

83 RAILINGS AND BARRIERS

83-1 GENERAL

83-1.01 GENERAL

Section 83-1 includes general specifications for constructing railings and barriers.

Excavation and backfill must comply with section 19.

83-1.02 MATERIALS

83-1.02A General

Reserved

83-1.02B Steel Parts and Hardware

Welding must comply with AWS D1.1. Grind welds on exposed surfaces flush with the adjacent surfaces.

Galvanize completed steel parts and hardware for railings and thrie beam barrier under section 75-1.02B.

After galvanizing, the railing and barrier elements must be free of fins, abrasions, rough or sharp edges, and other surface defects and must not be kinked, twisted, or bent. If straightening is necessary, use an authorized method. Elements with kinks, twists, or bends may be rejected.

Clean and regalvanize (1) abraded or damaged galvanized surfaces of steel rail elements and posts and (2) ends of steel rail elements cut after galvanizing. If authorized, you may repair the surfaces under section 75-1.02B instead of regalvanizing.

83-1.02C Mortar

Mortar must comply with the specifications for mortar in section 51-1, except the mortar must consist of 1 part by volume of cement and 3 parts by volume of clean sand.

83-1.02D Markers

Markers must comply with section 82.

83-1.03 CONSTRUCTION

83-1.03A General

After constructing railings, barriers, terminal systems, crash cushions, and vegetation control, use the surplus excavated material to meet the grading requirements. Disposal of surplus material must comply with section 19-2.03B.

83-1.03B Mortar

Cure mortar by either the water method or the curing compound method using curing compound no. 6.

83-1.03C Median Barriers

Trim existing median plantings to clear the work area for median barrier construction. Dispose of the trimmings.

Do not remove an existing median barrier more than 500 feet in advance of the barrier being constructed.

At the end of each day's activities, reset the existing median barrier without mesh or glare screen and anchor the barrier in an authorized way such that no gap is left between the reset barrier and the barrier being constructed. You may place temporary barrier system instead of resetting the existing barrier.

83-1.03D Miscellaneous Construction

Where shown, paint the structure name, bridge number, year constructed, and other bridge identification information. Painting concrete must comply with section 78-4.03C(3).

Bridge identification on the bridge barrier must be (1) painted at each structure approach, (2) visible to approaching traffic, and (3) located near the paving notch, if applicable.

For open bridge barrier rails, paint bridge identification on the widest rail element.

For structures with adjacent retaining walls or approaches where metal beam bridge railings extend beyond the structure, paint bridge identification on the concrete end block of the barrier.

SECTION 83

RAILINGS AND BARRIERS

For bents and piers, paint bridge identification corresponding to the name and number shown, on the face of the bridge barrier directly above the centerline of each bent or pier.

83-1.04 PAYMENT

Except for midwest guardrail system and double midwest guardrail system, the payment quantity for railings is the length measured along the face of the railing, including end and intermediate posts, with no deductions for gaps in the railing for lighting and sign supports.

83-2 METAL RAILINGS AND BARRIERS

83-2.01 GENERAL

83-2.01A General

83-2.01A(1) General

Section 83-2.01 includes general specifications for constructing metal railings and barriers.

Locations shown are approximate. The Engineer will determine exact locations. Confirm layout with the Engineer prior to installation.

83-2.01A(2) Materials

W-beam elements, thrie beam elements, end caps, and return caps must comply with AASHTO M 180 for Class A, Type I, except within 0.5 miles of the coast the components must comply with AASHTO M 180 for Class A, Type II.

10-gauge rail elements for thrie beam elements and transition railings must comply with AASHTO M 180 for Class B, Type I, except within 0.5 miles of the coast the 10-gauge rail elements must comply with AASHTO M 180 for Class B, Type II.

Bolts, nuts, and other fittings for W-beam and thrie beam must comply with AASHTO M 180.

A W6 x 8.5 Steel post may be substituted for a W6 x 9 steel post.

Plastic blocks for midwest guardrail systems and thrie beam barrier must be on the Authorized Material List for highway safety features.

Grease used to coat the inside surfaces of foundation tubes to receive wood posts must not melt or run at a temperature of 149 degrees F.

83-2.01A(3) Construction

For midwest guardrail systems and thrie beam barrier, install posts, steel foundation tubes and soil plates in soil.

Cut off any excess bolt that extends more than 0.5 inch beyond the nut.

Metal beam railing must not be cut or modified in the field. Do not drill or punch new holes.

Steel or wood posts must not be cut in the field to reduce length.

Do not place posts in asphalt, concrete or structural section.

Do not install new wood posts or blocks with cracks wider than 1/4 inch with cracking evident through the wood to another side of the post or block.

Install posts no more than 1 inch per foot out of plumb unless otherwise described.

Place rub rail guardrail element when height of guardrail is more than 3 inches above standard placement height.

At locations exposed to traffic, schedule activities so that at the end of each day, no post holes are open and no posts are installed without the blocks and rail elements assembled and mounted. Anchor both leading and trailing ends of all guardrail or barriers to a permanent or temporary terminal system, end anchor assembly or anchor block. You may anchor to existing guardrail if connected using a standard bolted rail element splice.

SECTION 83

RAILINGS AND BARRIERS

Identify steel posts longer than 6 feet by painting the post length as a 2-inch-tall numeral in the web near the top of the post before installation. Before applying paint, ensure the post surface is free of all dirt, grease, oil, salt, or other contaminants by washing it with detergent or other suitable cleaner. Rinse thoroughly with fresh water and allow to fully dry. Use black metallic acrylic resin type paint.

83-2.01A(4) Payment

Not Used

83-2.01B Minor Concrete Vegetation Control

Reserved

83-2.02 MIDWEST GUARDRAIL SYSTEMS

83-2.02A General

83-2.02A(1) Summary

Section 83-2.02 includes specifications for constructing midwest guardrail systems.

83-2.02A(2) Definitions

Reserved

83-2.02A(3) Submittals

Submit 2 certified copies of mill test reports as an informational submittal for each heat of steel from which the rail elements and steel posts are formed or fabricated.

For end anchor assemblies and rail tensioning assemblies, submit:

1. 2 certified copies of the mill test reports for each manufactured length of cable used.
2. 1 sample of the cable for testing. The cable must be 39 inches in total length and must be properly fitted with a swaged fitting and right-hand thread stud at both ends as specified in section 83-2.02B(2), including a clevis if shown.

