

BRIDGE RAIL

Guide

2005



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Bridge Rail Guide 2005

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Bridge Rail Guide 2003

TEST LEVEL INDEX

Test Level	Impact Speed	Vehicle Type
TL-1	50 kph/30 mph	820kg Car; 2000kg Pickup
TL-2	70 kph/45 mph	820kg Car; 2000kg Pickup
TL-3	100 kph/62 mph	820kg Car; 2000kg Pickup
TL-4	100 kph/62 mph 80 kph/50 mph	820kg Car; 2000kg Pickup 8,000kg Single Unit Truck
TL-5	100 kph/62 mph 80 kph/50 mph	820kg Car; 2000kg Pickup 36,000kg Tractor Trailer
TL-6	100 kph/62 mph 80 kph/50 mph	820kg Car; 2000kg Pickup 36,000kg Tanker Truck

Comments or changes may be forwarded to Martha.Nevai@fhwa.dot.gov.

This project was funded by: FHWA California Division; FHWA HQ Structures; FHWA Federal Lands Division; Caltrans.

Information contained within this guide should be verified with the contact agency for accuracy prior to use.

Updated bridge rail guide can be found at: <http://www.fhwa.dot.gov/bridge/bridgerail/>

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TR1 Modified Bridge Rail

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Parapet Sidewalk Mount

Type T501SW

Type C411

Type T203

Texas Type T411 Aesthetic Rail

Texas TT Rail

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Vertical Concrete Parapet with Aluminum Tube Bridge Rail

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Steel Thrie-Beam Rail, side mount

Steel Thrie-Beam Rail with Upper Channel, TCB8000 design

W-Beam Breakaway Steel Post Railing

Section 1

W-BEAM BRIDGE RAIL



Section 1

W-BEAM BRIDGE RAIL

Name	Location	Test Level
Texas T101	Federal Lands	TL-2
Side Mount W Beam	Michigan	TL-3
Box Beam Rail	Ohio	TL-2
Type T6 - Tubular W-Beam	Texas	TL-2
W-Beam Retrofit	West Virginia	TL-2

Texas T101 Transition Rail

Height:
32"

Cost per linear foot:
\$90

Test level:
TL-2

Utilized in:
Federal Lands

Contact:
Mark Clabaugh, P.E.
Federal Lands Bridge Office
21400 Ridgetop Circle
Sterling, VA 20166
(703) 404-6235



Texas T101

Plans Not Yet Available.

Side Mount W Beam

Height:
28"

Cost per linear foot:
\$65

Test level:
TL-3

Utilized in:
Michigan

Contact:
Steve Beck
Michigan Dept
of Transportation
State Transportation Building
425 W. Ottawa Street
P.O. Box 30050
Lansing, MI 48909
(517) 373-0097



Side Mount W Beam

Plans Not Yet Available.

Box Beam Rail (W-Beam Backed with Steel Beam)

Height:
27"

Cost per linear foot:
\$41

Test level:
TL-2

Utilized in:
Ohio

Contact:
Matt Shamis
Federal Highway
Administration- Ohio Division
200 North High Street
Room 328
Columbus, OH 43215
(614) 280-6847



Type T6 - Tubular W-Beam

Height:
27"

Cost per linear foot:
\$38

Test level:
TL-2

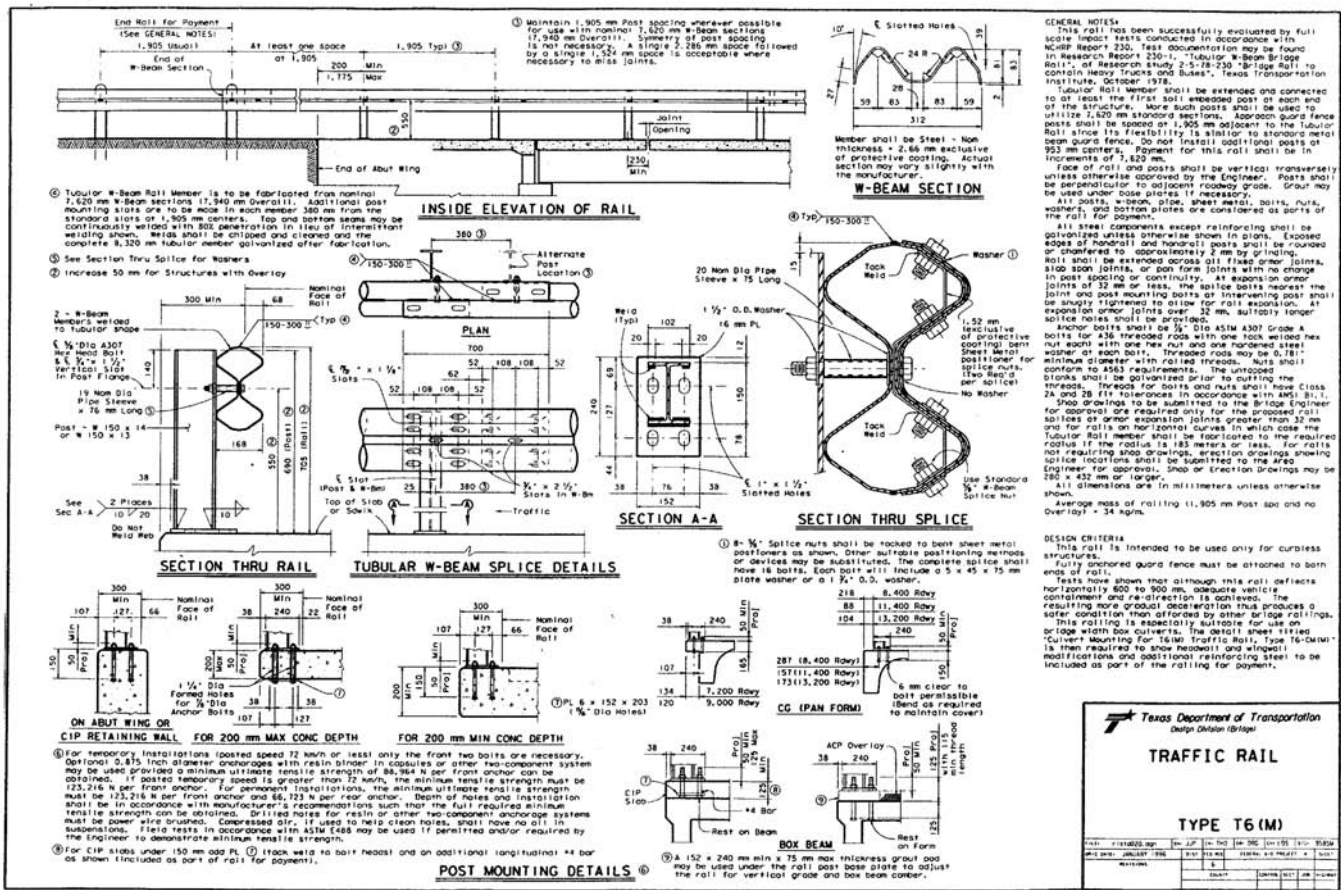
Utilized in:
Texas

Contact:
Mark Bloschock
Texas DOT Bridge Division
RA118
125 E. 11th Street
Austin, TX 78701-2483
(512) 416-2178



W-Beam Bridge Rail

Type T6 - Tubular W-Beam



W-Beam Retrofit

Height:
28.5"

Cost per linear foot:
\$__

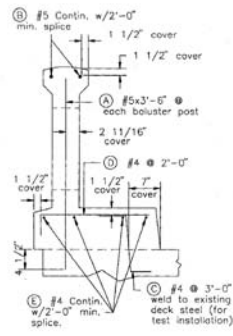
Test level:
TL-2

Utilized in:
West Virginia

Contact:
Jim Shook
West Virginia Dept
of Transportation
Building 5
1900 Kanawha Blvd E
Charleston, WV 25305
(304) 558-9747

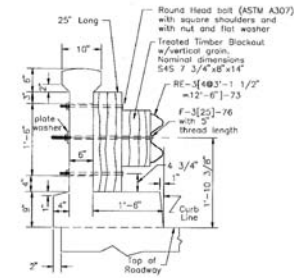


W-Beam Retrofit



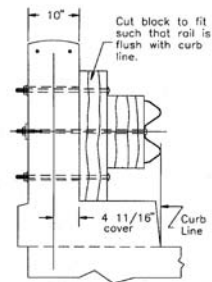
TYPICAL CONCRETE RAIL SECTION REINFORCING

Figure 1. Drawings for concrete baluster bridge railing.



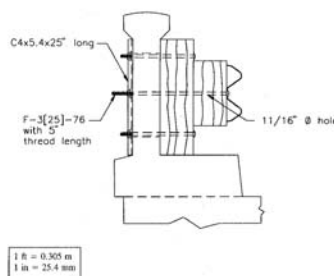
TYPICAL CONCRETE RAIL SECTION WITH W-BEAM RETROFIT WHEN ϕ 5/8" BOLT CAN NOT GO THROUGH CONCRETE RAILING VOID

Figure 2. Drawings for W-beam retrofit for concrete baluster bridge railing.



SECTION AT END OF RAILING

Figure 2. Drawings for W-beam retrofit for concrete baluster bridge railing (continued).



TYPICAL CONCRETE RAIL SECTION WITH W-BEAM RETROFIT WHEN ϕ 5/8" BOLT CAN GO THROUGH CONCRETE RAILING VOID

Figure 2. Drawings for W-beam retrofit for concrete baluster bridge railing (continued).

Section **2**

THRIE-BEAM BRIDGE RAIL



Section 2

THRIE-BEAM BRIDGE RAIL

Name	Location	Test Level
Delaware Thrie-Beam Retrofit Railing	Delaware	TL-4
Michigan Bridge Railing, Thrie-Beam Retrofit (R4 Type)	Michigan	TL-4
Missouri Thrie-Beam Rail and Channel, Top-Mounted	Missouri	TL-3
Nebraska Tubular Thrie-Beam Bridge Rail	Nebraska	TL-3
Oregon Thrie-Beam Side Mount	Oregon	TL-2
Washington State 10 Gauge Thrie-Beam Retrofit	Washington	TL-2

Delaware Thrie-Beam Retrofit Railing

Height:
32"

Cost per linear foot:
\$__

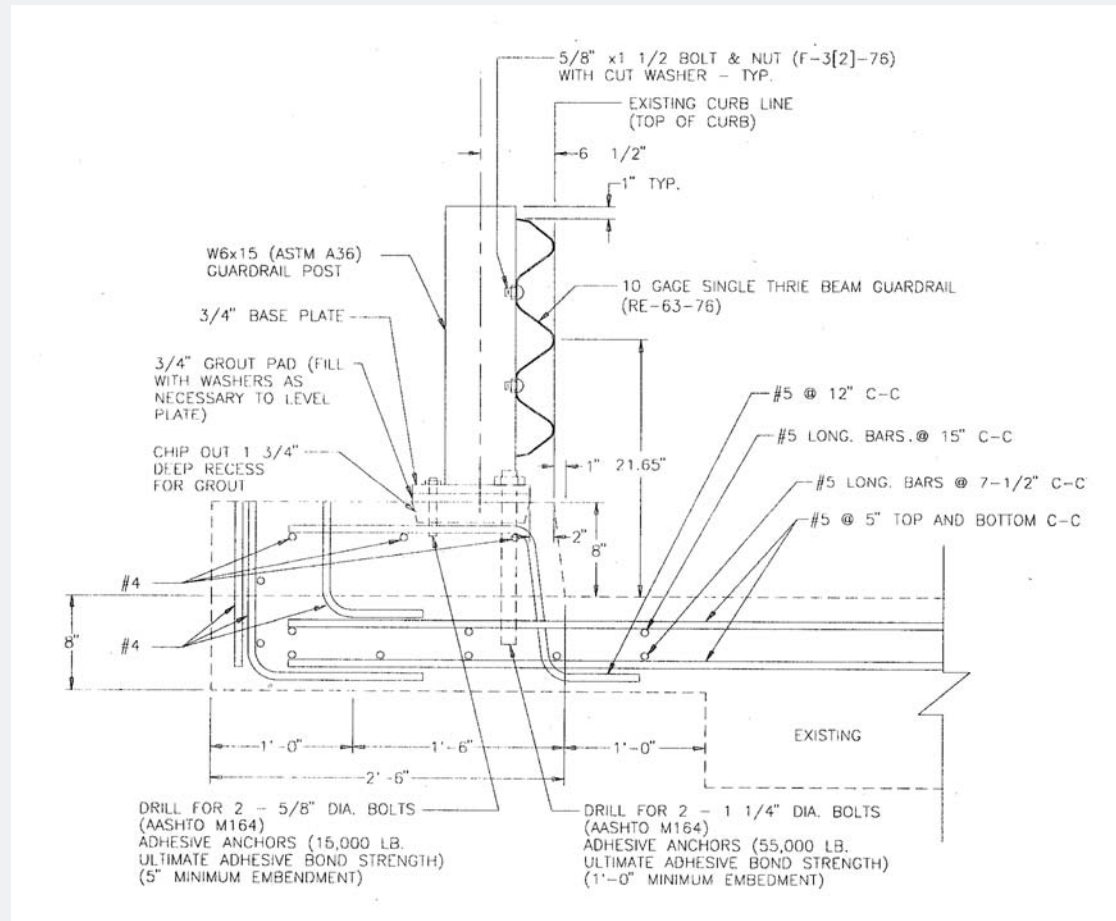
Test level:
TL-4

Utilized in:
Delaware

Contact:
Jiten Soneji
Delaware Departmentt
of Transportation
800 Bay Road
P.O. Box 778
Dover, DE 19903
(302) 760-2299



Delaware Curb Mounted Thrie-Beam Retrofit Railing



Michigan Bridge Railing, Thrie-Beam Retrofit (R4 Type)

Height:
34"

Cost per linear foot:
\$25

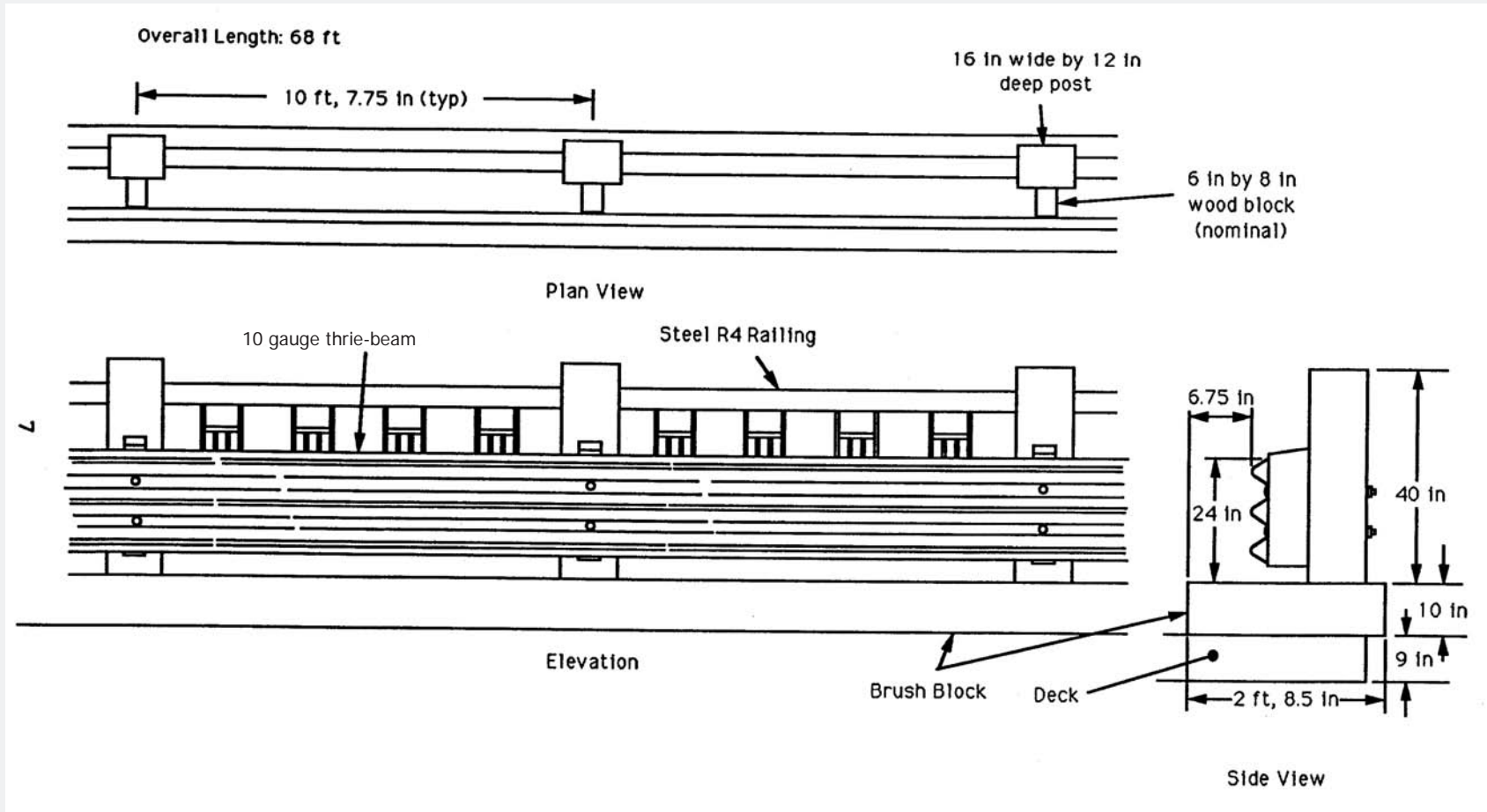
Test level:
TL-4

Utilized in:
Michigan

Contact:
Steve Beck
Michigan Dept
of Transportation
State Transportation Building
425 W. Ottawa Street
P.O. Box 30050
Lansing, MI 48909
(517) 373-0097



Michigan Bridge Railing, Thrie-Beam Retrofit (R4 Type)



Missouri Thrie-Beam Rail and Channel, Top Mounted

Height:
30.5"

Cost per linear foot:
\$100-125

Test level:
TL-3

Utilized in:
Missouri

Contact:
Peter Clogston, P.E.
Federal Highway Admin,
Missouri Division Office
209 Adams Street
Jefferson City, MO 65101
(573) 638-2613

Photo Not Yet Available

Nebraska Tubular Thrie-Beam Bridge Rail

Height:
32"

Cost per linear foot:
\$_

Test level:
TL-3

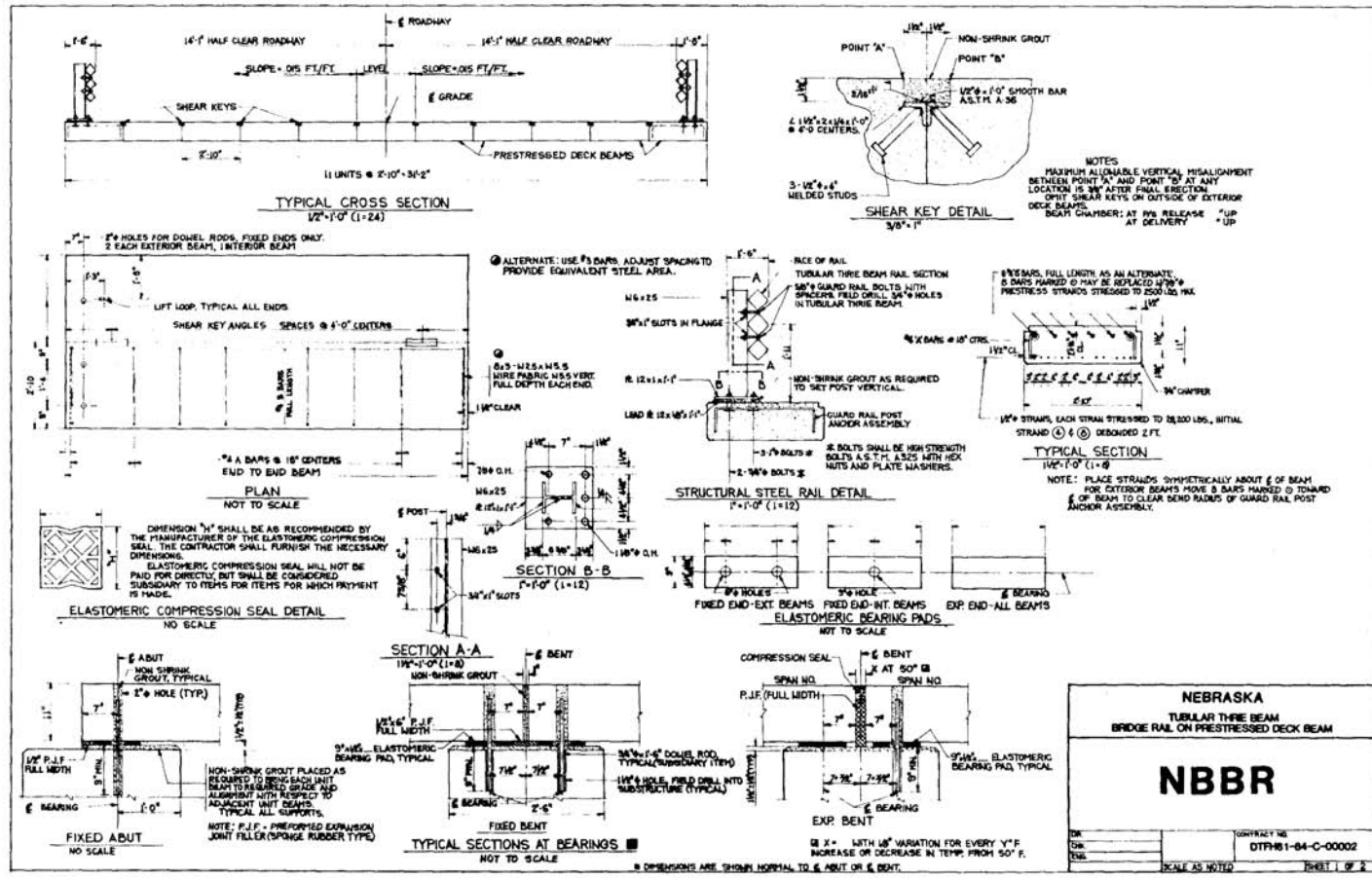
Utilized in:
Nebraska

Contact:
Federal Highway
Administration
100 Centennial Mall-North
Room 220
Lincoln, NE 68508
(402) 437-5977

Photo Not Yet Available

Thrie-Beam Bridge Rail

Nebraska Tubular Thrie-Beam Bridge Rail



Oregon Thrie-Beam Side Mount

Height:
29"

Cost per linear foot:
\$63.60

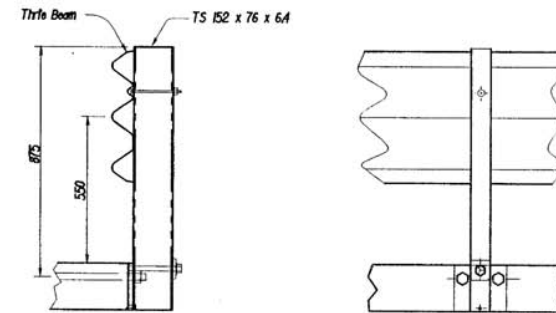
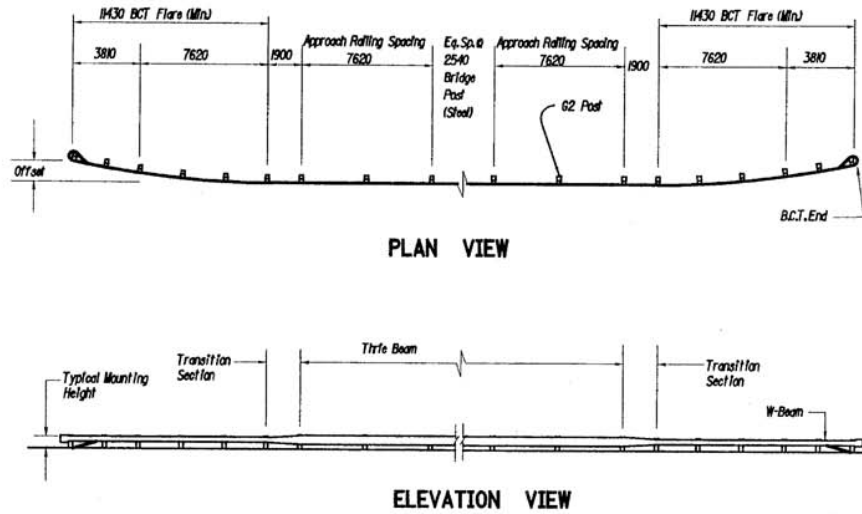
Test level:
TL-2

Utilized in:
Oregon

Contact:
Antony P. Stratis, P.E.
Tech Center Bridge Manager
Region 1
123 NW Flanders Street
Portland, OR 97209
(503) 731-8490



Oregon Thrie-Beam Side Mount

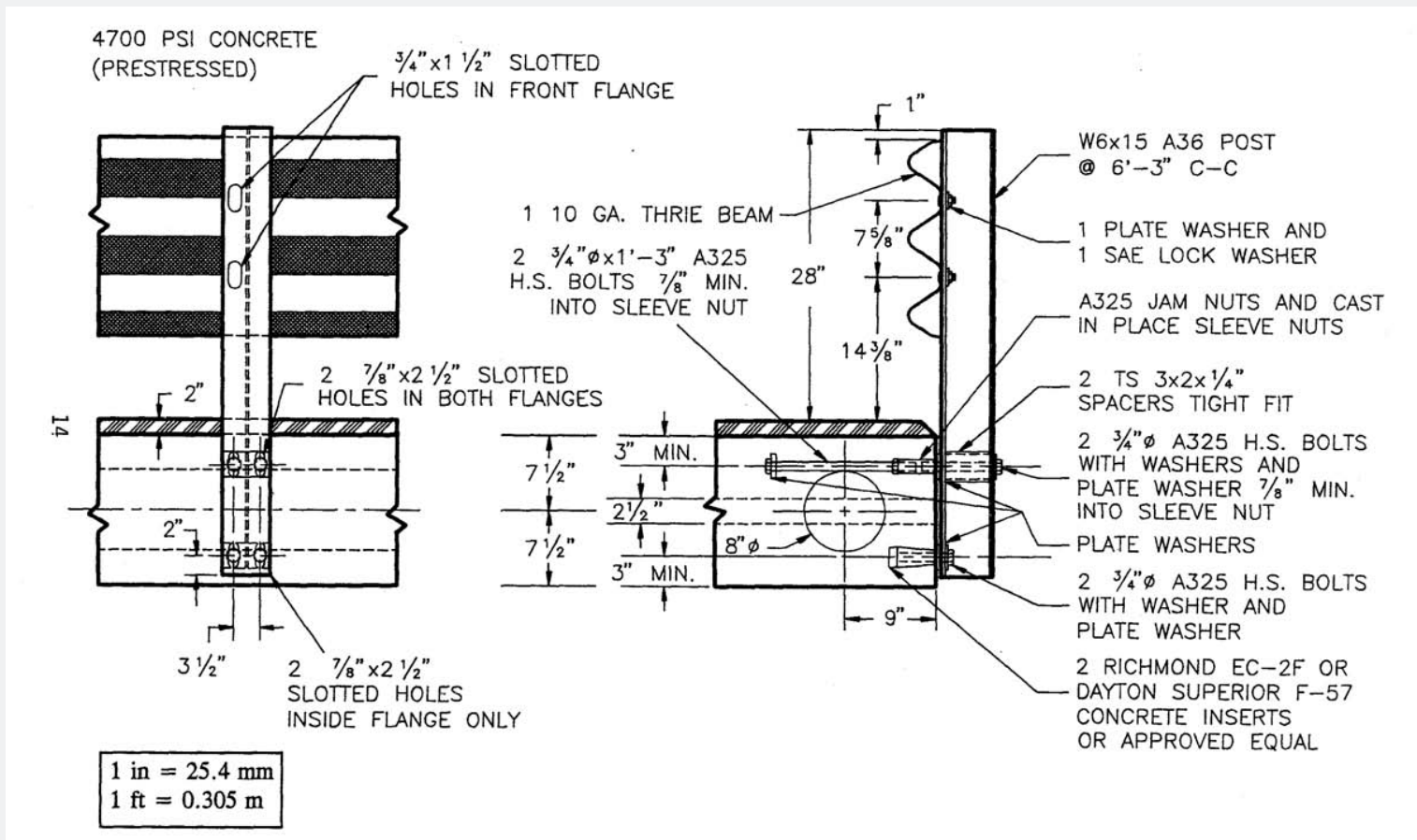


All Dimensions Shown Are mm unless Otherwise Noted.

FIGURE D.1 Side-Mounted Thrie-Beam Bridge Railing

Rail Height	810 mm			
Test Vehicle	902-kg Car	1022-kg Car	1022-kg Car	9080-kg Bus
Impact Speed km/h	99	94	97	72
Impact Angle Degrees	14.1	16.0	16.0	7.7

Oregon Thrie-Beam Side Mount



Washington 10 Gauge Thrie-Beam Retrofit (curb mounted)

Height:
30"

Cost per linear foot:
\$40

Test level:
TL-2

Utilized in:
Washington State

Contact:
Scott Sargent
WSDOT Bridge and
Structures Office
P.O. Box 47340
Olympia, WA 98504-7340
(360) 705-7753



Section 3

METAL TUBE BRIDGE RAIL



Section 3

METAL TUBE BRIDGE RAIL

Subsection	Name	Location	Test Level
Aluminum Tube Bridge Rails	Foothills Parkway Aluminum Bridge	Federal Lands	TL-2
	Standard 1-Bar Metal Rail	North Carolina	TL-2
Steel Tube Bridge Rails Attached to Bottom of Deck	Texas Energy-Absorbing Bridge Rail	Texas	TL-3
Steel Tube Bridge Rails Attached to Side of Deck	California Type 18	California	TL-3
	California Side Mount Type 115 Rail	California	TL-2
	California Type 116 Rail	California	TL-2
	California Type 117 Rail	California	TL-2
	Illinois 2399- Type Side Mount	Illinois	TL-4
	2-Tube Oregon Side Mount	Oregon	TL-4

Section 3

METAL TUBE BRIDGE RAIL

Subsection	Name	Location	Test Level
Steel Tube Bridge Rails Attached to Top of Deck	Texas Type 421 Aesthetic Rail	Texas	TL-2
	Washington, DC Historic Bridge Rail Retrofit (Curb Mount)	Washington, DC	TL-2
Steel Tube Bridge Rails Attached to Parapet	Alaska Rail - Curb Mounted	Alaska	TL-4
	California Type 9 (AASHTO BR2)	California	TL-2
	California ST-10 Rail	California	TL-4
	Bridge Railing, Aesthetic Parapet Type BR 27D	Michigan	TL-4
	Minnesota Combination Bridge Rail Design #3	Minnesota	TL-4
	Type C202	Texas	TL-5

Section 3

METAL TUBE BRIDGE RAIL

Subsection	Name	Location	Test Level
Curb Mounted Steel Tube Bridge Rails	George Washington Parkway Steel Bridge Rail	Federal Lands	TL-2
	Illinois 2399 - Curb Mount	Illinois	TL-4
	Michigan Multi Tube Bridge Railing	Michigan	TL-4
	Bridge Railing, 2 Tube	Michigan	TL-4
	NETC 2-Rail Curb-Mounted Railing	New England	TL-4
	Two-Rail Barrier	New York	TL-4
	Three-Rail Barrier Top Deck Flush Mount	New York	TL-4
	Four-Rail Barrier	New York	TL-4
	Five-Rail Barrier	New York	TL-4

Section 3

METAL TUBE BRIDGE RAIL

Subsection	Name	Location	Test Level
Steel Tube Bridge Rails Attached to Curb	Oregon 2-Tube Curb Mount	Oregon	TL-2
	Oregon 3-Tube Curb Mount	Oregon	TL-4
	Wyoming 2-Tube Steel Railing	Wyoming	TL-4
	Wyoming 2-Tube, Curb-Mounted	Wyoming	TL-3

Foothills Parkway Aluminum Bridge Rail

Height:
33"

Cost per linear foot:
\$75

Test level:
TL-2

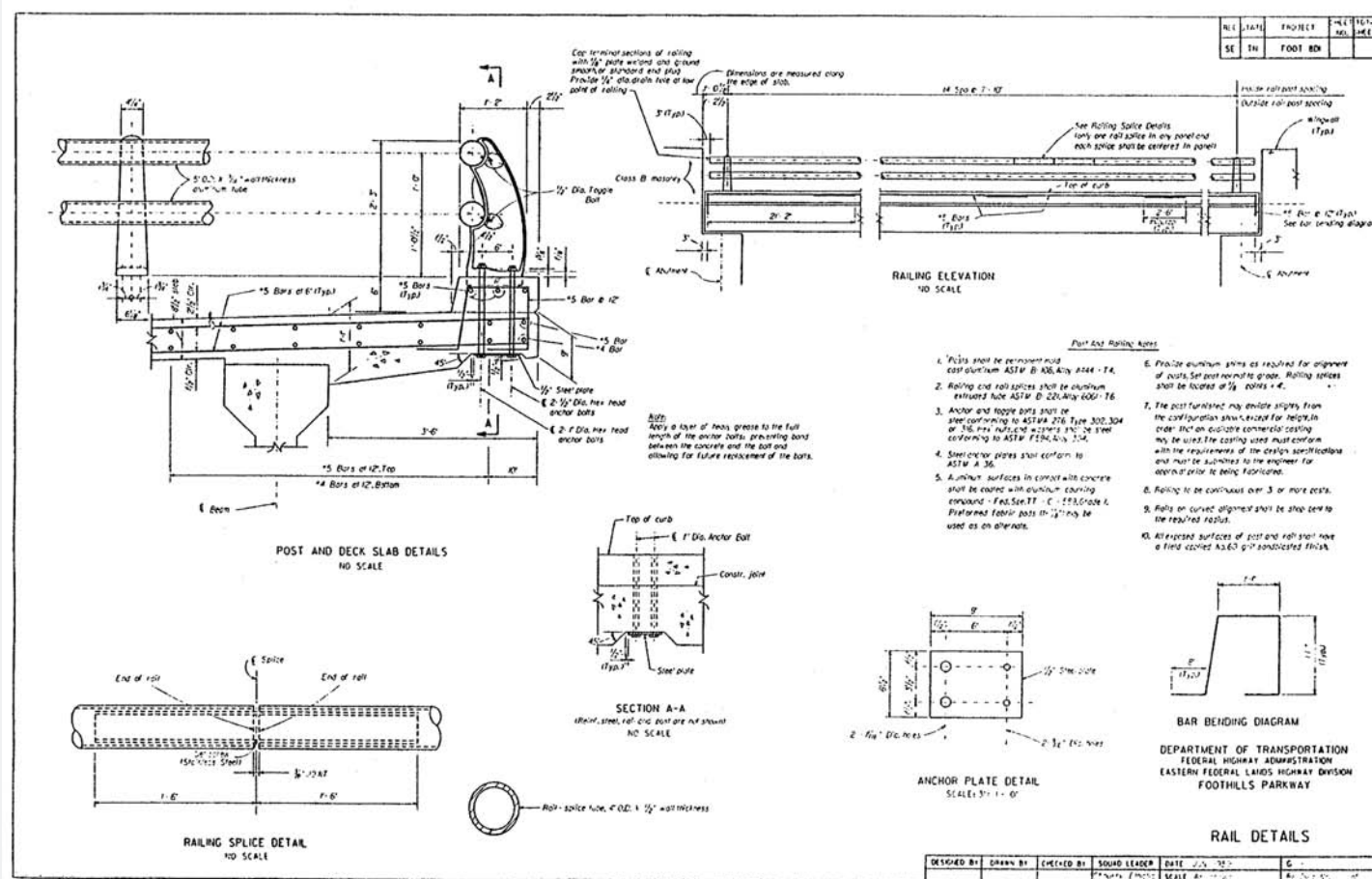
Utilized in:
Federal Lands

Contact:
Mark Clabaugh, P.E.
Federal Lands Bridge Office
21400 Ridgetop Circle
Sterling, VA 20166
(703) 404-6235



Aluminum Tube Bridge Rail

Foothills Parkway Aluminum Bridge Rail



Standard 1-Bar Metal Rail

Height:
32"

Cost per linear foot:
\$110

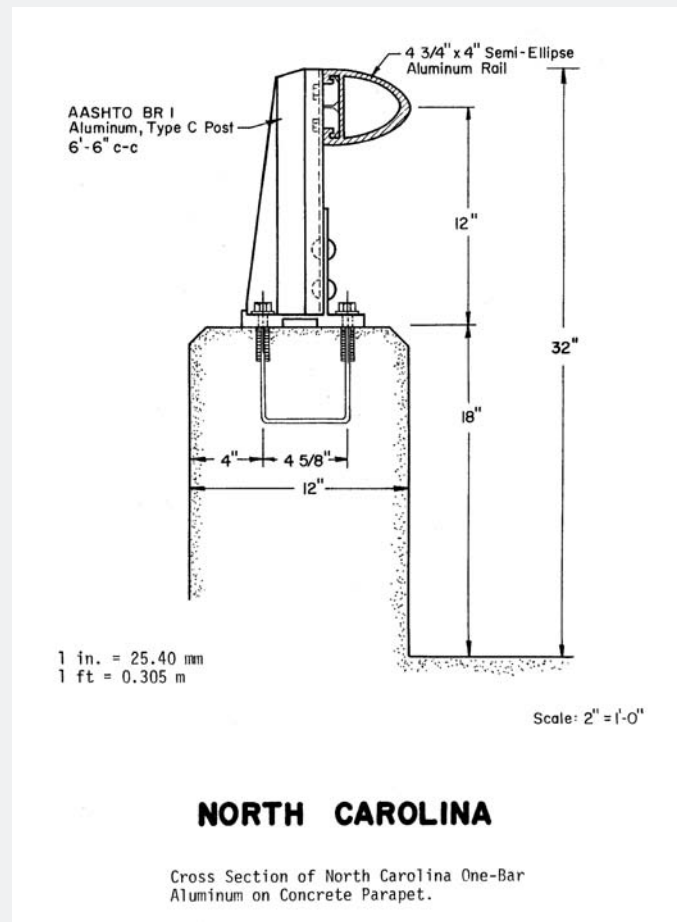
Test level:
TL-2

Utilized in:
North Carolina

Contact:
John Emerson, P.E.
North Carolina Dept
of Transportation
1500 Mail Service Center
Raleigh, NC 27699
(919) 733-4362



Standard 1-Bar Metal Rail



Texas Energy Absorbing Bridge Rail

Height:
27"

Cost per linear foot:
\$_

Test level:
TL-3

Utilized in:
Texas

Contact:
Mark Bloschock
Texas DOT Bridge Division
RA118
125 E. 11th Street
Austin, TX 78701-2483
(512) 416-2178

Photo Not Yet Available

Section **3**

Steel Tube Bridge Rail Attached to Side of Deck

California Type 18

Height:
36"

