STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	E1

EROSION & SEDIMENT CONTROL SYMBOLS

Bonded Fiber Matrix Mulching (Seeding)(Pay Item 62510-2000)

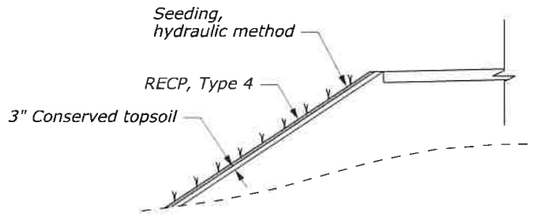
Rolled Erosion Control Product (RECP)(Pay Item 62901-1100)

Riprap

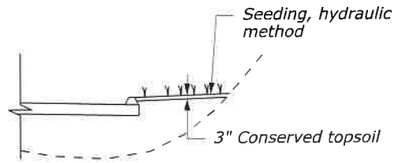
Rolled Erosion Control Product, Type 5.C (Turf Reinforcement Mat) (Pay Item 62901-1400)

NOTES:

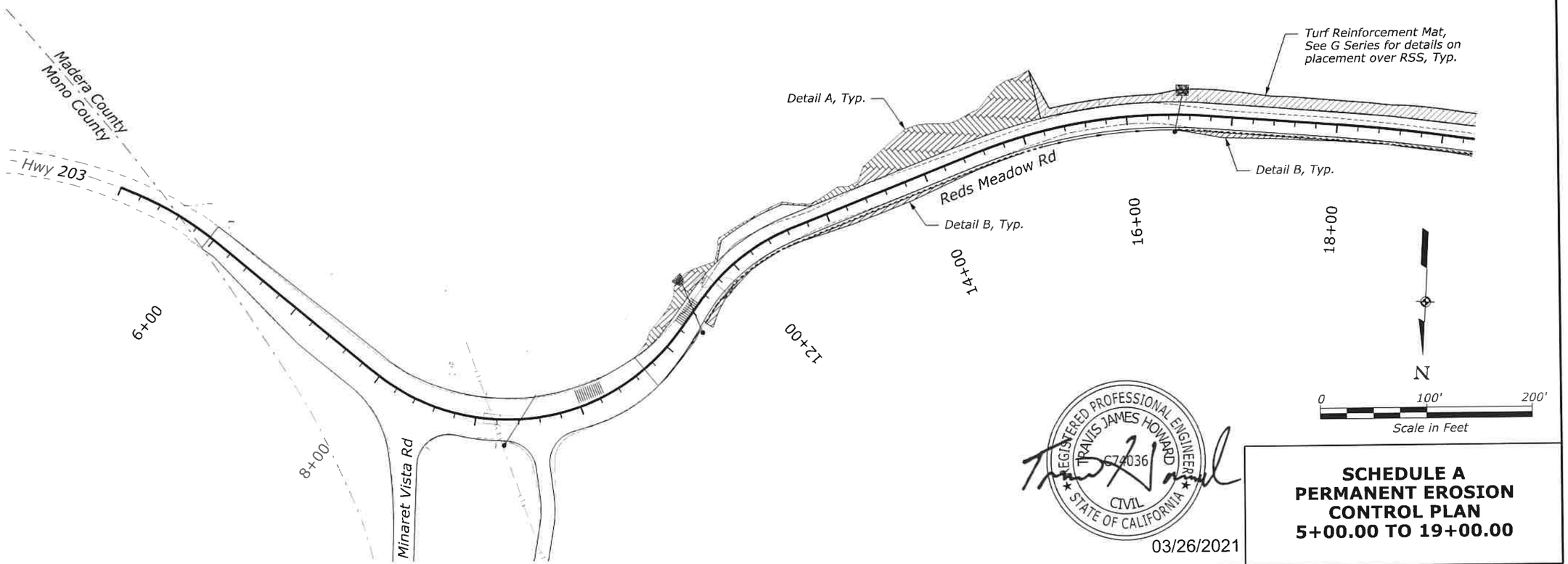
1. *Erosion and sediment control devices not to scale. Refer to the Conventional Plan Symbols and Abbreviations sheet for erosion and sediment control symbols.*
2. *Seeding and RECP as shown on the plans are considered permanent erosion control items and are paid for under 62510-2000 Seeding, Hydraulic Method, and 62901-1100 Rolled Erosion Control Product, Type 4 respectively.*
3. *Include seeding for areas shown as bonded fiber matrix mulching and RECP. See Detail A and B.*
4. *Apply Upland/Dry Sites seed mix on all new cut and fill slopes. Apply Riparian/Wet Sites seed mix on all disturbed ground in the vicinity of culvert inlets, outlets, and adjacent to any riparian areas. Coordinate seed mix selection for specific locations with the CO. Seeding is paid for under 62510-2000 Seeding, Hydraulic Method, regardless of seed mix utilized.*
5. *Turf reinforcement mat as shown on the plans is considered permanent erosion control and is paid for under 62901-1400, Rolled Erosion Control Product, Type 5.C (Turf Reinforcement Mat).*



CUT/FILL AT 1:2
DETAIL A



CUT/FILL FLATTER THAN 1:2
DETAIL B



REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

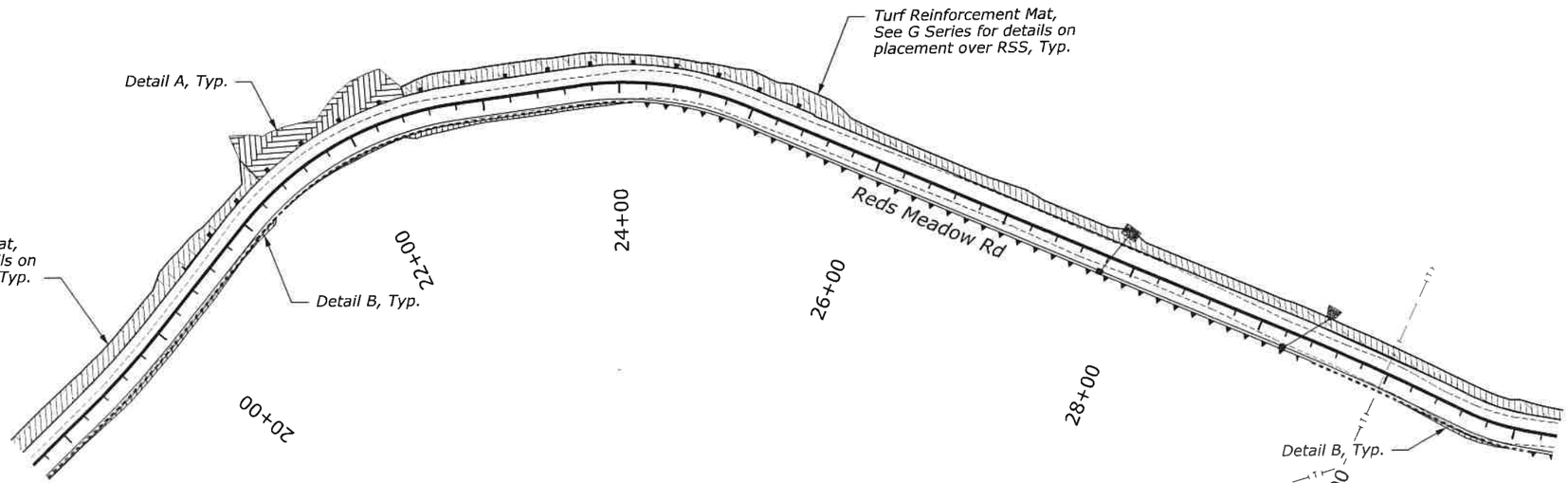
03/26/2021

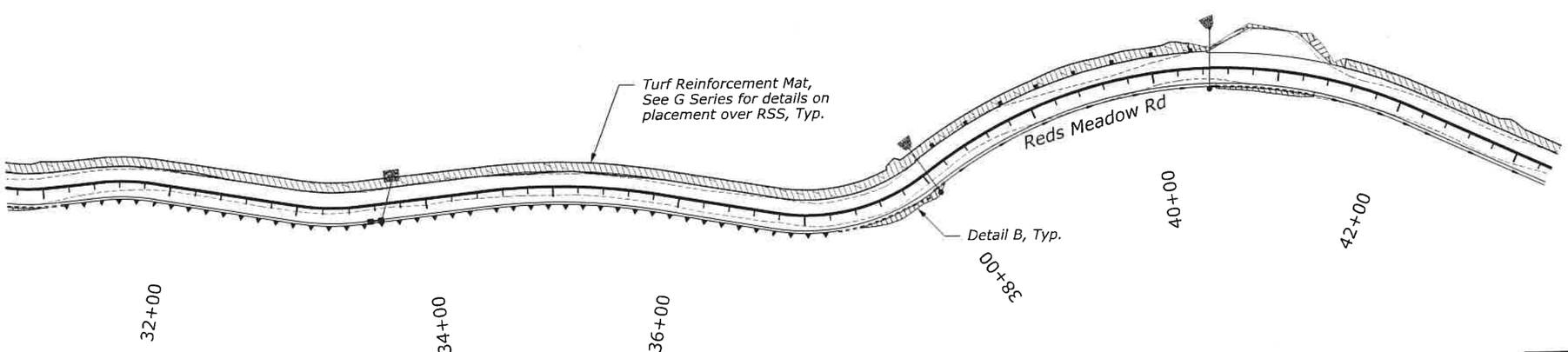
SCHEDULE A
PERMANENT EROSION CONTROL PLAN
5+00.00 TO 19+00.00

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	E2

NOTE:

1. See sheet E1 for notes and details.





REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

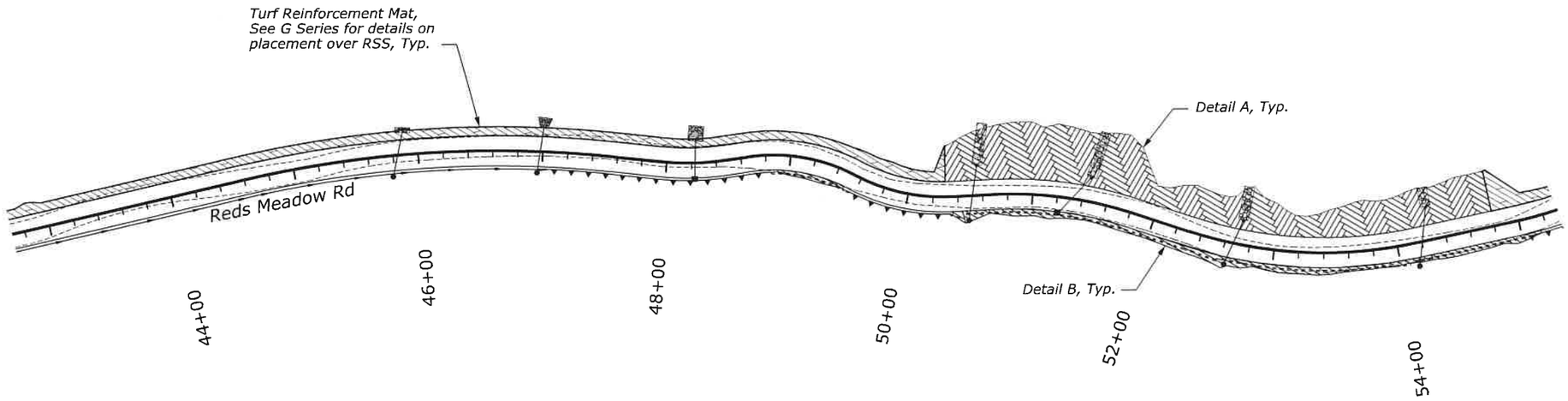
03/26/2021

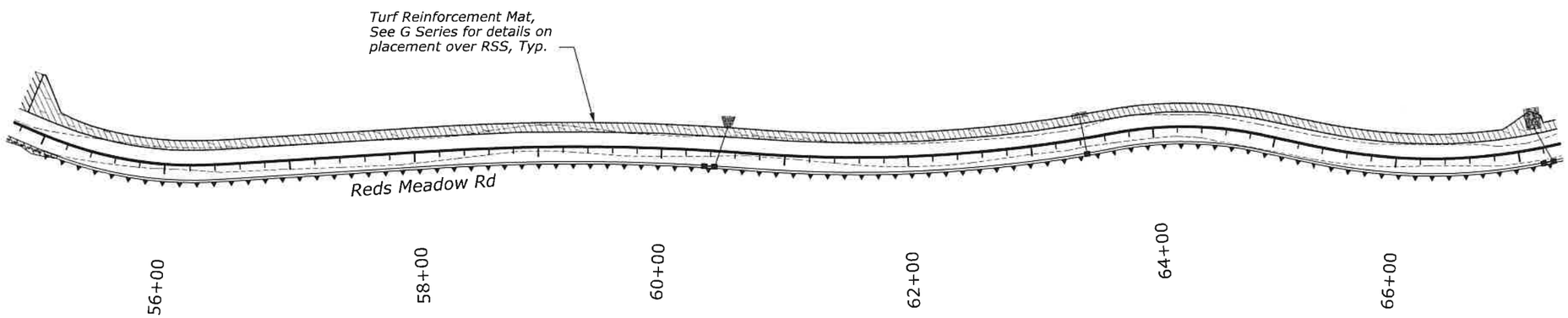
SCHEDULE A
PERMANENT EROSION CONTROL PLAN
19+00.00 TO 43+00.00

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	E3

NOTE:

1. See sheet E1 for notes and details.





REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

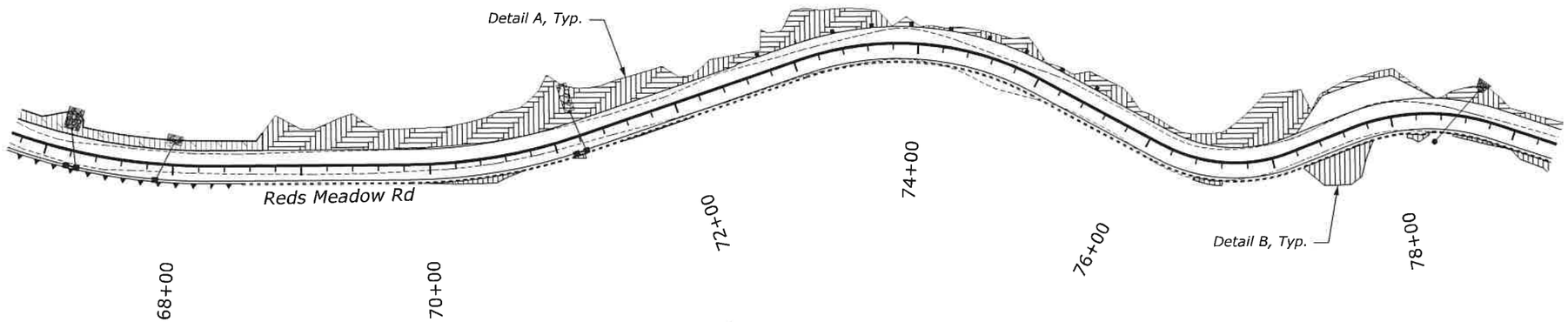
03/26/2021

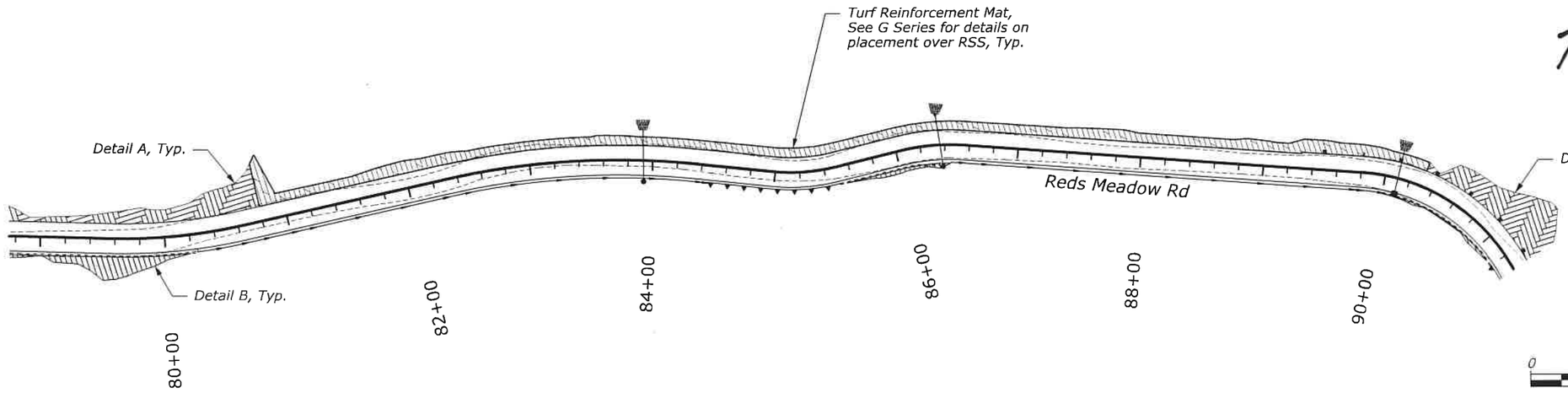
SCHEDULE A
PERMANENT EROSION CONTROL PLAN
43+00.00 TO 67+00.00