83-2.02A(4) Quality Assurance

Reserved

83-2.02B Materials

83-2.02B(1) General

83-2.02B(1)(a) General

Railing parts must be interchangeable with similar parts, regardless of the source.

The reinforcing steel in the concrete anchors for Type CA end anchor assemblies must comply with section 52.

83-2.02B(1)(b) Steel Components and Hardware

Workmanship for steel components and hardware must be equivalent to good commercial practice. Edges, bolt holes, and surfaces must be free of torn metal, burrs, sharp edges, and protrusions.

Fabricate the metal work in the shop. Do not punch, cut, or weld in the field.

Instead of the rolled steel section shown, you may substitute a welded section built up from structural steel plates if:

1. Depth, width, and average thicknesses of the welded section are at least equal to those of the rolled section
2. Steel plates of the welded section comply with ASTM A36/A36M
3. Flanges of the welded section are welded to the web with continuous fillet welds on each side of the web

The rail element metal must withstand a cold bend, without cracking, of 180 degrees around a mandrel of a diameter equal to 2.5 times the plate thickness.

If the radius of curvature of a rail element is 150 feet or less, shape the rail element in the shop. Stencil the radius of curvature on the back of each rail element in 2-1/2-inch-high numerals.

Fabricate steel posts from steel complying with ASTM A36/A36M.

Bolts must have shoulders of a shape that will prevent the bolts from turning. The holes in the rail elements must be of a shape similar to the bolt shoulder.

83-2.02B(1)(c) Wood Posts and Blocks

The grade and species of wood posts and blocks must be no. 1 timbers, also known as no. 1 structural, Douglas fir or no. 1 timbers Southern yellow pine. Wood posts and blocks must be graded under section 57-2.01B(2), except allowances for shrinkage after mill cutting must not exceed 5 percent of the American Softwood Lumber Standard, PS 20, minimum sizes when installed.

Wood posts and blocks must be rough or S4S. The size tolerance of rough sawn blocks in the direction of the bolt holes must not exceed $\pm 1/4$ inch.

After fabrication, the wood posts and blocks must be pressure treated under section 57-2.01 and AWP A U1, Use Category UC4A, Commodity Specification A.

83-2.02B(1)(d) Bolt Hole Grease

Grease used to fill bolt holes in wood posts and blocks must be recommended for corrosion protection by the manufacturer. The grease must not melt or run at a temperature of 149 degrees F.

83-2.02B(1)(e) Components for Connection to a Concrete Surface

Components for connecting midwest guardrail systems to vertical concrete surfaces, such as bridge railings, barriers, retaining walls, and abutments, must comply with the following requirements:

1. Metal box spacers and plate washers must be fabricated from steel complying with ASTM A36/A36M.
2. Metal box spacers must be fabricated from separate plates and welded or press-formed and welded.
3. HS bolts must comply with ASTM F3125, Grade A325/A325M, or ASTM A449, or be fabricated from steel rods complying with ASTM A449. The bolts or rods must comply with the mechanical requirements in ASTM F3125, Grade A325/A325M after galvanizing. The nuts and washers must comply with ASTM F3125, Grade A325/A325M.
4. For connecting guardrail to existing bridge railings or barriers, the epoxy adhesive used in the sand and the epoxy adhesive mixture for repairing spalled or damaged areas around the anchor bolt holes must be a 2-component, commercial-quality epoxy adhesive manufactured especially for making epoxy-sand mortar.
5. HSS sleeves must comply with ASTM A500/A500M, ASTM A501/A501M, or ASTM A1085/A1085M.

83-2.02B(2) End Anchor Assemblies and Rail Tensioning Assemblies

Section 83-2.02B(2) applies to end anchor assemblies and rail tensioning assemblies.

Concrete used to construct the anchors for end anchor assemblies must comply with the specifications for minor concrete.

Fabricate the metal components of anchor assemblies in compliance with good shop practice.

Fabricate the anchor plates, metal plates, foundation tubes, and soil plates from steel complying with ASTM A36/A36M.

Fabricate the anchor rods from steel complying with ASTM A36/A36M, ASTM A572, or ASTM A576, Grade 1018, 1019, 1021, or 1026. Hot forge the eyes or form the eyes with CJP welds. After fabricating and before galvanizing, thermally stress relieve anchor rods with eyes that were formed with any part of the eye below 1,600 degrees F during forming or with eyes that were closed by welding. The completed anchor rod after galvanizing must develop a strength of 50,000 lb.

Instead of using built-up fabrication, you may press-form the anchor plates from steel plate with or without welded seams.

Bolts and nuts must comply with ASTM A307.

SECTION 83

RAILINGS AND BARRIERS

Anchor cables must be 3/4-inch, preformed 6 x 19 wire strand core or independent wire rope core, galvanized under Federal Specification RR-W-410, right regular lay, manufactured from improved plow steel with a minimum breaking strength of 23 tons. The overall length of each cable anchor assembly must be at least 6.5 feet.

Use cable clips and a cable thimble to attach the cable to the anchor rod where shown. Thimbles must be commercial-quality, galvanized steel. Cable clips must be commercial-quality, drop-forged, galvanized steel.

Swaged fittings must be machined from hot-rolled steel bars complying with AISI C 1035 and annealed suitable for cold swaging. Galvanize the swaged fitting before swaging. To keep the stud in the proper position, drill a lock pin hole through the head of the swaged fitting and install a 1/4-inch plated steel spring pin. Stamp the manufacturer's identifying mark on the body of the swaged fitting.

Before galvanizing, mill a 3/8-inch slot in the stud end for the locking pin. Studs must comply with ASTM A449 after galvanizing.

The swaged fittings, stud, and nut assembly must develop the specified breaking strength of the cable.

Ship cable assemblies as a complete unit, including studs and nuts.

Clevises must be drop-forged galvanized steel and must develop the specified breaking strength of the cable.

For anchor rods to be buried in earth, coat the portions to be buried with a 20-mil minimum thickness of one of the following:

1. Coal tar enamel complying with AWWA C 203
2. Coal tar epoxy complying with either of the following:
 - 2.1. SSPC-Paint 16, Coal Tar Epoxy-Polyamide Black Paint
 - 2.2. U.S. Army Corps of Engineers Specifications, Formula C-200a, Coal Tar-Epoxy (Black) Paint

83-2.02B(3) Transition Railings

Reserved

83-2.02C Construction

83-2.02C(1) General

83-2.02C(1)(a) General

At locations where traffic is adjacent to midwest guardrail system work, all materials required to complete the guardrail work at a location must be available before you start work at the location.

