

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G14



ROCK CUT LIMITS
Station 365+00



ROCK CUT LIMITS
Looking Downstation
Station 365+00

Jonathan Blum

LEGEND:



Limits of Rock Excavation by Controlled Blasting

NOTES:

- Limits of rock excavation may vary when directed by CO.
- "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
- "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ④ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
- Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.

STATION 365+00							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
2	--	--	--	5	6	30	Granite

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

**STATION 365+00
ROCK CUT PLAN**

No Scale

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3/13/2019

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G15



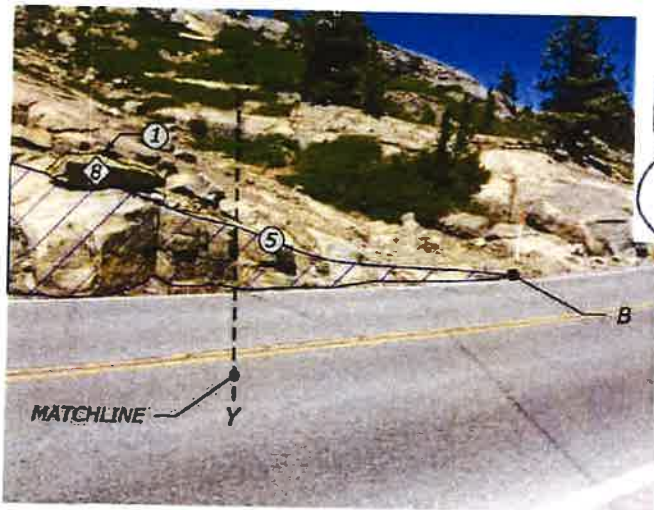
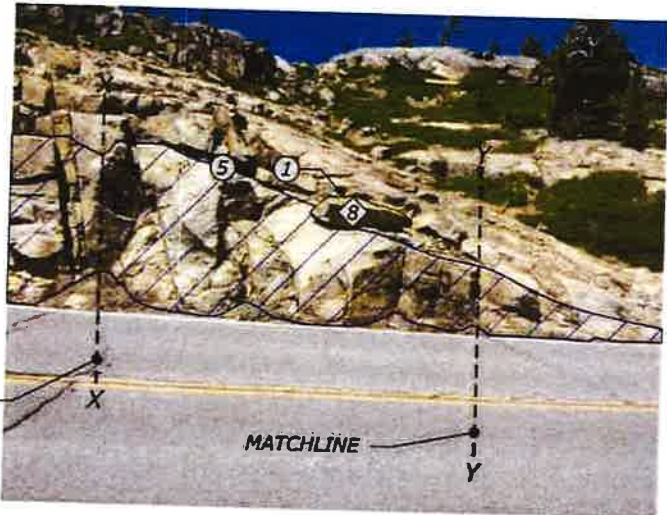
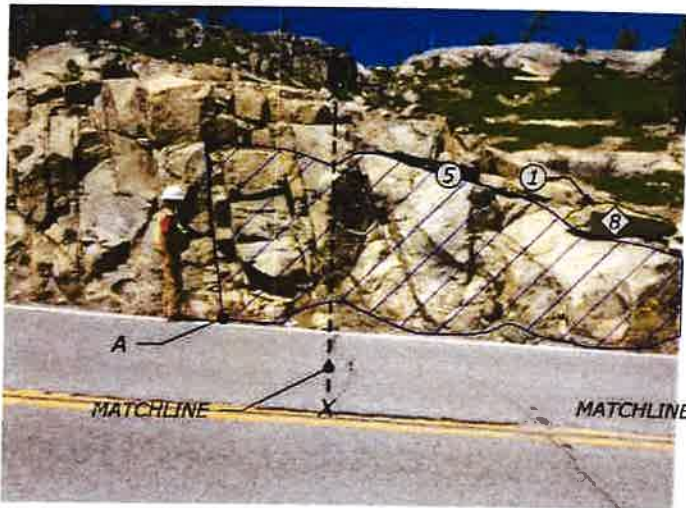
Jonathan Blum

LEGEND:

-  Limits of Rock Excavation by Controlled Blasting
-  Limits of Rock Scaling
-  Rock or Block Number

NOTES:

- ① Rock to be inspected for removal by hand scaling techniques and to be removed if directed by the CO.
2. Limits of rock excavation and scaling may vary when directed by CO.
3. "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
4. "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ⑤ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
6. Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.



ROCK CUT LIMITS
Station 366+35 to 366+90



ROCK CUT LIMITS
Looking Upstation
Station 366+35 to 366+90



ROCK CUT LIMITS
Looking Downstation
Station 366+35 to 366+90

STATION 366+35 TO 366+90							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
6	1	1	--	28	5	140	Granite

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

**STATION 366+35 TO 366+90
ROCK CUT PLAN**

No Scale

User: jcravens

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3/13/2019

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G16

Jonathan Blum
No. 2312
REGISTERED PROFESSIONAL ENGINEER
CALIFORNIA
EXPIRATION DATE 12/31/2020



ROCK CUT LIMITS
Station 367+25 to 367+65



ROCK CUT LIMITS
Looking Upstation
Station 367+25 to 367+65

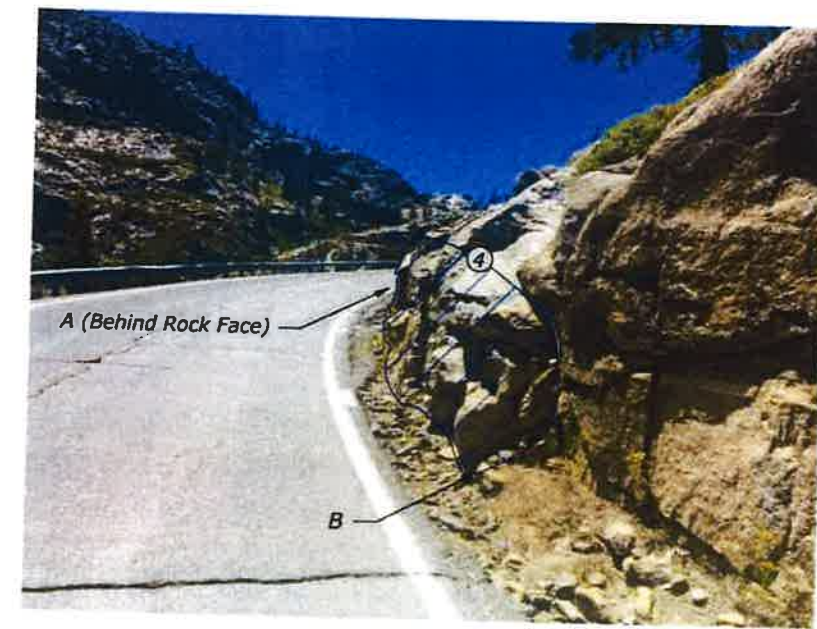
LEGEND:



Limits of Rock Excavation by Controlled Blasting

NOTES:

1. Limits of rock excavation and may vary when directed by CO.
2. "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
3. "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ④ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
5. Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.



ROCK CUT LIMITS
Looking Downstation
Station 367+25 to 367+65

STATION 367+25 TO 367+65							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
12	--	--	--	20	6	120	Granite

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

**STATION 367+25 TO 367+65
ROCK CUT PLAN**

No Scale

User: jcravens

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3/12/2019

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G17



ROCK CUT LIMITS
Station 369+90 to 370+30



ROCK CUT LIMITS
Looking Downstation
Station 369+90 to 370+30



ROCK CUT LIMITS
Looking Upstation
Station 369+90 to 370+30

Jonathan Blum
No. 2312

LEGEND:



Limits of Soil and Rock Excavation
by Controlled Blasting

NOTES:

1. Limits of rock excavation may vary when directed by CO.
2. "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
3. "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ④ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
5. Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.

STATION 369+90 TO 370+30							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
4	--	--	--	20	4	80	Soil/Granite

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

**STATION 369+90 TO 370+30
ROCK CUT PLAN**

No Scale

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4/11/2019

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G18



ROCK CUT LIMITS
Station 370+30 to 370+70

LEGEND:



Limits of Rock Excavation by Controlled Blasting



Location of Rock Dowel or Rock Bolt

NOTES:

1. Limits of rock excavation may vary when directed by CO.
2. Install rock dowel or bolt at location, inclination, and depth directed by the CO.
3. Install additional rock reinforcement if directed by CO to stabilize rock face before starting excavation.
4. "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
5. "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ⑥ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
7. Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.



ROCK CUT LIMITS
Looking Upstation
Station 370+30 to 370+70



ROCK CUT LIMITS
Looking Downstation
Station 370+30 to 370+70

STATION 370+30 TO 370+70							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
7	--	--	2	20	5	100	Granite

Rock Dowels installed at 370+40 LT - 8LNFT & 8LNFT

No Scale

Jonathan Blum



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

**STATION 370+30 TO 370+70
ROCK CUT PLAN**

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3/13/2019

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G19



ROCK CUT LIMITS
Station 384+80 to 385+15

LEGEND:



Limits of Rock Excavation by Controlled Blasting



Limits of Rock Scaling



Rock or Block Number

NOTES:

- ① Rock to be inspected for removal by hand scaling techniques and to be removed if directed by the CO.
2. Limits of rock excavation and scaling may vary when directed by CO.
3. "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
4. "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ⑤ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
6. Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.



ROCK CUT LIMITS
Looking Upstation
Station 384+80 to 385+15



ROCK CUT LIMITS
Looking Downstation
Station 384+80 to 385+15

STATION 384+80 TO 385+15							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
3	0.5	1	--	18	5	90	Granite

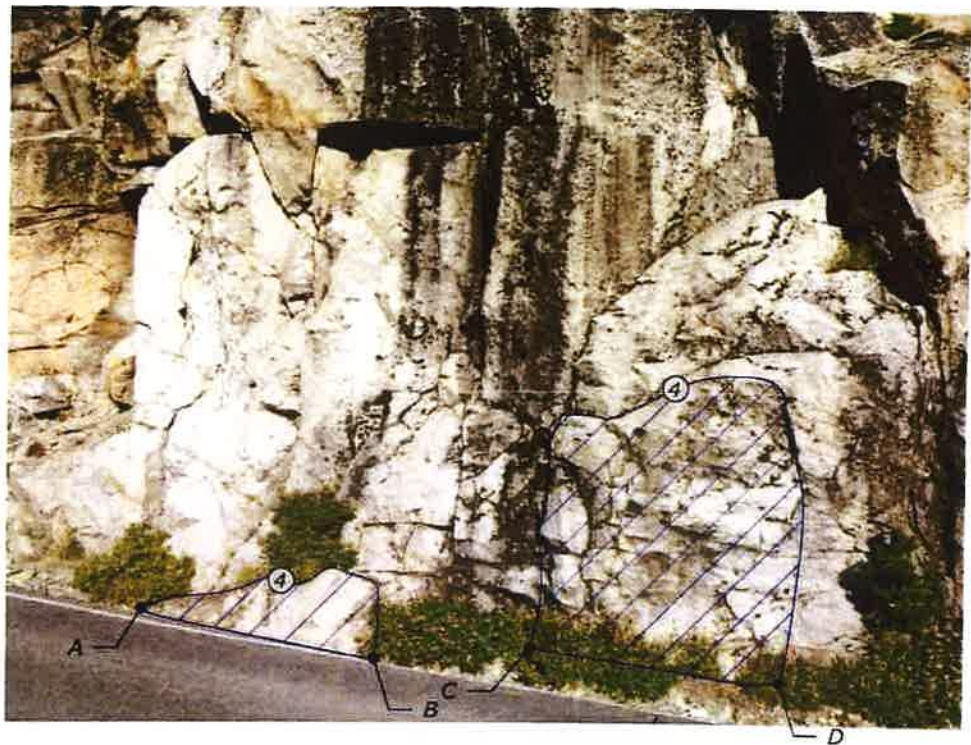
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

**STATION 384+80 to 385+15
ROCK CUT PLAN**

No Scale

Jonathan Blum
REGISTERED PROFESSIONAL ENGINEER
No. 23112
CIVIL
CALIFORNIA

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G20



ROCK CUT LIMITS
Station 385+15 to 385+55



ROCK CUT LIMITS
Looking Upstation
Station 385+15 to 385+55

LEGEND:



Limits of Rock Excavation by Controlled Blasting

NOTES:

- Limits of rock excavation may vary when directed by CO.
- "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
- "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ④ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
- Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.

STATION 385+15 TO 385+55							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
4	--	--	--	20	8	160	Granite

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

STATION 385+15 TO 385+55
ROCK CUT PLAN

No Scale

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STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G21



ROCK CUT LIMITS
Station 389+30 to 389+80



ROCK CUT LIMITS
Looking Upstation
Station 389+30 to 389+80

Jonathan Blum
Professional Engineer
No. 2312
California State Board of Engineers

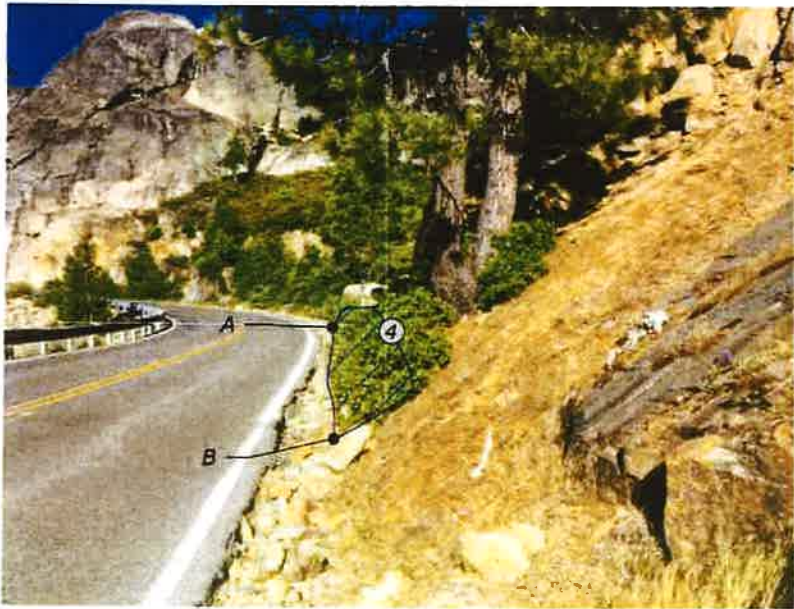
LEGEND:



Limits of Soil and Rock Excavation
by Controlled Blasting

NOTES:

- Limits of rock excavation may vary when directed by CO.
- "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
- "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ④ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
- Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.



ROCK CUT LIMITS
Looking Downstation
Station 389+30 to 389+80

STATION 389+30 TO 389+80							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
4	--	--	--	25	6	150	Soil/Granite

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

**STATION 389+30 TO 389+80
ROCK CUT PLAN**

No Scale

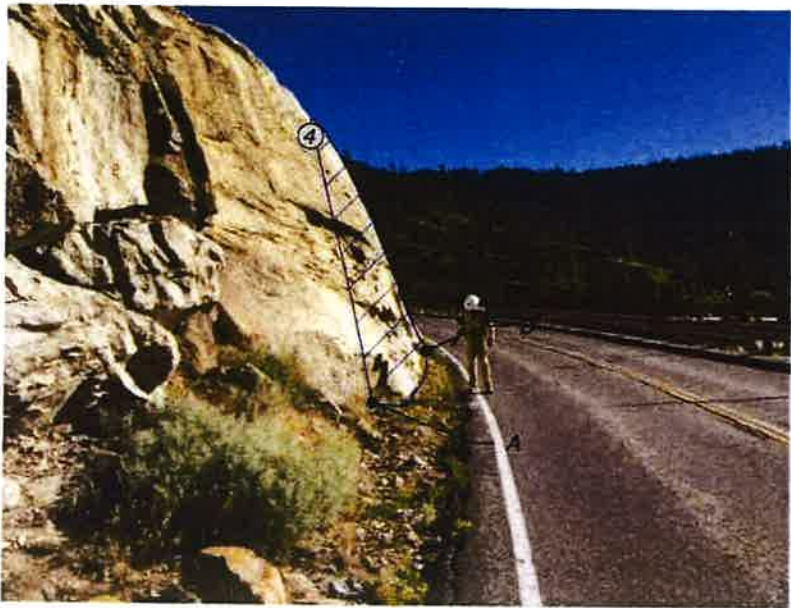
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G22



Jonathan Blum



ROCK CUT LIMITS
Station 392+72 to 393+06



ROCK CUT LIMITS
Looking Upstation
Station 392+72 to 393+06



ROCK CUT LIMITS
Looking Downstation
Station 392+72 to 393+06

LEGEND:



Limits of Rock Excavation by Controlled Blasting

NOTES:

- Limits of rock excavation may vary when directed by CO.
- "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
- "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ④ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
- Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.

STATION 392+72 TO 393+06							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
5	--	--	--	17	11	187	Granite

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

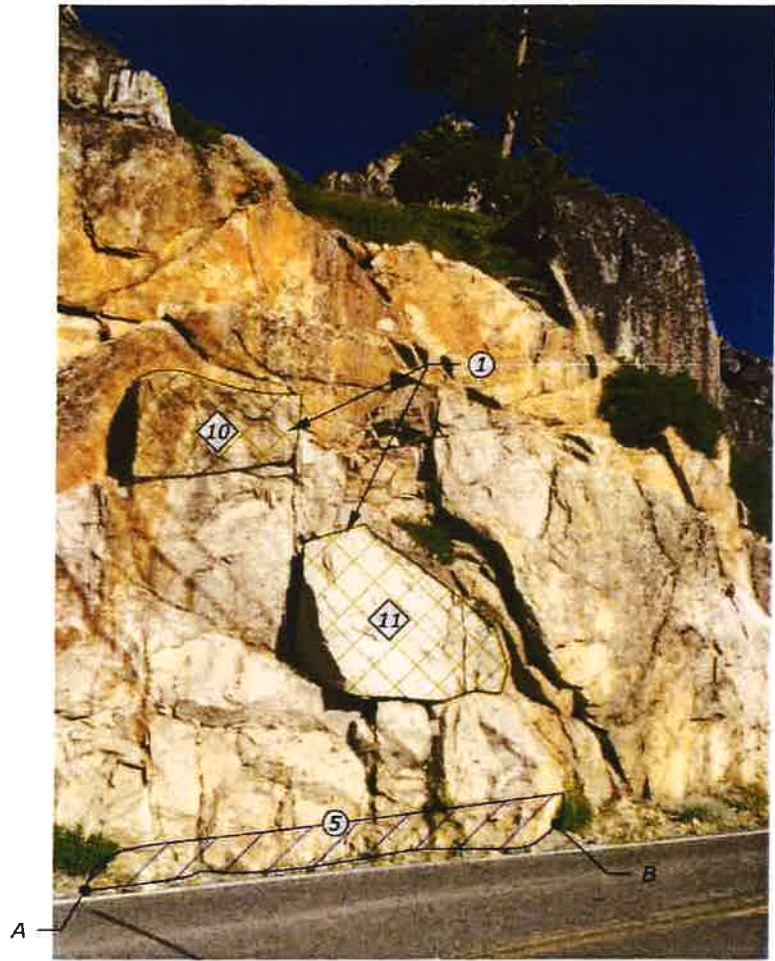
STATION 392+72 TO 393+06
ROCK CUT PLAN

No Scale

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STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G23


Jonathan Blum






ROCK CUT LIMITS
Station 394+10 to 394+35



ROCK CUT LIMITS
Looking Upstation
Station 394+10 to 394+35

LEGEND:

-  Limits of Rock Excavation by Controlled Blasting
-  Limits of Rock Scaling
-  Rock or Block Number

NOTES:

- ① Rock to be inspected for removal by hand scaling techniques and to be removed if directed by the CO.
2. Limits of rock excavation and scaling may vary when directed by CO.
3. "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
4. "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ⑤ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
6. Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.

STATION 394+10 TO 394+35							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
10	3	2	--	13	3	39	Granite

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

**STATION 394+10 TO 394+35
ROCK CUT PLAN**

No Scale

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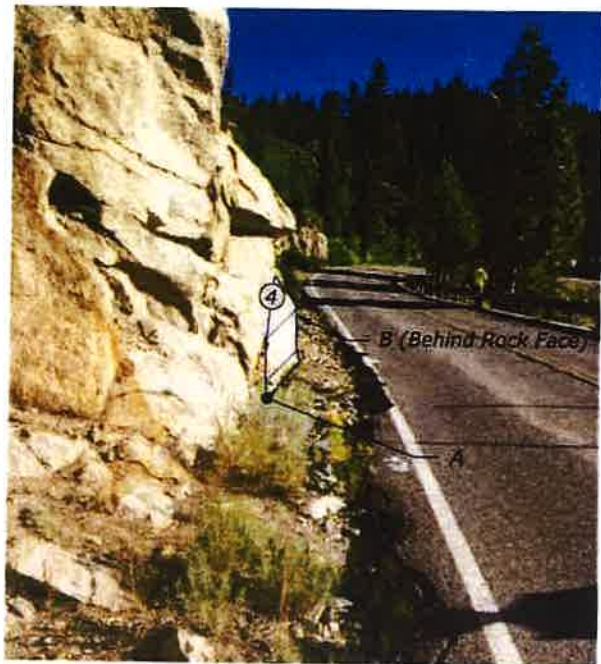
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3/13/2019

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G24



ROCK CUT LIMITS
Station 394+70 to 394+90



ROCK CUT LIMITS
Looking Upstation
Station 394+70 to 394+90

Jonathan Blum



LEGEND:



Limits of Rock Excavation by Controlled Blasting

NOTES:

- Limits of rock excavation may vary when directed by CO.
- "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
- "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.
- ④ Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.
- Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.



ROCK CUT LIMITS
Looking Downstation
Station 394+70 to 394+90

STATION 394+70 TO 394+90							
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
2	--	--	--	10	4	40	Granite

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

**STATION 394+70 TO 394+90
ROCK CUT PLAN**

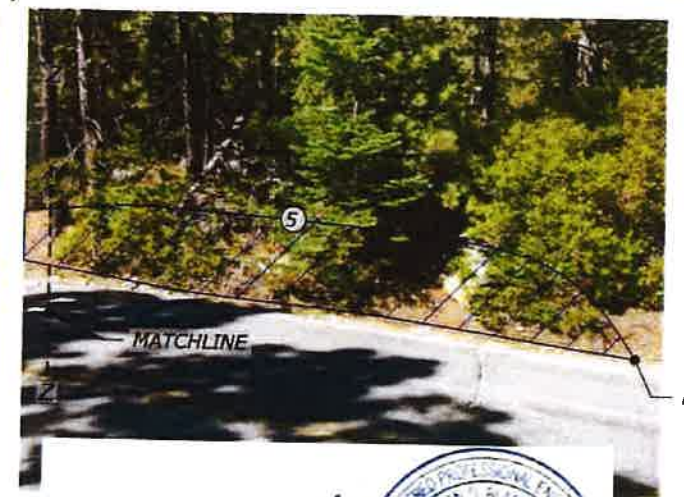
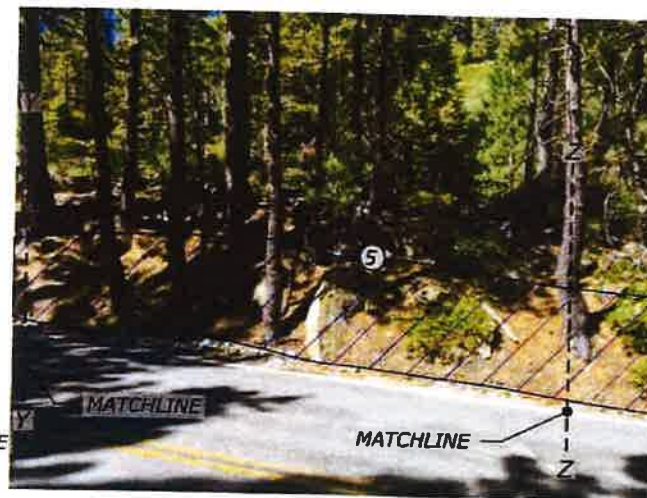
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3/13/2019

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 401(1) DONNER PASS	G25



ROCK CUT LIMITS

Station 438+80 to 440+90

LEGEND:



Limits of Soil and Rock Excavation
by Controlled Blasting

NOTES:

1. Limits of soil and rock excavation may vary when directed by CO.
2. "Field Estimated Excavation Quantity" is the estimated in-place volume of rock before it is removed.
3. "Rock Excavation by Controlled Blasting" includes excavation methods that are suitable for sliver cuts that include controlled blasting, chemical expanders, hydraulic splitters, or

Jonathan Blum
REGISTERED PROFESSIONAL ENGINEER
CALIFORNIA No. 2312
2018-2024
CFL

methods approved by the CO. These methods must limit disturbance to the rock beyond the presplit lines and rock excavation limits shown on the plans.

4. Remove soil overburden and trees prior to drilling holes for presplitting.
5. Drill holes for presplitting at not more than 24 inches on-center along the top of cut lines and as directed by the CO.

6. Presplit holes shall be to a depth of at least 1 foot below finished subgrade at the base of the cut.

ROCK CUT LIMITS

Looking Upstation
Station 438+80 to 440+90

STATION 438+80 TO 440+90

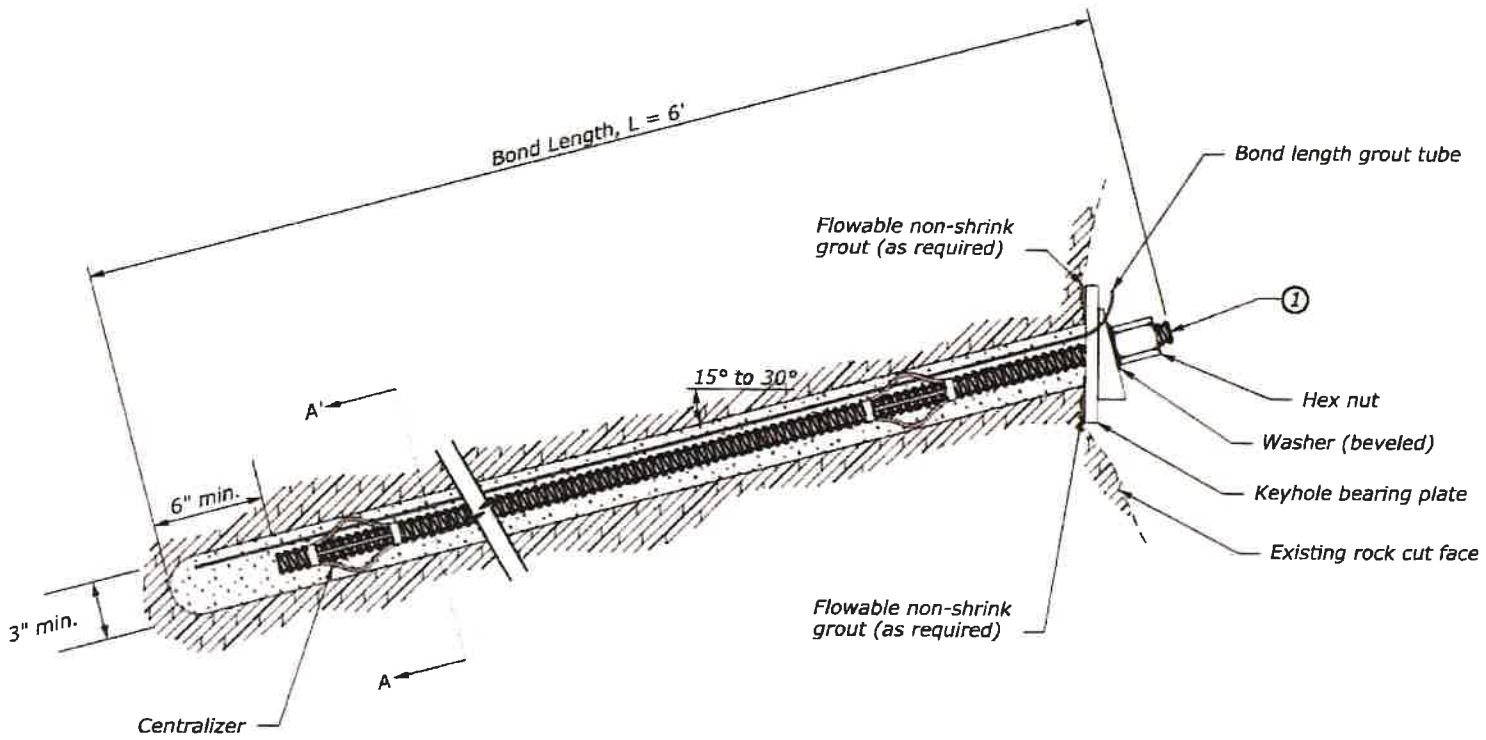
Field Estimated Excavation Quantity (CUYD)	Estimated Scaling Volume (CUYD)	Estimated No. of Individual Rocks to be Removed	Estimated No. of Rock Reinforcement	Estimated No. of Presplit Holes	Average Depth of Presplit Hole (ft)	Total Lineal Feet of Presplit Holes (ft)	Material Type
58	--	--	--	105	8	840	Soil/Granite

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

STATION 438+80 TO 440+90 ROCK CUT PLAN

No Scale

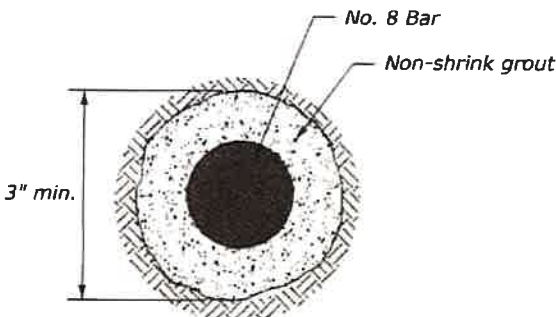
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 40(1) DONNER PASS	G26



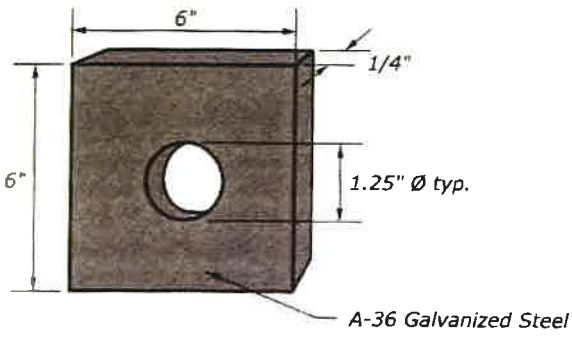
TYPICAL ROCK DOWEL DETAIL

NOTES:

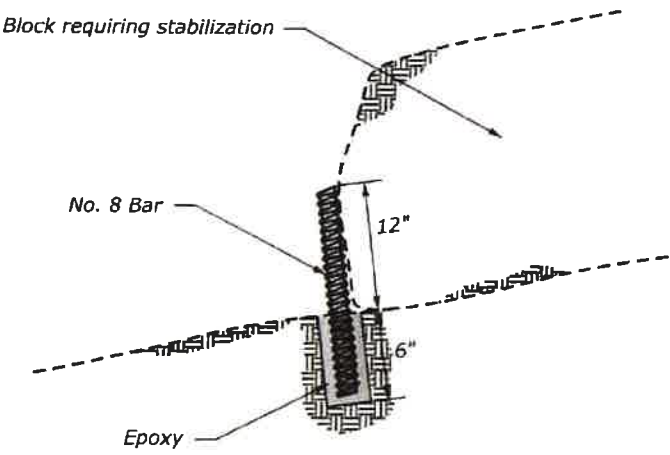
1. Rock Dowels shall consist of 1" reinforcing bar. Reinforcing bars shall be epoxy coated with bearing plate, beveled washers (ASTM A-536), and hex nut (ASTM A-29). All hardware and bars that are exposed shall be galvanized.
2. CO to verify quantities prior to ordering.
3. The CO will mark locations and orientations of the Rock Dowels in the field based on the quantities and general locations provided in the Plans.
4. Rock Dowels shall be fully grouted.
5. The design assumes the bond zone of the Rock Dowel will be in granite.
6. Rock Dowels designed to provide confinement. Additional Rock Dowels may be required as directed by the CO based on conditions observed during construction.
7. The design load is 5 kips per anchor.
8. Shear pins to be installed at location directed by the CO based on field conditions.