Cost per linear foot:
\$_

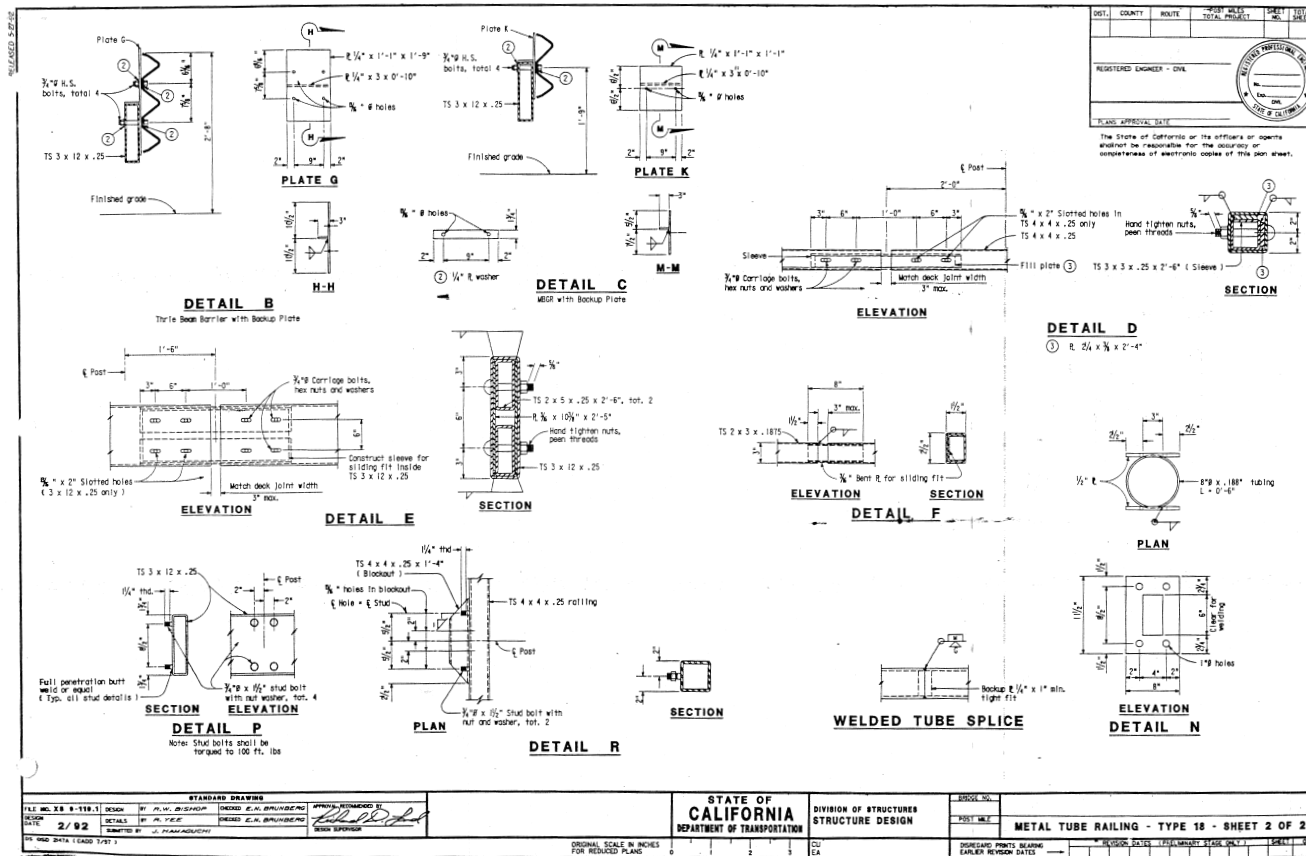
Test level:
TL-2

Utilized in:
California

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



California Type 18



California Side Mount Type 115 Rail

Height:
30"

Cost per linear foot:
\$__

Test level:
TL-2

Utilized in:
California

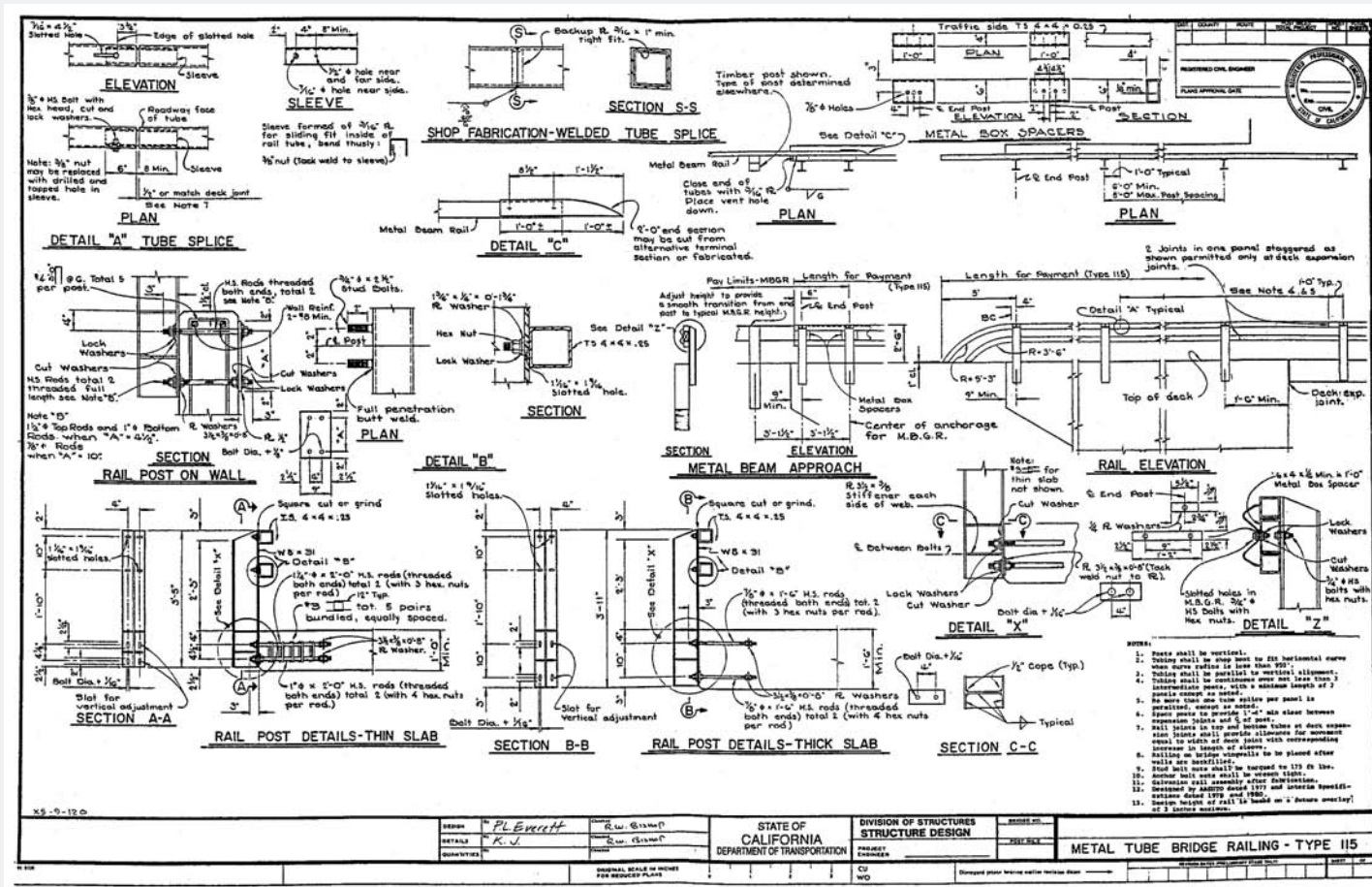
Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



Section 3

Steel Tube Bridge Rail Attached to Side of Deck

California Side Mount Type 115 Rail



California Type 116 Rail

Height:
42"

Cost per linear foot:
\$__

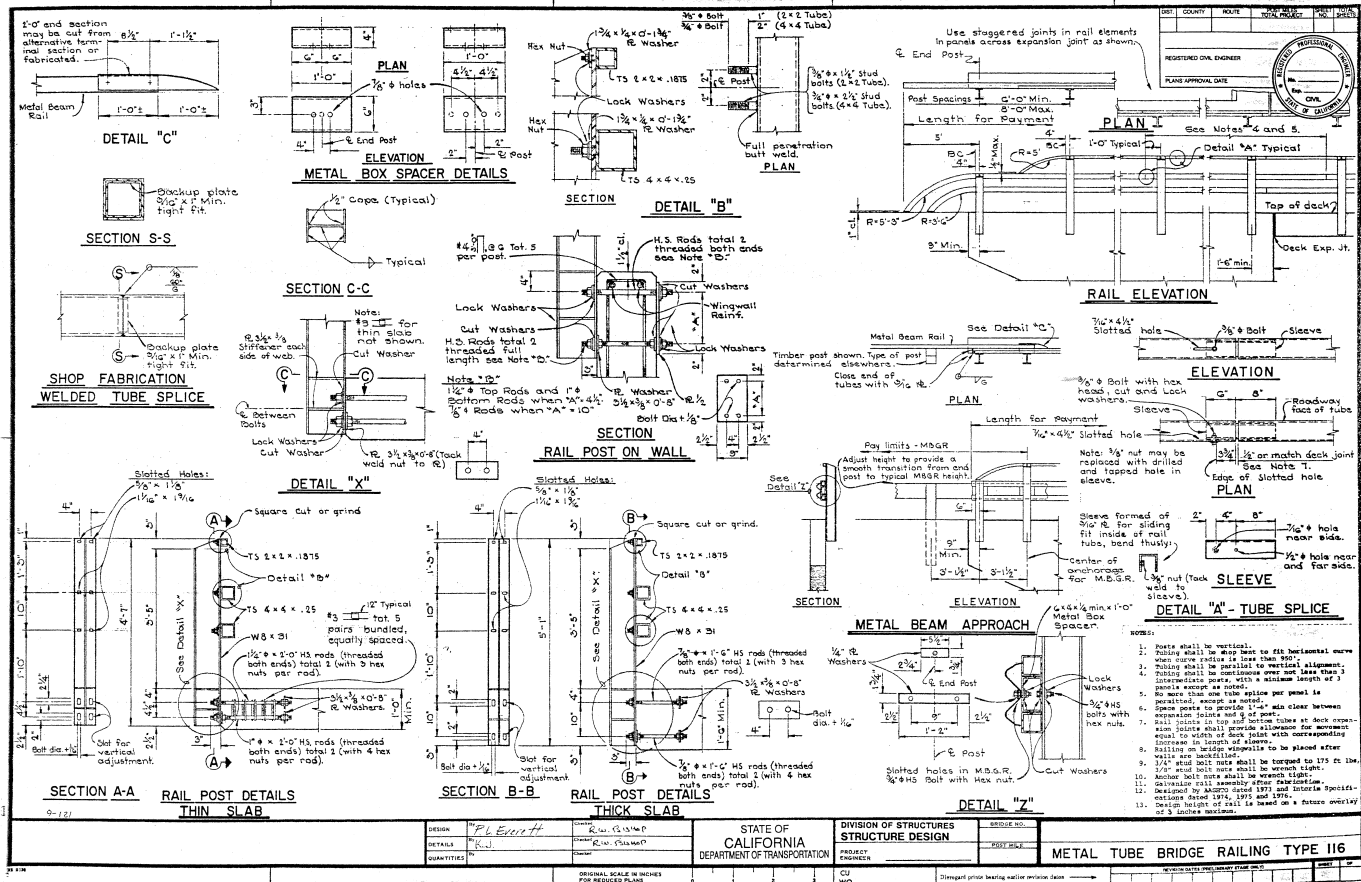
Test level:
TL-2

Utilized in:
California

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



California Type 116 Rail



California Type 117 Rail

Height:
54"

Cost per linear foot:
\$__

Test level:
TL-2

Utilized in:
California

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



Illinois 2399 - Type Side Mount

Height:
32"

Cost per linear foot:
\$75

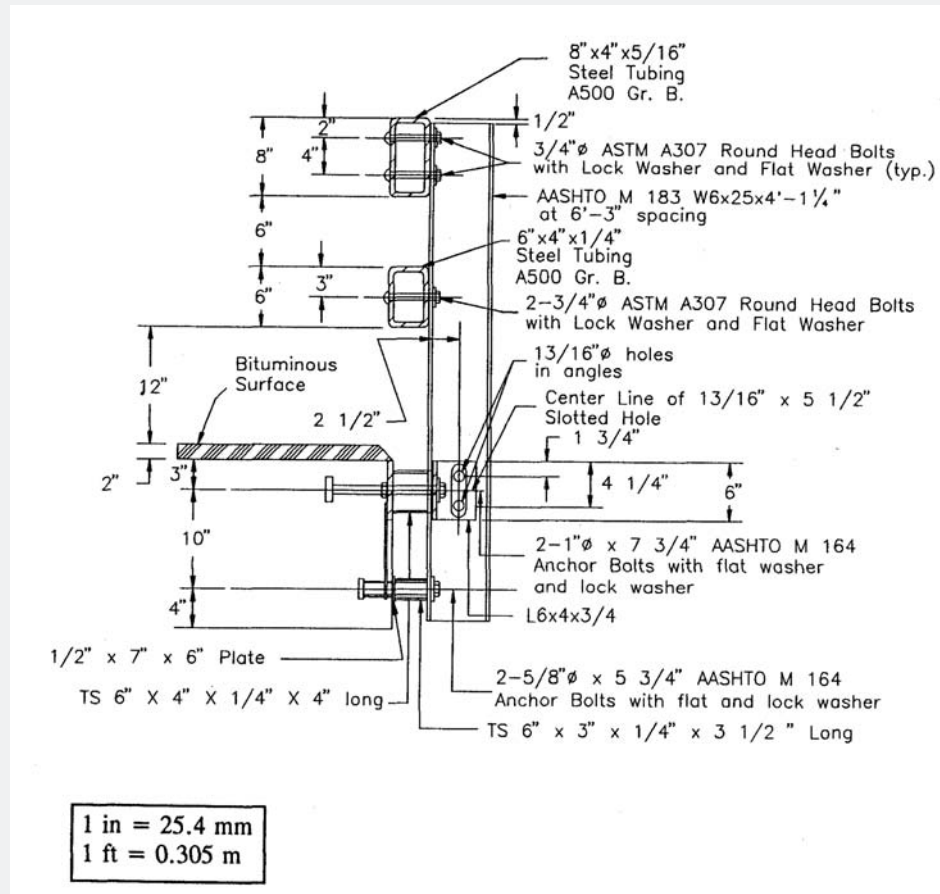
Test level:
TL-4

Utilized in:
Illinois

Contact:
Thomas J. Domagalski
Illinois Dept of Transportation
2300 South Dirksen Parkway
Room 240
Springfield, IL 62764
(217) 782-2125



Illinois 2399 - Type Side Mount



Section **3**

Steel Tube Bridge Rail, Attached to Side of Deck

Oregon 2-Tube Side Mount

Height:
32"

Cost per linear foot:
\$77

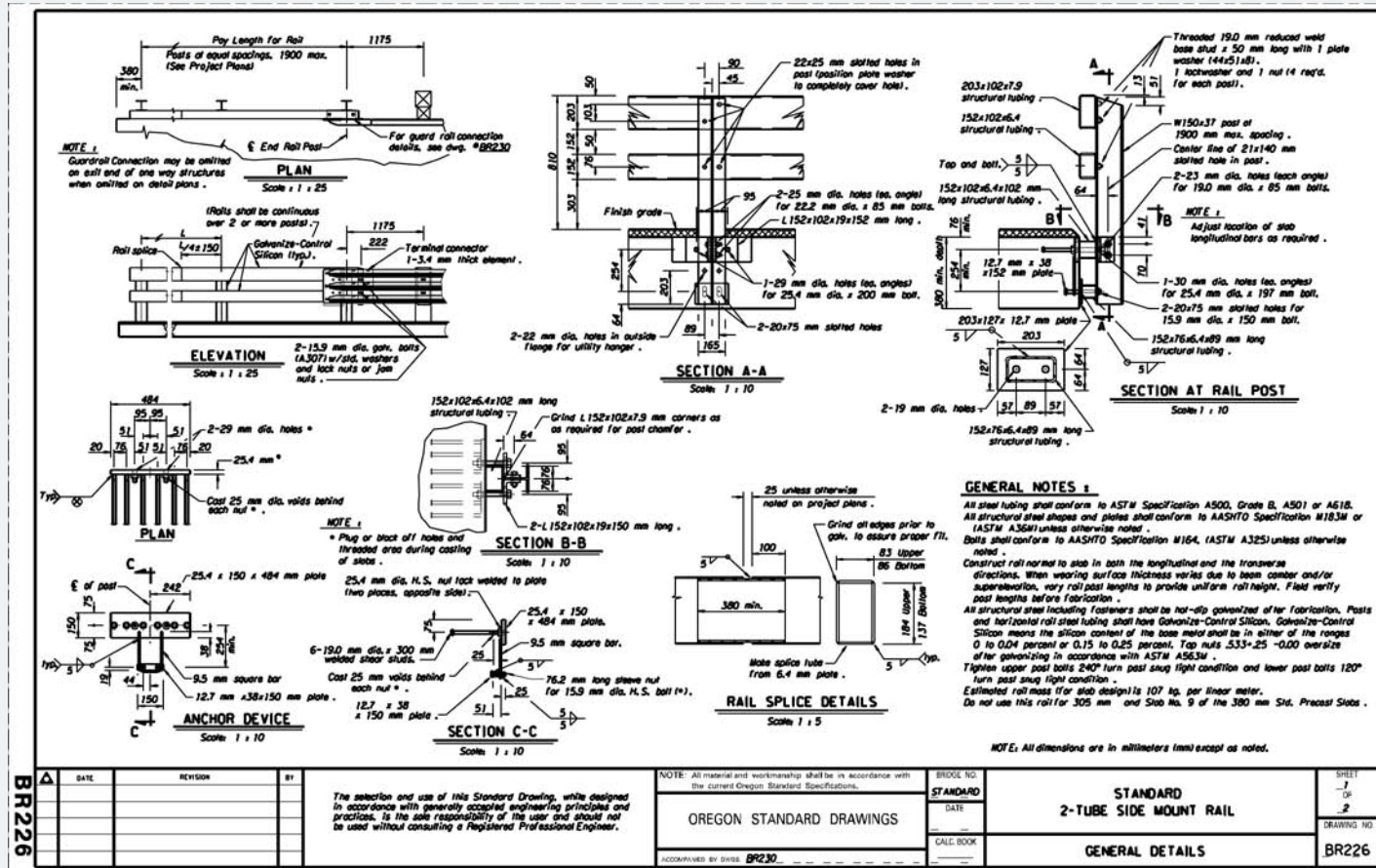
Test level:
TL-4

Utilized in:
Oregon

Contact:
Antony P. Stratis, P.E.
Tech Center Bridge Manager
Region 1
123 NW Flanders Street
Portland, OR 97209
(503) 731-8490



Oregon 2-Tube Side Mount



Texas Type 421 Aesthetic Rail

Height:
32"

Cost per linear foot:
\$__

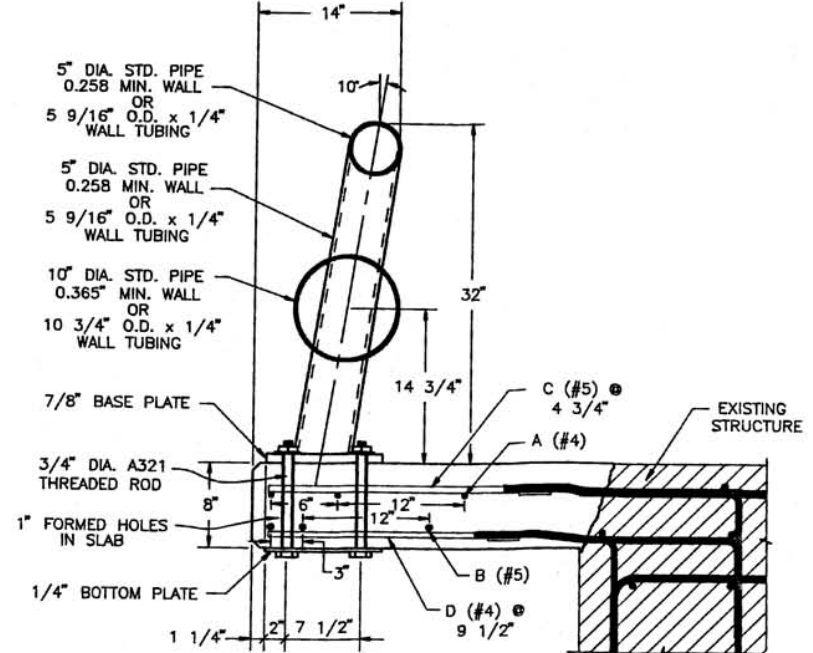
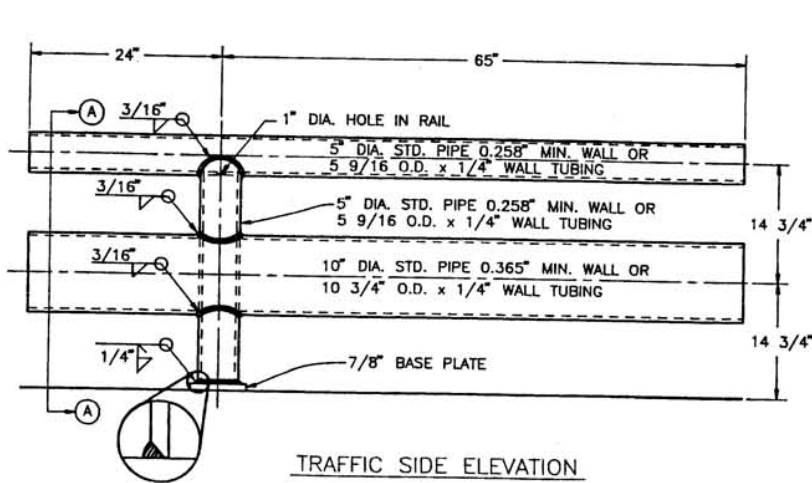
Test level:
TL-2

Utilized in:
Texas

Contact:
Mark Bloschock
Texas DOT Bridge Division
RA118
125 E. 11th Street
Austin, TX 78701-2483
(512) 416-2178



Texas Type 421 Aesthetic Rail



Washington, DC Historic Bridge Rail Retrofit (Curb Mount)

Height:
27"

Cost per linear foot:
\$__

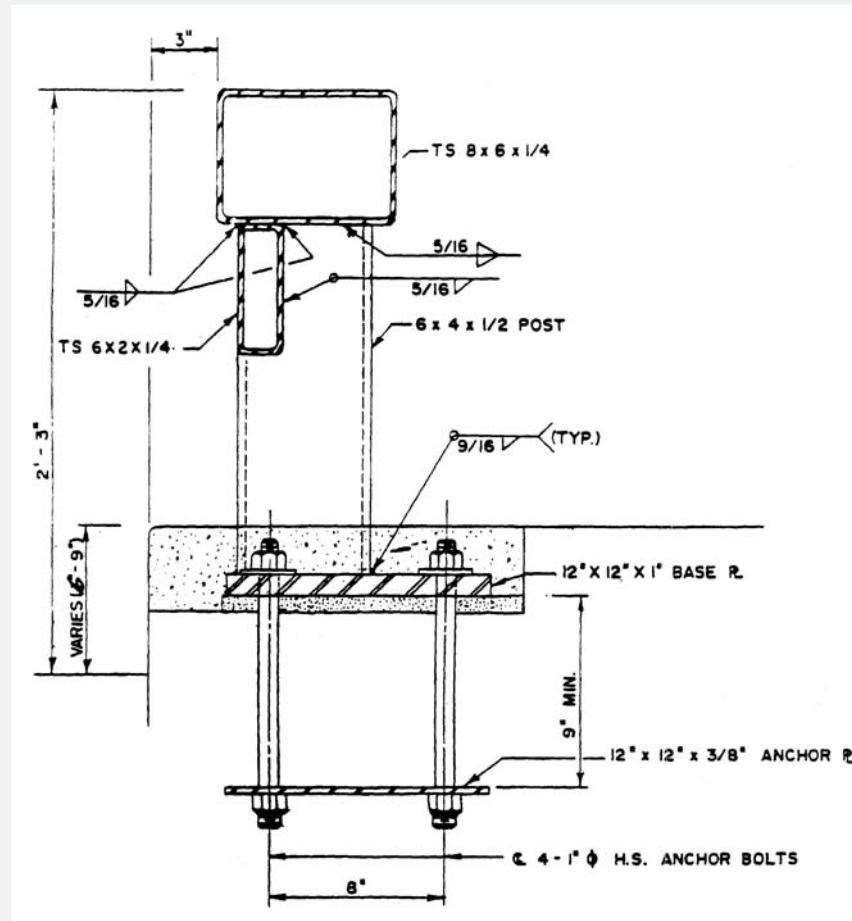
Test level:
TL-2

Utilized in:
Washington, DC

Contact:
Robert McNeely
District Dept of Transportation
1403 W Street, NW
Washington, DC 20009
(202) 438-7770



Washington, DC Historic Bridge Rail Retrofit (Curb Mount)



Alaska Rail - Curb Mounted

Height:
32"

Cost per linear foot:
\$90

Test level:
TL-4

Utilized in:
Alaska

Contact:
Richard Pratt
Alaska Dept of Transportation
3132 Channel Drive
Juneau, AK 99801
(907) 465-2975



California Type 9 (AASHTO BR2)

Height:
27"

Cost per linear foot:
\$_

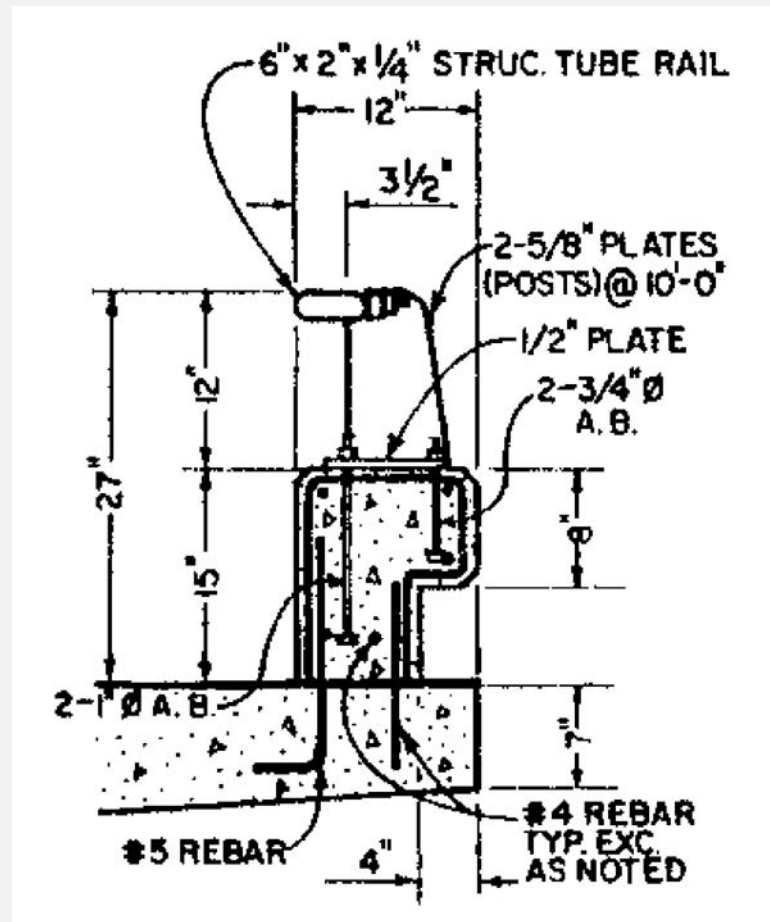
Test level:
TL-2

Utilized in:
California

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



California Type 9 (AASHTO BR2)



California ST-10 Rail

Height:
33"

Cost per linear foot:
\$120

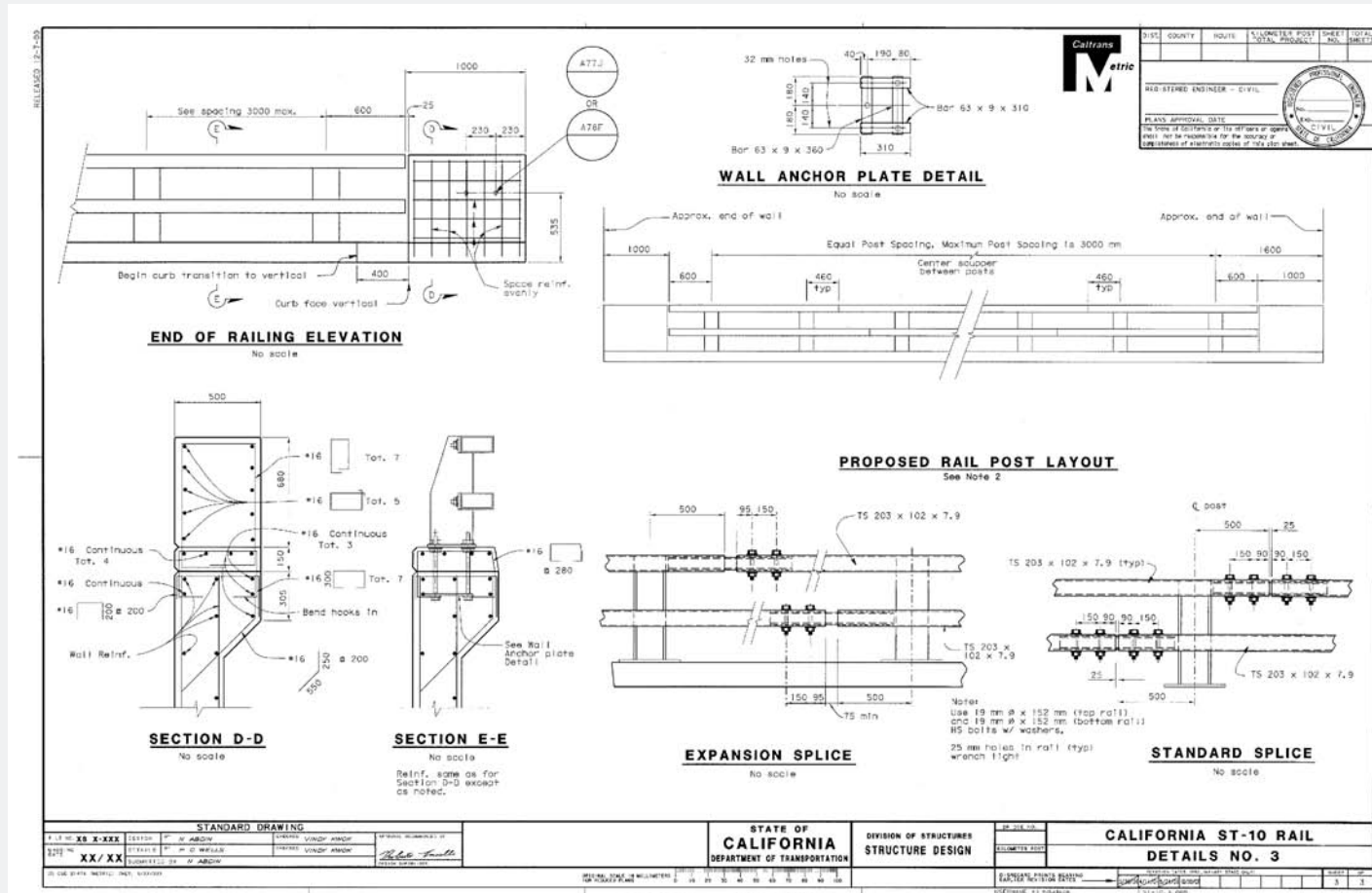
Test level:
TL-4

Utilized in:
California

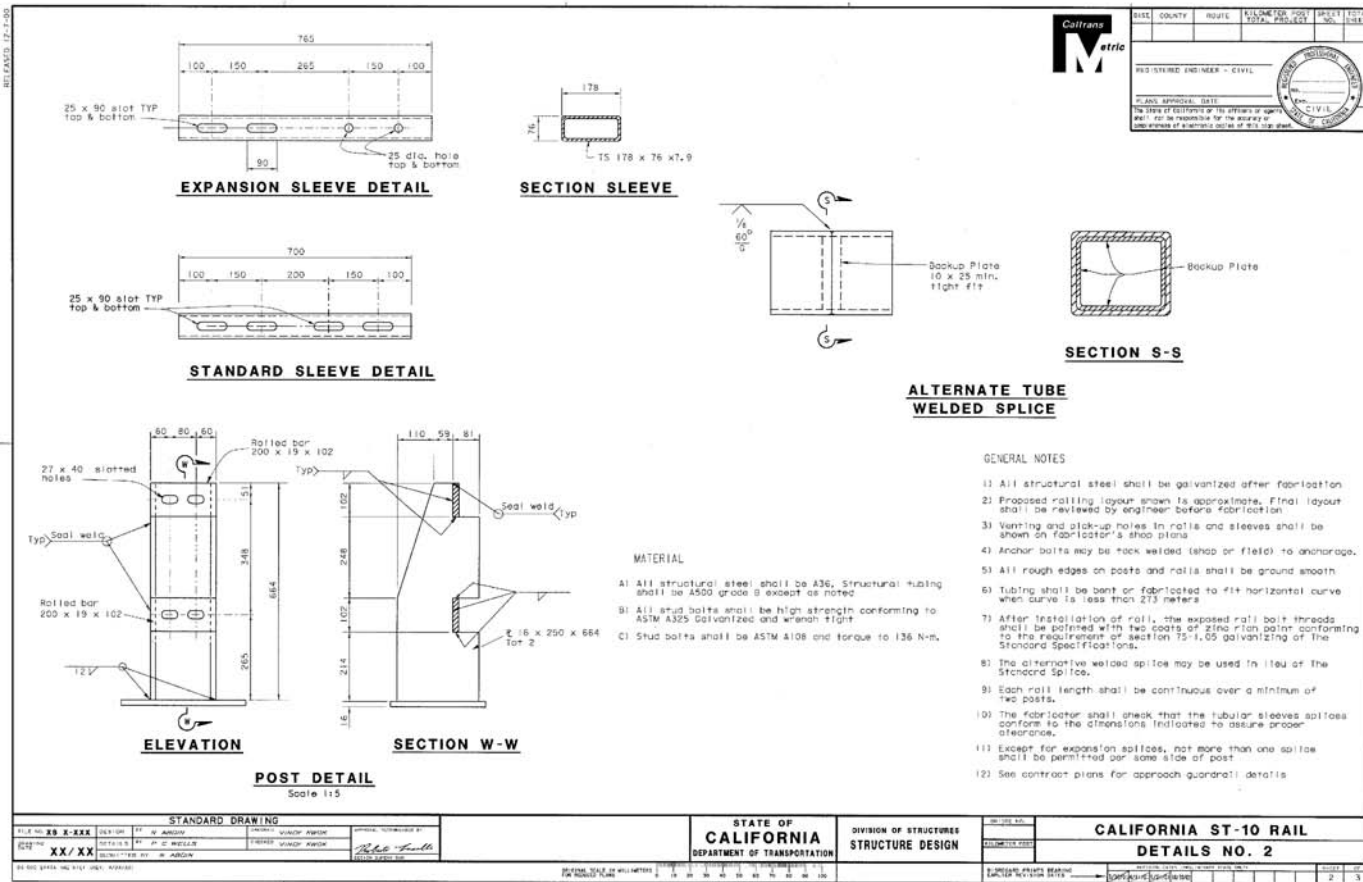
Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



California ST-10 Rail



California ST-10 Rail



Bridge Railing, Aesthetic Parapet Type BR 27D

Height:
42"

Cost per linear foot:
\$120

Test level:
TL-4

Utilized in:
Michigan

Contact:
Steve Beck
Michigan Dept
of Transportation
State Transportation Building
425 W. Ottawa Street
P.O. Box 30050
Lansing, MI 48909
(517) 373-0097



Bridge Railing, Aesthetic Parapet Type BR 27D

Plans Not Yet Available.

Minnesota Combination Bridge Rail, Design #3

Height:
36"

Cost per linear foot:
\$75

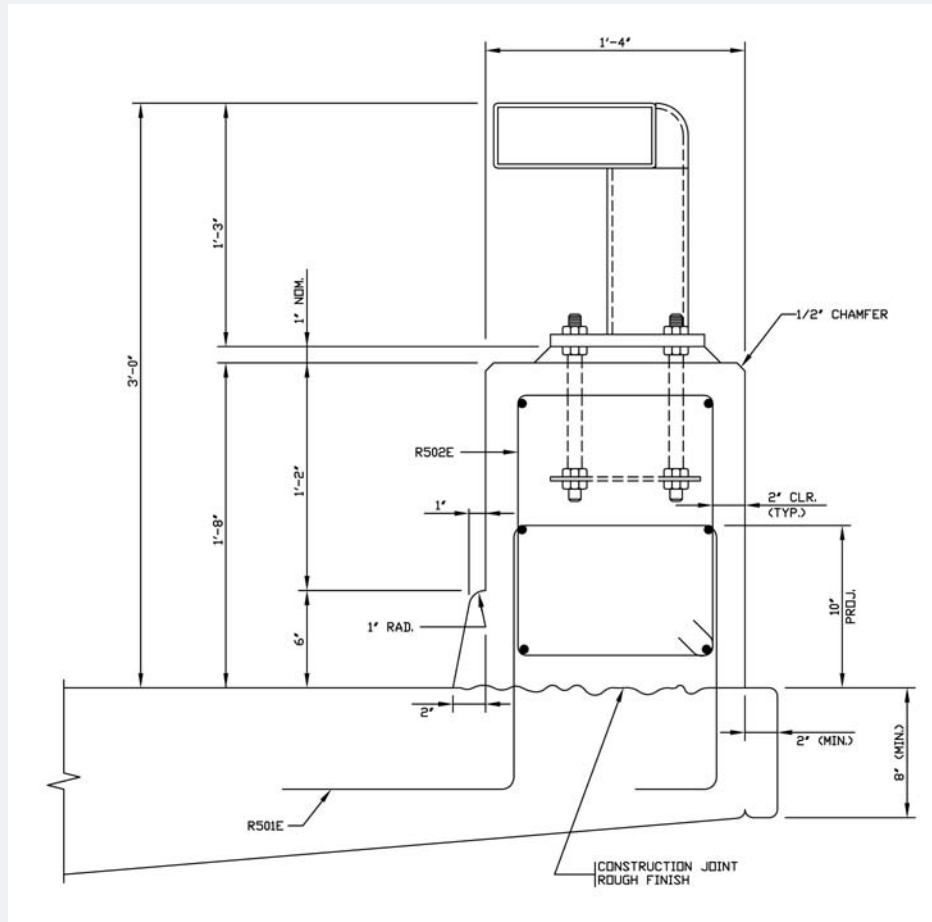
Test level:
TL-4

Utilized in:
Minnesota

Contact:
Raymond Cekalla
Minnesota DOT Bridge Office
3485 Hadley Avenue North
Mail Stop 610
Oakdale, MN 55128-3307
(651) 747-2172



Minnesota Combination Bridge Rail, Design #3



Type C202

Height:
54"

Cost per linear foot:
\$_

Test level:
TL-5

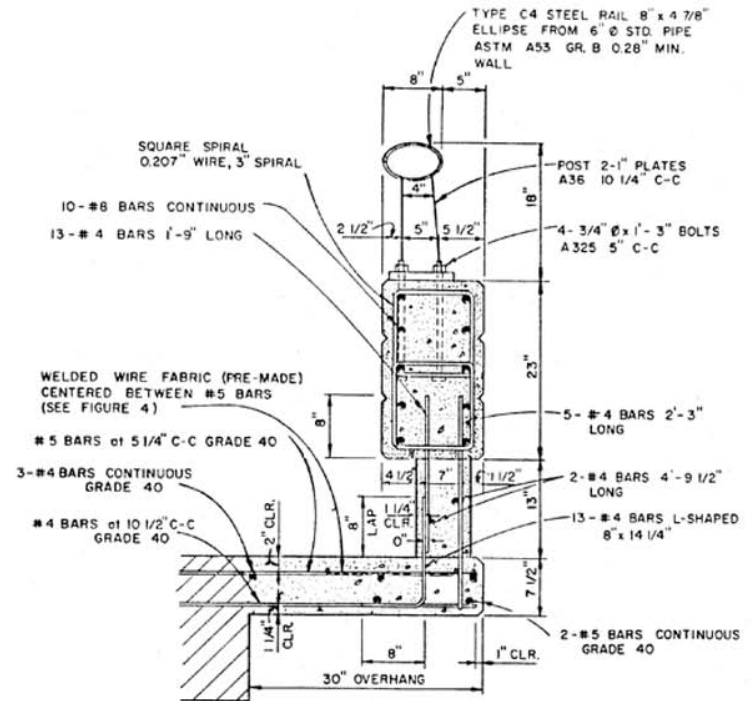
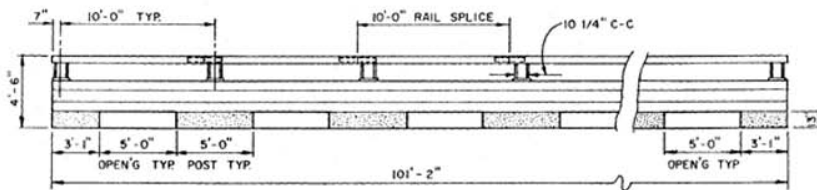
Utilized in:
Texas

Contact:
Mark Bloschock
Texas DOT Bridge Division
RA118
125 E. 11th Street
Austin, TX 78701-2483
(512) 416-2178



Photo Not Yet Available

Type C202



Cross Section of the Modified C202 Bridge Rail.

