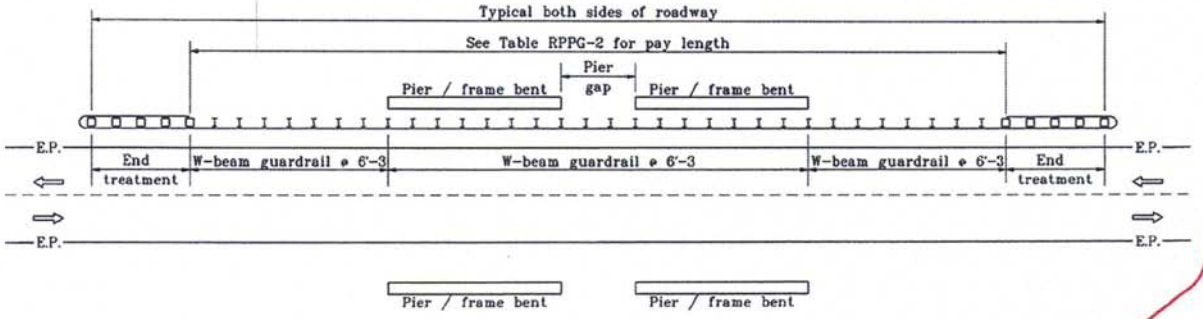
GENERAL NOTES

1. This drawing shall be used where W-beam guardrail is specified along a two-lane two-way roadway to shield the piers of tandem overhead structures.
2. The details on this drawing are typical guardrail layouts for shielding the piers of tandem overhead structures. The required length of guardrail shall be determined in accordance with Tables RPPG-1 and RPPG-2, and shall be as shown on the plans.
3. Dimensions and details not shown on this sheet shall be as shown on the plans.
4. See Standard Drawing E 601-RPPG-03 for tables RPPG-1 and RPPG-2.

NOTES ARE DESIGN-RELATED



TWO-LANE TWO-WAY WITH TWIN OVERHEAD STRUCTURE AND PIER TO E.P. ≤ 16'-0



TWO-LANE TWO-WAY WITH TWIN OVERHEAD STRUCTURE AND PIER TO E.P. > 16'-0

VARIATIONS OR DETAILS TO NEW IDM FIG 49-4E(5)

INDIANA DEPARTMENT OF TRANSPORTATION

ROADSIDE PIER PROTECTION GUARDRAIL

MAY 1999

STANDARD DRAWING NO. E 601-RPPG-05

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

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

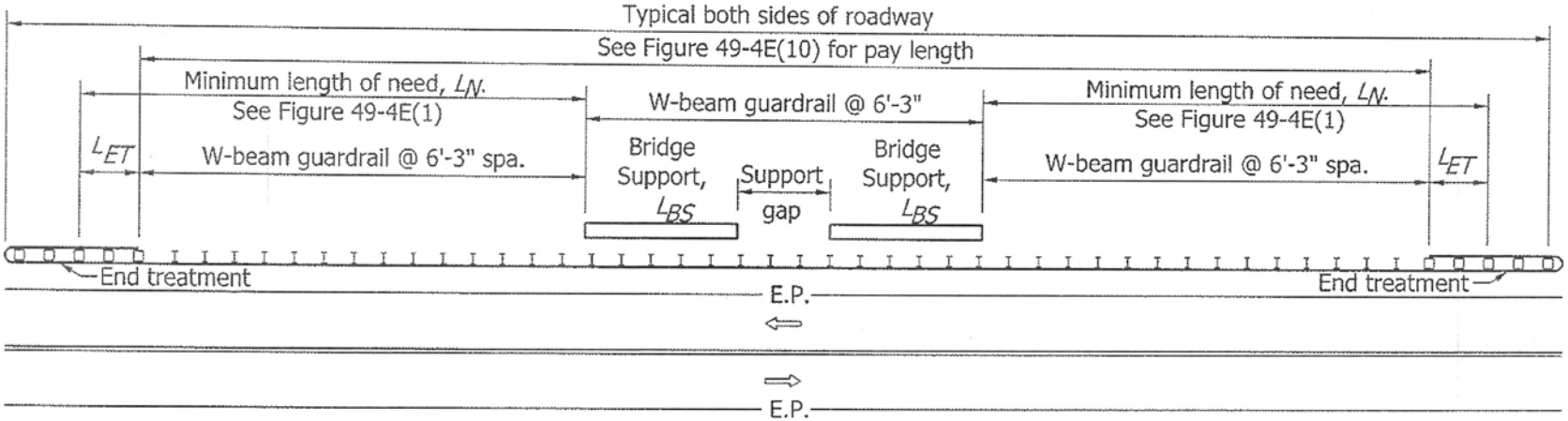
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

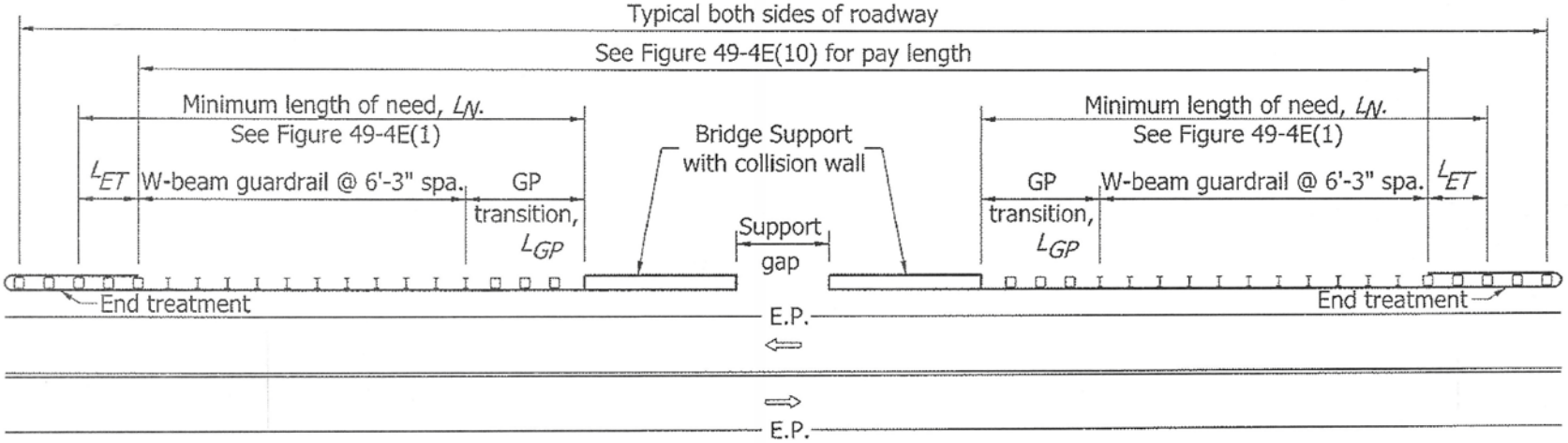
ORIGINALLY APPROVED 5-03-99

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4E(5) GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, TWO-WAY ROADWAY, TWIN OVERHEAD STRUCTURE (DRAFT)



(a): >16 ft Edge of Travelway to Front Face of Bridge Support



(b): ≤16 ft Edge of Travelway to Front Face of Bridge Support

GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, TWO-WAY ROADWAY, TWIN OVERHEAD STRUCTURES

Figure 49-4E (5)

REVISION TO THE STANDARD DRAWINGS

601-RPPG-01 ROADSIDE PIER PROTECTION GUARDRAIL (PROPOSED TO DELETE)

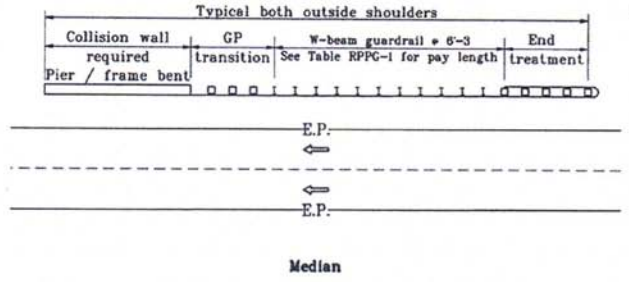
GENERAL NOTES

1. This drawing shall be used where W-beam guardrail is specified along the outside shoulder of a multi-lane divided roadway to shield the piers of an overhead structure.
2. The details on this drawing are typical guardrail layouts for shielding the piers of single or tandem overhead structures. The required length of guardrail shall be determined in accordance with Tables RPPG-1 and RPPG-2, and shall be as shown on the plans.
3. Dimensions and details not shown on this drawing shall be as shown on the plans.
4. Rectangular plate washers shall be installed at each post along this section.
5. See Standard Drawing E 601-RPPG-03, for tables RPPG-1 and RPPG-2.