Construct midwest guardrail systems using:

1. Steel or wood line posts.
2. Wood blocks for line posts. You may use plastic blocks for steel line posts where shown.
3. Only 1 type of post and block for any 1 continuous length of guardrail.

83-2.02C(1)(b) Posts

Drive wood posts with or without pilot holes, or place the posts in drilled holes. Backfill any space around the wood posts with selected earth that is free of rock. Place the earth in 4-inch-thick layers. Moisten and thoroughly compact each layer.

Drive steel posts with or without pilot holes. If pilot holes are used, backfill any space around the steel posts with dry sand or pea gravel after driving.

Drive steel foundation tubes with soil plates attached with or without pilot holes, or place them in drilled holes. Backfill any space around the foundation tubes with selected earth that is free of rock. Place the earth in 4-inch-thick layers. Moisten and thoroughly compact each layer. Coat the inside surfaces of the foundation tubes to receive wood terminal posts with grease. Insert the posts into the tubes by hand. Do not drive the posts. You may slightly round the post edges to facilitate insertion.

83-2.02C(1)(c) Bolt Holes in Wood Posts and Cuts in Blocks

If copper naphthenate, Alkaline Copper Quaternary ammonium compound, or copper azole is used to treat wood posts and blocks, before inserting the bolts, fill the bolt holes with grease.

You may field bore the 2-3/8-inch-diameter holes shown for wood guardrail terminal posts and wood rail tensioning assembly posts.

If you perform field cutting or boring after treatment, manually treat with preservative under section 57-2.01C(3)(b).

83-2.02C(1)(d) Rail Elements

The edges and center of the rail elements must contact each post block when bolted.

Lap the rail elements such that the exposed ends do not face approaching traffic.

The rail elements must have full bearing at joints.

Install end caps and return caps where shown. Install end caps flush with barrier face.

83-2.02C(1)(e) Connection to a Concrete Bridge Railing or Barrier

If connecting a midwest guardrail system to a new concrete bridge railing, AGT buttress, anchor block, or barrier, form holes using galvanized HSS sleeves.

If connecting a midwest guardrail system to an existing concrete bridge railing or barrier, drill anchor bolt holes in the concrete.

Repair any areas around the holes that were spalled or otherwise damaged during drilling using an epoxy adhesive and sand mixture in proportions of 1:4 to 1:6. The epoxy adhesive must comply with section 83-2.02B(1)(e). Mix the 2 components and the epoxy-sand mixture under the manufacturer's instructions.

83-2.02C(1)(f) Anchor Bolts Set With Epoxy

For anchor bolts set with epoxy, place the anchor bolts in holes filled with a 2-component epoxy mixture complying with the specifications for load bearing applications.

83-2.02C(2) End Anchor Assemblies

Place the concrete for end anchors for Type CA end anchor assemblies against the undisturbed material of the excavated holes. If ordered, form the top 12 inches of the holes.

Tighten the anchor cables for Type CA end anchor assemblies after the concrete anchor has cured for at least 5 days.

83-2.02C(3) Transition Railings

Construct AGT using wood blocks with steel posts.

83-2.02C(4) Buried Post End Anchors

Alignment and elevation of the buried post end anchor will be established by the Engineer.

Excavate into slope and extend rail elements until there is 1 foot minimum of cover over the anchor post. A partial element may be used if needed to achieve required cover.

Do not install blocks on posts where blocks will have contact with soil. Bolt the rail directly to the post.

Backfill buried post end anchors and grade as shown. Provide drainage and conform to adjacent grading and other features.

The guardrail element attached to the anchor post may be drilled in the field at the bolted connection.

For buried post end anchor Type B-S, install longer posts if needed to maintain 3-foot post embedment.

83-2.02D Payment

Except for midwest guardrail systems located within the pay limits of (1) a terminal system, (2) a transition railing, (3) an end anchor assembly, (4) a buried post end anchor, or (5) a railing tensioning assembly, the payment quantity for midwest guardrail system is the length measured along the face of the rail element

SECTION 83

RAILINGS AND BARRIERS

from end post to end post of the completed railing. The point of measurement at the end post is the center of the bolt attaching the rail element to the end post. If midwest guardrail system is connected to a structure, barrier, wall, or abutment, the point of measurement is the midpoint between the 2 bolts attaching the rail element to the structure, barrier, wall, or abutment.

Rub rail will be measured from the first post connected to the rub rail to the last post connected to the rub rail and will be paid as additional length of MGS.

The payment quantity for double midwest guardrail system is the length measured from end post to end post along the center line of the guardrail.

83-2.03 THRIE BEAM BARRIERS

83-2.03A General

Section 83-2.03 includes specifications for constructing thrie beam barrier.

Thrie beam barrier must comply with the specifications for midwest guardrail systems in section 83-2.02.

Thrie beam barrier work includes transition sections between W beam and thrie beam elements.

83-2.03B Materials

Use steel posts for thrie beam barrier Type M, except use wood posts for posts set in steel foundation tubes at trailing end anchors.

Use wood or plastic blocks with steel posts.

For thrie beam barrier on bridges:

1. Threaded rods must comply with ASTM A307
2. Anchor bolts must comply with ASTM F1554, Grade 55
3. Plates must comply with section 55

83-2.03C Construction

If median barrier delineation is shown, match the barrier marker spacing to the raised pavement marker spacing on the adjacent median edge line pavement delineation.

83-2.03D Payment

The payment quantity for single thrie beam barrier is the length measured from end post to end post along the face of the rail element of the installed barrier. The quantity does not include any portion of single thrie beam barrier within the pay limits of a transition railing.

The payment quantity for single thrie beam barrier constructed on each side of a bent underneath a structure or on each side of other obstructions is the length measured along each face of the installed barriers.

The payment quantity for double thrie beam barrier is the length measured from end post to end post along the center line of the installed barrier. The quantity does not include any portion of double thrie beam barrier within the pay limits of a transition railing.

The point of measurement at the end posts of single and double thrie beam barriers is the center of the bolt or rod attaching the rail element to the end post.

If a single thrie beam barrier is constructed on each side of a median obstruction and the single barriers merge into a double barrier, the post with 2 blocks attached is the end post for measuring the length of the single and double thrie beam barriers.

The division point for determining the payment quantities of double thrie beam barrier (bridge) and double thrie beam barrier is the face of the paving notch of the bridge.

83-2.04 TERMINAL SYSTEMS

83-2.04A General

83-2.04A(1) General

Section 83-2.04 includes general specifications for constructing terminal systems.