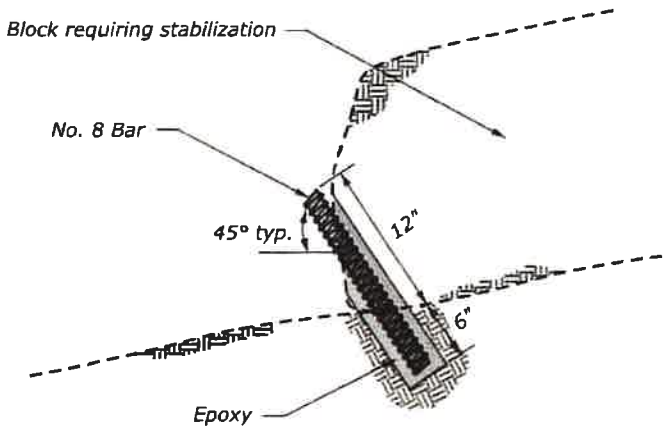
**SECTION A-A'
BOND LENGTH**



TYPICAL BEARING PLATE DETAIL



OR



TYPICAL SHEAR PIN DETAIL

Jonathan Blum

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CENTRAL FEDERAL LANDS HIGHWAY DIVISION
U.S. CUSTOMARY SPECIAL

ROCK REINFORCEMENT DETAIL

SPECIAL
260-A

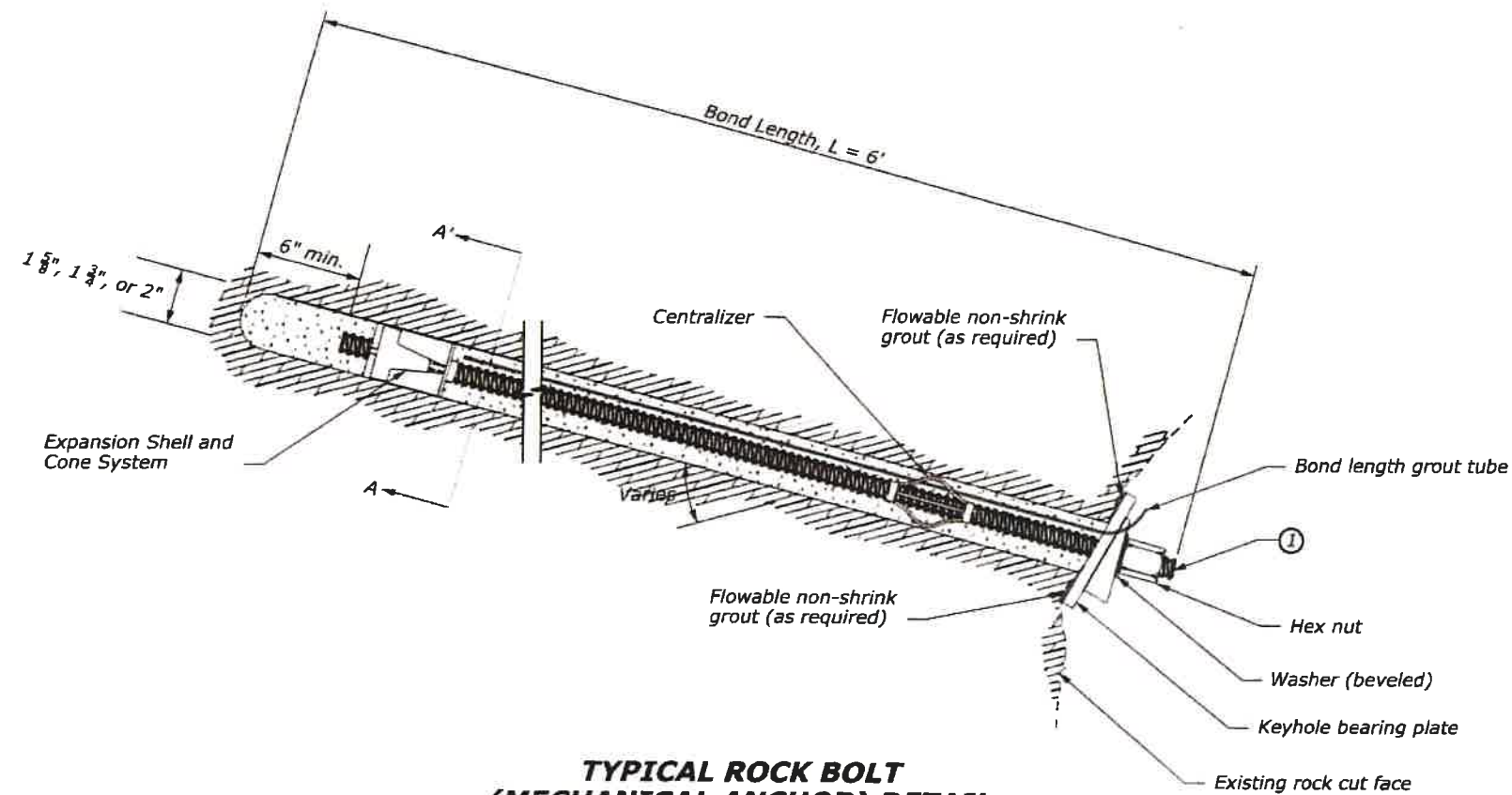
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User: Jamie Cravens

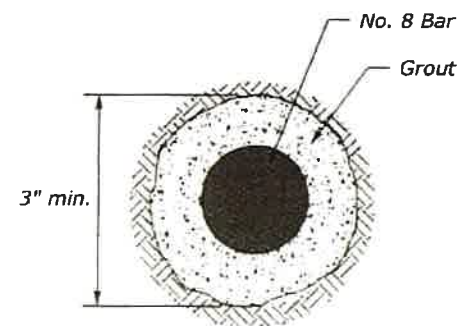
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1/2/2019

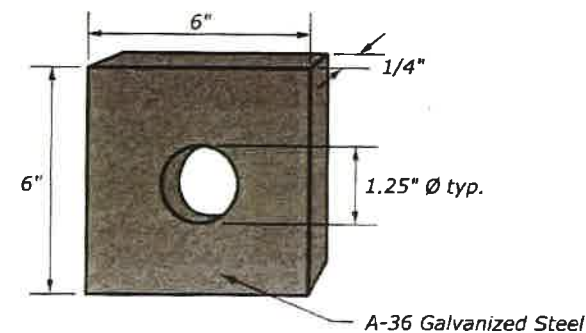
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 40(1) DONNER PASS	G27



**TYPICAL ROCK BOLT
(MECHANICAL ANCHOR) DETAIL**



**SECTION A-A'
BOND LENGTH**



TYPICAL BEARING PLATE DETAIL

NOTES:

1. Rock Bolts shall consist of 1" hollow core bar (ASTM 615) connected to a mechanical, steel expansion shell. Reinforcing bars shall be epoxy coated with bearing plate, beveled washers and hex nut conforming to ASTM F432. All hardware and bars that are exposed shall be galvanized.
2. CO to verify quantities of Rock Bolts prior to ordering.
3. The CO will mark locations and orientations of the Rock Bolts in the field based on the quantities and general locations provided in the Plans.
4. Rock Bolts shall be fully grouted following tension and lock off.
5. The design assumes the bond zone of the Rock Bolt will be in hard granitic rock.
6. Rock Bolt designed to provide confinement. Additional Rock Bolts may be required as directed by the CO based on conditions observed during construction.
7. The design load is 5 kips per anchor.

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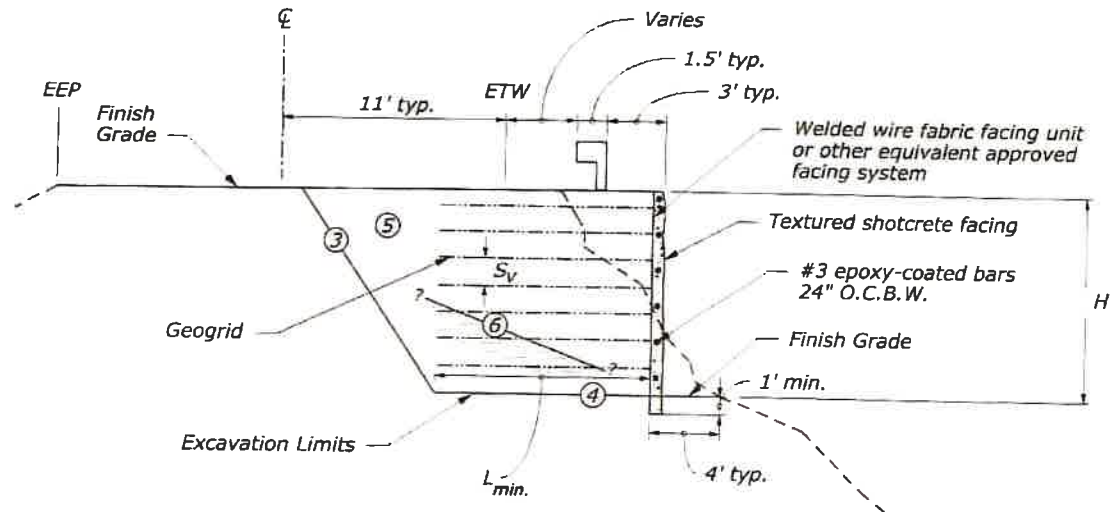
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION
U.S. CUSTOMARY SPECIAL

ROCK REINFORCEMENT DETAIL

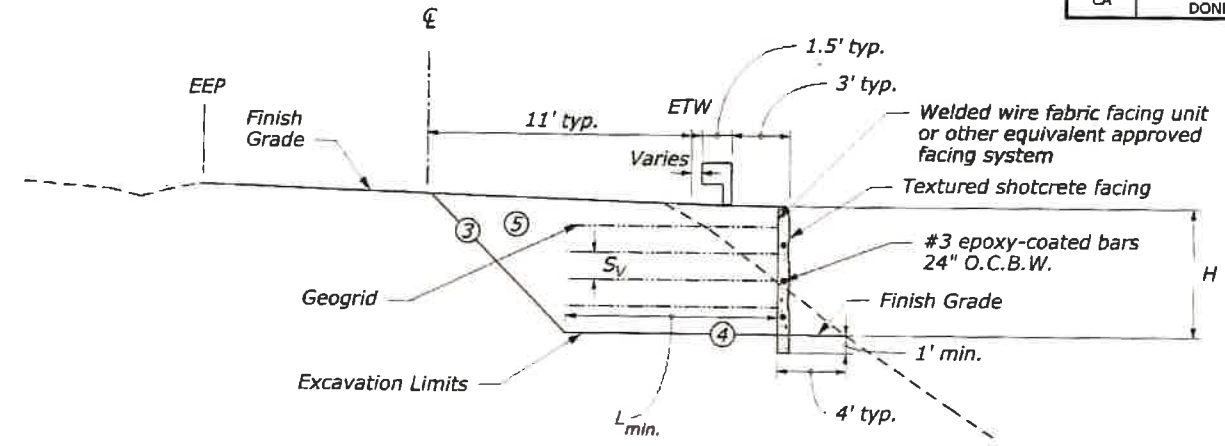
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SPECIAL
260-A

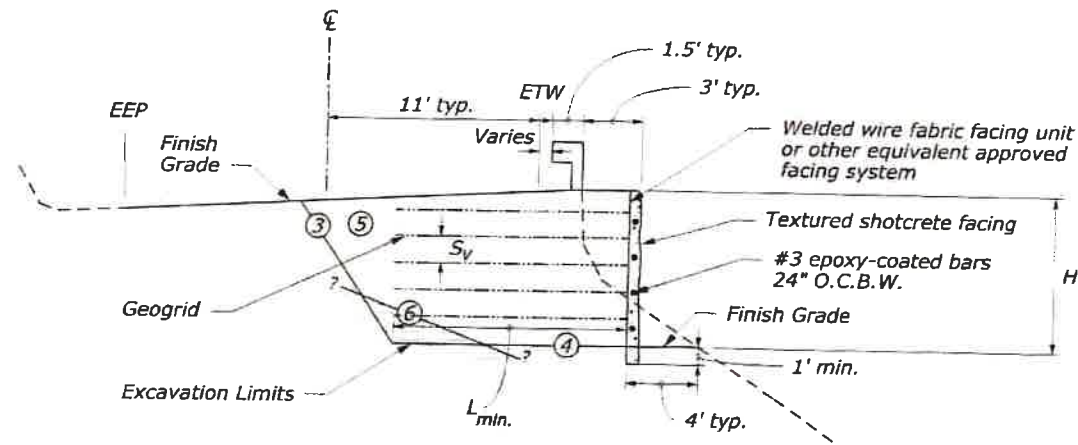
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	G29



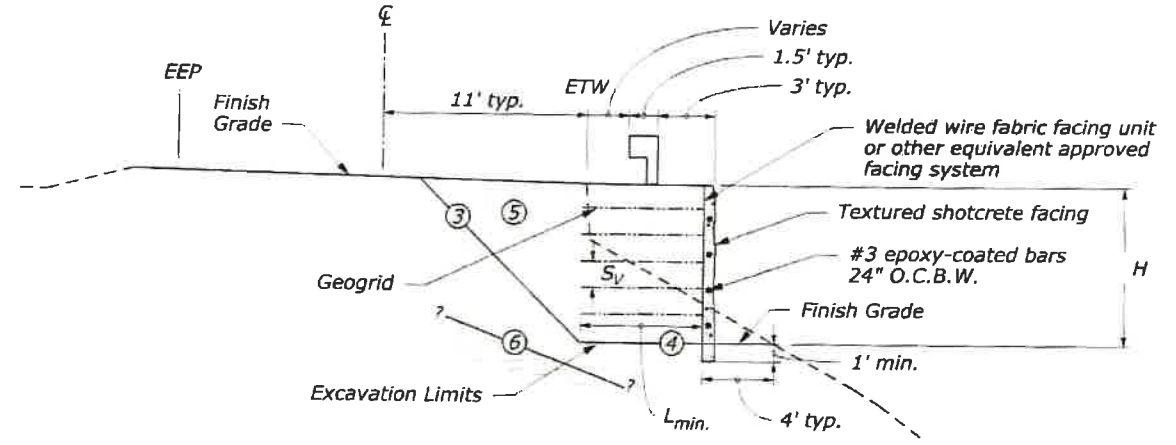
STATION 385+10 TO 386+40
1" = 10'



STATION 386+65 TO 387+75
1" = 10'



STATION 393+00 TO 394+20
1" = 10'



STATION 394+95 TO 396+25
1" = 10'

Geogrid Reinforced MSE Wall				
Station Limits	Height of RSS, H	Vertical Spacing, S _v	Minimum Reinforcement Length, L _{min} .	Type VI Geogrid Nominal Long-Term Strength, T _{al}
385+10 to 386+40	12 ft	1.5 ft	12 ft	4000 lb/ft
386+65 to 387+75	8 ft	1.5 ft	12 ft	4000 lb/ft
393+00 to 394+20	9 ft	1.5 ft	13 ft	4000 lb/ft
394+95 to 396+25	9 ft	1.5 ft	7 ft	4000 lb/ft

NOTE:

Geogrid Reinforced MSE Wall:

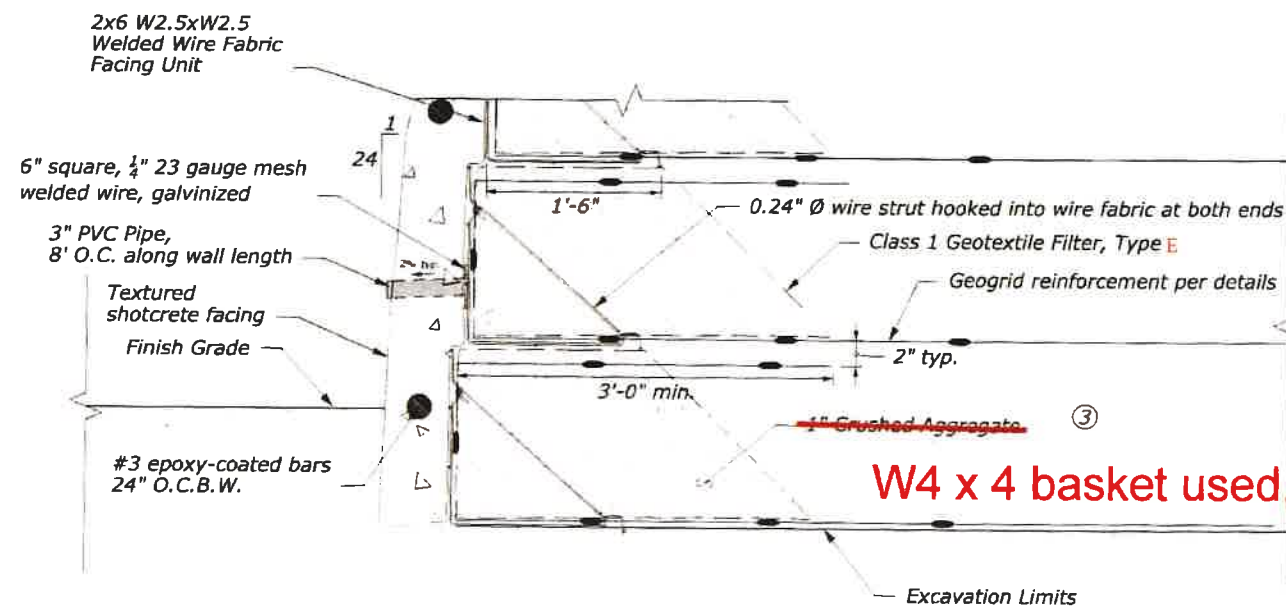
1. Remove unstable material as directed by CO.
2. Excavate existing soil and rock to allow for placement of geogrid reinforcement to minimum dimensions and limits shown.
- ③ Provide temporary slope or shoring as required by OSHA.
- ④ Place first layer of geogrid reinforcement on undisturbed subgrade.
- ⑤ Fill in reinforced soil slope.
- ⑥ Depth to rock varies. Bottom RSS and end reinforcement at rock interface as directed by CO.

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**GEOGRID REINFORCED MSE
WALL DETAIL**

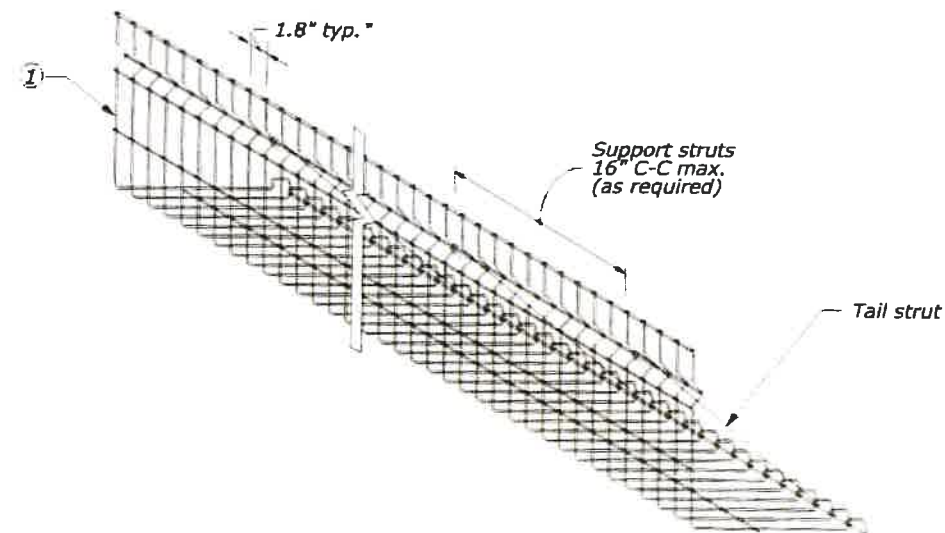
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	G30



W4 x 4 basket used, 2" x 6" rock used for facing instead of 1" crushed aggregate

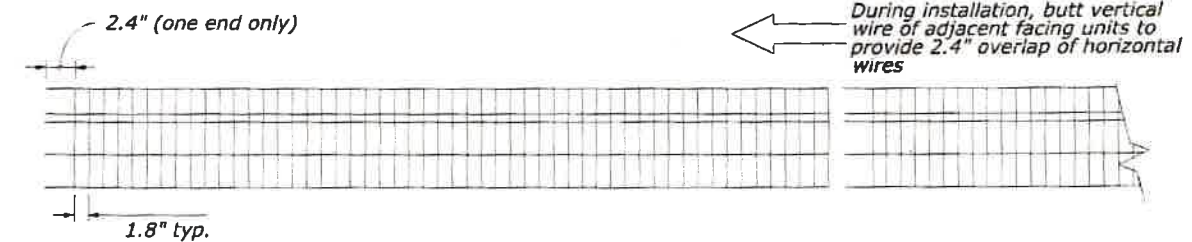
FACING DETAIL (WITH SHOTCRETE FACING)

No Scale



WIRE FACING UNIT

No Scale



ELEVATION VIEW

No Scale

NOTE:

- ① All facing units shall be galvanized per ASTM A123 after fabrication.
- ② Optional - A thin layer (2" min.) of finer stone (1/4"-1") may be placed at the top of each unit to provide a level surface for the unit above.
- ③ Fill in reinforced soil slope.
- ④ Provide wire facing per detail shown or other equivalent approved facing system.
- ⑤ Wrap geogrid at face with a minimum 3-foot return.

6. Shotcrete was placed at 8" thickness

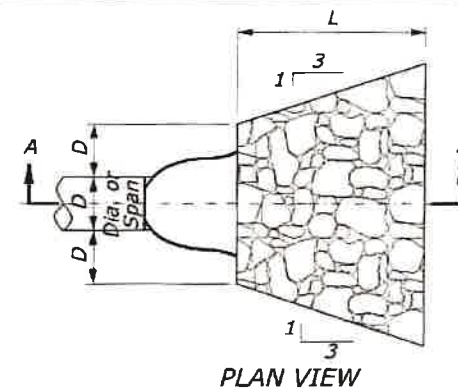
Jonathan Blum

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

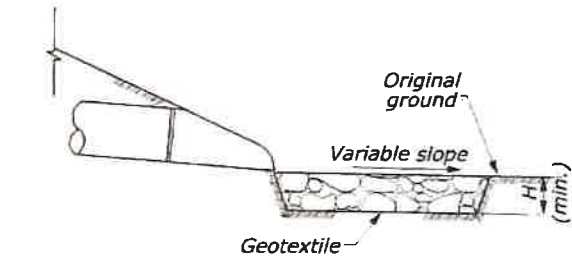
**GEOGRID REINFORCED MSE
WALL FACING DETAIL**

User: dhrung

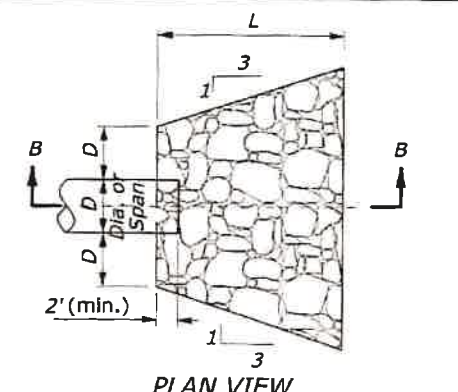
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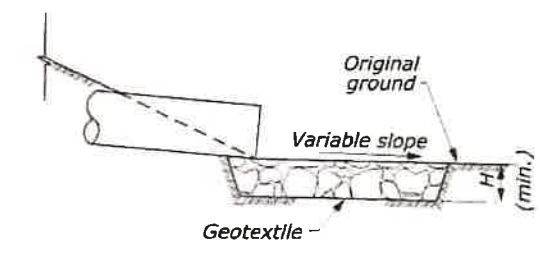
CULVERT WITH STANDARD END SECTION



SECTION A-A

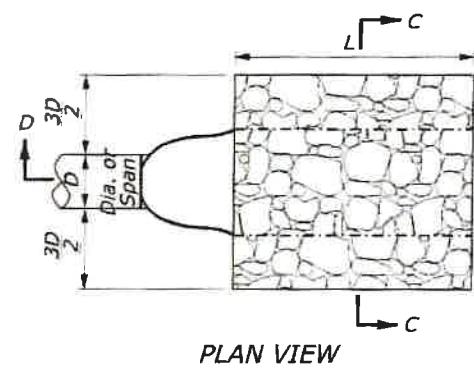


CULVERT WITHOUT STANDARD END SECTION

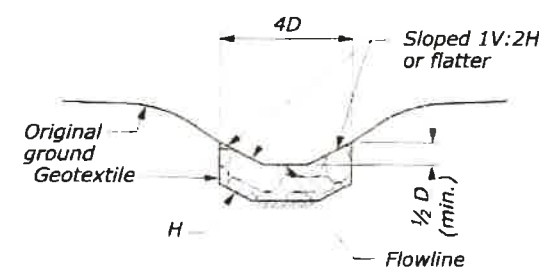


SECTION B-B

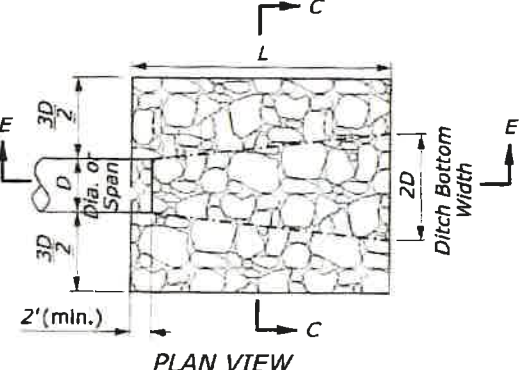
PROTECTIVE APRON AT CULVERT OUTLET WITHOUT DITCH



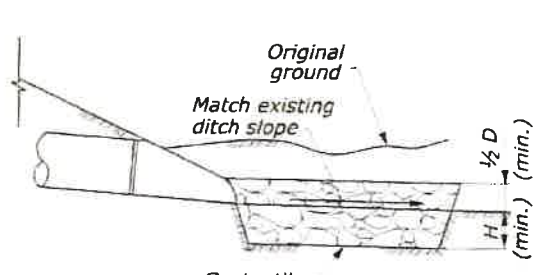
CULVERT WITH STANDARD END SECTION



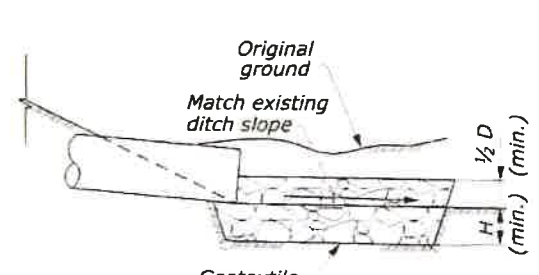
SECTION C-C



CULVERT WITHOUT STANDARD END SECTION



SECTION D-D



SECTION E-E

PROTECTIVE APRON AT CULVERT OUTLET WITH DITCH

OUTLET WITHOUT DITCH PROTECTIVE APRON DIMENSIONS AND ESTIMATED QUANTITIES						
	CULVERT SIZE D (inches)	RIPRAP CLASS	LENGTH OF APRON L (feet)	DEPTH OF APRON H (feet)	ESTIMATED RIPRAP QUANTITY (CY)	ESTIMATED GEOTEXTILE QUANTITY (SY)
WITH END SECTION	12	2	4	1.5	1	5
	18	2	6	1.5	2.2	9
	24	2	8	1.5	3.9	14
	30	3	12.5	2	10.9	28
	36	3	16	2	15.6	37
	42	4	21	2.5	34.1	63
WITHOUT END SECTION	48	4	24	2.5	44.5	79
	12	2	6	1.5	1.7	8
	18	2	8	1.5	3.2	12
	24	2	10	1.5	5.2	17
	30	3	14.5	2	13.3	33
	36	3	17	2	18.5	43
	42	4	23	2.5	38.7	70
	48	4	26	2.5	49.8	87

OUTLET WITH DITCH PROTECTIVE APRON DIMENSIONS AND ESTIMATED QUANTITIES						
	CULVERT SIZE D (inches)	RIPRAP CLASS	LENGTH OF APRON L (feet)	DEPTH OF APRON H (feet)	ESTIMATED RIPRAP QUANTITY (CY)	ESTIMATED GEOTEXTILE QUANTITY (SY)
WITH END SECTION	12	2	4	1.5	0.9	5
	18	2	6	1.5	2	8
	24	2	8	1.5	3.6	13
	30	3	12.5	2	9.3	24
	36	3	15	2	13.4	32
	42	4	21	2.5	27.3	53
WITHOUT END SECTION	48	4	24	2.5	35.6	65
	12	2	6	1.5	1.4	6
	18	2	8	1.5	2.7	10
	24	2	10	1.5	4.5	15
	30	3	14.5	2	10.8	27
	36	3	17	2	15.2	36
	42	4	23	2.5	29.9	57
	48	4	26	2.5	38.6	70

- NOTE:**
1. Use for aprons serving culverts with slopes of less than 10%.
 2. Furnish geotextile conforming to Subsection 714.01(a).
 3. Excavation for placement of riprap will not be measured for payment.

RESPONSIBLE ONLY FOR SELECTION OF APPROPRIATE STANDARD DETAIL

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION
U.S. CUSTOMARY DETAIL

PLACED RIPRAP AT CULVERT OUTLETS

DETAIL APPROVED FOR USE
REVISED: 08/2014
DETAIL
C251-50

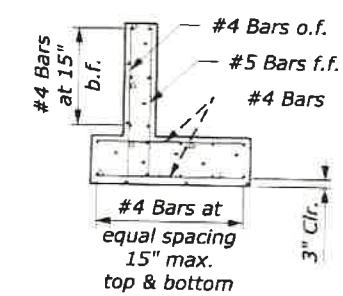
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WINGWALLS FOR CONCRETE HEADWALLS																
DIMENSIONS, REINFORCING STEEL AND CONCRETE TABLE OF QUANTITIES																
D INCH	H FEET	0° WINGWALL SKEW			15° WINGWALL SKEW			30° WINGWALL SKEW			45° WINGWALL SKEW			60° WINGWALL SKEW		
		W FEET	CONC. CUYD	STEEL LB	W FEET	CONC. CUYD	STEEL LB	W FEET	CONC. CUYD	STEEL LB	W FEET	CONC. CUYD	STEEL LB	W FEET	CONC. CUYD	STEEL LB
48	5.00	6.00	2.81	178	6.00	2.78	178	6.00	2.76	178	6.00	2.74	178	6.00	2.73	178
54	5.25	6.00	2.86	180	6.00	2.82	180	6.00	2.80	180	6.00	2.78	180	6.75	3.06	202
60	5.50	6.25	2.90	181	6.00	2.86	181	6.00	2.84	181	6.00	2.82	181	7.50	3.39	224
66	5.75	7.00	2.94	183	6.00	2.90	183	6.00	2.87	183	6.00	2.85	183	8.25	3.74	241
72	6.00	7.50	2.98	185	6.00	2.94	185	6.00	2.91	185	6.50	3.09	202	9.00	4.09	263
78	6.25	8.25	3.02	186	6.00	2.98	186	6.00	2.95	186	7.00	3.34	213	9.75	4.45	285
84	6.50	8.75	3.06	188	6.00	3.02	188	6.25	3.09	197	7.50	3.59	232	10.50	4.81	311
90	6.75	9.50	3.11	190	6.00	3.06	190	6.50	3.24	207	8.00	3.84	246	11.25	5.18	329
96	7.00	10.00	3.15	191	6.25	3.21	200	7.00	3.49	218	8.50	4.10	260	12.00	5.56	350

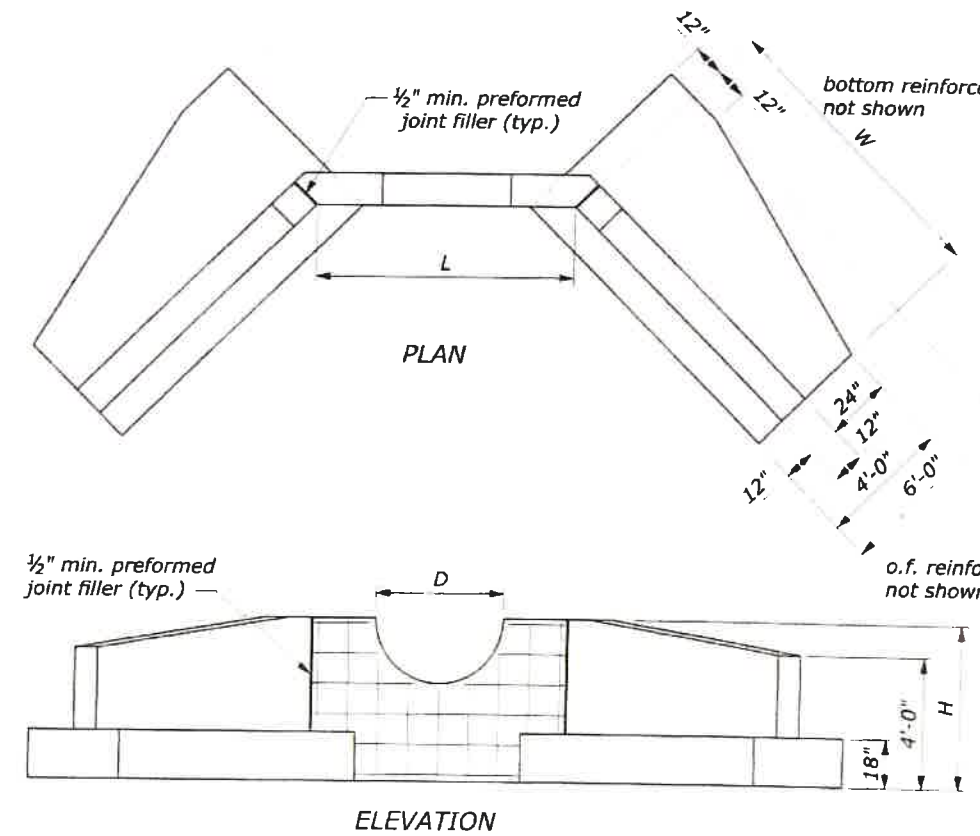
RECOMMENDED WINGWALL SKEWS				
WINGWALL	PIPE SKEW			
	0°	15°	30°	45°
①	45°	45°	60°	60°
②	45°	30°	15°	0°
③	45°	30°	15°	0°
④	45°	45°	60°	60°

NOTE:

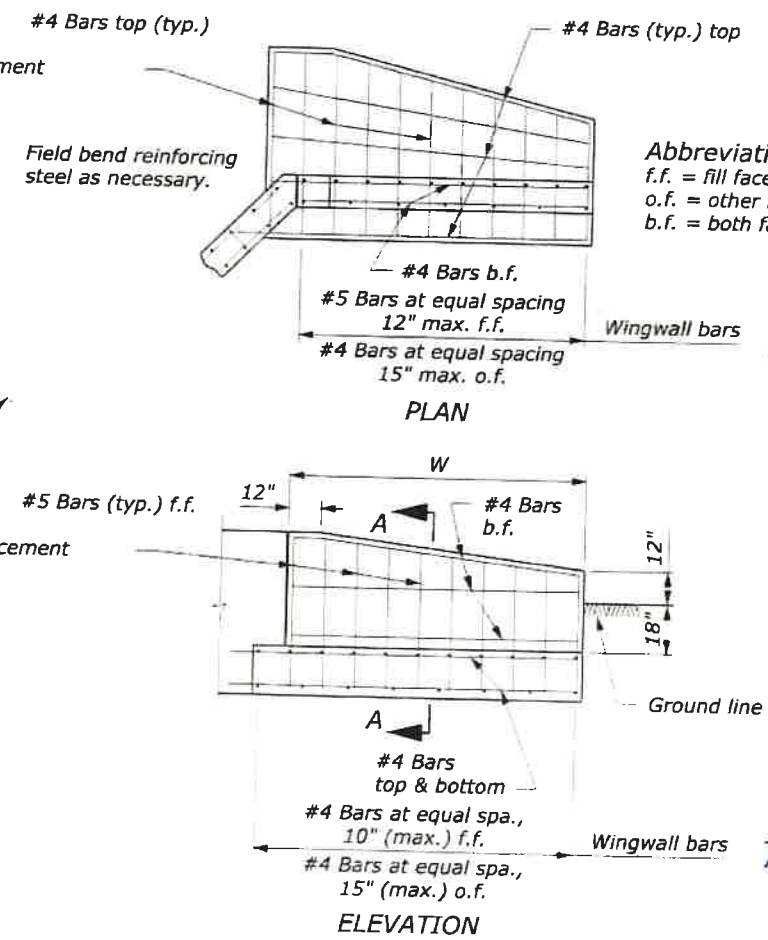
- Concrete conforms to Section 601. Chamfer all exposed edges 3/4-inch and finish all exposed surfaces with a Class 1 ordinary finish.
- Reinforcing steel clearance is 2-inches unless otherwise noted.
- For skew angles shown in table, the length W and quantities for wingwalls are computed for a 1V:1.5H side slope. For 1V:2H or 1V:2.5H slopes compute length W with the following equation:
 $W = D/2 \times \text{slope} \times \text{secant (wingwall skew angle)}$
Minimum W not less than 6 feet.
- Quantities shown in table are for one wingwall only. For lengths W not shown in table, approximate the quantities by multiplying the quantities for 0° skew and a given height H by the factor: $1 + [(W-6.0) \times 0.14]$.
- See Standards 601-1 and 601-2 for headwall and slope paving dimensions.
- Final quantities will be determined by using the tables on this standard.
- Do not order materials until the length, skew angle, and slope bevel in the field have been approved.