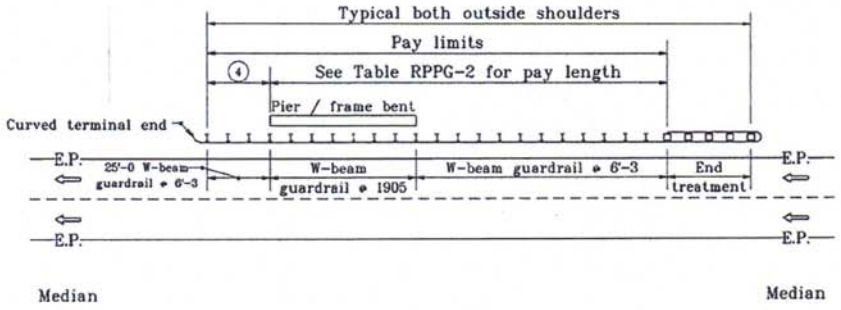
THIS NOTE IS ADDRESSED ON NEW STD DWG E 601-GRBS-01.

DELETE THIS STD DWG

NOTES ARE DESIGN-RELATED



MULTI-LANE DIVIDED WITH SINGLE OR TANDEM OVERHEAD STRUCTURES AND SHOULDER PIER TO E.P. ≤ 16'-0



MULTI-LANE DIVIDED WITH SINGLE OR TANDEM OVERHEAD STRUCTURES AND SHOULDER PIER TO E.P. > 16'-0

VARIATIONS OR DETAILS TO NEW IDM FIG 49-4E (6)

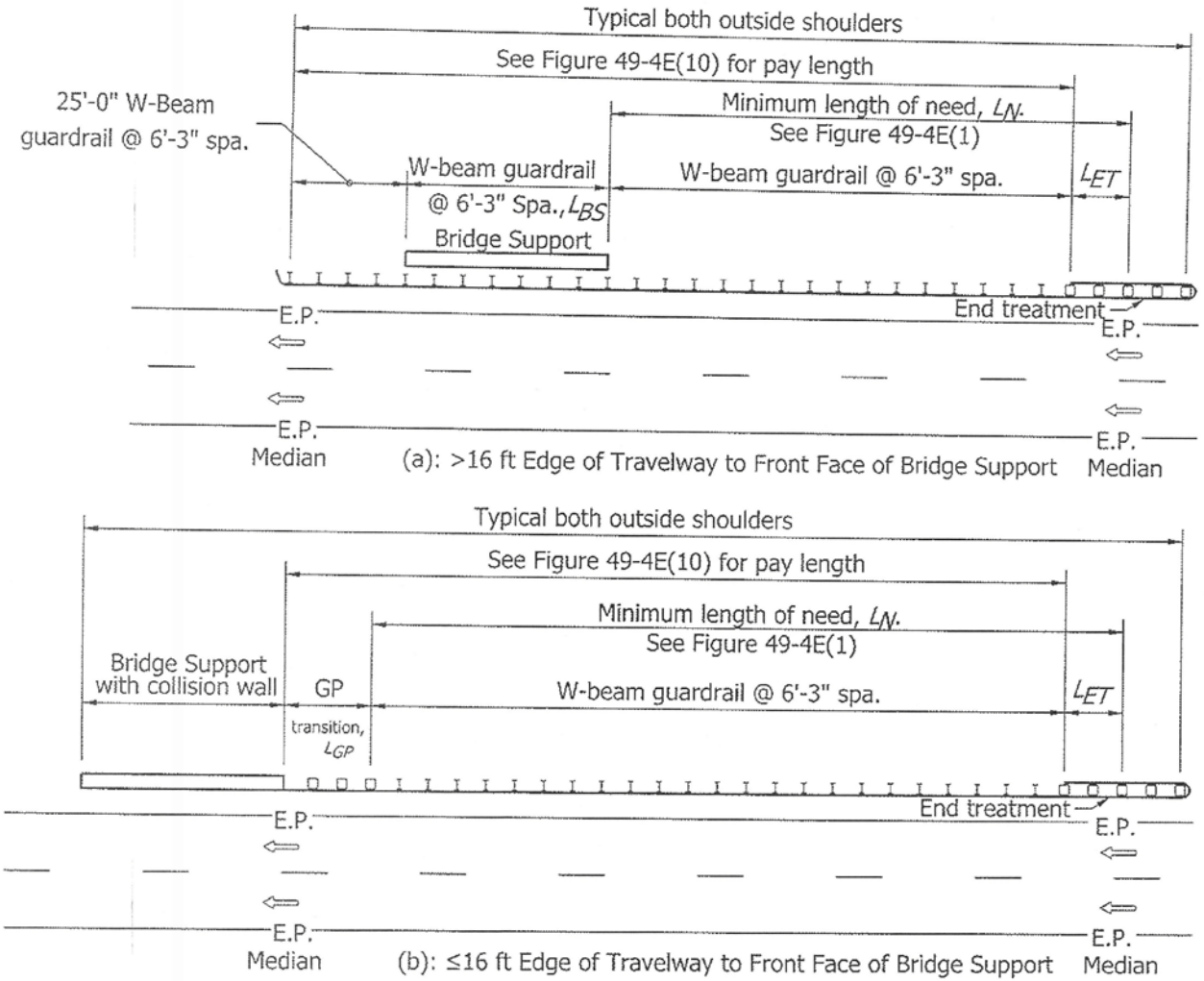
INDIANA DEPARTMENT OF TRANSPORTATION
ROADSIDE PIER PROTECTION GUARDRAIL
APRIL 1995
STANDARD DRAWING NO. E 601-RPPG-01

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

DETAILS PLACED IN THIS FORMAT 11-15-99
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 4-03-95

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4E(6) GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, ONE-WAY ROADWAY, SINGLE OVERHEAD STRUCTURE, OUTSIDE SHOULDER (DRAFT)



GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, ONE-WAY ROADWAY, SINGLE OVERHEAD STRUCTURE, OUTSIDE SHOULDER

Figure 49-4E (6)

REVISION TO THE STANDARD DRAWINGS

601-RPPG-02 ROADSIDE PIER PROTECTION GUARDRAIL (PROPOSED TO DELETE)

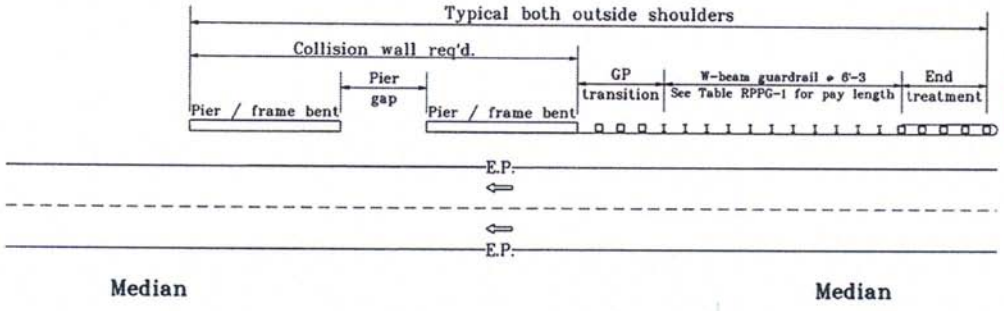
GENERAL NOTES

1. This drawing shall be used where W-beam guardrail is specified along the outside shoulder of a multi-lane divided roadway to shield the piers of an overhead structure.
2. The details on this drawing are typical guardrail layouts for shielding the piers of twin overhead structures. The required length of guardrail shall be determined in accordance with Tables RPPG-1 and RPPG-2, and shall be as shown on the plans.
3. Dimensions and details not shown on this drawing shall be as shown on the plans.
4. Rectangular plate washers shall be installed at each post along this section.
5. See Standard Drawing E 601-RPPG-03 for Tables RPPG-1 and RPPG-2.

