Florida Department of Transportation

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ROADWAY DESIGN BULLETIN 16-01
(FHWA Approved: 02/01/2016)

DATE: February 1, 2016

TO: District Directors of Transportation Operations, District Directors of Transportation Development, District Design Engineers, District Consultant Project Management Engineers, District Construction Engineers, District Geotechnical Engineers, District Structures Design Engineers, District Maintenance Engineers, District Roadway Design Engineers, District Traffic Operations Engineers, Program Management Engineers, District Materials Engineers

FROM: Michael Shepard, P.E., State Roadway Design Engineer

COPIES: Brian Blanchard, Tom Byron, Tim Lattner, David Sadler, Rudy Powell, Trey Tillander, Amy Tootle, Bruce Dana, John Krause, Bob Crim, Gregory Schiess, Nicholas Finch (FHWA), Phillip Bello (FHWA), Kevin Burgess (FHWA), Chad Thompson (FHWA)

SUBJECT: Design Standards, Index 400 (Guardrail)

This bulletin introduces ***Design Standards Revisions (DSRs)*** to the ***FY 2016-17 Design Standards eBook*** for a comprehensive restructuring of ***Design Standards***, Index 400 (Guardrail) and its associated ***Instructions for Design Standards (IDS)***, including a new ***Design Tool***. This bulletin also includes updates for the ***2016 Plans Preparation Manual (PPM),*** Volume 1, Chapter 4 to provide usage criteria for the new "Low-Speed Guardrail" and "Deep Post" installation options.

REQUIREMENTS

1) ***Design Standards***, Index 400 Series

   The following ***Design Standard Revisions (DSRs)*** are released:

   a. Revised ***Design Standards*** Index 400 (Guardrail), all Sheets, including:
      i. Revised ***Instructions for Design Standards (IDS)***
      ii. New ***Design Tool:*** Guardrail 'Length of Need' Design v1.0
   b. Revised Design Standards Index 410 (Concrete Barrier Wall), Sheets 2, 10, 16, 17, 18
   c. Revised Design Standards Index 411 (Pier Protection Barrier), Sheet 6

2) ***Plans Preparation Manual (PPM)***

Add the following to the ***2016 PPM,*** Volume 1, Chapter 4:

a. 4.4.1.2.1.b. "Low-Speed Guardrail – Post Spacing at 12'-6" (TL-2, MASH)"

b. 4.4.1.2.2. "Low-Speed Guardrail is limited to flush shoulder roadways with Design Speeds ≤ 45 mph."

c. Table 4.4.2 Minimum Barrier Setback (Measured from Face of the Barrier)

Semi-Rigid Barrier	
W-Beam with Post Spacing @ 12'-6" (TL-2)	5'-0"
Deep Post W-Beam installed @ 1:2 Slope Break	5'-6"

d. 4.4.6.2 "With approval of the District Design Engineer and where right-of-way is restricted (i.e. constrained condition), the Deep Post guardrail option, as detailed in Design Standards, Index 400 Slope Break Condition, may be used in lieu of providing a 2 ft. setback to the slope break point. Coordinate the use of the Deep Post guardrail option with the District Drainage Engineer and District Maintenance Engineer."

Modification for Non-Conventional Projects:
Delete the above paragraph and see RFP for requirements.

COMMENTARY

The ***DSR*** for Index 400 is a complete redevelopment intended to clarify information for designers and contractors, update criteria, and provide additional options. The revision includes the addition of a Table of Contents, a reduction in the page count, and the relocation of information to the appropriate documents (i.e., ***IDS***, ***Standard Specifications***, and ***PPM***). Additionally, the revision brings guardrail criteria closer to the latest national standards, including implementation of the *MASH*-tested Approach Transition Connections to Rigid Barrier, the *Texas Transportation Institute*'s Frangible Leave-Out post mounts, and the *AASHTO Roadside Design Guide*'s Length of Need Calculations. Lastly, the revision provides additional options including Deep Posts for Slope Break Conditions and Low-Speed Guardrail assemblies, which will result in cost savings.

The ***DSRs*** for Indexes 410 and 411 include minor modifications for maintaining compatibility with the ***DSR*** for Index 400, including an update to the Approach Transition Connection to Rigid Barrier.