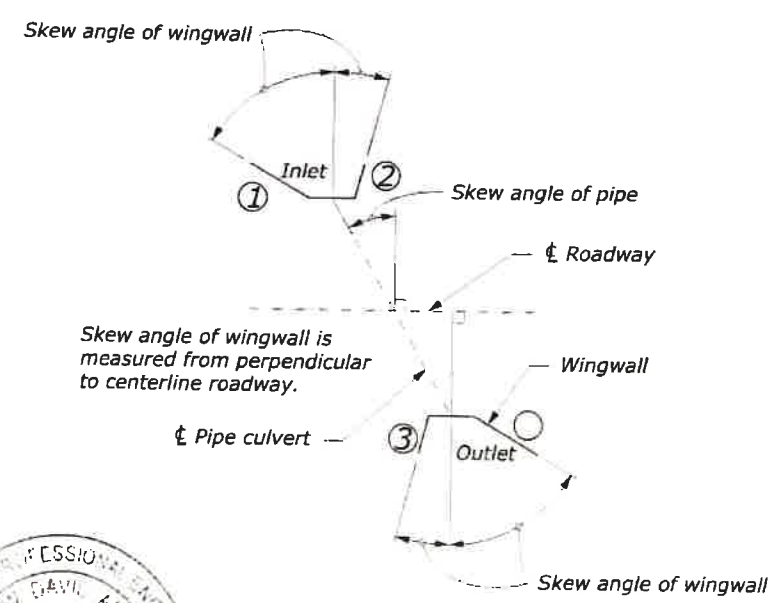
SECTION A-A



HEADWALL AND WINGWALL



TYPICAL WINGWALL



WINGWALL LAYOUT

PROFESSIONAL ENGINEER
C 05264
4/11/2019
RESPONSIBLE ONLY FOR
SELECTION OF
APPROPRIATE STANDARD
DETAIL

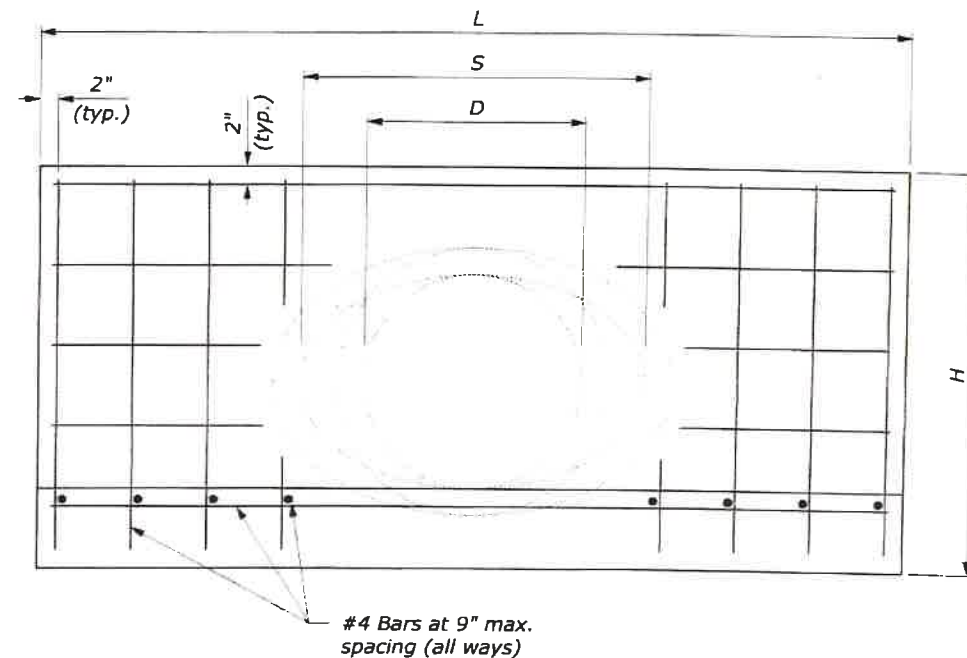
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
WINGWALLS FOR CONCRETE HEADWALLS	
STANDARD APPROVED FOR USE 06/2005 REVISED: 6/2007	STANDARD 601-3

NO SCALE

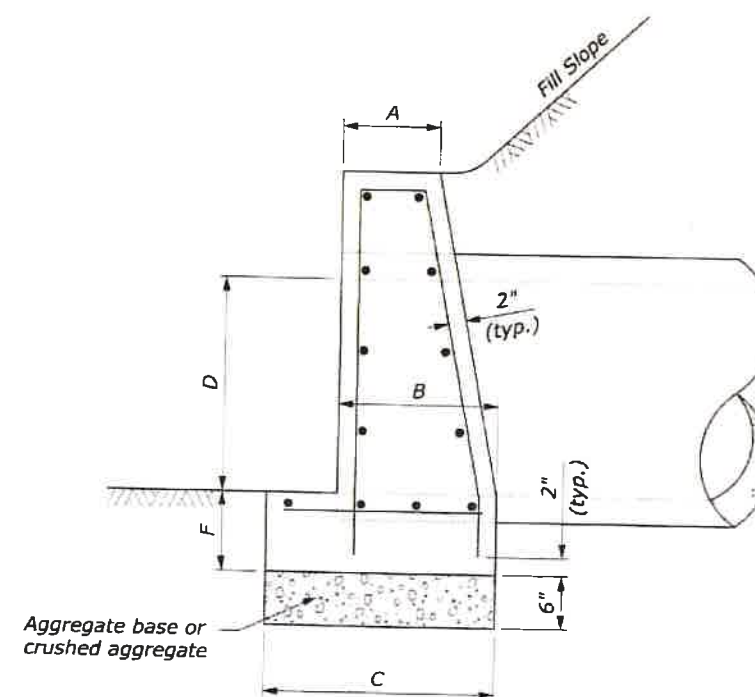
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T2

NOTE:

1. Orient all headwalls parallel to the roadway centerline unless otherwise indicated in the plans or by the CO.
2. When pipes are on a skew, adapt and lengthen headwalls as directed.
3. Chamfer all exposed corners not rounded to $\frac{3}{4}$ ".
4. Quantities shown are for one headwall with pipe at right angles.
5. Construct headwalls using dimensions shown under values for 1V:1.5H slope, unless otherwise designated by the CO.



FRONT ELEVATION



SIDE ELEVATION

HEADWALL FOR ELLIPTICAL PIPE

	SIZE OF ELLIPTICAL PIPE CULVERT (SPAN x RISE)									
	23" x 14"	30" x 19"	34" x 22"	38" x 24"	42" x 27"	45" x 29"	49" x 32"	53" x 34"	60" x 38"	68" x 43"
A	0'-8"	0'-9"	0'-10"	0'-10"	0'-11"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"
B	1'-2"	1'-5"	1'-6"	1'-8"	1'-9"	1'-10"	1'-11"	1'-11"	1'-11"	2'-0"
C	1'-6"	1'-11"	2'-1"	2'-4"	2'-5"	2'-7"	2'-8"	2'-9"	3'-3"	3'-6"
D	1'-2"	1'-7"	1'-10"	2'-0"	2'-3"	2'-5"	2'-8"	2'-10"	3'-2"	3'-7"
F	0'-8"	0'-8"	0'-9"	0'-9"	0'-9"	0'-9"	0'-9"	0'-9"	0'-9"	0'-9"
H	2'-10"	3'-3"	3'-7"	3'-9"	4'-0"	4'-2"	4'-5"	4'-7"	4'-11"	5'-4"
L	5'-5"	7'-2"	8'-6"	9'-2"	10'-2"	10'-11"	12'-1"	12'-11"	13'-0"	13'-0"
S	1'-11"	2'-6"	2'-10"	3'-2"	3'-6"	3'-9"	4'-1"	4'-5"	5'-0"	5'-8"
CUBIC YARDS OF CONCRETE										
Conc. Pipe	0.502	0.855	1.236	1.500	1.811	2.101	2.512	2.801	2.969	2.904

HEADWALL FOR CIRCULAR PIPE

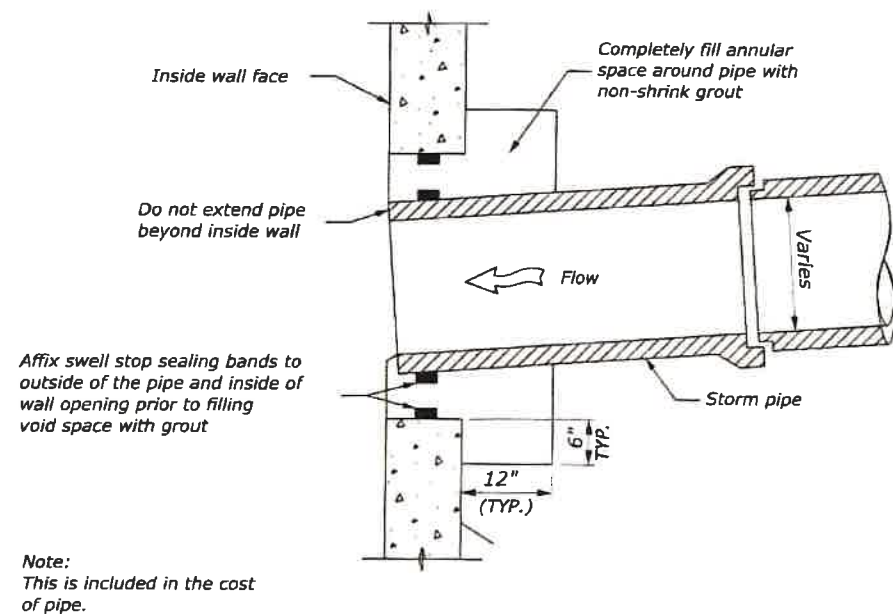
	DIAMETER OF PIPE CULVERT					
	6"	15"	18"	21" or 24"	27" or 30"	33" or 36"
A	0'-6"	0'-8"	0'-9"	0'-11"	1'-0"	1'-0"
B	0'-9"	1'-1"	1'-3"	1'-6"	1'-9"	2'-0"
C	1'-2"	1'-7"	1'-9"	2'-2"	2'-6"	2'-9"
D	1'-0"	1'-3"	1'-6"	2'-0"	2'-6"	3'-0"
F	0'-6"	0'-8"	0'-8"	0'-9"	0'-9"	0'-9"
H	2'-0"	2'-11"	3'-2"	3'-9"	4'-3"	4'-9"
L	3'-8"	5'-0"	6'-0"	8'-0"	10'-0"	12'-0"
CUBIC YARDS OF CONCRETE						
Conc. Pipe	0.241	0.492	0.697	1.319	2.067	2.947
C.M. Pipe	0.257	0.521	0.739	1.398	2.198	3.145



RESPONSIBLE ONLY FOR
SELECTION OF
APPROPRIATE STANDARD
DETAIL

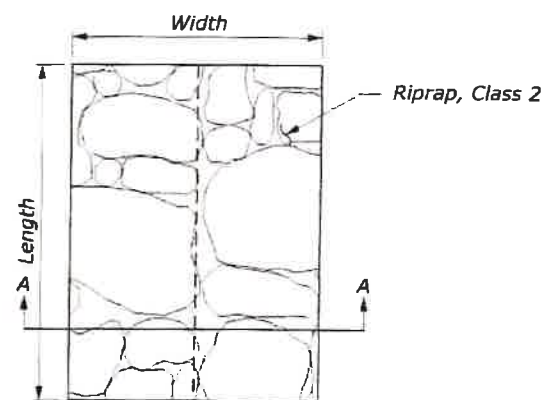
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
CONCRETE HEADWALL FOR SMALL PIPE CULVERT	
STANDARD APPROVED FOR USE 6/2005 REVISED: DRAFT: 3/2016	STANDARD 601-4

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T3

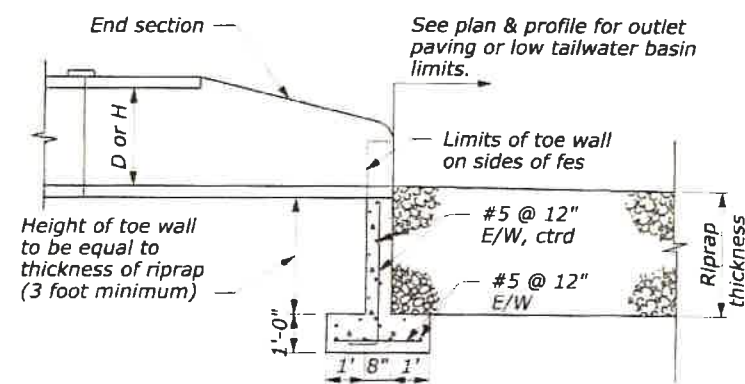


PIPE CONNECTION DETAIL
(Existing and precast walls)
Not to scale

Station	Length (ft)	Width (ft)	Depth of Rundown (ft)
322+63	30	6	1



RIPRAP RUNDOWN DETAIL
Not to scale

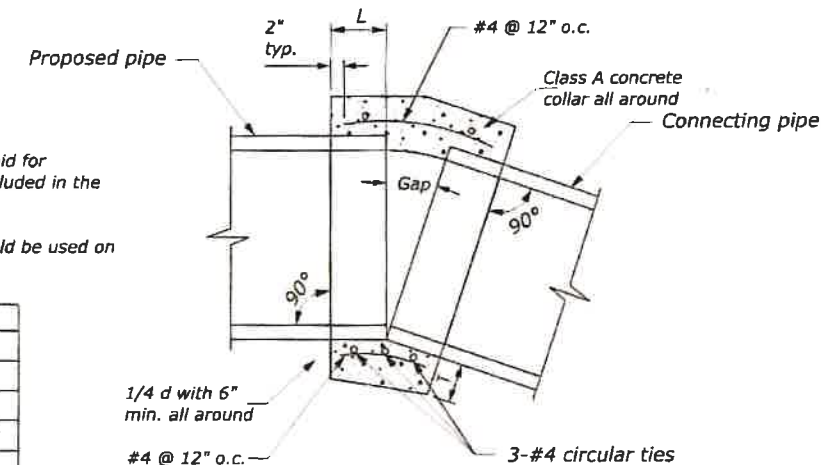


TOE WALL DETAIL
Not to scale

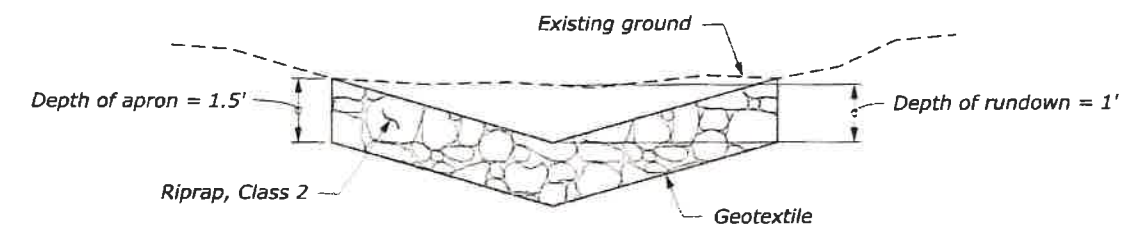
Note:

1. Pipe collars will not be paid for separately but will be included in the cost of the work.
2. Concrete pipe collar should be used on all pipe extensions.

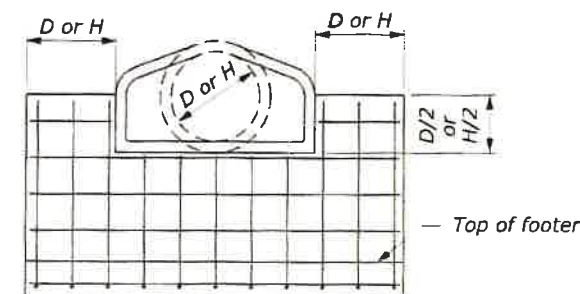
Pipe size	L	T
12"-24"	1.0'	6"
30"-42"	1.5'	8"
48"-60"	2.0'	11"
66"-78"	2.5'	12"
84"-96"	3.0'	13"
102"-114"	3.5'	14"



CONCRETE PIPE COLLAR
Not to scale



SECTION A-A
Not to scale



NOTES:

- ① Backfill both sides of wall evenly (within 1'-0" of each other).
- ② Install joint fasteners on all flared end sections.
- ③ Toe wall and all associated work shall be paid for as concrete (60101-0000) and reinforcing steel (55401-1000).



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION
U.S. CUSTOMARY SPECIAL

DRAINAGE DETAILS

NO SCALE

SPECIAL
602-A

User: mcarlson

3/20/2019 1:00:17 PM Q:\2015 Projects\15-030.02 Donner Pass Preliminary Design - CFLHD\CA FLAP NEV 40(1)\Roadway\CADD_Sheets\T-600\CA40_Sld_602-A.dgn

3/19/2019 9:21:13 AM Q:\2015 Projects\15-030.02 Donner Pass Preliminary Design - CFLHD\CA FLAP NEV 40(1)\Roadway\CADD_Sheets\T-600\CA40_Sht_602-1.dgn User: mcarlson

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T4

METAL ROUND PIPE CULVERT

FILL HEIGHT AND METAL THICKNESS TABLE FOR HELICAL LOCKSEAM AND WELDED SEAM PIPE CULVERT

STEEL														ALUMINUM																	
PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	2 1/2" x 1/2" CORRUGATIONS					3" x 1" CORRUGATIONS					5" x 1" CORRUGATIONS				PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	2 1/2" x 1/2" CORRUGATIONS					3" x 1" CORRUGATIONS								
		METAL THICKNESS (INCH/GAGE)										METAL THICKNESS (INCH/GAGE)						METAL THICKNESS (INCH/GAGE)													
		0.064/16 0.079/14 0.109/12 0.138/10 0.168/8										0.064/16 0.079/14 0.109/12 0.138/10 0.168/8						0.064/16 0.079/14 0.109/12 0.138/10 0.168/8				0.060/16 0.075/14 0.105/12 0.135/10 0.164/8									
		MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE (FEET)										MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE (FEET)						MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE (FEET)													
12	12	100	100	100	100	100										12	12	100	100	100	100	100									
15	12	100	100	100	100	100										15	12	100	100	100	100	100									
18	12	100	100	100	100	100										18	12	100	100	100	100	100									
21	12	100	100	100	100	100										21	12	88	100	100	100	100									
24	12	100	100	100	100	100										24	12	77	97	100	100	100									
30	12	85	100	100	100	100										30	12	62	77	100	100	100									
36	12	71	89	100	100	100	81	100	100	100	100					36	12	52	64	90	100	100	71	89	100	100	100				
42	12	61	76	100	100	100	70	87	100	100	100					42	12	44	55	77	99	100	59	74	100	100	100				
48	12	53	66	93	100	100	61	76	100	100	100	54	68	95	100	100	48	12						51	64	89	100	100			
54	12		59	83	100	100	54	68	95	100	100	48	60	85	100	100	54	18						44	56	78	100	100			
60	12			74	97	100	49	61	86	100	100	43	54	76	98	100	60	18						39	50	69	93	100			
66	12				87	100	44	55	78	100	100	39	49	69	89	100	66	18						57	72	85	98	100			
72	12				80	97	40	51	71	92	100	36	45	63	82	100	72	18						58	70	82	98	100			
78	12					87	37	47	66	85	100	33	42	58	75	92	78	24						45	56	76	89	100			
84	12					75	35	43	61	78	96	31	39	54	70	86	84	24							37	55	70	82			
90	12						32	40	57	73	90	29	36	51	65	80	90	24							34	48	64	75			
96	12							38	53	69	84						96	24								41	59	70			
102	18							36	50	65	79						102	24									46	65			
108	18								47	61	75						108	24								38	51	61			
114	18								45	58	71						114	24									46	55			
120	18								43	55	67						120	24									42	50			
126	18									52	64						126	24										45			
132	18									50	61						132	24													
138	18									48	58						138	24													
144	18										56						144	24										40			

NOTE:

- When directed, camber pipe culverts upward from a chord through the inlet and outlet inverts an ordinate amount equal to 1% of the pipe length. Develop camber on a parabolic curve. If the midpoint elevation on the parabolic curve as designed exceeds the elevation of the inlet invert, reduce the amount of camber or increase the pipe culvert gradient.
- Fill heights exceeding 100 feet require special analysis by the CO.
- The fill heights in the table are for helical lockseam and welded seam pipe only. Fill heights for culvert pipe with annular corrugations are more restrictive than those of helical lockseam and welded seam pipe. Obtain approval before furnishing annular corrugation pipe.
- Measure minimum cover from the top of the pipe culvert to the subgrade for flexible pavements, and to the top of the pavement for rigid pavements. Measure maximum fill height from the top of the pipe to the top of the pavement for both flexible and rigid pavement.

METAL PIPE ARCH CULVERT

FILL HEIGHT AND METAL THICKNESS TABLE FOR HELICAL LOCKSEAM AND WELDED SEAM PIPE CULVERT

STEEL														ALUMINUM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
PIPE ARCH SIZE SPAN x RISE INCHES	EQUI- VALENT DIAMETER INCHES	MINIMUM CORNER RADIUS INCHES	MINIMUM COVER INCHES	2 3/8" x 1/2" CORRUGATIONS					3" x 1" CORRUGATIONS					5" x 1" CORRUGATIONS					PIPE ARCH SIZE SPAN x RISE INCHES	EQUI- VALENT DIAMETER INCHES	MINIMUM CORNER RADIUS INCHES	MINIMUM COVER INCHES	2 3/8" x 1/2" CORRUGATIONS					3" x 1" CORRUGATIONS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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				0.064/16	0.079/14	0.109/12	0.138/10	0.168/8	0.079/14	0.109/12	0.138/10	0.168/8	0.079/14	0.109/12	0.138/10	0.168/8	0.060/16	0.075/14					0.105/12	0.135/10	0.060/16	0.075/14	0.105/12	0.135/10																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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085264
Matthew David Andrews
4/11/2019
CIVIL
STATE OF CALIFORNIA
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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL LANDS HIGHWAY

U.S. CUSTOMARY STANDARD

METAL PIPE CULVERT

STANDARD APPROVED FOR USE 12/1993
REVISED: 4/1994 6/2005

STANDARD
602-1

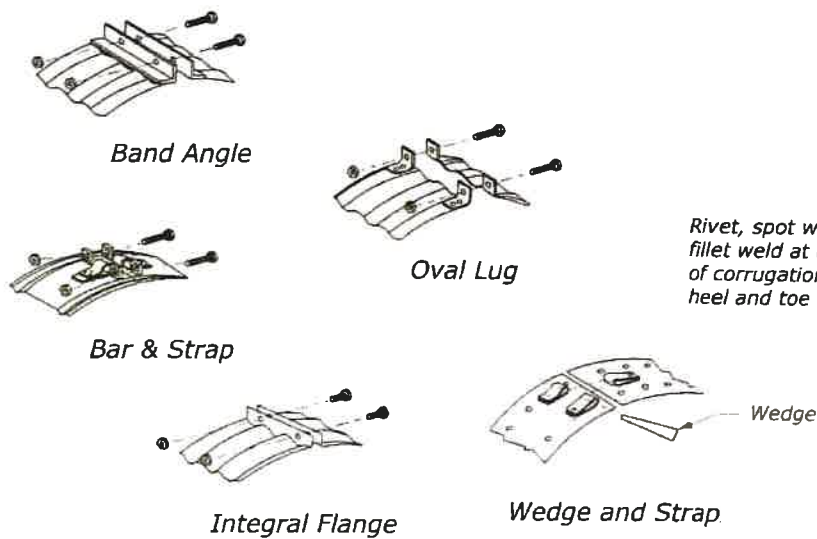
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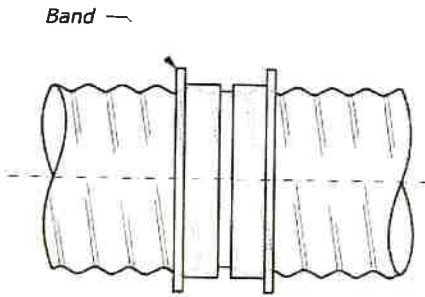
3/19/2019

COUPLING BANDS FOR METAL PIPE CULVERT ^[1]					
CORRUGATION SIZE ^[2] INCHES	ROUND PIPE DIAMETER INCHES	PIPE ARCH SPAN x RISE INCHES	MINIMUM BAND WIDTH (INCHES)		
			ANNULAR CORRUGATED BANDS ^[3]	HELICALLY CORRUGATED BANDS ^[4]	SEMI- CORRUGATED BANDS ^[5]
1½ x ¼	underdrain ^[6]	-	10.5	7	10.5
	12 to 36	17 x 13 to 42 x 29	7	12	
2½ x ½	42 to 72	49 x 33 to 83 x 57	10.5	12	
	78 to 84	-	10.5	12	10.5
3 x 1	36 to 72	60 x 46 to 81 x 59	12	14	10.5
	78 to 144	87 x 64 to 142 x 91	12	14	10.5
5 x 1	36 to 72	60 x 46 to 81 x 59	20	22	
	78 to 144	87 x 64 to 142 x 91	20	22	

- ^[1] Fabricate annular, helical and semi-corrugated type coupling bands from the same metal as the connecting pipe. Provide coupling bands not more than 3 nominal sheet thicknesses thinner than the thickness of the pipe to be connected, and no thinner than 0.052 inch for steel or 0.048 inch for aluminum. Fasten coupling bands with the following diameter of bolt: ¾" for 18" round culvert (21" x 15" pipe arch) or less ½" for 21" round culvert (24" x 18" pipe arch) or more
- ^[2] For helically corrugated pipe with rerolled ends, the nominal corrugations size refers to the dimension of the end corrugation in the pipe.
- ^[3] Use annular corrugated bands with pipes having annular corrugations or with helical pipe having rerolled end to form annular corrugations. A 10.5 inch band is acceptable on pipe ends rerolled with 2½" x ½" corrugations. A 12 inch band is acceptable on pipe ends rerolled with 3" x 1" pipe corrugations.
- ^[4] Use helical corrugated bands with pipes having helically corrugated ends.
- ^[5] The minimum band widths shown for 3" x 1" and 5" x 1" corrugated sizes apply to 2½" x ½" corrugations on rerolled pipe ends.
- ^[6] Smooth sleeve-type couplers and flat bands may be used for pipe diameters of 12" or less. Use a matching metal having a nominal thickness of not less than 0.040 inch for steel, or 0.036 inch for aluminum, or a plastic with an equivalent strength to metal.



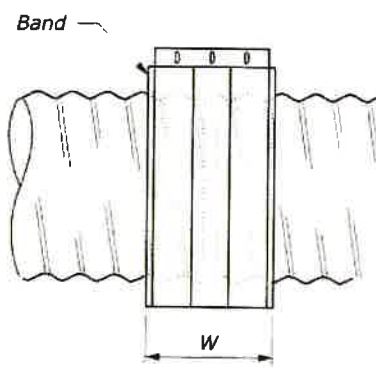
STANDARD BAND CONNECTIONS



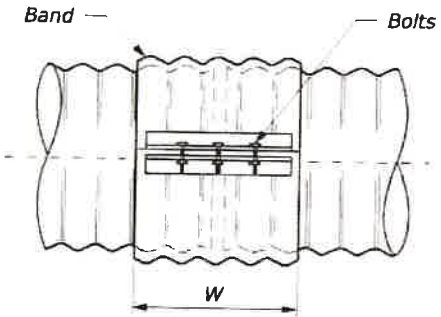
SLEEVE JOINT

Smoothen sleeve with center stop.
Stab type joint

SMOOTH SLEEVE BAND

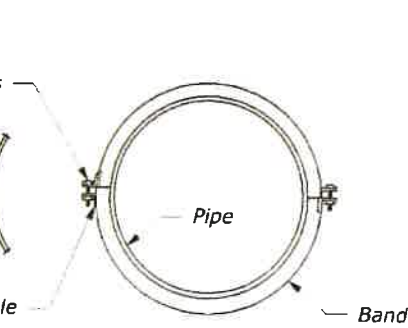


FLAT BAND



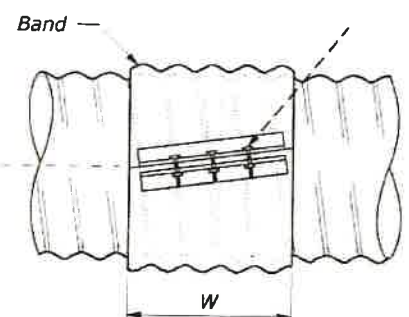
SIDE VIEW

END VIEW



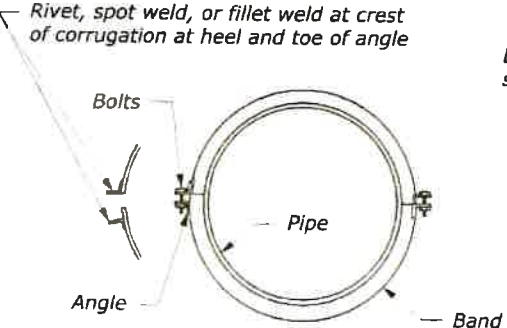
Second angle connection optional to 42" diameter, required above 42" diameter

ANNULAR BAND



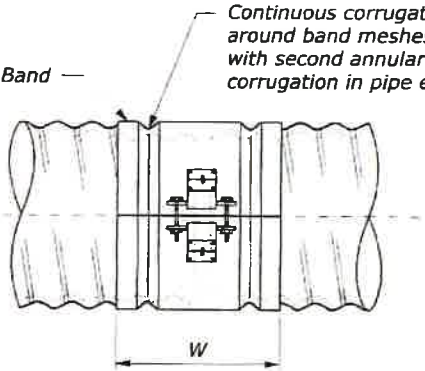
SIDE VIEW

END VIEW

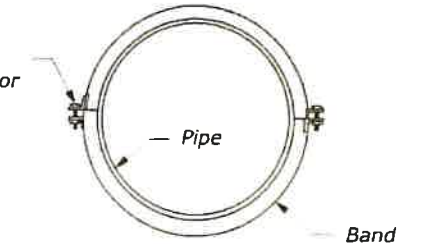


Second angle connection optional to 42" diameter, required above 42" diameter

HELICAL BAND



SIDE VIEW



END VIEW

SEMI-CORRUGATED BAND

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL LANDS HIGHWAY

U.S. CUSTOMARY STANDARD
**METAL PIPE CULVERT
COUPLING BAND**

STANDARD APPROVED FOR USE 12/1993
REVISED: 4/1994 6/2005

STANDARD
602-2

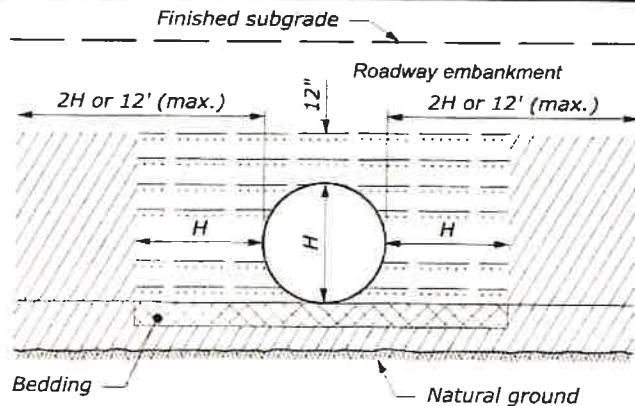
- NOTE:**
- Watertight pipe joints are not required unless specified in the Special Contract Requirements.
 - Other types of coupling bands or fastening devices that comply with the joint performance criteria of AASHTO Standard specifications for Highway Bridges, Division II Section 26 may be used.