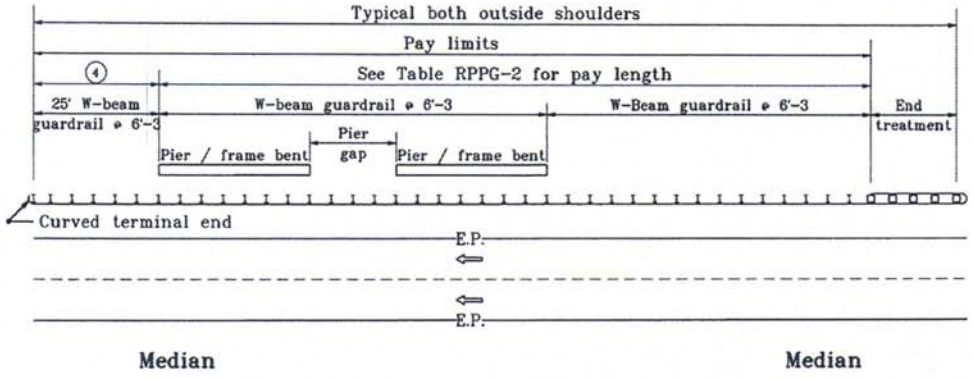
THIS NOTE IS ADDRESSED ON NEW STD DWG E 601-GRBS-01

DELETE THIS STD DWG

NOTES ARE DESIGN-RELATED



MULTI-LANE DIVIDED WITH TWIN OVERHEAD STRUCTURE AND OUTSIDE SHOULDER PIER TO E.P. ≤ 16'-0



MULTI-LANE DIVIDED WITH TWIN OVERHEAD STRUCTURE AND OUTSIDE SHOULDER PIER TO E.P. > 16'-0

VARIATIONS OF DETAILS TO NEW IDM R16 49-4E(7)

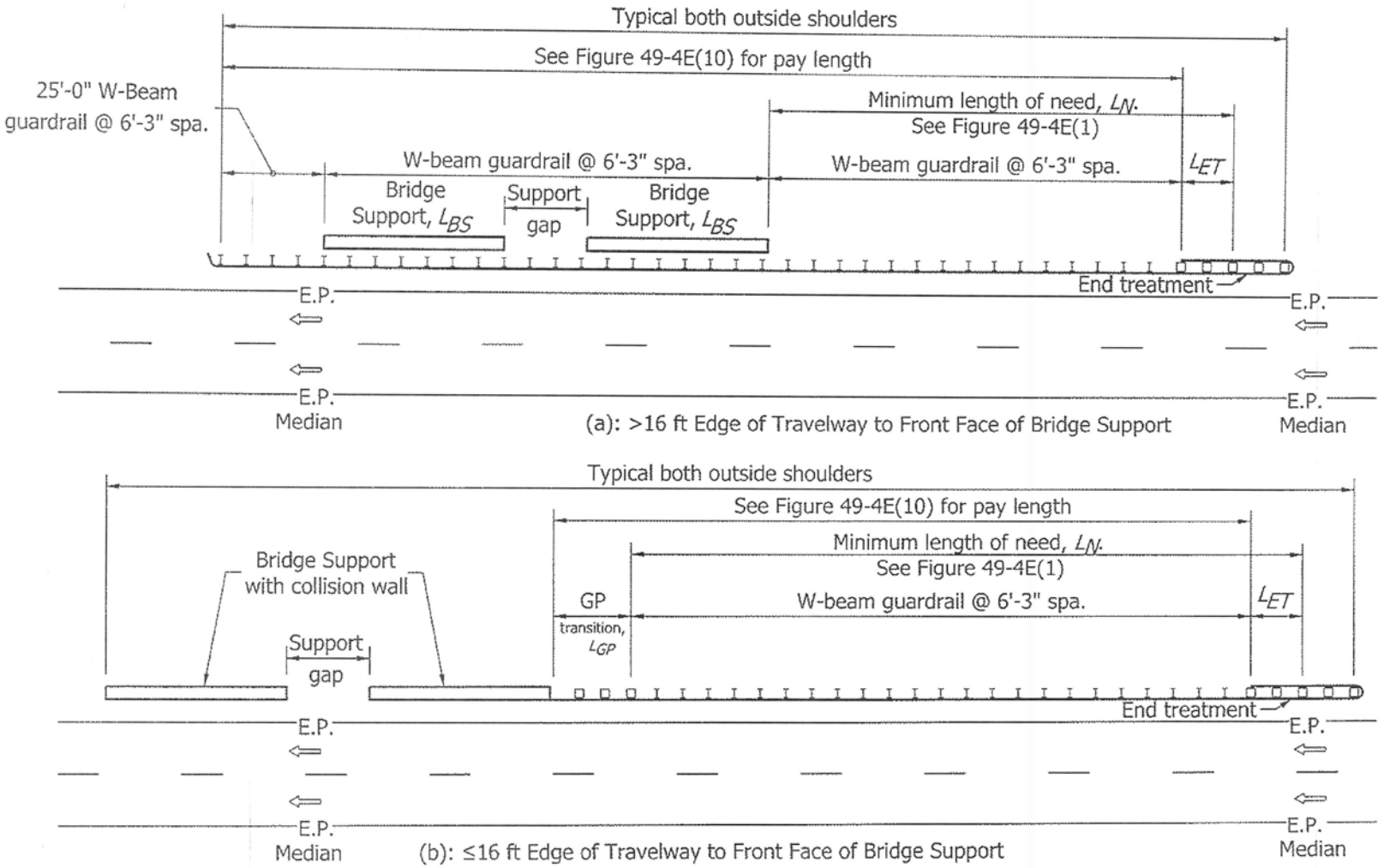
INDIANA DEPARTMENT OF TRANSPORTATION
ROADSIDE PIER PROTECTION GUARDRAIL
SEPTEMBER 1997
STANDARD DRAWING NO. E 601-RPPG-02

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

DETAILS PLACED IN THIS FORMAT 11-15-99
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 9-01-97

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4E(7) GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, ONE-WAY ROADWAY, TWIN OVERHEAD STRUCTURE, OUTSIDE SHOULDER (DRAFT)