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	E4

NOTE:

1. *See sheet E1 for notes and details.*





0 100' 200'

Scale in Feet

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

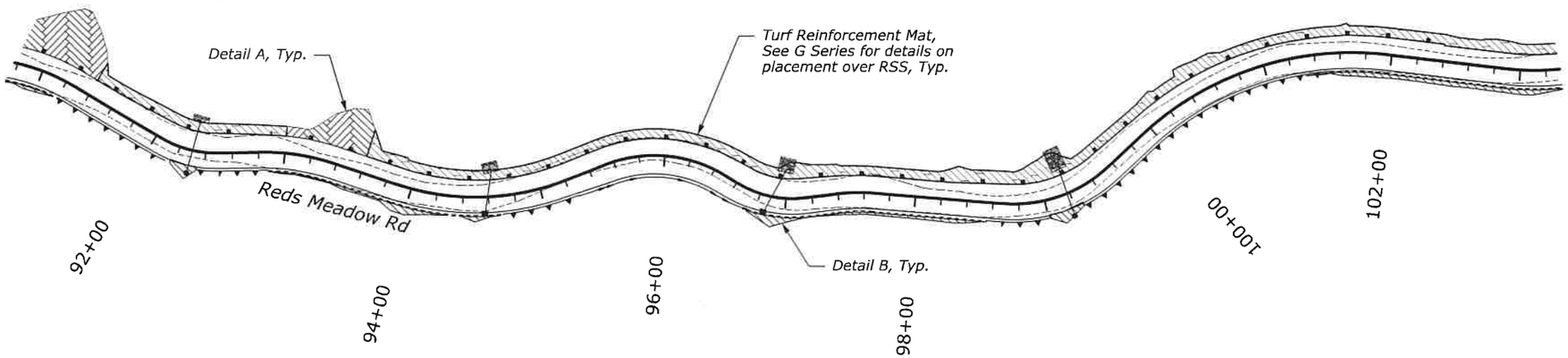
03/26/2021

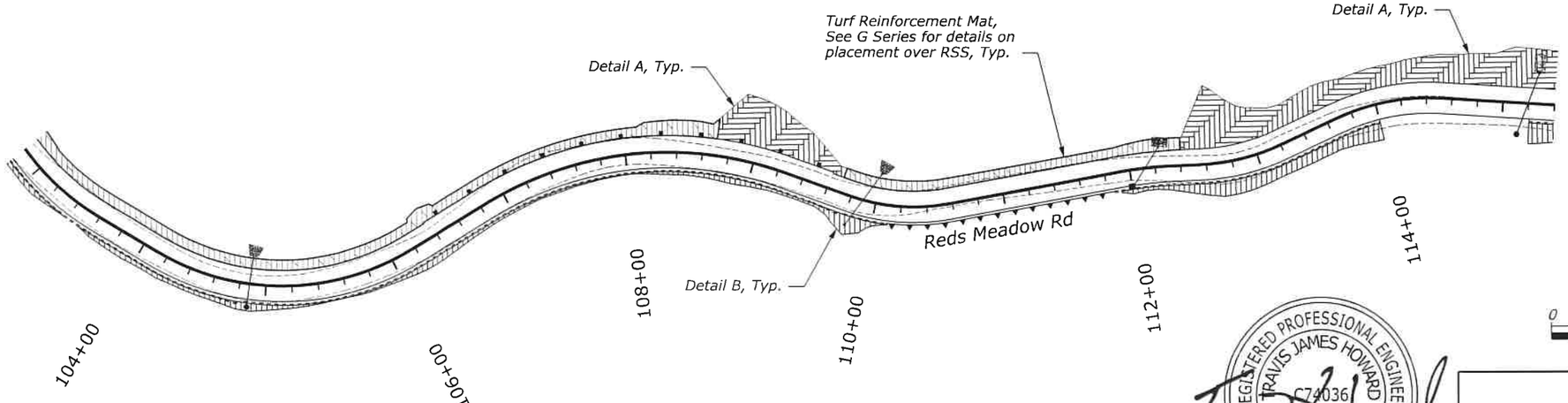
SCHEDULE A
PERMANENT EROSION CONTROL PLAN
67+00.00 TO 91+00.00

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	E5

NOTE:

1. See sheet E1 for notes and details.





REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

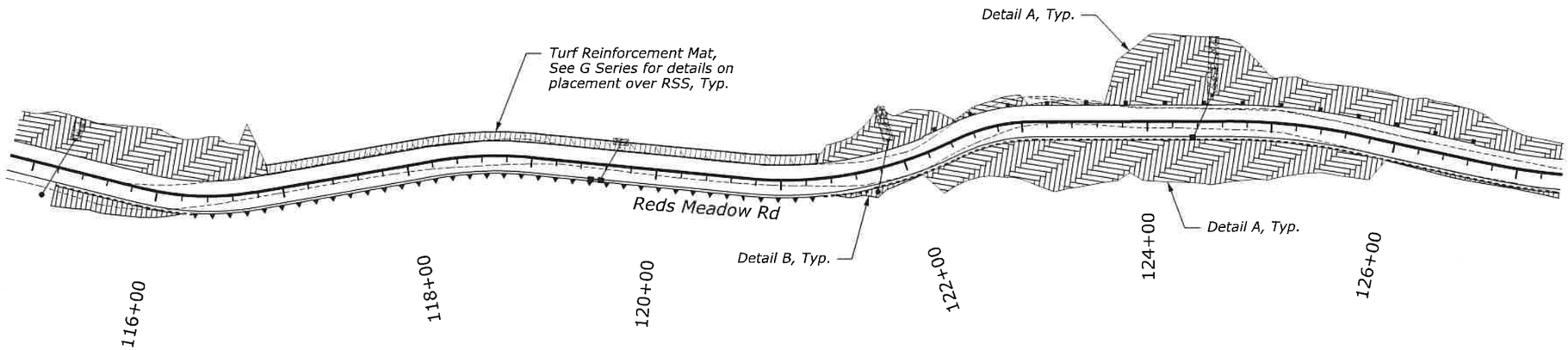
03/26/2021

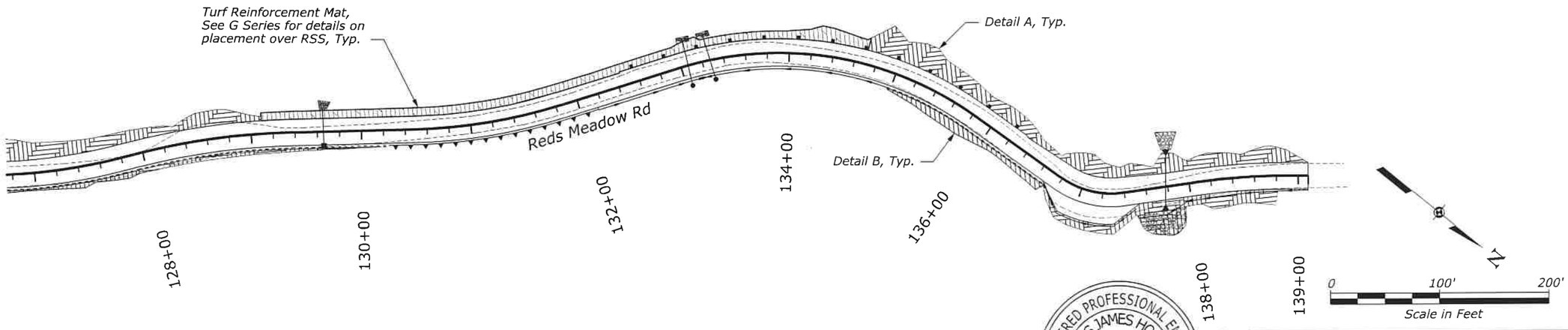
SCHEDULE A
PERMANENT EROSION CONTROL PLAN
91+00.00 TO 115+00.00

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	E6

NOTE:

1. See sheet E1 for notes and details.





REGISTERED PROFESSIONAL ENGINEER
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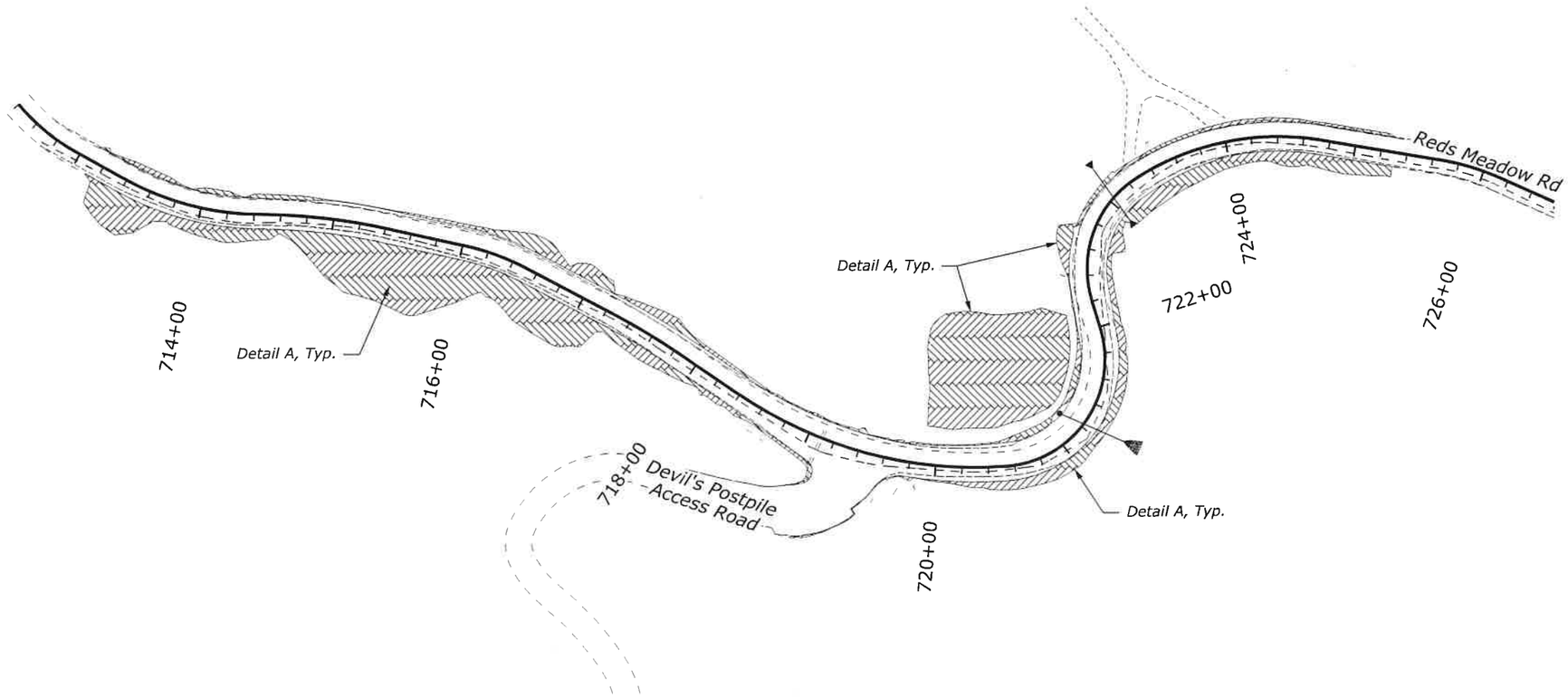
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021

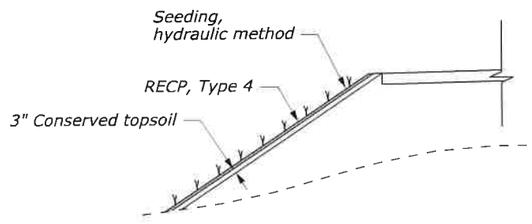
SCHEDULE A
PERMANENT EROSION CONTROL PLAN
115+00.00 TO 139+09.15

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	E7

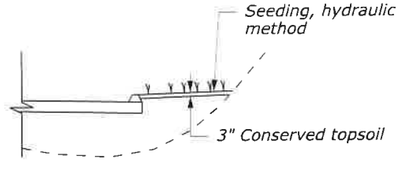


NOTES:

1. *Erosion and sediment control devices not to scale. Refer to the Conventional Plan Symbols and Abbreviations sheet for erosion and sediment control symbols.*
2. *Seeding and RECP as shown on the plans are considered permanent erosion control items and are paid for under 62510-2000 Seeding, Hydraulic Method, and 62901-1100 Rolled Erosion Control Product, Type 4 respectively.*
3. *Include seeding for areas shown as bonded fiber matrix mulching and RECP. See Detail A and B.*
4. *Apply Upland/Dry Sites seed mix on all new cut and fill slopes. Apply Riparian/Wet Sites seed mix on all disturbed ground in the vicinity of culvert inlets, outlets, and adjacent to any riparian areas. Coordinate seed mix selection for specific locations with the CO. Seeding is paid for under 62510-2000 Seeding, Hydraulic Method, regardless of seed mix utilized.*