LICENSED PROFESSIONAL ENGINEER
DAVID ANDREWS
C 35264
4/1/2019
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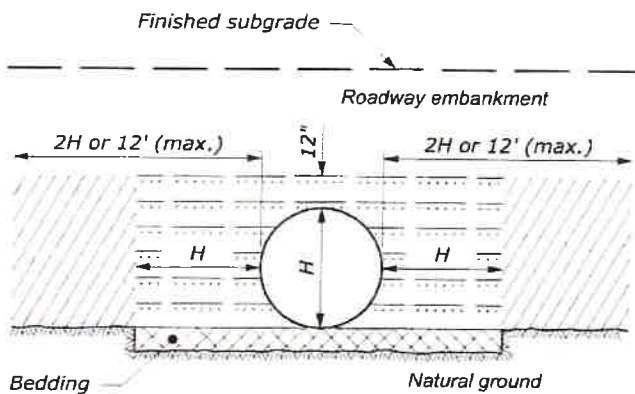
RESPONSIBLE ONLY FOR
SELECTION OF
APPROPRIATE STANDARD
DETAIL

NO SCALE

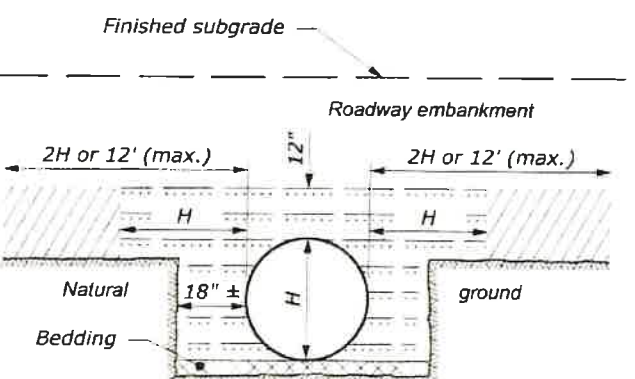
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T6



ABOVE NATURAL GROUND



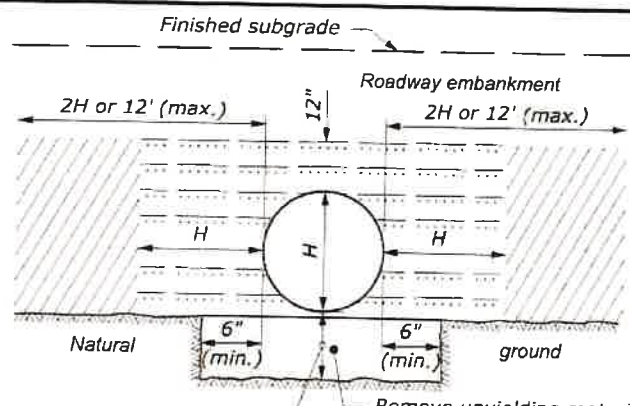
ON NATURAL GROUND



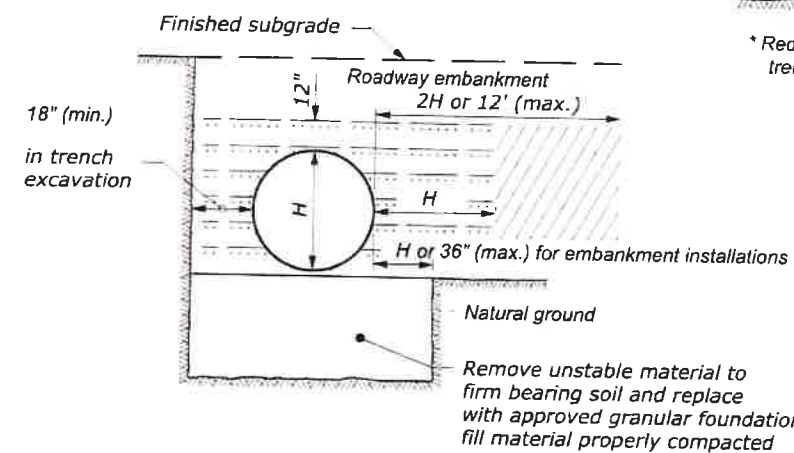
ABOVE AND BELOW NATURAL GROUND

LEGEND:

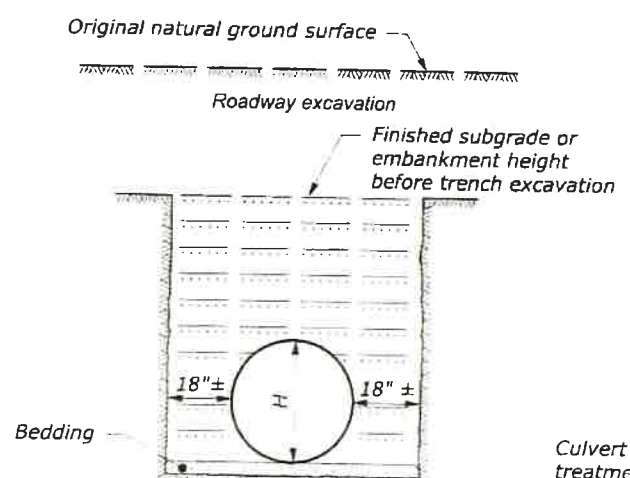
- Bedding material (uncompacted)
- Embankment material placed in layers not exceeding 6" compacted depth.
- Compacted backfill material placed in layers not exceeding 6" compacted depth; or lean concrete backfill in accordance with Section 614.
- Impermeable backfill material.



ON UNYIELDING MATERIAL

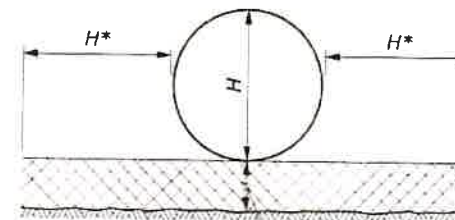


ON UNSTABLE MATERIAL



BELOW NATURAL GROUND OR TRENCH EXCAVATION IN EMBANKMENT

BEDDING DEPTH	
PIPE SIZE (H)	DEPTH
12" to 54"	4"
> 54"	6"

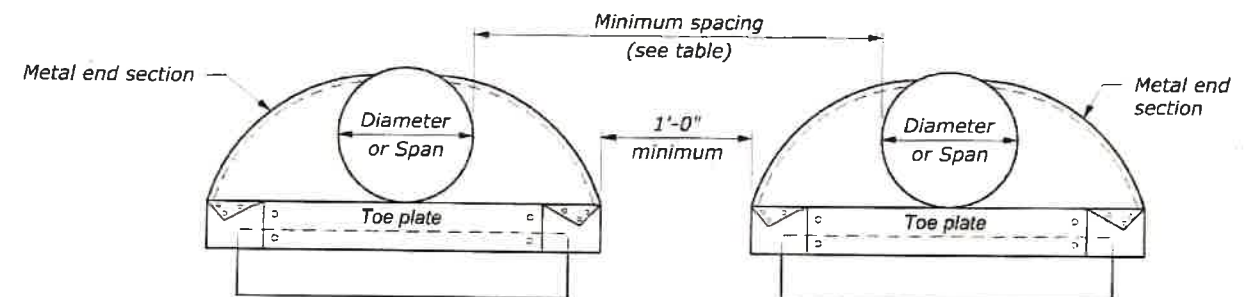


PIPE BEDDING

MINIMUM SPACING	
DIAMETER or SPAN	SPACING
UP to 48"	24"
48" and UP	Half diameter or span or 36", whichever is less

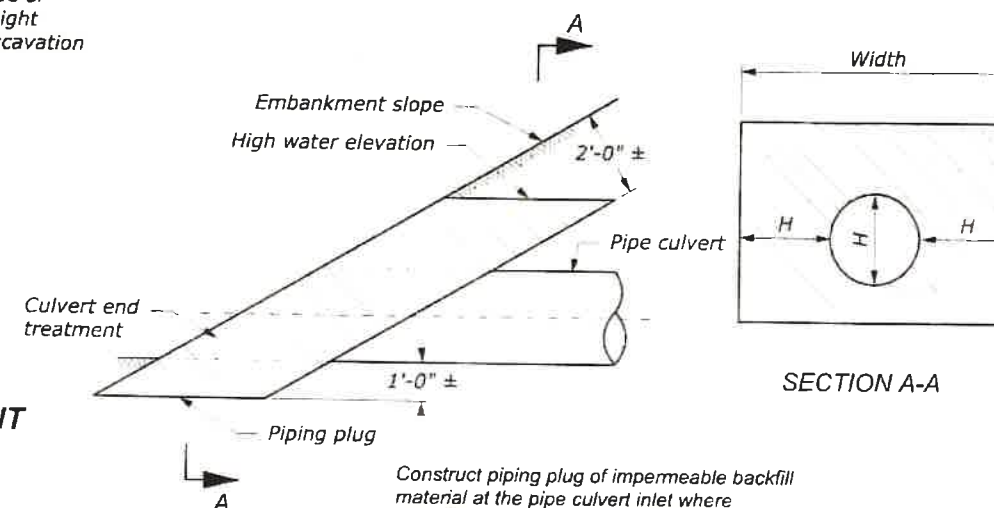
NOTE:

- When directed, camber pipe culverts upward from a chord through the inlet and outlet inverts an ordinate amount equal to 1% of the pipe length. Develop camber on a parabolic curve. If the midpoint elevation on the parabolic curve as designed exceeds the elevation of the inlet invert, reduce the amount of camber or increase the pipe culvert gradient.
- H equals the diameter of all round pipe culverts or the rise dimension of all pipe arch culverts.
- See Section 704 for bedding and backfill requirements.



ELEVATION

MULTIPLE PIPE INSTALLATION



PIPING PLUG



RESPONSIBLE ONLY FOR SELECTION OF APPROPRIATE STANDARD DETAIL

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD METAL AND PLASTIC PIPE CULVERT BEDDING	
	STANDARD 602-3

User: mcarlson

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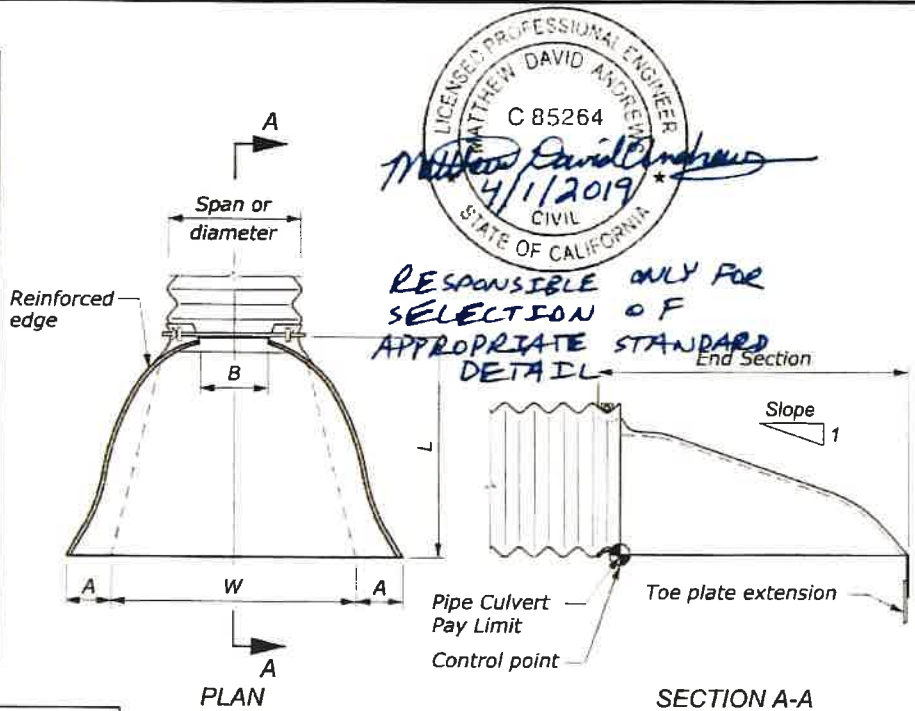
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3/19/2019 9:21:17 AM

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T7

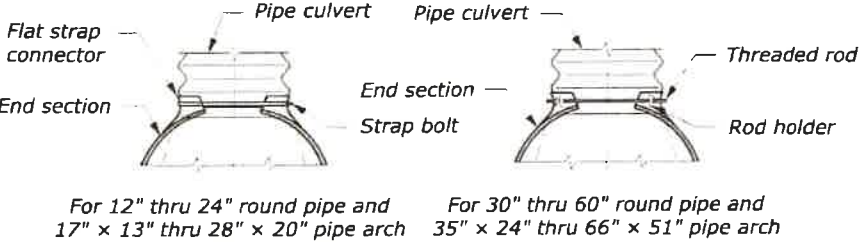
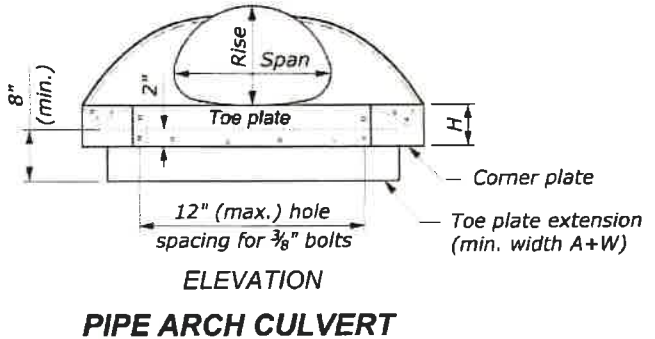
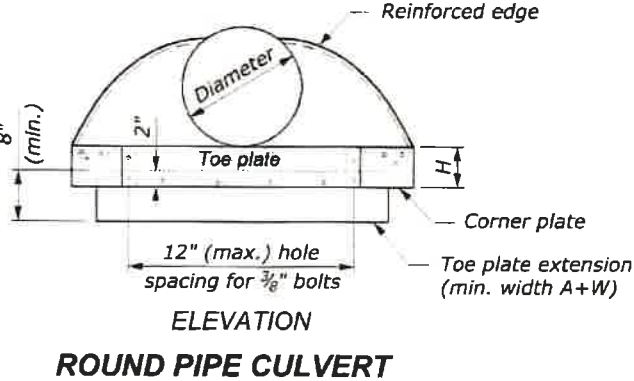
END SECTIONS FOR ROUND PIPE CULVERT

PIPE SIZE DIAMETER INCHES	METAL THICKNESS				DIMENSIONS INCHES					SLOPE Approx.
	STEEL		ALUMINUM		A (min)	B (max)	H (min)	L (±2")	W (max)	
	INCHES	GAGE	INCHES	GAGE						
12	0.064	16	0.060	16	5	7	6	21	44	2¼
15	0.064	16	0.060	16	6	8	6	26	52	2¼
18	0.064	16	0.060	16	7	10	6	31	58	2⅝
21	0.064	16	0.060	16	8	12	6	36	66	2⅝
24	0.064	16	0.060	16	9	13	6	41	72	2⅝
30	0.079	14	0.075	14	11	16	8	51	88	2⅝
36	0.079	14	0.075	14	13	19	9	60	105	2
42	0.109	12	0.105	12	15	25	10	69	122	2⅝
48	0.109	12	0.105	12	17	29	12	78	131	2
54	0.109	12	0.105	12	17	33	12	84	143	2
60	0.109	12	0.105	12	17	36	12	87	157	1⅝
66	0.109	12	0.105	12	17	39	12	87	162	1⅝
72	0.109	12	0.105	12	17	44	12	87	169	1½
78	0.109	12	0.105	12	17	48	12	87	178	1⅝
84	0.109	12	0.105	12	17	52	12	87	184	1⅓
90	0.109	12	0.105	12	17	58	12	87	188	1¼
96	0.109	12	0.105	12	17	58	12	87	197	1⅝

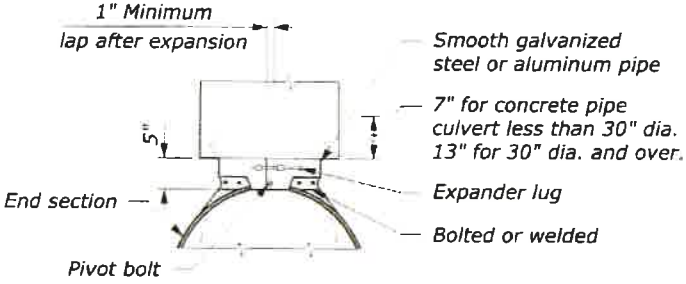


ROUND OR PIPE ARCH CULVERT

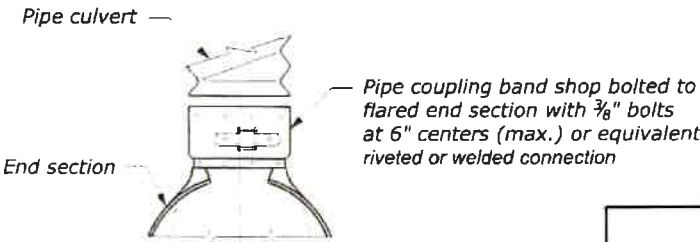
END SECTIONS FOR PIPE ARCH CULVERT											
PIPE SIZE SPAN × RISE INCHES	EQUI- VALENT DIAM. (INCHES)	METAL THICKNESS				DIMENSIONS INCHES					SLOPE Approx.
		STEEL		ALUMINUM		A (min)	B (max)	H (min)	L (±2")	W (max)	
		INCHES	GAGE	INCHES	GAGE						
17 × 13	15	0.064	16	0.060	16	7	9	6	19	30	2½
21 × 15	18	0.064	16	0.060	16	7	10	6	23	36	2½
24 × 18	21	0.064	16	0.060	16	8	12	6	28	42	2½
28 × 20	24	0.064	16	0.060	16	9	14	6	32	48	2½
35 × 24	30	0.079	14	0.075	14	10	16	8	39	60	2½
42 × 29	36	0.079	14	0.075	14	12	18	9	46	75	2½
49 × 33	42	0.109	12	0.105	12	13	21	12	53	85	2½
57 × 38	48	0.109	12	0.105	12	18	26	12	63	90	2½
60 × 46	54	0.109	12	0.105	12	18	34	12	70	102	2
64 × 43	54	0.109	12	0.105	12	18	30	12	70	102	2
66 × 51	60	0.109	12	0.105	12	18	33	12	77	116	1½
71 × 47	60	0.109	12	0.105	12	18	33	12	77	114	1½
73 × 55	66	0.109	12	0.105	12	18	36	12	77	126	1½
77 × 52	66	0.109	12	0.105	12	18	36	12	77	126	1½
81 × 59	72	0.109	12	0.105	12	18	39	12	77	138	1½
83 × 57	72	0.109	12	0.105	12	18	39	12	77	138	1½
87 × 63	78	0.109	12	0.105	12	20	38	12	77	148	1½
95 × 67	84	0.109	12	0.105	12	20	34	12	87	162	1½
103 × 71	90	0.109	12	0.105	12	20	38	12	87	174	1½
112 × 75	96	0.109	12	0.105	12	20	40	12	87	174	1½



DESIGN A
CONNECTION TO ANNULAR
CORRUGATED METAL PIPE



DESIGN B
CONNECTION TO CONCRETE
PIPE INLET END



DESIGN C
CONNECTION TO METAL PIPE
OR OUTLET END OF CONCRETE PIPE

NOTE:

1. Variations in design and dimensions are permitted to allow for manufacturer's standards.
2. Fabricate the diameter of the end section of Design B to match the inside diameter of the concrete pipe culvert.
3. Design C may be used in lieu of design A for all metal pipe culvert sizes. Coupling bands may be any acceptable type for the pipe culvert specified.
4. Fabricate multiple piece bodies with lap seams tightly joined by 3/8" rivets or bolts. Fabricate end section center panels for 60" and larger diameter pipe and equivalent pipe arch from 0.138 inch steel or 0.135 inch aluminum.
5. On end section center panels for 66" and larger equivalent pipe arch provide 2 1/2" x 2 1/2" x 1/4" angle reinforcement bolted or riveted under the center panel seam.
6. Supplement the reinforced edges of end sections for 60" and larger diameter pipe and 66" and larger equivalent pipe arch with 2 1/2" x 2 1/2" x 1/4" stiffener angles attached with bolts or rivets.
7. Fabricate connector section, corner plate and toe plate extensions from the same metal thickness as the panel body. Use toe plate extension where shown on the plans.
8. Warp embankment slopes to match the slope of the flared end sections.

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
METAL END SECTIONS	
	STANDARD 602-4

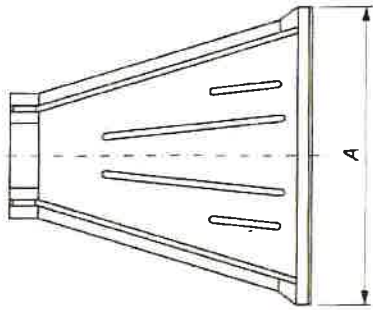
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T8

POLYETHYLENE (PE) PLASTIC ROUND PIPE CULVERT														
FILL HEIGHT TABLE AND MINIMUM CELL CLASSIFICATION NUMBER PER ASTM D 3350														
SMOOTH WALL (SOLID WALL)								CORRUGATED			RIBBED			
PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	CELL CLASSIFICATION NUMBER 335434C						PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	CELL CLASS. NO. 435400C	PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	CELL CLASS. NO. 334433C	CELL CLASS. NO. 335434C
		MINIMUM WALL THICKNESS (INCHES)												
		0.607	0.857	0.923	1.154	1.385	1.292							
MAXIMUM FILL HEIGHT (FEET)								MAXIMUM FILL HEIGHT (FEET)			MAXIMUM FILL HEIGHT (FEET)			
12	12	57						12	12	10	18	12	18	24
18	12		52					15	12	10	24	12	22	28
24	12			38				18	12	10	30	12	22	28
30	12				38			24	12	10	36	12	25	31
36	12					38		30	12	10	42	12	21	27
42	12						27	36	12	10	48	12	21	26
48	12						27							

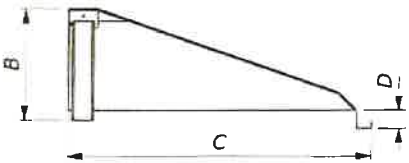
NOTE:

- When directed, camber pipe culverts upward from a chord through the inlet and outlet inverts an ordinate amount equal to 1% of the pipe length. Develop camber on a parabolic curve. If the midpoint elevation on the parabolic curve as designed exceeds the elevation of the inlet invert, reduce the amount of camber or increase the pipe culvert gradient.
- Measure minimum cover from the top of the pipe culvert to the subgrade for flexible pavements, and to the top of the pavement for rigid pavements. Measure maximum fill height from the top of the pipe to the top of the pavement for both flexible and rigid pavement.

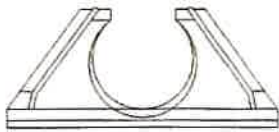
POLYVINYL CHLORIDE (PVC) PLASTIC ROUND PIPE CULVERT										
FILL HEIGHT TABLE AND MINIMUM CELL CLASSIFICATION NUMBER PER ASTM D 1784										
SMOOTH WALL (SOLID WALL)						RIBBED				
PIPE SIZE	MINIMUM COVER	CELL CLASS. NO. 12454		CELL CLASS. NO. 12364		PIPE SIZE	MINIMUM COVER	CELL CLASS. NO. 12454C	CELL CLASS. NO. 12364C	
DIAMETER INCHES		MINIMUM WALL THICKNESS (INCHES)								
		0.358	0.438	0.358	0.438			DIAMETER INCHES	INCHES	MAXIMUM FILL HEIGHT (FEET)
		MAXIMUM FILL HEIGHT (FEET)								
12	12	65		69		12	12	37	26	
15	12		62		66	15	12	32	22	
						18	12	33	23	
						24	12	29	21	
						30	12	28	20	
						36	12	27	19	
						42	12	26	18	
						48	12	24	17	



TOP



SIDE



FRONT

END SECTION DIMENSIONS				
PIPE SIZE DIAMETER INCHES	DIMENSIONS INCHES			
	A	B	C	D
12	42	14.5	33	6
15	46	24.5	45.5	6
18	54	29	55	6
24	64	37	65	6
30	88	36	63.5	6
36	88	43	66.5	6



RESPONSIBLE ONLY FOR
SELECTION OF
APPROPRIATE STANDARD
DETAIL

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
PLASTIC PIPE CULVERT	
STANDARD APPROVED FOR USE 12/1993 REVISED: 4/1994 6/2005 DRAFT: 2/2009	STANDARD 602-5

NO SCALE

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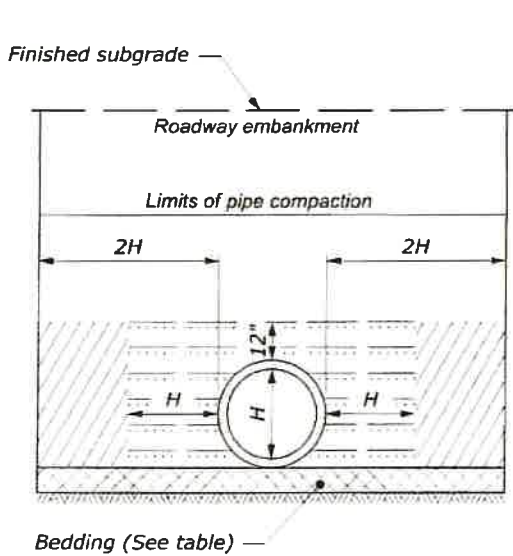
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T9

CONCRETE ROUND PIPE CULVERT									
FILL HEIGHT AND PIPE CLASS TABLE									
PIPE SIZE DIAMETER INCHES	EMBANKMENT					TRENCH			
	MINIMUM COVER INCHES	CLASS II	CLASS III	CLASS IV	CLASS V	CLASS II	CLASS III	CLASS IV	CLASS V
		MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE IN FEET							
12	12	10	10	15	23	18	18	26	13
18	12	10	10	25	39	13	13	31	45
24	12	10	10	15	30	15	15	22	40
30	12	9	13	15	35	13	16	20	46
36	12	9	9	20	41	10	13	26	56
48	12	12	13	26	44	15	16	30	49
60	12	15	17	28	44	15	20	32	49
72	12	13	17	30	41	15	20	35	49
84	12	13	19	30		15	23	37	
96	12	13	20			15	24		
108	14	15	20			18	26		

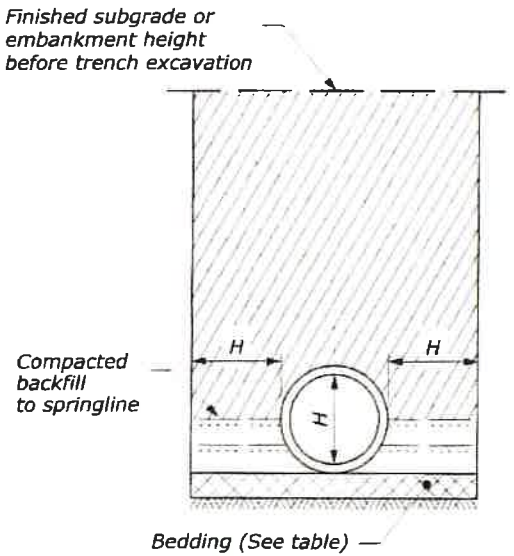
- LEGEND:
- Bedding material (uncompacted).
 - Embankment material placed in layers not exceeding 6" compacted depth.
 - Compacted backfill material placed in layers not exceeding 6" compacted depth, or lean concrete backfill in accordance with Section 614
 - Impermeable backfill material.

- NOTE:
- When directed, camber pipe culverts upwards from a chord through the inlet and outlet inverts an ordinate amount equal to 1% of the pipe length. Develop camber on a parabolic curve. If the midpoint elevation on the parabolic curve as designed exceeds the elevation of the inlet invert, reduce the amount of camber or increase the pipe culvert gradient.
 - Measure minimum cover from the top of the pipe culvert to the subgrade for flexible pavements, and to the top of the pavement for rigid pavements. Measure maximum fill height from the top of the pipe to the top of the pavement for both flexible and rigid pavements.
 - Pipe compaction limits shown are for pipe installation in an embankment. For pipe installation in a trench, the compaction limits shall be the walls of the trench.
 - Where unyielding or unstable material is encountered, install the pipe culvert according to the limits of pipe compaction shown on Standard 602-3.
 - Maximum fill heights for pipe culvert installations may be increased on approval of site-specific structural pipe designs meeting the criteria of AASHTO Standard Specifications for Highway Bridges.
 - Use Supplemental Concrete Pipe Tie when specified in the contract documents.

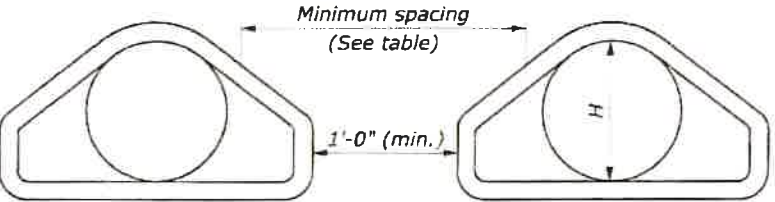
BEDDING DEPTH	
PIPE SIZE (H)	DEPTH
12" TO 54"	4"
> 54"	6"



EMBANKMENT INSTALLATION

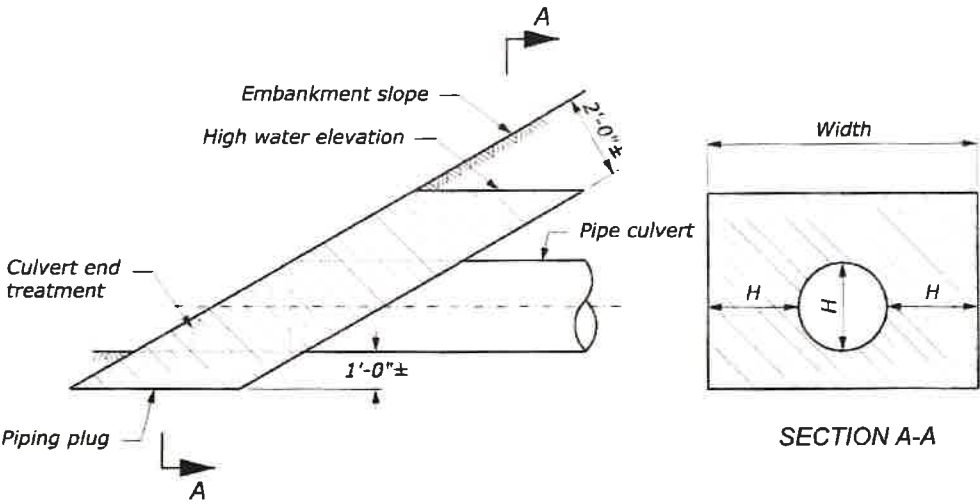


TRENCH INSTALLATION



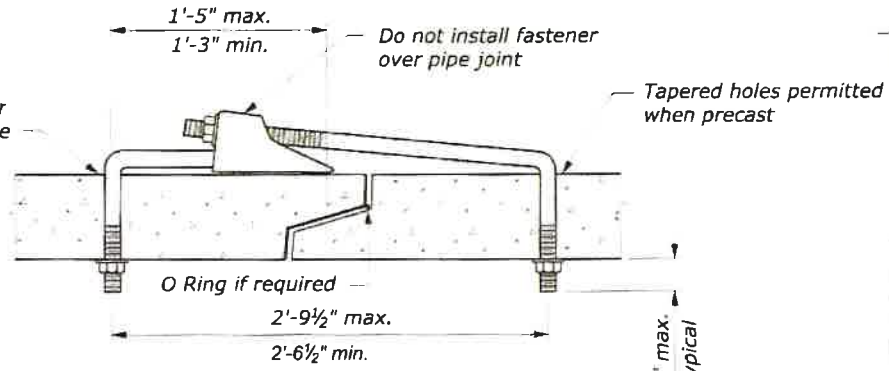
MULTIPLE ROUND PIPE INSTALLATION

MINIMUM SPACING		
DIAMETER	EMBANKMENT	TRENCH
12"-36"	15"	2H
36"-96"	0.5H	72"
OVER 96"	48"	72"



Construct a piping plug of impermeable backfill material at the pipe inlet where granular material is used for backfill. Width may be adjusted to tie into impervious material.

PIPING PLUG



SUPPLEMENTAL CONCRETE PIPE TIE

RESPONSIBLE ONLY FOR SELECTION OF APPROPRIATE STANDARD DETAIL

4/1/2019

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
CONCRETE PIPE CULVERT INSTALLATION	
STANDARD 602-7	

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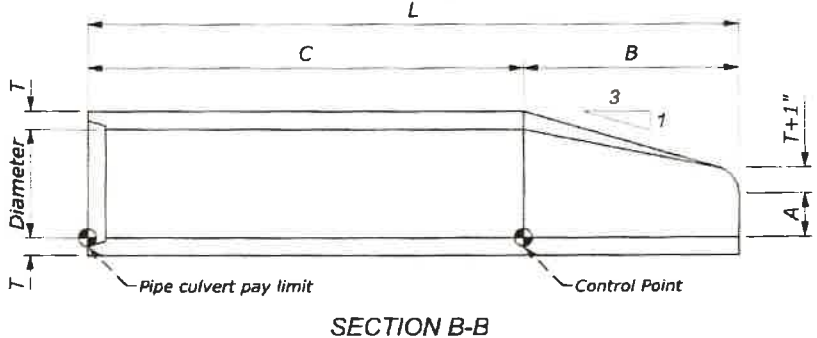
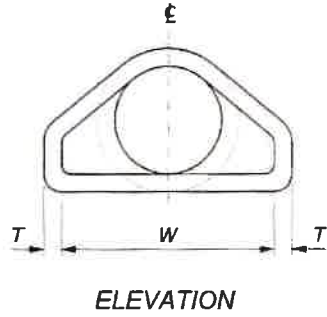
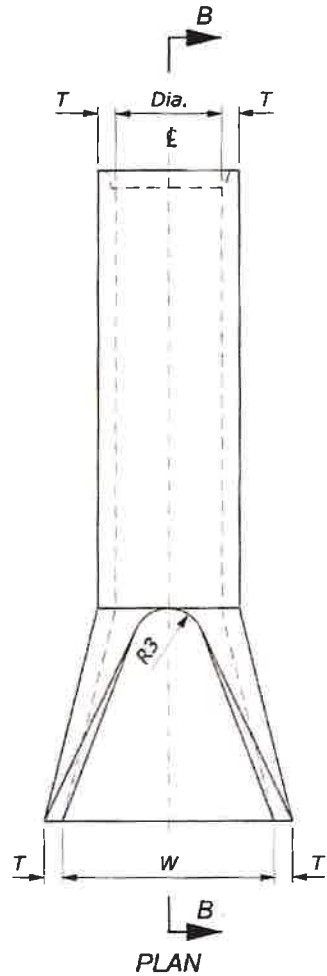
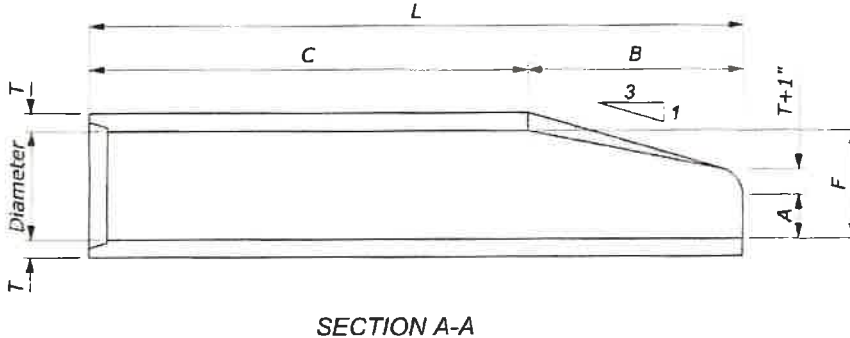
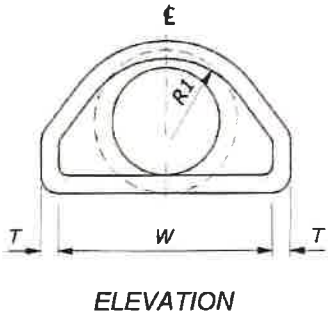
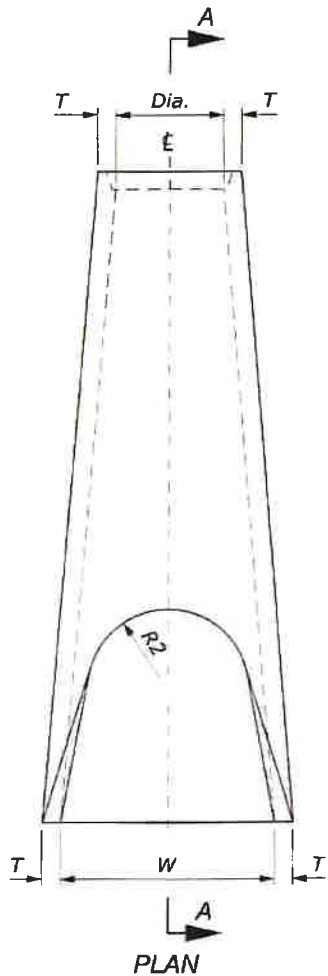
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T10

NOTE:

- Variations in design and dimensions are permitted to allow for manufacturer's standards.
- Fabricate the outlet end section with a groove end and the inlet end section with a tongue end.
- Warp embankment slopes to match the slope of the flared end section.

