

DELETE Section 606 in its entirety and REPLACE with the following:

**SECTION 606
GUARDRAIL**

606-1.01 DESCRIPTION. Construct new guardrail, terminal sections, and transition rail of the kind and type specified.

Remove and reconstruct or remove and dispose of existing guardrail, terminal sections, and transition rail.

606-2.01 MATERIALS. Use materials that conform to the following:

Concrete	Section 501, Class A
Flexible Delineator Posts	Section 730-2.05
Guardrail Connection Plate	Section 722
Guardrail Hardware	Subsection 710-2.07
Guardrail Posts and Blockouts	Subsection 710-2.06
High Strength Bolts	Section 722
Metal Beam Rail	Subsection 710-2.04
Terminals	Subsection 710-2.11
Wire Cable	Subsection 709-2.02

Terminal Markers. Single piece marker, meeting the requirements of Section 730-2.05 Flexible Delineator Posts.

Post-mounted flexible delineators. Single piece marker, meeting the requirements of Section 730-2.05 Flexible Delineator Posts.

Furnish terminal markers, color as shown on the plans, nominally 0.125 by 3.75 inches by 66 inches long or as shown on the plans, with a 3 inch by 12 inch retroreflective sheeting matching the color of the adjacent lane line, or as shown on the plans.

Furnish post-mounted flexible delineators, color and dimensions as shown on the plans, with a 3 inch by 12 inch retroreflective sheeting matching the color of the adjacent lane line, or as shown on the plans.

Fabricate side-mounted guardrail reflector assembly brackets from aluminum alloy.

Retroreflective sheeting for terminal markers, post-mounted flexible delineators, and side-mounted guardrail reflectors shall meet ASTM D4956 requirements for Type VIII, IX, or XI.)

CONSTRUCTION REQUIREMENTS

606-3.01 GENERAL. Install guardrail and terminals at the locations shown on the Plans. Conform with the Standard Drawings and these Specifications.

At locations where public traffic is adjacent to guardrail work, have all materials on site, including crashworthy terminals, that are required to completely install a segment of guardrail before beginning work on that segment.

Start guardrail installation at the "upstream" end (the end adjacent traffic will encounter first) by either installing a crashworthy terminal or connecting to an existing barrier. Continue installation in the direction of traffic. Exception: if the guardrail run will connect to existing barrier, buried in the backslope, or guardrail, existing or new bridge railing, or other existing structure at the "downstream" end, guardrail installation may be started at the point of connection.

Do not leave posts installed for guardrail within the clear zone for more than 48 hours before installing the rail. At the end of each work shift, install drums or Type II barricades with flashing warning lights to delineate incomplete sections of guardrail and terminal sections.

If guardrail runs are not completed within 10 calendar days after beginning installation, install temporary crash cushions meeting NCHRP 350 or MASH test level 3 at all non-crashworthy guardrail ends within the clear zone. Apply Traffic Price Adjustment if the Contractor does not comply with the crash cushion requirement.

Where necessary, adjust the height of existing guardrail to provide a smooth transition to new guardrail. Use 25 linear feet of guardrail or two 12' 6" pieces of guardrail to transition to match the existing or new guardrail elements and/or end treatments.

After shaping the slopes and staking proposed guardrail terminal section locations, request the Engineer to field verify their locations. Receive approval of the staked locations before installing terminal sections.

Treat field cuts to timber posts and blockouts according to AWWPA standard M 4.

Install blockouts according to manufacturer's recommendations and as shown on the plans.

Install side-mounted guardrail reflectors and post-mounted flexible delineators as follows:

1. At intervals noted on the plans or Standard Drawings, starting with the first guardrail post beyond terminal sections
2. With the retroreflective sheeting facing approaching traffic
3. With retroreflective sheeting on both sides, on two-way roadways
4. Not on the terminal sections, except as shown on the plans

Attach terminal markers, in a vertical position, to the P.T. post of Short Radius Guardrail sections and to the post where the flare begins for parallel guardrail terminals. Coordinate terminal marker locations with the Engineer.

At the end of each work shift, install drums or Type II barricades with flashing warning lights to delineate incomplete sections of guardrail and terminal sections.

606-3.02 POSTS. Set posts to accommodate the line, grade, and curvature shown on the Plans.

Use either wood or steel posts when allowed by the type of guardrail specified, subject to the following:

1. Use one type of post material on the project unless extending an existing run of guardrail.
2. Match existing post material to extend an existing run of guardrail.

Set posts as follows:

1. Set posts plumb, in the location and to the depth shown on the Plans or Standard Drawings.
2. Choose an installation method that does not damage the post, adjacent pavement, structures, utility conduits, and final slopes. Repair all damage to the satisfaction of the Engineer, or replace the damaged item, as per subsection 105-1.11.
3. Set wood or steel posts in dug, drilled, or pre-punched holes. Steel posts may also be set by ramming or driving if:
 - a. The underlying material is no larger than six inch; and
 - b. The posts are not damaged during installation.

4. For placement in solid rock or broken rock embankment greater than six inch, set wood or steel posts in pre-dug, pre-drilled, or pre-punched holes.
5. Backfill and compact around posts with material as specified in the typical section to firmly support the post laterally and vertically. Compact under and around posts to the Engineer's satisfaction.

606-3.03 BEAM RAIL. Fabricate metal work in the fabricator's shop. Bend curved guardrail elements with radii less than or equal to 100 feet in the fabricator's shop or with an approved bending apparatus.

Receive approval before field punching, cutting, or welding. Repair damaged spelter coat areas on galvanized rail elements according to AASHTO M 36.