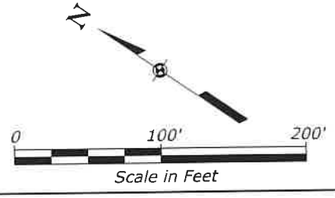


CUT/FILL AT 1:2
DETAIL A



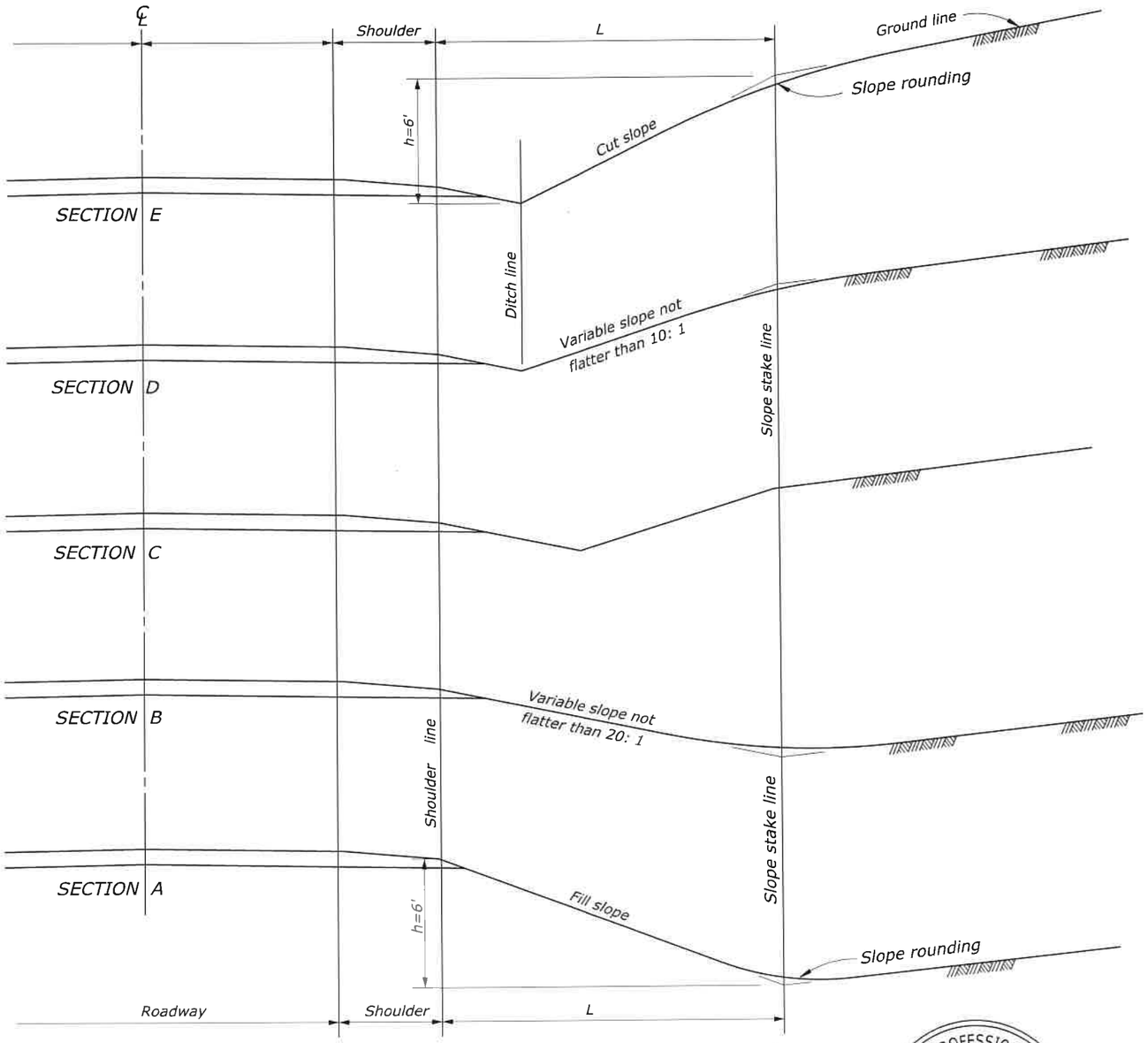
CUT/FILL FLATTER THAN 1:2
DETAIL B

03/26/2021



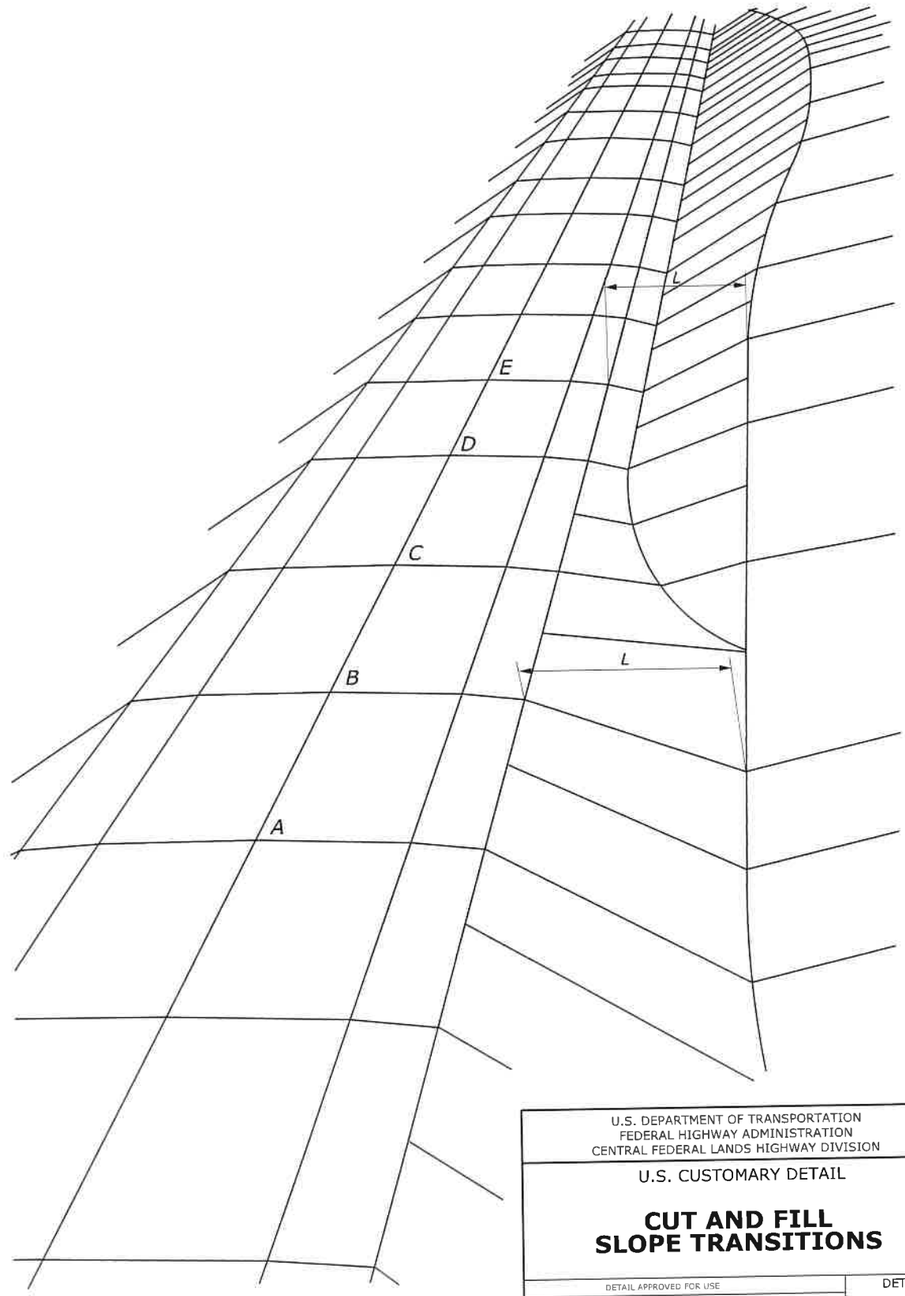
OPTION X
EROSION CONTROL PLAN
713+00.00 TO 725+00.00

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	F1



Note :

1. Distance L is to be maintained as the distance to slope stakes to establish the blend of cut and fill slopes into the original ground.



NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021

FOR SELECTION ONLY

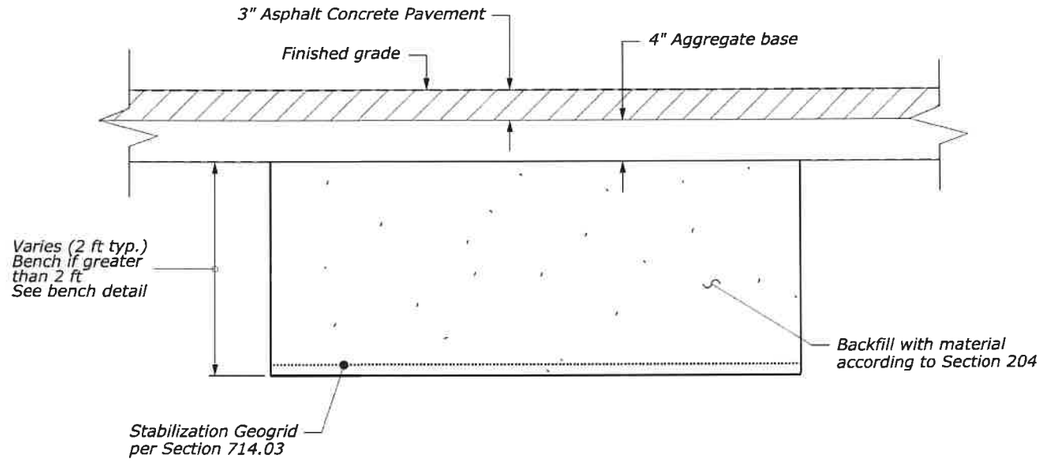
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY DETAIL

CUT AND FILL SLOPE TRANSITIONS

DETAIL APPROVED FOR USE	DETAIL
APPROVED : MAY 2011	E204-01

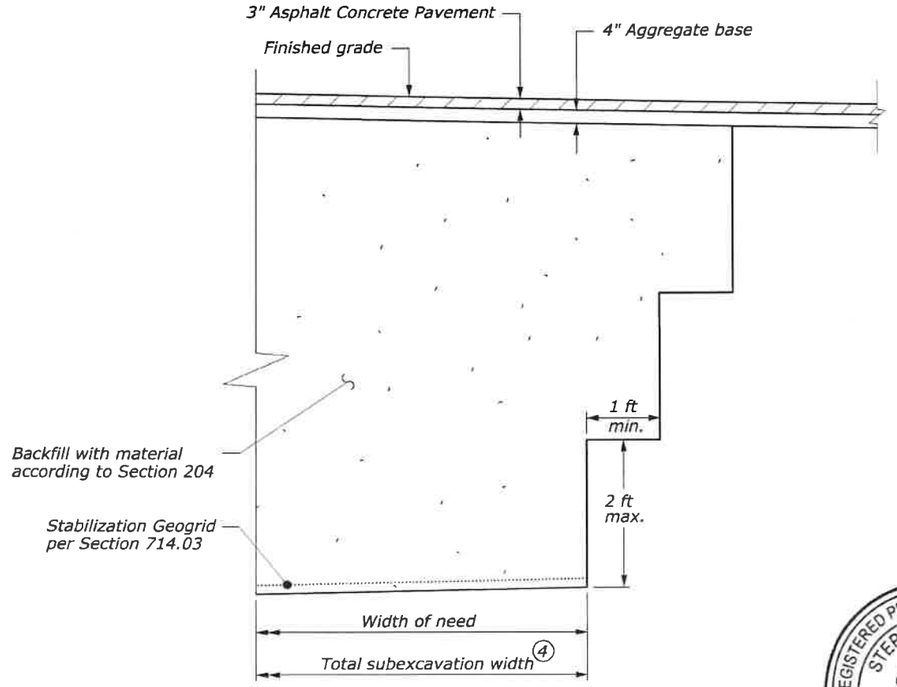
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	F2



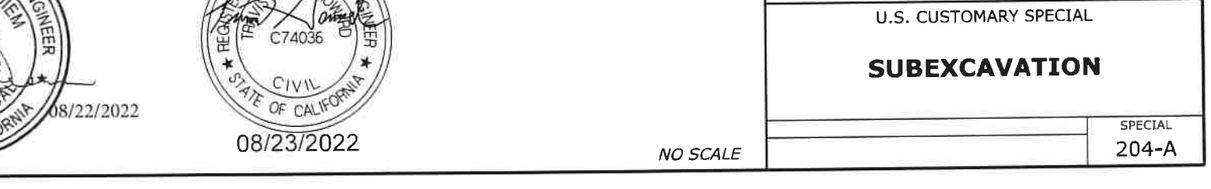
SUBEXCAVATION
TYPICAL SECTION

NOTE:

1. Replace unsuitable material according to Subsection 204.07 unless otherwise specified.
2. Minimum subexcavation dimensions are 6 ft wide x 6 ft long.
3. Do not place backfill material within the structural section.
4. Widen top of subexcavation area to allow for bench width in bottom layers. Provide a 1 ft min. bench width for every 2 ft of subexcavation depth.
5. Daylight to drain when the excavation is within 4 ft of the subgrade hinge point. Slope the excavation bottom 2% toward the daylight for drainage, or match the existing roadway cross slope when steeper than 2%.
6. At daylight locations, match the existing fill slope or make slope adjustments to match the subgrade hinge point. Do not construct slopes steeper than 1:2 unless approved by the CO.
7. At locations where evidence of subsurface water is observed during construction, use a Class 1, Type B, Woven Geotextile and daylight to drain.
8. See C-Sheets for locations where subexcavation is required. Additional locations to be determined during construction by the CO.