END SECTIONS FOR ROUND PIPE CULVERT

PIPE SIZE DIAMETER INCHES	DIMENSIONS INCHES									
	T	A	B	C	L	W	F	R1	R2	R3
12	2	4	24	48 7/8	72 7/8	24	13	10 7/8	9	4
15	2 1/4	6	27		73	30	16	12 1/2	11	6
18	2 1/2	9	27		73	36	19	15 1/2	12	7 1/2
21	2 3/4	9	36		73	42	22	16 1/2	13	5
24	3	9 1/2	43 1/2		73 1/2	48	25	16 3/4	14	8
27	3 1/4	10 1/2	48	25 1/2	73 1/2	54	28	—	14 1/2	9
30	3 1/2	12	54	19 3/4	73 3/4	60	31	18 1/2	15	8
33	3 3/4	13 1/2	59 1/2	37 1/2	96	66	34	23 3/4	17 1/2	9
36	4	15	63		96	72	37	23 3/4	20	11
42	4 1/2	21	63		96	78	43	—	22	11
48	5	24	72		96	84	49	—	22	12

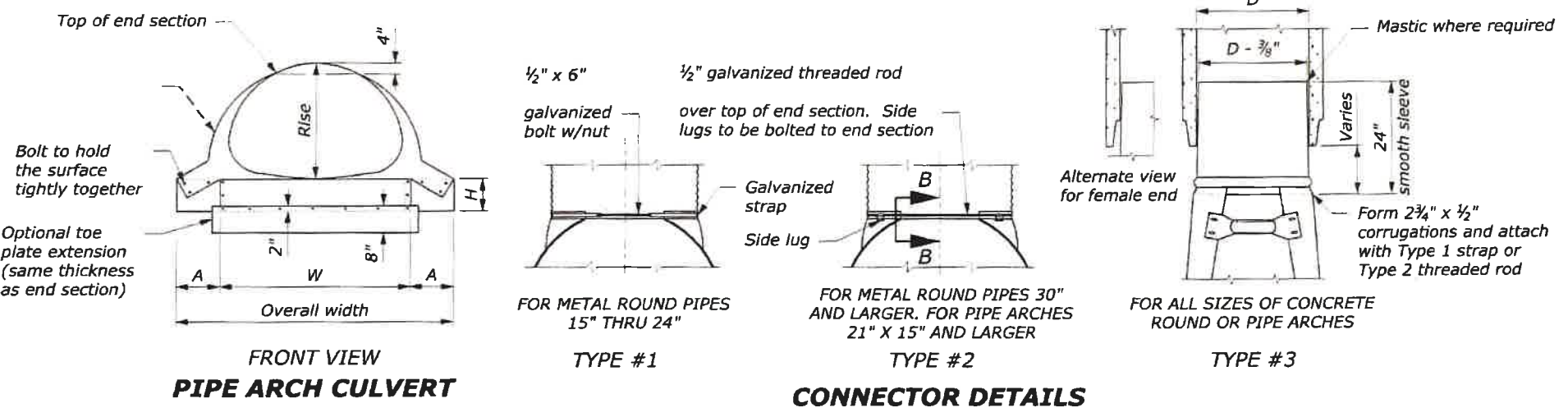
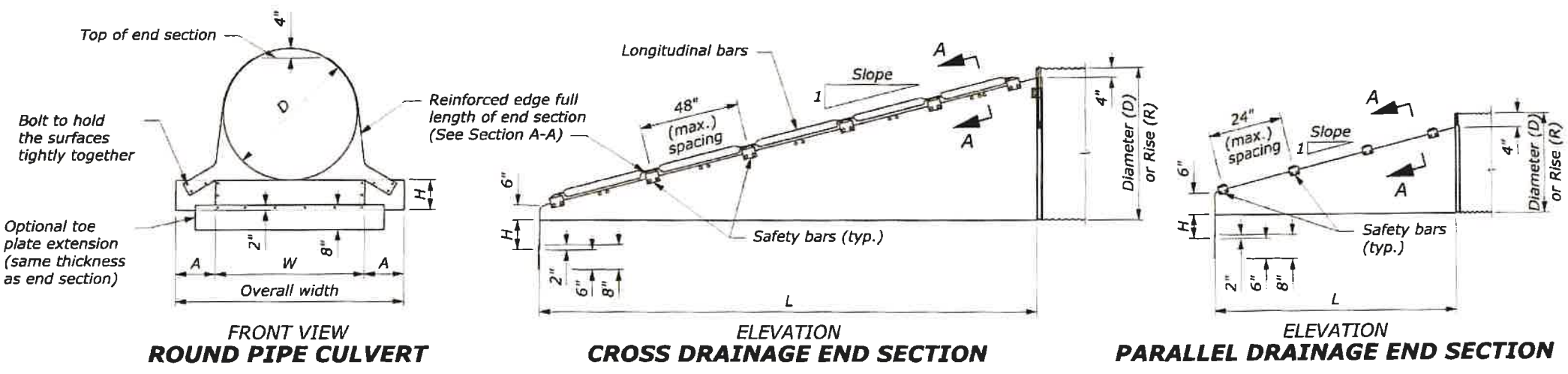


RESPONSIBLE ONLY FOR
SELECTION OF
APPROPRIATE STANDARD
DETAIL

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD CONCRETE END SECTION FOR ROUND PIPE	
	STANDARD 602-8

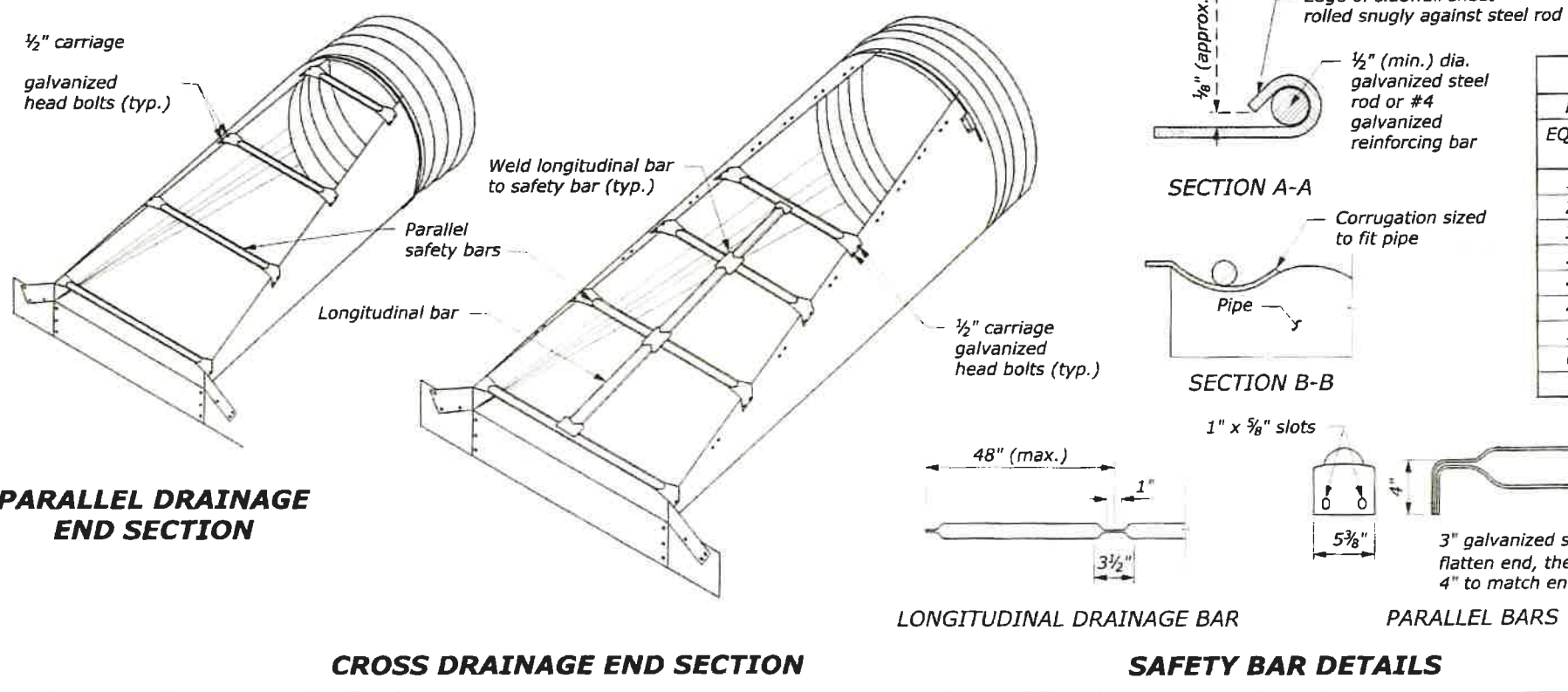
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T11

- NOTE:**
1. Use end sections on 1V:4H to 1V:6H slopes only. Use toe plate extension where shown on the plans.
 2. Fabricate safety and longitudinal bars from steel pipe conforming to ASTM A53 schedule 40 specifications. Galvanize bars hot dipped after fabrication.
 3. A longitudinal bar is required for cross drainage end sections when the span is greater than 30". Use additional longitudinal bars if spacing exceeds 30" on larger end sections.
 4. Safety and longitudinal bars are not required on 30" and smaller cross drainage end sections.
 5. Safety bars are not required on 18" and smaller parallel drainage end sections.
 6. 18" diameter sleeves have a thickness of 0.079", all others are 0.109".



METAL END SECTIONS FOR ROUND PIPE CULVERT

PIPE SIZE Ø INCHES	METAL THICK (MIN.) INCH/GAGE	DIMENSIONS IN INCHES					
		A	H	W	OVERALL WIDTH	L	
						Slope=4	Slope=6
18	0.064/16	8	6	24	40	32	47
24	0.064/16	8	6	30	46	55	83
30	0.109/12	12	9	36	60	79	118
36	0.109/12	12	9	42	66	102	154
42	0.109/12	16	12	48	80	126	189
48	0.109/12	16	12	54	86	150	224
54	0.109/12	16	12	60	92	173	260
60	0.109/12	16	12	66	98	197	295



METAL END SECTIONS FOR PIPE ARCH CULVERT

PIPE SIZE (INCHES) EQUIV. Ø	SPAN	RISE	METAL THICK (MIN.) INCH/GAGE	DIMENSIONS (INCHES)				
				A	H	W	OVERALL WIDTH	L
								Slope=4 Slope=6
18	21	15	0.064/16	8	6	27	43	20 30
24	28	20	0.064/16	8	6	33	49	40 60
30	35	24	0.109/12	12	9	40	64	55 83
36	41	29	0.109/12	12	9	47	71	75 112
42	48	32	0.109/12	16	12	54	86	90 136
48	56	37	0.109/12	16	12	62	94	110 165
54	63	42	0.109/12	16	12	69	101	130 195
60	70	46	0.109/12	16	12	76	107	146 218
72	82	56	0.109/12	16	12	88	120	185 278

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4/1/2019

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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL LANDS HIGHWAY

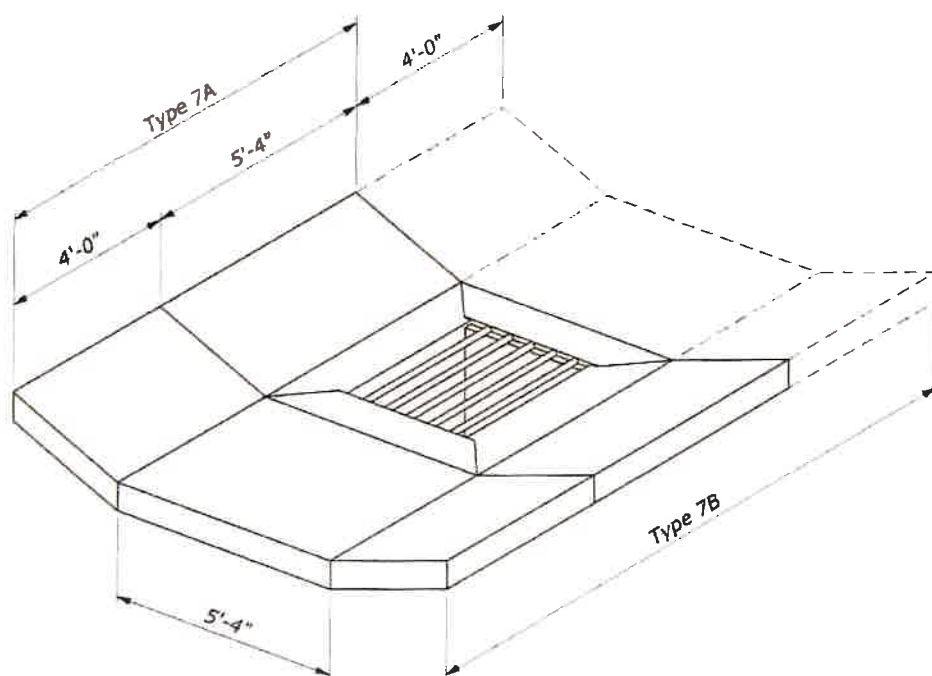
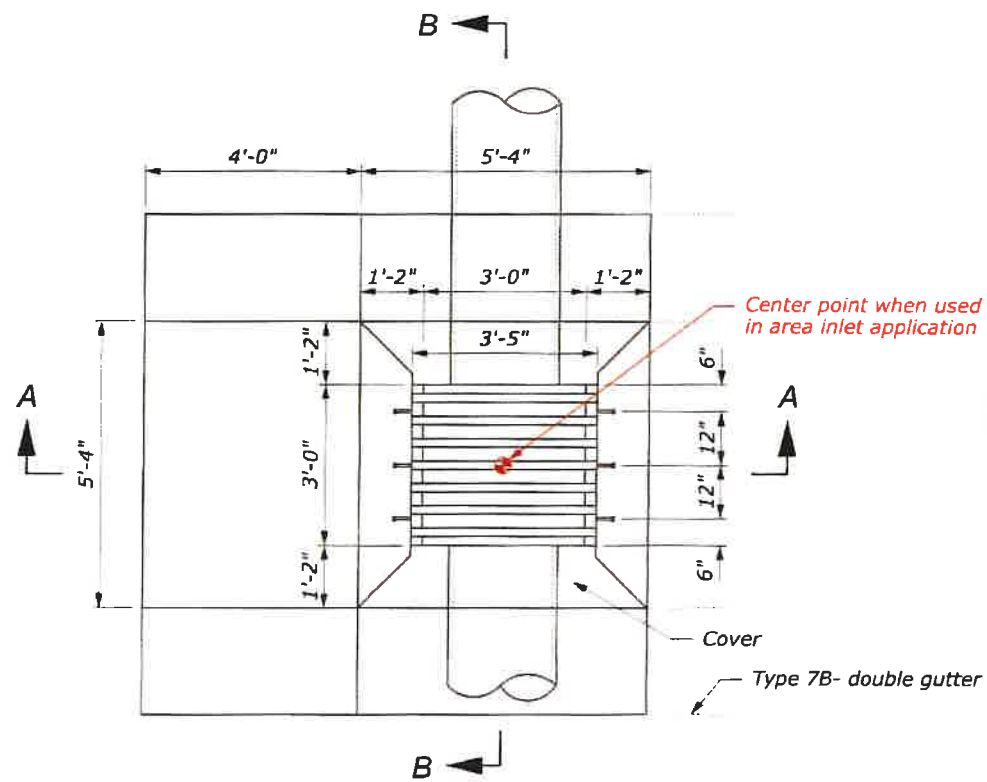
U.S. CUSTOMARY STANDARD

METAL END SECTION WITH SAFETY BARS

STANDARD 602-9

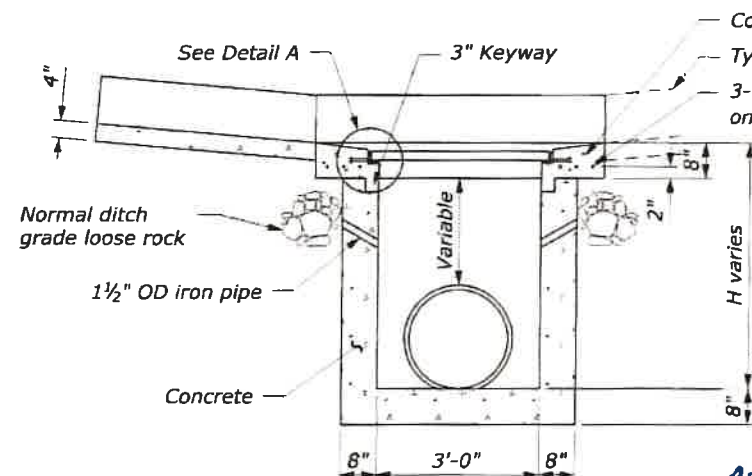
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STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T13

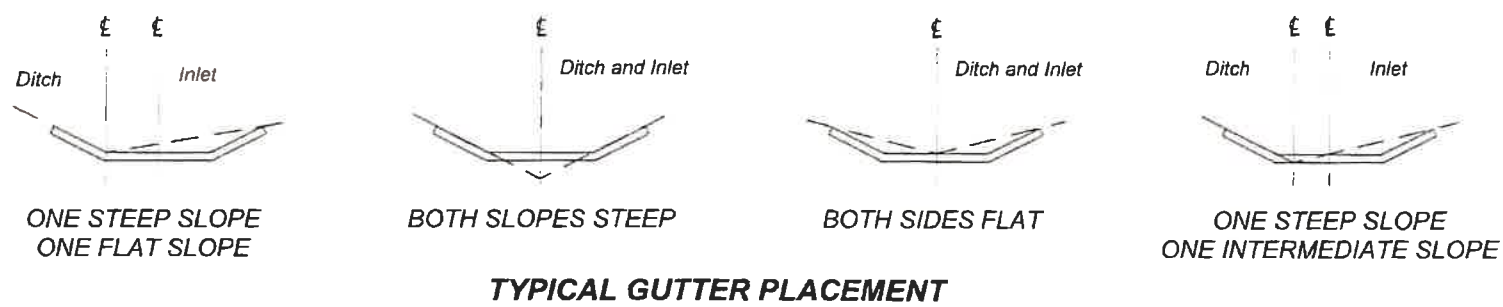
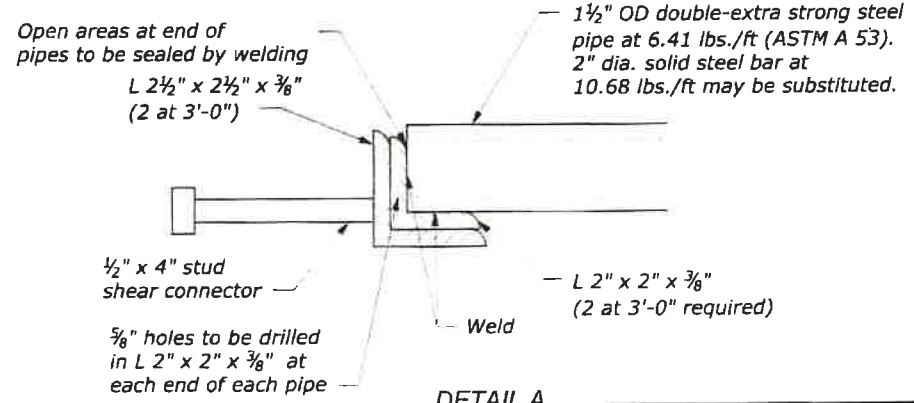
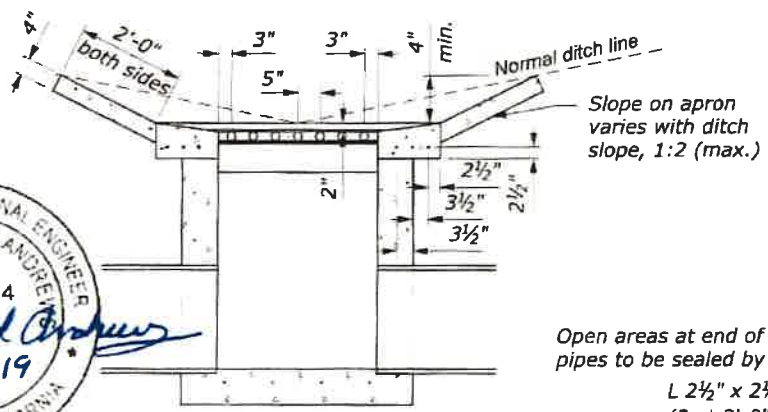


- NOTE:**
1. Type 7A has a single gutter when inlet is on a grade.
 2. Type 7B has a double gutter when inlet is in a sag between two grades.
 3. Ditch to be warped to tie smoothly into inlet gutter.
 4. Outside dimensions of grate to be 3'-4" x 2'-11³/₄".
 5. Maximum depth (H) is 12'-8".
 6. All reinforcing bars are #5 placed a minimum 1¹/₂ inch clear from face of concrete. In floors, place bars on 6 inch centers each way. In walls, place horizontal bars on 6 inch centers and vertical bars on 12 inch centers.
 7. Galvanize grate after fabrication in accordance with AASHTO M 111.
 8. Alternate methods of anchoring angle iron will be acceptable if approved by the CO.
 9. Use CalTrans type 18-9x grate on 604-C. Two grates will be required for each 7B Inlet.

APPROXIMATE QUANTITIES						
Pipe size	12"	15"	18"	24"	30"	36"
Minimum Depth (H)	2'-0"	2'-3 ³ / ₄ "	2'-6 ¹ / ₂ "	3'-1"	3'-7 ¹ / ₂ "	4'-2"
Inlet concrete for minimum depth, CUYD	0.947	1.045	1.143	1.339	1.535	1.731
Additional inlet concrete	0.362 cuyd for each additional foot of depth (H)					
Gutter concrete	Type 7A: 0.724 cuyd Type 7B: 1.185 cuyd					
Cover concrete (not included above)	0.413 cuyd					
Cover reinforcing steel	63 lb					



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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY SPECIAL
INLET
TYPE 7A AND 7B
FOR 12" TO 36" CULVERT

SPECIAL
604-B

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TYPE 18-10 AND 24-13 GRATE
(Welded Steel)

NOTES:
Bearing bars to be 3/4" x 1/2" bars on 1 1/2" centers.
3/4" x 1/2" cross bars may be fillet welded, resistance welded or electroforged to bearing bars.
Weight of Type 24 grate = 141 LBS.
Weight of Type 18 grate = 107 LBS. (Type 24 grate shown).

SECTION E-E
TYPE 18-10 AND 24-13 GRATE

TYPE 18-8C AND 24-10C GRATE
(Cast ductile iron)

NOTES:
Weight of Type 24 grate = 155 LBS.
Weight of Type 18 grate = 130 LBS.
On Type 18 grate only center bearing bars.

SECTION C-C
TYPE 18-8C AND 24-10C GRATE

TYPE 18-9X AND 24-12X GRATE
(Welded Steel)

NOTES:
Bearing bars to be 3/4" x 1/2" bars on 1 1/2" centers.
12 bars for Type 24 grate - 9 bars for Type 18 grates. (Type 24 grate shown).
Weight of Type 24 grate = 192 LBS.
Weight of Type 18 grate = 145 LBS.
3/4" x 1/2" cross bars may be fillet welded, resistance welded or electroforged to bearing bars.

SECTION E-E
TYPE 18-9X AND 24-12X GRATE

TYPE 36R AND 36RX GRATE DETAILS

NOTES:
1. When alternative grates are allowed - final pay based on alternative with the lesser weight.
2. Use frame shown on Standard Plan D74A, D74B or D77A as appropriate.
3. When Type 24-10S, 24-12X or 24-13 grates are used with 600 inlets, a 1/2" x 3/4" x 1'-4 1/2" steel bar shall be welded across the center of inlet frame to separate the individual grates.
4. See Standard Plan D77A for connecting chain to welded grate and frame. When chain is required, do not use cast ductile iron grate.

CROSS BAR DETAIL TYPE 36RX

CROSS BAR DETAIL ALTERNATIVE CAST DUCTILE IRON GRATE OR CAST CARBON STEEL GRATE TYPE 36RX MODIFIED TYPE 36R AND 36RX GRATE FOR ODI INLET

ALTERNATIVE CAST DUCTILE IRON GRATE OR CAST CARBON STEEL GRATE TYPE 36R AND 36RX

BASIS FOR MISC IRON AND STEEL FINAL PAY WEIGHTS FOR DRAINAGE INLETS

INLET TYPE	GRATE TYPE	No. OF GRATES	WEIGHT LB
G30 (SEE NOTE 4)	24-10C	2	391
	24-10S	2	456
	24-12X	2	473
	24-13	2	374
G3, G3L, G3, G2, G3, G4 (TYPE 24)	24-10C	1	202
	24-10S	1	229
	24-12X	1	239
	24-13	1	188
G4 (TYPE 18)	18-8S	1	167
	18-9X	1	187
GT1, GT2	18-10	1	149
	18-8S	2	374
GT3, GT4	18-9X	2	374
	24-10C	2	404
	24-10S	2	458
	24-12X	2	478
ODI	24-13	2	376
	36RX (Mod)	1	196
GMP, GCP, GCP (ODI)	36RX	1	215
	36R (Mod)	1	220
GMP, GCP, GCP (TRASH RACK)	36R	1	236
	36R	1	27
GRATE CHAIN			2

GRATE BAR SPACING TABLE

TYPE	No. OF BARS	CLEAR BAR SPACING	X	Y	Z
36R	13	2 1/4"	2 1/4"	2 1/4"	2 1/4"
36RX (STEEL)	15	2 1/4"	2 1/4"	2 1/4"	2 1/4"
36RX (CAST)	13	2 1/4"	2 1/4"	2 1/4"	2 1/4"
36R Mod	12	2 1/4"	2 1/4"	2 1/4"	2 1/4"
36RX Mod (STEEL)	13	2 1/4"	2 1/4"	2 1/4"	2 1/4"
36RX Mod (CAST)	12	2 1/4"	2 1/4"	2 1/4"	2 1/4"

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
GRATE DETAILS No. 2
NO SCALE
D77B

From: 2018 edition of the California Department of Transportation Standard Plans

***Caltrans G2 with 3 x 3 grate used as substitute**

RESPONSIBLE ONLY FOR SELECTION AND MODIFICATION OF APPROPRIATE STANDARD DETAIL

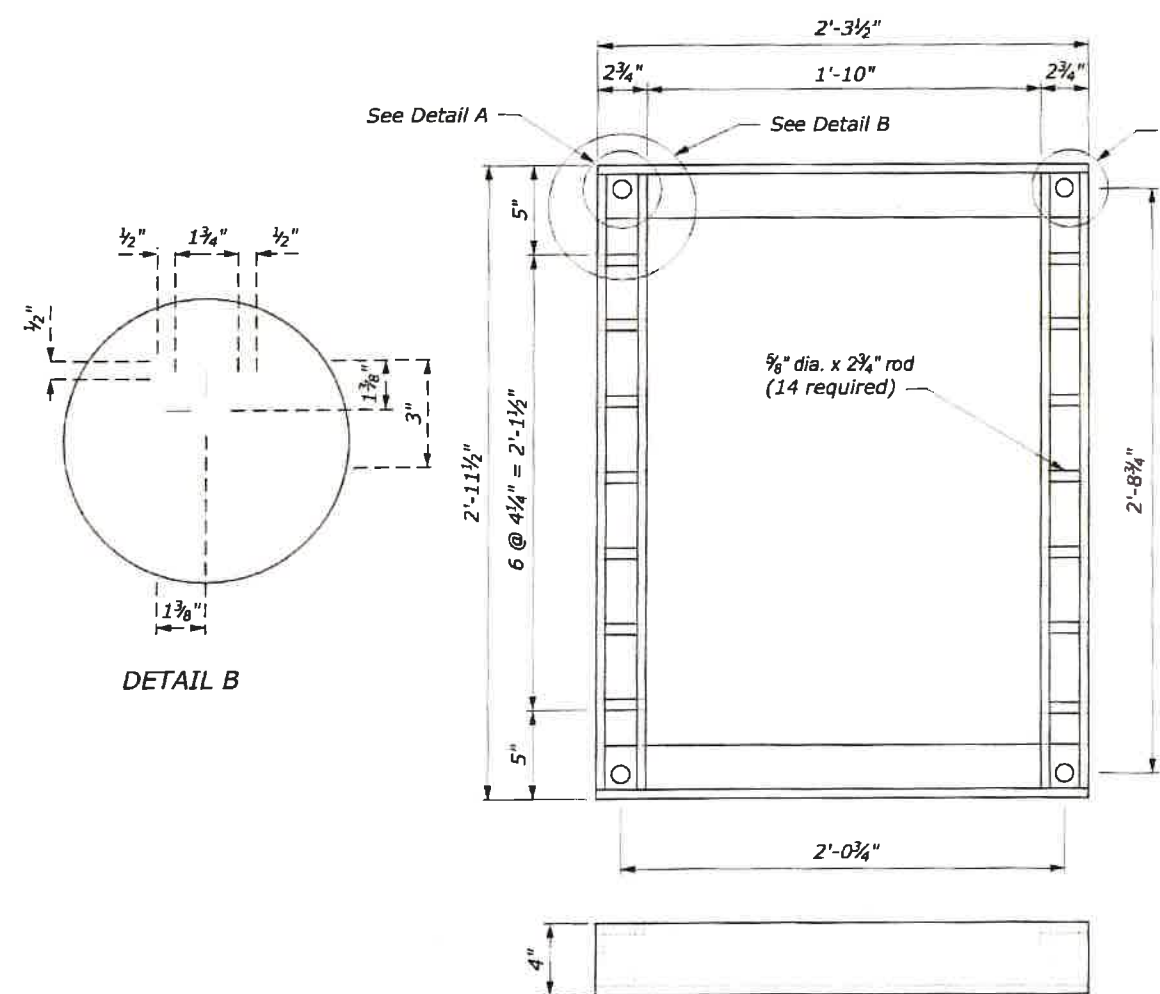
DAVID
4/1/2019
CIVIL

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION
U.S. CUSTOMARY SPECIAL

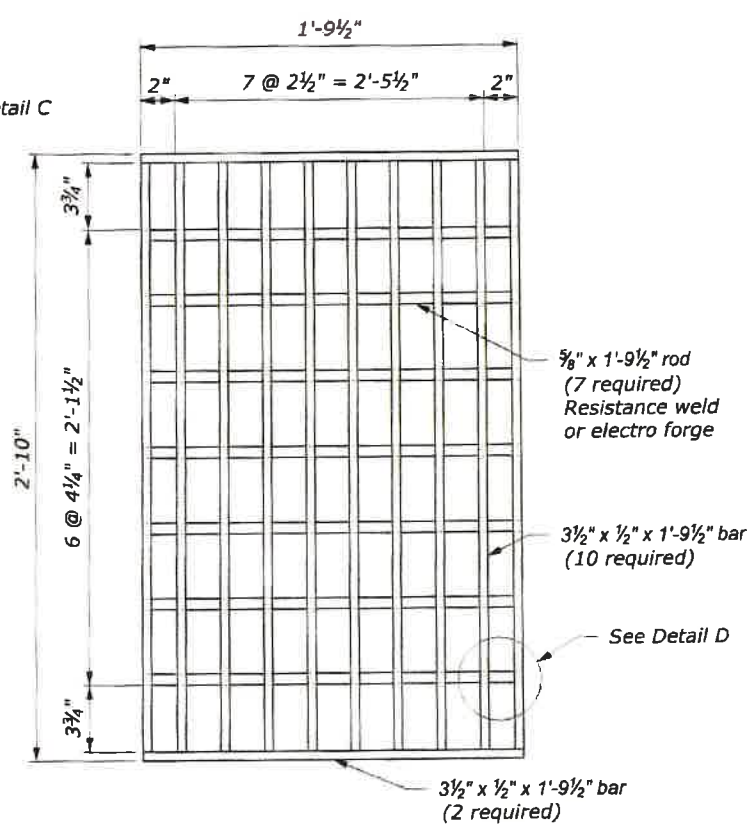
GRATE DETAILS No. 2

SPECIAL
604-C

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T16



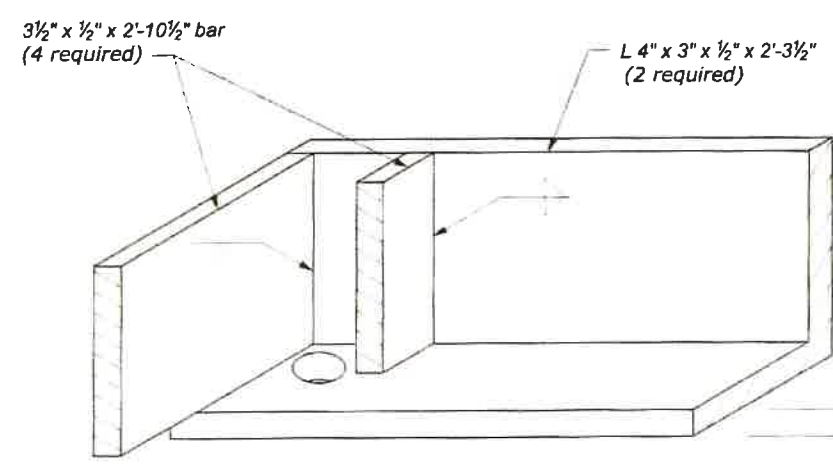
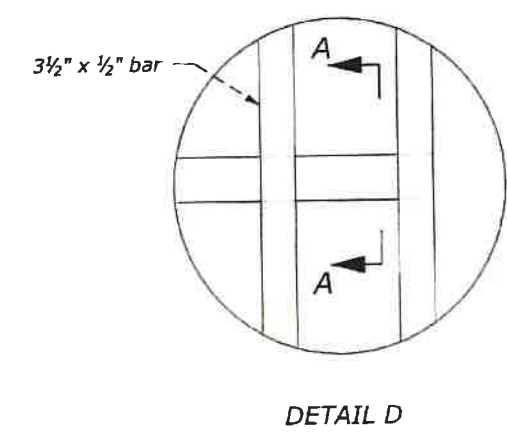
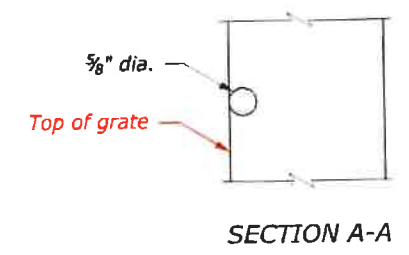
GRATE FRAME



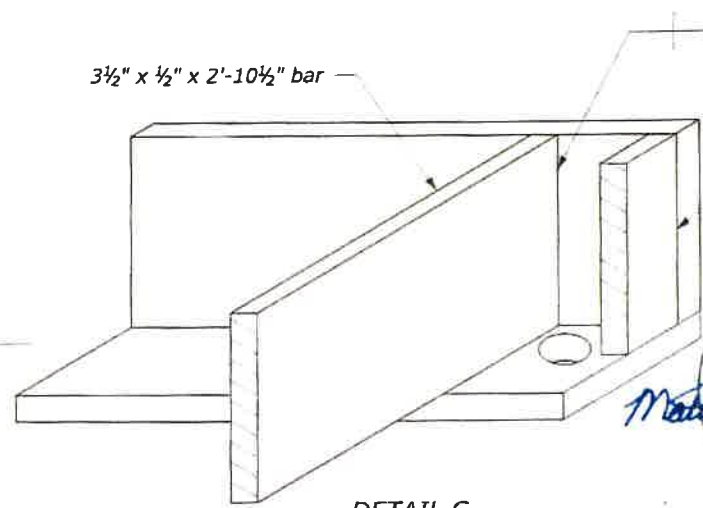
GRATE

NOTE:

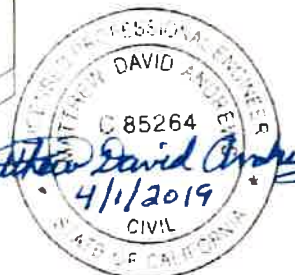
1. Hot dip galvanize all metal parts for frame and grate after fabrication.
2. Fabricate frame and grate from structural steel.
3. Furnish four 3/4" x 8" anchor bolts with nuts to attach frame to inlet.
4. Cut holes in 3 1/2" x 1/2" bar as required to place 5/8 inch diameter rods.
5. Spot weld 5/8 inch diameter rods for frame and grate to 3 1/2" x 1/2" bars.