Comprehensive training has been scheduled at each District location from February through April to help the Districts and their consultants with implementing the requirements of this bulletin. Additionally, summarized training will be available at the FDOT Design Training Expo 2016.

IMPLEMENTATION

These ***DSRs***, along with the revised ***PPM*** criteria and ***Standard Specifications*****,** will be mandatory for all projects with lettings beginning July 1, 2017. Implementation of these revisions on projects let prior to July 1, 2017 is at the discretion of the District.

Revised ***Specifications*** Sections 536, 538, and 967 are required for use with the ***DSRs***. These revised ***Specifications*** are now available as Modified Special Provisions (MSPs) through the District Specifications Offices. These revisions will later be published in the July 2017 ***Standard Specifications***. See Attachment 'A' below for drafts of these MSPs.

Updated Pay Items to accompany these ***DSRs*** are now posted and available through the ***Design Quantities and Estimates*** (DQE) system.

When these ***DSRs*** are used for projects let prior to July 1, 2017:

- Insert the revised ***Design Standards*** Index drawings in the Plans as described in the ***PPM***, Volume 2, Section 3.2.8
- Request the applicable MSPs from the District Specifications Office and include them in the project Specifications Package.

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MAS/rms
Attachments

Attachment 'A'

Draft Modified Special Provisions for Sections 536, 538, and 967

SECTION 536
GUARDRAIL

536-1 Description.

Construct guardrail, including End Treatments, Transition Connections to Rigid Barrier, and other associated hardware, as specified in the Plans and in accordance with the Index 400 Series Design Standards. Remove existing guardrail as specified in the Plans.

536-2 Materials.

Use components for guardrail, including Posts, Offset Blocks, Steel Panels, Bolts, Foundations, Barrier Delineators, End Delineators, Rub Rail, Pipe Rail, and Approach Terminals in accordance with Section 967.

536-3 Construction.

Install components in accordance with the Plans, the Design Standards, and the APL Drawings as applicable.

536-3.1 Height Tolerance: Install guardrail panels at the height shown in the Design Standards with a general tolerance of 1 inch above and ½ inch below the nominal height specified. Where unavoidable surface irregularities are encountered, a tolerance of 3 inch above and 1 inch below the nominal height is permissible (e.g. across shoulder gutters, inlets, and roadway surface break lines).

536-3.2 Station Location Tolerance: Where guardrail feature stationing is called out in the Plans, the longitudinal stationing tolerance is ± 3'-1½" unless otherwise restricted by field conditions as determined by the Engineer.

For Transition Connections to Rigid Barrier, install the Thrie-Beam Terminal Connector at a ¼ inch tolerance relative to the end of the Rigid Barrier as defined in the Plans and Design Standards.

536-3.3 Setting Posts: Set posts plumb and to the soil depth shown in the Design Standards. Use the Deep Post option only where specified in the Plans. Place posts in excavations, backfill the space around the posts, and thoroughly tamp the backfilled soil. As an alternate method, use a post-driving machine meeting the approval of the Engineer.

For guardrail post replacement, backfill and tamp the existing soil hole prior to setting the replacement post.

If driving timber posts, either block out holes in the asphalt pavement during the asphalt paving operation or cut holes through the asphalt mat prior to the post installation. Blocked out or cut holes in the asphalt pavement must be at least 50% larger than the cross-sectional area of the timber post. After driving the posts, patch the area of asphalt around each post with fresh, hot bituminous mixture.

If driving steel posts, drive the post directly through the asphalt mat. Fill asphalt depressions or cracks with fresh, hot bituminous mixture in a manner meeting the approval of the Engineer.

For both timber and steel post locations where subsurface miscellaneous rock or other solid material is obstructing the post placement, remove such material as follows:

1. If any part of an obstruction is located within 0 and 18 inches in depth, excavate a minimum 24 inch diameter hole around the post location for the full depth of the post, with the back edge of the excavated hole placed a minimum of 15 inches behind the back face of the post.

2. If an obstruction is only located below 18 inches in depth, excavate a minimum 12 inch diameter hole around the post location, for the full depth of the post, with the back edge of the excavated hole placed a minimum of 3 inches behind the back face of the post.