George Washington Parkway Steel Bridge Rail

Height:
42"

Cost per linear foot:
\$200

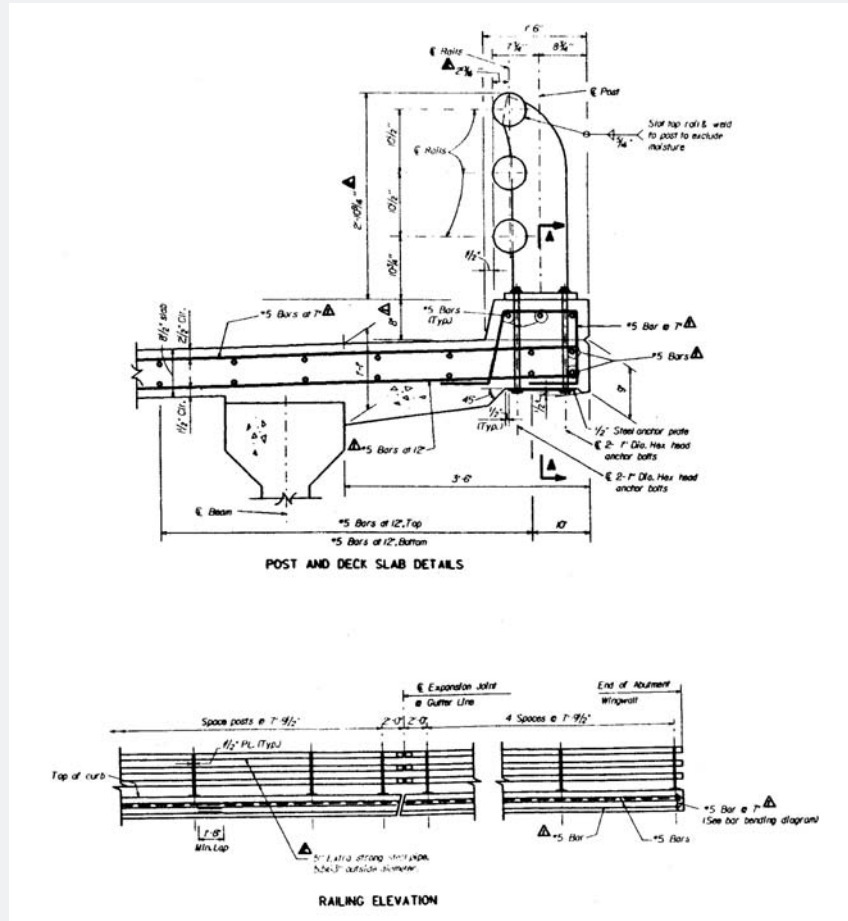
Test level:
TL-3

Utilized in:
George Washington
Parkway, Virginia

Contact:
Mark Clabaugh, P.E.
Federal Lands Bridge Office
21400 Ridgeway Circle
Sterling, VA 20166
(703) 404-6235



George Washington Parkway Steel Bridge Rail



Illinois 2399 - Curb Mount

Height:
32"

Cost per linear foot:
\$75

Test level:
TL-4

Utilized in:
Illinois

Contact:
Thomas J. Domagalski
Illinois Dept of Transportation
2300 South Dirksen Parkway
Room 240
Springfield, IL 62764
(217) 782-2125



Michigan Multi Tube Bridge Railing

Height:
42"

Cost per linear foot:
\$150

Test level:
TL-4

Utilized in:
Michigan

Contact:
Steve Beck
Michigan Dept
of Transportation
State Transportation Building
425 W. Ottawa Street
P.O. Box 30050
Lansing, MI 48909
(517) 373-2090



Michigan Multi Tube Bridge Railing

Plans Not Yet Available.

Bridge Railing, 2 Tube

Height:
32.5"

Cost per linear foot:
\$100

Test level:
TL-4

Utilized in:
Michigan

Contact:
Steve Beck
Michigan Dept
of Transportation
State Transportation Building
425 W. Ottawa Street
P.O. Box 30050
Lansing, MI 48909
(517) 373-0097



Bridge Railing, 2 Tube

Plans Not Yet Available.

NETC 2-Rail Curb-Mounted Railing

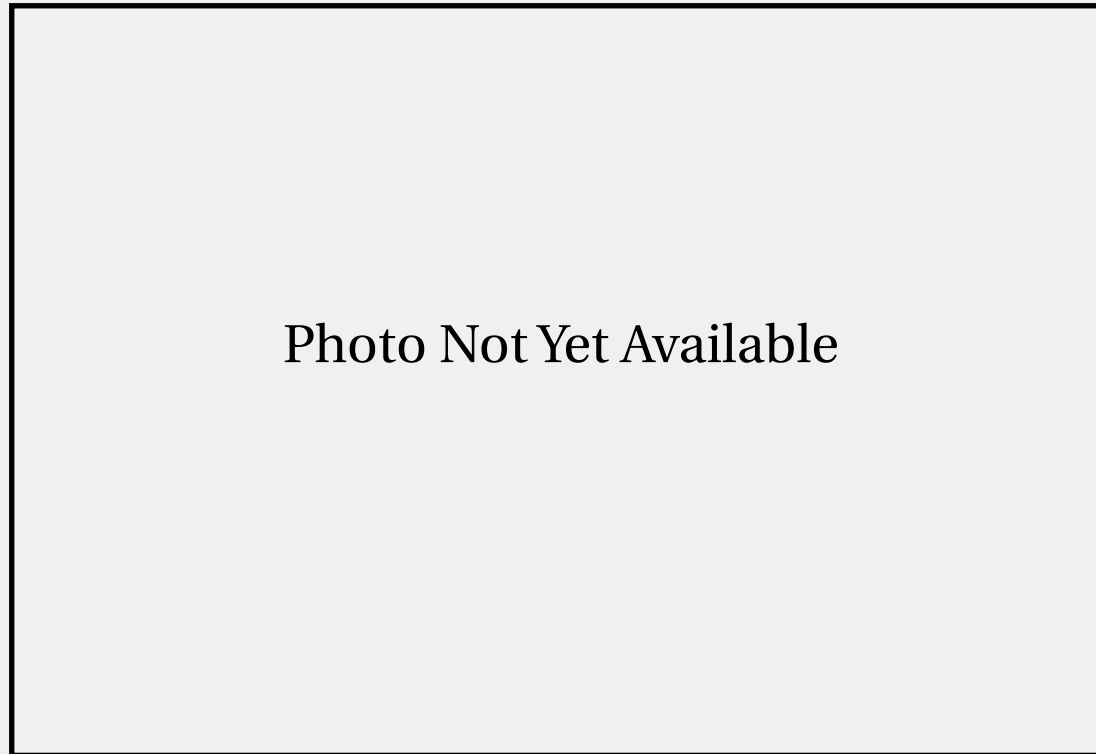
Height:
34"

Cost per linear foot:
\$__

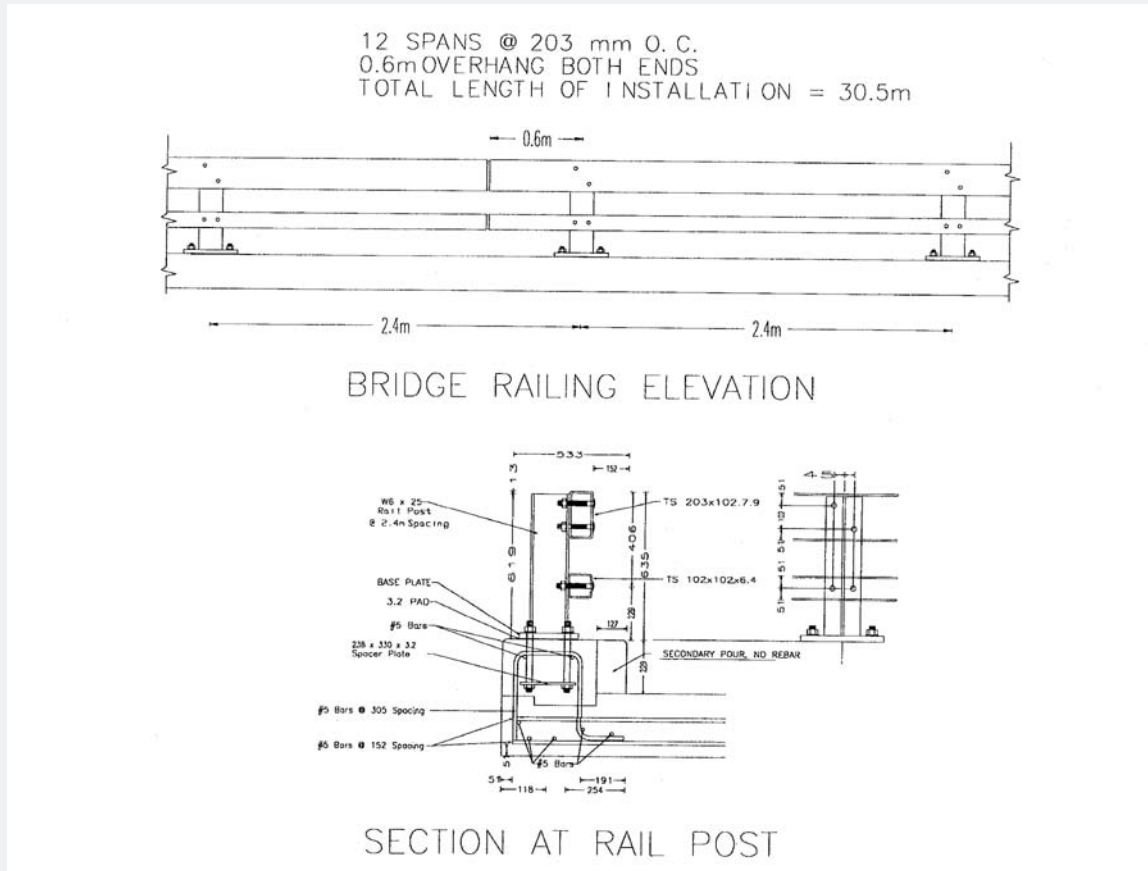
Test level:
TL-4

Utilized in:
Nebraska

Contact:
Gerald M. McCarthy
Connecticut
Transportation Institute
University of Connecticut
179 Middle Turnpike,
Unit 5202
Storrs, CT 06269
(860) 486-5400



NETC 2-Rail Curb-Mounted Railing



Two-Rail Barrier

Height:
32"

Cost per linear foot:
\$243

Test level:
TL-4

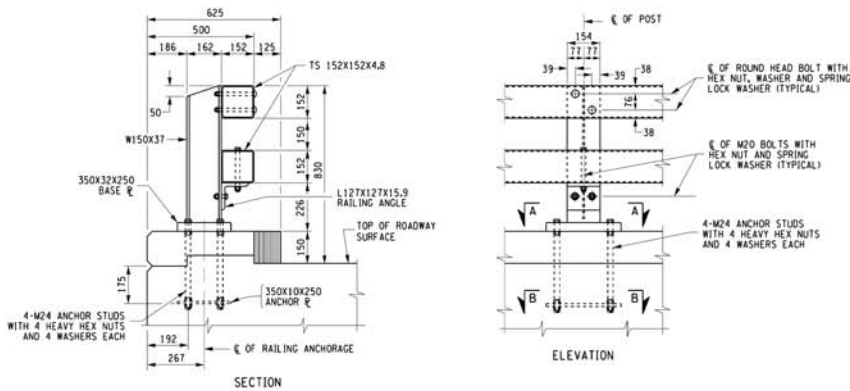
Utilized in:
New York

Contact:
Harry White
New York State Dept
of Transportation
1220 Washington Avenue
Albany, NY 12232
(518) 485-1148

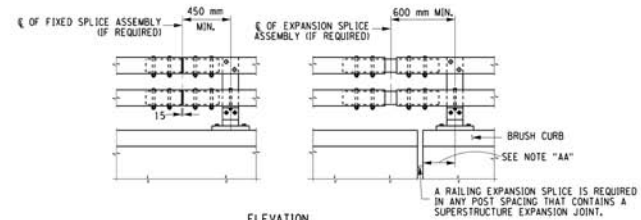


Two-Rail Barrier

BD-RS1
R2



STEEL BRIDGE RAILING
(TWO-RAIL - BRUSH CURB)
SCALE 1:10



STEEL BRIDGE RAILING SPLICE DETAILS
(TWO-RAIL - BRUSH CURB)
SCALE 1:20

DESIGNER NOTES:

NOTE "AA":
THE MINIMUM DISTANCE FROM THE POST TO AN EXPANSION JOINT SHALL BE DETERMINED BY THE MINIMUM EDGE DISTANCE OF 125 mm FROM ANY ANCHOR STUD TO THE END OF THE SLAB, OR TO THE EXPANSION JOINT RECESS POUR, IF ONE IS USED. ON PRESTRESSED CONCRETE BRIDGES, THE POST SHALL BE LOCATED TO MINIMIZE ANCHOR PLATE/END BLOCK REINFORCEMENT CONFLICTS. POST SPACING SHALL BE ADJUSTED ACCORDINGLY.

THE MAXIMUM CENTER TO CENTER SPACING OF RAILING POSTS IS 2.5 m. THESE RAILINGS ARE ADEQUATE FOR A TL-4 (PL-2) SERVICE LEVEL.

FOR SECTIONS A-A & B-B, SEE BD-R5B.

FOR SPLICE DETAILS, SEE BD-R5B.

FOR DETAILS OF RAILING ANGLE, SEE BD-R53.

FOR DETAILS OF ROUND HEAD BOLT, SEE BD-R53.

FOR TRANSITION DETAILS, SEE BD-R54.

NOTES:

ALL RAILING IS TO BE FABRICATED AND ERECTED ACCORDING TO SECTION 588 OF THE STANDARD SPECIFICATIONS.

PRIOR TO GALVANIZING THE ASSEMBLED POST, GRIND ALL EDGES TO A MINIMUM RADIUS OF 2 mm.

BOLTS SHALL BE TORQUED SNUG TIGHT (APPROXIMATELY 135 N-m).

ALL DIMENSIONS ARE SHOWN IN MILLIMETERS UNLESS OTHERWISE NOTED.

ISSUED 4/7/98	7	STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION STRUCTURES DESIGN AND CONSTRUCTION DIVISION
REVISED		
2/1/00		STEEL BRIDGE RAILING TWO-RAIL AND THREE-RAIL
11/5/01		
APPROVED:	11/5/01	ISSUED UNDER E1 98-012 EFFECTIVE WITH THE LETTING OF 10/22/98
ORIGINAL SIGNED BY JAMES M. O'CONNELL, PE DEPUTY CHIEF ENGINEER (STRUCTURES)		

Three-Rail Barrier Top Deck Flush Mount

Height:
32"

Cost per linear foot:
\$515

Test level:
TL-4

Utilized in:
New York

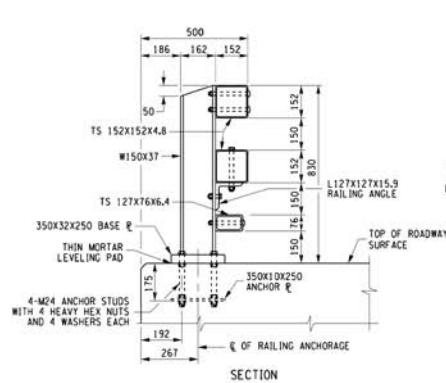
Contact:
Harry White
New York State Dept
of Transportation
1220 Washington Avenue
Albany, NY 12232
(518) 485-1148



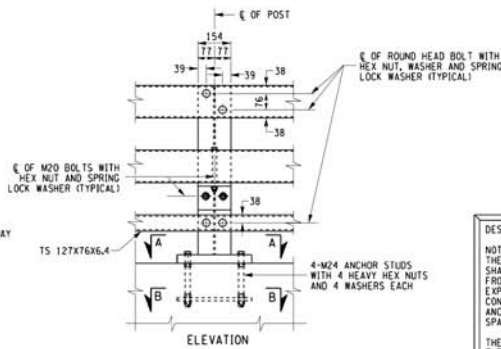
Photo Not Yet Available

Three-Rail Barrier

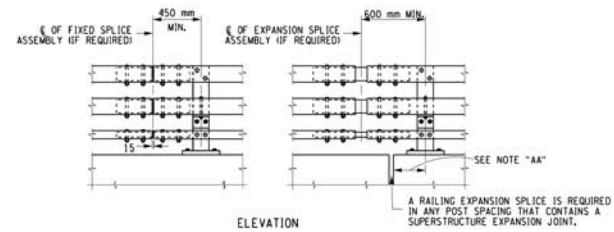
BD-RS1
R2



STEEL BRIDGE RAILING
(THREE-RAIL - CURBLESS)
SCALE 1:10



ELEVATION



ELEVATION

STEEL BRIDGE RAILING SPLICE DETAILS
(THREE-RAIL - CURBLESS)
SCALE 1:20

DESIGNER NOTES:

NOTE "AA":
THE MINIMUM DISTANCE FROM THE POST TO AN EXPANSION JOINT SHALL BE DETERMINED BY THE MINIMUM EDGE DISTANCE OF 125 mm FROM ANY ANCHOR STUD TO THE END OF THE SLAB, OR TO THE EXPANSION JOINT RECESS POUR, IF ONE IS USED. ON PRESTRESSED CONCRETE BRIDGES THE POST SHALL BE LOCATED TO MINIMIZE ANCHOR PLATE/END BLOCK REINFORCEMENT CONFLICTS. POST SPACING SHALL BE ADJUSTED ACCORDINGLY.

THE MAXIMUM CENTER TO CENTER SPACING OF RAILING POSTS IS 2.5 m. THESE RAILINGS ARE ADEQUATE FOR A TL-4 (PL-2) SERVICE LEVEL.

FOR SECTIONS A-A & B-B, SEE BD-RS1.

FOR SPLICE DETAILS, SEE BD-RS8.

FOR DETAILS OF RAILING ANGLE, SEE BD-RS3.

FOR DETAILS OF ROUND HEAD BOLT, SEE BD-RS3.

FOR TRANSITION DETAILS, SEE BD-RS4.

NOTES:

ALL RAILING IS TO BE FABRICATED AND ERECTED ACCORDING TO SECTION 568 OF THE STANDARD SPECIFICATIONS.

PRIOR TO GALVANIZING THE ASSEMBLED POST, GRIND ALL EDGES TO A MINIMUM RADIUS OF 2 mm.

BOLTS SHALL BE TORQUED SNUG TIGHT (APPROXIMATELY 135 N-m).

ALL DIMENSIONS ARE SHOWN IN MILLIMETERS UNLESS OTHERWISE NOTED.

ISSUED 4/7/98	STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION STRUCTURES DESIGN AND CONSTRUCTION DIVISION
REVISED	
2/1/00 11/5/01	
STEEL BRIDGE RAILING TWO-RAIL AND THREE-RAIL	
APPROVED: 11/5/01 ORIGINAL SIGNED BY JAMES M. O'CONNELL, PE DEPUTY CHIEF ENGINEER (STRUCTURES)	ISSUED UNDER E1 98-012 EFFECTIVE WITH THE LETTING OF 10/22/98

Four-Rail Barrier

Height:
42"

Cost per linear foot:
\$515

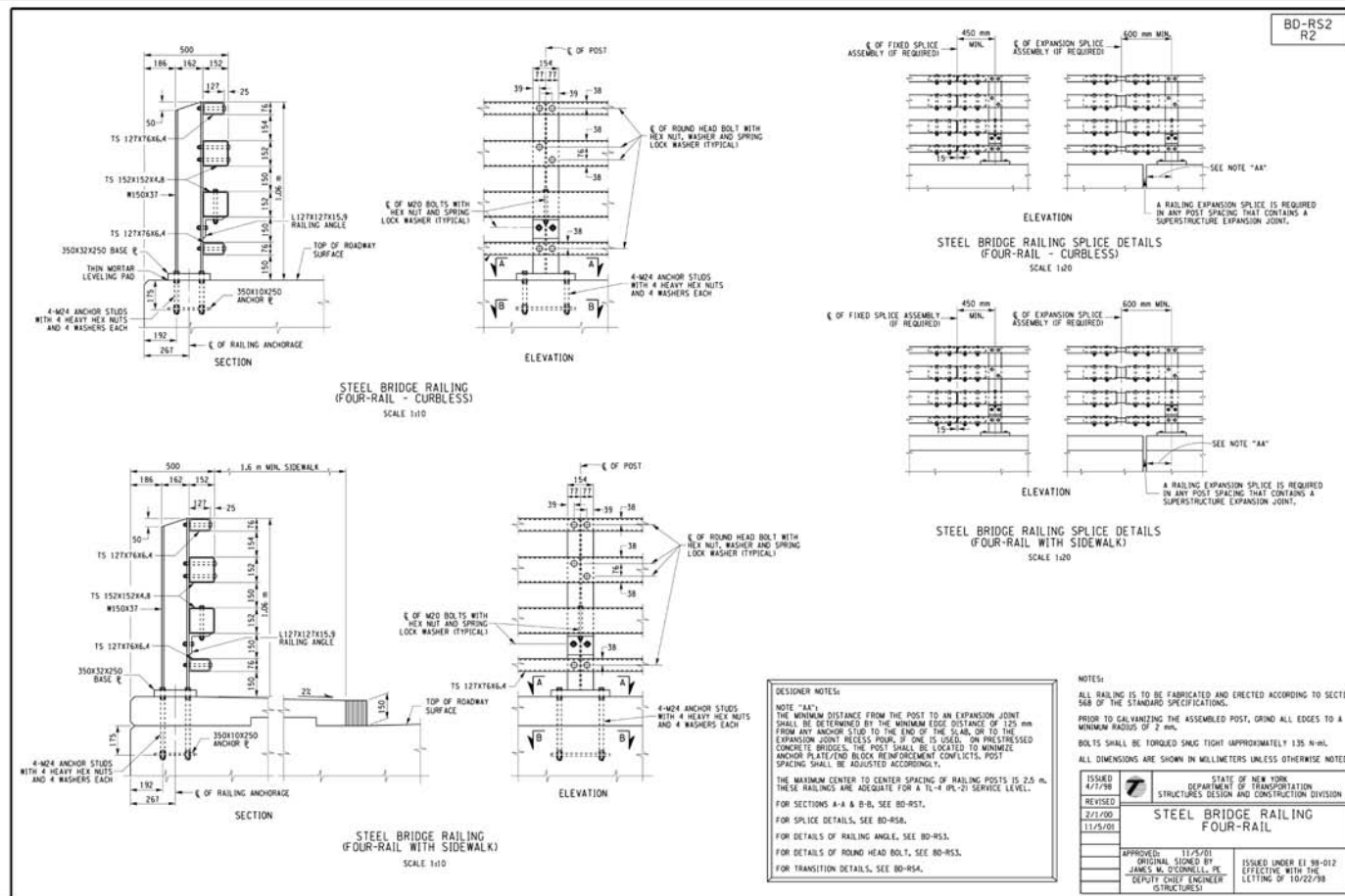
Test level:
TL-4

Utilized in:
New York

Contact:
Harry White
New York State Dept
of Transportation
1220 Washington Avenue
Albany, NY 12232
(518) 485-1148



Four-Rail Barrier



Five-Rail Barrier

Height:
56"

Cost per linear foot:
\$382

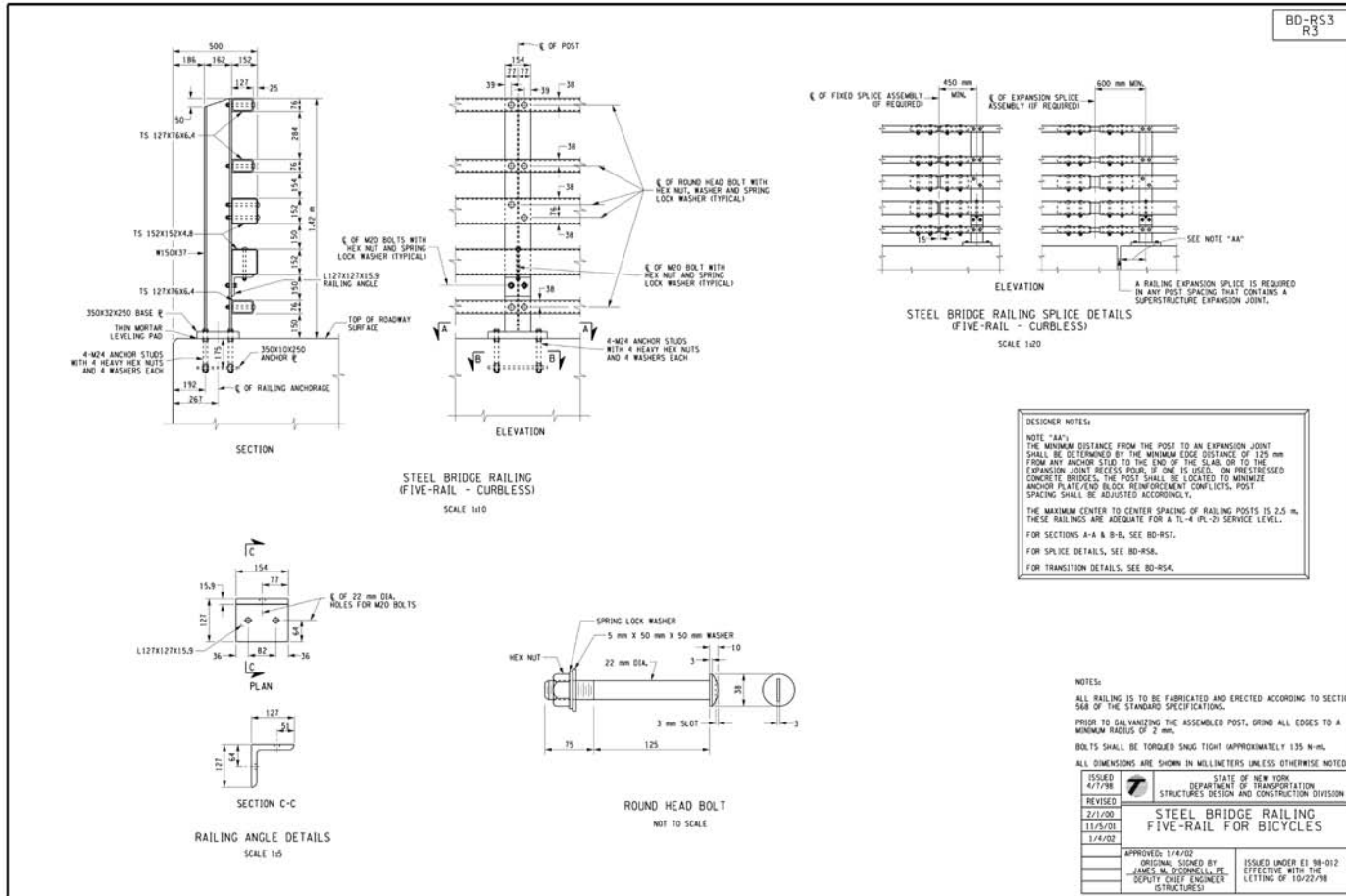
Test level:
TL-4

Utilized in:
New York

Contact:
Harry White
New York State Dept
of Transportation
1220 Washington Avenue
Albany, NY 12232
(518) 485-1148



Five-Rail Barrier



BD-RS3
R3

DESIGNER NOTES:

NOTE "AA":
THE MINIMUM DISTANCE FROM THE POST TO AN EXPANSION JOINT SHALL BE DETERMINED BY THE MINIMUM EDGE DISTANCE OF 129 mm FROM ANY ANCHOR STUD TO THE END OF THE SLAB, OR TO THE EXPANSION JOINT RECESS POLE, IF ONE IS USED. ON PRESTRESSED CONCRETE BRIDGES, THE POST SHALL BE LOCATED TO MINIMIZE ANCHOR PLATE/REINFORCING CONFLICTS. POST SPACING SHALL BE ADJUSTED ACCORDINGLY.

THE MAXIMUM CENTER TO CENTER SPACING OF RAILING POSTS IS 2.5 m. THESE RAILINGS ARE ADEQUATE FOR A TL-4 UPL-20 SERVICE LEVEL.

FOR SECTIONS A-A & B-B, SEE BD-RS7.

FOR SPLICE DETAILS, SEE BD-RS4.

FOR TRANSITION DETAILS, SEE BD-RS4.

NOTES:

ALL RAILING IS TO BE FABRICATED AND ERECTED ACCORDING TO SECTION 508 OF THE STANDARD SPECIFICATIONS.

PRIOR TO GALVANIZING THE ASSEMBLED POST, GRIND ALL EDGES TO A MINIMUM RADIUS OF 2 mm.

BOLTS SHALL BE TORQUED SNUG TIGHT (APPROXIMATELY 135 N-m).

ALL DIMENSIONS ARE SHOWN IN MILLIMETERS UNLESS OTHERWISE NOTED.

ISSUED 4/7/98	STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION STRUCTURES DESIGN AND CONSTRUCTION DIVISION
REVISED 12/1/00	STEEL BRIDGE RAILING FIVE-RAIL FOR BICYCLES
11/8/01	
1/4/02	
APPROVED: 1/4/02	ISSUED UNDER E1 98-012
ORIGINAL SIGNED BY JAMES M. O'CONNELL, PE	EFFECTIVE WITH THE LETTING OF 10-22-98
DEPUTY CHIEF ENGINEER STRUCTURES	

Oregon 2-Tube Curb Mount

Height:
32"

Cost per linear foot:
\$90

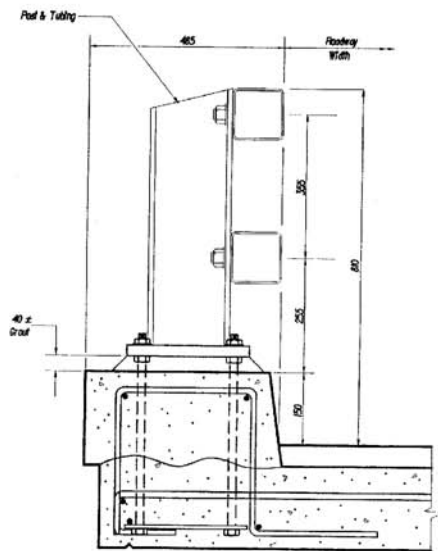
Test level:
TL-2

Utilized in:
Oregon

Contact:
Antony P. Stratis, P.E.
Tech Center Bridge Manager
Region 1
123 NW Flanders Street
Portland, OR 97209
(503) 731-8490



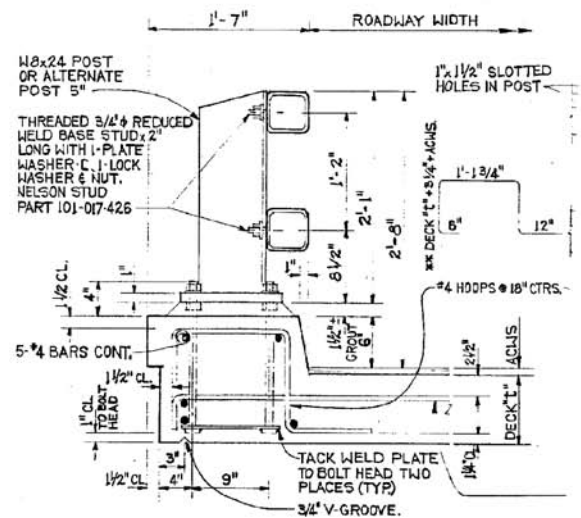
Oregon 2-Tube Curb Mount



All Dimensions Shown Are mm unless Otherwise Noted.