BENCH DETAIL



SUBEXCAVATION WITH UNDERDRAIN
TYPICAL SECTION

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
08/22/2022

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA
08/23/2022

NO SCALE

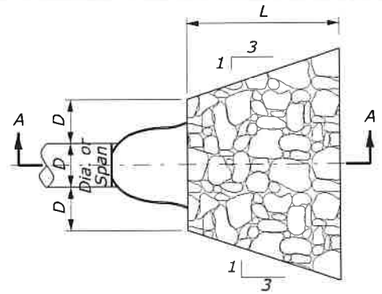
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY SPECIAL

SUBEXCAVATION

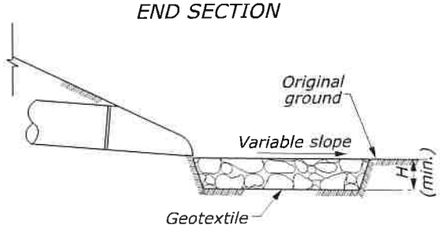
SPECIAL
204-A

8/19/2022 11:40:31 AM pw:\\ProjectWiseAMER.jacobs.com:DEN001\Documents\663395 - FHWA-TO 27 REDS MEADOW PEL\Work in Progress\Reds Meadow Road WIP\Roadway\CADD_Sheets\F-200\F204[illegible].dgn



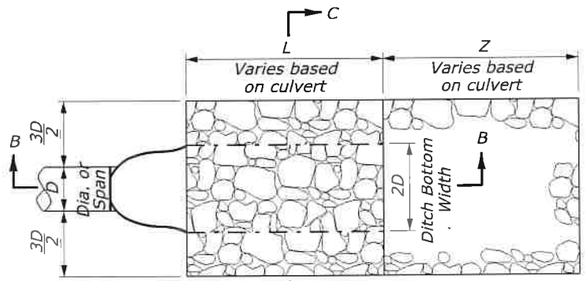
PLAN VIEW

CULVERT WITH STANDARD END SECTION



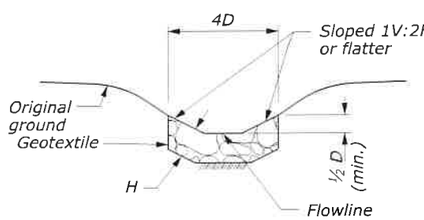
SECTION A-A

DETAIL A: PROTECTIVE APRON AT CULVERT OUTLET WITHOUT DITCH

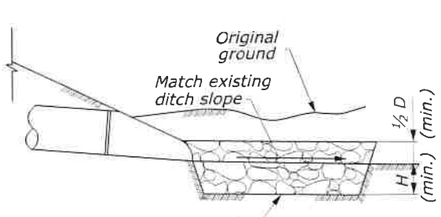


PLAN VIEW

CULVERT WITH STANDARD END SECTION



SECTION C-C



SECTION B-B

DETAIL B: PROTECTIVE APRON AT CULVERT OUTLET WITH DITCH

OUTLET PROTECTIVE APRON DIMENSIONS

CULVERT LOCATION	RIPRAP DETAIL	RIPRAP CLASS	CULVERT SIZE D (INCHES)	LENGTH OF APRON L (FEET)	LENGTH OF APRON Z (FEET)	DEPTH OF APRON H (FEET)	ROWS OF GABIONS (EACH)
11+42	A	2	24	10.00	-	1.50	-
16+49	D	-	-	-	-	-	9
27+82	D	-	-	-	-	-	7
29+31	A	2	24	8.00	-	1.50	-
33+69	D	-	-	-	-	-	8
38+04	A	2	24	10.00	-	1.50	-
40+45	A	2	24	8.00	-	1.50	-
45+84	D	-	-	-	-	-	3
47+98	A	2	24	10.00	-	1.50	-
48+23	D	-	-	-	-	-	11
50+52	B	2	24	8.00	29.27	1.50	-
51+32	B	2	24	8.00	33.82	1.50	-
52+67	B	2	24	8.00	21.91	1.50	-
54+20	B	2	24	8.00	9.30	1.50	-
60+47	A	2	24	8.00	-	1.50	-
63+43	D	-	-	-	-	-	3
67+22	D	-	-	-	-	-	16
67+92	D	-	-	-	-	-	6
71+21	B	2	24	8.00	16.84	1.50	-
78+53	A	2	24	8.00	-	1.50	-
83+92	A	2	24	10.00	-	1.50	-
86+36	A	2	24	8.00	-	1.50	-
90+10	A	2	24	10.00	-	1.50	-
92+30	D	-	-	-	-	-	3
94+59	D	-	-	-	-	-	7
96+89	D	-	-	-	-	-	10
99+18	D	-	-	-	-	-	16
104+87	A	2	24	10.00	-	1.50	-
109+90	A	2	24	10.00	-	1.50	-
112+12	D	-	-	-	-	-	6
115+20	B	2	24	8.00	11.56	1.50	-
119+62	D	-	-	-	-	-	4
121+82	B	2	24	8.00	21.86	1.50	-
124+42	B	2	24	8.00	43.55	1.50	-
129+67	A	2	24	10.00	-	1.50	-
133+04	D	-	-	-	-	-	4
133+27	D	-	-	-	-	-	4
137+78	A	3	36	16.00	-	2.00	-
598+70	A	3	36	16.00	-	2.00	-
604+00	A	2	24	8.00	-	1.50	-
700+50	B	2	12	4.00	-	1.50	-
704+00	A	2	12	4.00	-	1.50	-
705+60	A	2	24	8.00	-	1.50	-
721+23	A	2	18	6.00	-	1.50	-
755+85	B	2	12	4.00	-	1.50	-
760+50	B	2	12	4.00	-	1.50	-
761+80	B	2	12	4.00	-	1.50	-
763+50	A	2	12	4.00	-	1.50	-
795+60	A	2	24	8.00	-	1.50	-

NOTES:

1. Furnish Class 2, Type A, non-woven geotextile conforming to Subsection 714.01(a).
2. Excavation for placement of riprap will not be measured for payment.
3. See Sheet G2 for Details C and D.

NO SCALE

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G1

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

07/29/2022

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

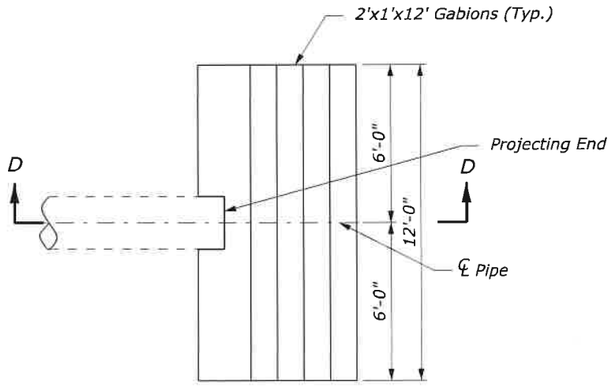
U.S. CUSTOMARY SPECIAL

PLACED RIPRAP AT CULVERT OUTLETS

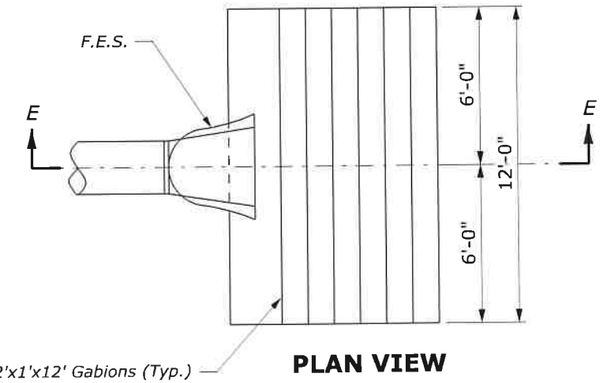
Sheet 1 of 2

SPECIAL
251-A

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G2



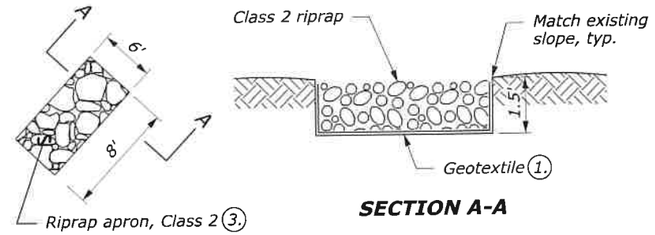
PLAN VIEW



PLAN VIEW

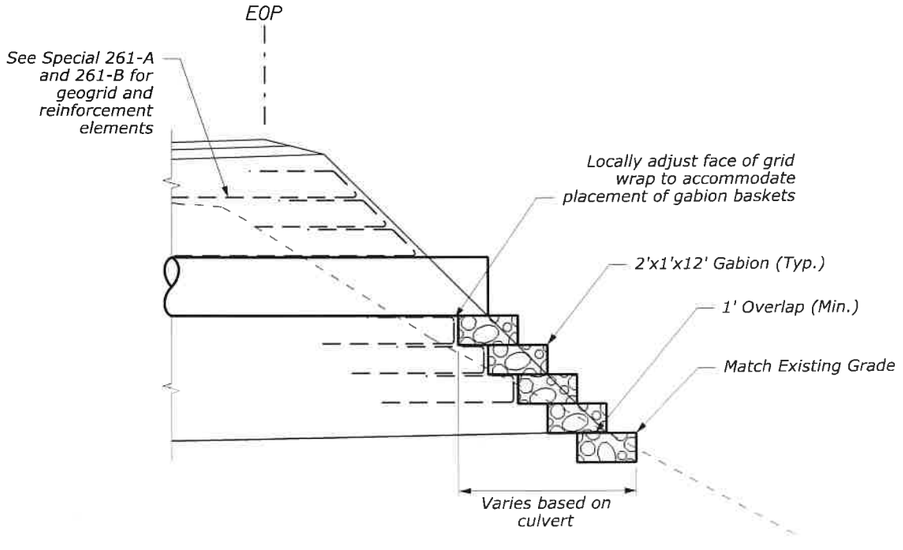
NOTE:

1. Furnish Class 2, Type A, non-woven geotextile conforming to Subsection 714.01(a).
2. Excavation for placement of gabions will not be measured for payment.
3. Adjust location and shape of riprap apron to conform to slope as needed. Coordinate final limits with CO in the field.
   Dimensions shown are approximate and subject to adjustment during construction.



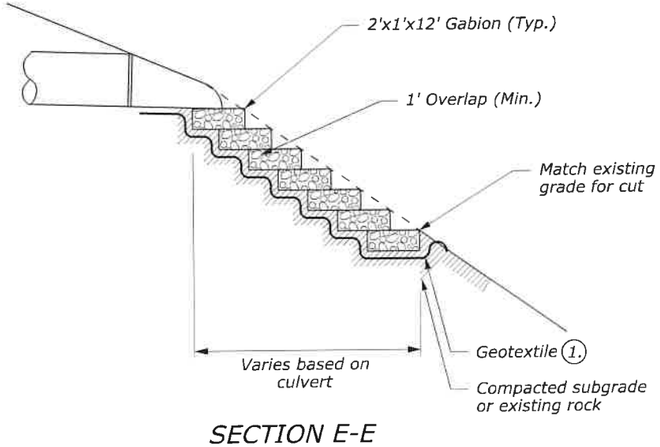
SECTION A-A

RIPRAP APRON ON SLOPE



SECTION D-D

DETAIL C: GABION PROTECTIVE APRON ON REINFORCED SOIL SLOPE



SECTION E-E

DETAIL D: GABION PROTECTIVE APRON ON NON-REINFORCED SLOPE

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021

NO SCALE

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

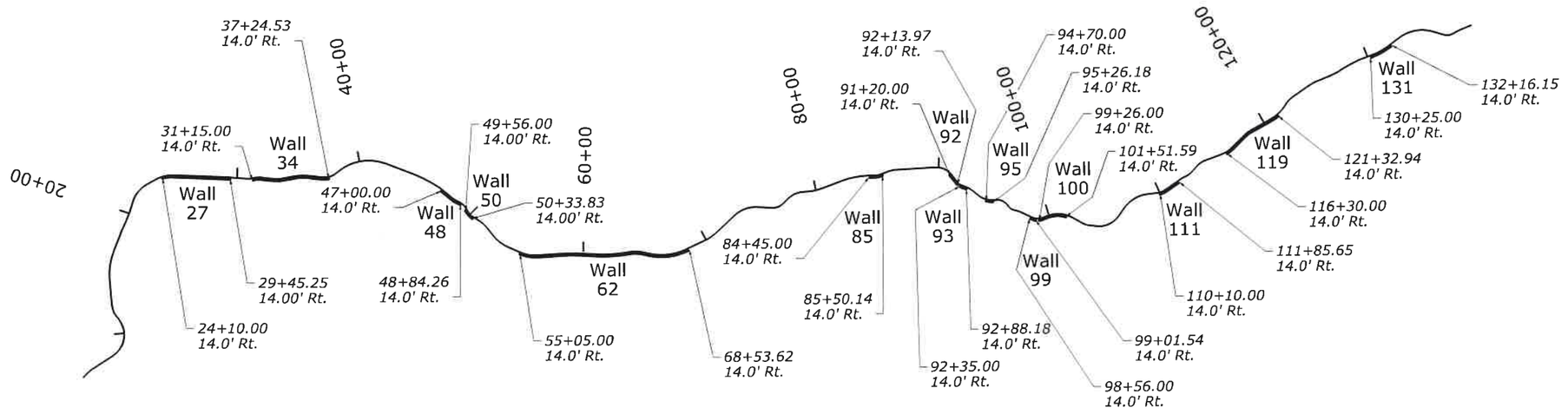
U.S. CUSTOMARY SPECIAL

PLACED RIPRAP AT CULVERT OUTLETS AND ON SLOPES

Sheet 2 of 2

SPECIAL
251-A

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G3



Retaining Wall Sheet Index

Wall Design Schedule

Wall Name	Mainline Station (Layout Line) Begin	Mainline Station (Layout Line) End	Wall Station (Layout Line) Begin	Wall Station (Layout Line) End	Side of Road	Wall Type	Max Design Wall Height, H_{Max} (ft)	Length of Wall (Along Wall Layout Line) (ft)	Area of Design Wall Face (sf)
Wall 27	24+10.00	29+45.25	10+00.00	15+30.00	Right	Soil Nail	9	530.00	3,628
Wall 34	31+15.00	37+24.53	10+00.00	16+10.00	Right	Soil Nail	10	610.00	5,022
Wall 48	47+00.00	48+84.26	10+00.00	11+85.00	Right	Soil Nail	9	185.00	1,408
Wall 50	49+56.00	50+33.83	10+00.00	10+85.00	Right	Soil Nail	7	85.00	455
Wall 62	55+05.00	68+53.62	10+00.00	23+60.00	Right	Soil Nail	11	1,360.00	9,053
Wall 85	84+45.00	85+50.14	10+00.00	11+10.00	Right	Soil Nail	10	110.00	827
Wall 92	91+20.00	92+13.97	10+00.00	10+95.00	Right	Soil Nail	9	95.00	672
Wall 93	92+35.00	92+88.18	10+00.00	10+55.00	Right	Soil Nail	7	55.00	287
Wall 95	94+70.00	95+26.18	10+00.00	10+60.00	Right	Soil Nail	12	60.00	515
Wall 99	98+56.00	99+01.54	10+00.00	10+50.00	Right	Soil Nail	6	50.00	248
Wall 100	99+26.00	101+51.59	10+00.00	12+20.00	Right	Soil Nail	10	220.00	1,732
Wall 111	110+10.00	111+85.65	10+00.00	11+80.00	Right	Soil Nail	9	180.00	1,134
Wall 119	116+30.00	121+32.94	10+00.00	15+05.00	Right	Soil Nail	10	505.00	3,871
Wall 131	130+25.00	132+16.15	10+00.00	11+95.00	Right	Soil Nail	8	195.00	1,245

NOTES:
1. See sheet G20 for Soil Nail Wall Typical Section.