3. Backfill the holes with soil and thoroughly tamp.

536-3.4 Post Location Conflicts: When the construction of guardrail at the required post spacing results in post(s) conflicting with sidewalks, gutter, underground utilities, or other permanent obstacles which cannot be removed as determined by the Engineer, the following options are permitted with the approval of the Engineer:

1. Additional Offset Blocks – Up to 2 additional Offset Blocks (3 total) may be used where the resulting post placement, moved farther behind the face of guardrail, will avoid a post conflict.

Use Button-Head Bolts of added length as needed to secure the panel system with the rear nut and washer. Where bolts greater than 25 inches are required, a 5/8 inch threaded rod meeting the same material requirements may be substituted and secured with steel hex nuts of over 1-1/8 inches in diameter. Use a steel washer against the post and not the panel. The rod is not permitted to extend beyond ¾ inch from the face of the tightened nut on the panel side; trim the rod as needed and galvanize in accordance with Section 562.

Over a distance of one post spacing, linearly widen the miscellaneous asphalt pavement where required to maintain a minimum of 10 inches of material behind the post.

2. Special Steel Posts – Where post placement atop a concrete structure cannot be avoided, use Special Steel Posts as defined in the Design Standards.

3. Encased Posts – Where post placement results in a conflict with an underground utility or obstacle, use the shallower Encased Post Option as defined in the Design Standards where the concrete encasement will not damage a utility.

4. Frangible Leave-Out – Where post placement results in a conflict with a concrete slab, use the Frangible Leave-Out as defined in the Design Standards. Do not use posts through concrete slabs deeper than 8".

536-3.5 Deep Post: Mark Deep Posts on the back face, centered 4 inches below the top edge, with a legible black letter 'D' approximately 2 inches vertical by 1 inch horizontal in size. Use a permanent black ink stamp or paint stencil.

536-3.6 Special Steel Post: Mount to concrete structures using the following systems.

536-3.6.1 Adhesive Bonded Anchors: For concrete structures 9 inches deep and greater, mount the Base Plate to the concrete using steel adhesive-bonded anchor bolts with a minimum tensile strength of 60 ksi and galvanized in accordance with ASTM A153. Stainless steel components may be substituted, but components plated in accordance with ASTM B-633 are not acceptable. Use adhesive-bonded anchors in accordance with Section 937 and 416 (Type HSHV) and in accordance with the manufacturer's specification.

Drill holes in concrete, through reinforcing steel if encountered. Thoroughly clean and dry the holes immediately prior to setting anchors.

At a minimum, meet the following strength capacities:

	Approach Slabs	Other Structures
Min. Tensile Load (Each Anchor)	14,000 lbs	8,000 lbs
Min. Shear Load (Each Anchor)	15,000 lbs	7,800 lbs

536-3.6.2 Hex-Head Bolt: For concrete structures less than 9 inches deep, use a ¾ inch Hex-Head bolt passing through a 7/8 inch drilled hole in the concrete structure and secured from underneath with a washer and nut. The threaded bolt must not protrude more than ¾ inches beyond the tightened nut; trim the threaded portion as needed and galvanize in accordance with Section 562.

536-3.7 Steel Panels: Use straight panels to construct radii of 125 feet or greater. Use fabricated shop-bent panels to accommodate radii of less than 125 feet.

536-3.8 Panel Slots and Holes: Use the Panel's unaltered, prefabricated slots and holes as shown in the Design Standards. Do not drill, punch, ream, or otherwise alter the prefabricated slots and holes to accommodate basic connections.

Creating new Post Bolt Slots is only permitted for reduced post spacing (quarter spacing) and adjusting post spacing to avoid structure edge conflicts as shown in the Design Standards. Where required, punch new Post Bolt Slots to the dimensions given in the Design Standards, spaced no closer than 4 inches measured edge to edge from an existing slot. Galvanize new punched slots per Section 562.

536-3.9 Barrier Delineators: Mount Barrier Delineators on top of the guardrail post by adhesive or mechanical means per the manufacturer's recommendations.