SECTION 83

RAILINGS AND BARRIERS

83-2.04A(2) Materials

Not Used

83-2.04A(3) Construction

Not Used

83-2.04A(4) Payment

Not Used

83-2.04B Alternative In-Line Terminal Systems

Reserved

83-2.04C Alternative Flared Terminal Systems

Reserved

83-2.04D–83-2.04H Reserved

83-2.05 CALIFORNIA BRIDGE RAILS

83-2.05A General

83-2.05A(1) Summary

Section 83-2.05 includes specifications for constructing California bridge rail.

California bridge rail consists of steel post and beam railing.

Concrete must comply with section 51.

Reinforcement must comply with section 52.

ST-75SW and ST-76SW California bridge rails include the handrailings.

Drill and bond the threaded rods using chemical adhesive systems under section 51-1.

83-2.05A(2) Definitions

Reserved

83-2.05A(3) Submittals

Submit shop drawings for the California bridge rail. The shop drawings must include:

1. Details for venting and pickup holes
2. Railing layout
3. Complete details for the construction of the work, including construction methods, sequence of shop and field assembly, and installation procedures

Submit 7 copies of the shop drawings. Allow 25 days for review. Upon authorization, the Engineer returns 2 copies to you for use during construction.

83-2.05A(4) Quality Assurance

Reserved

83-2.05B Materials

83-2.05B(1) General

Reserved

83-2.05B(2) Reinforced Concrete

In freeze-thaw areas:

1. Concrete must contain at least 675 pounds of cementitious material per cubic yard
2. Bar reinforcing steel must comply with section 52-2.02

83-2.05B(3) Metal Components

Structural shapes, structural tubing, plates, bars, bolts, nuts, and washers must comply with section 55-1.02. Other fittings must be commercial quality.

Formed steel sections must be uniform in appearance.

Stud bolts must comply with the specifications for studs in clause 9 of AWS D1.1.

Ferrous metal parts must be galvanized under section 75-1.02B.

Railings must conform to the curvature by means of a series of short chords, from center-to-center of rail posts, except (1) tubing for railings described as conforming to the curvature must be shop bent to fit the curvature and (2) tubing with a horizontal curve radius less than 900 feet must be shop bent or fabricated to fit the curvature. Joints must be matchmarked.

Anchor bolts and threaded rods must comply with ASTM F1554, Grade 105.

Cables must be galvanized and comply with ASTM A1023/A1023M.

Bridge rail post plates and base plates must comply with one of the following:

1. ASTM A709/A709M, Grade 36 or Grade 50
2. ASTM A572/A572M, Grade 42 or Grade 50
3. ASTM A36/A36M

Parapet shoe plates must comply with one of the following:

1. ASTM A709/A709M, Grade 50
2. ASTM A572/A572M, Grade 50

Structural steel tubing for bridge rail must comply with one of the following:

1. ASTM A500/A500M, Grade B or Grade C
2. ASTM A1085/A1085M

Thread-locking systems must comply with section 75-3.02B.

83-2.05B(4) Coatings

Organic zinc-rich primer used to paint the exposed bolt threads must be on the Authorized Material List for organic zinc-rich primers.

83-2.05C Construction

Railings must present a smooth, uniform appearance in their final position, conforming closely to the horizontal and vertical lines shown or ordered. Do not incorporate venting or pickup holes on the traffic side of railing.

Erect railings carefully and true to line and grade. Posts must be normal to the profile grade. Transverse to the profile grade, railings must be plumb within a tolerance not to exceed 0.02 foot in 10 feet. Adjacent rail elements must align with each other within 1/16 inch.

In freeze-thaw areas, cure concrete by the water method.

After installing the rail, paint the exposed bolt threads with 2 applications of organic zinc-rich primer.

83-2.05D Payment

The payment quantity for California bridge rail is the length measured from end to end along the face of the railing, including reinforced concrete end blocks and intermediate posts.

83-2.06 CHAIN LINK RAILINGS**83-2.06A General**

Section 83-2.06 includes specifications for constructing chain link railings.

83-2.06B Materials

Structural shapes, plates, bars, and bolts must comply with section 55-1.02.

Structural tubing steel must comply with ASTM A500/A500M or A501.

Frame members carrying electrical conductors must be rigid metal conduit manufactured of mild steel complying with UL 6, Electrical Rigid Metal Conduit - Steel. Hot dip galvanize the interior and exterior surfaces of the rigid metal conduit.

Truss rods, post tops, and other required fittings and hardware must be steel, malleable iron, or wrought iron. Post tops and other closures must be watertight. Fittings and hardware must fasten properly to the posts and other members.

Cable used in the frame must:

1. Be wire rope
2. Be 5/16 inch in diameter
3. Have a minimum breaking strength of 5,000 lb
4. Be galvanized under Federal Specification RR-W-410

Crimped sleeve clamps and stud socket assemblies must:

1. Be metal
2. Develop the strength of the cable
3. Be the same color as the cable

Tension wires must be at least 7-gauge coil spring steel.

Post clips must be at least 9-gauge steel.

Wire ties or hog rings must be 9-gauge, commercial-quality steel wire.

Galvanize the tension wires, post clips, wire ties, and hog rings under ASTM A116, Coating Type Z, Class 3.

You may substitute one of the following for the steel wire ties or hog rings:

1. 6-gauge (0.192-inch minimum diameter) aluminum wire ties complying with ASTM B211 or B211M, Alloy 1100-H18.
2. 6-gauge (0.192-inch minimum diameter) aluminum hog rings complying with ASTM B211 or B211M, Alloy 6061-T94 or Alloy 5052-H38.

Chain link fabric must be 11 gauge and must comply with one of the following:

1. AASHTO M 181, Type I, Class C
2. AASHTO M 181, Type IV, Class A
3. ASTM F1345, Class 2

Chain link fabric must be woven into approximately 1-inch mesh.

All of the railings for a single structure must be the same color.

83-2.06C Construction

Give wire ties at least 1 complete turn. Bend the wire tie ends away from pedestrian traffic.

Tighten truss rods and cables with turnbuckles or other fittings.

Install a thimble at each cable loop.

Stretch and fasten the chain link fabric securely to the posts, other members, and tension wires. Stretch the tension wires tightly.

Wherever necessary to conform to horizontal or vertical curvature, rework and fit the fabric to present a smooth, neat, and workmanlike appearance.

Provide openings in the fabric as required by other facilities. Reinforce the openings with at least 1 turn of 6-gauge wire.