DETAIL A (OBLIQUE)



DETAIL C (OBLIQUE)



RESPONSIBLE ONLY FOR SELECTION AND MODIFICATION OF APPROPRIATE STANDARD DETAIL

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD FRAME AND GRATE TYPE 5A	
	STANDARD 604-6

User: mcarlson

11:53:30 AM Q:\2015 Projects\15-030.02 Donner Pass Preliminary Design - CFLHD\CA FLAP NEV 40(1)\Roadway\CADD_Sheets\T-600\CA40-Sta_609-A.dgn

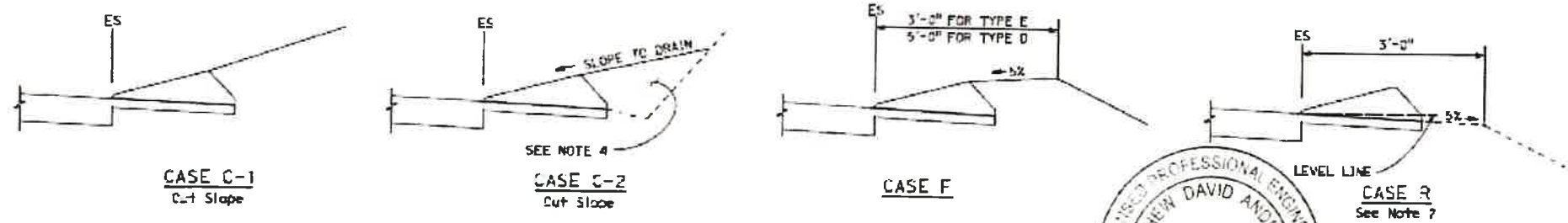
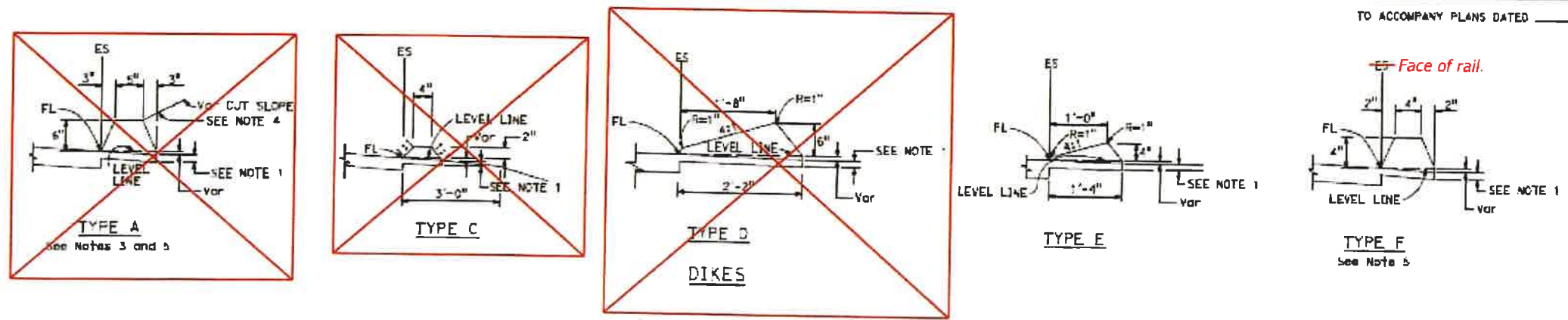
4/1/2019

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T17

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Matthew David Andrew
REGISTERED CIVIL ENGINEER
JANUARY 15, 2016
PLANS APPROVAL DATE
THE STATE OF CALIFORNIA OR ITS OFFICIALS
OR AGENTS SHALL NOT BE RESPONSIBLE FOR
THE ACCURACY OR COMPLETENESS OF DIMENSIONS
SHOWN ON ANY PLAN SHEET.

TO ACCOMPANY PLANS DATED _____



NOTES:

1. For HMA shoulders only, extend top layer of HMA placed on the shoulder under dike with no joint at the ES. For projects with GFC shoulder or, do not extend GFC under dike. See project plans for modified dike details.
2. Case R applies to retrofit only projects where restrictive conditions do not provide enough width for Case F backfill.
3. Type A dike only to be used where restrictive slope conditions do not provide enough width to use Type D or Type E dike.
4. Fill and compact with excavated material to top of dike.
5. Use Type F dike, where dike is required with guardrail installations. See project plans for dike positioning details. See project plans for wing point offsets with guardrail.

DIKE QUANTITIES	
TYPE	CUBIC YARDS PER LINEAR FOOT
A	0.0135
C	0.0038
D	0.0293
E	0.0130
F	0.0066

Quantities based on 5% cross slope.

Matthew David Andrew
C 85264
4/1/2019
CIVIL
STATE OF CALIFORNIA
RESPONSIBLE ONLY FOR SELECTION
AND MODIFICATION OF
APPROPRIATE STANDARD DETAIL

HOT MIX ASPHALT DIKES

NO SCALE

RSP A87B DATED JANUARY 15, 2016 SUPERSEDES RSP A87B DATED JULY 18, 2012 AND
STANDARD PLAN A87B DATED MAY 20, 2011 - PAGE 120 OF THE STANDARD PLANS BOOK DATED 2012.

REVISED STANDARD PLAN RSP A87B

From: 2018 edition of the California Department of Transportation Standard Plans.

NOTE:

1. Install Curb, Asphalt, 4-Inch Depth per details shown in 609-A (Revised Standard Plan A87B). See C Sheets for location and limits of Type E and Type F curb.

NO SCALE

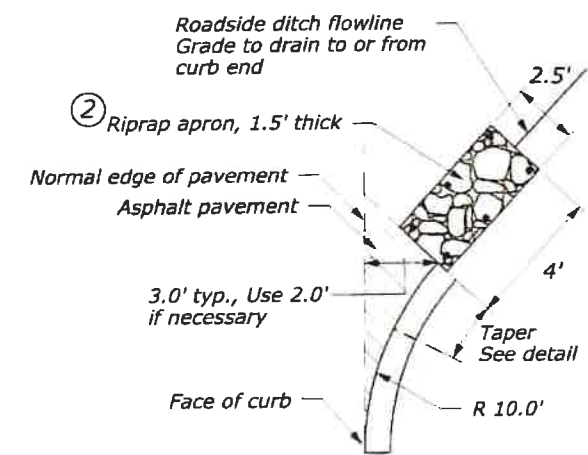
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY SPECIAL
CURB DETAILS

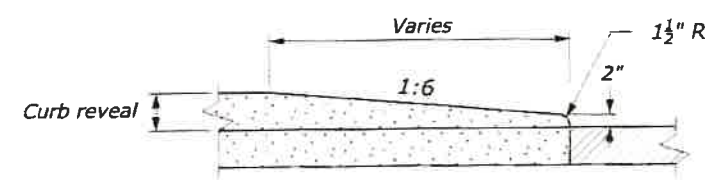
Sheet 1 of 2

SPECIAL
609-A

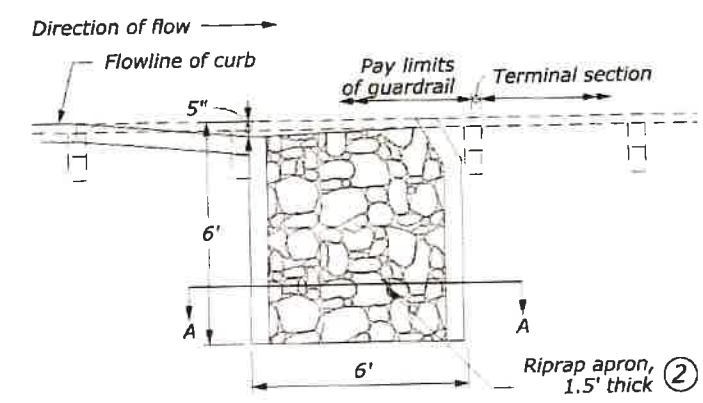
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T18



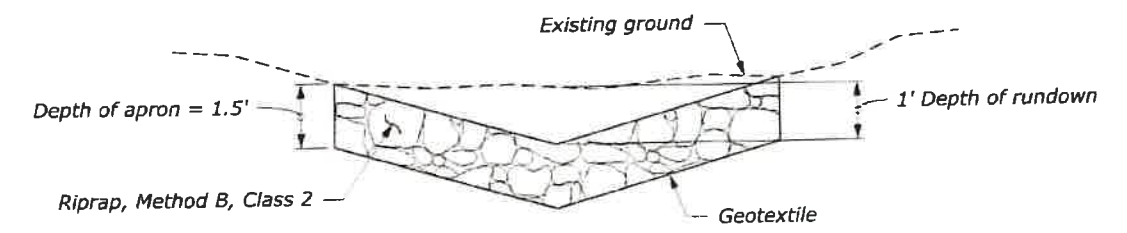
**CURB END ①
(PLAN)**



**TYPE E CURB TAPER
(ELEVATION)**



**TYPE F CURB TERMINUS ①
(PLAN)**



SECTION A-A

NOTE:

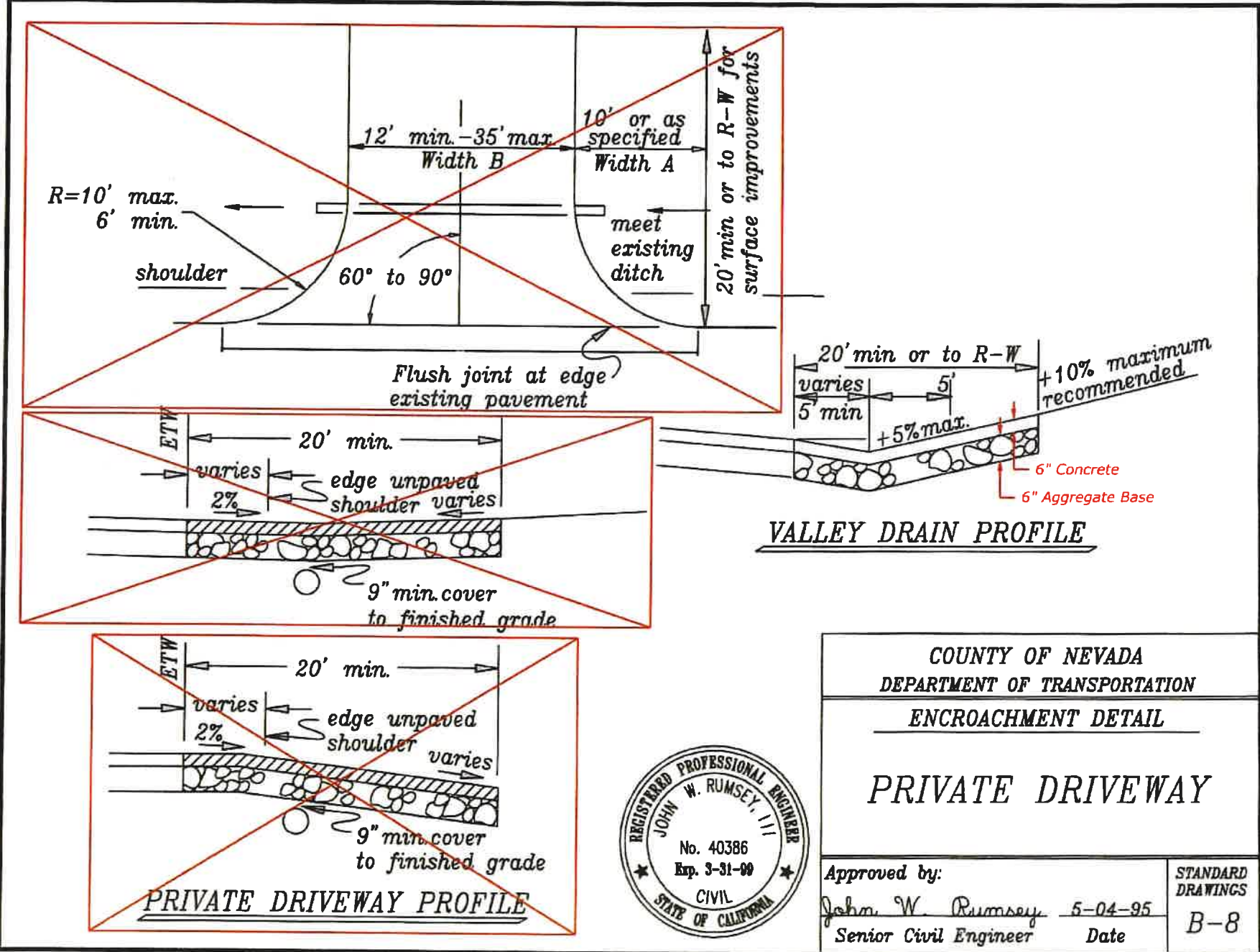
- ① Install Curb End detail at the beginning and end of all Type E curbs. Install Type F Curb Terminus at the end of all Type F curbs. Adjust as necessary to fit field conditions.
- ② Riprap apron will be measured under Placed Riprap, Method B, Class 2.



U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION CENTRAL FEDERAL LANDS HIGHWAY DIVISION	
U.S. CUSTOMARY SPECIAL CURB DETAILS	
Sheet 2 of 2	
NO SCALE	SPECIAL 609-A

3/20/2019 12:58:58 PM Q:\2015 Projects\15-030.02 Donner Pass Preliminary Design - CELHD\CA FLAP NEV 40(1)\Roadway\CADD_Sheets\T-600\CA40_Sta_609-A.dgn User: mcarlson

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T19



COUNTY OF NEVADA DEPARTMENT OF TRANSPORTATION ENCROACHMENT DETAIL	
PRIVATE DRIVEWAY	
Approved by: John W. Rumsey Senior Civil Engineer	5-04-95 Date B-8



RESPONSIBLE ONLY FOR SELECTION
AND MODIFICATION OF
APPROPRIATE STANDARD DETAIL

NOTE:
1. Install Gutter, Concrete according to Valley Drain Profile detail.

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION CENTRAL FEDERAL LANDS HIGHWAY DIVISION
U.S. CUSTOMARY SPECIAL
GUTTER DETAILS
SPECIAL 609-B

NO SCALE

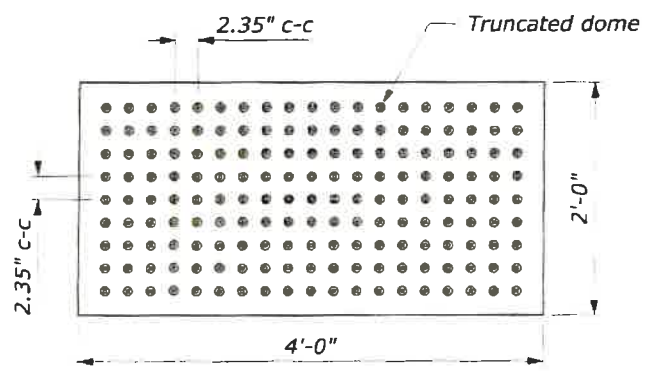
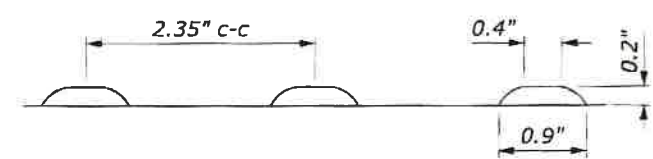
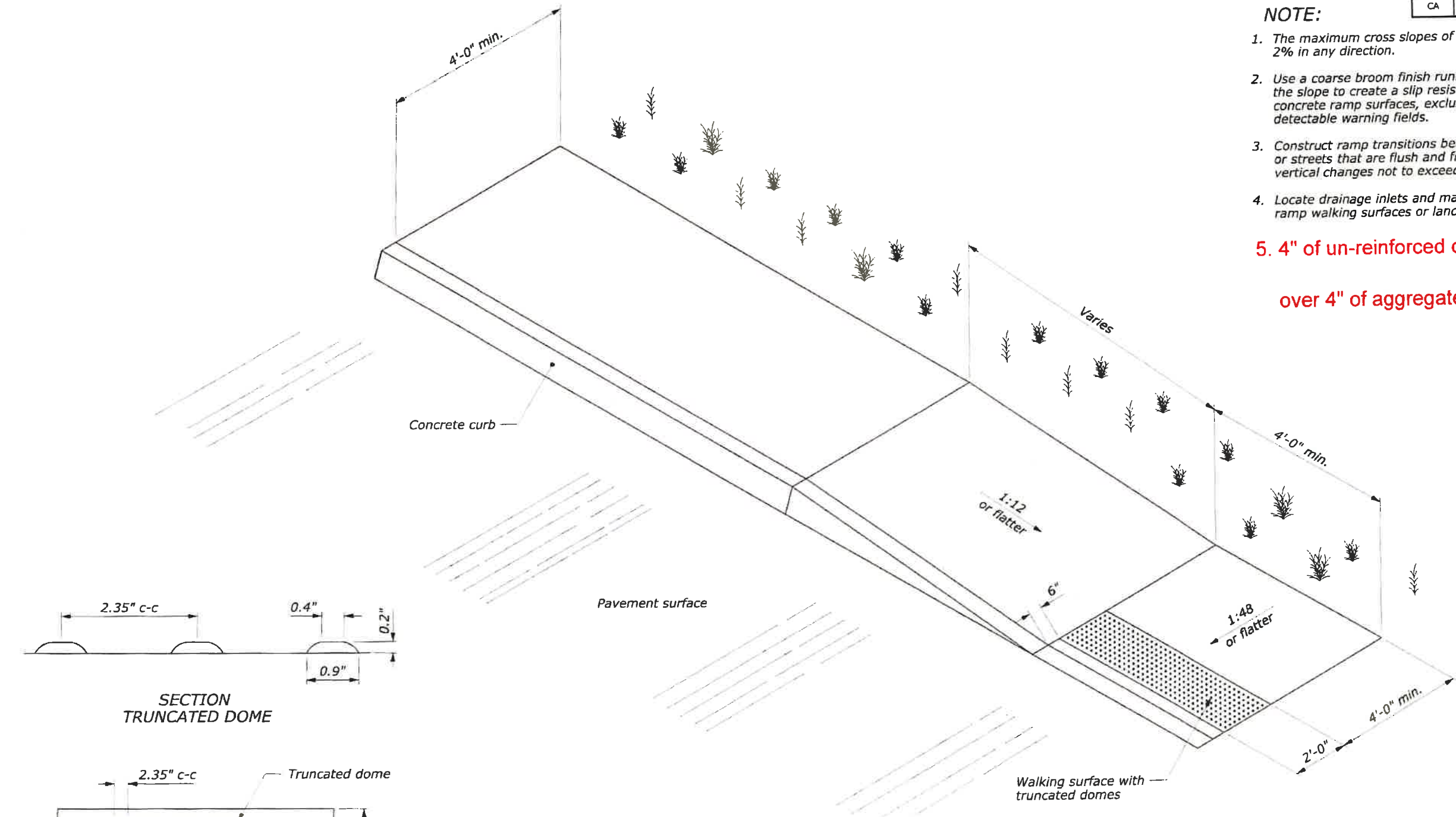
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STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T20

NOTE:

1. The maximum cross slopes of ramps must not exceed 2% in any direction.
2. Use a coarse broom finish running perpendicular to the slope to create a slip resistant surface on concrete ramp surfaces, exclusive of the detectable warning fields.
3. Construct ramp transitions between walks, gutters, or streets that are flush and free of abrupt vertical changes not to exceed 2.5 inches.
4. Locate drainage inlets and manholes outside of ramp walking surfaces or landings.

5. 4" of un-reinforced concrete placed over 4" of aggregate base.



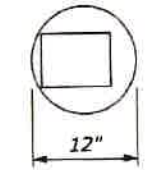
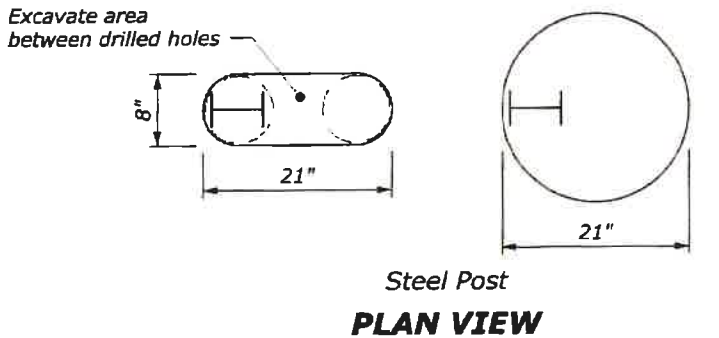
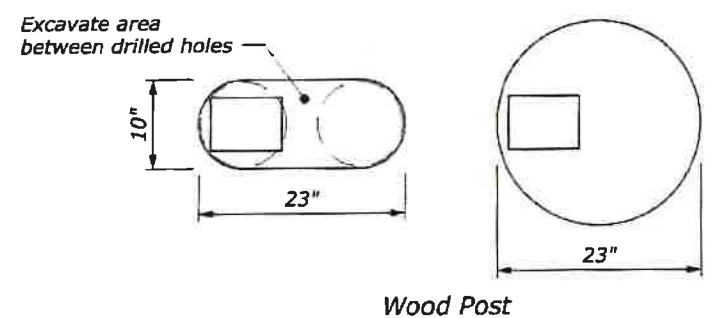
PARALLEL CURB RAMP

RESPONSIBLE ONLY FOR
 SELECTION OF
 APPROPRIATE STANDARD
 DETAIL

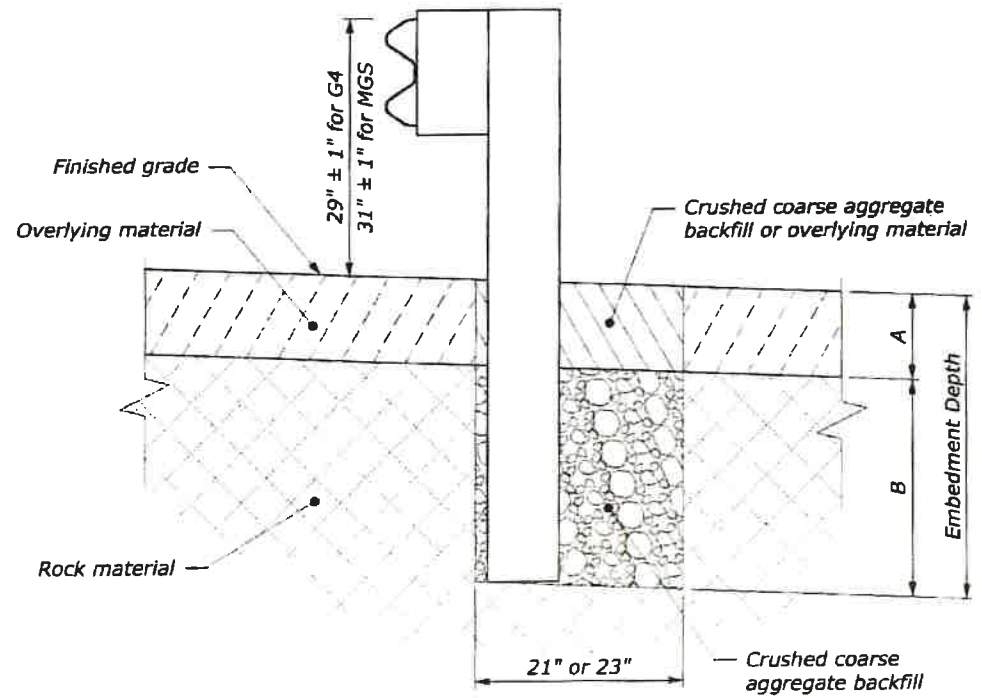
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD WHEELCHAIR RAMP CURB TAPER	
	STANDARD 615-2

User: mcalison
 9:21:50 AM Q:\2015 Projects\15-030.02 Donner Pass Preliminary Design - CFLHD\CA FLAP NEV 40(1)\Roadway\CADD_Sheets\T-600\DONNER\CA40_Std_615-2.dgn
 3/19/2019

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T21

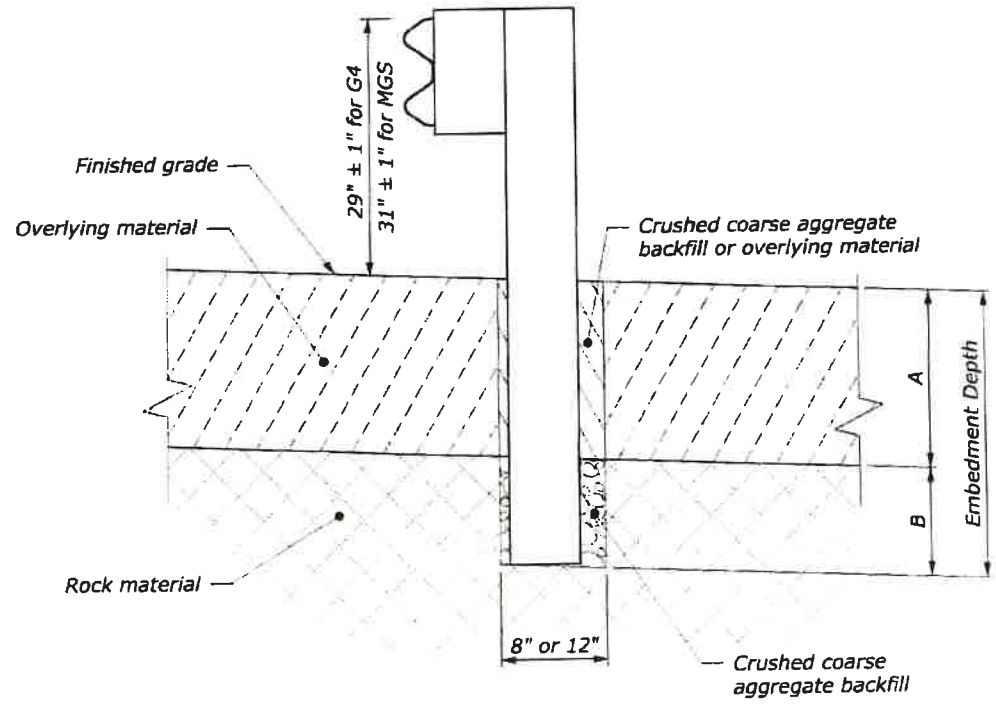


- NOTE:**
1. Use this standard when posts cannot be embedded to the minimum depth shown on Standards 617-10, 617-11, 617-31, or 617-32.
 2. Unless otherwise specified, use either the circular or the oblong hole configuration for Case 1 conditions.
 3. Use crushed coarse aggregate backfill that conforms to "coarse aggregate for concrete" or "granular backfill for underdrain pipe with geotextile" in Section 703.
 4. Place crushed coarse aggregate according to the post requirements in Section 617.
 5. Treat field cut galvanized steel post surfaces that expose the base metal with two coats of zinc-oxide paint.



ELEVATION
Case 1: Overlying material depth (A) is 18" or less.

POST EMBEDMENT DIMENSIONS			
HOLE TYPE	EMBEDMENT DEPTH	OVERLYING MATERIAL (A)	DRILLING DEPTH (B)
Case 1	24" to 42"	0 to 18"	24"
Case 2	30" to 42"	> 18" to 30"	12"
	42"	> 30"	42" - A



ELEVATION
Case 2: Overlying material depth (A) is greater than 18".