536-3.10 End Delineators: Install the Retroreflective Sheeting to the approach face (nose) of Approach Terminals, Trailing Anchorages, and Controlled Release Terminal (CRT) End Treatments where indicated in the Design Standards. Mount the Retroreflective Sheeting vertically centered on the approach face by adhesive or mechanical means per the manufacturer's recommendations. Retroreflective Sheeting must be a minimum 8 inches in height with a minimum area of 160 square inches for Approach Terminals and Trailing Anchorages and 240 square inches for CRT End Treatments.

536-3.11 Pipe Rail. Install where indicated in the Plans or where required by the Engineer to meet the requirements of the Design Standards. Treat field drilled holes in accordance with Section 562.

536-3.12 Existing Guardrail: Stockpile guardrail, if specified, within the right-of-way at a location approved by the Engineer. Dispose of all remaining guardrail not specified for stockpiling.

536-3.13 Approach Terminal Assemblies: Install Approach Terminal Assemblies as specified in the Plans and APL drawings and in accordance with the geometry and adjacent grading of the Design Standards.

If the Plans call for a "Flared" Approach Terminal Assembly and do not identify the specific system to be used, the contractor has the option to construct any Department-approved "Flared"

Terminal Assembly identified on the APL, subject to the conditions identified in the Plans or the APL drawings.

Likewise, if the Plans call for a "Parallel" Approach Terminal Assembly and do not identify the specific system to be used, the contractor has the option to construct any Department-approved "Parallel" Terminal Assembly identified on the APL, subject to the conditions identified in the Plans or the APL drawings.

536-4 Certification and Acceptance.

Submit to the Engineer certification letters from the manufacturers confirming that all materials used meet the requirements of this Section along with Section 6 and the Design Standards. The letters must list all of the APL items used along with the device-specific APL numbers. Provide this certification at least ten days prior to guardrail construction.

For steel panels and panel components, submit to the Engineer a certified mill analysis meeting the material requirements of Section 967.

For steel posts and steel offset blocks, submit to the Engineer a certified mill analysis from the manufacturer showing the physical and chemical properties of each heat meeting the requirements of ASTM A36, the amount of spelter coating, and galvanization meeting the requirements of ASTM A123.

Submit to the Engineer a Certificate of Compliance verifying that the guardrail system, materials, and construction practices comply with applicable Design Standards and Specifications.

Acceptance of submitted material will be based on the material certifications, Certificate of Compliance, and visual inspection by the Engineer.

536-5 Method of Measurement.

536-5.1 Guardrail: The quantity paid for will be the plan length of the guardrail type in linear feet, constructed, in place, and accepted. The plan length for guardrail is measured end-to-end following the centerline of the panels, between the Begin/End Guardrail Stations as specified in the Plans. This includes the full lengths of the adjoining End Treatments and Transition Connections to Rigid Barrier.

536-5.2 Rub Rail: The quantity paid for will be the plan length, in linear feet, constructed, in place and accepted.

536-5.3 Pipe Rail: The quantity paid for will be the plan length, in linear feet, constructed, in place and accepted.

536-5.4 Special Guardrail Post: The quantity paid for will be the number of each, constructed, in place and accepted.

536-5.5 Bridge Anchorage Assembly / Approach Transition Connection to Rigid Barrier: The quantity to be paid for will be the number of each, constructed, in place and accepted.

536-5.6 Removal of Existing Guardrail: The quantity paid for will be the length, in feet, measured and accepted prior to removal.

536-5.7 Guardrail Post Replacement: The quantity paid for will be the number of each, replaced.

536-5.8 Guardrail End Treatment: The quantity paid for will be the number of each type as designated, constructed, in place, and accepted.

536-6 Basis of Payment.

536-6.1 Guardrail: Price and payment will be full compensation for all work specified under this Section, including furnishing and installing posts, panels, Barrier Delineators, and all other materials as defined in the Plans and the Design Standards. The price and payment will include any Reduced Post Spacing, Nested Panels, Trailing End Transition Connections to Rigid Barrier, and CRT post segments as specified in the Plans.