SECTION 83

RAILINGS AND BARRIERS

Attach pipe handrailing to chain link railing where shown. Pipe handrailing must comply with section 83-2.09.

83-2.06D Payment

Not Used

83-2.07 CABLE RAILINGS

83-2.07A General

Section 83-2.07 includes specifications for constructing cable railings.

83-2.07B Materials

Concrete for the post footings must comply with the specifications for minor concrete.

Pipe for posts and braces must be standard steel pipe or pipe complying with section 80-3.02B.

Truss rods, post tops, cable clamps, eye bolts, thimbles, and other required fittings must be commercial-quality steel, malleable iron, or wrought iron. Post tops must be watertight. The eye of the eye bolts must be either drop forged or formed with a complete penetration weld. The eye must develop 100 percent of the bolt strength.

Turnbuckles must:

1. Be commercial quality
2. Have jaw or eye ends
3. Have a minimum breaking strength of 2,700 lb
4. Be steel pipe type or drop-forged steel

Crimped sleeve clamps and stop sleeve clamps must:

1. Be nonferrous metal
2. Develop the strength of the cable
3. Be the same color as the cable

Cables must be galvanized and comply with ASTM A1023/A1023M.

83-2.07C Construction

Tension the cables to provide taut railings between posts.

Install a thimble at each cable loop.

83-2.07D Payment

Not Used

83-2.08 TUBULAR RAILINGS

83-2.08A General

83-2.08A(1) Summary

Section 83-2.08 includes specifications for constructing tubular railings.

Tubular railing includes rail tubes, post tubes, plates, rail splice sleeves, and fasteners. For Type 85 concrete barrier, tubular bicycle railing includes the upper and lower tubular bicycle railing.

83-2.08A(2) Definitions

Reserved

83-2.08A(3) Submittals

Submit a certificate of compliance verifying that all components of the tubular railing comply with section 83-2.08B.

Submit shop drawings for tubular railing. Shop drawings must include:

1. Details for venting holes in rails, posts, and sleeves

SECTION 83**RAILINGS AND BARRIERS**

2. Railing layout
3. Complete details for the construction of the work including methods of construction, sequence of shop and field assembly, galvanization, and installation procedures

Submit 7 copies of the shop drawings. Allow 25 days for review. Upon authorization, the Engineer returns 2 copies to you for use during construction.

83-2.08A(4) Quality Assurance

Reserved

83-2.08B Materials

The materials for tubular railing components must comply with the specifications shown in the following table:

Material	Specification
Rail and post tubes	ASTM A500/A500M, Grade B
Rolled bars and plates	ASTM A36/A36M
Rail splice sleeves	ASTM A36/A36M
Bolts	ASTM F3125, Grade A325/A325M, Type 1
Threaded rods	ASTM A449, Type 1 or ASTM F1554, Grade 55, Class 2A
Nuts for bolts and threaded rods	ASTM A563/A563M
Washers for bolts and threaded rods	ASTM F436/F436M, Type 1, including S1 supplementary

Rail tubes must be shop bent or fabricated to fit the horizontal curve if the radius is less than 900 feet.

If the vertical radius of the tubular railing is 30 feet or less, that portion of the railing must be either shop bent or built up from 1/4-inch-thick structural steel plates. The built-up tubular rail elements must match the seamless tubing in appearance.

The difference between out-to-out rail splice sleeve dimensions and the clear inside dimensions of the tubular steel rail elements must not exceed 3/16 inch after galvanizing.

Carefully handle the materials such that no parts are bent, broken, abraded, or otherwise damaged. Do not use manufacturing, handling, or installation methods that damage or distort the members or damage the galvanizing.

83-2.08C Construction**83-2.08C(1) General**

Before the tubular railing parts are assembled, clean the bearing surfaces and surfaces to be in permanent contact. If the railing is mounted on a concrete surface, the post bases must be true and flat to provide uniform bearing.

Tubular railings must present a smooth, uniform appearance in their final position and conform closely to the horizontal and vertical lines as shown.

83-2.08C(2) Tubular Handrailing

Adjust the vertical position of the tubular handrailing to compensate for the camber and dead load deflection of the superstructure. The Engineer determines the adjustment amount before the railing is installed.

The metal railing posts to which the chain link railing attaches must fit the mounting brackets, pipe sleeves, and other connection fittings.

Where necessary, install shims at posts and rail elements to provide uniform bearing and conformance with the horizontal lines and vertical grade lines. Shims at steel posts must be commercial-quality, galvanized sheet steel.

83-2.08C(3) Tubular Bicycle Railing

If authorized as alternative to cast-in threaded rods, you may cast sleeves for the threaded rods, or drill and bond the threaded rods using chemical adhesive systems under section 51-1.

SECTION 83

RAILINGS AND BARRIERS

Erect railing true to line and grade. Posts must be normal to the profile grade. Transverse to the profile grade, railings must be plumb within a tolerance not to exceed 0.02 foot in 10 feet. Adjacent rail elements must align with each other within 1/16 inch.

83-2.08D Payment

Not Used

83-2.09 PIPE HANDRAILINGS

83-2.09A General

Section 83-2.09 includes specifications for constructing pipe handrailings.

83-2.09B Materials

Rail elements must be commercial-quality standard steel pipe.

Brackets, bolts, nuts, and other fittings must be commercial-quality structural steel, except standard steel pipe fittings may be used where shown.

83-2.09C Construction

Erect pipe handrailings carefully and true to line and grade.

83-2.09D Payment

Not Used

83-2.10–83-2.14 RESERVED

83-3 CONCRETE BARRIERS

83-3.01 GENERAL

83-3.01A Summary

Section 83-3 includes specifications for constructing concrete barriers and wildlife passage ways in concrete barriers.

Concrete must comply with section 51.

Reinforcement must comply with section 52.

Drill and bond dowels under section 51.

Concrete barrier work includes:

1. Bar reinforcing steel, including the length that extends from the barrier into decks, walls, and footings
2. Constructing Type L wildlife passage ways
3. Constructing steel plate barriers at overhead sign foundations, electroliers, drainage structures, and other locations shown

Thrie beam barrier elements, end caps, and hardware required to construct Type M wildlife passage ways must comply with section 83-2.03.