CURB MOUNT-POST DETAIL

FIGURE D.5 2-Tube Curb-Mounted Bridge Railing



CURB MOUNT-POST DET

1 1/2" = 1'-0" (1 = 8)

FIGURE D.5 Oregon 2-Tube Curb Mounted Bridge Railing

Rail Height	810 mm	
Test Vehicle	905-kg Car	2107-kg Car
Impact Speed km/h	94	97
Impact Angle Degrees	18.8	25

Oregon 3-Tube Curb Mount

Height:
42"

Cost per linear foot:
\$80

Test level:
TL-4

Utilized in:
Oregon

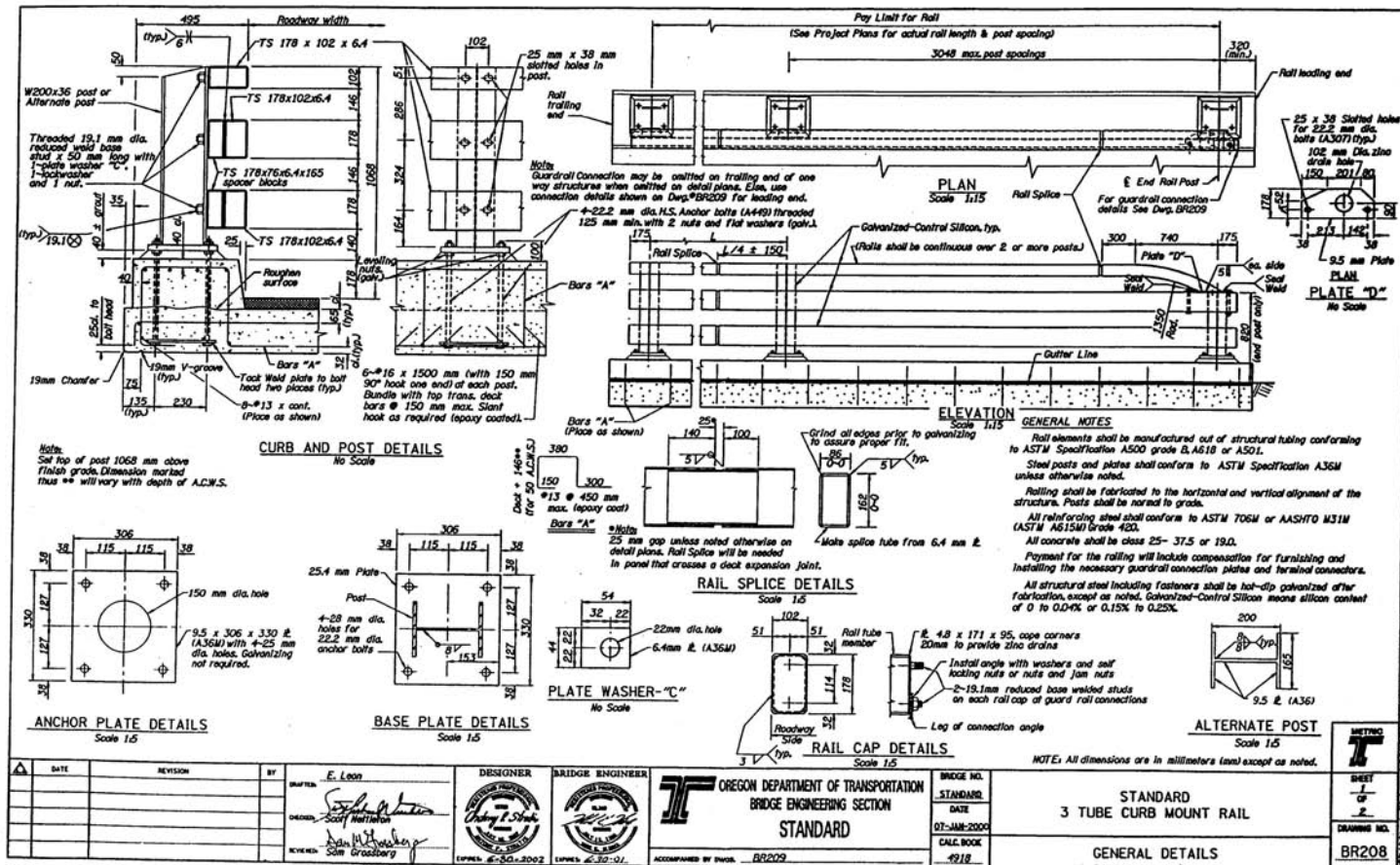
Contact:
Antony P. Stratis, P.E.
Tech Center Bridge Manager
Region 1
123 NW Flanders Street
Portland, OR 97209
(503) 731-8490



Section 3

Steel Tube Bridge Rail, Attached to Curb

Oregon 3-Tube Curb Mount



Section **3**

Steel Tube Bridge Rail, Attached to Curb

Wyoming 2-Tube Steel Railing

Height:
32"

Cost per linear foot:
\$55

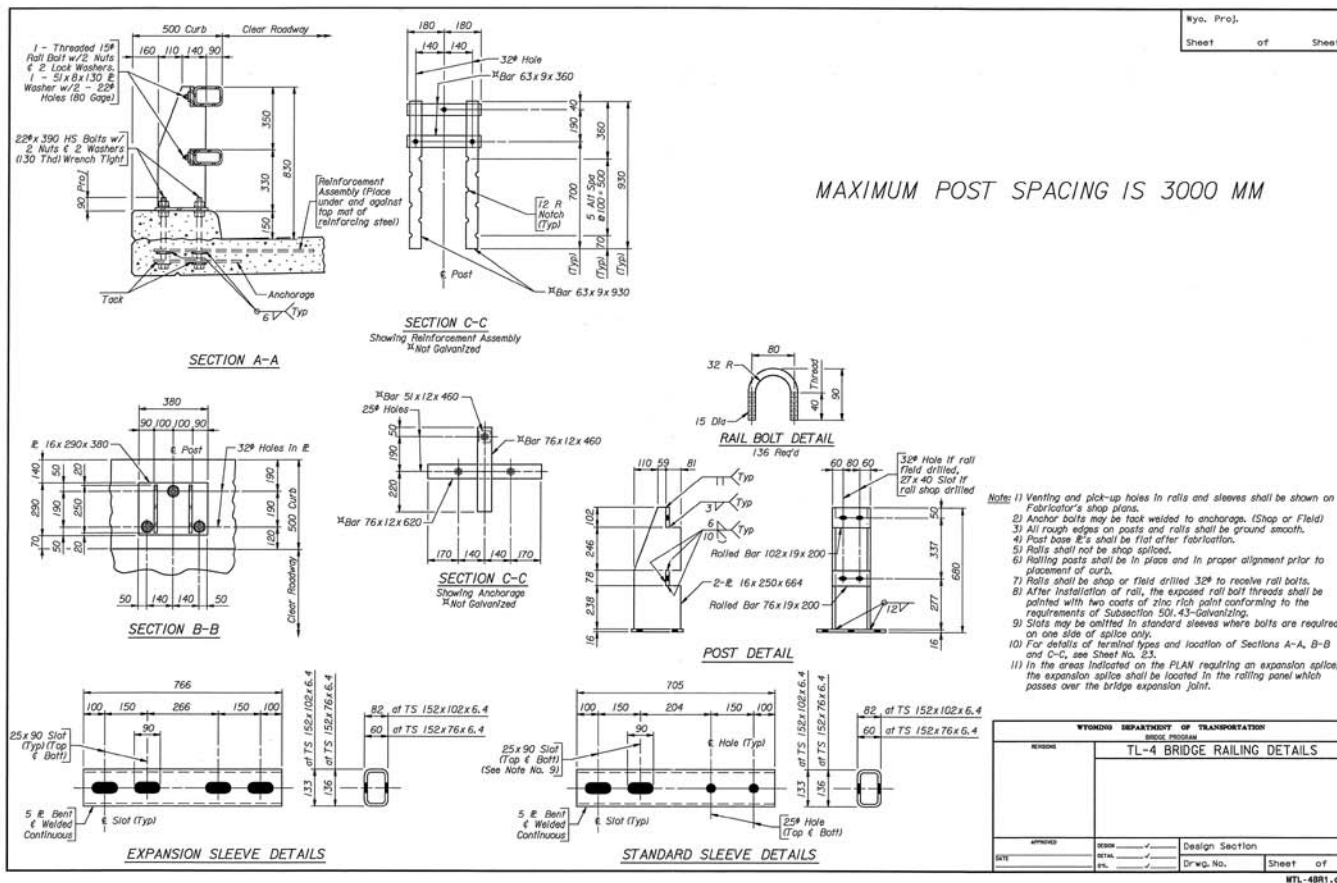
Test level:
TL-4

Utilized in:
Wyoming

Contact:
Lee Potter, P.E.
Federal Highway Admin,
Wyoming Division
2617 E. Lincolnway, Suite D
Cheyenne, WY 82001
(307) 772-2004 ext 146



Wyoming 2-Tube Steel Railing



Wyoming 2-Tube, Curb-Mounted

Height:
29"

Cost per linear foot:
\$53

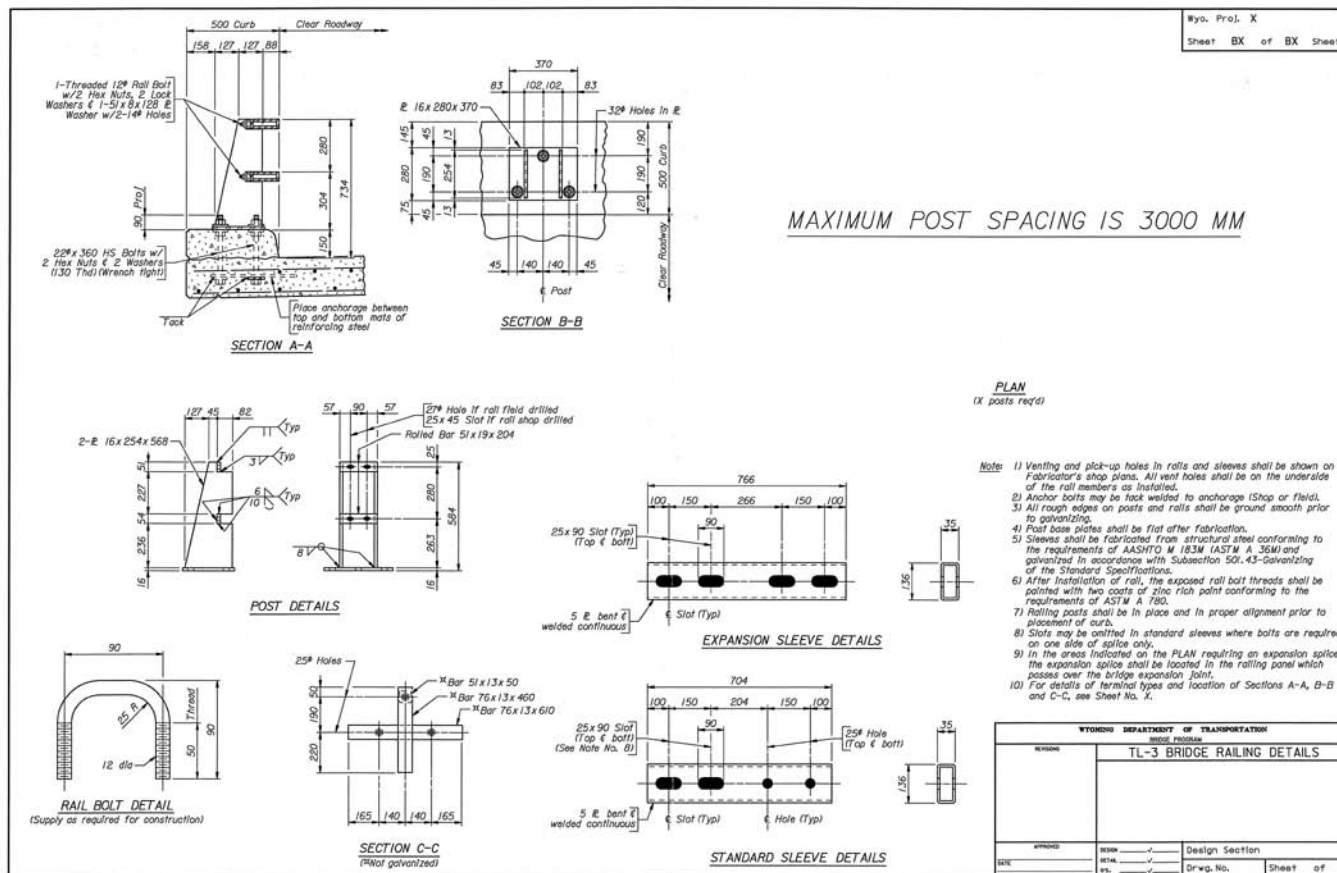
Test level:
TL-3

Utilized in:
Wyoming

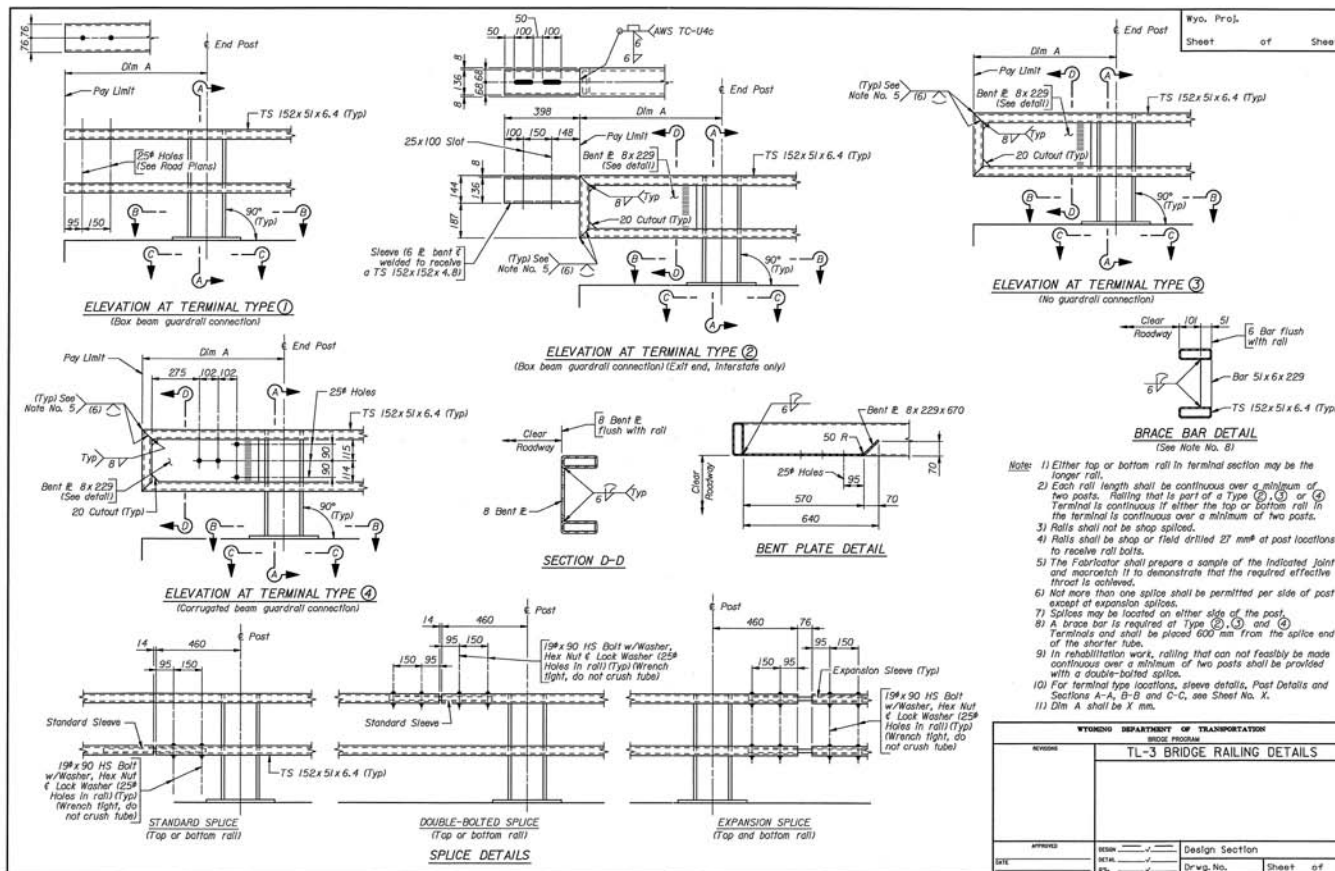
Contact:
Lee Potter, P.E.
Federal Highway Admin,
Wyoming Division
2617 E. Lincolnway, Suite D
Cheyenne, WY 82001
(307) 772-2004 ext 146



Wyoming 2-Tube, Curb-Mounted



2-Tube, Curb-Mounted



Section 4

VERTICAL CONCRETE PARAPET



Section 4

VERTICAL CONCRETE PARAPET

Name	Location	Test Level
32" New Jersey Shape Concrete Barrier	California	TL-4
Type 80 & 80 SW Concrete Barrier	California	TL-4
Baltimore Washington Parkway Stone Rail	Federal Lands	TL-2
Federal Lands Modified Kansas Corral Bridge Rail	Federal Lands	TL-2
Natchez Trace Concrete Bridge Rail	Federal Lands	TL-2
New Jersey Barrier	Georgia	TL-4
Vertical Parapet with Single-Pipe Aluminum Handrail	Georgia	TL-4
Vertical Parapet with Two-Pipe Aluminum Handrail	Georgia	TL-2

Section 4

VERTICAL CONCRETE PARAPET

Name	Location	Test Level
Vertical Parapet with Security Fence	Georgia	TL-4
Iowa Concrete Open Railing	Iowa	TL-2
Iowa Concrete Block Railing Retrofit	Iowa	TL-4
Modified Kansas Corral Rail	Kansas	TL-2
Kansas 32" Corral Rail	Kansas	TL-4
42" Single Slope Concrete Barrier	Missouri	TL-5
Concrete Beam and Post	Nebraska	TL-2
Nebraska Open Concrete Bridge Rail	Nebraska	TL-4
TR1 Modified Bridge Rail	Oklahoma	TL-2

Section 4

VERTICAL CONCRETE PARAPET

Subsection	Name	Location	Test Level
	Parapet Flush Mount	Oregon	TL-4
	Parapet Sidewalk Mount	Oregon	TL-4
	Type T501SW	Texas	TL-4
	Type C411	Texas	TL-2
	Type T203	Texas	TL-3
	Texas Type T411 Aesthetic Rail	Texas	TL-2
	Texas TT Rail	Texas	TL-6
	NJ Barrier	Missouri	TL-4
Vertical Concrete Parapet with Aluminum Tube Bridge Rail	New Jersey Concrete Barrier	California	TL-4
	Type 26 Concrete Barrier with Sidewalk	California	TL-2

Section 4

VERTICAL CONCRETE PARAPET

Subsection	Name	Location	Test Level
Vertical Concrete Parapet with Aluminum Tube Bridge Rail	Type 732 Concrete Barrier	California	TL-4
	Type 736 Concrete Barrier	California	TL-4
	Type 742 Concrete Barrier	California	TL-5
Aluminum Tube Bridge Rails	LB Foster Precast NJ Shape, Bolted Down	New Jersey	TL-4
	California Type 20	California	TL-3
New Jersey Barrier with Rail	New Jersey Barrier w/22" Steel Bicycle Rail	Georgia	TL-4
	Bicycle Rail Attachment to Safety Shape Concrete Rail	Minnesota	TL-4
	New Jersey Safety Shape Parapet	Nevada	TL-3
	Type HT	Texas	TL-5
	Type T501	Texas	TL-6

32" New Jersey Shape Concrete Barrier

Height:
32"

Cost per linear foot:
\$47

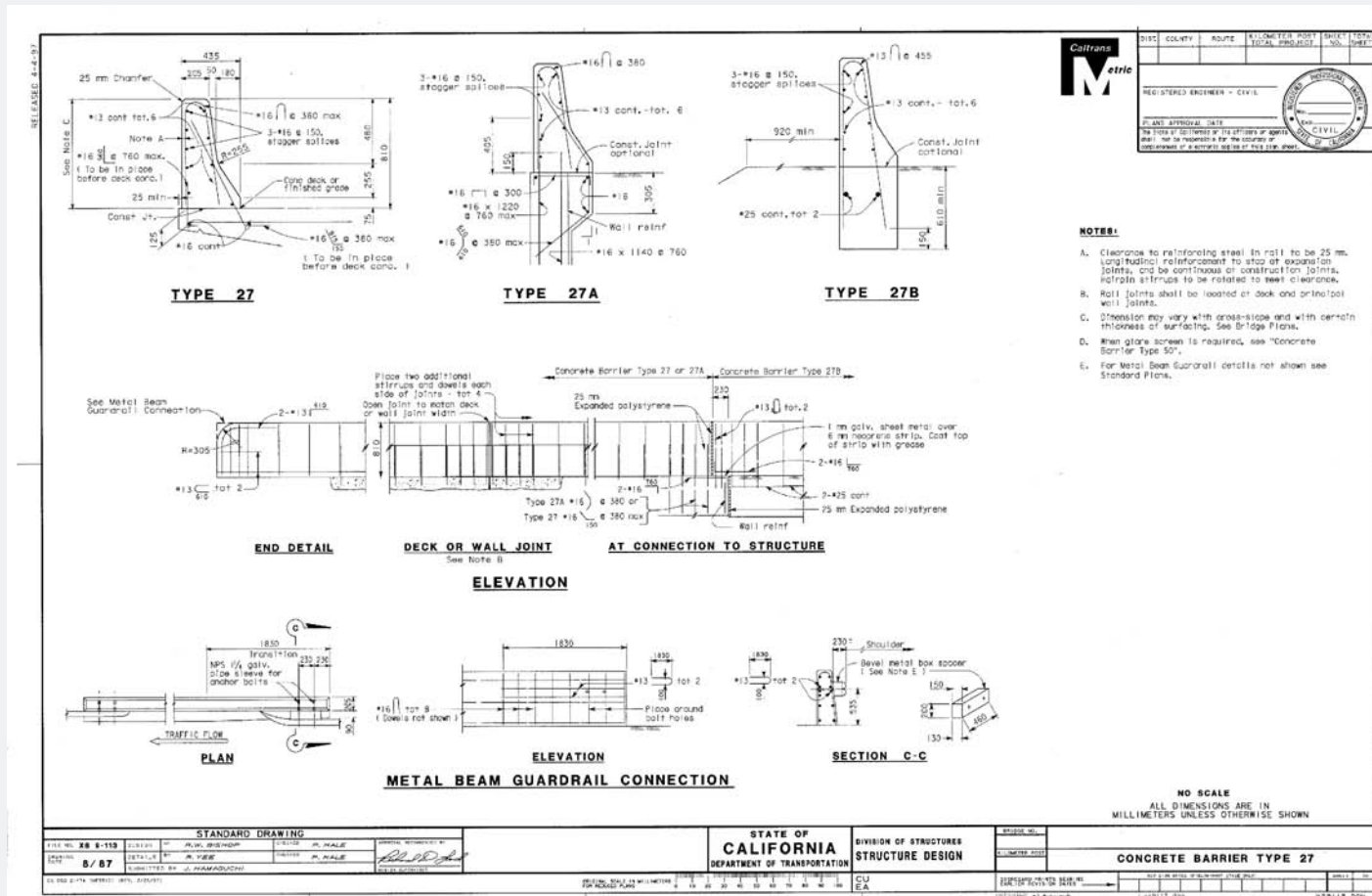
Test level:
TL-4

Utilized in:
California

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



32" New Jersey Shape Concrete Barrier



Type 80 and 80 SW Concrete Barrier

Height:
32"

Cost per linear foot:
\$150

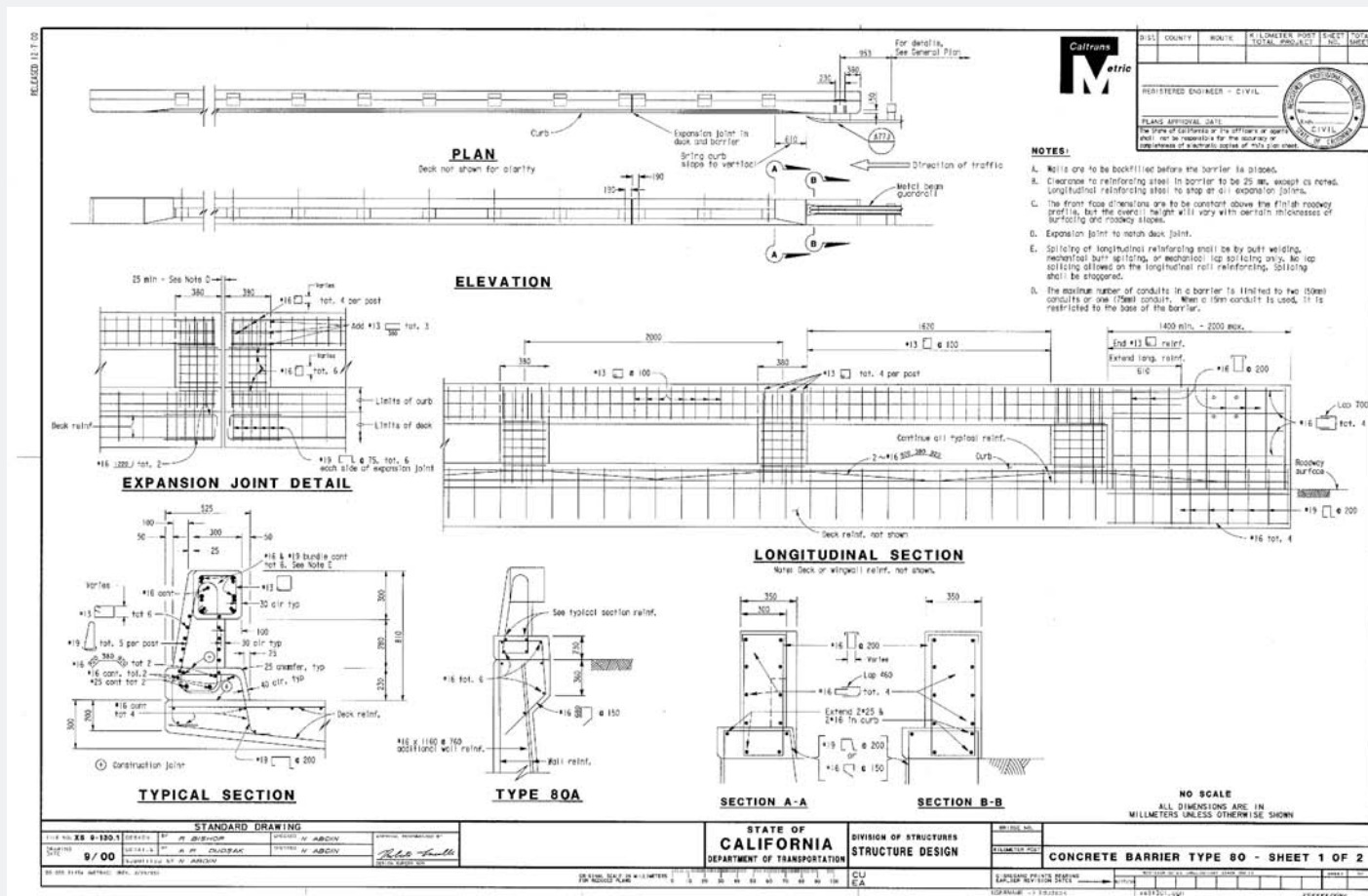
Test level:
TL-4

Utilized in:
California

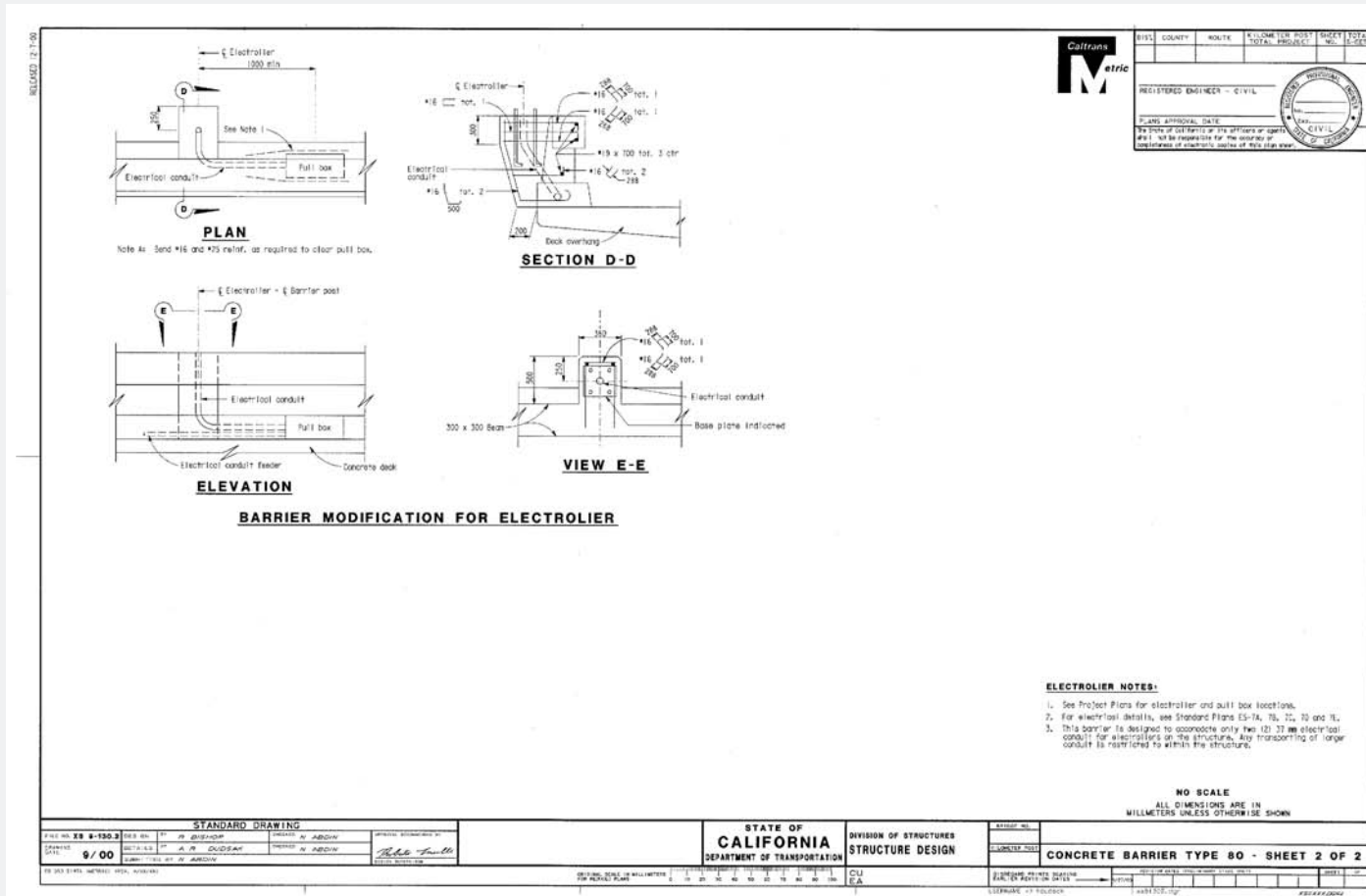
Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



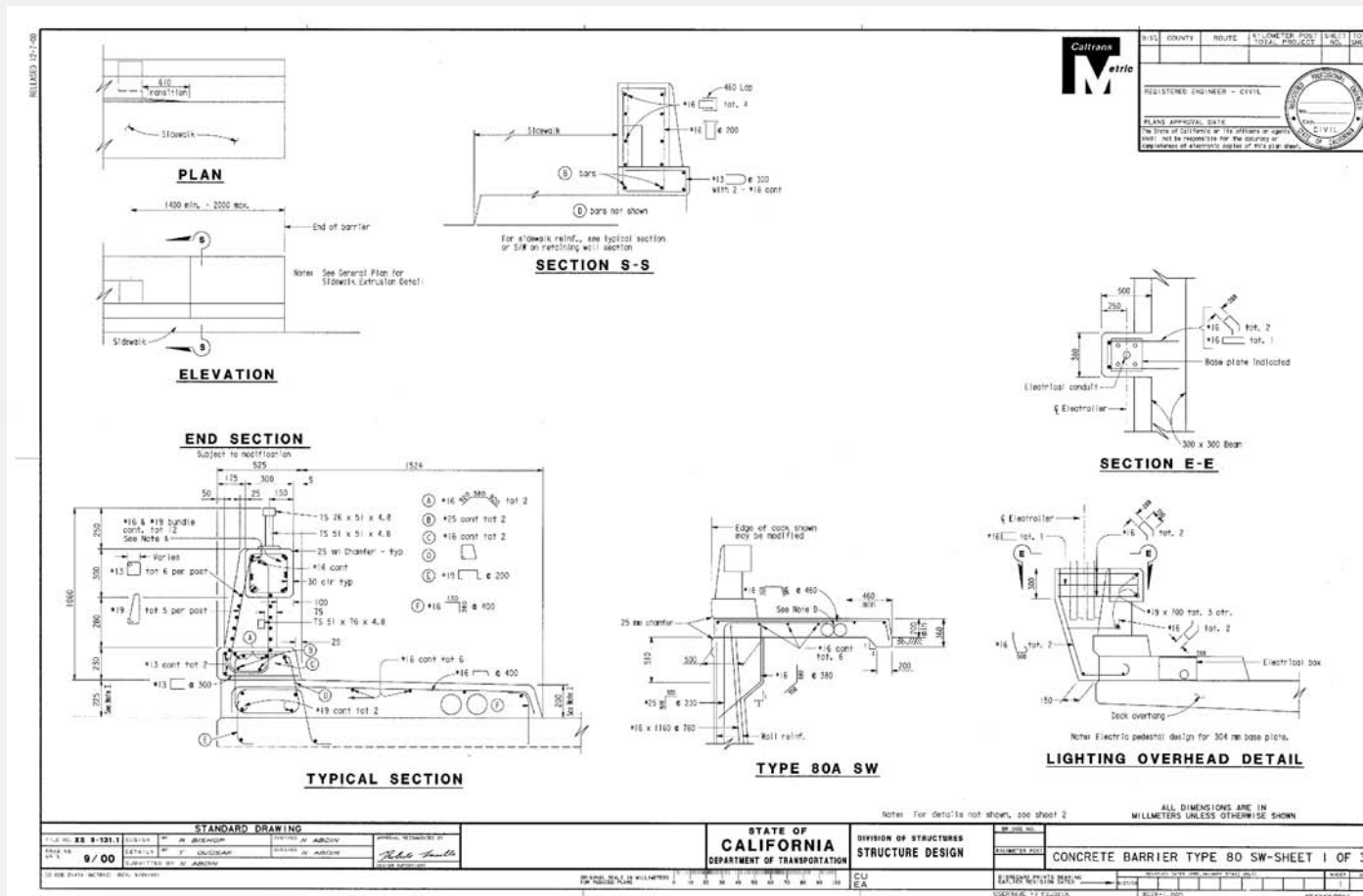
Type 80 and 80 SW Concrete Barrier



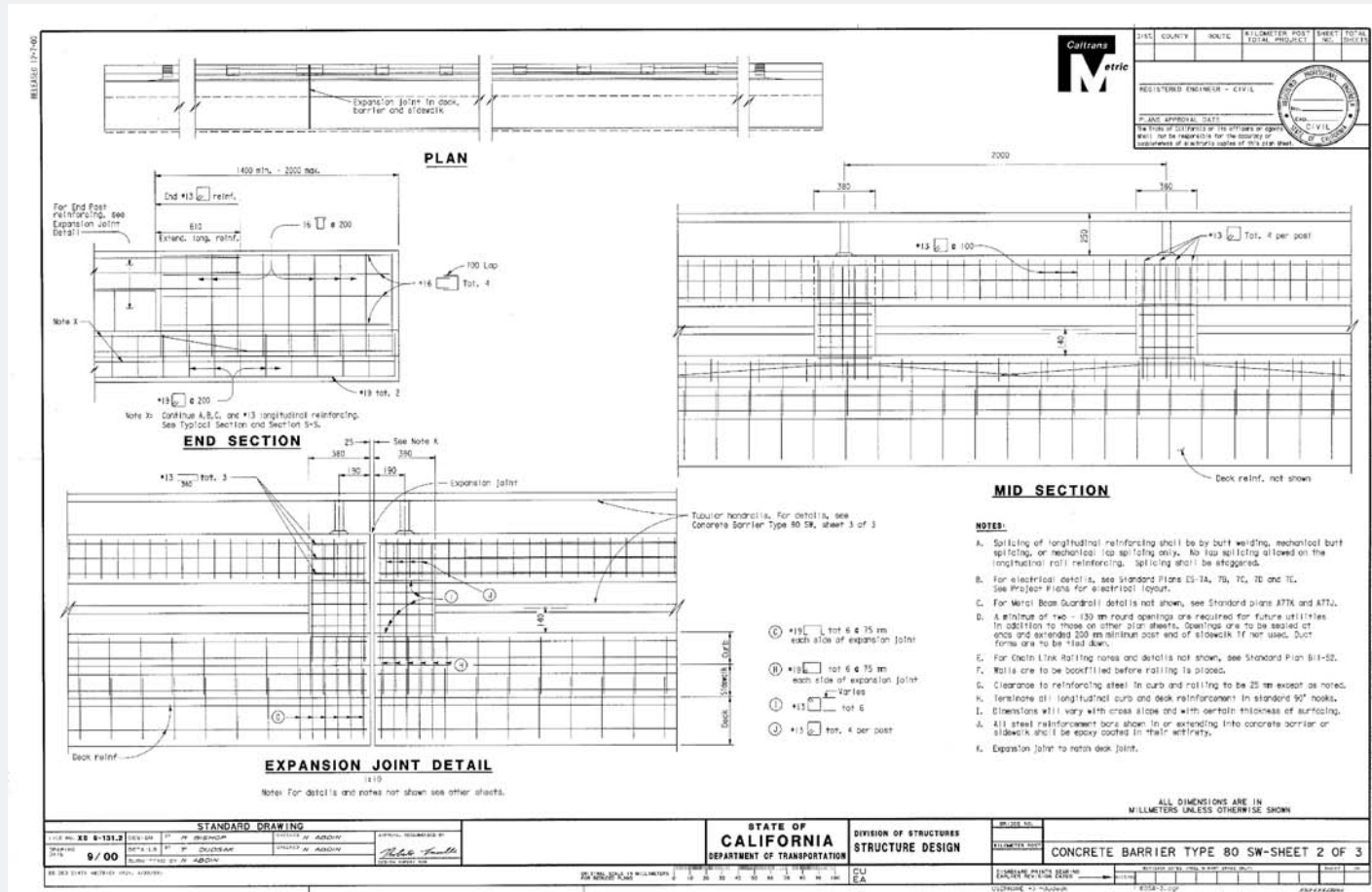
Type 80 and 80 SW Concrete Barrier



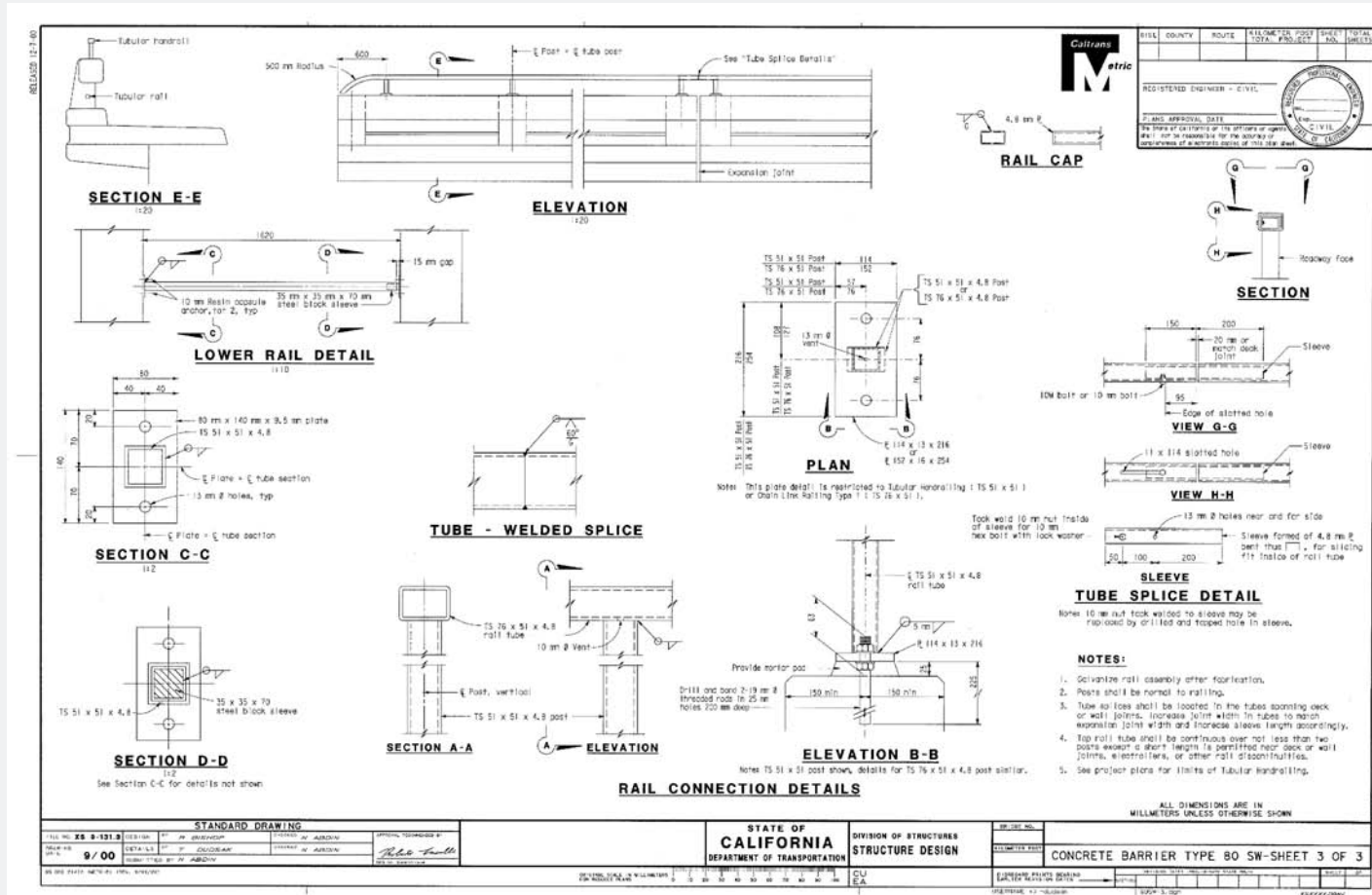
Type 80 and 80 SW Concrete Barrier



Type 80 and 80 SW Concrete Barrier



Type 80 and 80 SW Concrete Barrier



Baltimore Washington Parkway Stone Rail

Height:
32"