The type of Guardrail specified will be that which comprises the guardrail run (e.g. W-Beam General, W-Beam Double Face, W-Beam Low-Speed, Modified Thrie-Beam etc.) between End Treatments and Transition Connections to Rigid Barrier. For guardrail systems with direct connections between End Treatments and Transition Connections to Rigid Barrier, the type of Guardrail specified will be W-Beam General for single faced guardrail applications or Double Face W-Beam for double faced guardrail applications.

Payment will be made under the Pay Items as follows:

1. Where the Contractor furnishes all materials for the guardrail and the Engineer does not require shop-bent panels, payment will be made under the Pay Item of Guardrail.

2. Where the radius of the guardrail installation is such as to require shop bending of the guardrail panels per this Section (see Steel Panel requirements), payment will be made under the Pay Item of Guardrail with Shop-Bent Panels for the installed length of Shop-Bent Panels segments only.

536-6.2 Rub Rail: Price and payment will include all components specified in the Plans and Design Standards.

536-6.3 Pipe Rail: Price and payment will include all components specified in the Plans and Design Standards. Pipe Rail will be shown and tabulated in the Plans for the condition that steel posts are installed at the indicated Pipe Rail location, however the Pipe Rail is not required if the timber post option is selected and installed at the indicated Pipe Rail location.

536-6.4 Special Guardrail Post: Price and payment will include all costs for furnishing and installing the Special Guardrail Posts that are over and above the costs for Standard Posts, where Special Guardrail Posts are installed instead of Standard Posts. Special Guardrail Posts include Deep Posts, Special Steel Posts, Encased Posts, and Frangible Leave-Outs as defined in the Design Standards and indicated in the Plans.

536-6.5 Bridge Anchorage Assembly / Approach Transition Connection to Rigid Barrier: Price and payment will include costs, over and above the adjoining guardrail type of the same length, for furnishing and installing all hardware for Approach Transition Connections to Rigid Barrier per the Design Standards. This includes Barrier Delineators for Existing Post and Beam Bridge railings.

536-6.6 Removal of Existing Guardrail: Price and payment will include all labor and equipment required for removal and disposition of the existing guardrail as specified in the Plans. No additional payment will be made for the removal of transition connections, Double Faced Guardrail, Thrie-Beam Guardrail, nested panels, Pipe Rail, Rub Rail or End Terminals.

536-6.7 Guardrail Post Replacement: Price and payment will include all labor, materials, and equipment required for the removal and disposal of existing posts in areas provided by the Contractor. Price and payment will also include the backfilling and compaction of existing holes and the post replacement with new posts.

536-6.8 Guardrail End Treatment: Price and payment will include all costs, above and beyond the adjoining guardrail type of the same length, for furnishing and installing all Guardrail End Treatment components specified in the Plans. Guardrail End Treatments may include parallel or flared Approach Terminals, Type II Trailing Anchorages, CRT End Treatments, and Double Faced Approach Terminals as defined in the Plans.

536-6.9 Payment Items: Payment will be made under:

Item No. 536- 1- Guardrail - per foot.
Item No. 536- 2- Guardrail - Shop-Bent Panels - per foot.
Item No. 536- 5- Rub Rail - per foot.
Item No. 536- 6- Pipe Rail - per foot.
Item No. 536- 7- Special Guardrail Post - each.
Item No. 536- 8- Bridge Anchorage Assembly / Approach Transition Connection to Rigid Barrier - each.
Item No. 536- 73- Removal of Existing Guardrail - per foot.
Item No. 536- 83- Guardrail Post Replacement- each.
Item No. 536- 85- Guardrail End Treatment - each.

SECTION 538
RESETTING GUARDRAIL

538-1 Description.

Remove the existing guardrail system and reinstall, using new and reusable components as permitted, at the locations shown in the Plans. Reinstall guardrail in conformance with the current Design Standards, including the criteria for height, spacing, and midspan splices. The reset guardrail will include new and reusable components, excluding components defined as non-reusable below.

Furnish and install new End Treatment Assemblies, Approach Transition Connections to Rigid Barrier, Trailing End Transition Connections to Rigid Barrier, and Bridge Anchorage Assemblies per Section 536 where required (i.e. reuse of these devices is not permitted).

538-2 Materials.

538-2.1 General: Construct reset guardrail using only new and reusable components, excluding non-reusable components as defined below. Reinstall all components for resetting guardrail in accordance with Section 536.