83-3.01B Definitions

Reserved

83-3.01C Submittals

If the extrusion or slip form method is to be used and the reinforcement is not fixed in place before placing the concrete, submit a QC plan for the extrusion or slip form construction method. The QC plan must include:

1. Contingency plan for correcting problems in production, transportation, or placement
2. Procedure for splicing concrete barrier reinforcement
3. Procedure for positioning reinforcement during extrusion or slip form operations
4. Test procedure for verifying the final positions of the longitudinal reinforcement

5. Test report form to be used that shows the station of the test, the position of the reinforcement relative to the top of the barrier, and the clearance cover from the faces of the barrier to the reinforcement

Submit the test report forms within 48 hours after constructing the concrete barrier.

Submit a certificate of compliance for a new or used Type 60K portable concrete barrier that is not cast on the job site.

If tubular railing is shown on concrete barrier, submit 2 copies of the threaded rod layouts before placing the barrier reinforcement.

83-3.01D Quality Assurance**83-3.01D(1) General**

Reserved

83-3.01D(2) Quality Control**83-3.01D(2)(a) General**

Reserved

83-3.01D(2)(b) Barrier Smoothness

Test the smoothness of the top and exposed faces of barriers using a 10-foot straightedge laid on the surfaces.

83-3.01D(2)(c) Barrier Reinforcement Positions

For the extrusion or slip form construction method, if the reinforcement is not fixed in place before placing the concrete, verify the final positions of the horizontal reinforcement at 100-foot intervals, evaluated a minimum of 20 feet behind the trailing extrusion or slip form edge, by testing the position of the reinforcement relative to the top of the barrier and the clearance cover from the faces of the barrier to the reinforcement.

83-3.01D(3) Department Acceptance

The Department rejects concrete barriers with any reinforcement that does not comply with section 83-3.03A(6)(c)(iii).

83-3.02 MATERIALS**83-3.02A General**

Reserved

83-3.02B Concrete**83-3.02B(1) General**

Concrete for Type 60M series concrete barriers must comply with the specifications for minor concrete, except the concrete must contain at least 550 pounds of cementitious material per cubic yard.

In non-freeze-thaw areas, concrete for concrete barriers other than Type 60M series must contain at least 590 pounds of cementitious material per cubic yard.

In freeze-thaw areas, concrete for concrete barriers must contain at least 675 pounds of cementitious material per cubic yard.

For Type 60MF, 60MGF, and 60MSF concrete barriers, the concrete paving between the tops of the 2 walls of the barrier and the optional concrete slab at the base between the 2 walls of the barrier must comply with the specifications for minor concrete.

83-3.02B(2) Concrete for Extrusion or Slip form Methods

Minor concrete for extruded or slip formed concrete barriers must comply with the following:

1. Maximum aggregate size must be no larger than 1-1/2 inches and no smaller than 3/8 inch.
2. If the 3/8-inch maximum size aggregate is used, the concrete must contain at least 675 pounds of cementitious material per cubic yard.

3. Combined aggregate gradation must produce concrete of the shape and surface texture specified.
4. Consistency must be such that after extrusion or slip forming, the concrete maintains the shape of the barrier without support.

You may make the concrete by continuously batching the materials by volume and mixing in a continuous mixer under the batching and mixing requirements in ASTM C685/C685M.

83-3.02C Bar Reinforcing Steel

In freeze-thaw areas, bar reinforcing steel for concrete barriers must be epoxy coated under section 52-2.02.

83-3.02D Steel Plates and Hardware

Structural steel plates must comply with section 55-1.02D.

Hardware, including concrete anchorage devices, must comply with section 75-3.

Galvanized structural steel plates and hardware must comply with section 75-1.02B.

83-3.02E Granular Backfill

For Type 60MF, 60MGF, and 60MSF concrete barriers, the granular material for backfill between the 2 walls of concrete barrier must:

1. Be earthy material suitable for the purpose intended
2. Have no rocks, lumps, or clods exceeding 1-1/2 inches in greatest dimension

83-3.02F Reserved**83-3.02G Connection of a Concrete Barrier to a Structure**

Sheet metal, neoprene strip, and grease at the connection of a concrete barrier to a structure must comply with the following:

1. Sheet metal must be commercial-quality galvanized sheet steel that is smooth and free of kinks, bends, or burrs. Joints in the sheet metal must be butt joints sealed with plastic duct-sealing tape.
2. Neoprene strip must comply with the specifications for neoprene in section 51-2.04.
3. Grease must comply with SAE AS8660.

Expanded polystyrene at the connection of a concrete barrier to a structure and at a concrete barrier transition at a bridge column must comply with section 51-2.01B(1).

83-3.02H Type 60K Portable Concrete Barriers

Type 60K portable concrete barrier must consist of interconnected new or undamaged used PC portable concrete barrier units.

For Type 60K portable concrete barrier:

1. Concrete must comply with the specifications for minor concrete, except weighmaster certificates and certificates of compliance are not required
2. Steel plates must comply with ASTM A36/A36M. After fabrication, galvanize the steel plates under section 75-1.02B
3. Connection pins must be round bars complying with ASTM A36/A36M

83-3.03 CONSTRUCTION**83-3.03A General****83-3.03A(1) General**

Reserved

83-3.03A(2) Closing Gaps in Concrete Barriers

During construction on highways open to traffic, if a gap is left in the concrete barrier, such as for equipment or special drainage features, close the gap by temporary or permanent means when work is not actively in progress at the location of the gap.

83-3.03A(3) Adjusting Barrier Height

If the concrete barrier height is adjusted, the Engineer determines the adjustment amount before the concrete is placed.

For a concrete barrier constructed on a recently completed bridge, adjust the barrier height to compensate for the camber and dead load deflection of the superstructure. Construct the barrier after the falsework has been released and as long after the superstructure construction as the progress of the work will allow.

For a concrete barrier constructed on existing or new pavement or on an existing or new structure, adjust the barrier height to compensate for irregularities in the existing grade.

83-3.03A(4) Locating Expansion Joints

Locate concrete barrier expansion joints at deck, pavement, and principal wall joints. The expansion joint filler material must be the same size as the joint or a minimum of 1/2 inch.

83-3.03A(5) Placing Barriers

The concrete barrier must present a smooth, uniform appearance in its final position, conforming closely to the horizontal and vertical lines shown or ordered. The barrier must be free of lumps, sags, or other irregularities.

You may place the portion of the barrier that is below finished grade to the neat lines of the excavation.

Construct concrete barrier footings on a minimum of 90 percent compacted material.

Construct concrete barrier on a minimum of 4 inches of AC or concrete.