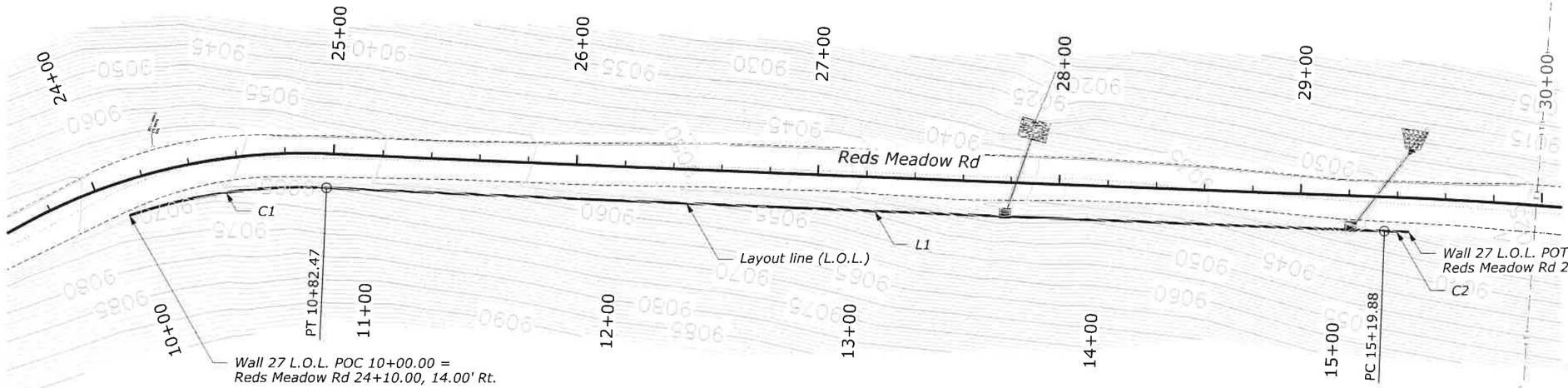
REGISTERED PROFESSIONAL ENGINEER
TIMOTHY D. VESCO
No. C 60219
Exp. 6/30/22
CIVIL
STATE OF CALIFORNIA

03/26/2021

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

WALL SITE PLAN AND GENERAL NOTES

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G4



REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

N

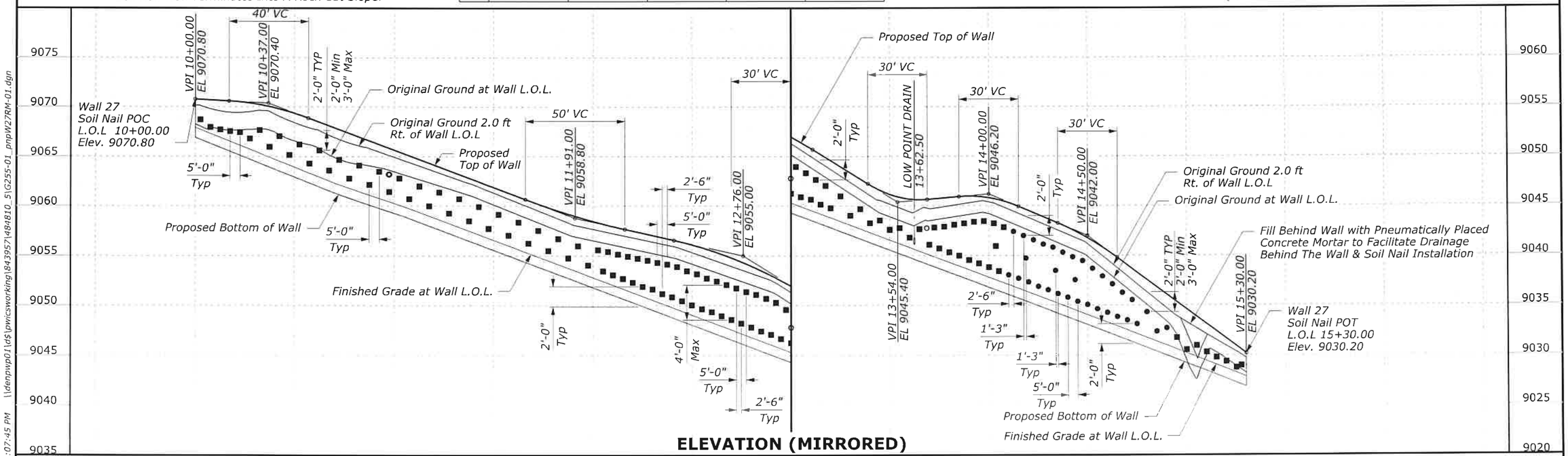
0 50' 100'
Scale in Feet

NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A Rock Cut Slope.

WALL 27 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+41.71	224.00	21°05'44"	82.47	41.71
C2	15+24.94	1566.00	00°22'13"	10.12	5.06

WALL 27 LINE TABLE		
NO.	BEARING	LENGTH
L1	N17°45'27"W	437.40



ELEVATION (MIRRORED)

Layout Line (L.O.L)	10+00		11+00	12+00	13+00	14+00	15+00
Mainline Station		25+00		26+00	27+00	28+00	29+00

NOTE:

1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 27 LAYOUT 10+00 TO 15+30

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G5

WALL 34 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+48.99	155.00	15°27'09"	41.80	21.03
C2	12+07.52	183.00	15°46'00"	50.36	25.34
C3	13+98.11	484.00	16°28'27"	139.16	70.07
C4	15+84.04	166.00	18°04'28"	52.37	26.40

WALL 34 LINE TABLE		
NO.	BEARING	LENGTH
L1	N29°51'23"W	27.96
L2	N14°24'14"W	112.41
L3	N30°10'14"W	95.50
L4	N13°41'47"W	90.43

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GE 3022
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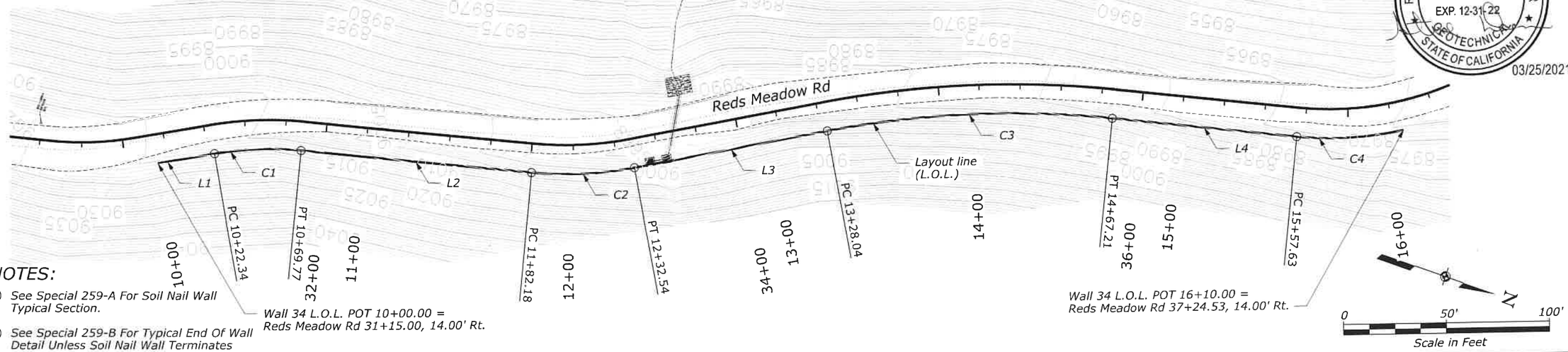
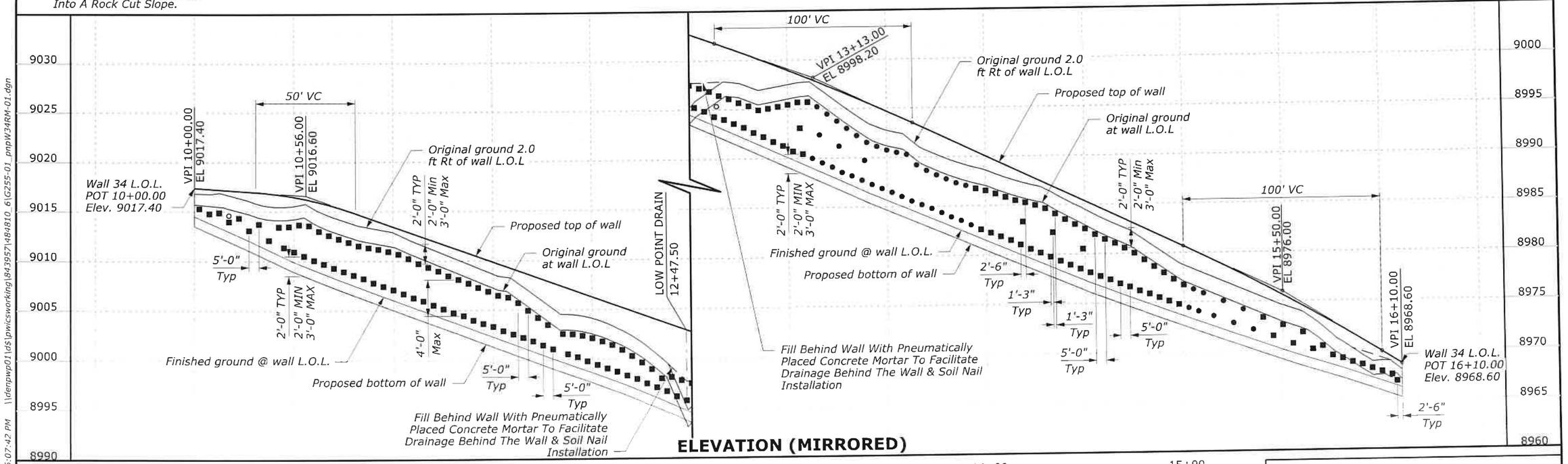


NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A Rock Cut Slope.



ELEVATION (MIRRORED)

NOTE:

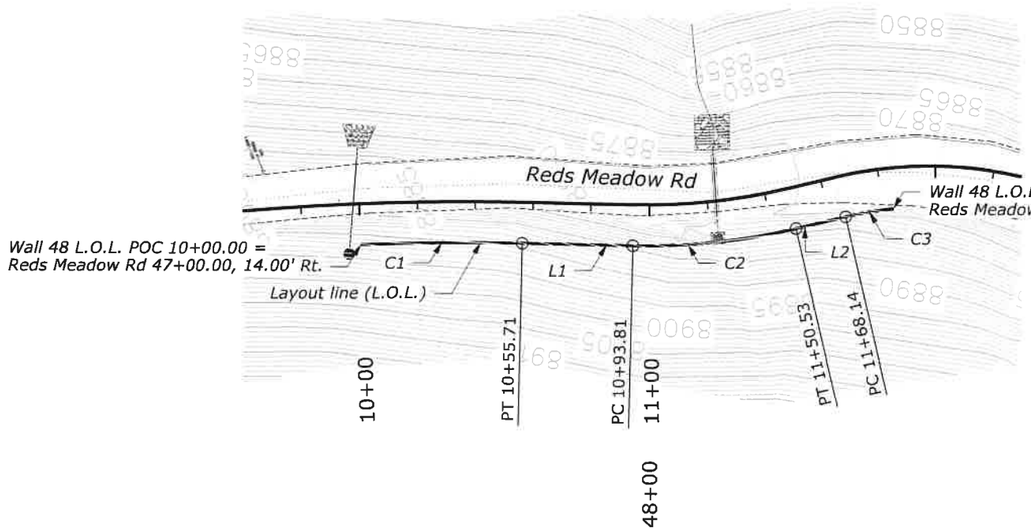
1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 34 LAYOUT 10+00 TO 16+10

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G6



WALL 48 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+27.86	870.00	03°40'07"	55.71	27.86
C2	11+22.32	226.00	14°22'49"	56.72	28.51
C3	11+76.58	126.00	07°40'06"	16.86	8.44

WALL 48 LINE TABLE		
NO.	BEARING	LENGTH
L1	N20°33'37"E	38.10
L2	N06°10'47"E	17.61

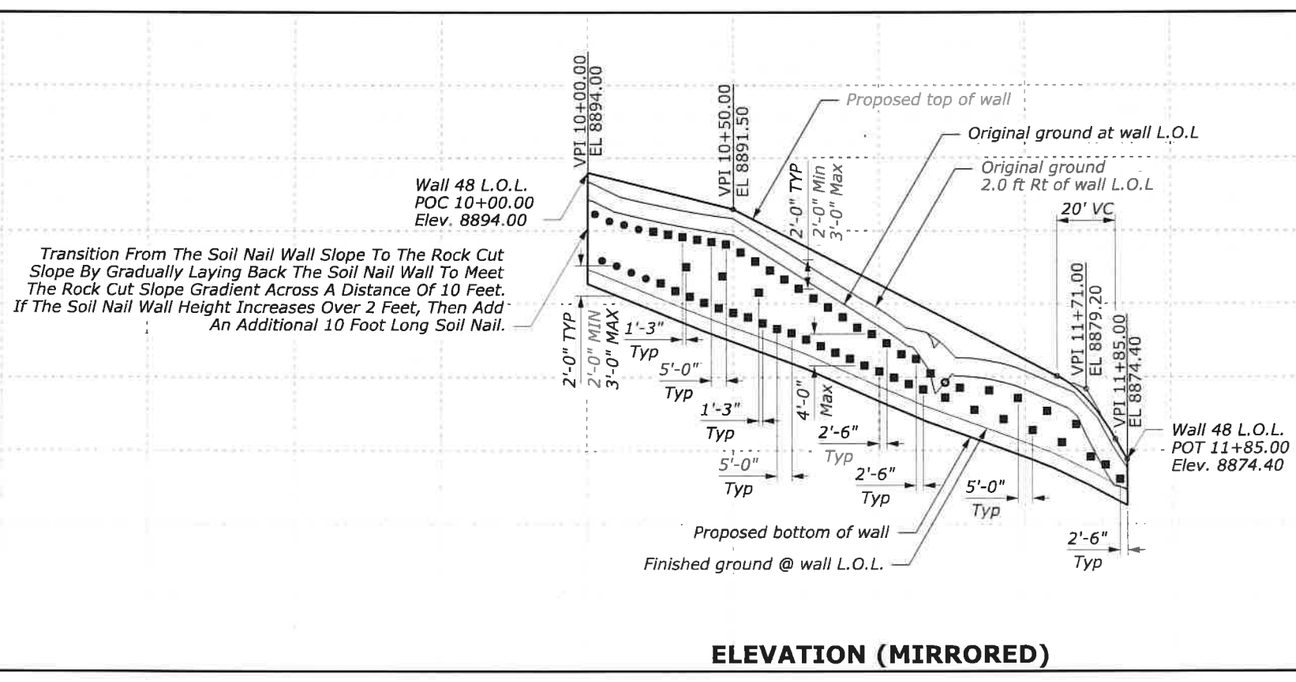
NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.