538-2.2 Planned Non-reusable Components: The following items are considered Planned Non-Reusable components and must be replaced with all new components:

1. Timber Posts
2. Timber Offset Blocks
3. End Treatment Assemblies
4. Approach Transition Connections to Rigid Barrier (including all panels, posts, hardware, offset blocks, etc.)
5. Trailing End Transition Connections to Rigid Barrier
6. Bridge Anchorage Assemblies (including all panels, posts, hardware, offset blocks, etc.)
7. Any other items specified as non-reusable by the Plans.

538-2.3 Unforeseen Non-reusable Components: During construction operations, the Engineer may deem existing components as unacceptable for re-use (excluding those listed above as Planned Non-reusable Components). Such components are considered Unforeseen Non-reusable Components and will require replacement with new components. Unforeseen Non-reusable components are subject to transportation payment as defined below.

Components damaged during construction operations are not considered Unforeseen Non-reusable Components and must be replaced with new components at no cost to the Department.

538-3 Construction Methods.

Install guardrail in accordance with Section 536.

If the reset guardrail is to be placed in the same location as the previous installation, do not use the previous installation's in-ground post holes; place the reset posts at the approximate midspan location of the previous installation. Backfill and thoroughly tamp the empty in-ground holes at the previous post locations.

To accommodate the new post locations, field punch new Post Bolt Slots in the reusable guardrail panels where needed. Match the dimension and treatment requirements of the Design Standards and Section 536.

538-4 Method of Measurement.

The quantity paid for will be the plan length quantity in feet, constructed, in place, and accepted. The plan length of a run of guardrail is measured end-to-end following the centerline of the panels, from the Begin/End Guardrail Station as defined in the Design Standards and specified in the Plans, including the End Treatments and Transition Connections to Rigid Barrier lengths.

538-5 Basis of Payment.

Price and payment will be full compensation for all work specified under this Section and Section 536, including the furnishing replacements for Planned Non-reusable Components and installation of all required components as defined in the Design Standards. The price and payment will include any Reduced Post Spacing, Trailing End Transition Connections, and CRT post segments as defined in the Design Standards and shown in the Plans.

Price and payment to furnish replacements for Unforeseen Non-reusable Components (excluding any items damaged by the Contractor) will be paid for at the original invoiced cost along with a transportation charge added in the amount of 25% of the invoiced cost.

Newly furnished End Treatment Assemblies, Transition Connections to Rigid Barrier, and Bridge Anchorage Assemblies are required with reset guardrail as needed; the price and payment are defined per Section 536.

538-5.1 Payment Item: Payment will be made under:

Item No. 538- 1- Guardrail - Reset - per foot.

SECTION 967
COMPONENTS FOR GUARDRAIL

967-1 Description.

This Section covers the material and fabrication requirements for Guardrail components as shown in the Design Standards, Index 400 Series and the Approved Products List (APL) as applicable.

967-2 Materials.

Obtain components from producers currently on the list of Producers with Accepted Quality Control Programs. Producers seeking inclusion on the list of Producers with Accepted Quality Control Programs must meet the requirements of Section 105.

967-2.1 Timber: Use timber products with a minimum stress grade of 1200 psi and meeting the material requirements of Section 954. Treat in accordance with the post requirements in Section 955. Dress on four sides (S4S).

967-2.2 Steel: Use steel guardrail materials meeting the component fabrication requirements below.

Where specified, weld components in accordance with the American Welding Society Structural Welding Code ANSI/AWS D1.1 (current edition) using material conforming to E60XX. Nondestructive testing of welds is not required.

967-3 Fabrication.

Fabricate components in accordance with the Plans, the Design Standards, and the APL Drawings as applicable.

967-3.1 Posts: Furnish posts not varying more than 1 inch from the specified length shown in the Design Standards.

967-3.1.1 Timber Posts: Shape and drill prior to wood treatment.

967-3.1.2 Steel Posts: Use material in accordance with ASTM A6 and ASTM A36. Drill or punch the steel posts prior to galvanizing in accordance with ASTM A123. Use steel guardrail posts fabricated from rolled sections with cross-sections defined in the American Institute of Steel Construction (AISC) Manual of Steel Construction as called for in the Design Standards.