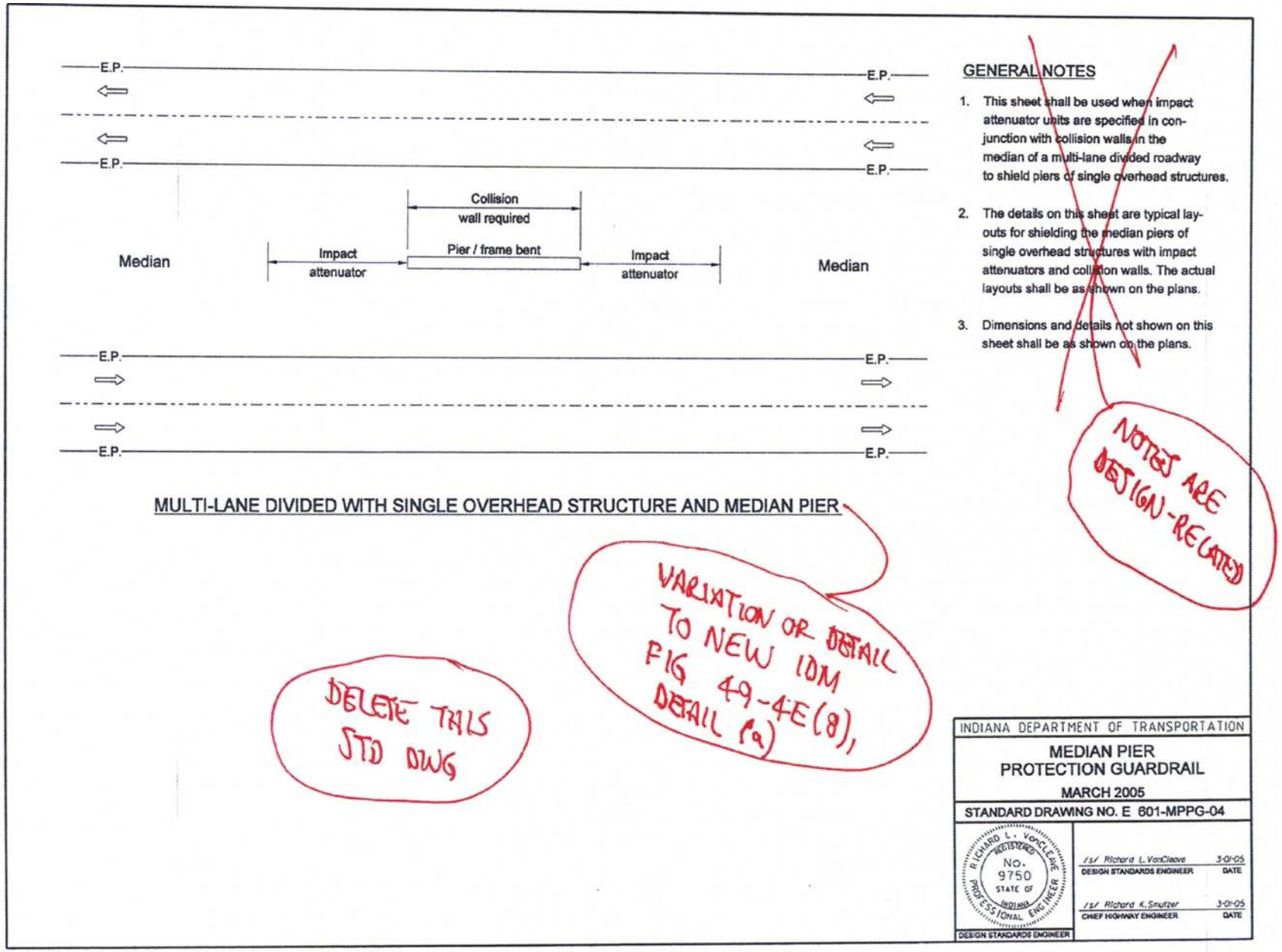


GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, ONE-WAY ROADWAY, TWIN OVERHEAD STRUCTURES, OUTSIDE SHOULDER

Figure 49-4E (7)

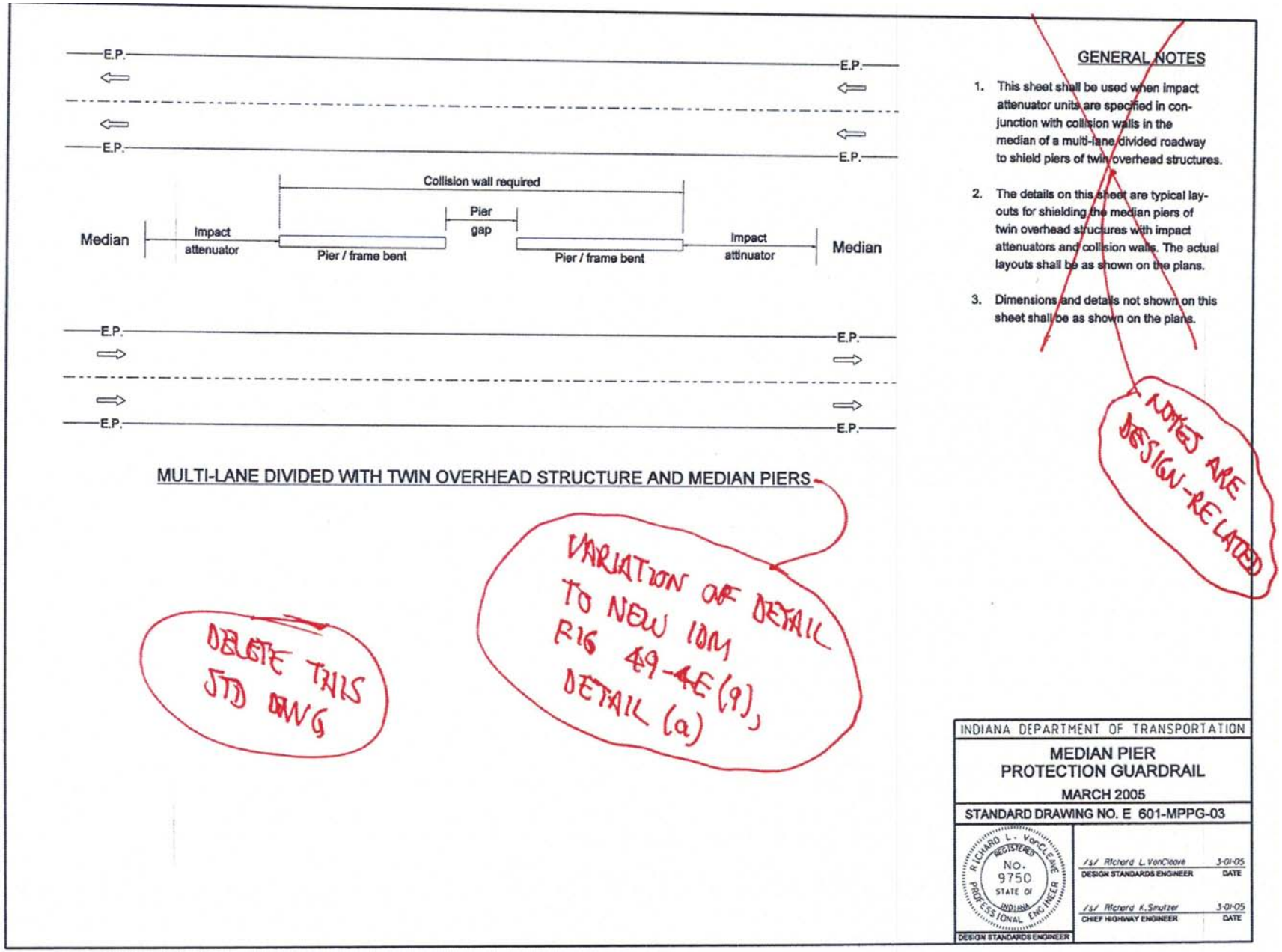
REVISION TO THE STANDARD DRAWINGS

601-MPPG-04 MEDIAN PIER PROTECTION GUARDRAIL (PROPOSED TO DELETE)