Lap rail elements so that the exposed ends face away from approaching traffic in the adjacent lane.

Use bolts long enough to extend at least 1/4 inch beyond the nuts. Except where required for adjustments, do not extend bolts more than 1 inch beyond the nuts.

Locate bolts at expansion joints at the center of the slotted holes.

Tighten bolts at expansion joints to snug-tight. Make all other bolts fully-tight.

606-3.04 CABLE RAIL. Install cable guardrail according to the Plans and Specifications. Install at the locations shown on the Plans.

606-3.05 TERMINAL SECTIONS.

1. Parallel Terminals. Install terminal sections according to the manufacturer's recommendations for the entire length of the terminal then, if required, transition rail height over 25' to match guardrail height and splice location. Install where shown on the Plans.

Follow Section 203 for excavation and embankment requirements.

Install ASTM D4956 Type III, IV, or V retroreflective sheeting on the end section of parallel terminals consisting of yellow and black bars sloping 45 degrees downward toward the traffic side of the terminal according to guidance for Object Markers for Obstructions Adjacent to the Roadway in Chapter 2C of the ATM.

2. Buried-in-Backslope Terminals. Install buried-in-backslope terminals where shown on the plans. If required, transition rail height over 25' to match guardrail height and splice location.

Attach terminal markers, in a vertical position, to the first post of each parallel guardrail terminal, and to the post where the flare begins for parallel guardrail terminals and buried-in-backslope terminals. Orient terminal markers to face traffic approaching in the near lane. Coordinate terminal marker locations with the Engineer.

606-3.06 REMOVAL AND RECONSTRUCTION OF GUARDRAIL. Remove and reconstruct guardrail as specified. Replace lost or damaged materials without extra compensation.

606-3.07 REMOVAL AND DISPOSAL OF EXISTING GUARDRAIL. Remove the existing guardrail shown on the Plans, including the rail, cable elements, terminal sections, hardware, posts, concrete bases, and steel tubes. Backfill resulting holes with material in 6-inch layers that is similar to the existing embankment and compact to the same approximate density. Removed items become your property.

606-3.08 ADJUST EXISTING GUARDRAIL. When called for on the Plans, reset existing guardrail to the height shown on the applicable Standard Drawing, measured from the top of the rail to the finished shoulder surface below the rail. Raise and lower the posts several times to prevent settlement and then re-drive them to the height shown on the Plans. Use other methods if approved.

606-3.09 INSTALL NEW GUARDRAIL. Install guardrail as shown on the applicable Standard Drawings, measured from the top of the rail to the finished shoulder surface below the rail.

Install MASH Test Level 3-compliant W31 guardrail as shown on the plans. Install new guardrail in conformance with tolerances shown on the plans.

606-4.01 METHOD OF MEASUREMENT. Section 109 and as follows:

1. Guardrail. Measured along the face of the rail or cable, from the center of the end posts.

Short Radius Guardrail. Per each, installed in place.

When the guardrail is connected to a terminal section, the pay limit for the rail ends where the specified terminal section begins.

2. Terminals. Per each, installed in place.
3. Transition Rail (Bridge Rail Thrie Beam Transition or Bridge Rail W-Beam Transition). Per each accepted connection.

606-5.01 BASIS OF PAYMENT.

Payment for temporary crash cushions installed to protect motorists from guardrail installations that have not been completed within 10 calendar days of beginning installation is subsidiary to other items.

1. Guardrail. Side-mounted guardrail reflectors, post-mounted flexible delineators, terminal markers, guardrail beam, posts, blockouts, and associated hardware are subsidiary. Installation of downstream anchors, transitions for rail height and splice locations, long span guardrail sections, and guardrail stiffening sections are subsidiary to guardrail installation.
2. Short radius guardrail sections. The contract price includes all materials from the terminal anchor to and including the first wood or steel post of standard guardrail or guardrail end terminal, and including the terminal anchor assembly, in-line anchor, terminal posts, CRT posts, rail elements, terminal markers, and associated hardware required for a complete installation.
3. Terminal Sections.
 - a. Parallel Guardrail Terminal. The contract price includes rail elements, posts, blockouts, pipe sleeves, cable assemblies, guardrail extruders, terminal markers, and all associated hardware required for a complete installation.
 - b. Buried in Backslope Guardrail Terminal. The contract price includes rail elements, posts, blockouts, concrete, rebar, anchors, and all associated hardware required for a complete installation.
4. Transition Rail. The contract price includes all brackets, beam sections, transition pieces, and all posts and associated hardware required for a complete connection of the guardrail section to a bridge rail or barrier.

All material required for embankment widening for guardrail and terminal sections is paid for under the appropriate pay items shown in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
606(1) W-Beam Guardrail	Linear Foot
606(2) Thrie Beam Guardrail	Linear Foot
606(3) Box Beam Guardrail	Linear Foot

Pay Item	Pay Unit
606(4) Cable Guardrail	Linear Foot
606(5) Removing and Reconstructing Guardrail	Linear Foot
606(6) Removing and Disposing of Guardrail	Linear Foot
606(7) Raising Existing Guardrail (Retired)	Linear Foot
606(8) Double-faced, W-Beam Guardrail	Linear Foot
606(9) Short Radius Guardrail	Each
606(10) Slotted Rail Terminal (SRT-350) (Retired)	Each
606(11) Extruder Terminal (ET-2000) (Retired)	Each
606(12) Guardrail/Bridge Rail Connection (Retired)	Each
606(13) Parallel Guardrail Terminal	Each
606(14) Buried in Backslope Guardrail Terminal	Each
606(15) Adjust Existing Guardrail	Linear Foot
606(16) Transition Rail	Each