Cost per linear foot:
\$300

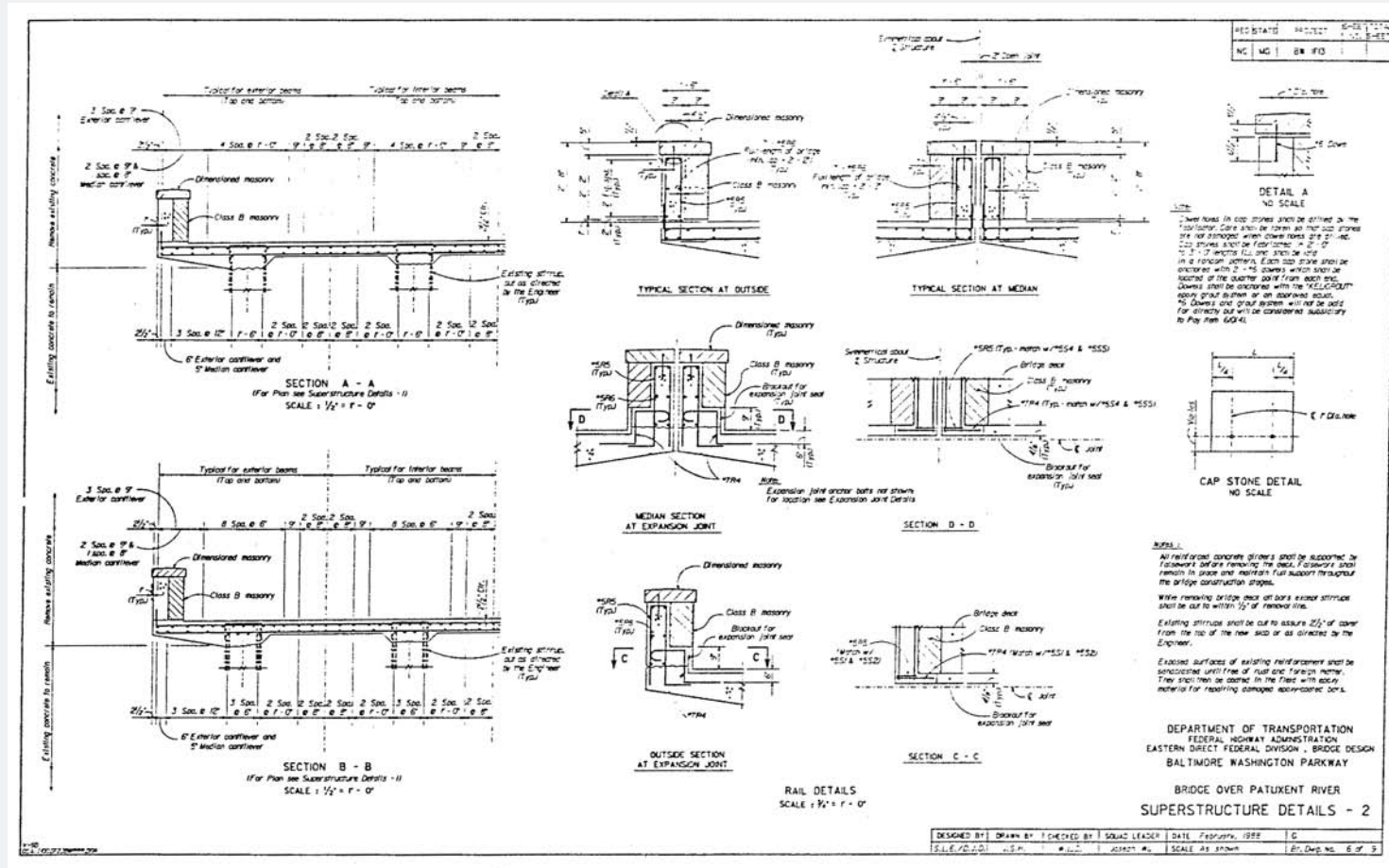
Test level:
TL-3

Utilized in:
Baltimore Washington
Parkway, Maryland

Contact:
Mark Clabaugh, P.E.
Federal Lands Bridge Office
21400 Ridgetop Circle
Sterling, VA 20166
(703) 404-6235



Baltimore Washington Parkway Stone Rail



Federal Lands Modified Kansas Corral Bridge Rail

Height:
27"

Cost per linear foot:
\$90

Test level:
TL-2

Utilized in:
Federal Lands

Contact:
Mark Clabaugh, P.E.
Federal Lands Bridge Office
21400 Ridgetop Circle
Sterling, VA 20166
(703) 404-6235



Natchez Trace Concrete Bridge Rail

Height:
32.5"

Cost per linear foot:
\$90

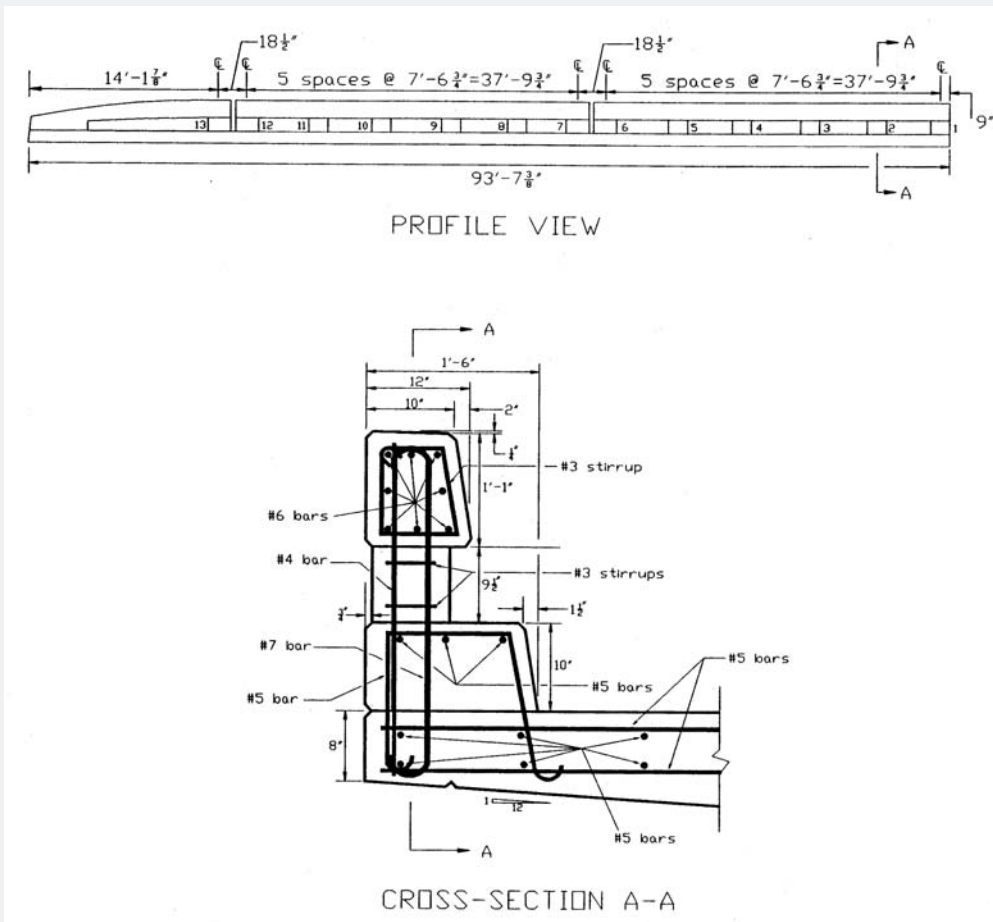
Test level:
TL-3

Utilized in:
Federal Lands

Contact:
Mark Clabaugh, P.E.
Federal Lands Bridge Office
21400 Ridgetop Circle
Sterling, VA 20166
(703) 404-6235



Natchez Trace Concrete Bridge Rail



New Jersey Barrier

Height:
32"

Cost per linear foot:
\$34

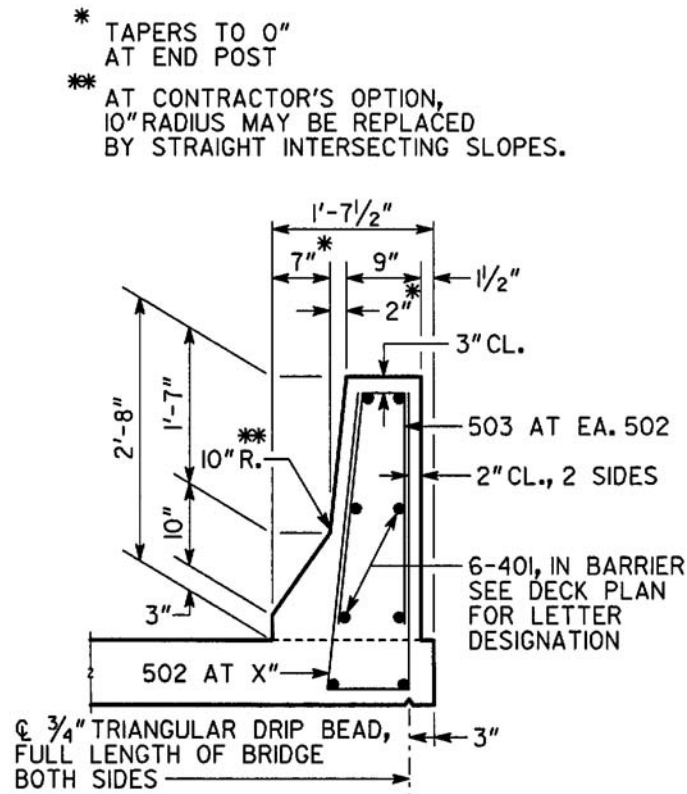
Test level:
TL-4

Utilized in:
Georgia

Contact:
Paul Liles
Georgia Dept of Transportation
No. 2 Capitol Square, SW
Atlanta, GA 30334
(404) 656-5280



New Jersey Barrier



New Jersey Concrete Barrier

Vertical Parapet with Single-Pipe Aluminum Handrail

Height:
42"

Cost per linear foot:
\$80

Test level:
TL-4

Utilized in:
Georgia

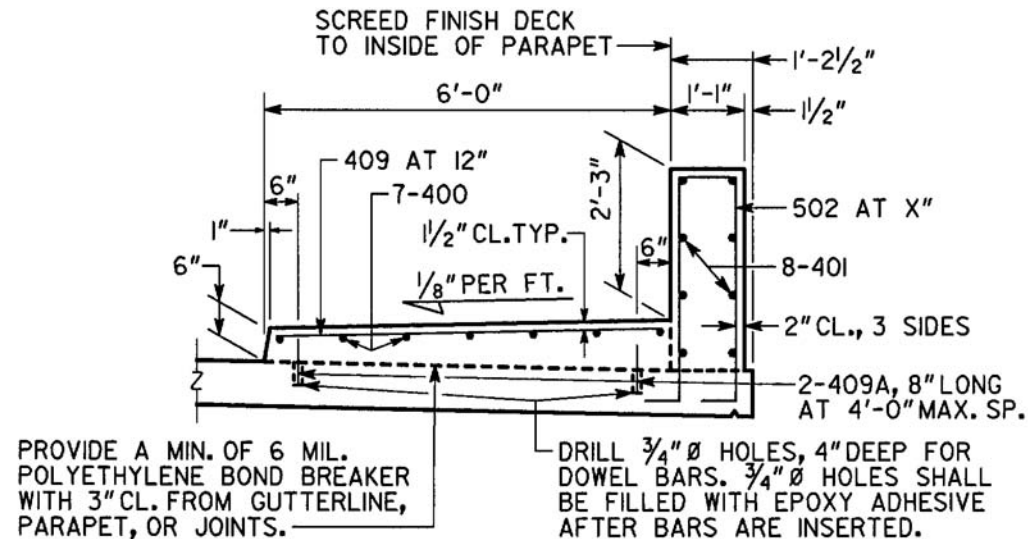
Contact:
Paul Liles
Georgia Dept of Transportation
No. 2 Capitol Square, SW
Atlanta, GA 30334
(404) 656-5280



Vertical Parapet with Single-Pipe Aluminum Handrail

PLACE TRANSVERSE SIDEWALK MARKINGS
ON SIDEWALK SPACED AT 5'-0"±.

COST OF BOND BREAKER AND EPOXY ADHESIVE TO BE
INCLUDED IN PRICE BID FOR SUPERSTRUCTURE ITEMS.



2'-3" Vertical Parapet and Sidewalk
(Used With 1'-3" Single Pipe Aluminum Hand Rail)

Vertical Parapet with Two-Pipe Aluminum Handrail

Height:
42"

Cost per linear foot:
\$90

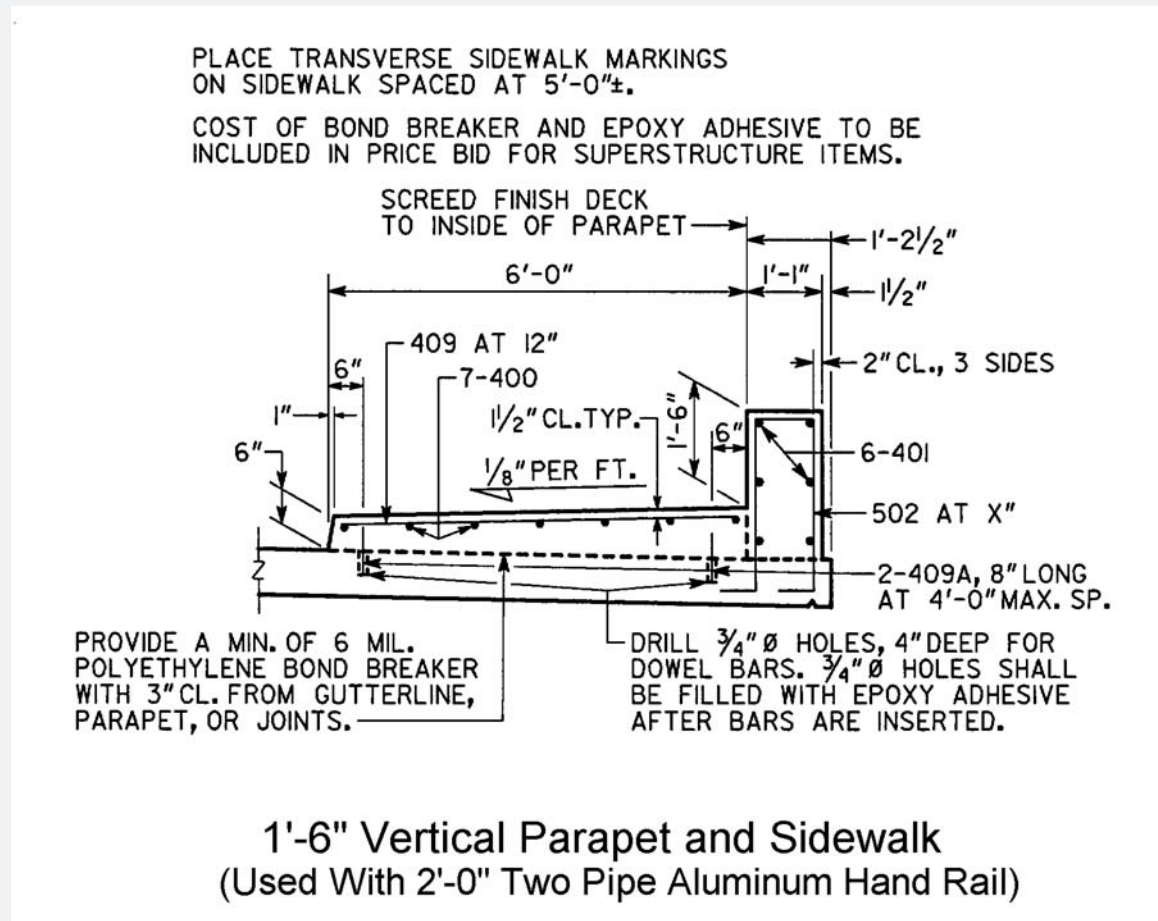
Test level:
TL-2

Utilized in:
Georgia

Contact:
Paul Liles
Georgia Dept of Transportation
No. 2 Capitol Square, SW
Atlanta, GA 30334
(404) 656-5280



Vertical Parapet with Two-Pipe Aluminum Handrail



Vertical Parapet with Security Fence

Height:
34"

Cost per linear foot:
\$55

Test level:
TL-4

Utilized in:
Georgia

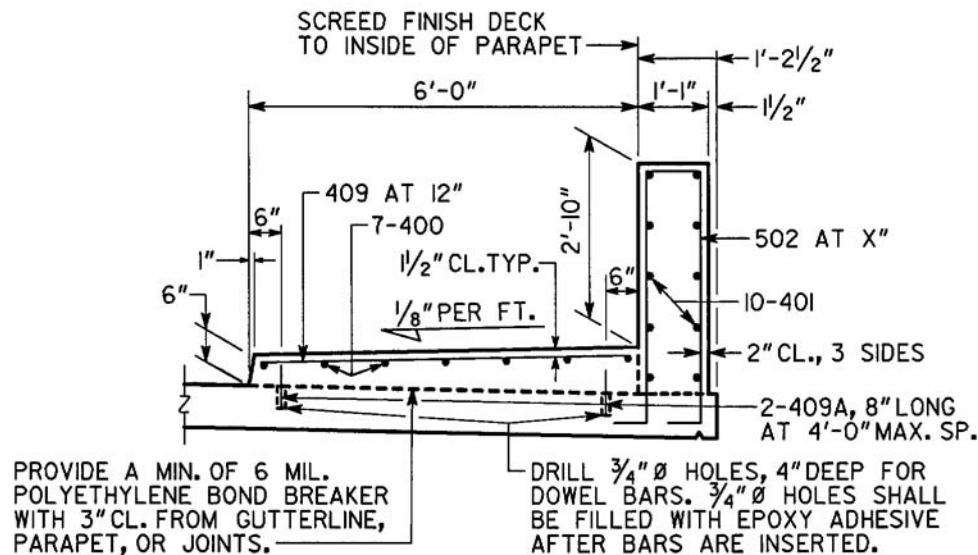
Contact:
Paul Liles
Georgia Dept of Transportation
No. 2 Capitol Square, SW
Atlanta, GA 30334
(404) 656-5280



Vertical Parapet with Security Fence

PLACE TRANSVERSE SIDEWALK MARKINGS
ON SIDEWALK SPACED AT 5'-0"±.

COST OF BOND BREAKER AND EPOXY ADHESIVE TO BE
INCLUDED IN PRICE BID FOR SUPERSTRUCTURE ITEMS.

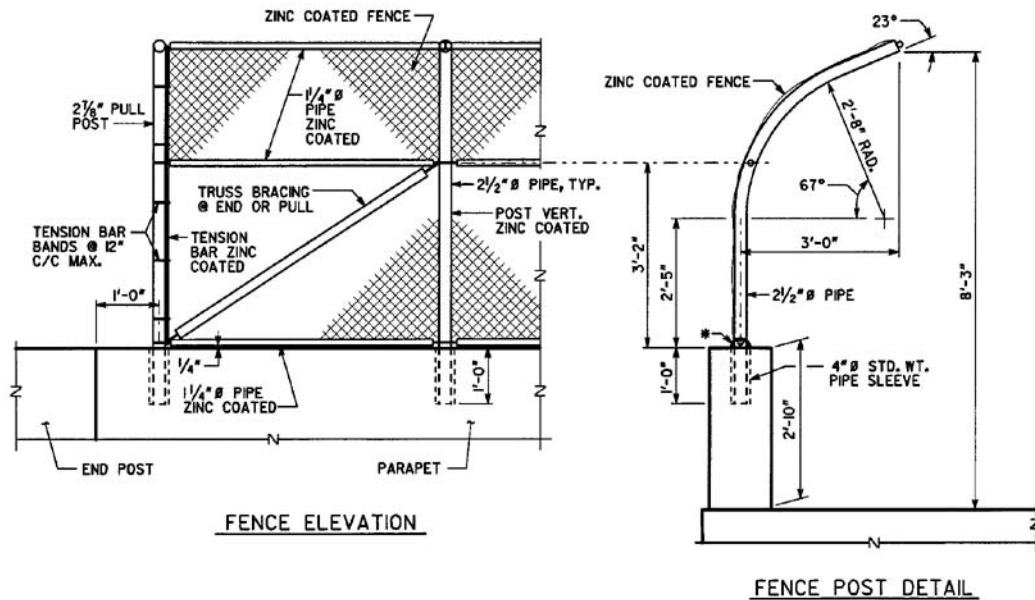


2'-10" Vertical Parapet and Sidewalk
(Used With Security Fence)

Vertical Parapet with Security Fence

FENCE NOTES:

1. FENCE SHALL BE 9 GAGE CHAIN LINK ZINC COATED TWO INCH SECURITY FENCE.
2. 4"Ø SLEEVE SHALL BE CAST IN THE PARAPET. NON-SHRINK GROUT SHALL BE ALLOWED TO CURE FOR THREE DAYS BEFORE FENCE FABRIC IS INSTALLED.
3. PROVIDE EXPANSION SLEEVE FOR ALL RAILS TO MATCH SUPERSTRUCTURE JOINTS.
4. FOR POST SPACING, SEE BRIDGE SHEET X.
5. FOR FURTHER DETAILS, SEE GEORGIA DOT SPECIFICATIONS SECTIONS 643 AND 894.
6. FABRIC SHALL BE FASTENED TO POST AT INTERVALS NOT GREATER THAN 14".



* NON-SHRINK PORTLAND CEMENT GROUT, TROWEL TO PROVIDE POSITIVE DRAINAGE.

Iowa Concrete Open Railing

Height:
29"

Cost per linear foot:
\$36

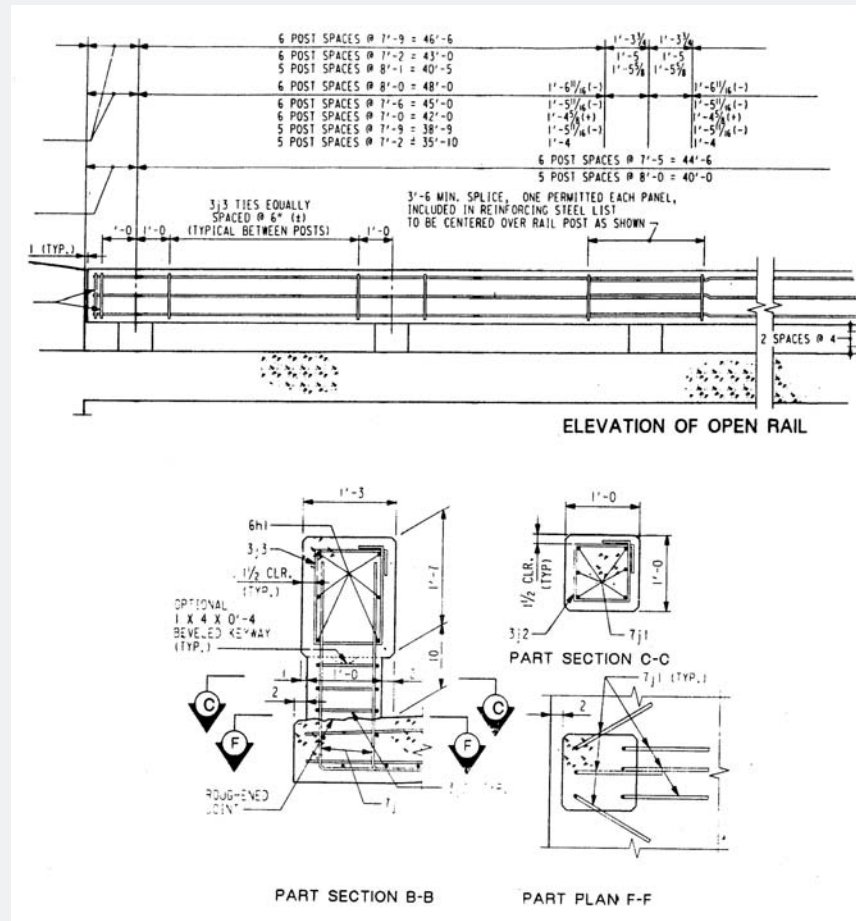
Test level:
TL-2

Utilized in:
Iowa

Contact:
Norman McDonald
Iowa Dept of Transportation
800 Lincoln Way
Ames, IA 50010
(515) 239-1101



Iowa Concrete Open Railing



Iowa Concrete Block Railing Retrofit

Height:
34"

Cost per linear foot:
\$40

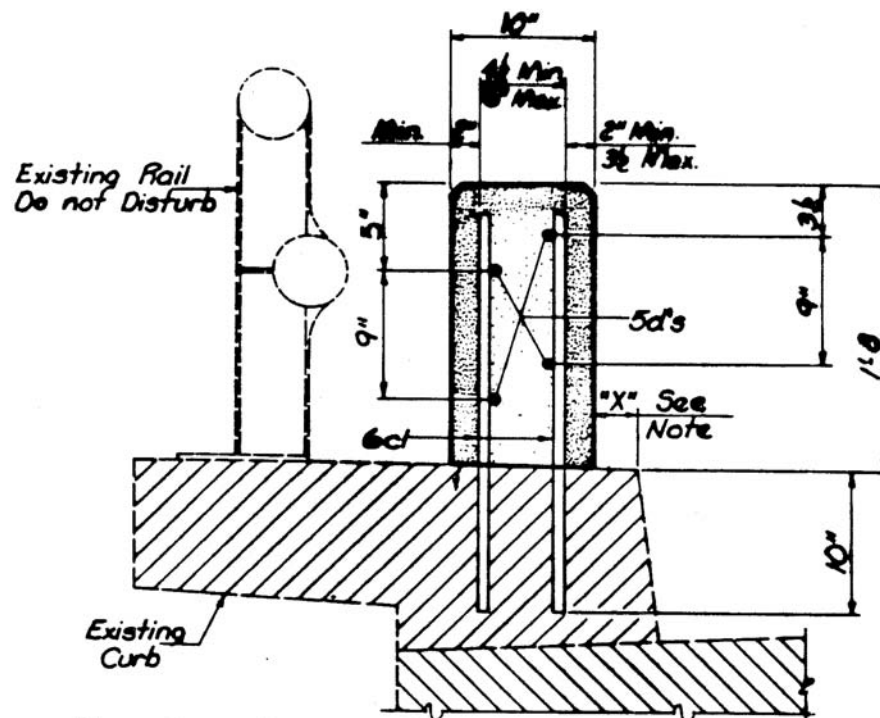
Test level:
TL-4

Utilized in:
Iowa

Contact:
Norman McDonald
Iowa Dept of Transportation
800 Lincoln Way
Ames, IA 50010
(515) 239-1101



Iowa Concrete Block Railing Retrofit



Note: On each side of bridge, Dimension "X" can be a minimum of 1" and a maximum of 3", but must be constant for full length of bridge, however approximately 10 linear feet at either end of rail length shall be transitioned to match existing beam guard rail attachment.

Modified Kansas Corral Rail

Height:
27"

Cost per linear foot:
\$35 (w/out curb)
\$41 (w/ curb)

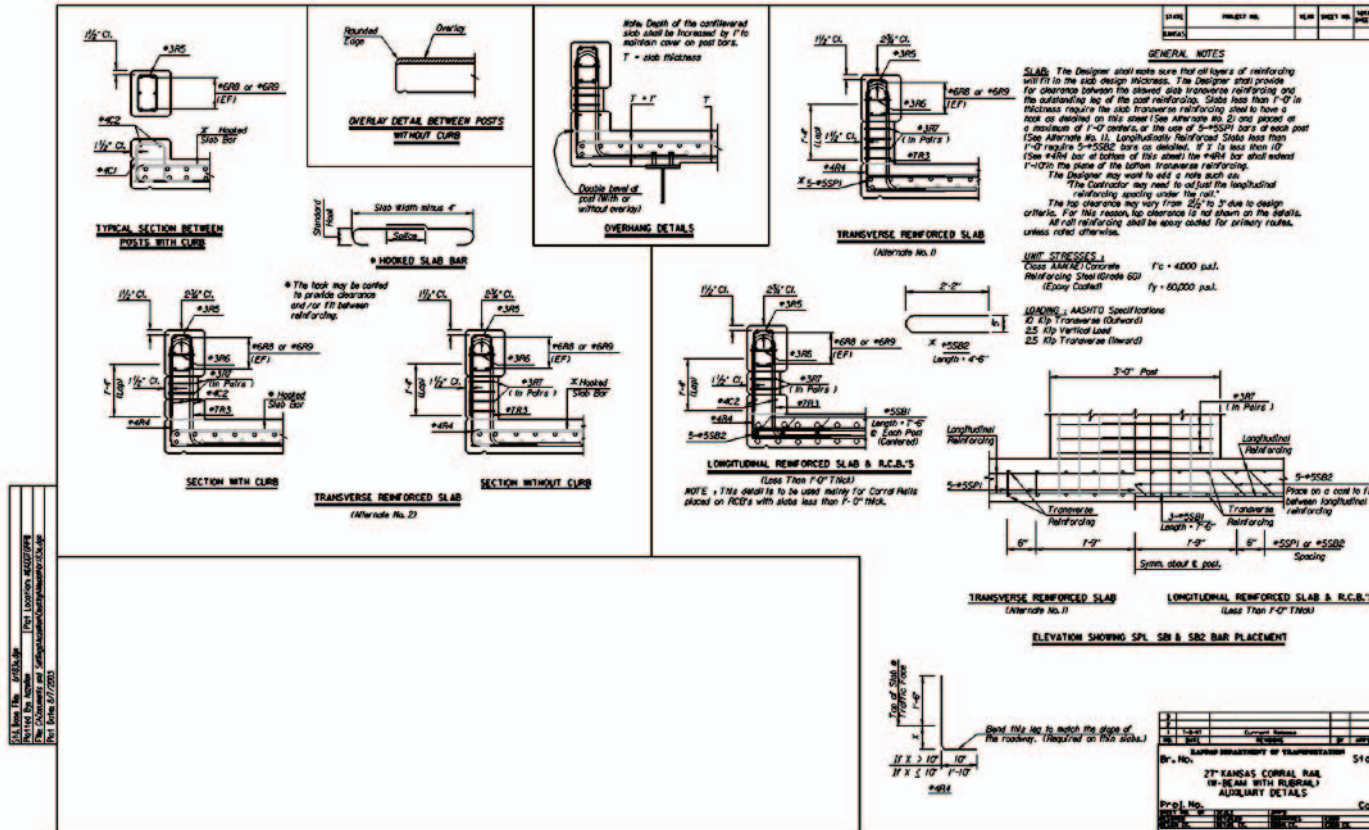
Test level:
TL-2

Utilized in:
Kansas

Contact:
Kenneth F. Hurst
Kansas DOT
700 Harrison, 13th Floor
Topeka, KS 66603-3754
(785) 296-3761



Modified Kansas Corral Rail



Kansas 32" Corral Rail

Height:
32"

Cost per linear foot:
\$42 (w/out curb)
\$48 (w/ curb)

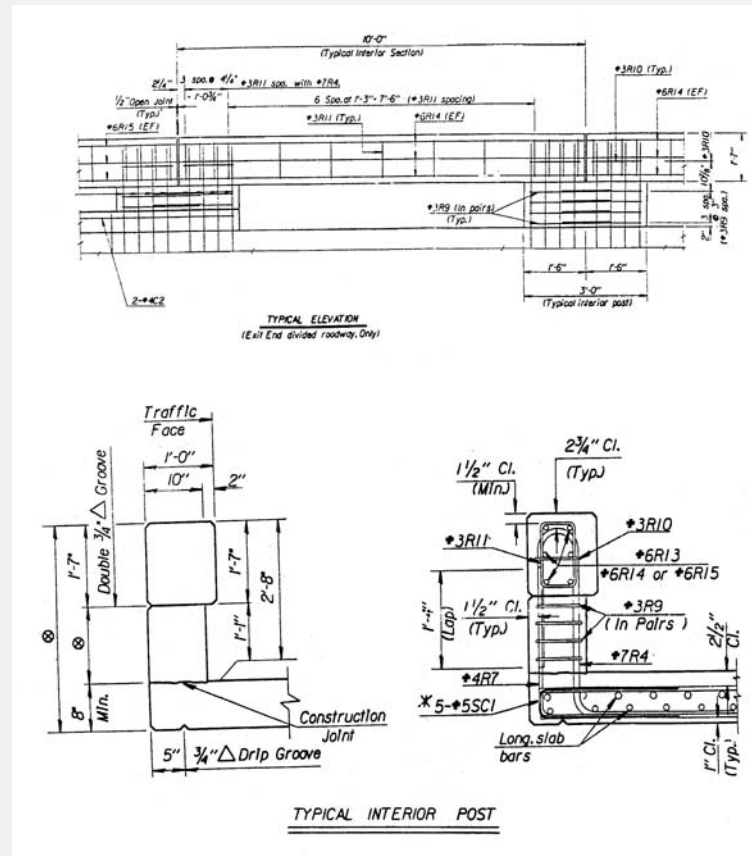
Test level:
TL-4

Utilized in:
Kansas

Contact:
Kenneth F. Hurst
Kansas DOT
700 Harrison, 13th Floor
Topeka, KS 66603-3754
(785) 296-3761



Kansas 32" Corral Rail



42" Single Slope Concrete Barrier

Height:
42"

Cost per linear foot:
\$70-75

Test level:
TL-5

Utilized in:
Missouri

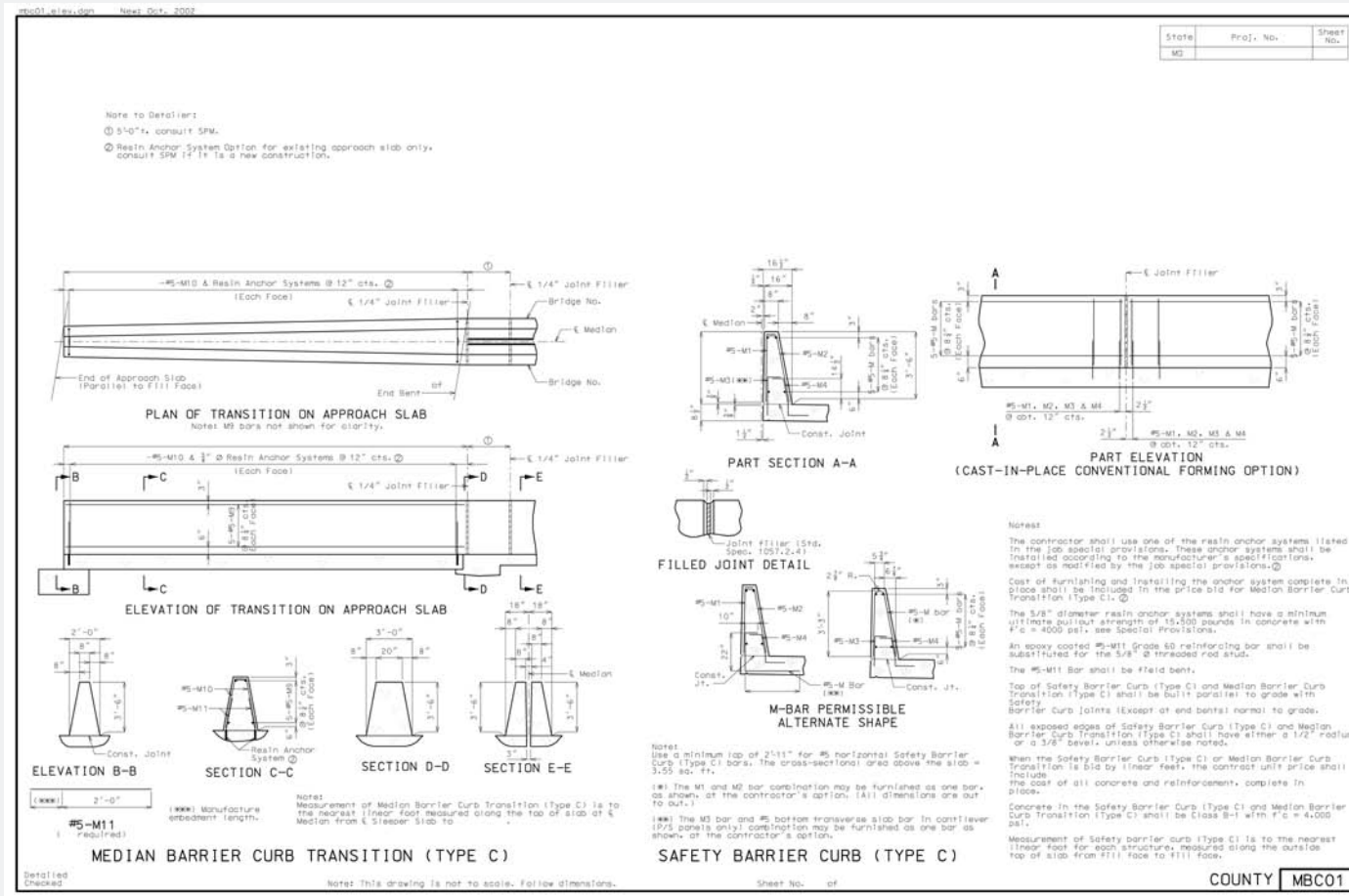
Contact:
Peter Clogston, P.E.
Federal Highway Admin,
Missouri Division Office
209 Adams Street
Jefferson City, MO 65101
(573) 638-2613



Section 4

Vertical Concrete Parapet

42" Single Slope Concrete Barrier



Concrete Beam and Post

Height:
29"

Cost per linear foot:
\$__

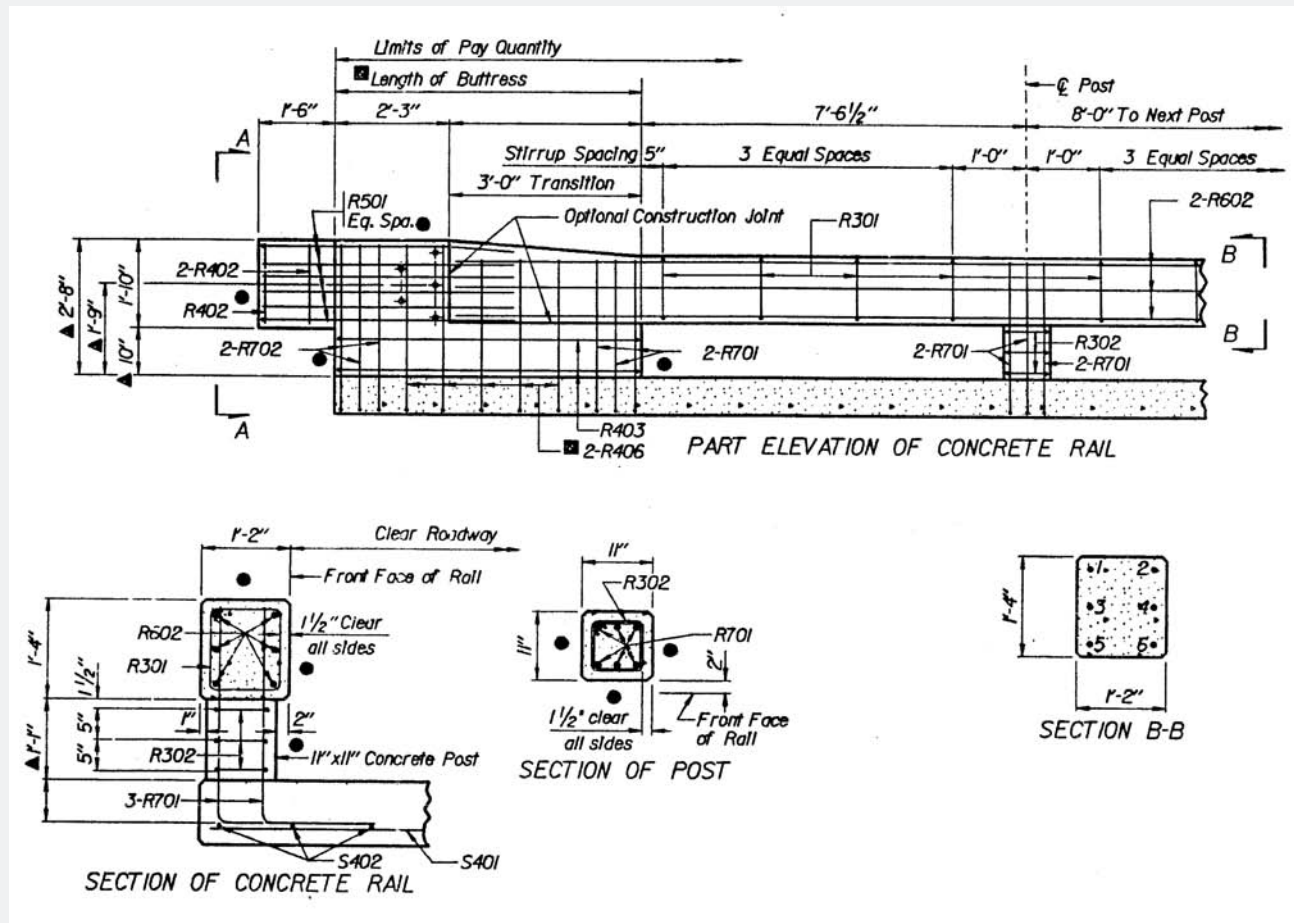
Test level:
TL-2

Utilized in:
Nebraska

Contact:
Milo D. Cress
Federal Highway
Administration
100 Centennial Mall-North
Room 220
Lincoln, NE 68508
(402) 437-5977