83-3.03A(6) Barrier Construction Methods**83-3.03A(6)(a) General**

Construct Type 60 series concrete barriers by one of the following methods:

1. Cast-in-place-with-fixed-forms method
2. Extrusion or slip form method
3. Combination of both methods

Construct concrete barriers other than Type 60 series by the cast-in-place-with-fixed-forms method.

83-3.03A(6)(b) Cast-In-Place-with-Fixed-Forms Method

Concrete barriers constructed by the cast-in-place-with-fixed-forms method must comply with section 51.

Do not use PC mortar blocks to support the reinforcing steel on the traffic side of barriers.

83-3.03A(6)(c) Extrusion or Slip form Method**83-3.03A(6)(c)(i) General**

Reserved

83-3.03A(6)(c)(ii) Placing Concrete

For concrete barriers constructed using an extrusion or slip form machine or other similar type of equipment, the concrete must be well compacted and dense and the exposed surfaces must comply with section 51. You may be required to submit evidence of successful operation of the extrusion or slip form machine or other equipment.

Feed the concrete to the extrusion or slip form machine at a uniform rate. Operate the machine under enough uniform restraint to the forward motion to produce a well-compacted concrete mass free from surface pits larger than 1 inch in diameter and requiring no further finishing other than that specified in section 83-3.03A(7).

83-3.03A(6)(c)(iii) Placing Reinforcing Bars

For concrete barriers constructed using extrusion or slip form methods, place the horizontal reinforcing bars continuously.

If the reinforcement is not fixed in place before placing the concrete, the reinforcement must not deviate more than 1 inch from the positions shown when tested under section 83-3.01D(2)(c).

83-3.03A(6)(c)(iv) Maintaining Barrier Grades

The grade for the top of concrete barriers constructed using extrusion or slip form methods must be indicated by an offset guide line set from survey marks established by the Engineer. The forming portion of the extrusion or slip form machine must be readily adjustable vertically during the forward motion of the machine to conform to the predetermined grade line. A grade line gauge or pointer must be attached to the machine such that a continual comparison can be made between the barrier being placed and the established grade line as indicated by the offset guide line.

Instead of the above method for maintaining the barrier grade, the extrusion or slip form machine may be operated on rails or forms set at a uniform depth below the predetermined finished top of the barrier grade or on existing pavement or bridge decks.

83-3.03A(6)(c)(v) Constructing Expansion Joints

For concrete barriers constructed using extrusion or slip forming methods, construct expansion joints using one of the following methods:

1. Comply with section 51.
2. Saw through the barrier section to its full depth. On each end of a saw-cut joint for a Type 60M series concrete barrier that is slip-formed, the barrier must have a 10" deep by 10'-0" long foundation/footing on either side of the joint that also includes the additional reinforcing.

If the Type 60M series concrete barrier was poured without the 10" deep by 10'-0" long foundation/footing with the additional reinforcing as shown, do not saw-cut a joint at that location. Remove a sufficient section of the Type 60M series concrete barrier and re-do it with the 10" deep by 10'-0" long foundation/footing with the additional reinforcing and cast it with forms. If the joints are sawed or formed before the concrete has hardened, firmly support the adjacent portions of the barrier with close fitting shields.

If the joints are sawed or formed after applying curing compound, treat the exposed barrier faces in the vicinity of the joint with curing compound after sawing or forming the joints.

83-3.03A(7) Finishing

Before applying the curing compound, the surface finish of Type 60 series concrete barriers must be free from surface pits larger than 1 inch in diameter, and you must give the surface a soft brush finish with strokes parallel to the line of the barriers. Do not finish the surface with a brush application of grout.

To facilitate finishing, remove fixed forms for CIP Type 60 series concrete barriers as soon as possible after the concrete has set enough to maintain the barrier shape without support.

The surface finish of Type 60 series concrete barriers must be Class 1 surface finish if cured by the forms-in-place method.

At least 7 days after placing Type 60 series concrete barriers, give the exposed surfaces a final light abrasive blast finish to achieve a uniform appearance.

The final surface finish of concrete barriers other than Type 60 series must be a Class 1 surface finish. Any alternative method of final surface finishing must be authorized.

Class 1 surface finish must comply with section 51-1.03F(3).

83-3.03A(8) Curing

Cure the exposed surfaces of concrete barriers by the curing compound method using curing compound no. 6.

For concrete barriers on bridges and walls that do not support soundwalls, you may cure the formed surfaces of the barriers by keeping the forms in place for at least 12 hours after placing the concrete. No further curing is required after the forms are removed.

For Type 60 series concrete barriers not using the forms-in-place curing method, apply the curing compound using a mechanical sprayer capable of applying the curing compound to at least one entire side and the top of the concrete barrier in one application at a uniform rate of coverage. Protect the spray against wind.

In freeze-thaw areas, cure concrete barriers on bridges and walls by the water method.

For Type 85 and Type 86 series concrete barriers, cure the formed surfaces of the barriers by keeping the forms in place for at least 36 hours after placing the concrete. No further curing is required after the forms are removed.

83-3.03A(9) Smoothness

The top and exposed faces of barriers must comply with the following smoothness requirements when tested under section 83-3.01D(2)(b):

1. For Type 60 series concrete barriers, the top must not vary more than 0.02 foot from the edge of the straightedge and the faces must not vary more than 0.04 foot from the edge of the straightedge.
2. For concrete barriers other than Type 60 series, both the top and faces must not vary more than 0.02 foot from the edge of the straightedge.

83-3.03A(10) Installing Tubular Handrailings

For a tubular handrailing mounted on a Type 80SW concrete barrier, drill and bond the threaded rods under the specifications for drilling and bonding dowels in section 51-1.

83-3.03A(11) Installing Barrier Markers

Cement the markers to the barrier under the manufacturer's instructions. Match the barrier marker spacing to the raised pavement marker spacing on the adjacent median edge line pavement delineation.

83-3.03A(12) Reserved

83-3.03A(13) Placing Granular Backfill

For Type 60MF, 60MGF, and 60MSF concrete barriers, place the granular material for backfill between the 2 walls of the concrete barrier must be placed without compaction.

83-3.03B Concrete Barriers at Existing Structures

For a concrete barrier constructed on an existing structure, bond the dowels in drilled holes in the existing concrete.

For a concrete barrier constructed to the face of an existing concrete structure, match the existing weep holes.

83-3.03C Connection of a Concrete Barrier to a Structure

At the connection of a concrete barrier to a structure, apply a uniform film of grease to the upper surface of the neoprene strip before placing the sheet metal.