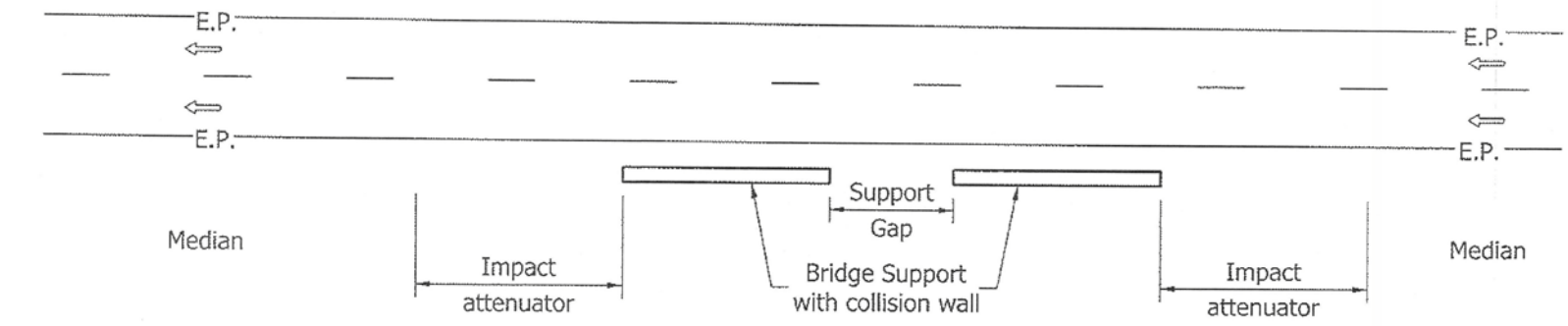
REVISION TO THE STANDARD DRAWINGS

601-MPPG-03 MEDIAN PIER PROTECTION GUARDRAIL (PROPOSED TO DELETE)

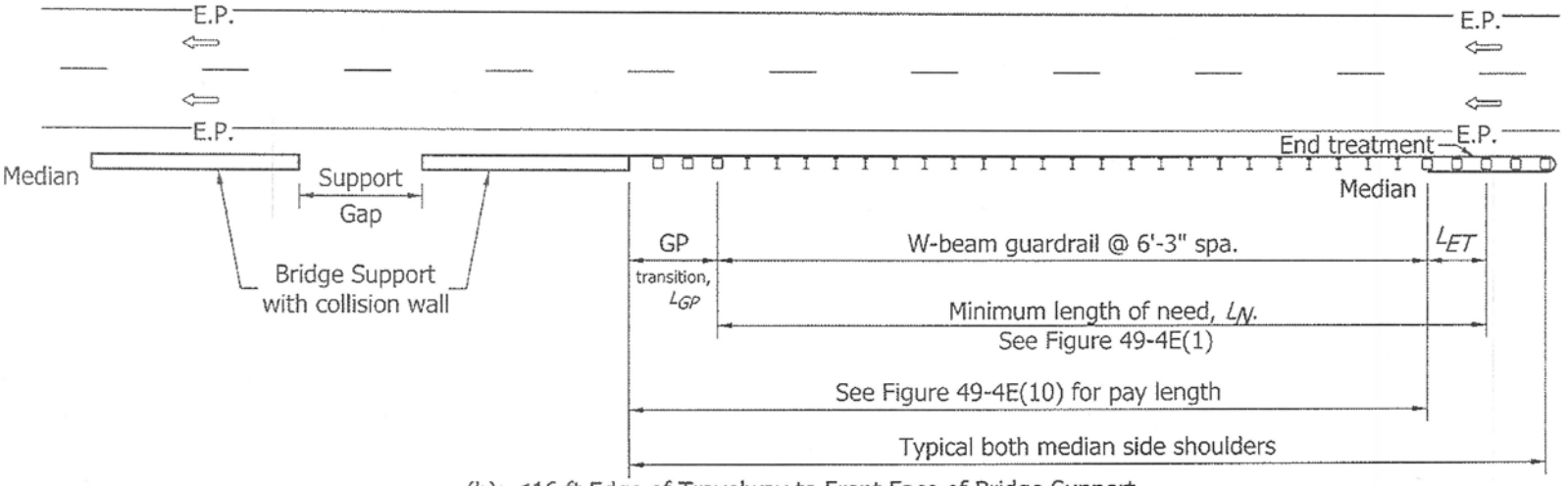


REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4E(9) GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, ONE-WAY ROADWAY, TWIN OVERHEAD STRUCTURE, MEDIAN SHOULDER (DRAFT)



(a): >16 ft Edge of Travelway to Front Face of Bridge Support



(b): ≤16 ft Edge of Travelway to Front Face of Bridge Support

GUARDRAIL CONFIGURATION FOR BRIDGE SUPPORT INSIDE CLEAR ZONE, ONE-WAY ROADWAY, TWIN OVERHEAD STRUCTURES, MEDIAN SHOULDER

Figure 49-4E (9)

REVISION TO THE STANDARD DRAWINGS

BACKUP: IDM FIGURE 49-4E(10) GUARDRAIL PAY LENGTH APPROACH TO BRIDGE SUPPORT INSIDE CLEAR ZONE (DRAFT)

Travel Configuration	Overpass Type and Location	Guardrail Pay Length, Support > 16 ft from Edge of Travelway (ft)	Guardrail Pay Length, Support ≤ 16 ft from Edge of Travelway (ft)
Two-Way Roadway	One Structure	$2(L_N - L_{ET}) + L_P$	$2(L_N - L_{ET} + L_{GP})$
	Twin Structures	$2(L_N - L_{ET} + L_P) + L_G$	$2(L_N - L_{ET} + L_{GP})$
One-Way Roadway	Outside Shoulder, One Structure	$L_N - L_{ET} + L_P + 25$	$L_N - L_{ET} + L_{GP}$
	Outside Shoulder, Twin Structures	$L_N - L_{ET} + 2L_P + L_G + 25$	$L_N - L_{ET} + L_{GP}$
	Median-Side Shoulder	(1)	$L_N - L_{ET} + L_{GP}$

(1) No guardrail is required. An impact attenuator is required where shown on Figure 49-4E(8) or 49-4E(9).

GUARDRAIL PAY LENGTH FOR APPROACH TO BRIDGE SUPPORT INSIDE CLEAR ZONE

Figure 49-4E(10)

REVISION TO THE STANDARD DRAWINGS

601-GRBS-01 GUARDRAIL AT BRIDGE SUPPORT (PROPOSED NEW, SHOWN PART 1)

GENERAL NOTES

1. This drawing shall be used where W-beam guardrail is specified along a two-lane two-way roadway to shield the piers of overhead structures.

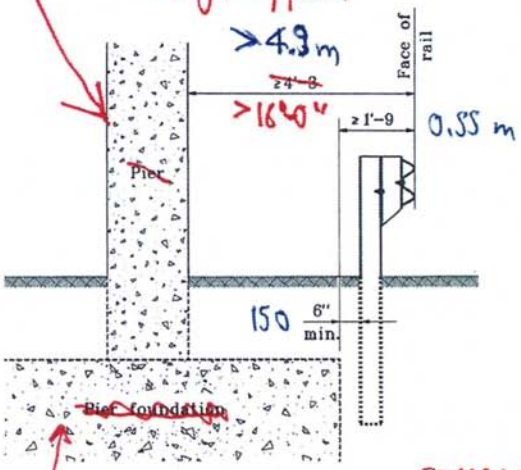
2. The required length of guardrail shall be determined in accordance with Tables RPPG-1 and RPPG-2, and shall be as shown on the plans.

   Dimensions and details not shown on this drawing shall be as shown on the plans.