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 SELECTION OF
 APPROPRIATE STANDARD
 DETAIL

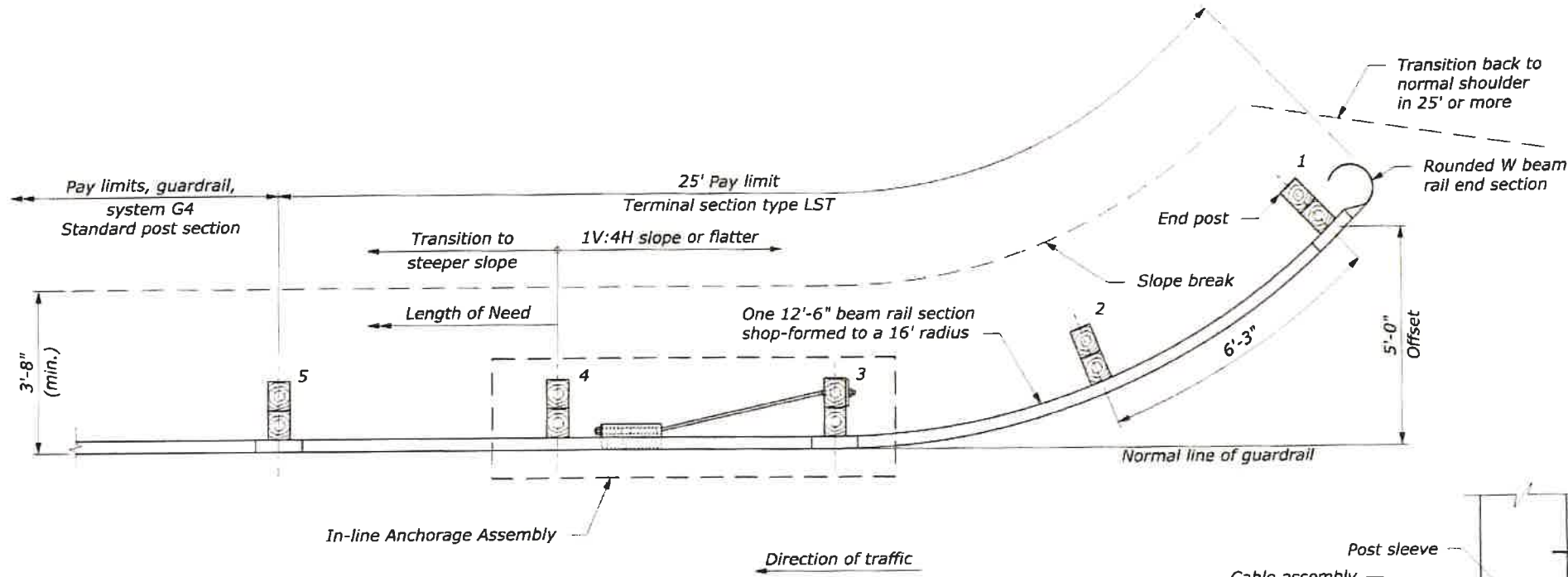
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
G4 AND MGS W-BEAM GUARDRAIL INSTALLATION IN ROCK	
	STANDARD 617-13

NO SCALE

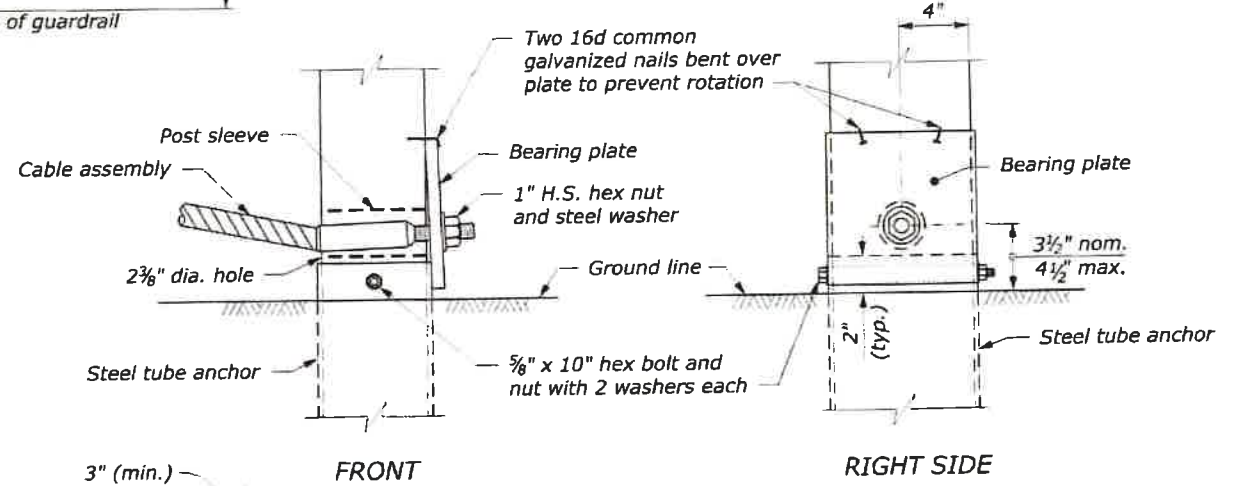
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T22

NOTE:

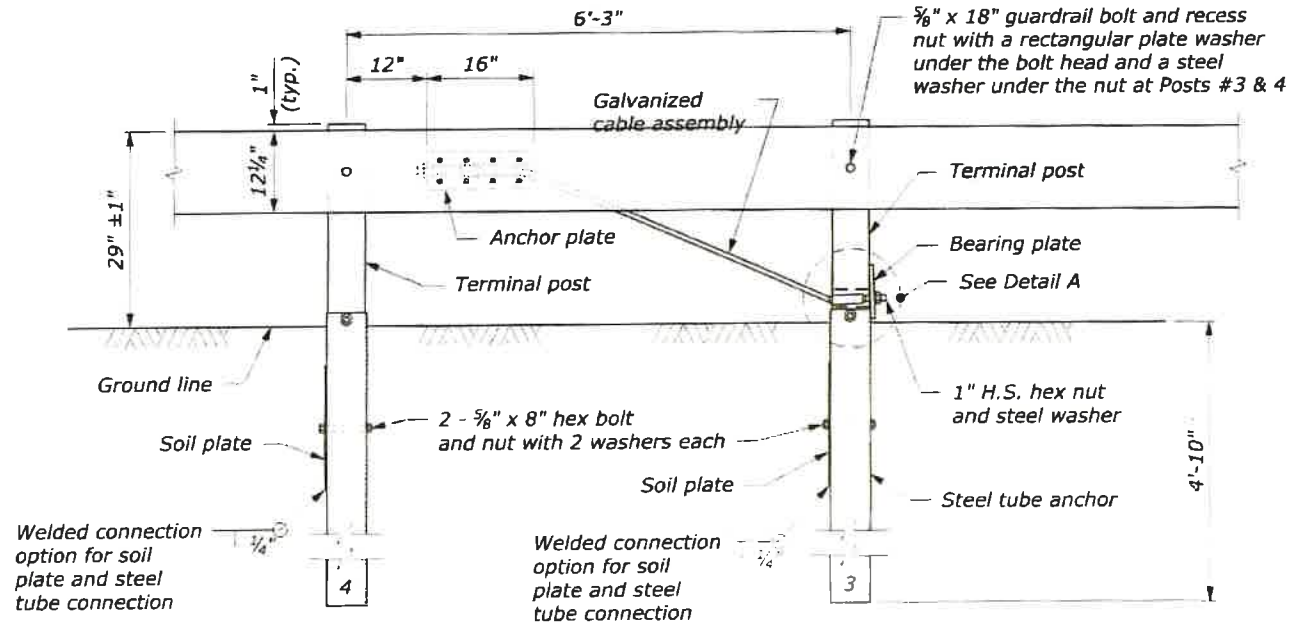
1. Pay limits for terminal section type LST include the in-line anchorage assembly and posts 1-5.
2. Use offset from face of rail to slope break as shown unless otherwise shown on plan.
3. Posts 1, 2 and 5 are standard guardrail posts. See Standard 617-10 for details.
4. See Standard 617-15 for other details.
5. Do not use LST terminal where speeds are in excess of 45 MPH.



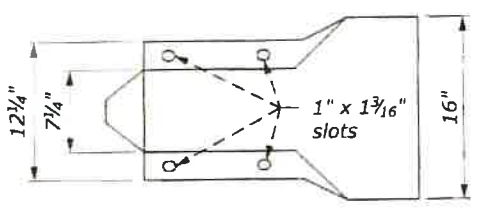
PLAN



**DETAIL A
POST #3 ASSEMBLY**



**ELEVATION
IN-LINE ANCHORAGE ASSEMBLY**



**ELEVATION
ROUNDED END SECTION**

RESPONSIBLE ONLY FOR
SELECTION OF
APPROPRIATE STANDARD
DETAIL

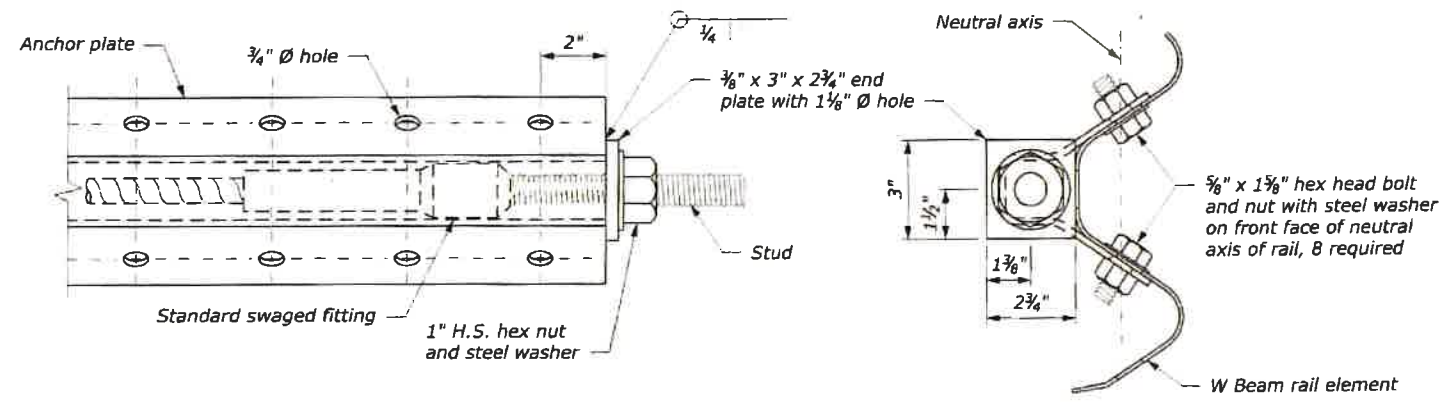
4/1/2019

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	STANDARD APPROVED FOR USE 6/2005	STANDARD 617-14
U.S. CUSTOMARY STANDARD G4-W BEAM GUARDRAIL LOW SPEED TERMINAL TYPE LST, WOOD POSTS		

NO SCALE

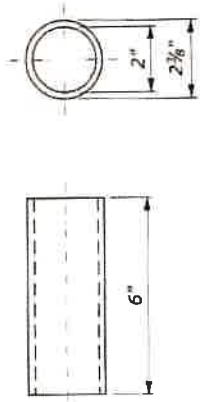
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STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T23

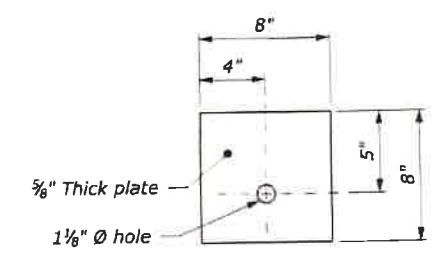


ANCHOR PLATE DETAILS FOR LST ANCHORAGE ASSEMBLY

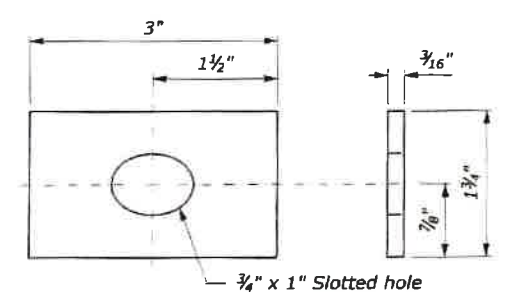
NOTE:
1. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.



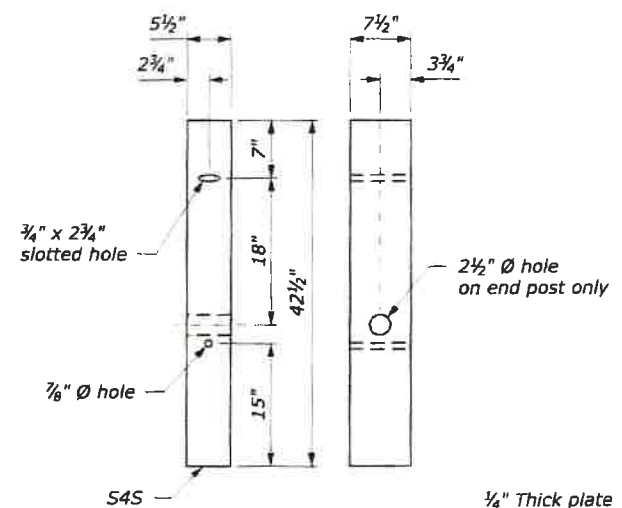
POST SLEEVE



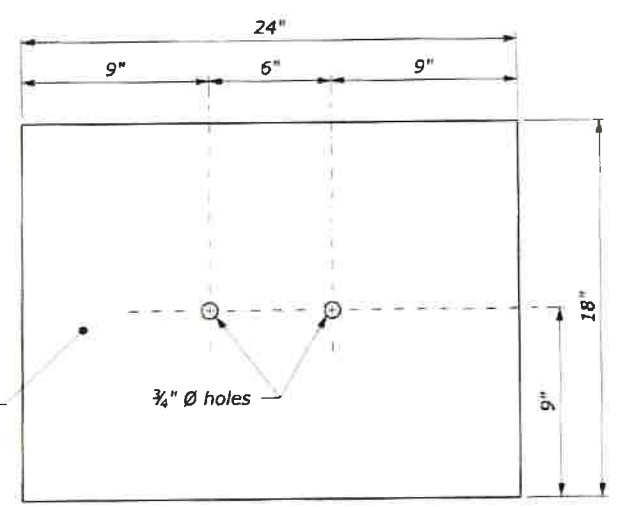
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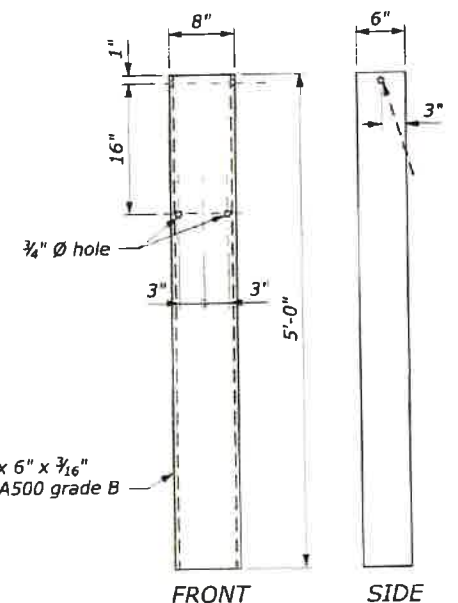
RECTANGULAR PLATE WASHER
(Use to attach the section to the post of anchorage assembly)



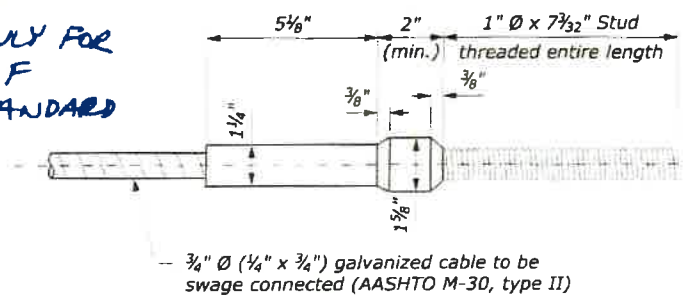
TERMINAL POST



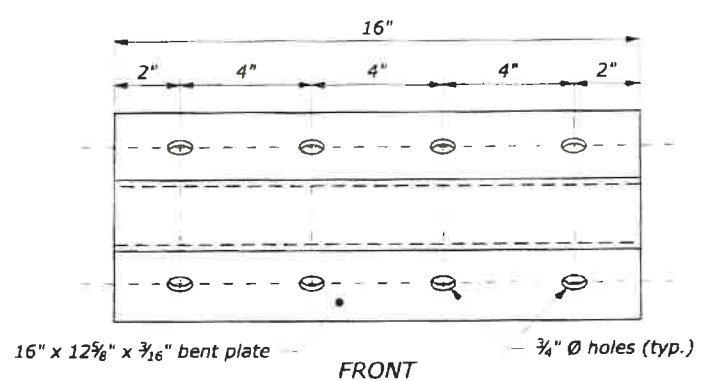
SOIL PLATE
(2 REQUIRED)



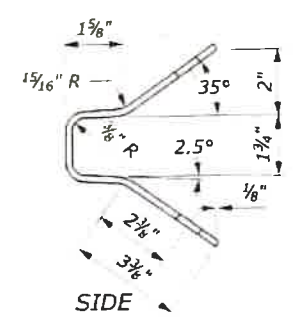
STEEL TUBE ANCHOR



CABLE ASSEMBLY
(Standard swaged fitting and stud)



GUARDRAIL ANCHOR PLATE



NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD G4 W-BEAM GUARDRAIL MELT, LST & CRT ANCHORAGE ASSEMBLY DETAILS	
STANDARD APPROVED FOR USE 1/1994	STANDARD 617-15

3/19/2019 9:22:16 AM Q:\2015 Projects\15-030.02 Donner Pass Preliminary Design - CFLHDICA FLAP NEV 40(1) Roadway\CADD_Sheets\T-600\DOWN\CA40_Std_617-15.dgn User: mcarlson

RESPONSIBLE ONLY FOR
SELECTION OF
APPROPRIATE STANDARD
DETAIL

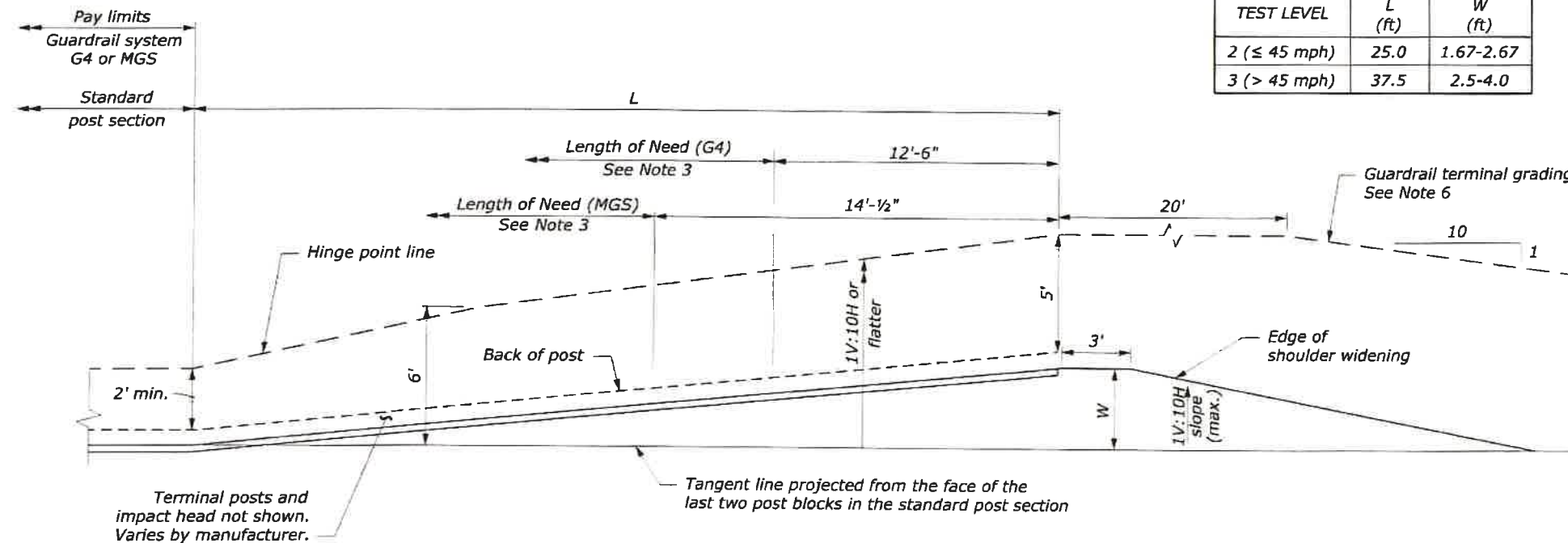


STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T24

TEST LEVEL	L (ft)	W (ft)
2 (≤ 45 mph)	25.0	1.67-2.67
3 (> 45 mph)	37.5	2.5-4.0

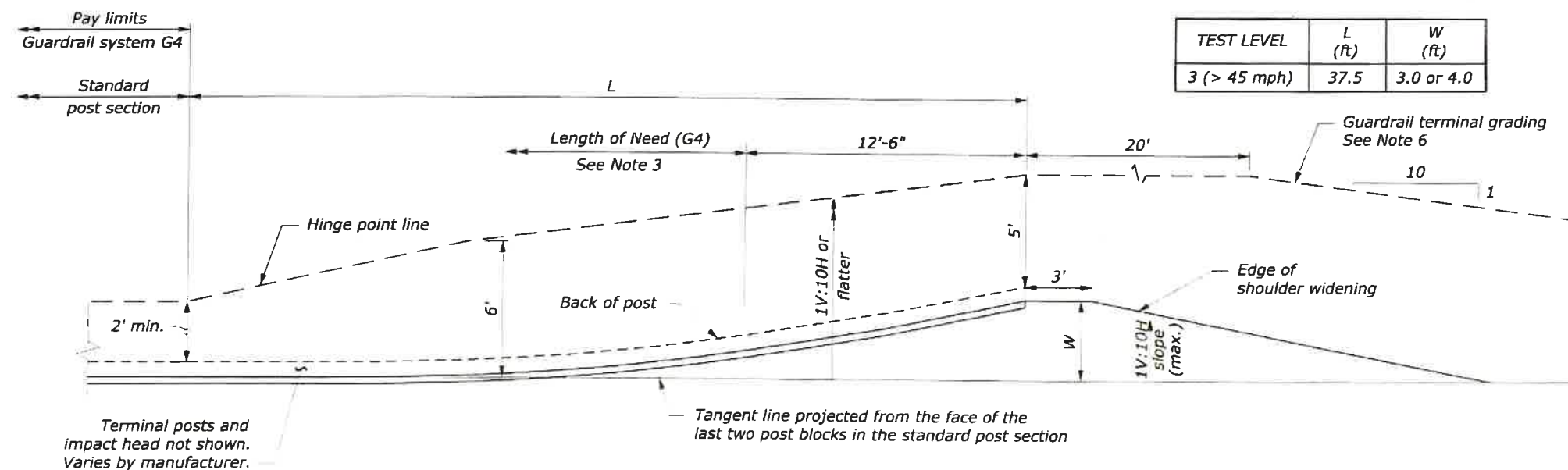
NOTE:

1. Install a flared W-beam guardrail terminal according to the manufacturer's recommendations. See manufacturer's drawings for other details.
2. Construct the terminal grading as shown in the staking notes or model. If no staking notes or model is provided, construct grading as shown on this sheet and as recommended by the manufacturer.
3. For design purposes, the length of need is assumed to begin as shown on the drawing. Verify the length of need with the manufacturer of a specific product. Adjust grading as necessary to install the flared terminal according to the manufacturer's recommendations.
4. Pave widened shoulder on both ends of guardrail runs when indicated on the plans.
5. Install a reflectorized object marker on the impact head.
6. Construct a 1V:4H or flatter slope outside of the guardrail terminal grading extents where practical.



PLAN

STRAIGHT FLARED OPTION G4 AND MGS W-BEAM GUARDRAIL



PLAN

PARABOLIC FLARED OPTION G4 W-BEAM GUARDRAIL

TEST LEVEL	L (ft)	W (ft)
3 (> 45 mph)	37.5	3.0 or 4.0



RESPONSIBLE ONLY FOR
SELECTION OF
APPROPRIATE STANDARD
DETAIL

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD G4 AND MGS W-BEAM GUARDRAIL TYPE FLARED TERMINAL AND GRADING	
STANDARD APPROVED FOR USE 6/2005	STANDARD
REVISED: DRAFT: 03/2018	617-19

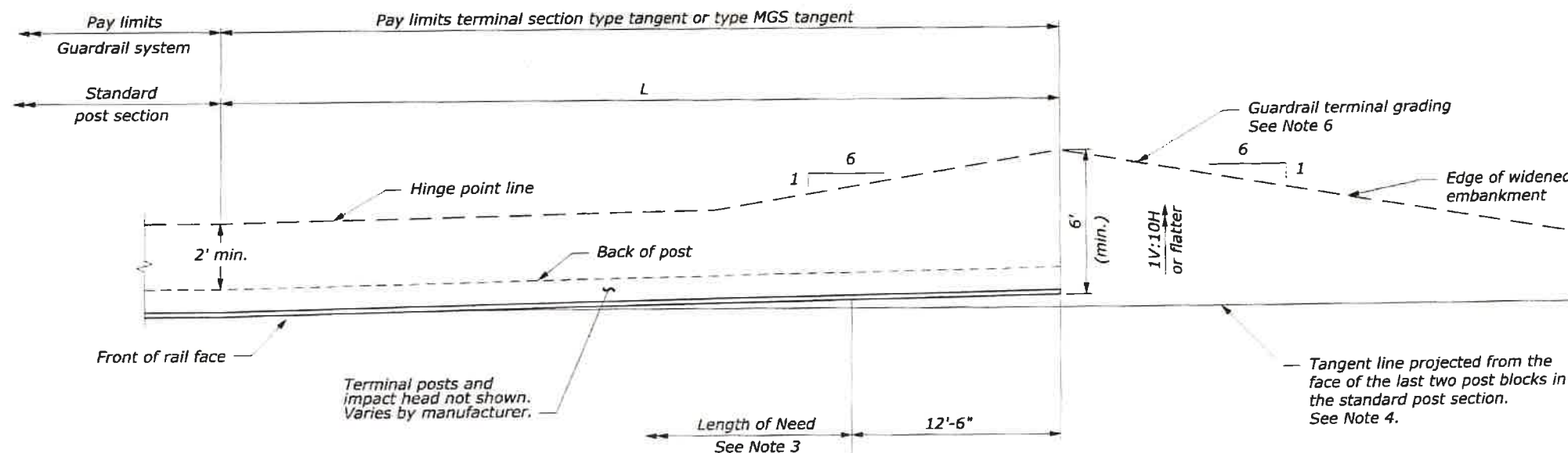
NO SCALE

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T25

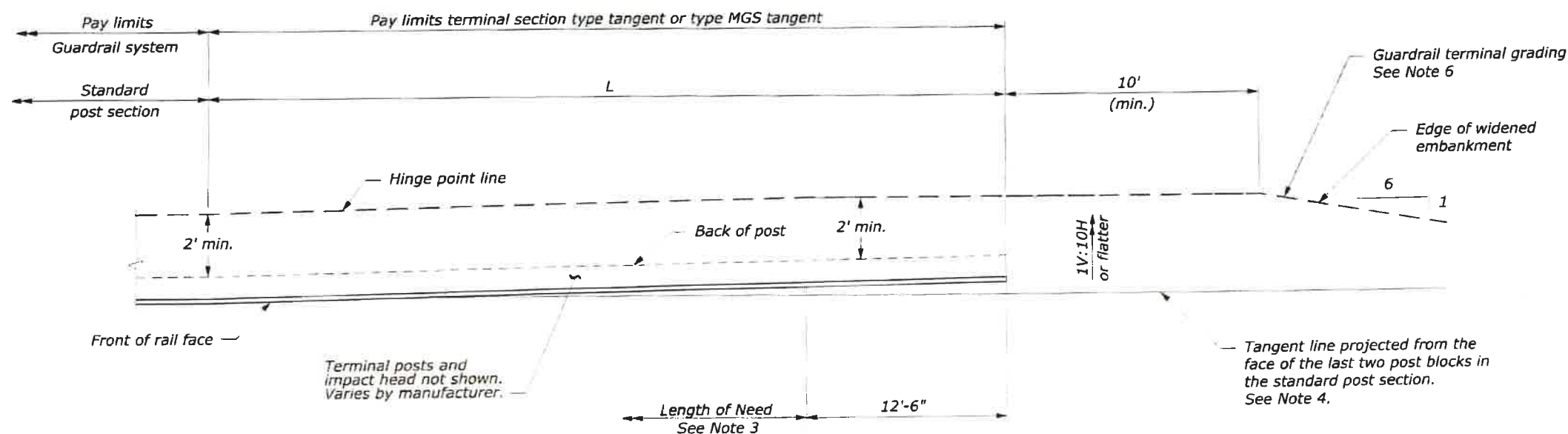
NOTE:

1. Install tangent terminal according to the manufacturer's recommendations. See manufacturer's drawings for other details.
2. Construct the terminal grading layout as shown in the staking notes or model. If no staking notes or model are provided, use the preferred grading layout as much as practical within site constraints. If necessary because of site limitations, use the alternative grading layout.
3. For design purposes, the length of need is assumed to begin at post 3. Verify the length of need with the manufacturer for a specific product. Adjust grading as necessary to install the tangent terminal according to the manufacturer's recommendations.
4. Install terminal at a 1:25 taper or flatter, to position the end farther away from the edge of the shoulder, or use a taper according to manufacturer's recommendations.
5. Install a reflectorized object marker on the impact head.
6. Construct a 1V:4H slope outside of the guardrail terminal grading extents where practical.

TEST LEVEL	L (ft)
2 (\leq 45 mph)	25
3 ($>$ 45 mph)	37.5 or 50 (for G4)
	50 (for MGS)



PLAN
PREFERRED GRADING



PLAN
ALTERNATIVE GRADING

RESPONSIBLE ONLY FOR
SELECTION OF
APPROPRIATE STANDARD
DETAIL

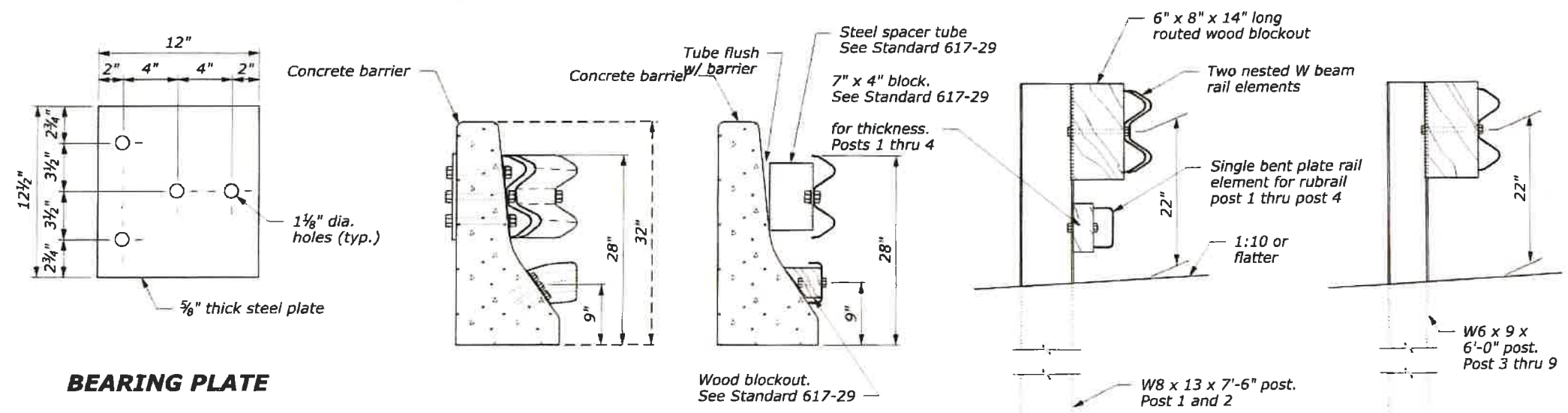
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD G4 AND MGS W-BEAM GUARDRAIL TYPE TANGENT TERMINAL AND GRADING	
STANDARD APPROVED FOR USE 6/2005	STANDARD 617-20
REVISED: DRAFT: 03/2018	

NO SCALE

User: mcarson

Q:\2015 Projects\15-030.02 Donner Pass Preliminary Design - CFLHD\CA FLAP NEV 40(1)\Roadway\CADD_Sheets\T-600\CA40_S&D_617-28.dgn 9:22:20 AM 3/19/2019

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T26



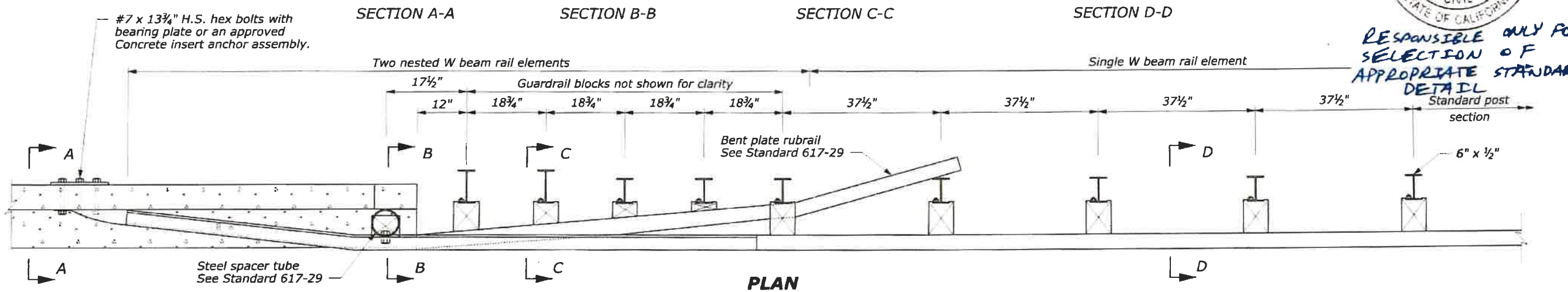
BEARING PLATE

NOTE:

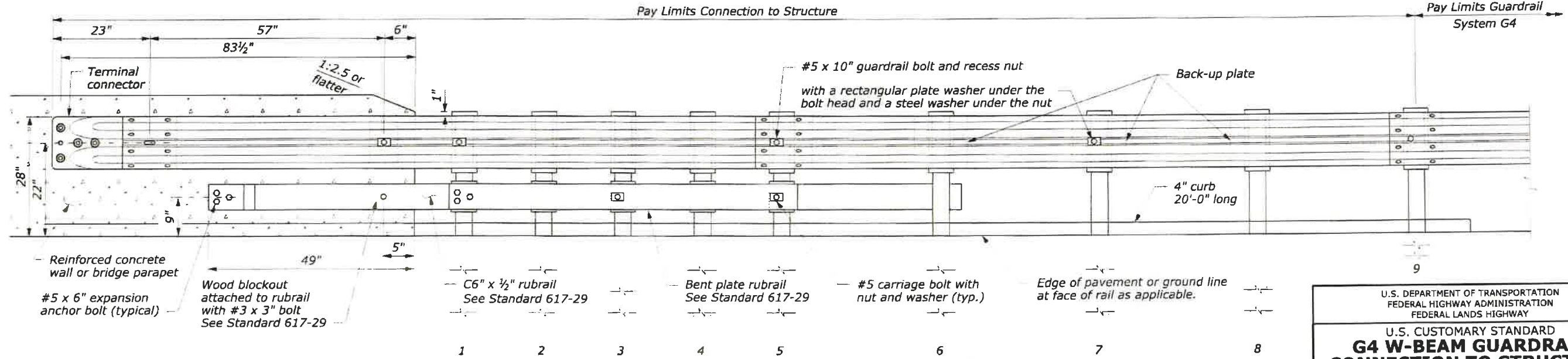
1. Posts 1 through 5 require an additional hole to attach lower wood blocks and/or rubrail.
2. Offset drill wood blocks for rubrail to sit squarely on the post flange on posts 1 through 4. Secure blocks to posts 2 and 4. Secure rubrail and blocks to post flange on posts 1, 3, and 5 using #5 carriage bolts.
3. Do not bolt W beam to posts and blocks at posts 2 and 4.
4. Reinforced concrete wall or bridge parapet must be capable of developing a 59.6 kip pull out strength.



