Amend **Section 606 - Guardrail** to read as follows:

"SECTION 606 - GUARDRAIL

606.01 Description. This work includes installing guardrails according to the contract.

The contract designates the types of guardrails as follows:

(1) Type 1 (Unassigned)

(2) Type 2 Cable-Chain Link Barrier Guardrail

(3) Type 3 Beam Type Guardrail

(4) Type 4 Rigid Barrier Type Guardrail

The construction of guardrails includes the assembly and erection of component parts at the locations shown in the contract or as specified by the Engineer.

606.02 Materials. Materials shall conform to the following:

Joint Fillers	705.01
Reinforcing Steel	709.01
Wire Rope or Wire Cable	709.02
Chain Link Fencing	710.03
Metal Beam Rail	710.04
Guardrail Posts	710.07
Guardrail Hardware	710.08

Concrete for Type 4 Rigid Barrier Type Guardrail shall be Class A. Concrete for Type 4 Rigid Barrier Type Guardrail shall conform to Section 601 - Structural Concrete.

Furnish zinc-coated steel post and zinc-coated steel rail beam for the Type 3 Beam Type Guard Rail. Do not mix the type of steel posts within the project.

When the location of manufacturing plants allows, the Engineer may inspect the plants periodically for compliance with specified manufacturing methods. The Engineer may get samples of materials for laboratory testing for compliance with material quality requirements. This may be the basis for acceptance of manufacturing lots regarding quality.

The condition of materials will be subject to inspection for acceptance before or during incorporation of materials into the work.

606.03 Construction Requirements. Repair zinc-coated base metal surfaces that the Contractor exposes, drills, threads, cuts according to 501.03(G)(2) - Repairing of Damaged Zinc-coated Surfaces.

Preserve and protect existing facilities that the Contractor may affect by the guardrail installation. Replace the guardrails that the Contractor damages due to its operation at no cost to the State.

(A) Beam Type Guard Rail.

(1) Posts. When using a suitable method, the Contractor may drive only steel posts, except those with anchors, into the ground. Maintain an accurate vertical alignment and shall not deform the steel post.

Set the wood and steel posts with anchors plumb in hand or mechanically dug holes. Backfill post holes with acceptable material placed in layers and compact thoroughly.

Set the posts vertically in the ground to the approximate depth shown in the contract. The posts, after backfilling or driving, shall be in accurate alignment with their tops at the required grade.

The Contractor may vary the guardrail post locations shown in the contract to ease clearing utility lines or to produce smooth transitions. Request such variance for acceptance by the Engineer. The Contractor may not vary the guardrail post locations of terminal sections.

When the contract requires additional bolts and holes on posts, drill the additional bolt holes and furnish the bolts for proper installation. Drill, furnish, and install this additional bolts at no cost to the State.

Do not make the additional bolt holes in posts by burning with a torch or other method or device. Manufacture or drill the holes in the posts.

Apply a preservation treatment to the wood posts and blocks according to Section 714 – Structural Timber and Related Materials.

Where field cutting or boring is done after treatment, thoroughly swab, spray, or brush the cuts and holes with two applications of preservatives accepted by the Engineer.

(2) **Rail Elements.** Install the rail elements that results in a smooth, continuous installation. Draw the bolts, except adjustment bolt, tight. Bolts shall be of sufficient length to extend beyond the nuts.

When the contract requires setting the guardrail posts at non-standard spacing, cut the rail elements and drill bolt holes as necessary for proper installation.

Do not make the additional bolt holes by burning with a torch or other method or device.

The Contract does not require paint on zinc-coated steel railing.

(3) **Existing Guardrail.** The Contractor shall be responsible for verifying underground facilities such as utilities ducts, cables, and pipes in locations where the Contractor will drive guardrail posts. Repair damages done to the facilities despite the location or if shown in the contract at no cost to the State.

When removing the existing guardrails, backfill and compact the holes with suitable material. Grade and compact the shoulder area before installing the new guardrails and posts.

Reinstallation of guardrail shall be according to Subsection 606.03(A).

When replacing the existing guardrails with new guardrails and posts, do not leave an unprotected opening in the guardrail system of more than 500 linear feet. Also, after each work day, protect the areas not yet completed with physical barriers according to the latest MUTCD.

(4) **Reset Guardrail Post.** Adjust the height of existing guardrail post such that the guardrail element will be at the required height according to the contract.

Spacer blocks bolted to the existing post are to remain intact. When required or specified by the Engineer, excavate or fill and compact around the post to be adjusted. Replace the guardrails that are damaged by the Contractor due to its operation at no cost to the State and according to the contract.

(B) Cable-Chain Link Barrier Guardrail.

(1) **Post.** Place the post at equal intervals. The Contractor may space the end post closer to adjacent posts, if specified by the Engineer. Set the posts vertical. Crown the concrete portion of the post footing at the top to shed water.

(2) **Chain Link and Tension Cable or Top Rail.** Fasten the chain link fabric to the tension cable, top tension wires or top rail, and posts with tie wires. Space the tie wires at approximately:

(a) 24 inch intervals to the tension cable, top tension wires or top rail and

(b) 15 inch intervals to the posts.

The tie wires shall start two inches from the top of the fabric with tie wires. Give the tie wire at least one complete twist.

Install the chain link fabric on the outer portion of the cables after clamping the cables in place and torque the u-bolts properly. The chain link fabric shall be on the "U" side of the cable clamps.