NOTES ARE DESIGN-RELATED

RETAIN AS STANDARD DETAIL DRAWING, WITH NEW DESIGNATION

Bridge support



GUARDRAIL-TO-PIER CLEARANCE

GUARDRAIL AT BRIDGE SUPPORT

INDIANA DEPARTMENT OF TRANSPORTATION
~~ROADSIDE PIER PROTECTION GUARDRAIL~~
SEPTEMBER 1997 GRBS-01
STANDARD DRAWING NO. E 601-~~RPPG-06~~

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

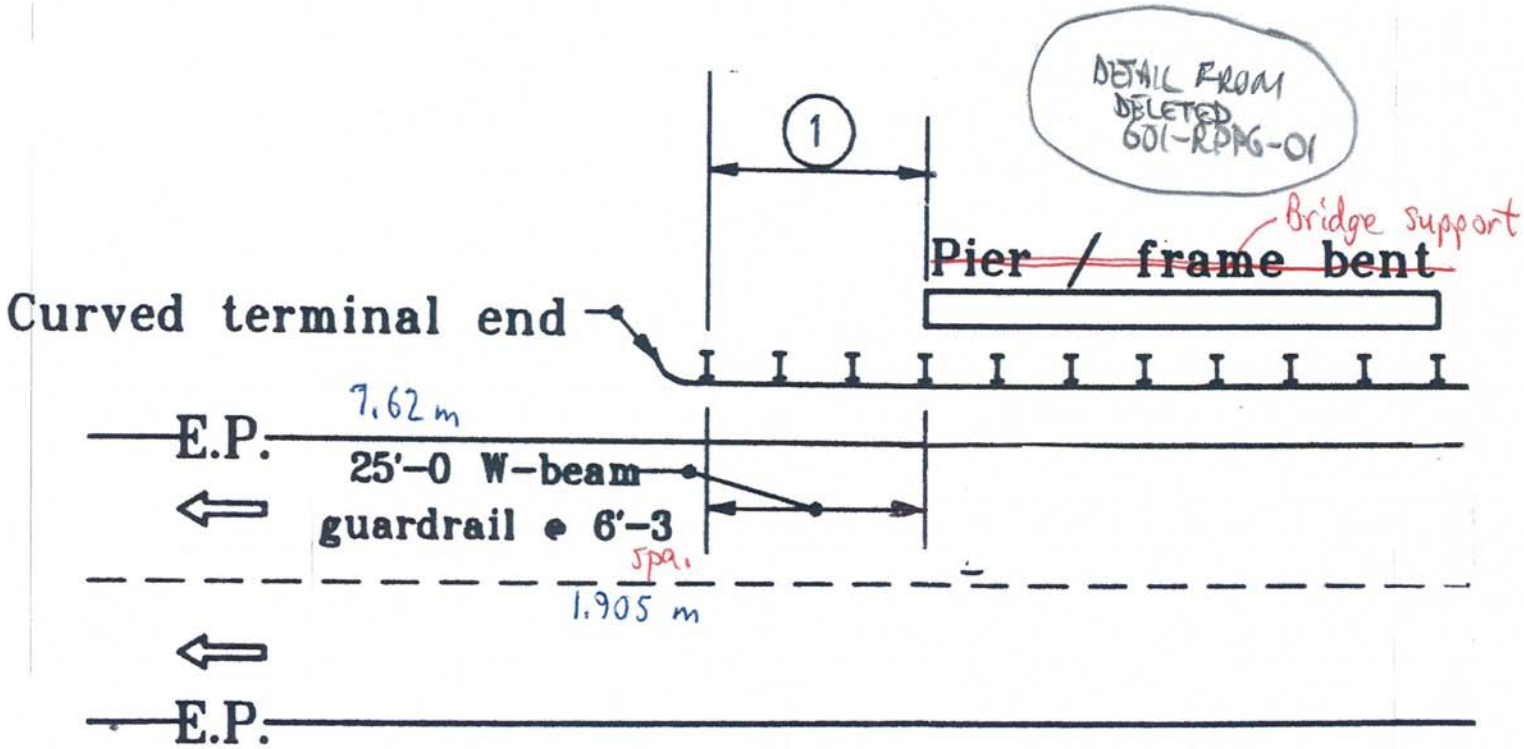
DETAILS PLACED IN THIS FORMAT 11-15-99

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

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 9-01-97

REVISION TO THE STANDARD DRAWINGS

601-GRBS-01 GUARDRAIL AT BRIDGE SUPPORT (PROPOSED NEW, SHOWN PART 2)



NOTES:

(1) Washers required for each post in this section shall be rectangular plate washers, as shown on Standard Drawing E601-WBGC-02.

DOWNSTREAM GUARDRAIL TREATMENT

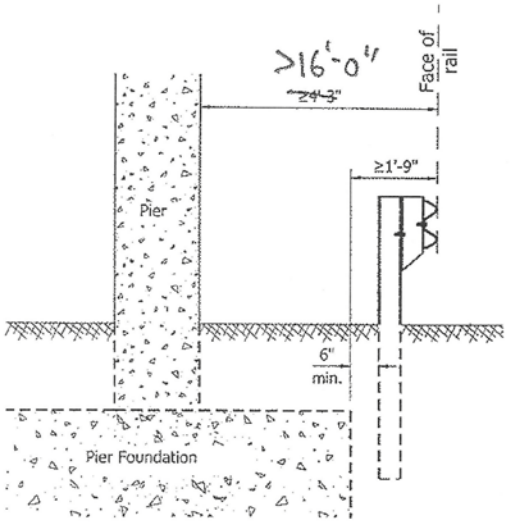
INCLUDE ON NEW STD DWG THAT ADDRESSES NOTE (4) ON DWG 601-RPPG-01

DOWNSTREAM GUARDRAIL AT BRIDGE PIER SUPPORTS

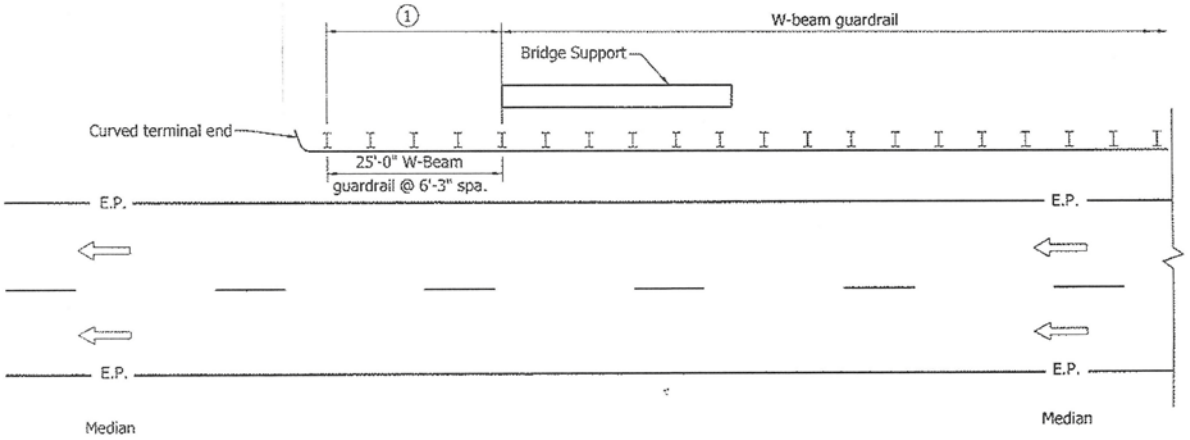
STD. DWG. NO. E601-GRBS-01

REVISION TO THE STANDARD DRAWINGS

601-GRBS-01 GUARDRAIL AT BRIDGE SUPPORT (PROPOSED NEW, DRAFT)



GUARDRAIL-TO-PIER CLEARANCE



DOWNSTREAM GUARDRAIL TREATMENT

NOTE:

① Washers required for each post in this section shall be rectangular plate washers, as shown on Standard Drawing E 601-WBGC-02.