967-3.2 Special Steel Post: Use plate material in accordance with ASTM A6 and ASTM A36. Use post material meeting the above requirements for Steel Posts. Drill, punch, and/or weld the steel posts and plates prior to galvanizing in accordance with ASTM A123.

967-3.3 Offset Blocks: Furnish Offset Blocks that do not vary more than 0.25 inch from the specified dimensions in the Design Standards.

967-3.3.1 Steel Offset Blocks: Meet the above requirements for Steel Posts.

967-3.3.2 Timber Offset Blocks: Meet the above requirements for Timber Posts.

967-3.3.3 Composite Offset Blocks: Furnish Composite Offset Blocks as listed on the APL. Manufacturers seeking evaluation of their product for approval must submit an application in accordance with Section 6 and include the following:

1. A detailed drawing of the product, with the product name and specifications suitable for posting on the APL.

2. Independent test reports that indicate the product meets all crash test requirements of the National Cooperative Highway Research Program, Report 350 (NCHRP 350) or the Manual for Assessing Safety Hardware 2009 (MASH-09).

3. Independent test reports indicating that the composite material meets the following physical requirements:

Composite Block	Test Method	Requirement
Durometer Hardness	ASTM D2240 Shore D	Minimum 50
Durometer Hardness after UV exposure	ASTM D5870	< 15 points change from initial after exposure per ASTM D4329, 1000 hours, cycle C, type UVB-313 lamps

967-3.4 Steel Panels: Furnish W-Beam, Thrie-Beam, Thrie-Beam Transitions, Terminal Connectors, End Shoes, End Units, and all compatible paneling in accordance with AASHTO M180, with the exception of the requirements below.

Use Type II zinc coating for all classes of panels (i.e. beams or rails) and meet the requirements of ASTM A123 regarding the coating properties, sampling, test methods, inspection, and certifications related to galvanization.

967-3.5 Bolts: Furnish Hex-Head Bolts and Button-Head Bolts, including nuts, washers, and other accessories, per the material requirements of AASHTO M180, except galvanize in accordance with ASTM A153.

For 7/8" diameter Hex-Head Bolts used to mount Thrie-Beam Terminal Connectors, use hot-dip galvanized bolts in accordance with ASTM A449 (Type 1), nuts in accordance with ASTM A563, and washers in accordance with ASTM F436.

967-3.6 Barrier Delineators: Furnish Barrier Delineators in accordance with Sections 705 and 993 and as listed on the APL.

967-3.7 End Delineators: Use yellow, Type IV or greater Retroreflective Sheeting in accordance with Section 994 and as listed on the APL.

967-3.8 Steel Plates: Furnish steel plates in accordance with ASTM A36. Drill holes prior to galvanizing in accordance with ASTM A123.

967-3.9 Pipe Rail: Use Schedule No. 40 Pipe in accordance with ASTM A53. Weld, if applicable, prior to galvanizing.

967-3.10 Rub Rail: Use material in accordance with ASTM A36. Drill, punch, and/or weld the panels prior to galvanizing per ASTM A123.

967-3.11 Steel Tube Foundations: Furnish Steel Tube Foundations meeting the requirements of ASTM A500, Grade B. After all punching, drilling, stamping, and/or welding is complete, galvanize in accordance with ASTM A123.

Use brackets and fixtures in accordance with ASTM A36. Drill or punch prior to galvanizing in accordance with ASTM A123.

967-3.12 Approach Terminal Assemblies: Furnish Approach Terminals as listed on the APL. Permanently mark the APL number on each assembly at a readily visible location and using lettering at least ¾ inches in height.

Manufacturers seeking evaluation of their product must submit documentation showing the Approach Terminal Assembly is deemed eligible by the Federal Highway Administration for federal funding on the National Highway System (NHS). A completed application must be submitted in accordance with Section 6 including a product drawing meeting the requirements of this Section and the Design Standards and that is signed and sealed by a registered Florida P.E. Product approval is contingent on the FDOT's evaluation of independent test reports, submitted by the manufacturer, indicating that the product meets all crash test requirements of the NCHRP 350 or MASH-09.