Stretch the tension wire tight with the turnbuckles. Install the turnbuckles at the beginning and end of each continuous section of chain link fabric and at such intermediate points as may be necessary for tightness.

Provide turnbuckles between 500 feet and 600 feet intervals for each tension cable.

Stagger the turnbuckle connections for tension cables so that the Contractor may locate not more than one turnbuckle in one panel. When a turnbuckle assembly falls at or within six inches of a post, clamp only the cable on the side of the post opposite the turnbuckle assembly to the post. At these locations, fasten the

turnbuckle assembly or the cable on the turnbuckle side to the post with a No. 9 gage tie wire.

When connecting tension cables to pipe-type turnbuckles by factory swaged steel pulls, the complete turnbuckle assembly shall develop 100% of the breaking strength of the cable.

Furnish one test sample of cable to the Engineer for each 10,000 feet or less of cable the Contractor will install. The test sample shall be three feet in total length. Fit the test sample properly with right-hand thread swaged pulls at both ends as specified in the above paragraph.

When connecting the tension cables to drop forged steel closed sockets, the complete turnbuckle assembly shall develop 100% of the breaking strength of the cable. Fill the sockets with pure zinc.

Furnish one test sample of cable to the Engineer for each 10,000 feet or less of cable the Contractor will install. The test sample shall be three feet in total length. Fit the test sample properly socketed at both ends as specified in the above paragraph.

The Contractor may use preformed zinc-coated cable dead ends as an alternative method of connecting the tension cables to the turnbuckles at anchor blocks only. The installed dead ends shall develop 100% of the breaking strength of the cable.

At structures where constructing two barrier fences, bound or weld the exposed ends of the connecting tension cables.

Do not overtighten the tension cables. Position the tension cables firmly so that between 0.25 inch and 0.5 inch sag in the cables between posts occurs.

Place the u-bolts of the cable clamp assemblies across the lay of the tension cables. Tighten the nuts on the u-bolts by applying between 30 and 35 foot-pounds of torque.

When installing barrier on existing structures, anchor the posts to the deck shown in the contract.

Drill anchor bolt holes in the deck without spalling or damaging the concrete surrounding the hole. Set the anchor bolts with a mixture of commercial quality, modified epoxy adhesive

and sand. The proportions of modified epoxy shall be between one adhesive to four sand and one adhesive to six sand. The Engineer will establish the exact proportions. The cementing agent includes two component mixture of modified epoxy adhesive manufactured especially for the making of epoxy-sand grouts. Mix two components according to the manufacturer's directions for use.

(C) Rigid Barrier Type Guardrail.

(1) **Preparation.** Shape and compact the foundation to a firm even surface according to the contract. Remove and replace soft and yielding material with acceptable material according to Section 305 - Aggregate Subbase Course.

(2) **Forms.** Forms shall be according to Section 503 - Concrete Structures.

(3) **Placing Concrete.** Moisten the foundation thoroughly immediately before placing the concrete. Concrete shall be cast-in-place. Place the concrete according to Section 503 - Concrete Structures.

On new and existing concrete bridge deck, dowel the barrier into the deck shown in the contract.

(4) **Finishing.** Finish the surface to a smooth, even surface according to Subsection 503.03(M)(2) – Class 2 Rubbed Finish.

(5) **Joints.** Construct expansion joint shown in the contract or at existing expansion joints of structures. Expansion joint filler shall be 0.5 inch thick.

Provide the construction joints with keys and at intervals shown in the contract.

(6) Transition Sections. At the end of the barrier, adjust or construct new and/or existing guardrail or chain link fence as specified by the Engineer or shown in the contract.

606.04 Method of Measurement. The Engineer will measure guardrail per linear foot.

The Engineer will measure from center to center of end posts. When making end connections to masonry or steel structures, the Engineer will measure to the face of such structures.

The Engineer will measure rigid barrier type guardrail per linear foot from end to end of the type specified.

The Engineer will measure end anchorage, terminal section and transition section as units of each kind.

The Engineer will measure resetting existing guardrail post per each.

606.05 Basis of Payment. The Engineer will pay for the accepted guardrail at the contract unit price per linear foot complete in place. The price includes full compensation for removing existing guardrails and posts; filling of post holes; grading and compacting the shoulder area; installing physical barrier; furnishing and installing the guardrails; and furnishing labor, materials, tools, equipment, and incidentals necessary to complete the work.

The Engineer will pay for the accepted end anchorage, terminal section and transition section at the contract unit price per each complete in place. The price includes full compensation for removing existing guardrails and posts; filling of post holes; grading and compacting the shoulder area; installing physical barrier; furnishing and installing the end anchorage, terminal section and transition section; and furnishing labor, materials, tools, equipment, and incidentals necessary to complete the work.

The Engineer will pay for the accepted resetting guardrail post at the contract unit price per each. The price includes full compensation for adjusting guardrails at obstruction, guardrails with rubrail, thrie beams, transitions, end terminals, rubrail, guardrail elements, cable assemblies, footings, and posts; excavating; filling; compacting; grading; and furnishing labor, materials, tools, equipment, and incidentals necessary to complete the work.

The Engineer will make payment under:

Pay Item	**Pay Unit**
Guardrail Type _____	Linear Foot
Terminal Section Type _____	Each"

END OF SECTION