INDIANA DEPARTMENT OF TRANSPORTATION

GUARDRAIL AT BRIDGE SUPPORT

DECEMBER 2010

STANDARD DRAWING NO. E 601-GRBS-01

DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER

COMMENTS AND ACTION

STANDARD DRAWINGS: 601-BAGR-01 and -02; 601-MPPG-01 through -04; 601-RPPG-01 through -05.

Motion: Second: Ayes: Nays:	Action: ____ Passed as Submitted ____ Passed as Revised ____ Withdrawn
Standard Specifications Sections affected: NONE Recurring Special Provision affected: NONE Standard Sheets affected: 601-BAGR-01 and -02; 601-MPPG-01 through -04; 601-RPPG-01 through -05. Design Manual Sections affected: 49-4.02(01); 49-4.02(04); 49-8.01(04); 49-9.02 GIFE Sections cross-references: NONE	____ 20__ Standard Specifications Book ____ Revise Pay Items List ____ 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 ___ By ____ Addition or ____ Revision Frequency Manual Update Req'd? Y___N___ By ____ Addition or ____ Revision Received FHWA Approval? ____

Mr. Strain
Date: 01/20/11

SPECIFICATION REVISIONS

REVISION TO THE STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Problems encountered with the cost reduction incentive specification (section 109.04) with regards to superstructure changes require changes to the specification.

PROPOSED SOLUTION: Incorporate the proposed language into the 2012 SS book.

APPLICABLE STANDARD SPECIFICATIONS: 109.04

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE:

APPLICABLE RECURRING SPECIAL PROVISIONS: None

PAY ITEMS AFFECTED: None

Submitted By: Randy Strain

Title: Bridge Policy and Standards Engineer,
Bridge Design, Inspection, Hydraulics, and Technical Support Division

Organization: INDOT

Phone Number: 232-3339

Date: January 04, 2011

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 109 – MEASUREMENT AND PAYMENT
109.04(b) CRI FORMAL PROPOSAL REQUIREMENTS
109.04(c) APPROVAL OF FORMAL CRI PROPOSAL

The Standard Specifications are revised as follows:

SECTION 109, BEGIN LINE 338, INSERT AS FOLLOWS:

a. The Contractor's redesign engineer shall be responsible for the professional quality, technical accuracy, and the coordination of all designs, drawings, specifications, *load rating analysis,* and other services furnished by the redesign engineer under this contract. The redesign engineer shall correct or revise any errors or omissions in its designs, drawings, specifications, and other services. The Contractor's redesign engineer shall indemnify, defend, and hold harmless the State and its agents, officials, and employees, from all claims and suits including court costs, attorney's fees, and other expenses caused by any acts, errors, or omissions of the Contractor's redesign engineer, its agents, or employees, in connection with the CRI proposal.

SECTION 109, AFTER LINE 501, INSERT AS FOLLOWS:

When a CRI proposal is received which changes superstructure type, superstructure dimensions, or superstructure dead load, the Engineer will perform a load rating analysis on the proposed structure. The load rating analysis must yield an inventory rating of 1.0 or greater for the design live load in order to be considered for approval. If the inventory rating is less than 1.0, the proposed design shall be modified so that the load rating analysis yields an inventory rating of 1.0 or greater for the design live load before the CRI proposal is considered for approval.

COMMENTS AND ACTION

109.04(b) CRI FORMAL PROPOSAL REQUIREMENTS
109.04(c) APPROVAL OF FORMAL CRI PROPOSAL

Motion: Second: Ayes: Nays:	Action: ____ Passed as Submitted ____ Passed as Revised ____ Withdrawn
Standard Specifications Sections affected: 109.04 pg 101 and pg 102 Recurring Special Provision affected: NONE Standard Sheets affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	____ 20__ Standard Specifications Book ____ Revise Pay Items List ____ 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 ___ By ____ Addition or ____ Revision Frequency Manual Update Req'd? Y___N___ By ____ Addition or ____ Revision Received FHWA Approval? ____

Mr. Pankow
Date: 01/20/11

SPECIFICATION REVISIONS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Current language in 702.13(h) is causing disputes.

PROPOSED SOLUTION: Delete the portion of 702.13(h) which only requires one party to the contract to have an advantage.

APPLICABLE STANDARD SPECIFICATIONS: 702.13(h)

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: None

PAY ITEMS AFFECTED: None

Submitted By: Greg Pankow

Title: State Construction Engineer

Organization: INDOT

Phone Number: 2-5502

Date: January 5, 2011

APPLICABLE SUB-COMMITTEE ENDORSEMENT:

Item No. 08 01/20/11 (2010 SS)
Mr. Pankow
Date: 01/20/11

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 702 – STRUCTURAL CONCRETE
702.13(h) TEST BEAMS

The Standard Specifications are revised as follows:

SECTION 702, BEGIN LINE 778, DELETE AND INSERT AS FOLLOWS:

(h) Test Beams

When ~~it is to the advantage of the Department or Contractor, when~~ portland-pozzolan cement, type IP or IP-A, is incorporated into the structural concrete elements listed below, when fly ash or ground granulated blast furnace slag is incorporated into the structural concrete elements listed below, or when field operations are being controlled by beam tests, the removal of forms, supports, and housings, and the discontinuance of heating and curing may be permitted when the modulus of rupture reaches or exceeds the following values:

COMMENTS AND ACTION

702.13(h) TEST BEAMS

Motion: Second: Ayes: Nays:	Action: ____ Passed as Submitted ____ Passed as Revised ____ Withdrawn
Standard Specifications Sections affected: 702.13(h) pg 491 Recurring Special Provision with 702.13(h) reference: 730-B-157 QUALITY CONTROL/QUALITY ASSURANCE, QC/QA, SUPERSTRUCTURE CONCRETE Standard Sheets affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	____ 20__ Standard Specifications Book ____ Revise Pay Items List ____ 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 ___ By ____ Addition or ____ Revision Frequency Manual Update Req'd? Y__N__ By ____ Addition or ____ Revision Received FHWA Approval? ____

Mr. Pankow
Date: 01/20/11

SPECIFICATION REVISIONS

REVISION TO THE STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Department's desire to reduce the number of recurring special provisions by incorporating some of these into the Standard Specifications.

PROPOSED SOLUTION: incorporate longstanding recurring special provision for General Bridge Requirements (206-B-113) into 2012 SS book. This RSP has remained essentially unchanged, except for line number updates, for several years. Due to other previously approved changes, some minor modifications to the changes in RSP 206-B-113 must be done prior to incorporating into the 2012 SS book.

APPLICABLE STANDARD SPECIFICATIONS: 206.08,702.02, 702.13(a), 702.28, 703.06

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: Delete RSP 206-B-113 GENERAL BRIDGE REQUIREMENTS

PAY ITEMS AFFECTED: None

Submitted By: Greg Pankow

Title: State Construction Engineer

Organization: INDOT

Phone Number: 2-5502

Date: January 5, 2011

APPLICABLE SUB-COMMITTEE ENDORSEMENT:

Item No. 09 01/20/11 (2010 SS)
Mr. Pankow
Date: 01/20/11

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 206 – STRUCTURE EXCAVATION
206.08 PREPARATION OF FOUNDATION SURFACES

The Standard Specifications are revised as follows:

SECTION 206, BEGIN LINE 139, INSERT AS FOLLOWS:

206.08 Preparation of Foundation Surfaces

Excavation for foundations on rock without piles shall extend a minimum of 2 ft (0.6 m) into solid rock. All rock or other hard material, if

Item No. 09 01/20/11 (2010 SS)
Mr. Pankow
Date: 01/20/11

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 702 – STRUCTURAL CONCRETE
702.02 CLASSES OF CONCRETE
702.13(a) CONSTRUCTION
702.28 BASIS OF PAYMENT

The Standard Specifications are revised as follows:

SECTION 702, AFTER LINE 25, INSERT AS FOLLOWS:

Concrete in superstructure, integral bents, and railings shall be class C. Concrete in bent caps, unless poured integrally with the superstructure; pier caps; abutment caps; pier stems; abutment walls; mudwalls; columns; crashwalls; collision walls; and wingwalls, unless poured with integral end bents, shall be class A. Concrete in footings shall be class B.