83-3.03D Concrete Barrier Transitions

For a concrete barrier transition:

1. Remove portions of the existing concrete barrier where shown
2. Roughen the contact surfaces of the existing concrete barrier
3. Drill and bond dowels into the existing concrete barrier

83-3.03E Type 60K Portable Concrete Barriers

Set Type 60K portable concrete barriers on a firm, stable foundation. Grade the foundation to provide uniform bearing throughout the entire barrier length.

Place and maintain the abutting ends of the PC concrete units in alignment without substantial offset to each other. Position the PC concrete units straight on tangent alignments and on a true arc on curved alignments. The minimum curve radius for horizontal alignments is 164 feet.

The final surface finish of Type 60K portable concrete barriers must comply with section 51-1.03F(2).

SECTION 83

RAILINGS AND BARRIERS

Place the fabrication date and your name or logo on each panel. The fabrication date and name or logo must be 4 inches or less in height and must be located 12 inches or less above the bottom of the rail panel.

Cure the exposed surfaces of concrete elements by the water method, the forms-in-place method, or the curing compound method. Curing compound must be curing compound no. 1.

83-3.03F Wildlife Passage Ways

Construct wildlife passage ways in concrete barriers where shown.

Construct the passage way opening by forming the opening in the concrete barrier or, after the concrete barrier is constructed, by saw cutting the outline of the opening and removing the concrete and bar reinforcing steel within the limits of the opening.

The completed opening for the wildlife passage way must be clear and unobstructed for the dimensions shown.

For a Type M wildlife passage way, you may be required to remove concrete barrier. Before removing the concrete barrier, make a saw cut of approximately 1 inch in depth on the face of the barrier along the removal limits.

83-3.04 PAYMENT

The payment quantity for concrete barriers other than Types 60MF, 60MGF, and 60MSF is the length measured along the top of the barrier.

The payment quantity for Type 60MF, 60MGF, and 60MSF concrete barriers is the length measured once along the centerline between the 2 walls of the barrier.

The payment quantity for concrete barriers includes the length of gaps in the concrete barrier where steel plate barrier is attached to the concrete barrier.

The payment quantity for concrete barriers includes barrier markers.

83-4 CRASH CUSHIONS

83-4.01 GENERAL

83-4.01A General

Section 83-4 includes specifications for constructing crash cushions.

83-4.01B Materials

Not Used

83-4.01C Construction

Not Used

83-4.01D Payment

Not Used

83-4.02–83-4.10 RESERVED

83-5–83-10 RESERVED

83-11 EXISTING RAILINGS AND BARRIERS

83-11.01 GENERAL

83-11.01A General

Section 83-11.01 includes general specifications for performing work on existing railings, barriers, terminal systems, and crash cushions.

83-11.01B Materials

Concrete must comply with the specifications for minor concrete.

Reinforcement must comply with section 52.

SECTION 83**RAILINGS AND BARRIERS****83-11.01C Construction**

If a portion of a guardrail or thrie beam barrier is to remain in place, removing, salvaging, reconstructing, relocating, or resetting work includes:

1. Resetting end caps, return caps, and buried post anchors
2. Providing connections to existing and new facilities, including connections to concrete

83-11.01D Payment

The payment quantities for removing, salvaging, reconstructing, relocating, and resetting existing railings and barriers are measured as specified for measuring new railings and barriers.

83-11.02 EXISTING GUARDRAILS**83-11.02A General****83-11.02A(1) General**

Section 83-11.02 includes specifications for performing work on existing guardrail.

83-11.02A(2) Materials

Not Used

83-11.02A(3) Construction

Not Used

83-11.02A(4) Payment

Not Used

83-11.02B Remove Guardrails**83-11.02B(1) General**

Section 83-11.02B includes specifications for removing guardrail which includes specifications for removing terminal systems, end anchors, and transitions.

83-11.02B(2) Materials

Not Used

83-11.02B(3) Construction

Where removing guardrail, remove any concrete anchors and steel foundation tubes.

83-11.02B(4) Payment

The payment quantity for removing W-beam, thrie beam, a terminal system, end anchor, or transition is the length measured along the face of the rail elements.

83-11.02C Salvage Guardrails**83-11.02C(1) General**

Section 83-11.02C includes specifications for salvaging guardrail.

83-11.02C(2) Materials

Not Used

83-11.02C(3) Construction

Remove, disassemble, clean, prepare, mark, bundle, package, tag, haul, and stockpile the guardrail to be salvaged.

Comply with the requirements for number per bundle for the guardrail components shown in the following table:

Component	Number per bundle
Rail	25
Steel posts	10
Plastic blocks	50

SECTION 83

RAILINGS AND BARRIERS

Tag incomplete bundles and show the quantity contained.

83-11.02C(4) Payment

Not Used

83-11.02D Reconstruct Guardrails

Reserved

83-11.02E Adjust Guardrails

Reserved

83-11.02F–83-11.02J Reserved

83-11.03 EXISTING METAL BRIDGE RAILINGS

83-11.03A General

83-11.03A(1) General

Section 83-11.03 includes specifications for performing work on existing metal bridge railings.

83-11.03A(2) Materials

Not Used

83-11.03A(3) Construction

Not Used

83-11.03A(4) Payment

Not Used

83-11.03B Reconstruct Metal Bridge Railings

83-11.03B(1) General

83-11.03B(1)(a) Summary

Section 83-11.03B includes specifications for reconstructing metal bridge railings.

83-11.03B(1)(b) Definitions

Reserved

83-11.03B(1)(c) Submittals

Submit 2 copies of shop drawings showing the details of the refabrication of the removed materials and the fabrication of the new materials. Include a list of the new materials, the type of metal, and the metal specifications.

83-11.03B(1)(d) Quality Assurance

Reserved

83-11.03B(2) Materials

Not Used

83-11.03B(3) Construction

Remove, refabricate, and install the metal bridge railing of the type shown.

Refabrication of removed material, fabrication of new material, and installation of the railing must comply with the specifications for a new metal bridge railing of the type being reconstructed.

Perform aluminum welding by the inert-gas-shielded arc welding process. Finish exposed aluminum welds to a neat surface.

Repair abraded and damaged galvanized surfaces on the removed material under section 75-1.02B.

83-11.03B(4) Payment

The payment quantity for reconstruct metal railing (bridge) is the length measured along the face of the reconstructed railing and includes the length of gaps in the railing for lighting and sign supports.

SECTION 83

RAILINGS AND BARRIERS

83-11.03C–83-11.03G Reserved

83-11.04–83-11.08 RESERVED