RESPONSIBLE ONLY FOR SELECTION OF APPROPRIATE STANDARD DETAIL



PLAN

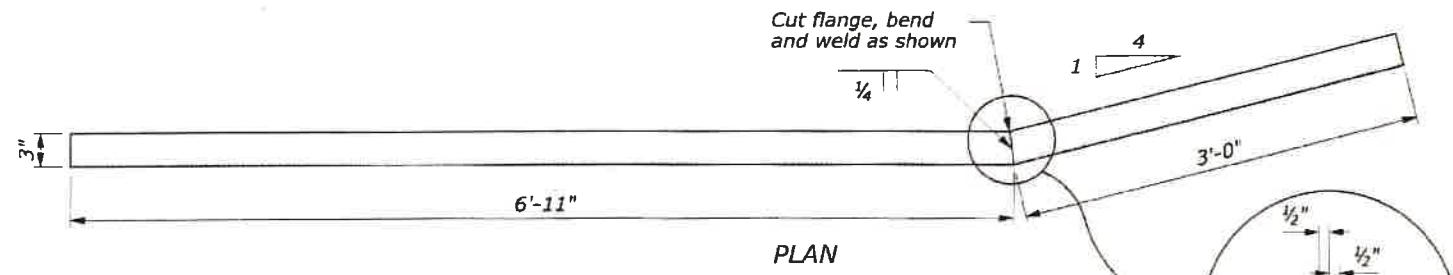


ELEVATION

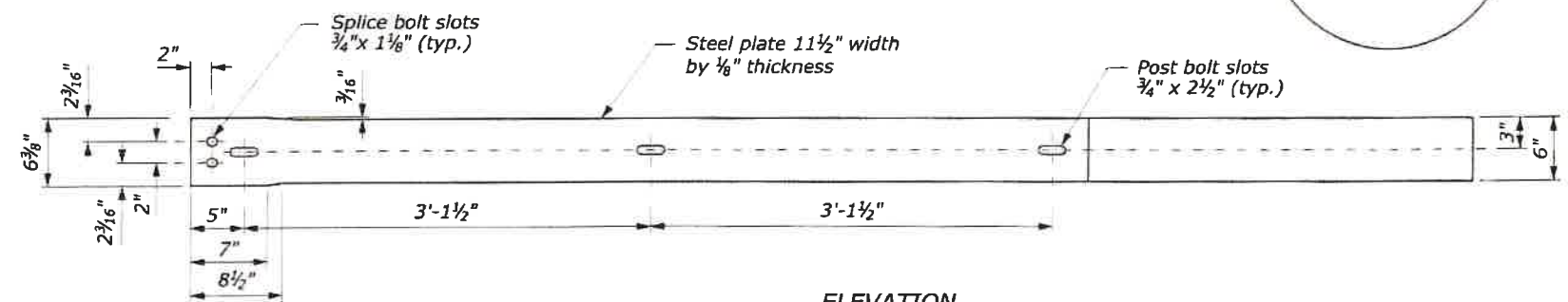
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD G4 W-BEAM GUARDRAIL CONNECTION TO STRUCTURE SAFETY SHAPE FACE STEEL POSTS	
STANDARD APPROVED FOR USE --/--	STANDARD 617-28
REVISED: DRAFT: 9/2013	

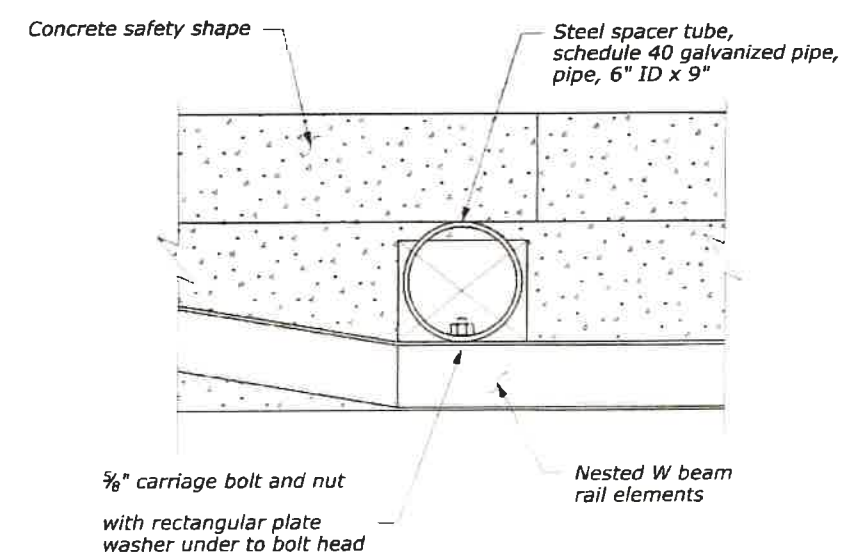
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T27



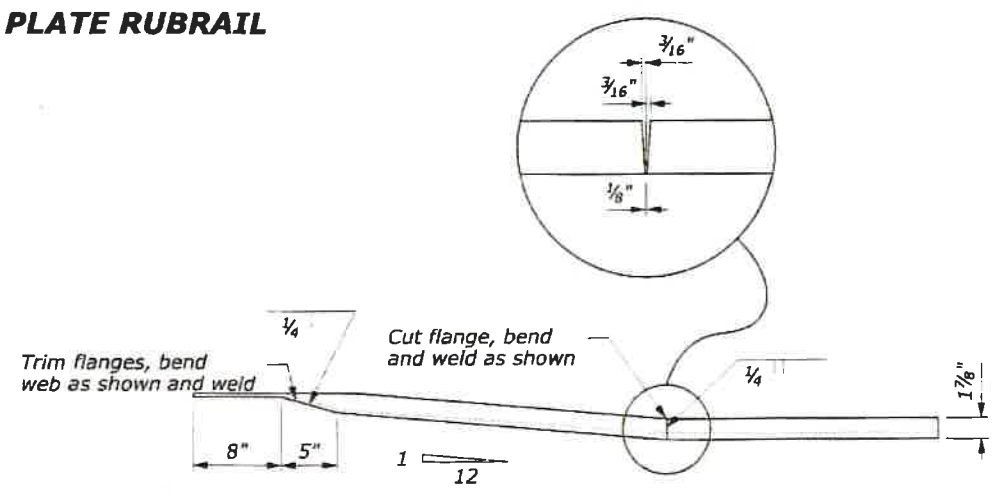
PLAN



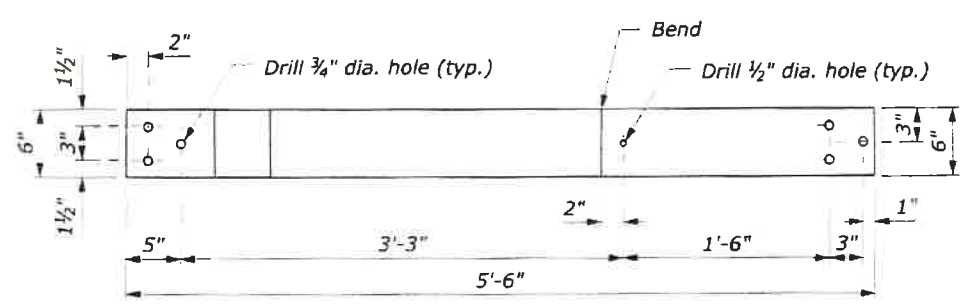
ELEVATION
BENT PLATE RUBRAIL



STEEL SPACER BLOCK



PLAN

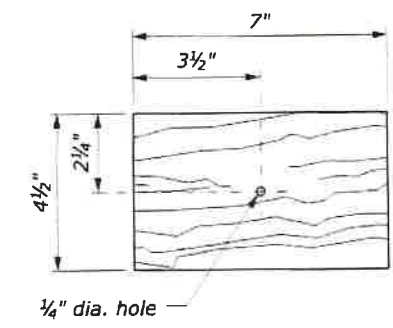


ELEVATION
C6X8.2 RUBRAIL

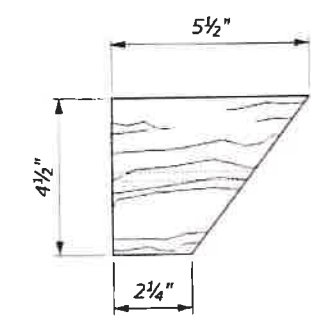
RESPONSIBLE ONLY FOR
 SELECTION OF
 APPROPRIATE STANDARD
 DETAIL

NOTE:

1. Attach rubrail end flush with sloped tow of safety shape. Shop fabricate the C6 x 8.2 rubrail end to be consistent with the slope of safety shape. Both clockwise and counterclockwise fabrications may be required.
2. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.

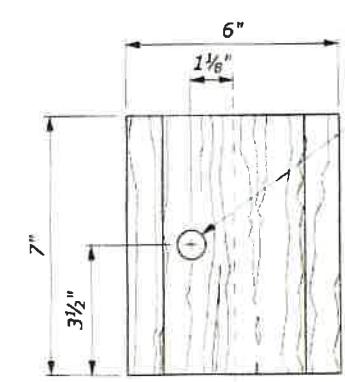


FRONT

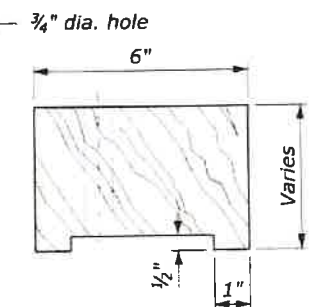


SIDE

WOOD BLOCKOUT FOR RUBRAIL
ON CONCRETE SAFETY SHAPE



FRONT



TOP

WOOD BLOCKOUT FOR
RUBRAIL ON STEEL POSTS

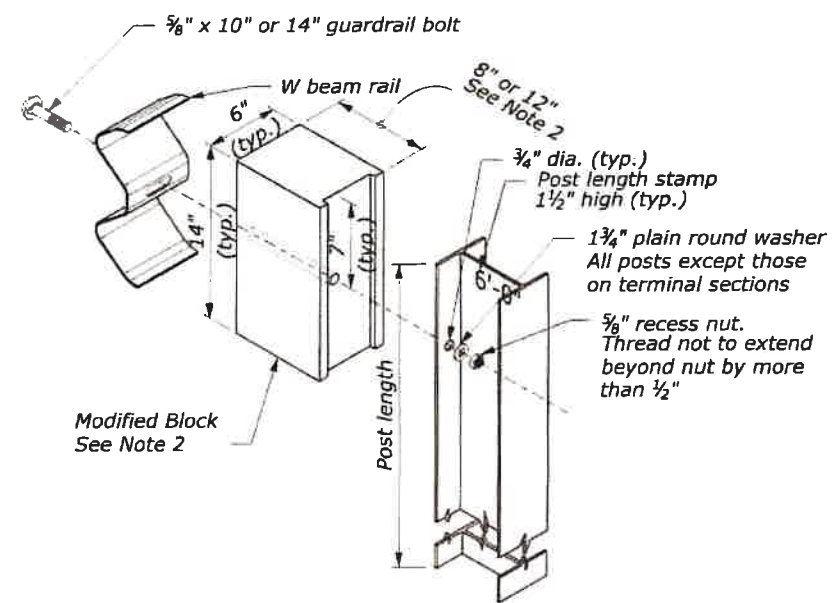
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
G4 BEAM GUARDRAIL CONNECTION TO STRUCTURE SAFETY SHAPE FACE RUBRAIL	
REVISED: DRAFT: 9/2013	STANDARD 617-29

User: mcarlson

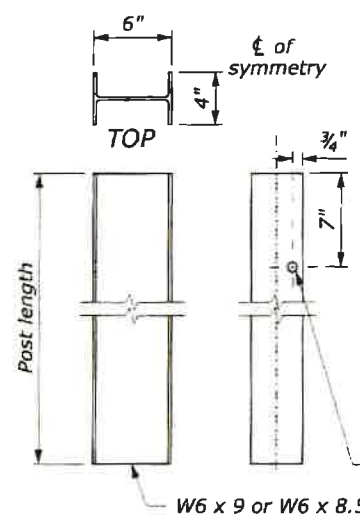
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3/19/2019

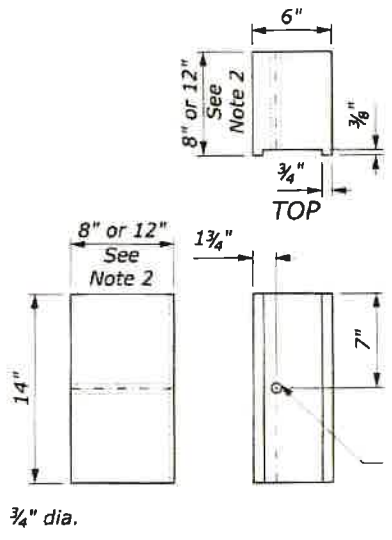
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T28



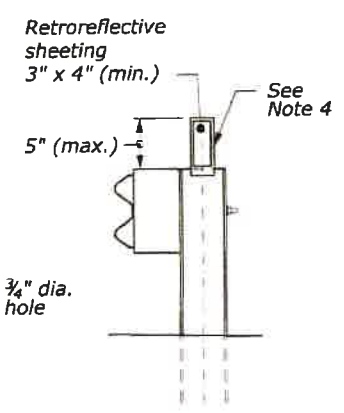
POST AND BLOCK



STRUCTURAL SHAPE POST



BLOCK

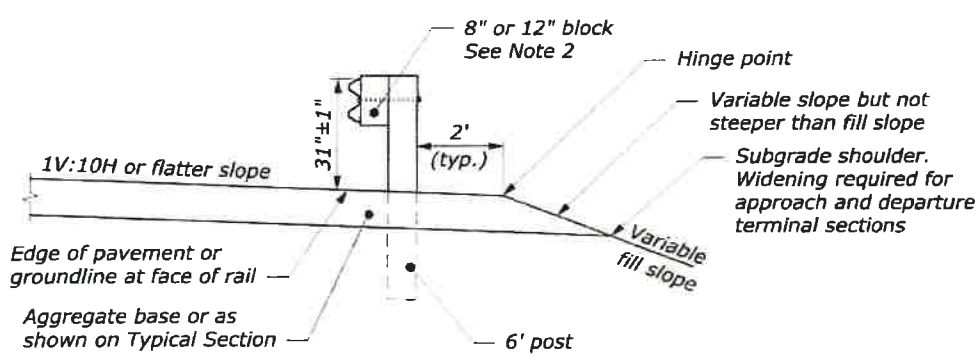


FLEXIBLE DELINEATOR GUARDRAIL MOUNT

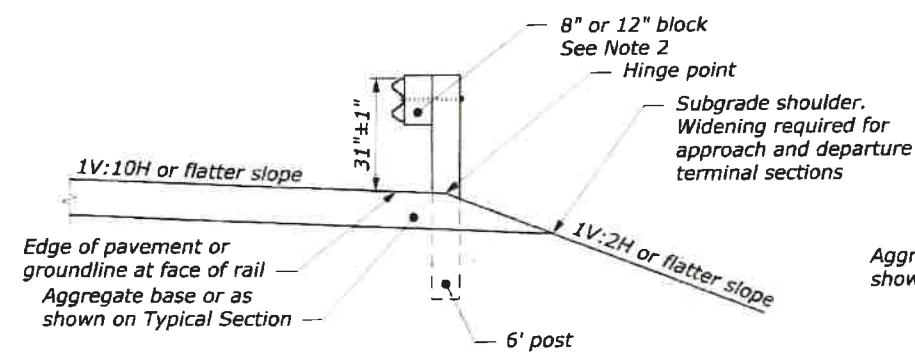
NOTE:

1. When encountering impenetrable material, one post may be omitted in locations where the typical guardrail cross section includes 2 feet (min.) between the back of the guardrail post and the hinge point. For all other locations, see Section 617 and Standards 617-13 or 617-37.
2. Size of block shown elsewhere on the plans. Modified block may be wood, plastic, or composite material. Use consistent material throughout the length of guardrail run.
3. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.
4. Install a flexible hinged delineator every fourth post. Fasten delineator to the web of the steel post using either an adhesive or mechanical means according to the manufacturer's recommendations.

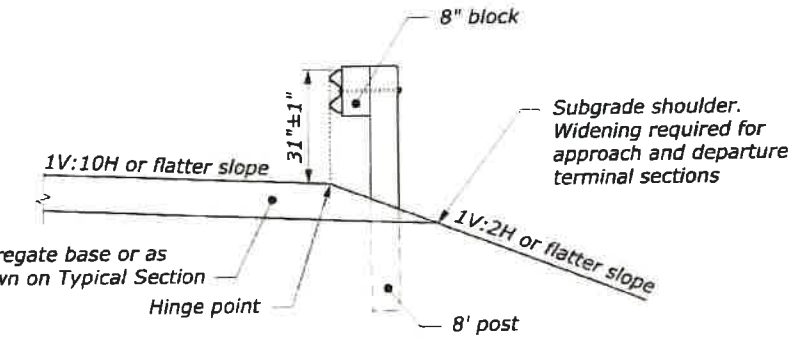
RESPONSIBLE ONLY FOR SELECTION OF APPROPRIATE STANDARD DETAIL



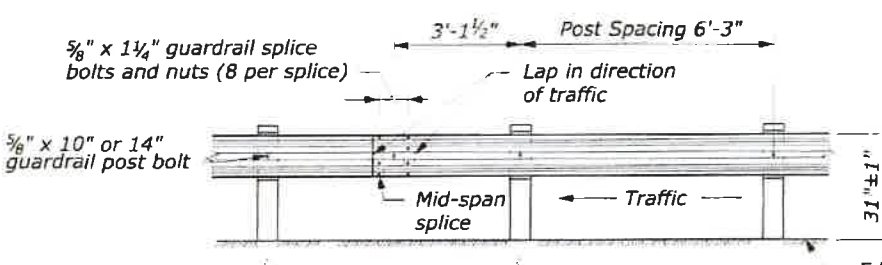
TYPICAL GUARDRAIL CROSS SECTION 6' POST, 8" OR 12" BLOCK



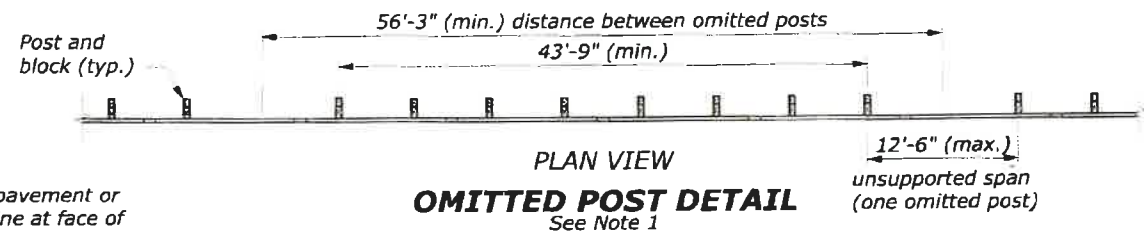
TYPICAL GUARDRAIL CROSS SECTION 6' POST CENTERED ON HINGE, 8" OR 12" BLOCK



TYPICAL GUARDRAIL CROSS SECTION 8' POST ON SLOPE, 8" BLOCK



TYPICAL GUARDRAIL ELEVATION



OMITTED POST DETAIL
See Note 1

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
MGS W-BEAM GUARDRAIL STEEL POSTS	
STANDARD APPROVED FOR USE xx/xxxx	STANDARD 617-32
REVISED: DRAFT: 03/2018	

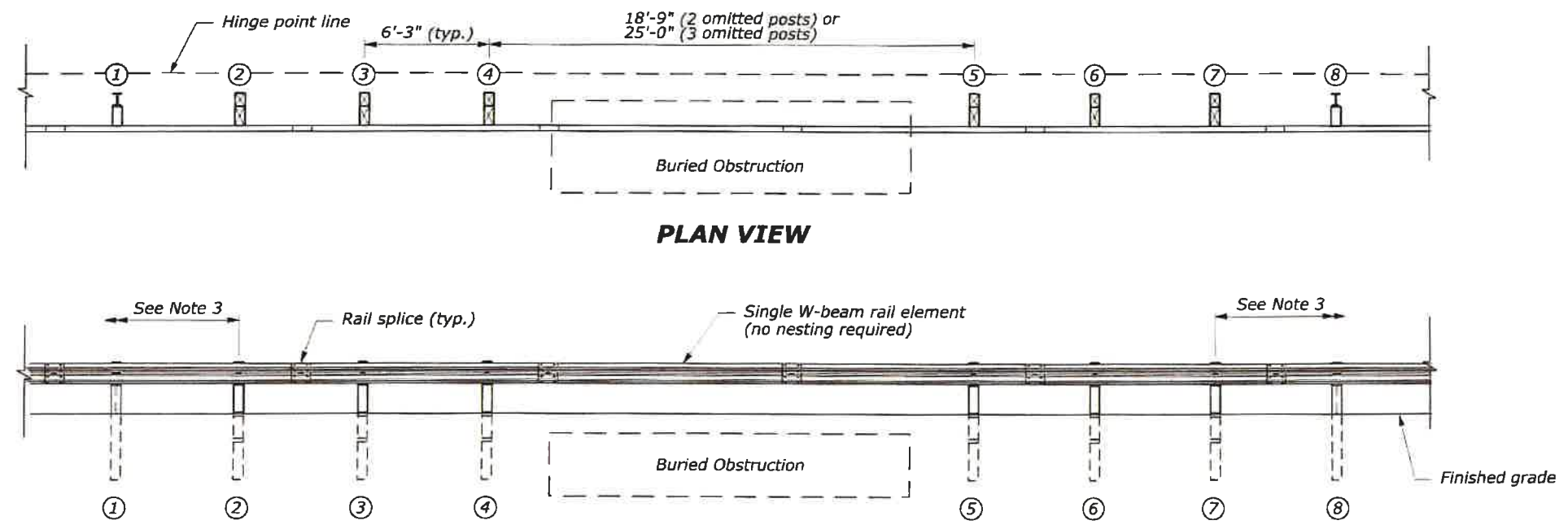
13 March 2018 2:55 PM L:\FHLD Safety\General - Safety Team\Standards\MGS Standards\DCN\Std617-32.dgn [USC]

Use: Christine Black

12:53:03 PM L:\FLHD Safety\General - Safety Team\Standards\MGS Standards\DWG\Std617-37.dgn

3/15/2018

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T29

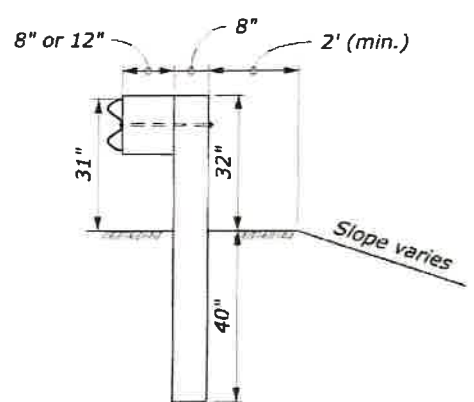


PLAN VIEW

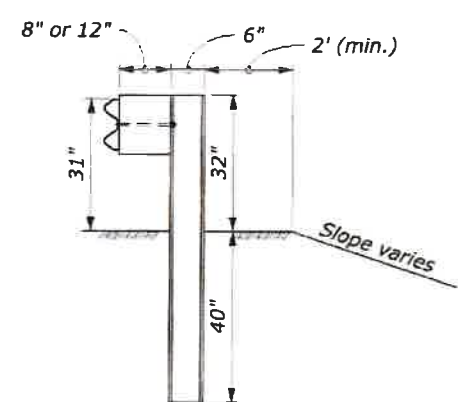
ELEVATION VIEW

NOTE:

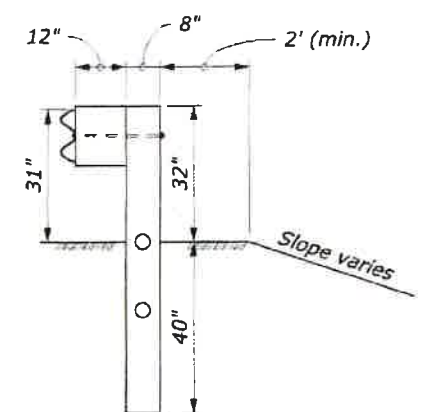
1. Posts ① and ⑧ may be wood or steel.
2. Use wood posts for CRT posts.
3. The minimum length of guardrail, including the end terminals, upstream and downstream of posts ② and ⑦ is 62.5 feet.
4. In locations where the culvert headwall extends above the finished grade to act as a vertical roadway curb, the maximum height of the culvert headwall above the finished grade is 2 inches.
5. See Standards 617-31 or 617-32 for other assembly details.



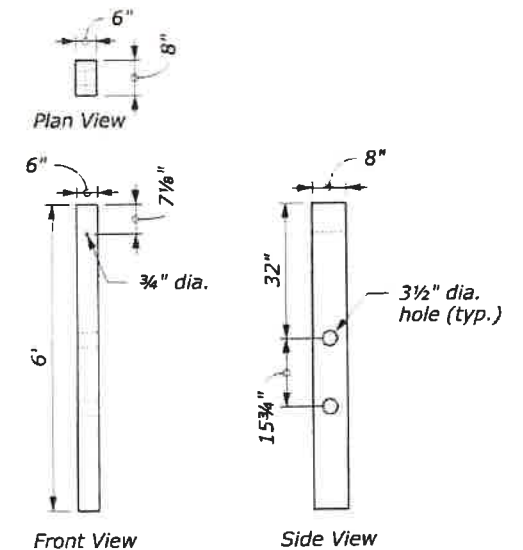
WOOD POST DETAIL
Posts ① and ⑧
See Note 1



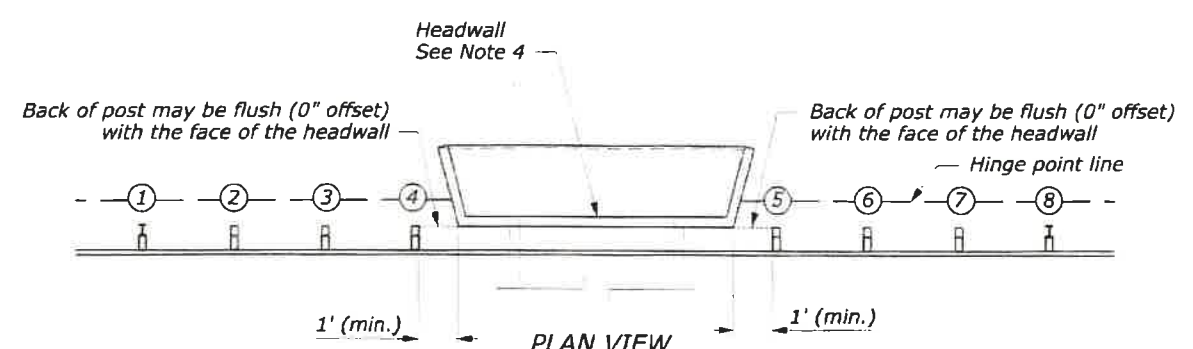
STEEL POST DETAIL
Posts ① and ⑧
See Note 1



CRT POST DETAIL
Posts ② thru ⑦
See Note 2



CRT WOOD POST



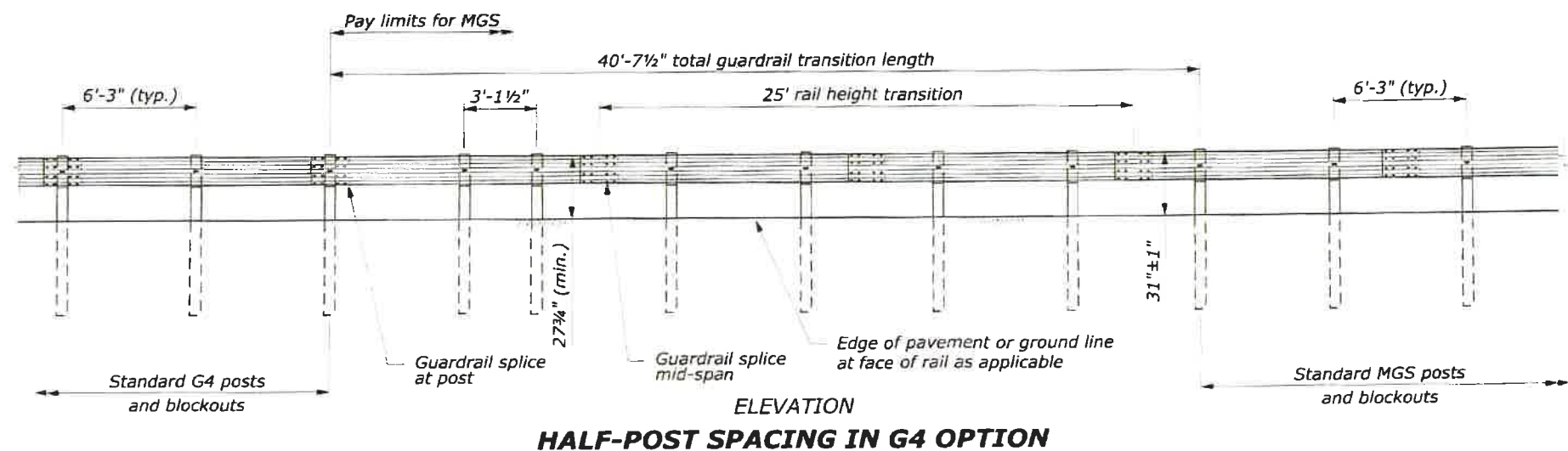
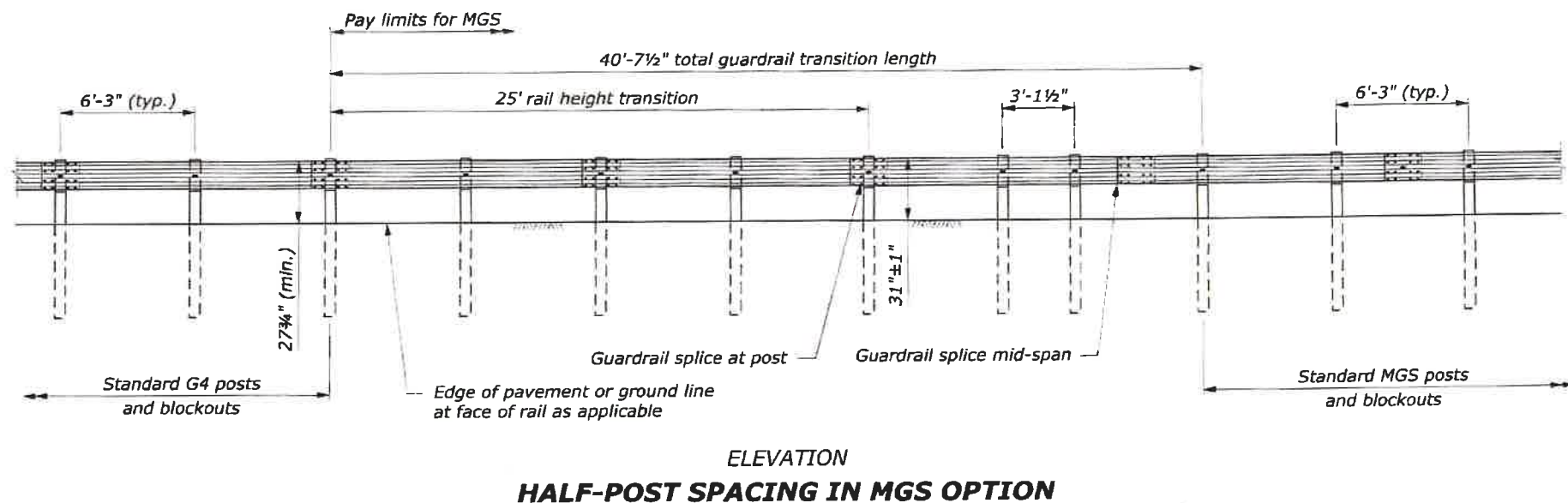
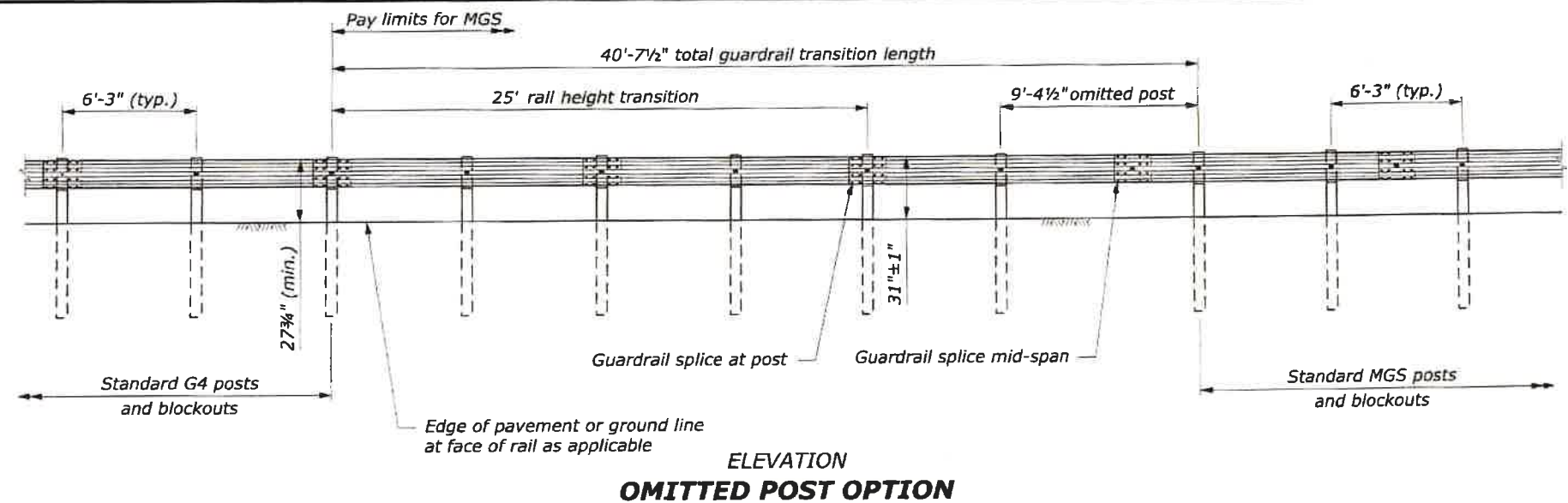
SPAN WITH HEADWALL DETAIL

PROFESSIONAL ENGINEER
MICHAEL DAVID ANDERSON
C 85264
4/1/2019
CIVIL
STATE OF CALIFORNIA
RESPONSIBLE ONLY FOR
SELECTION OF
APPROPRIATE STANDARD
DETAIL

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY OFFICE	
U.S. CUSTOMARY STANDARD	
MGS W-BEAM GUARDRAIL LONG-SPAN SYSTEM	
STANDARD APPROVED FOR USE X/X/Y	STANDARD
REVISED: DRAFT: 03/2018	617-37

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP NEV 40(1) DONNER PASS	T30

- NOTE:**
1. Unless otherwise specified, use any of the options shown as required to meet project-specific conditions.
 2. Use consistent guardrail post material throughout the length of the guardrail run.
 3. If applicable, conversion of the 8-inch wide G4 blackout to the 12-inch wide MGS blackout may occur anywhere within the length of the G4 to MGS transition shown on this sheet.
 4. See Standards 617-10, 617-11, 617-31, or 617-32 for other assembly details.



RESPONSIBLE ONLY FOR
 SELECTION OF
 APPROPRIATE STANDARD
 DETAIL

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD G4 TO MGS W-BEAM GUARDRAIL TRANSITION	
STANDARD APPROVED FOR USE XX/XXXX	STANDARD
REVISED: DRAFT: 03/2018	617-39

NO SCALE