N

0 50' 100'

Scale in Feet



ELEVATION (MIRRORED)

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

NOTE:

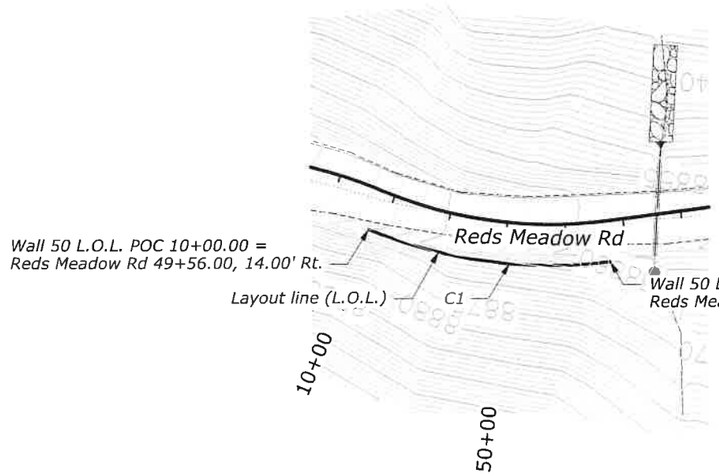
1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 48 LAYOUT 10+00 TO 11+85

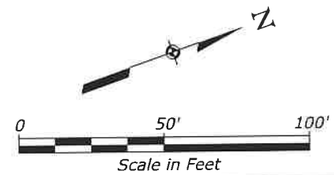
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G7

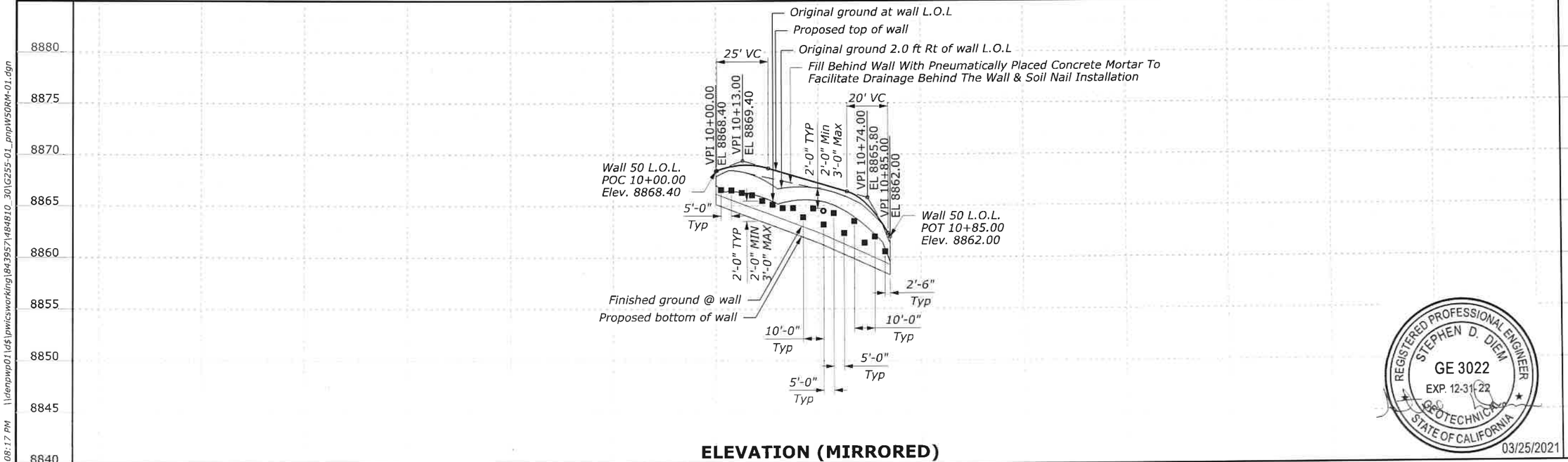


WALL 50 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+43.45	166.00	29°20'18"	85.00	43.45

NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.





ELEVATION (MIRRORED)

Layout Line (L.O.L) 10+00 11+00

NOTE:

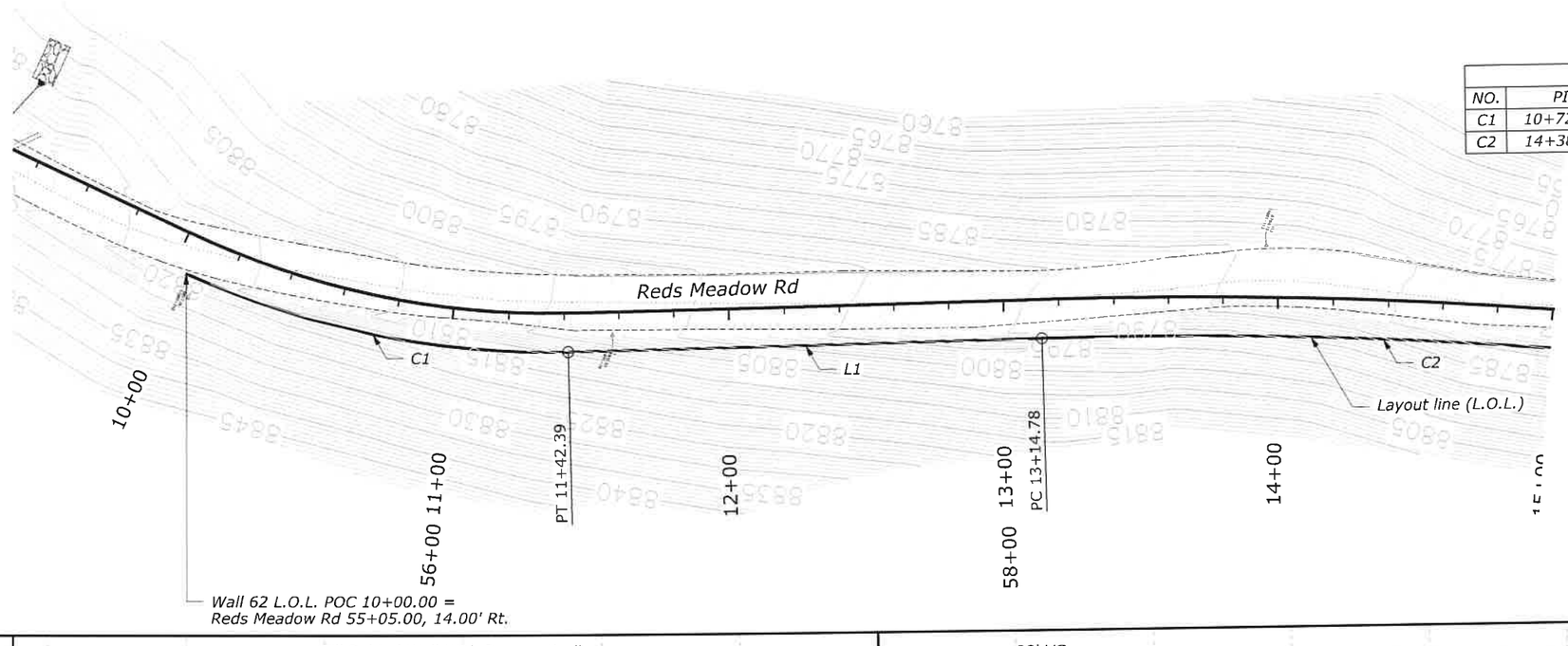
1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 50 LAYOUT 10+00 TO 10+85

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G8



WALL 62 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+72.37	323.00	25°15'27"	142.39	72.37
C2	14+38.83	1786.00	07°56'49"	247.71	104.06

WALL 62 LINE TABLE		
NO.	BEARING	LENGTH
L1	N23°31'13"W	172.39

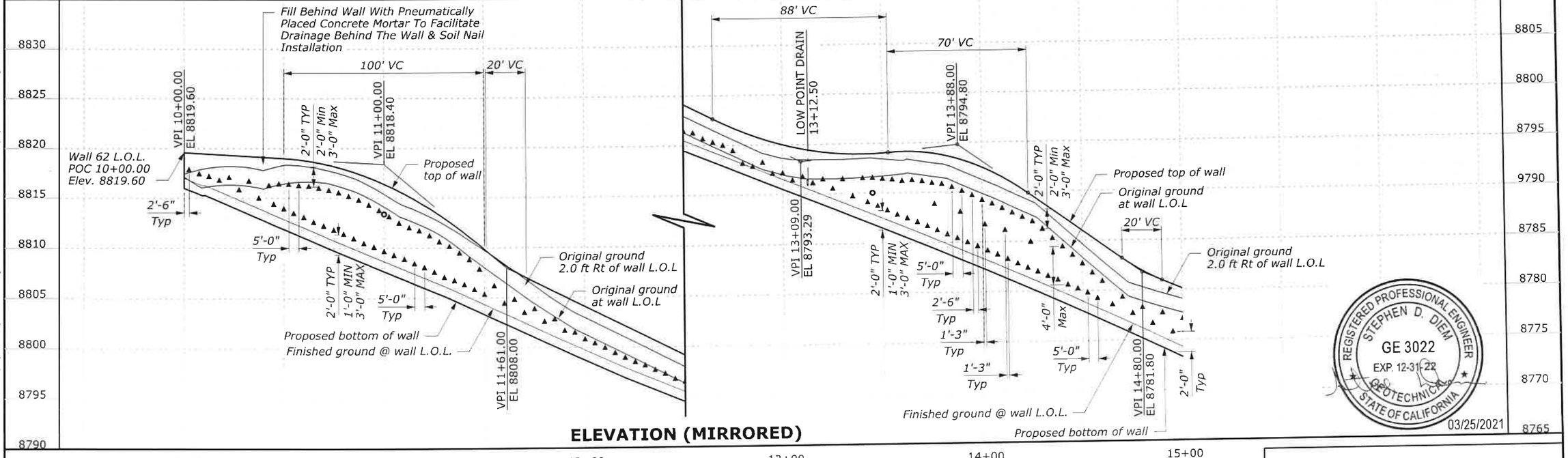
NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.

N

0 50' 100'

Scale in Feet



ELEVATION (MIRRORED)

Layout Line (L.O.L) 10+00 11+00 12+00 13+00 14+00 15+00

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

NOTE:

1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

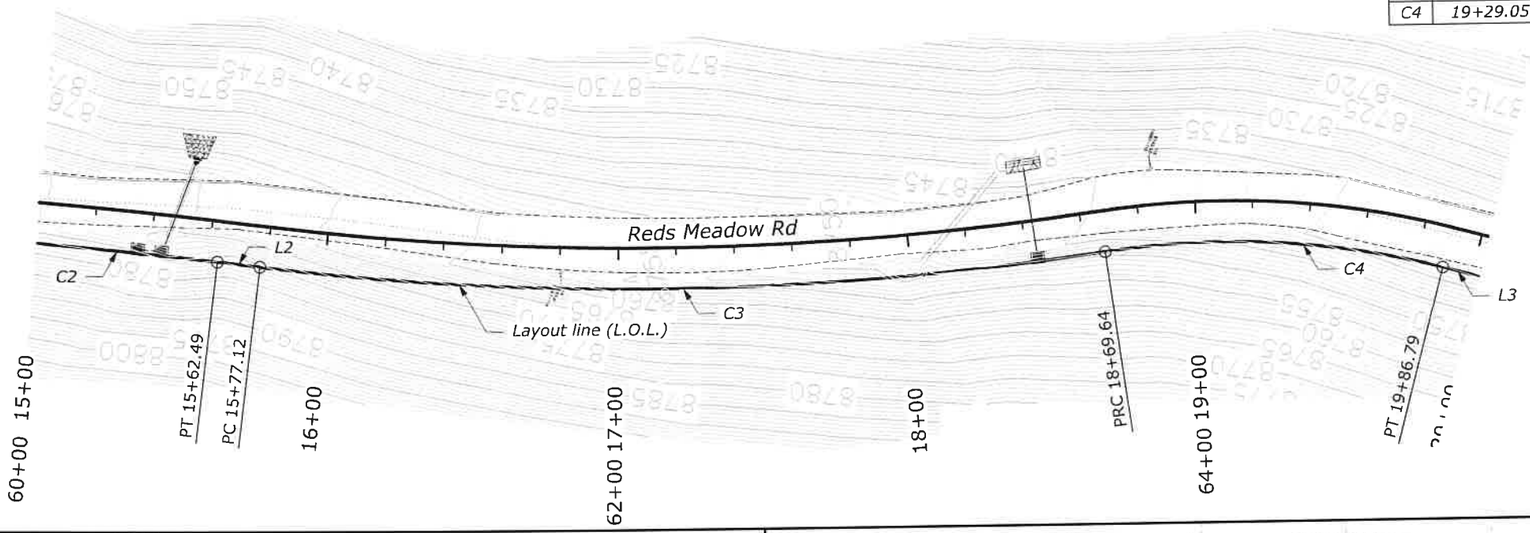
- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 62 LAYOUT 10+00 TO 15+00

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G9

WALL 62 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C2	14+38.83	1786.00	07°56'49"	247.71	124.06
C3	17+24.20	1134.00	14°46'48"	292.53	147.08
C4	19+29.05	295.00	22°43'59"	117.05	59.30

WALL 62 LINE TABLE		
NO.	BEARING	LENGTH
L2	N15°34'24"W	14.62
L3	N07°37'14"W	47.18



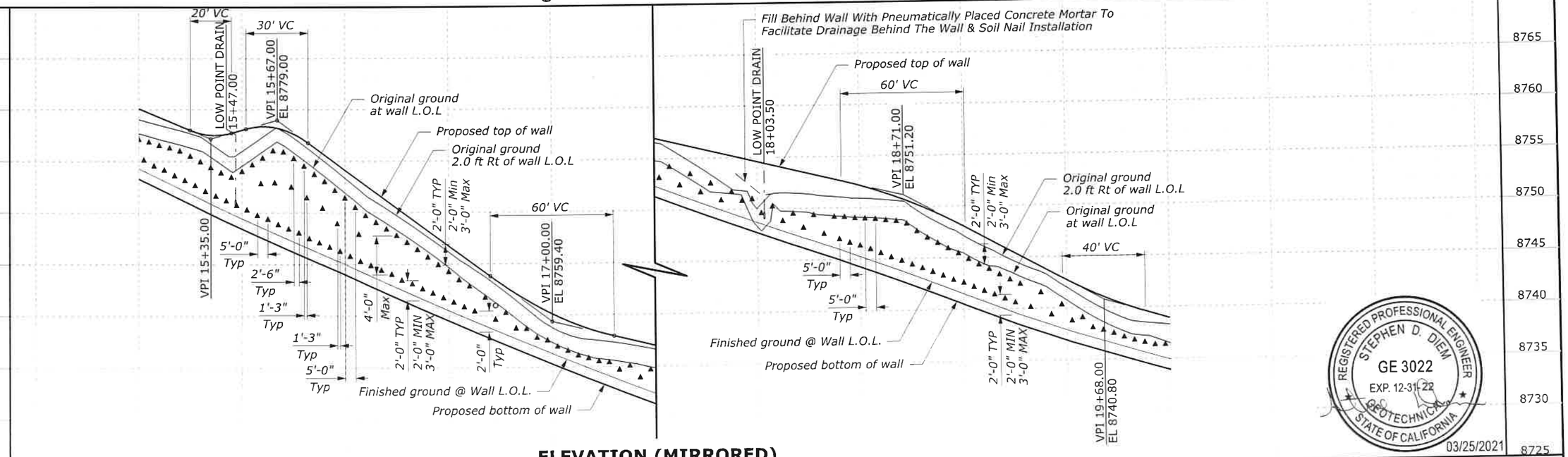
NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.