Concrete Beam and Post



Nebraska Open Concrete Bridge Rail

Height:
29"

Cost per linear foot:
\$__

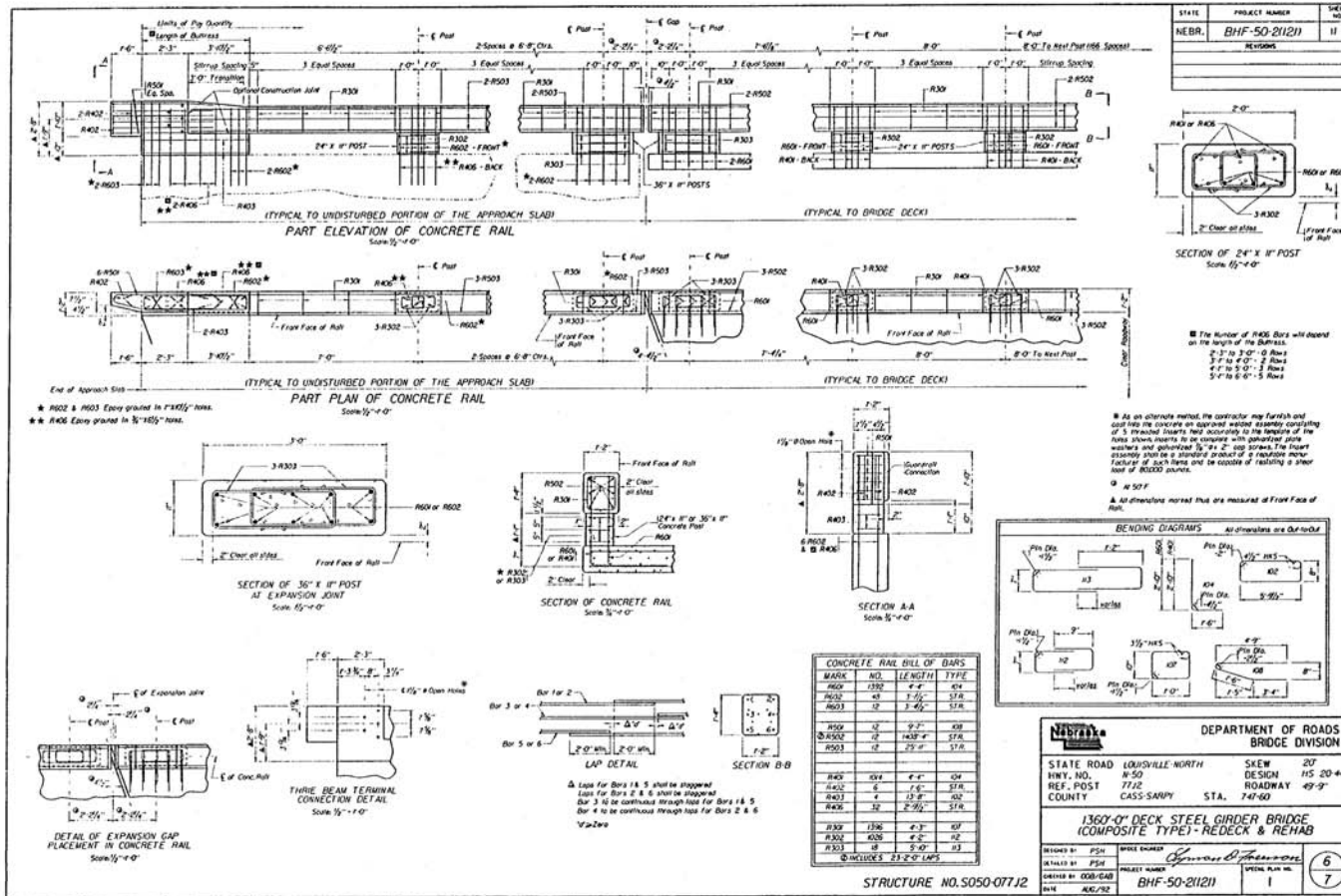
Test level:
TL-4

Utilized in:
Nebraska

Contact:
Milo D. Cress
Federal Highway
Administration
100 Centennial Mall-North
Room 220
Lincoln, NE 68508
(402) 437-5977



Nebraska Open Concrete Bridge Rail



TR1 Modified Bridge Rail

Height:
29"

Cost per linear foot:
\$35

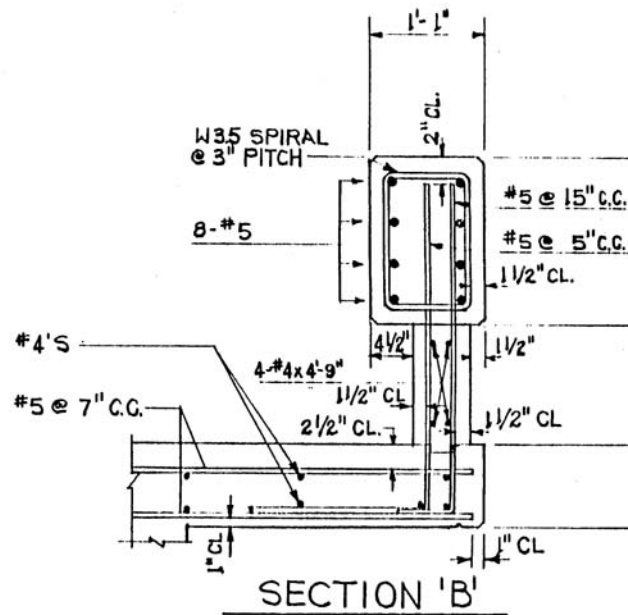
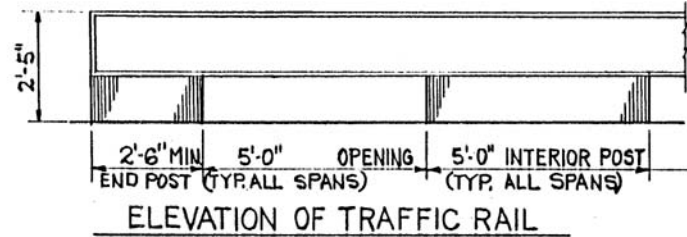
Test level:
TL-2

Utilized in:
Oklahoma

Contact:
Greg Allen
Oklahoma Dept
of Transportation
200 N.E. 21st Street
Oklahoma City, OK 73105
(405) 521-2606



TR1 Modified Bridge Rail



Parapet Flush Mount

Height:
54"

Cost per linear foot:
\$92

Test level:
TL-4

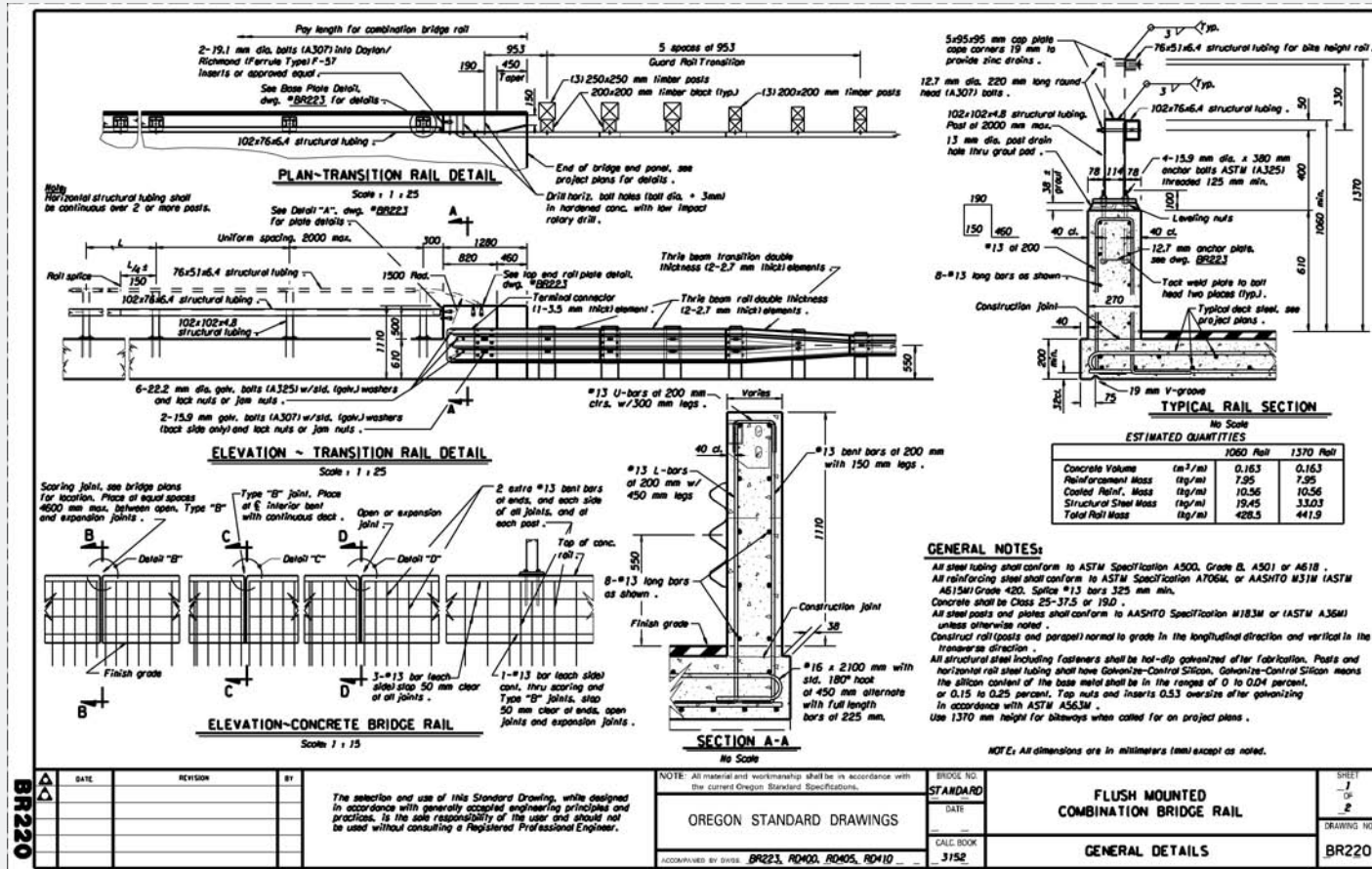
Utilized in:
Oregon

Contact:
Antony P. Stratis, P.E.
Tech Center Bridge Manager
Region 1
123 NW Flanders Street
Portland, OR 97209
(503) 731-8490



Vertical Concrete Parapet

Parapet Flush Mount



BR220

DATE	REVISION	BY

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications.
OREGON STANDARD DRAWINGS
REVISIONS BY DATE
315E

BROCK NO. STANDARD	FLUSH MOUNTED COMBINATION BRIDGE RAIL	SHEET 1 OF 2
DATE	GENERAL DETAILS	DRAWING NO. BR220
SCALE BOOK 315E		

Parapet Sidewalk Mount

Height:
54"

Cost per linear foot:
\$92

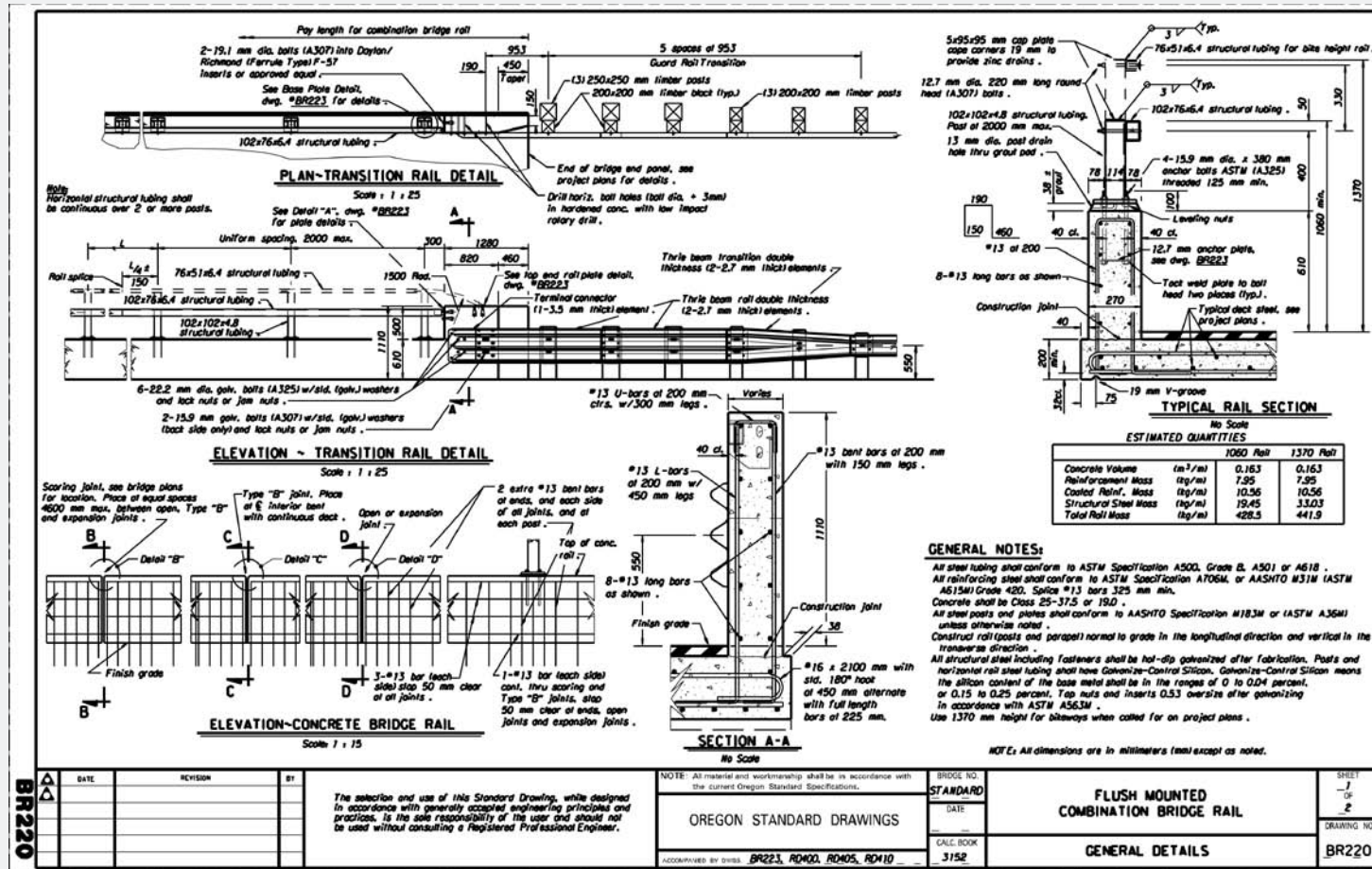
Test level:
TL-4

Utilized in:
Oregon

Contact:
Antony P. Stratis, P.E.
Tech Center Bridge Manager
Region 1
123 NW Flanders Street
Portland, OR 97209
(503) 731-8490



Parapet Sidewalk Mount



Type T501SW

Height:
72"

Cost per linear foot:
\$107

Test level:
TL-4

Utilized in:
Texas

Contact:
Mark Bloschock
Texas DOT Bridge Division
RA118
125 E. 11th Street
Austin, TX 78701-2483
(512) 416-2178



Type T501SW

Plans Not Yet Available.

Type C411

Height:
42"

Cost per linear foot:
\$75

Test level:
TL-2

Utilized in:
Texas

Contact:
Mark Bloschock
Texas DOT Bridge Division
RA118
125 E. 11th Street
Austin, TX 78701-2483
(512) 416-2178



Type T203

Height:
27"

Cost per linear foot:
\$38

Test level:
TL-3

Utilized in:
Texas

Contact:
Mark Bloschock
Texas DOT Bridge Division
RA118
125 E. 11th Street
Austin, TX 78701-2483
(512) 416-2178



Texas Type T411 Aesthetic Rail

Height:
32"

Cost per linear foot:
\$75

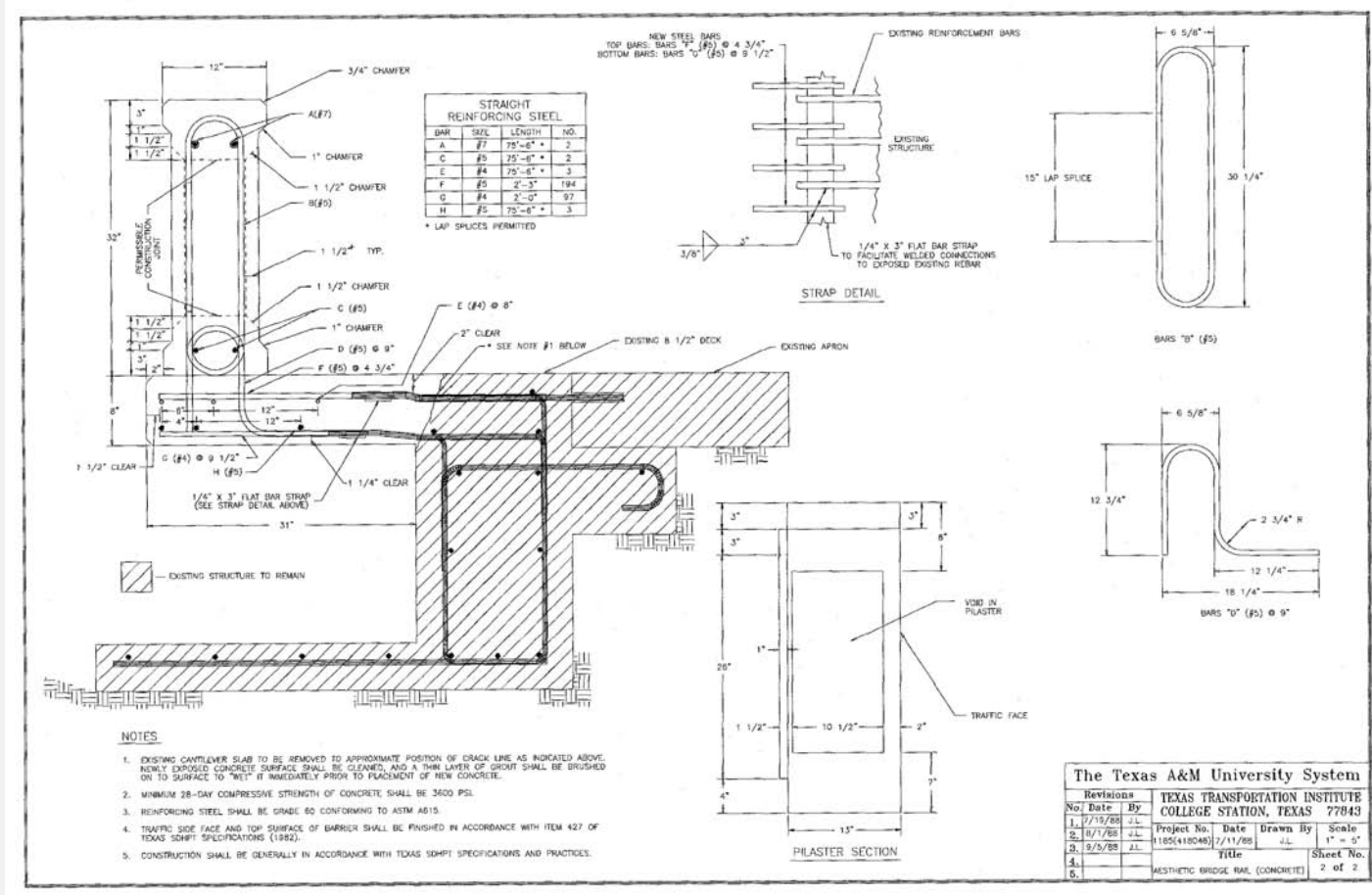
Test level:
TL-2

Utilized in:
Texas

Contact:
Mark Bloschock
Texas DOT Bridge Division
RA118
125 E. 11th Street
Austin, TX 78701-2483
(512) 416-2178



Texas Type T411 Aesthetic Rail



Texas TT Rail

Height:
90"

Cost per linear foot:
\$250

Test level:
TL-6

Utilized in:
Texas

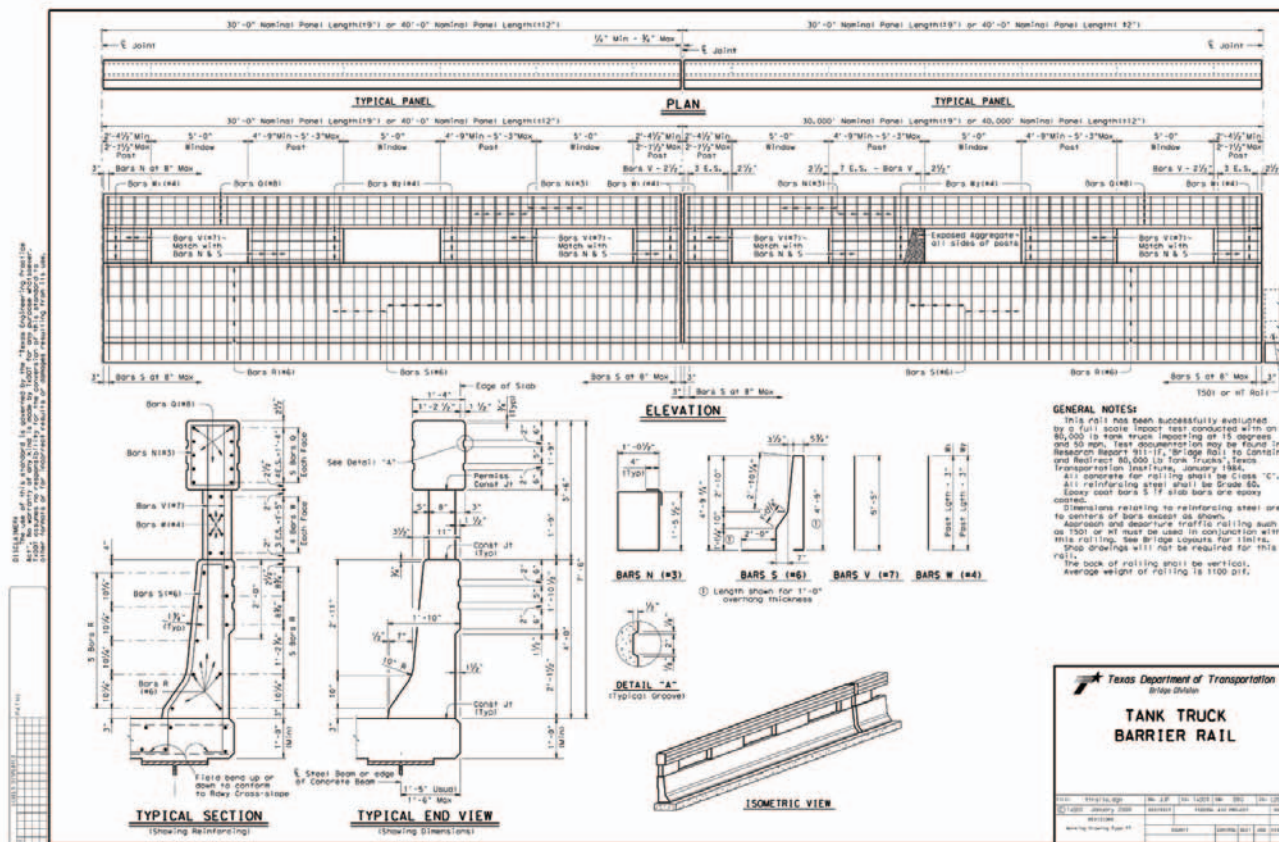
Contact:
Mark Bloschock
Texas DOT Bridge Division
RA118
125 E. 11th Street
Austin, TX 78701-2483
(512) 416-2178



Section 4

Vertical Concrete Parapet

Texas TT Rail



NJ Barrier

Height:
32"

Cost per linear foot:
\$50-55

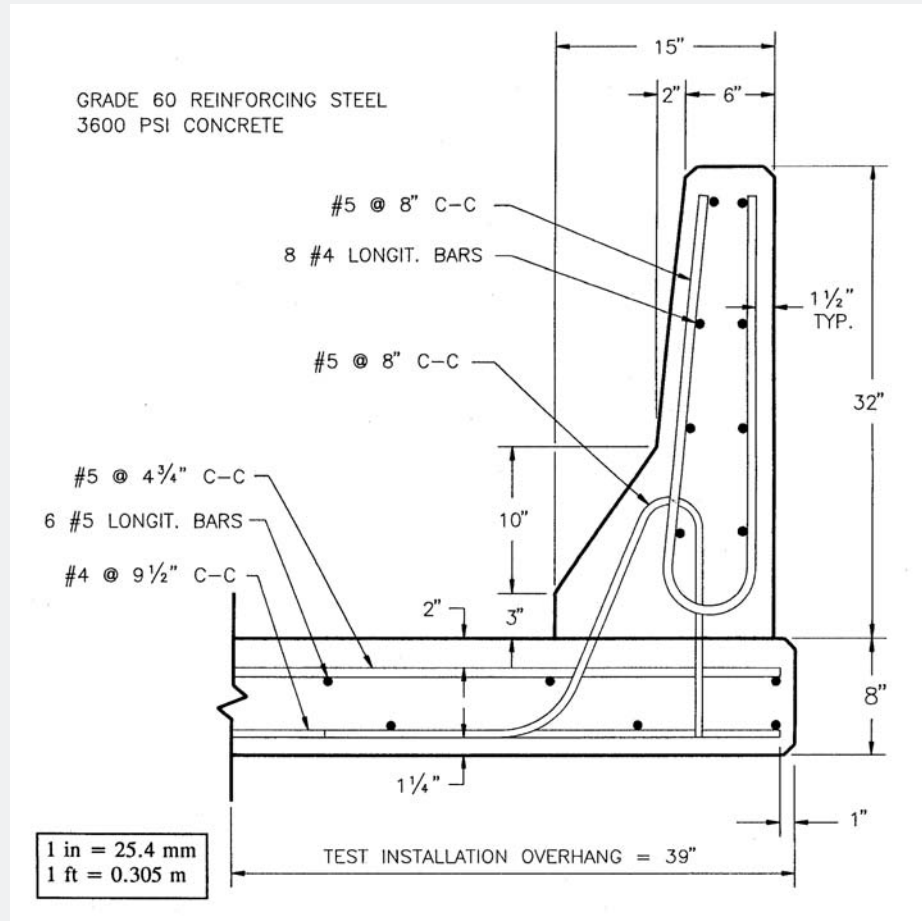
Test level:
TL-4

Utilized in:
Missouri

Contact:
Peter Clogston, P.E.
Federal Highway Admin,
Missouri Division Office, RA118
209 Adams Street
Jefferson City, MO 65101
(573) 638-2613



NJ Barrier



New Jersey Concrete Barrier

Height:
32"

Cost per linear foot:
\$50

Test level:
TL-4

Utilized in:
California

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



Type 26 Concrete Barrier with Sidewalk

Height:
36"

Cost per linear foot:
\$90

Test level:
TL-2

Utilized in:
California

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



Type 732 Concrete Barrier

Height:
32"

Cost per linear foot:
\$70

Test level:
TL-4

Utilized in:
California

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



Type 736 Concrete Barrier

Height:
36"

Cost per linear foot:
\$70

Test level:
TL-4

Utilized in:
California

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



Type 742 Concrete Barrier

Height:
42"

Cost per linear foot:
\$85

Test level:
TL-5

Utilized in:
California

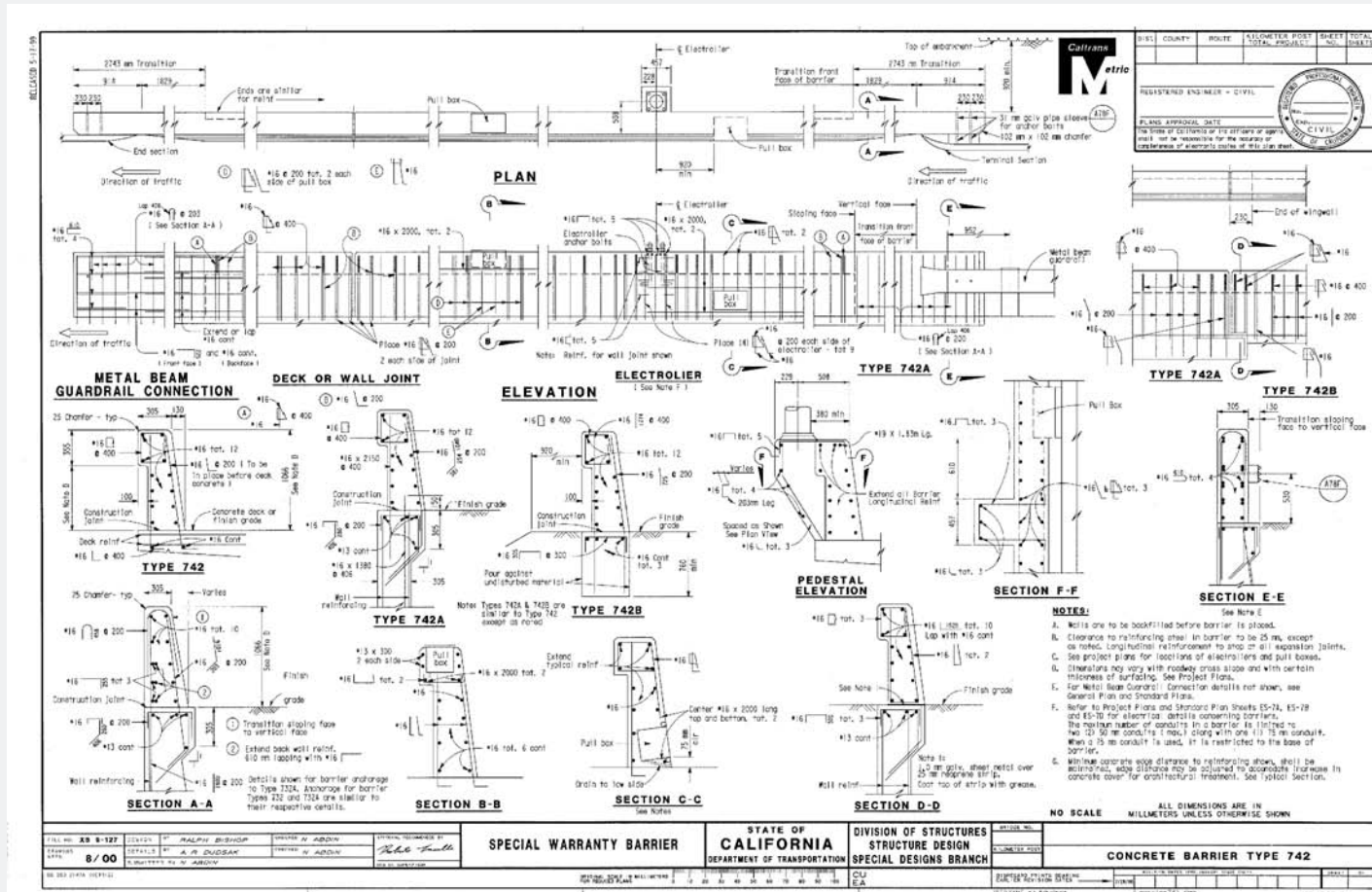
Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



Section 4

Vertical Concrete Parapet with Aluminum Tube Bridge Rail

Type 742 Concrete Barrier



LB Foster Precast NJ Shape, Bolted Down

Height:
34"

Cost per linear foot:
\$__

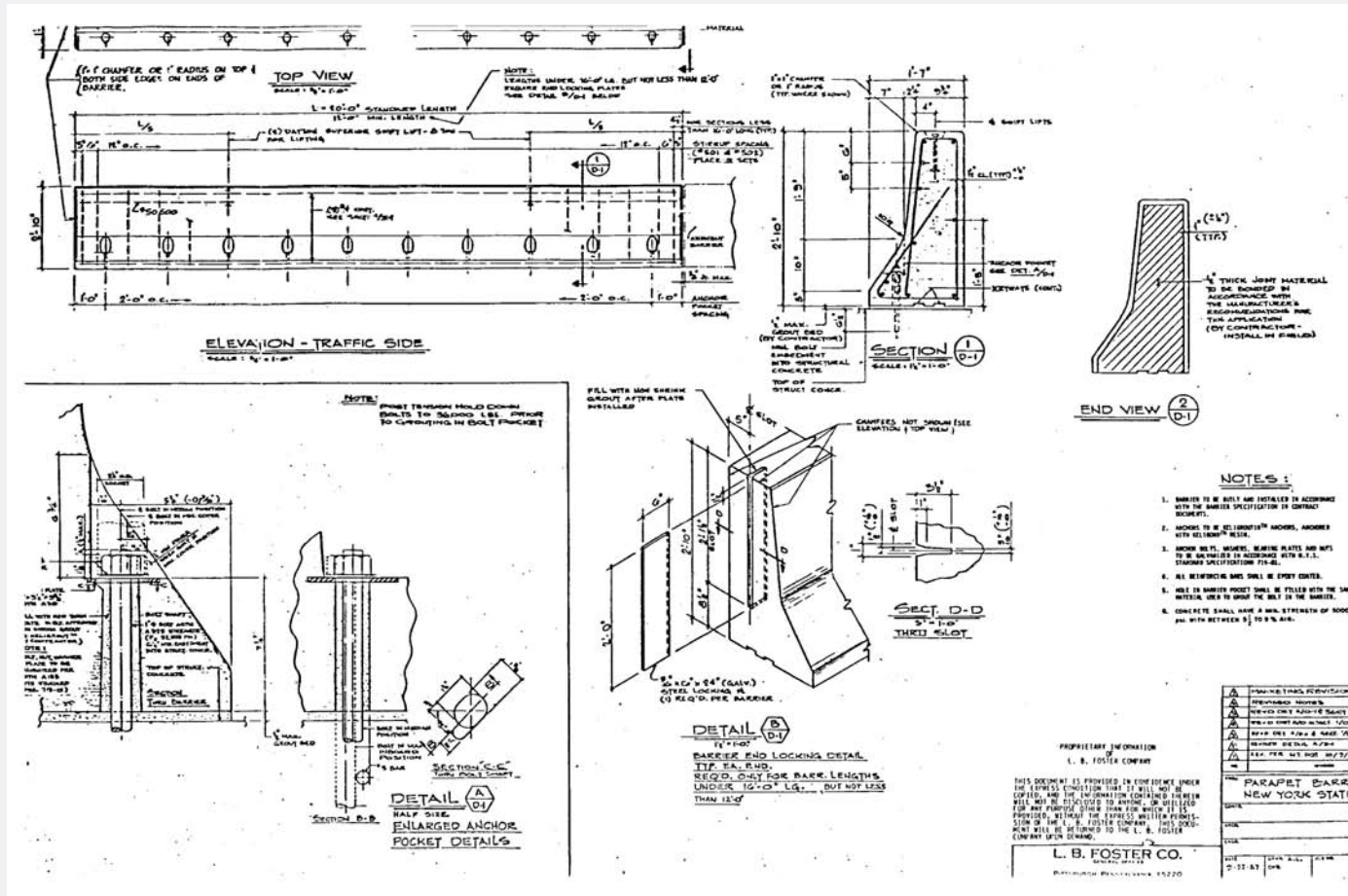
Test level:
TL-4

Utilized in:
New Jersey

Contact:
Jose Lopez
New Jersey Dept
of Transportation
1035 Parkway Avenue
Trenton, NJ 08625
(609) 530-2457

Photo Not Yet Available

LB Foster Precast NJ Shape, Bolted Down



California Type 20

Height:
39"

Cost per linear foot:
\$_

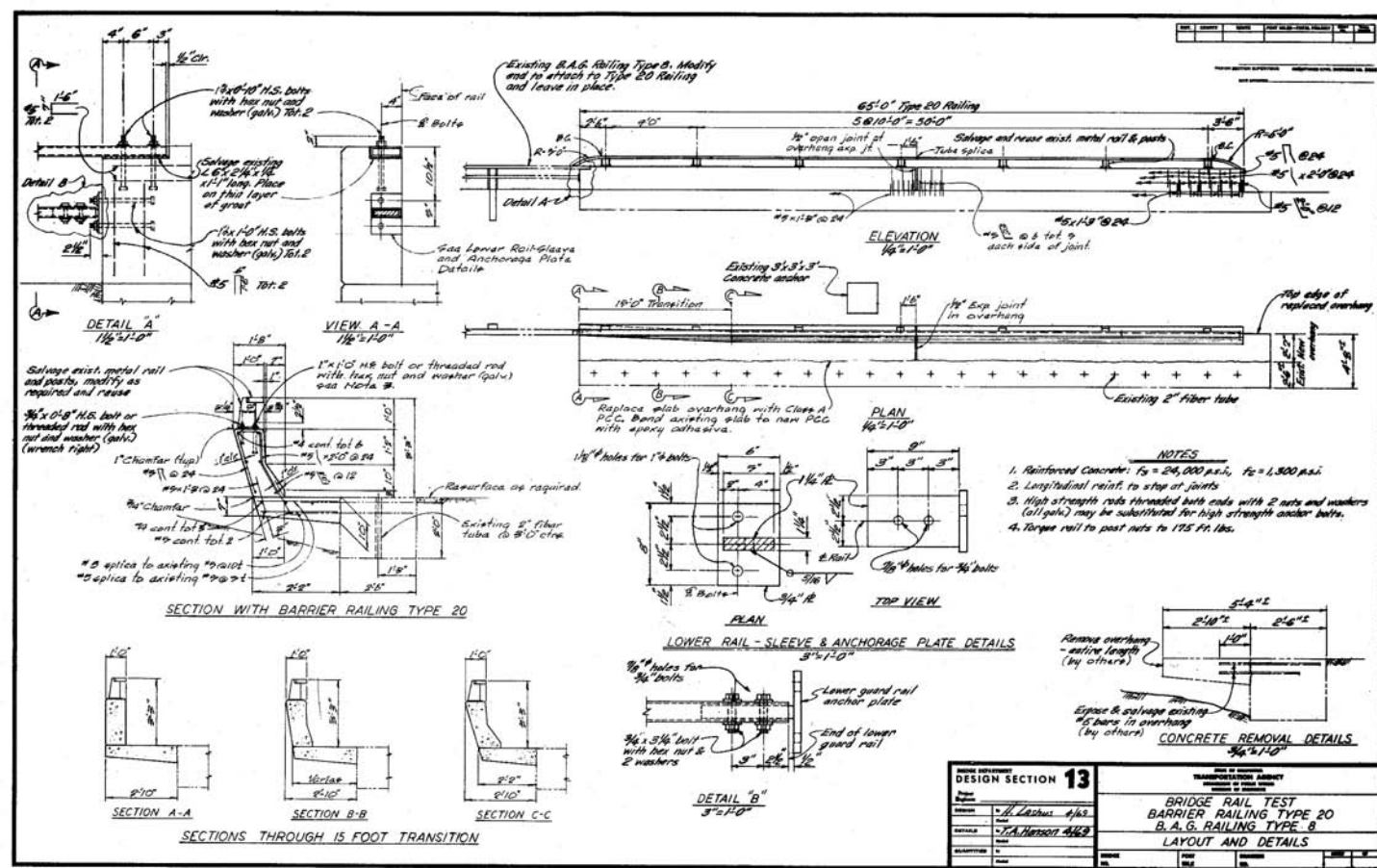
Test level:
TL-3

Utilized in:
California

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805

Photo Not Yet Available.