SECTION 702, BEGIN LINE 582, DELETE AND INSERT AS FOLLOWS:

Forms *for exposed concrete edges* shall be ~~filleted and~~ chamfered ~~as shown on the plans and~~ *3/4 in. (19 mm). Forms* shall be given a bevel or draft ~~for~~ *in the case of* all projections, such as girders and copings, to ensure easy removal.

SECTION 702, BEGIN LINE 1483, INSERT AS FOLLOWS:

The cost of forms, *polyvinyl chloride slab bridge floor drains,* falsework, falsework piling, centering, expansion joints, waterproofing, curing, finishing, and necessary incidentals shall be included in the cost of the pay items. The cost of placing epoxy resin adhesive on existing concrete surfaces shall

Item No. 09 01/20/11 (2010 SS)
Mr. Pankow
Date: 01/20/11

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 703 – REINFORCING BARS
703.06 PLACING AND FASTENING

The Standard Specifications are revised as follows:

SECTION 703, BEGIN LINE 55, INSERT AS FOLLOWS:

703.06 Placing and Fastening

Reinforcing bars shall not be ordered for piers or bents to be founded on soil or rock until the foundation conditions have been investigated. The bottom elevations of such footings will then be determined. Written permission will then be given to order such reinforcing bars. Sufficient excavation and all necessary soundings shall be made as directed so that exact bottom elevations of footings may be determined.

All dimensions shown on the plans for spacing of reinforcing bars apply to

REVISION TO THE STANDARD SPECIFICATIONS

BACKUP. CONTENT OF THE RSP 206-B-113 GENERAL BRIDGE REQUIREMENTS WITH PROPOSED CHANGES AS SHOWN HIGHLIGHTED IN GRAY (SEE PROPOSAL)

SECTION 206, BEGIN LINE 139, INSERT AS FOLLOWS:

206.08 Preparation of Foundation Surfaces

Excavation for foundations on rock without piles shall extend a minimum of 2 ft (600 mm) into solid rock. All rock or other hard material, if

SECTION 702, AFTER LINE ~~21~~25, INSERT AS FOLLOWS:

Concrete in superstructure, integral bents, and railings shall be class C. Concrete in bent caps, unless poured integrally with the superstructure; pier caps; abutment caps; pier stems; abutment walls; mudwalls; columns; crashwalls; collision walls; and wingwalls, unless poured with integral end bents, shall be class A. Concrete in footings shall be class B.

SECTION 702, BEGIN LINE 582, DELETE AND INSERT AS FOLLOWS:

Forms *for exposed concrete edges* shall be ~~filleted and~~ chamfered ~~as shown on the plans and *1 in. (25 mm)*~~*3/4 in. (19 mm).* *Forms* shall be given a bevel or draft ~~for~~ *in the case of* all projections, such as girders and copings, to ensure easy removal.

SECTION 702, BEGIN LINE 1483, INSERT AS FOLLOWS:

The cost of forms, *polyvinyl chloride* ~~*deck*~~*slab bridge floor drains,* falsework, falsework piling, centering, expansion joints, waterproofing, curing, finishing, and necessary incidentals shall be included in the cost of the pay items. The cost of placing epoxy resin adhesive on existing concrete surfaces shall

SECTION 703, BEGIN LINE 55, INSERT AS FOLLOWS:

703.06 Placing and Fastening

Reinforcing bars shall not be ordered for piers or bents to be founded on soil or rock until the foundation conditions have been investigated. The bottom elevations of such footings will then be determined. Written permission will then be given to order such reinforcing bars. Sufficient excavation and all necessary soundings shall be made as directed so that exact bottom elevations of footings may be determined.

All dimensions shown on the plans for spacing of reinforcing bars apply to

SECTION 707, AFTER LINE 200, INSERT AS FOLLOWS:

~~*Voids in precast concrete members shall be formed of approved material. Voids shall be vented during curing. All voids shall be drained by means of an approved method.*~~

SECTION 707, LINE 219, INSERT AS FOLLOWS:

~~face and top of the curb section shall be finished in accordance with 702.21. *The outside faces of fascia beams and the tops of all beams shall be sealed in accordance with 702.21. Such faces shall not be rubbed.*~~

COMMENTS AND ACTION

206.08 PREPARATION OF FOUNDATION SURFACES
702.02 CLASSES OF CONCRETE
702.13(a) CONSTRUCTION
702.28 BASIS OF PAYMENT
703.06 PLACING AND FASTENING

Motion: Second: Ayes: Nays:	Action: ____ Passed as Submitted ____ Passed as Revised ____ Withdrawn
Standard Specifications Sections affected: 206.08 pg 178; 702.02 pg 474; 702.13(a) pg 486; 702.28 pg 506; 703.06 pg 508. Recurring Special Provision affected: 206-B-113 GENERAL BRIDGE REQUIREMENTS Standard Sheets affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	____ 20__ Standard Specifications Book ____ Revise Pay Items List ____ 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 ___ By ____ Addition or ____ Revision Frequency Manual Update Req'd? Y___N___ By ____ Addition or ____ Revision Received FHWA Approval? ____

Mr. Walker
Date: 01/20/11

SPECIFICATION REVISIONS

REVISION TO THE STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED:

Section 203 does not have any requirement for soils used in embankment other than the requirement that compaction to 95% density be attained. Occasionally poor soil is either obtained from the project or proposed as borrow that is unsuitable due to chemical composition or low maximum density. This proposal will place a similar, though less strict, requirement on embankment soil as the subgrade soil requirements in RSP 207-R-577.

PROPOSED SOLUTION: Insert the enclosed language into Section 203.09

APPLICABLE STANDARD SPECIFICATIONS: 203.09

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: None

Submitted By: Ron Walker

Title: Manager of the Office of Materials & Test

Organization: INDOT

Phone Number: 317-610-7251 x 204

Date: December 22, 2010

APPLICABLE SUB-COMMITTEE ENDORSEMENT?

Item No. 10 01/20/11 (2010 SS)
Mr. Walker
Date: 01/20/11

REVISION TO THE STANDARD SPECIFICATIONS

SECTION 203 – EXCAVATION AND EMBANKMENT
203.09 GENERAL REQUIREMENTS

The Standard Specifications are revised as follows:

SECTION 203, AFTER LINE 211, INSERT AS FOLLOWS:

Soils containing greater than 7% dry weight calcium, magnesium sulfate or organic material, or soils with a maximum dry density of less than 90 pcf (1440 kg/m3) will not be permitted in the embankment. Calcium and magnesium carbonate shall be determined in accordance with ITM 507, loss of ignition shall be determined in accordance with AASHTO T 267, and density shall be determined in accordance with AASHTO T 99.

COMMENTS AND ACTION

203.09 GENERAL REQUIREMENTS

Motion: Second: Ayes: Nays:	Action: ____ Passed as Submitted ____ Passed as Revised ____ Withdrawn
Standard Specifications Sections affected: 203.09 pg 143. Recurring Special Provision affected: Standard Sheets affected: Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	____ 20__ Standard Specifications Book ____ Revise Pay Items List ____ 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 ___ By ____ Addition or ____ Revision Frequency Manual Update Req'd? Y__N__ By ____ Addition or ____ Revision Received FHWA Approval? ____