N

0 50' 100'

Scale in Feet



ELEVATION (MIRRORED)

Layout Line (L.O.L) 15+00 16+00 17+00 18+00 19+00 20+00

REGISTERED PROFESSIONAL ENGINEER STEPHEN D. DIEM GE 3022 EXP. 12-31-22 GEOTECHNICAL STATE OF CALIFORNIA

03/25/2021

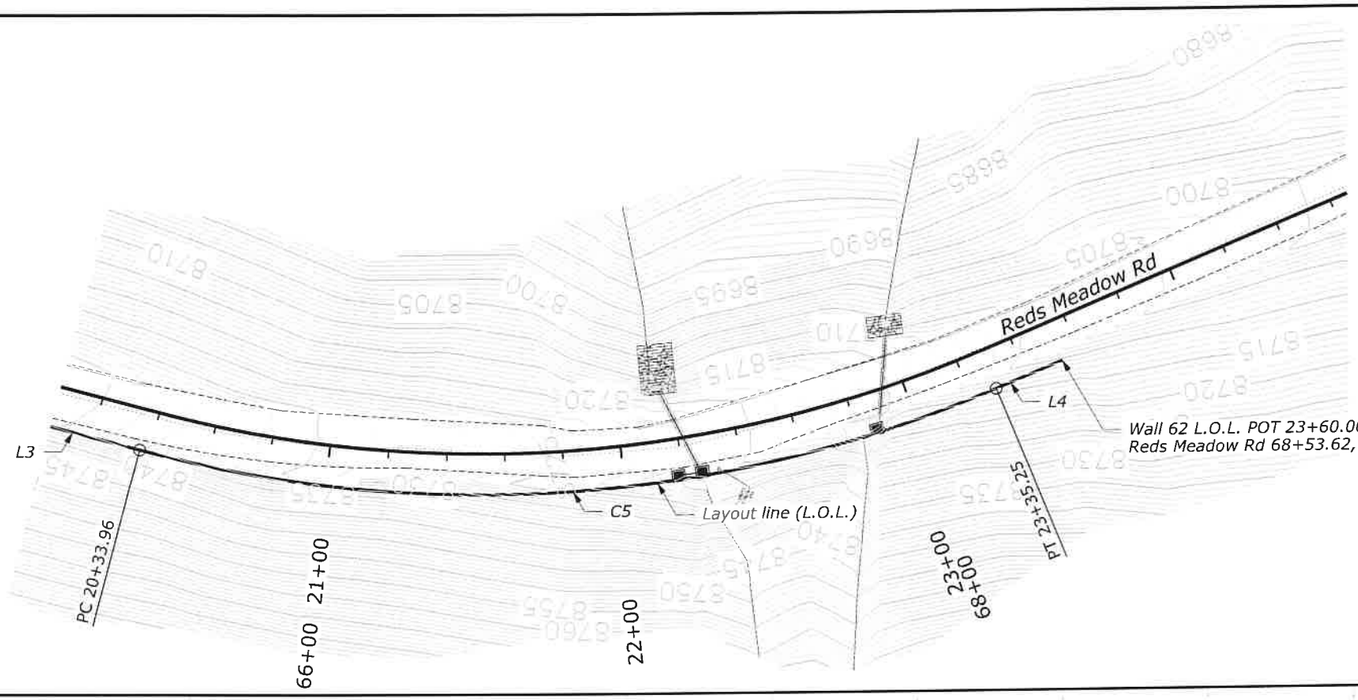
NOTE:

1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 62 LAYOUT 15+00 TO 20+00



WALL 62 LINE TABLE		
NO.	BEARING	LENGTH
L3	N07°37'14"W	47.18
L4	N44°30'51"W	33.37

WALL 62 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C5	21+90.13	464.00	37°12'13"	301.29	156.17

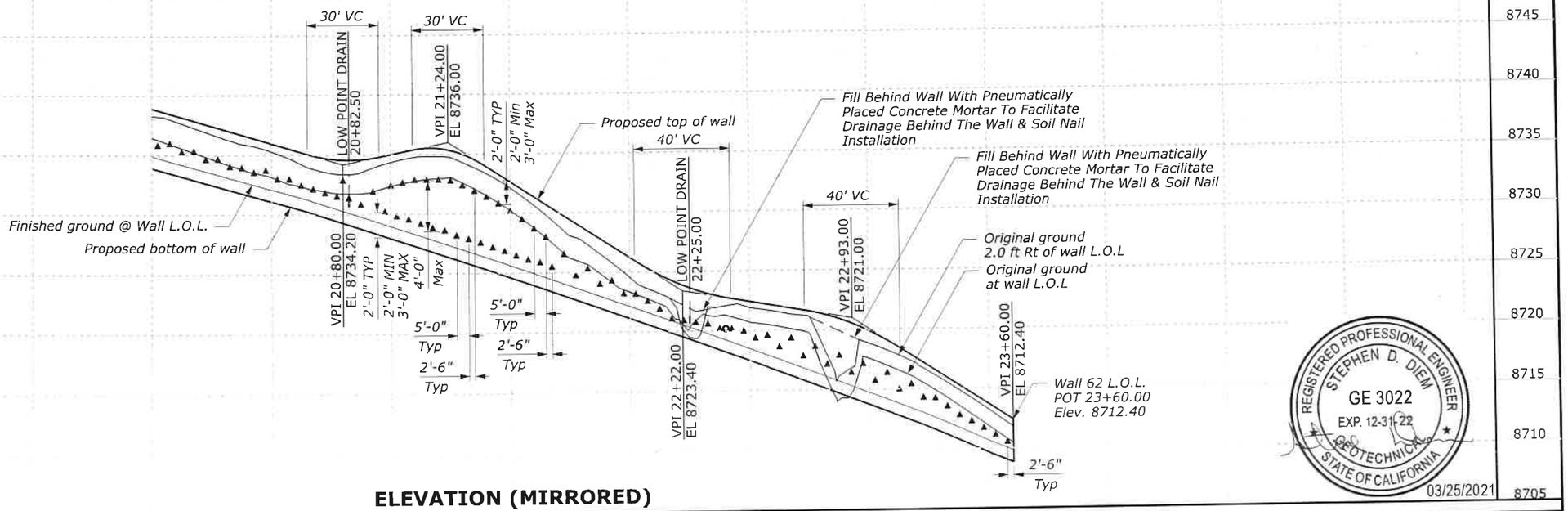
NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.

N

0 50' 100'

Scale in Feet



ELEVATION (MIRRORED)

Layout Line (L.O.L) 20+00 21+00 22+00 23+00 24+00

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

NOTE:

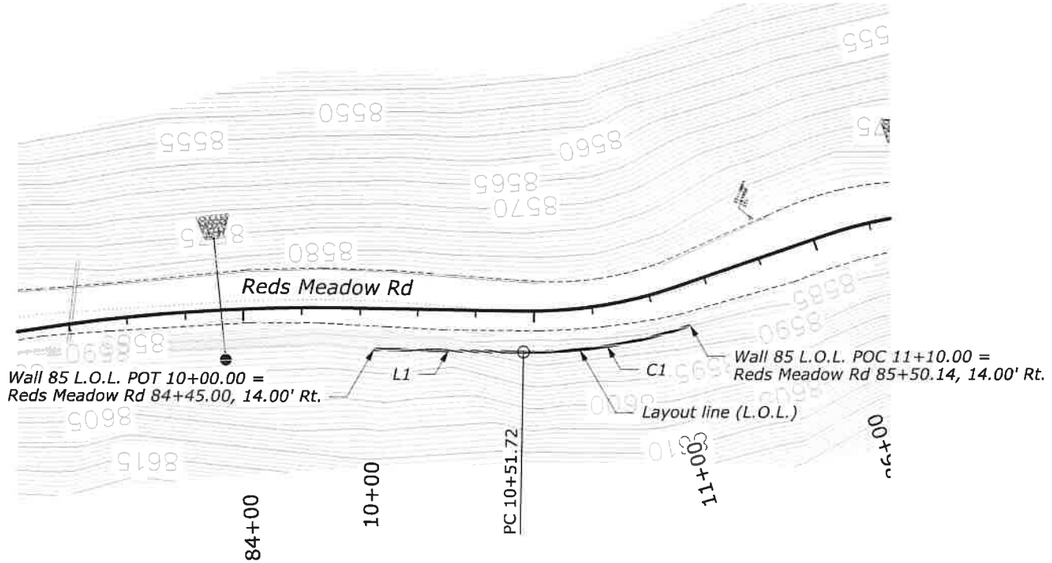
1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 62 LAYOUT 20+00 TO 23+60

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G11



WALL 85 LINE TABLE		
NO.	BEARING	LENGTH
L1	N21°31'02"W	51.72

WALL 85 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+80.81	166.00	19°52'39"	57.59	29.09

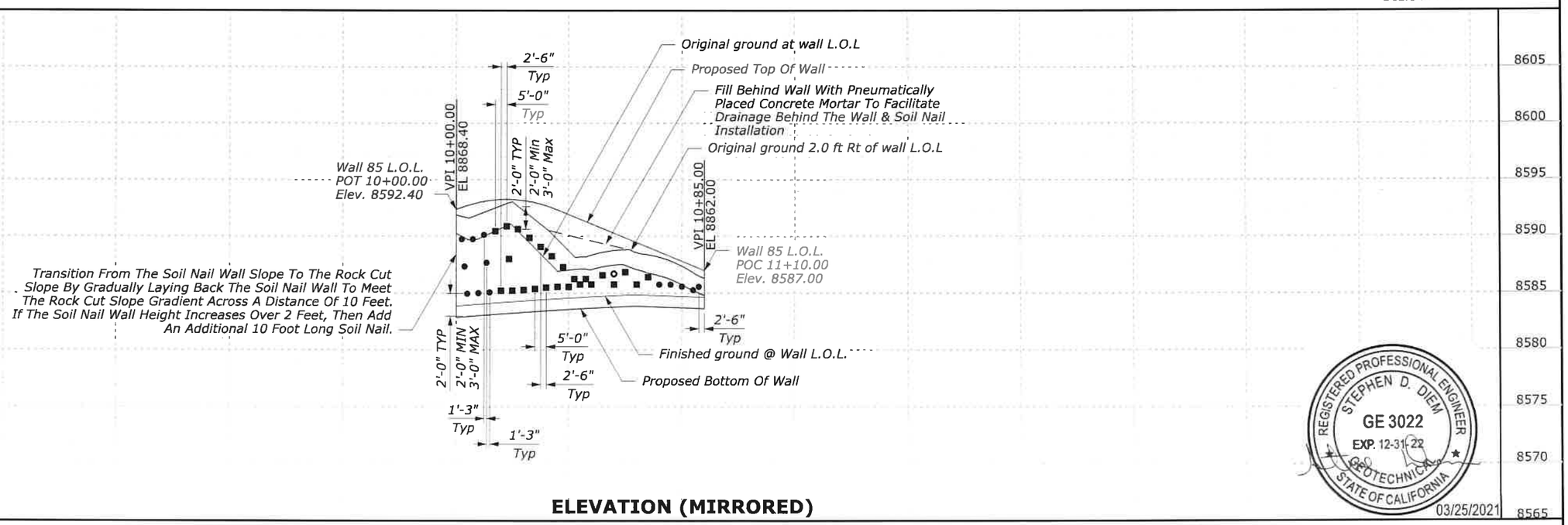
NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.

N

0 50' 100'

Scale in Feet



ELEVATION (MIRRORED)

Layout Line (L.O.L) 10+00 11+00

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA

03/25/2021

NOTE:

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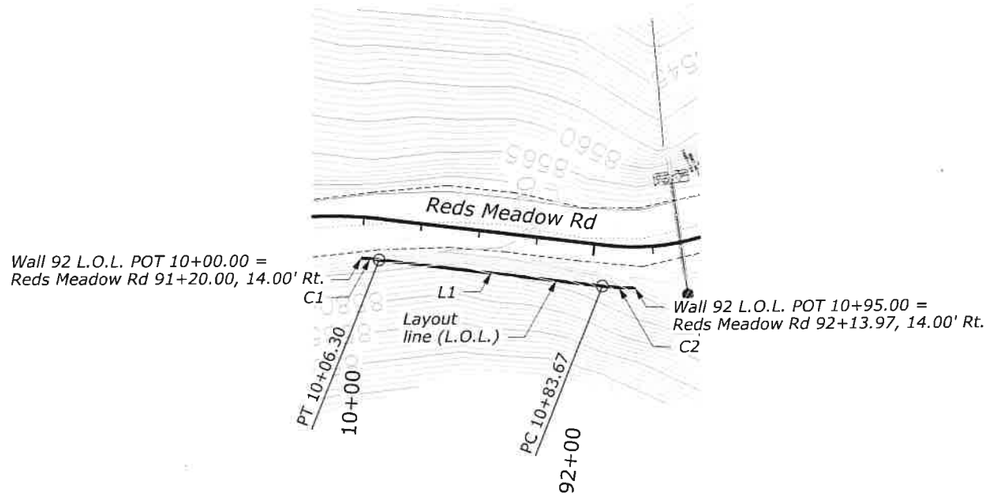
LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 85 LAYOUT 10+00 TO 11+10

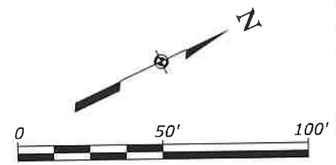


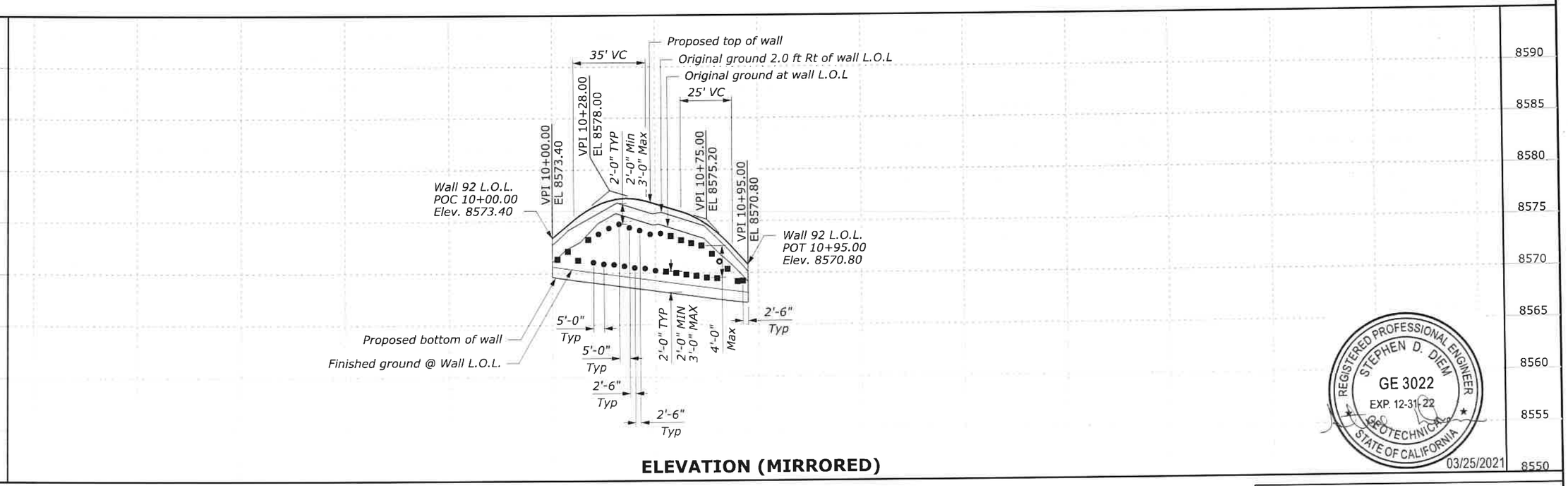
WALL 92 LINE TABLE		
NO.	BEARING	LENGTH
L1	N31°42'27"E	77.36

WALL 92 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+03.15	138.00	02°36'58"	6.30	3.15
C2	10+89.34	95.00	06°50'10"	11.33	5.67

NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.