California Type 20



New Jersey Barrier with 22" Steel Bicycle Rail

Height:
54"

Cost per linear foot:
\$68

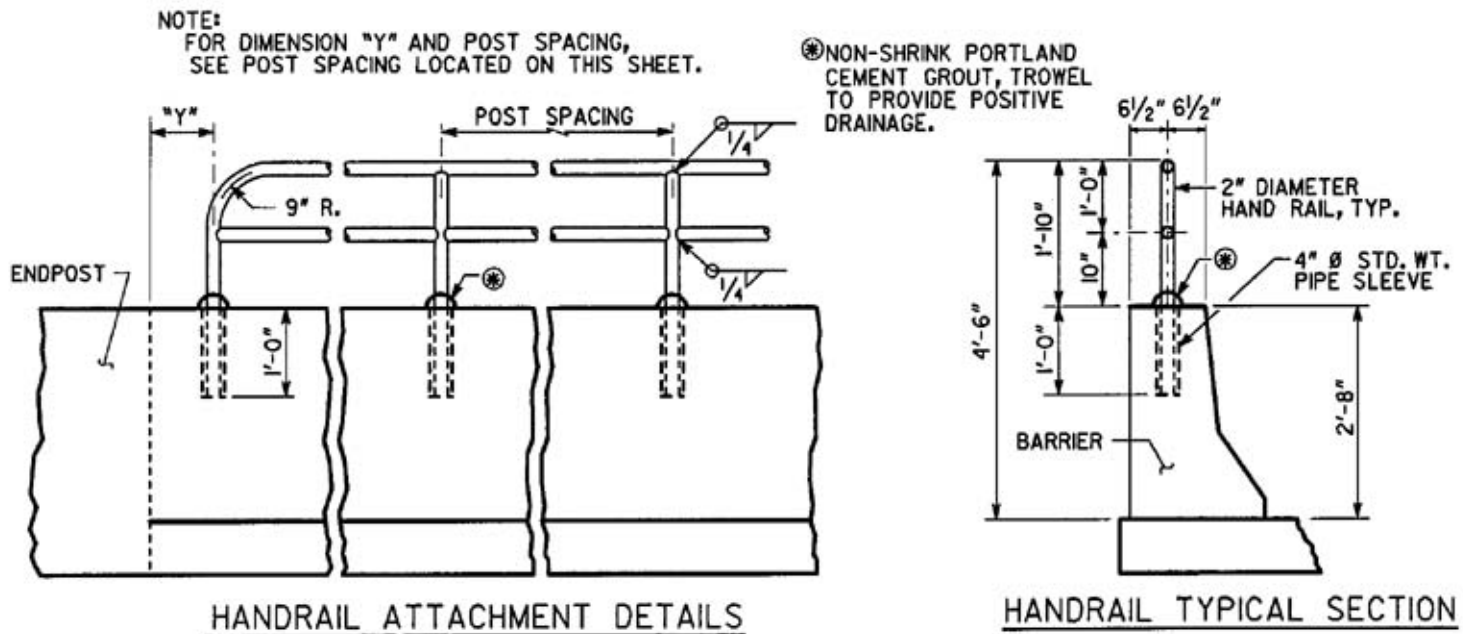
Test level:
TL-4

Utilized in:
Georgia

Contact:
Paul Liles
Georgia Dept of Transportation
No. 2 Capitol Square, SW
Atlanta, GA 30334
(404) 656-5280



New Jersey Barrier with 22" Steel Bicycle Rail



NOTE: FOR ADDITIONAL DETAILS SEE GA. STD. 9031-R.

New Jersey Concrete Barrier with 1'-10" Steel Bicycle Rail

Bicycle Rail Attachment to Safety Shape Concrete Rail

Height:
54.5"

Cost per linear foot:
\$75

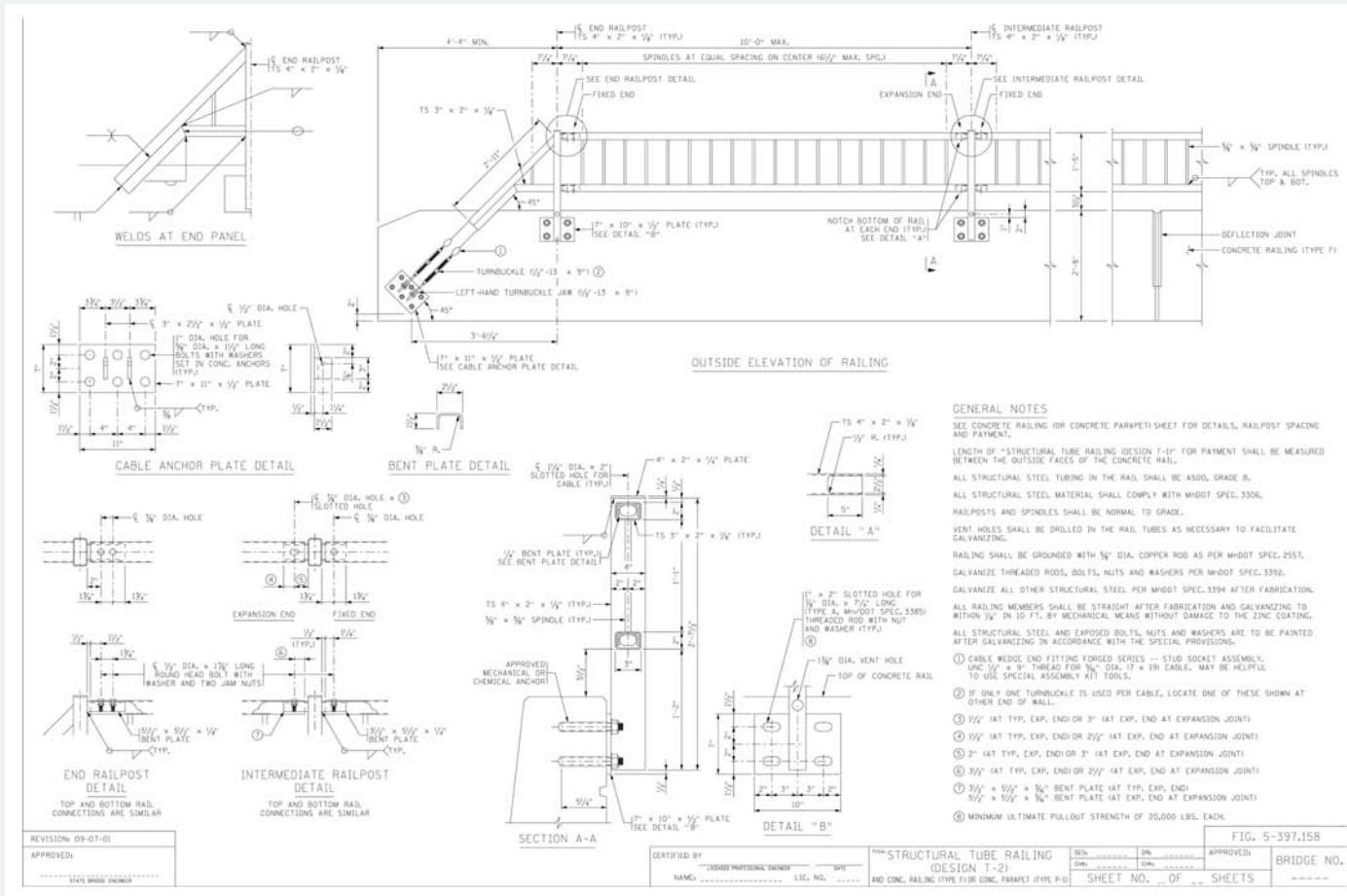
Test level:
TL-4

Utilized in:
Minnesota

Contact:
Raymond Cekalla
Minnesota DOT Bridge Office
3485 Hadley Avenue North
Mail Stop 610
Oakdale, MN 55128-3307
(651) 747-2172



Bicycle Rail Attachment to Safety Shape Concrete Rail



New Jersey Safety Shape Parapet

Height:
39"

Cost per linear foot:
\$__

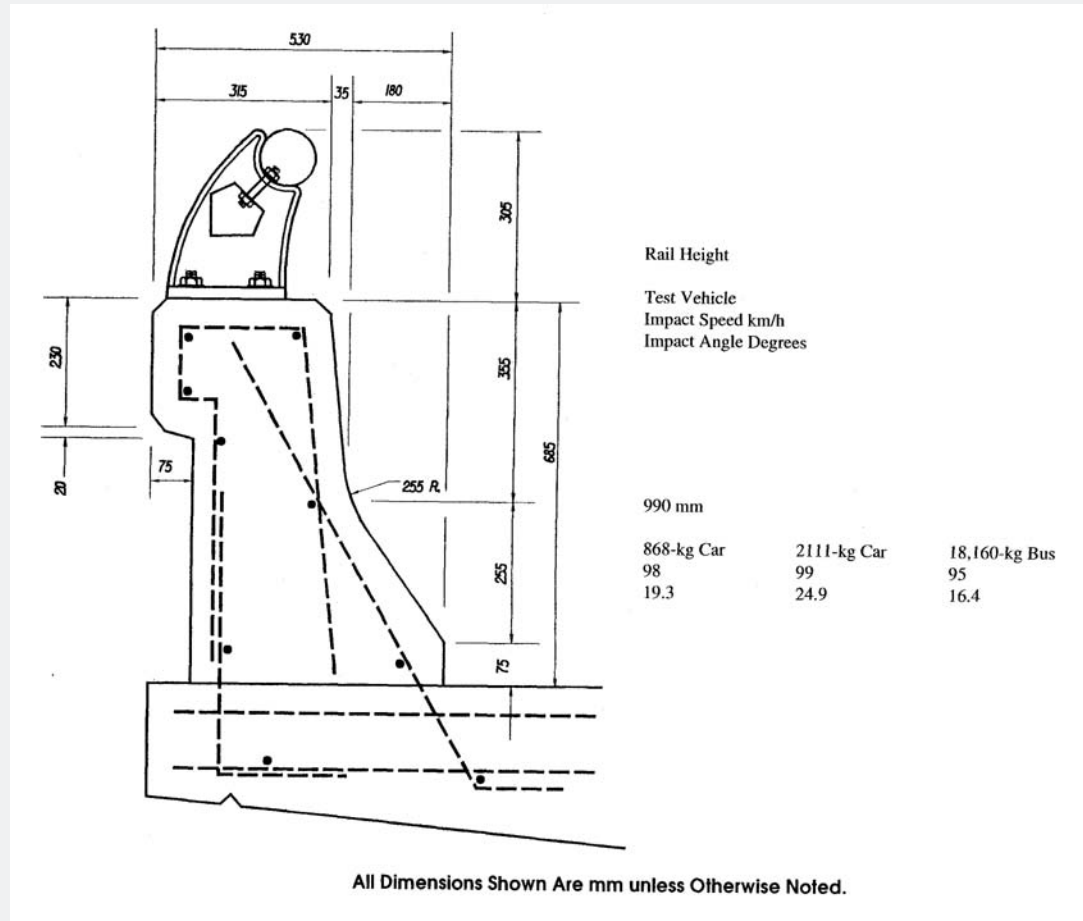
Test level:
TL-4

Utilized in:
Nevada

Contact:
Bill Crawford
Nevada Dept of Transportation
1263 South Stewart Street
Room 405
Carson City, NV 89712
(775) 888-7542



New Jersey Safety Shape Parapet



Section **4**

New Jersey Barrier with Rail

Type HT

Height:
50"

Cost per linear foot:
\$95

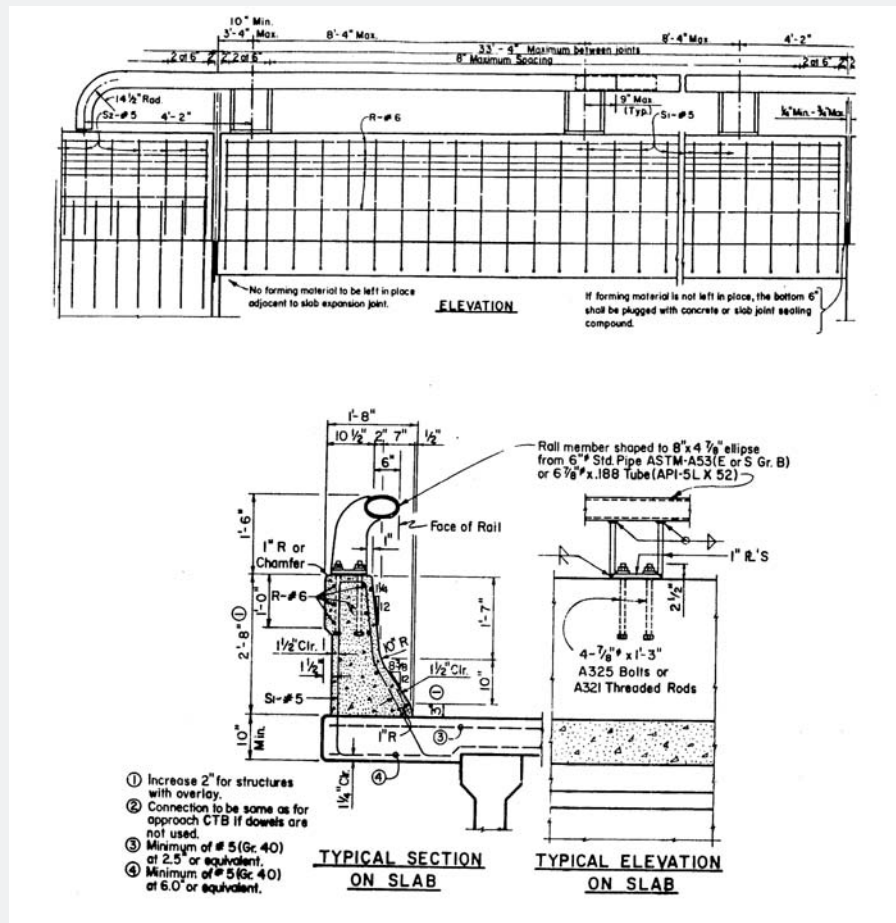
Test level:
TL-5

Utilized in:
Texas

Contact:
Mark Bloschock
Texas DOT Bridge Division
RA118
125 E. 11th Street
Austin, TX 78701-2483
(512) 416-2178



Type HT



Section 5

F-Shape Concrete Barrier



Section 5

F-SHAPE CONCRETE BARRIER

	Name	Location	Test Level
	32" F-Shape	Florida	TL-4
	42" F-Shape	Florida	TL-5
	Soundwall/F-Shape	Florida	TL-4
	Vertical Face Guide, 34" Retrofit	Florida	TL-4
	Vertical Face Guide, 42" Retrofit	Florida	TL-4

32" F-Shape

Height:
32"

Cost per linear foot:
\$35

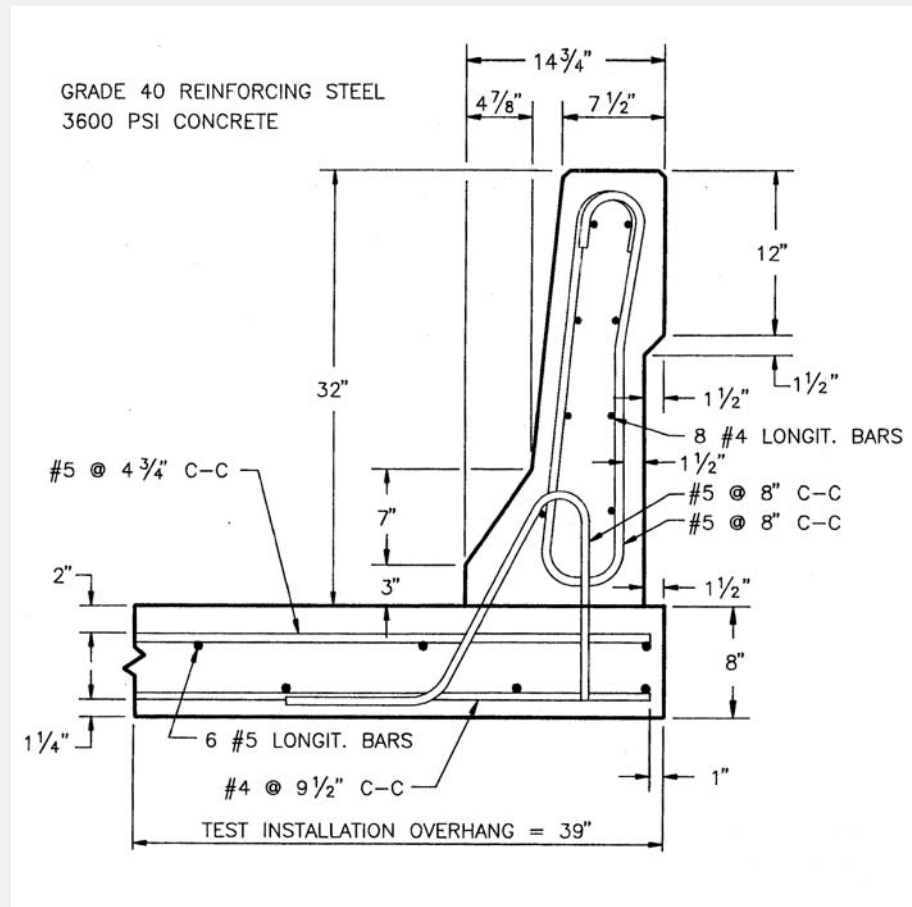
Test level:
TL-4

Utilized in:
Florida

Contact:
Charles Boyd
Florida Dept of Transportation
605 Suwannee Street
Mail Station 33
Tallahassee, FL 32399-0450
(850) 414-4275



32" F-Shape



42" F-Shape

Height:
42"

Cost per linear foot:
\$45

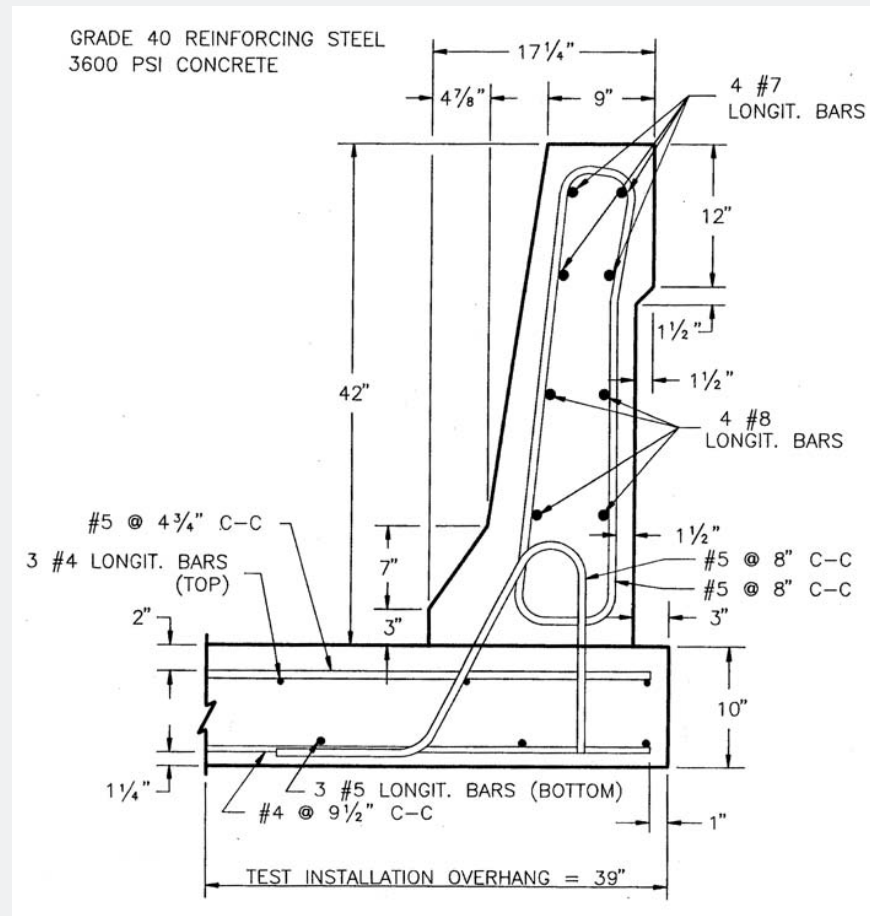
Test level:
TL-5

Utilized in:
Florida

Contact:
Charles Boyd
Florida Dept of Transportation
605 Suwannee Street
Mail Station 33
Tallahassee, FL 32399-0450
(850) 414-4275



42" F-Shape



Soundwall/F-Shape

Height:
8'

Cost per linear foot:
\$200

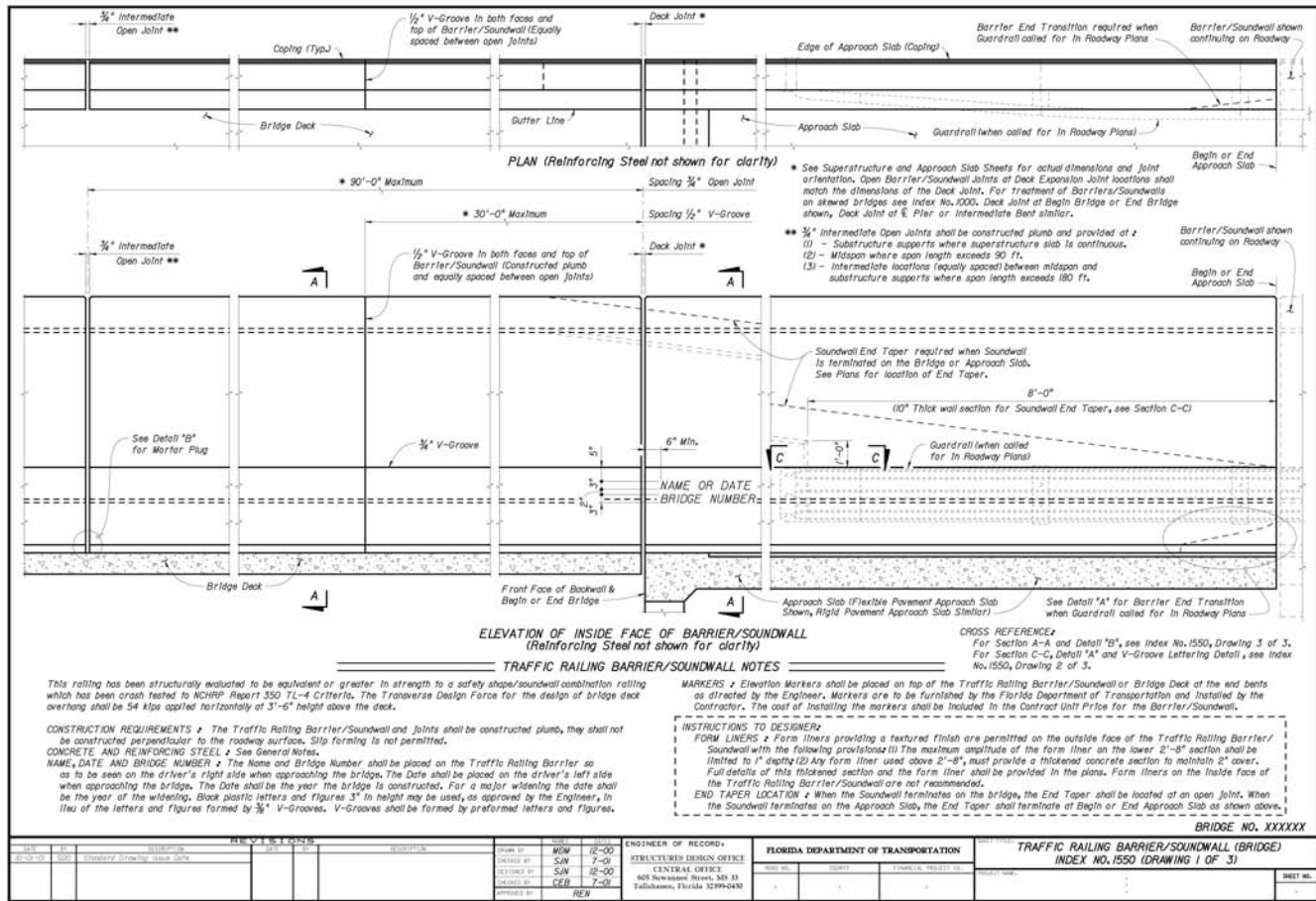
Test level:
TL-4

Utilized in:
Florida

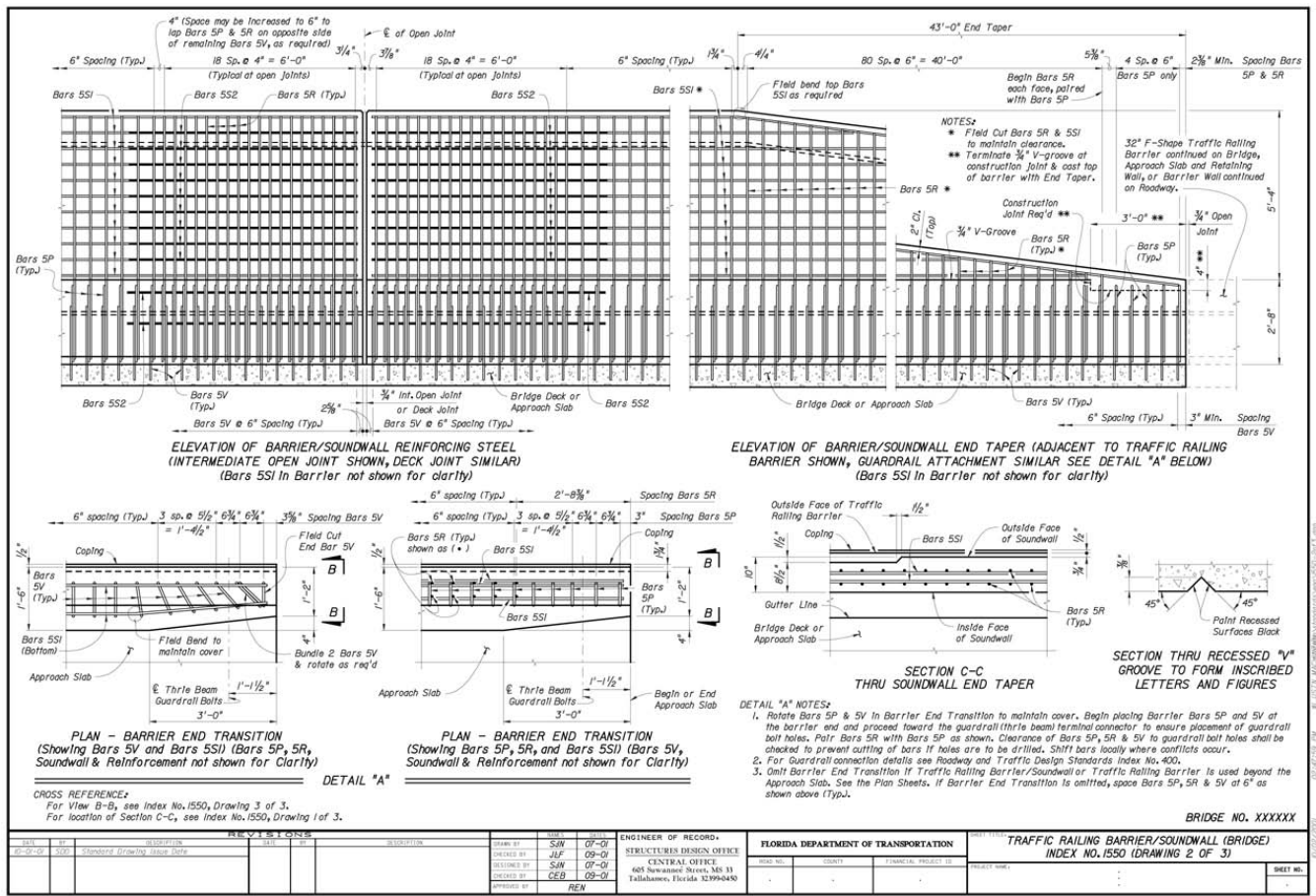
Contact:
Charles Boyd
Florida Dept of Transportation
605 Suwannee Street
Mail Station 33
Tallahassee, Fl 32399-0450
(850) 414-4275



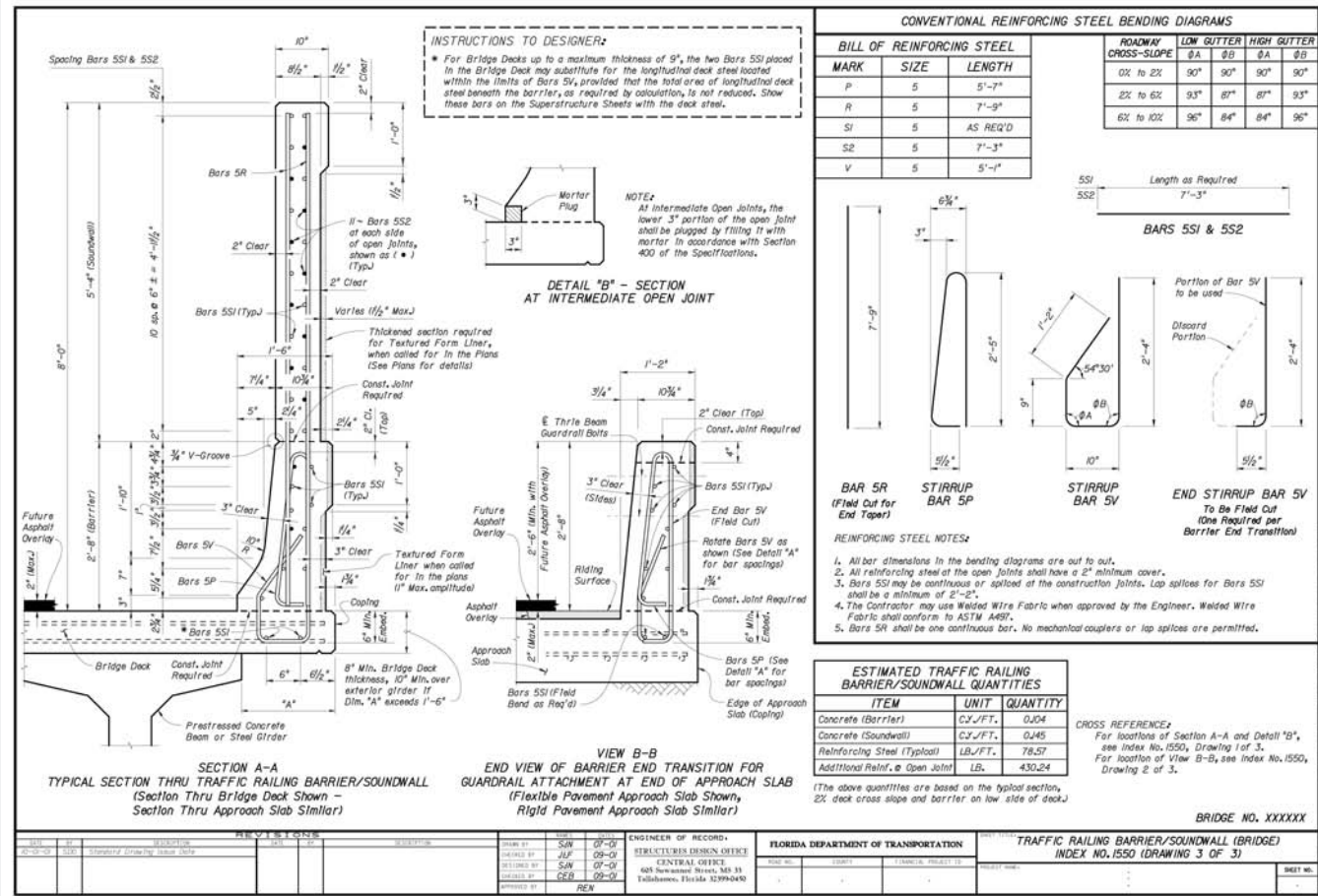
Soundwall/ F-Shape



Soundwall/ F-Shape



Soundwall/ F-Shape



Vertical Face Guide, 34" Retrofit

Height:
34"

Cost per linear foot:
\$40

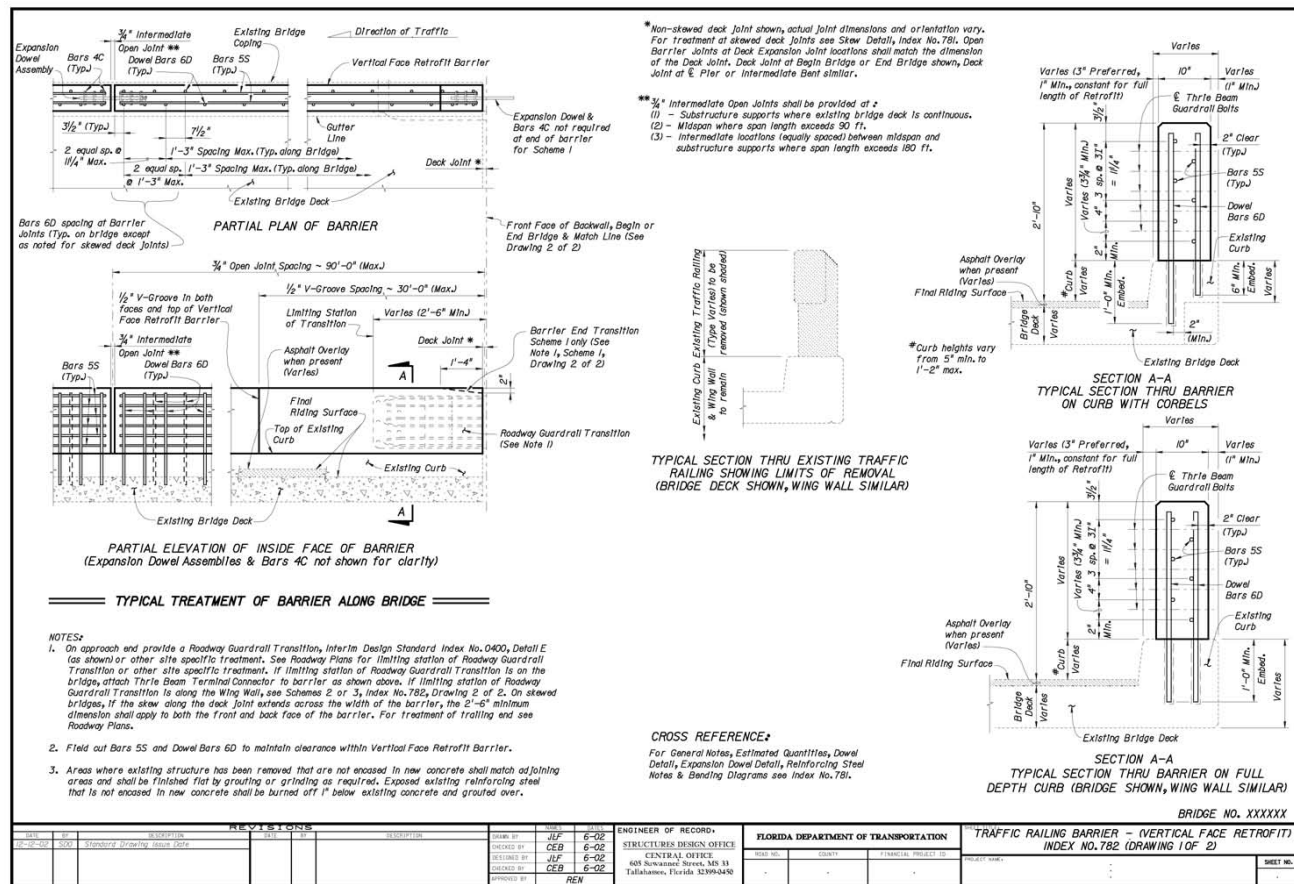
Test level:
TL-4

Utilized in:
Florida

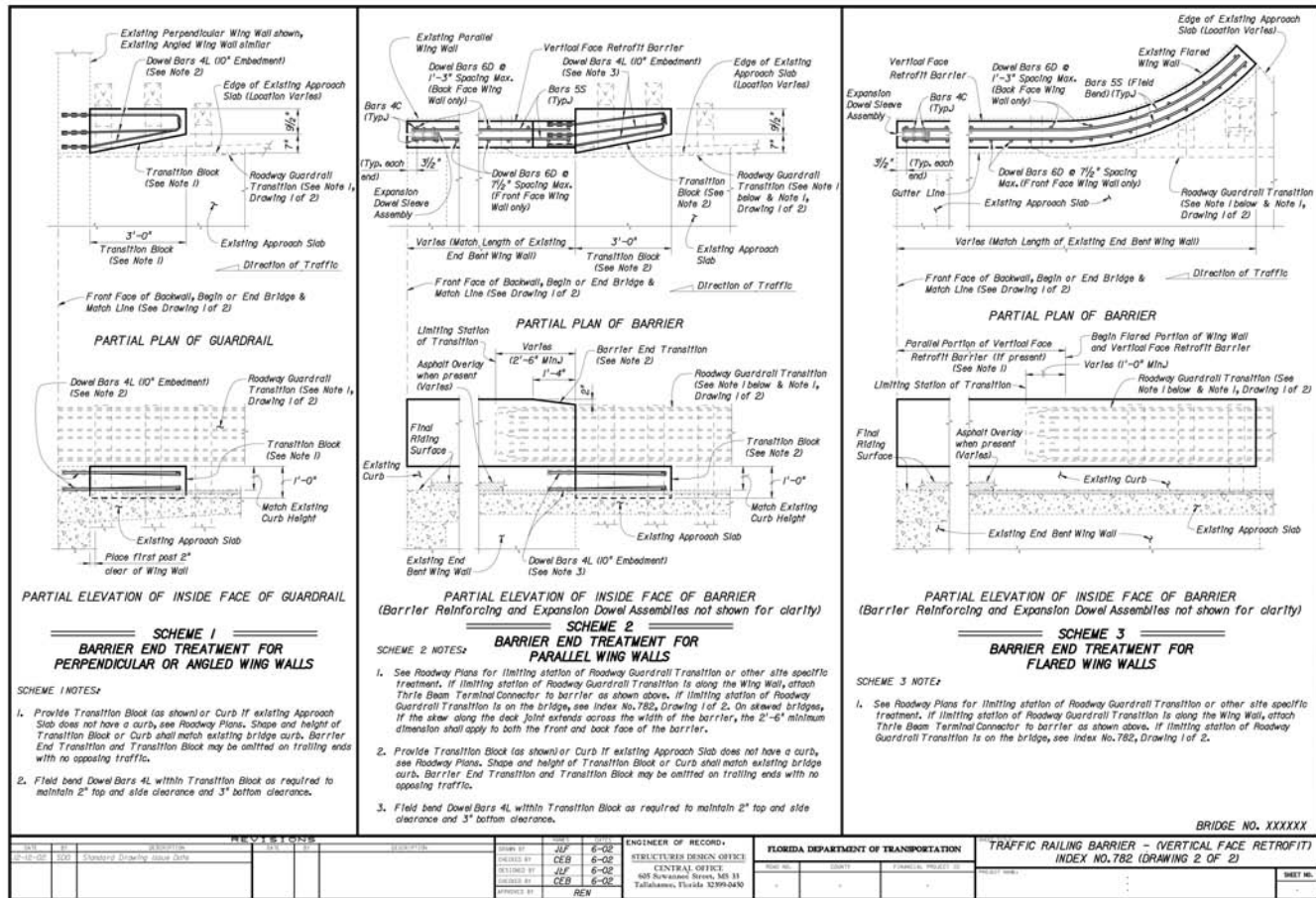
Contact:
Charles Boyd
Florida Dept of Transportation
605 Suwannee Street
Mail Station 33
Tallahassee, FL 32399-0450
(850) 414-4275



Vertical Face Guide, 34" Retrofit



Vertical Face Guide, 34" Retrofit



Vertical Face Guide, 42" Retrofit

Height:
42"

Cost per linear foot:
\$55

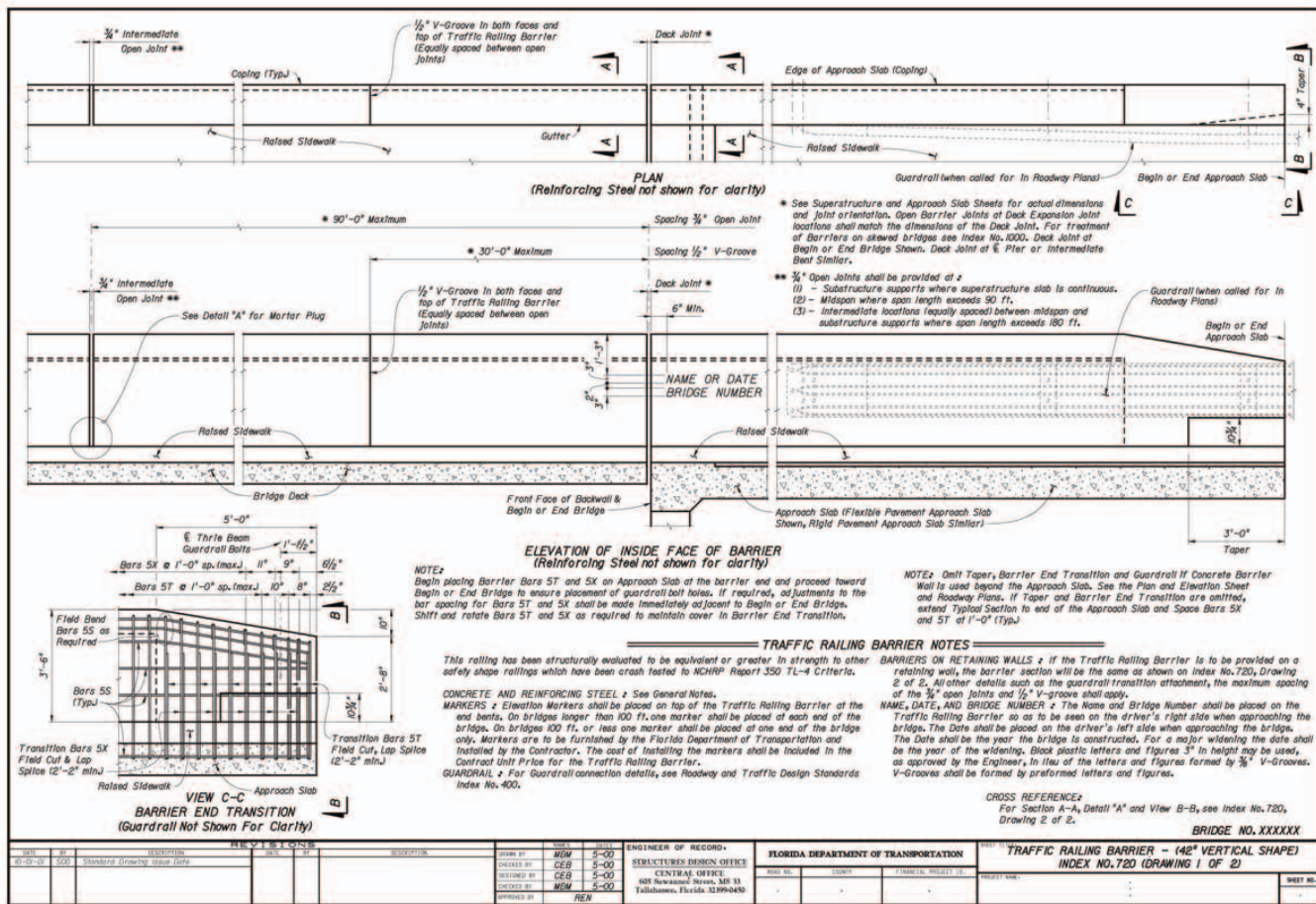
Test level:
TL-4

Utilized in:
Florida

Contact:
Charles Boyd
Florida Dept of Transportation
605 Suwannee Street
Mail Station 33
Tallahassee, FL 32399-0450
(850) 414-4275



Vertical Face Guide, 42" Retrofit



Section 6

TIMBER BRIDGE RAILS



Section 6

TIMBER BRIDGE RAIL

	Name	Location	Test Level
	Timber Rail 3 Bridge Rail	Oklahoma	TL-2
	Panel-Lam Timber Vehicle Bridge Rail	?	TL-?
	Curb-Type Glu-Lam Rail for Longitudinal Timber Decks	?	TL-1
	Glu-Lam Rail with Steel Box Attachment, side mount	?	TL-2
	Glu-Lam Timber Rail with Curb, GC8000 design	?	TL-4
	Timber Curbs for Longitudinal Timber Decks	?	Below TL-1
	W-Beam Breakaway Timber Post Railing	?	TL-1
	Steel Thrie-Beam Rail, side mount	?	TL-2

Section 6

TIMBER BRIDGE RAIL

Name	Location	Test Level
Steel Thrie-Beam Rail with Upper Channel, TCB8000 design	?	TL-4
W-Beam Breakaway Steel Post Railing	?	TL-1

Timber Rail 3 Bridge Rail

Height:
27"

Cost per linear foot:
\$__

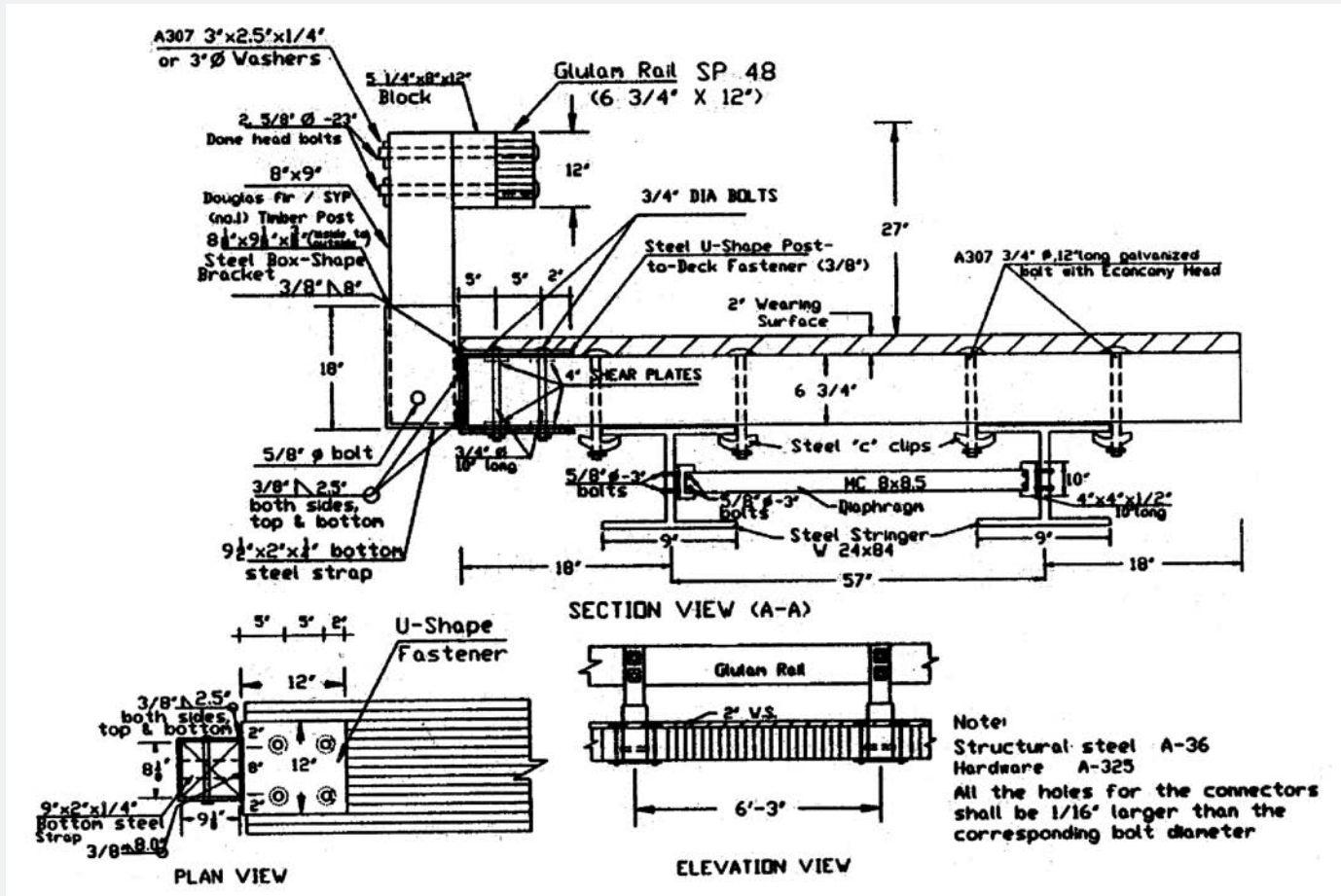
Test level:
TL-3

Utilized in:
—

Contact:
—



Timber Rail 3 Bridge Rail



Panel-Lam Timber Vehicle Bridge Rail

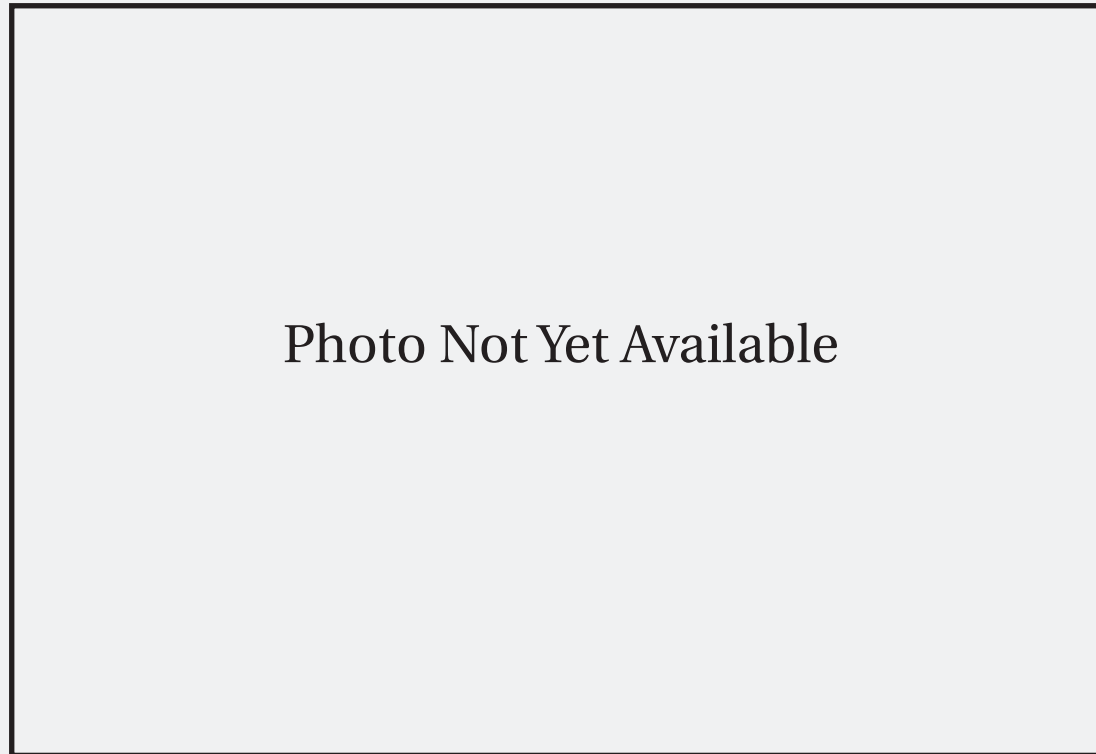
Height:
48"

Cost per linear foot:
\$__

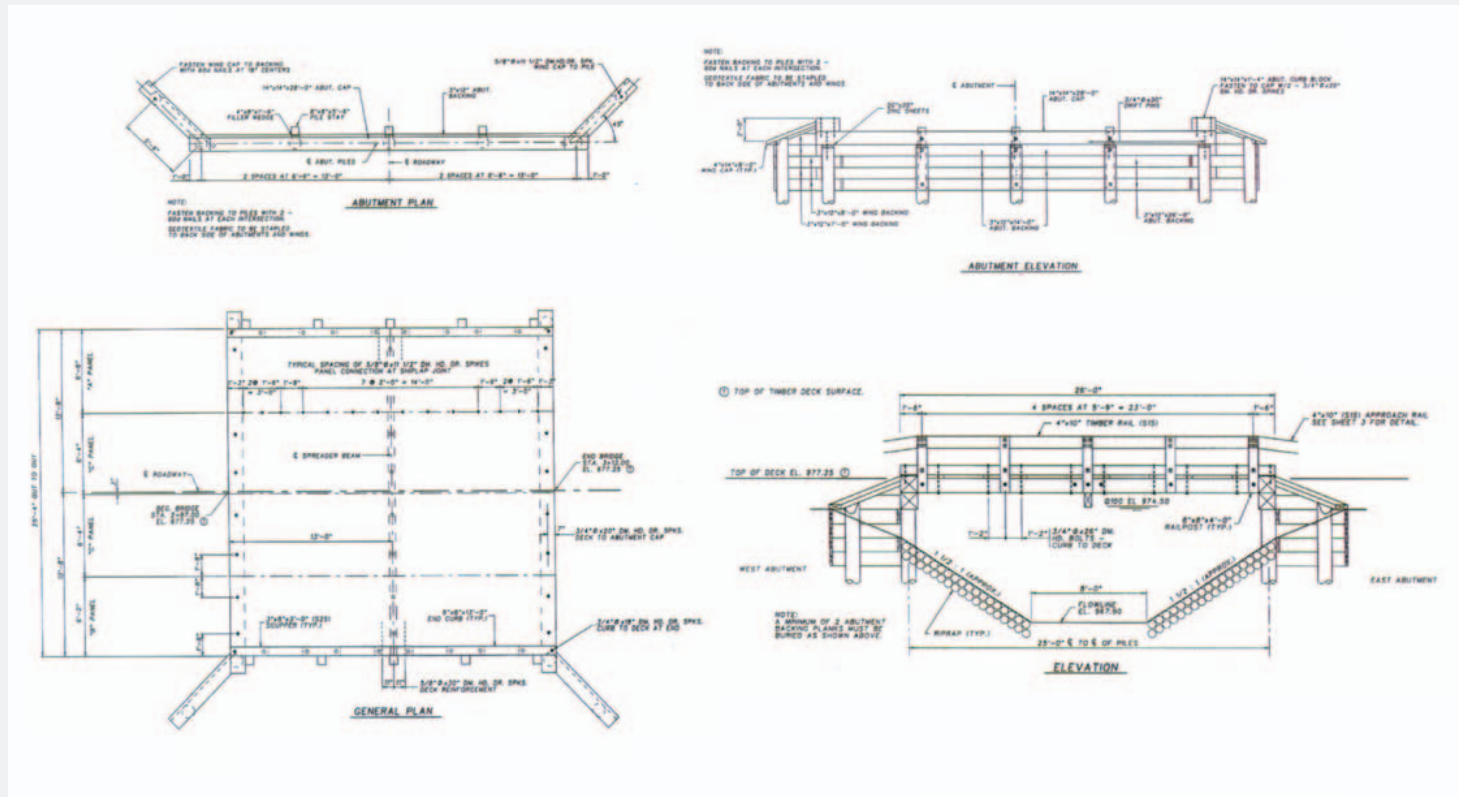
Test level:
__

Utilized in:
__

Contact:
Nahed Abdin
California Dept
of Transportation
1801 30th Street, FM1-2/9I
Sacramento, CA 95816
(916) 227-8805



Panel-Lam Timber Vehicle Bridge Rail



Curb-Type Glu-Lam Rail for Longitudinal Timber Decks

Height:
21"

Cost per linear foot:
\$__

Test level:
TL-1

Utilized in:

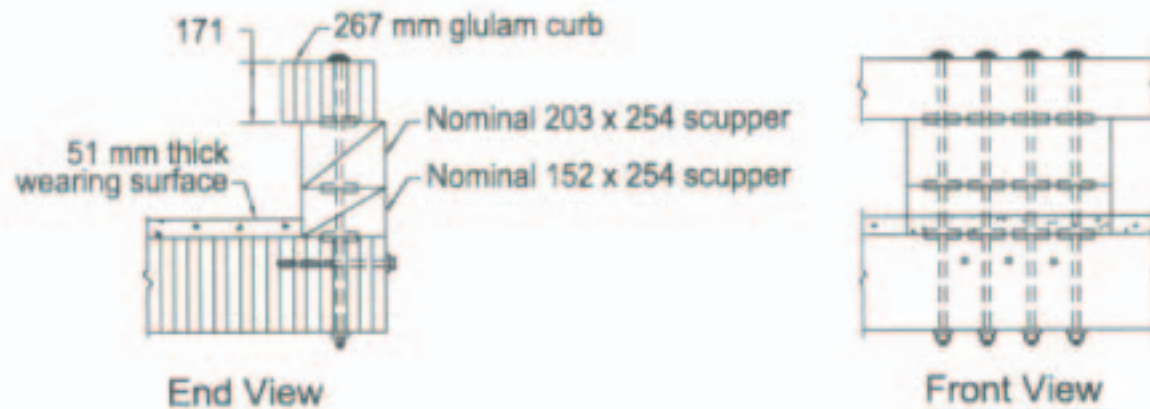
Contact:

Ronald K. Faller, Ph.D., P.E.
Research Assistant Professor
Midwest Roadside
Safety Facility
University of Nebraska-Lincoln
527 Nebraska Hall
Lincoln, NE 68588-0529
(402) 472-6864



Curb-Type Glu-Lam Rail for Longitudinal Timber Decks

Curb-type Rail



*Dimensions in mm.

The low-height, curb-type timber rail was constructed with a glu-lam timber rail and supported with scupper blocks. The curb and scupper blocks, spaced 3048 mm on center, were connected to the bridge deck with bolts and timber connectors.

Glu-Lam Rail with Steel Box Attachment, side mount

Height:
32"

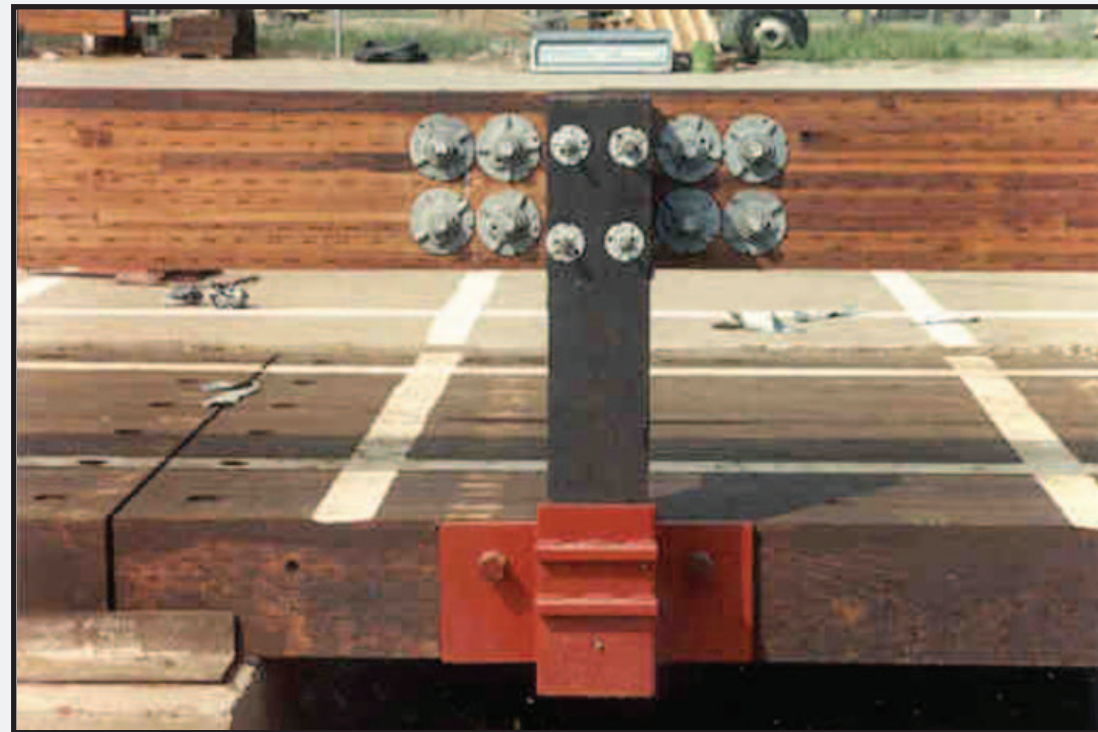
Cost per linear foot:
\$__

Test level:
TL-2

Utilized in:

Contact:

Ronald K. Faller, Ph.D., P.E.
Research Assistant Professor
Midwest Roadside
Safety Facility
University of Nebraska-Lincoln
527 Nebraska Hall
Lincoln, NE 68588-0529
(402) 472-6864



Glu-Lam Timber Rail with Curb, GC8000 design

Height:
33"

Cost per linear foot:
\$__

Test level:
TL-4

Utilized in:

Contact:

Ronald K. Faller, Ph.D., P.E.
Research Assistant Professor
Midwest Roadside
Safety Facility
University of Nebraska-Lincoln
527 Nebraska Hall
Lincoln, NE 68588-0529
(402) 472-6864



Glu-Lam Timber Rail with Curb, GC8000 design

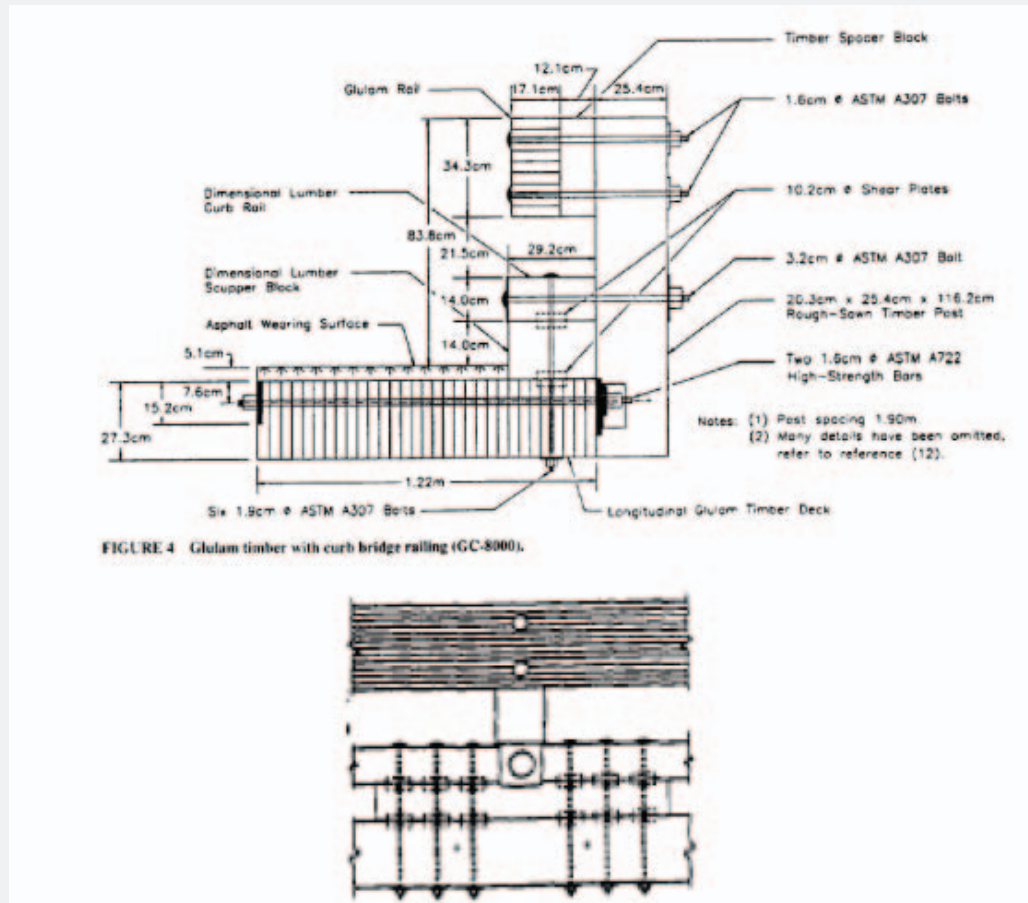


FIGURE 4 Glulam timber with curb bridge railing (GC-8000).

Timber Curbs for Longitudinal Timber Decks

Height:
12"

Cost per linear foot:
\$__

Test level:
Below TL-1

Utilized in:

Contact:

Ronald K. Faller, Ph.D., P.E.
Research Assistant Professor
Midwest Roadside
Safety Facility
University of Nebraska-Lincoln
527 Nebraska Hall
Lincoln, NE 68588-0529
(402) 472-6864



Timber Curbs for Longitudinal Timber Decks

General Configuration

Option 1; Section A-A

Option 2; Section A-A

A Curb Details

Option 1 - Sawn Lumber

Option 1 - Glulam

Option 2 - Sawn Lumber

Option 2 - Glulam

B Curb Splice Details

Option 1

Option 2

C Scupper Block Detail

D Scupper Block Detail

E Scupper Block Detail

Design

- These curb railings were specifically sized based for low-volume road applications using a 4x4x8, unless found that vehicles with an impact velocity of 13 mph and impact angle of 15 degrees. These railings are adequate for longitudinal dimensional, operational, well-maintained, and guard-terminated glulam timber decks that are 10 in. or greater in actual thickness. For additional information, refer to Development of Low-Volume Curb-Type Bridge Railings for Timber Bridge Decks (Miller and others 1998).
- Drawings include cross-section designs for both curb railing options with details for both sawn lumber and glulam configurations. In all cases, the actual height of the curb railing shall be 12 in. across the central way (top of wearing surface on top of bridge deck if a wearing surface is installed, but not greater than 14 in. above the bridge deck).
- Scupper blocks are included in the curb railing designs to provide the required curb height and allow drainage for each railing. Scupper blocks for either option may be sawn lumber or glulam and may require adjustment in the height dimension to achieve the actual curb height specified in Note 2 based on actual dimensions of the curb and scupper block members. In the case of the sawn lumber option 2, the two scupper blocks may be replaced with a single block of the required dimension.
- Each curb railing is shown with a 2-in. thick continuous spacer strip installed to serve both as a measure for an installed pavement wearing surface. If a timber or glulam wearing surface is used, the strip should be under the wearing surface only (not continuous) to allow for free drainage of the strip. The strip may be eliminated and the scupper block height adjusted accordingly. If no wearing surface is used, the strip may be eliminated.
- Dimensions for sawn lumber are nominal dimensions. Actual dimensions will vary depending on surfacing but shall not be less than 10 in. less than the stated nominal dimensions.
- Dimensions for glulam are actual dimensions. The R S/N is standard glulam width may be increased to a minimum 6-1/2 in. to allow for other standard glulam sizes. In such cases, detail dimensions shall be modified accordingly.

Materials

- Sawn lumber and glulam shall comply with the requirements of AASHTO M118 and shall be pressure treated with wood preservative in accordance with AASHTO M115. Glulam shall be non-alkaloid setting and shall conform to an industrial appearance grade.
- Curbs and scupper blocks may be sawn lumber or glulam. When sawn lumber is used, members shall be closely graded by 1 (Quality 1) or Douglas Fir-Larch. Glulam and other species and grades of sawn lumber may be used provided that the minimum calculated values for the species and grade are not less than the following:
 $F_b = 1,300 \text{ psi}$; $E = 1,300,000 \text{ psi}$
- Blocks shall comply with the ASTM A975 requirements, Grade 2, and shall preferably be double-headed timber blocks. Slots on the top of the curb shall be 2x4x8.
- All steel components and fasteners shall be galvanized in accordance with AASHTO M111 or M152 or shall otherwise be protected with an equal or superior protection.

Fabrication and Construction

- To the extent possible, all wood shall be cut, dried, and completely kiln-dried prior to pressure treatment with preservative. Other Note: Number of wood in required if wood is damaged, all cuts, bore holes, and damage shall be immediately treated with wood preservative in accordance with AASHTO M115.
- Glulam member installation systems shall be provided under full loads and under rule that are in contact with wood. When the size and strength of the fasteners are sufficient to develop compression strength without wood crushing, fasteners may be limited under heads of double-headed timber blocks.

The bridge railings described on these drawings were developed and crash tested under a cooperative research agreement between the Midwest Roadside Safety Facility of the University of Nebraska-Lincoln and the USDA Forest Service, Forest Products Laboratory.

University of Nebraska-Lincoln

UAS

Crash-Tested Bridge Rails for Longitudinal Wood Decks on Low-Volume Roads

Low Volume Curb Railing

August 1998

Sheet 1 of 1

W-Beam Breakaway Timber Post Railing

Height:
29"

Cost per linear foot:
\$__

Test level:
TL-1

Utilized in:

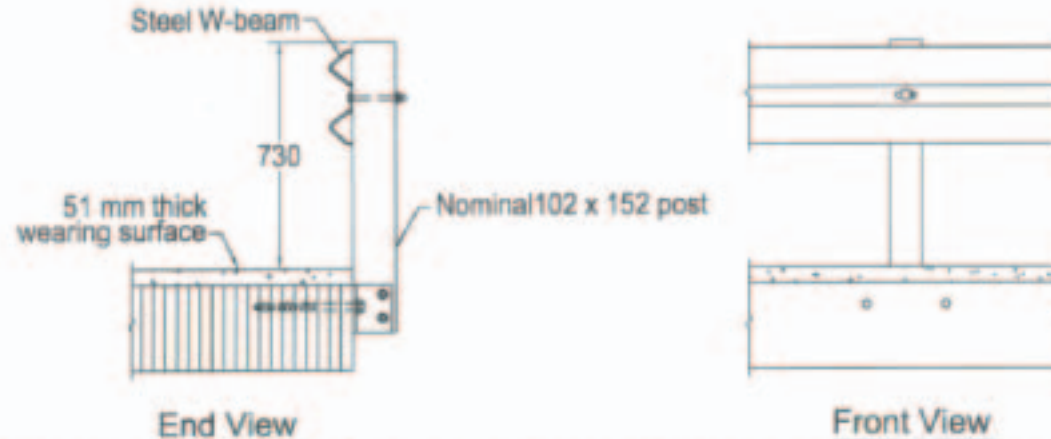
Contact:

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(402) 472-6864



W-Beam Breakaway Timber Post Railing

Flexible Steel Rail



The flexible steel rail consisted of a 12-gauge W-beam rail mounted to breakaway sawed lumber posts spaced 1905 mm on center. The lower end of the post was placed between two steel angles that were connected to the vertical edge of the bridge deck with lag screws.

Steel Thrie-Beam Rail, side mount

Height:
32"

Cost per linear foot:
\$__

Test level:
TL-2

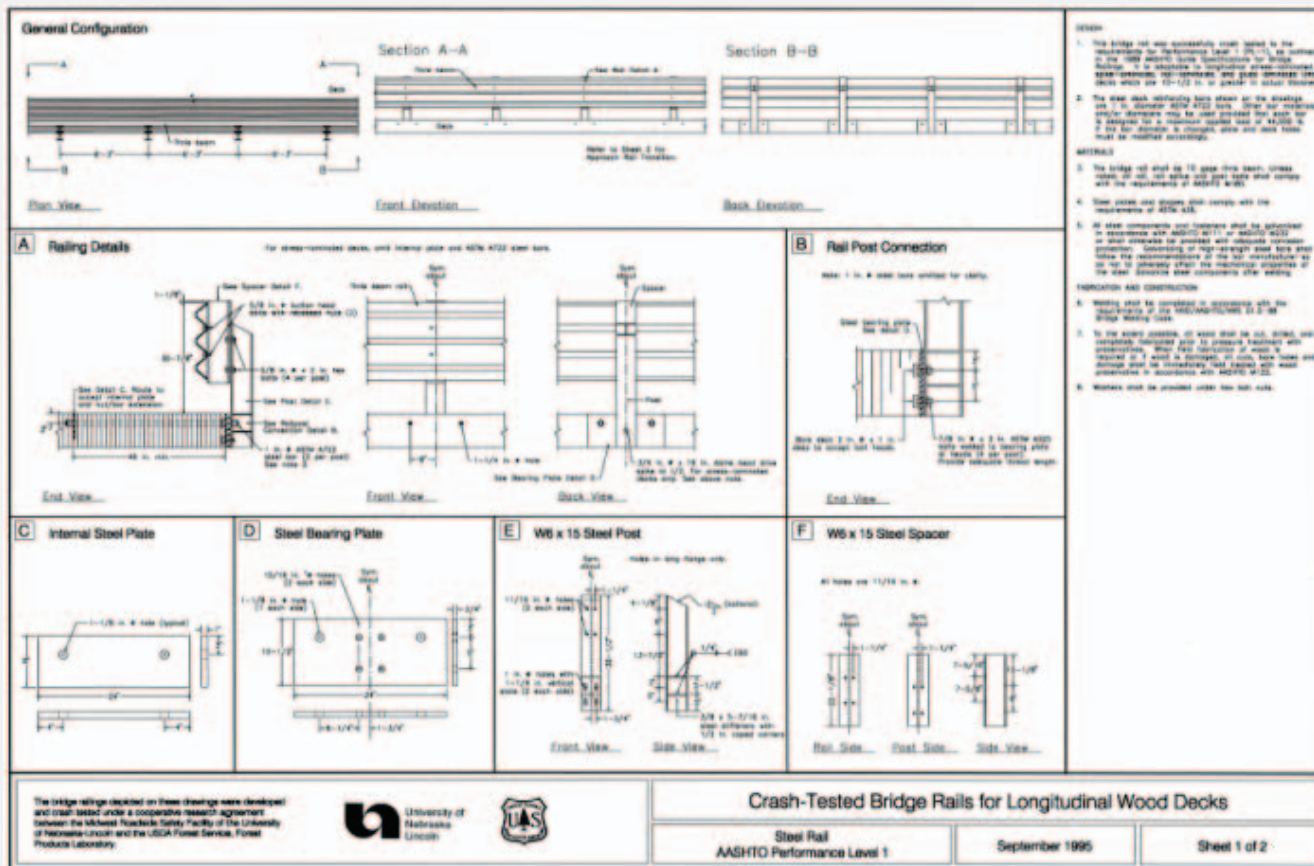
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Steel Thrie-Beam Rail, side mount



Steel Thrie-Beam Rail with Upper Channel, TCB8000 design

Height:
33"

Cost per linear foot:
\$__

Test level:
TL-4

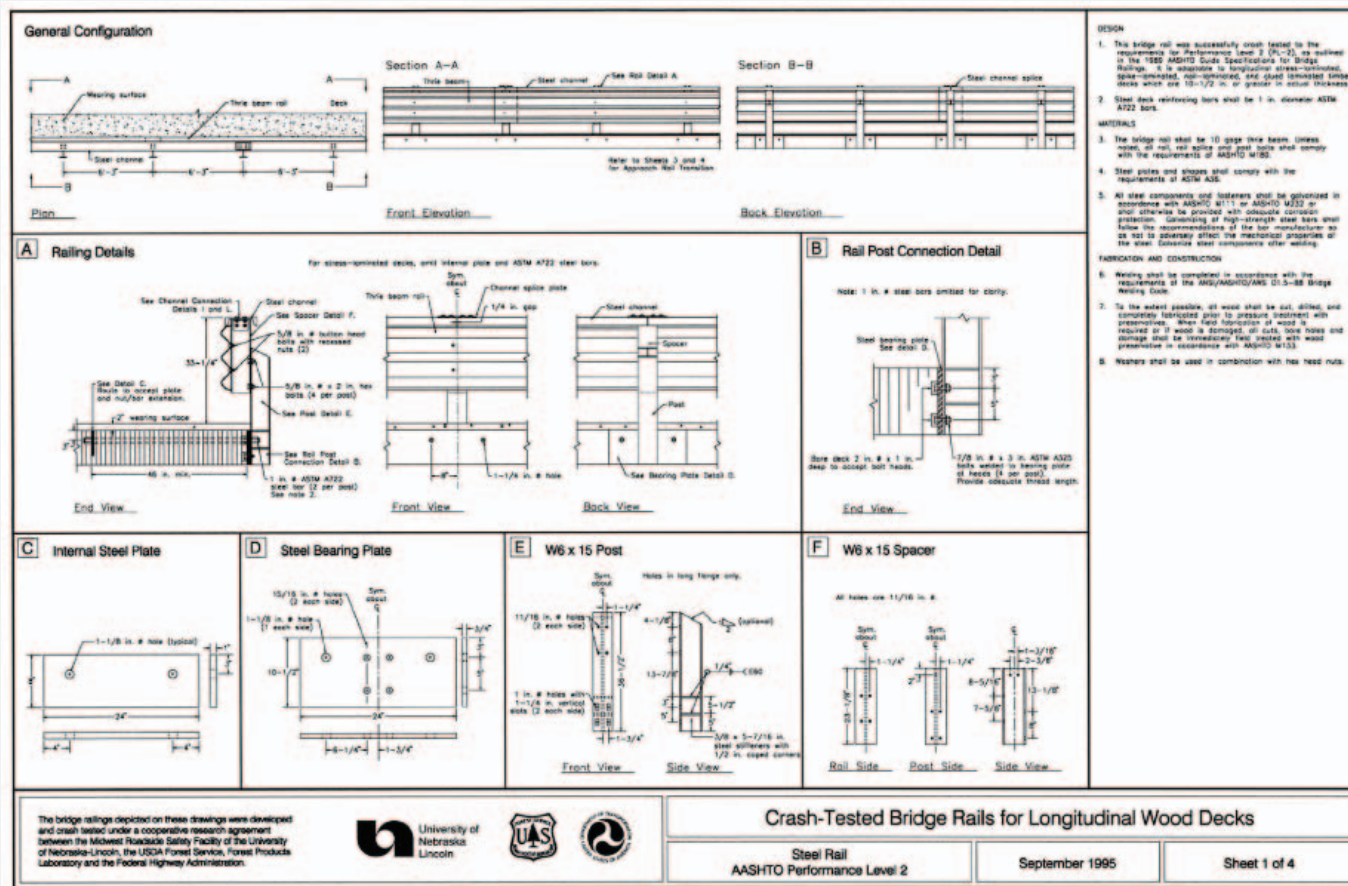
Utilized in:

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Steel Thrie-Beam Rail with Upper Channel, TCB8000 design



W-Beam Breakaway Steel Post Railing

Height:
41"

Cost per linear foot:
\$__

Test level:
TL-1

Utilized in:

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