ELEVATION (MIRRORED)

NOTE:

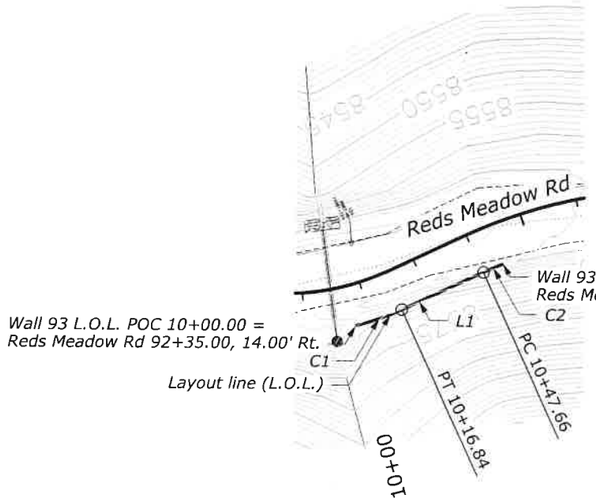
1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- ● 10 Foot Long Nail
- ■ 15 Foot Long Nail
- ▲ 17 Foot Long Nail
- ◆ 20 Foot Long Nail
- ● 25 Foot Long Nail
- ○ Verification Test Nail

SOIL NAIL WALL 92 LAYOUT 10+00 TO 10+95

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G13

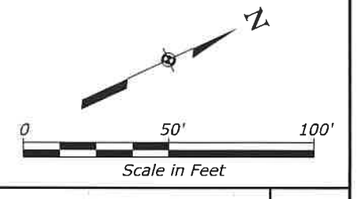


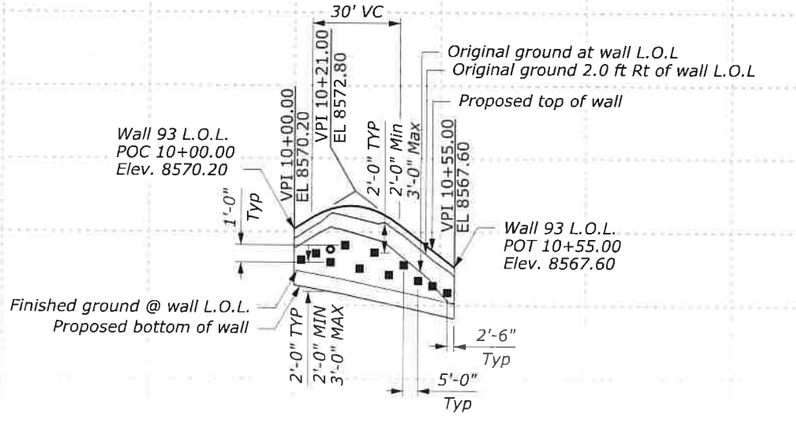
WALL 93 LINE TABLE		
NO.	BEARING	LENGTH
L1	N00°09'38"W	30.82

WALL 93 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+08.44	95.00	10°09'20"	16.84	8.44
C2	10+51.33	155.00	02°42'48"	7.34	3.67

NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.





ELEVATION (MIRRORED)

8590 8585 8580 8575 8570 8565 8560 8555 8550

Layout Line (L.O.L)

10+00 11+00

NOTE:

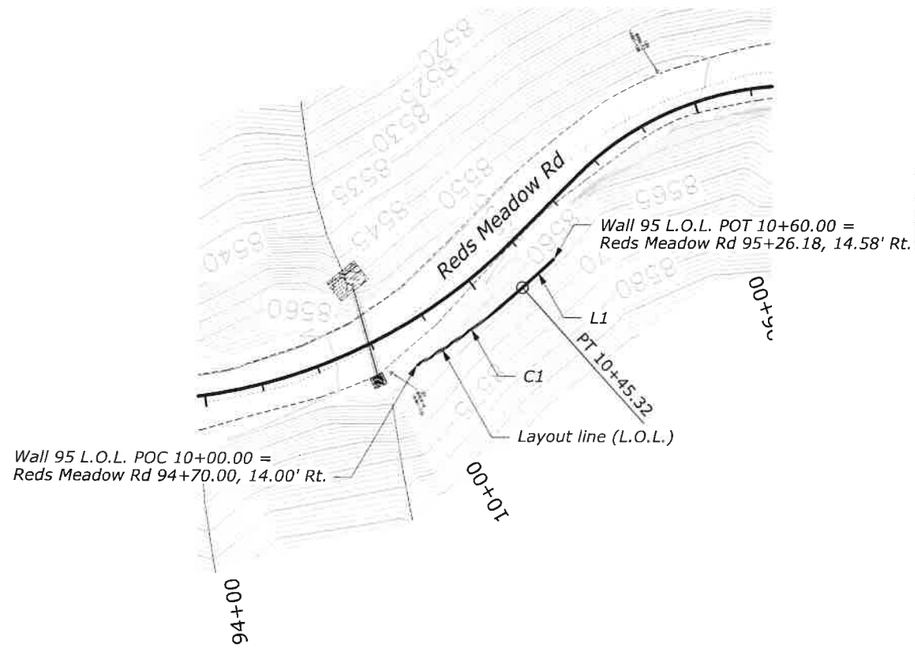
1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 93 LAYOUT 10+00 TO 10+55

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G14

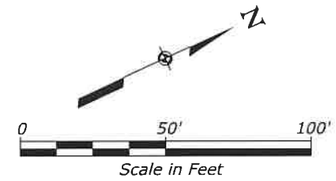


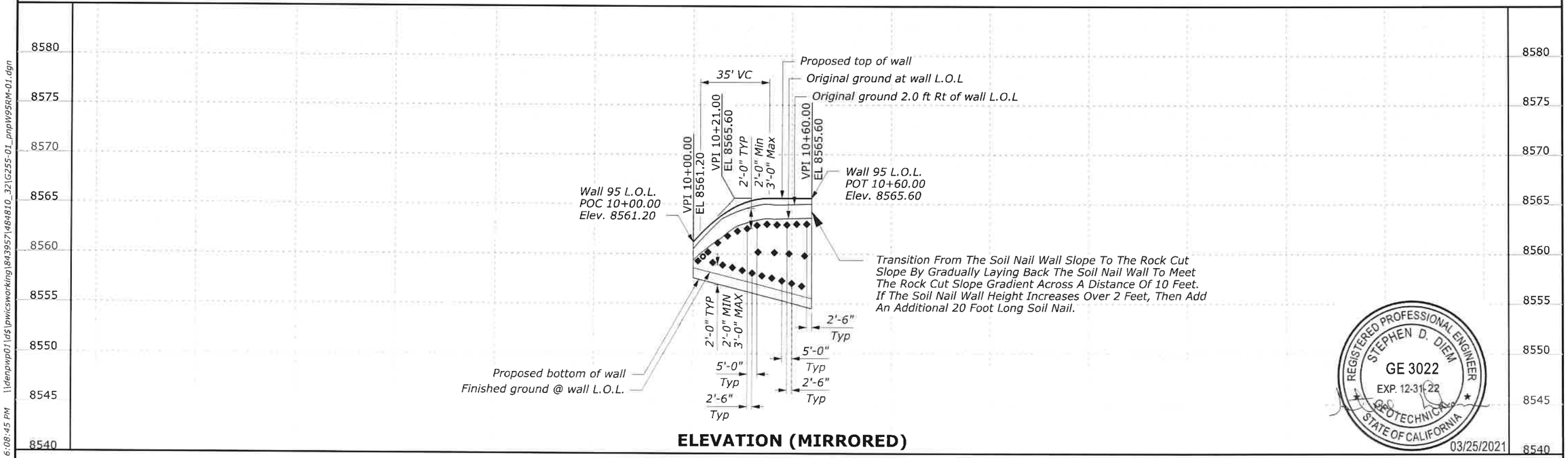
WALL 95 LINE TABLE		
NO.	BEARING	LENGTH
L1	N17°25'52"W	14.68

WALL 95 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+22.76	203.00	12°47'30"	45.32	22.76

NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.





ELEVATION (MIRRORED)

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

NOTE:

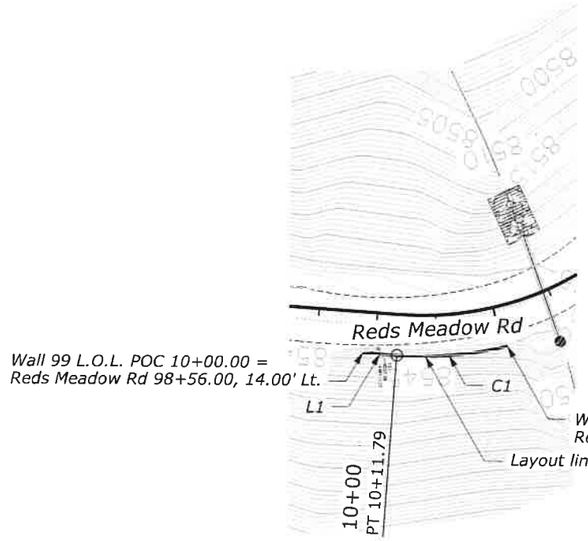
1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 95 LAYOUT 10+00 TO 10+60

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G15



WALL 99 LINE TABLE		
NO.	BEARING	LENGTH
L1	N05°44'16"E	11.79

WALL 99 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+11.79	120.00	18°14'46"	38.21	19.27

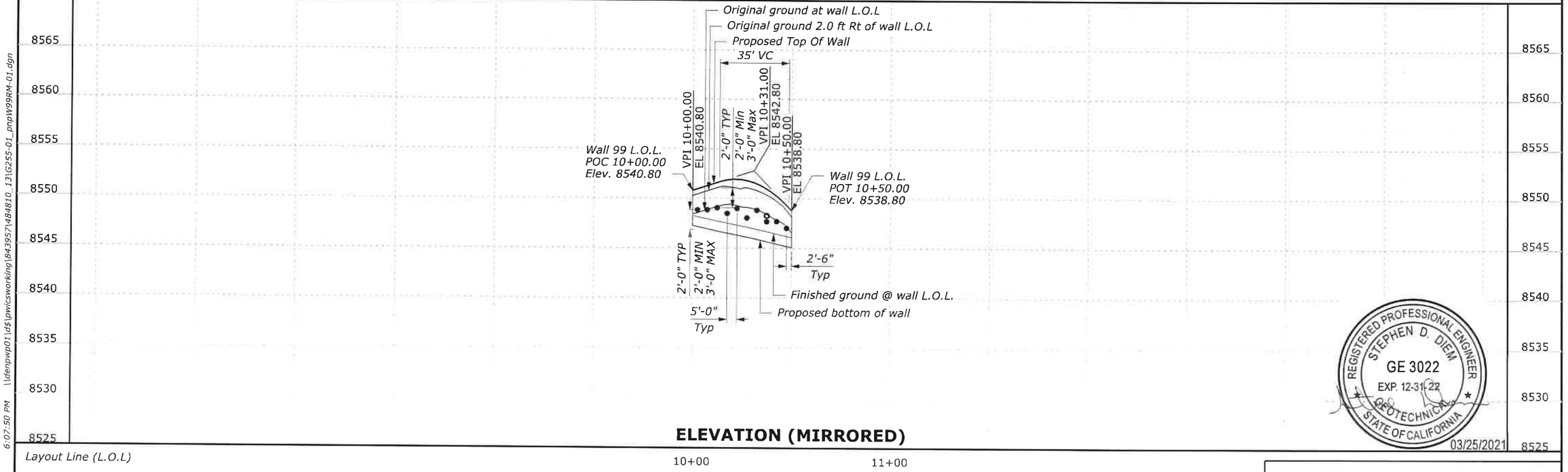
NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.

N

0 50' 100'

Scale in Feet



ELEVATION (MIRRORED)

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

NOTE:

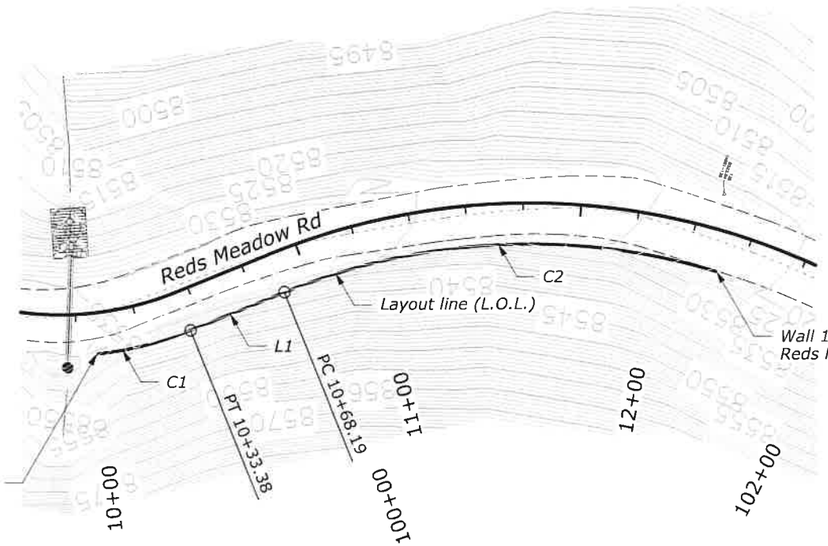
1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 99 LAYOUT 10+00 TO 10+50

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G16

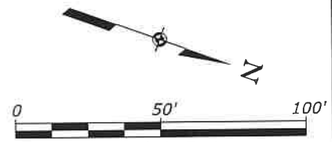


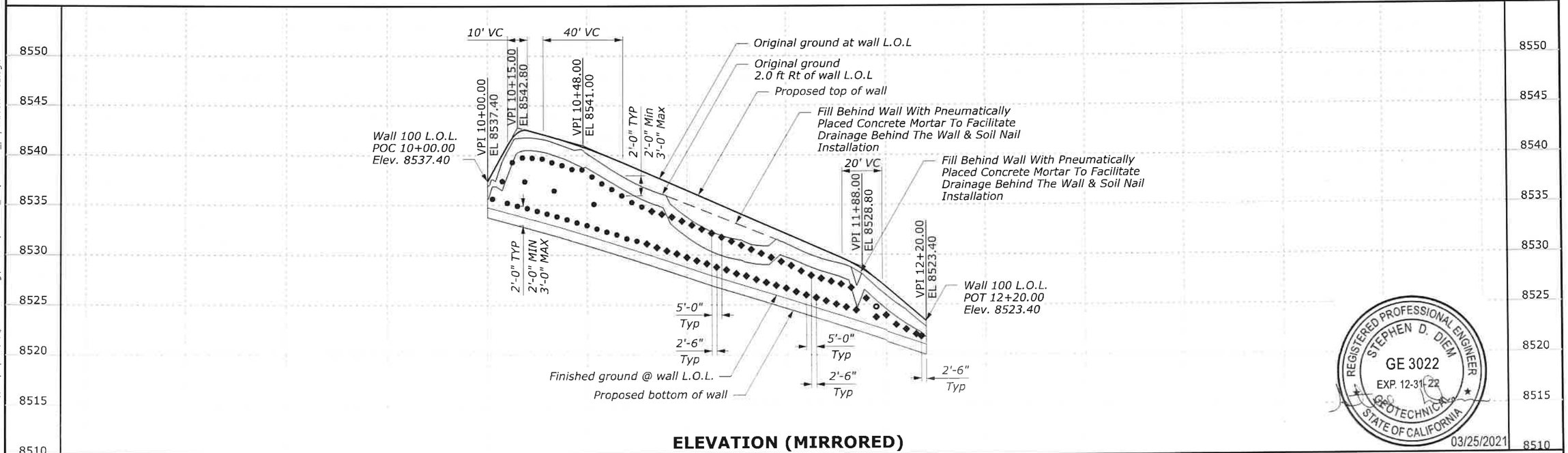
WALL 100 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+16.80	120.00	15°56'20"	33.38	16.80
C2	11+47.14	224.00	38°49'53"	151.81	78.95

WALL 100 LINE TABLE		
NO.	BEARING	LENGTH
L1	N41°40'03"W	34.80

NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.





ELEVATION (MIRRORED)

NOTE:

1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 100 LAYOUT 10+00 TO 12+20

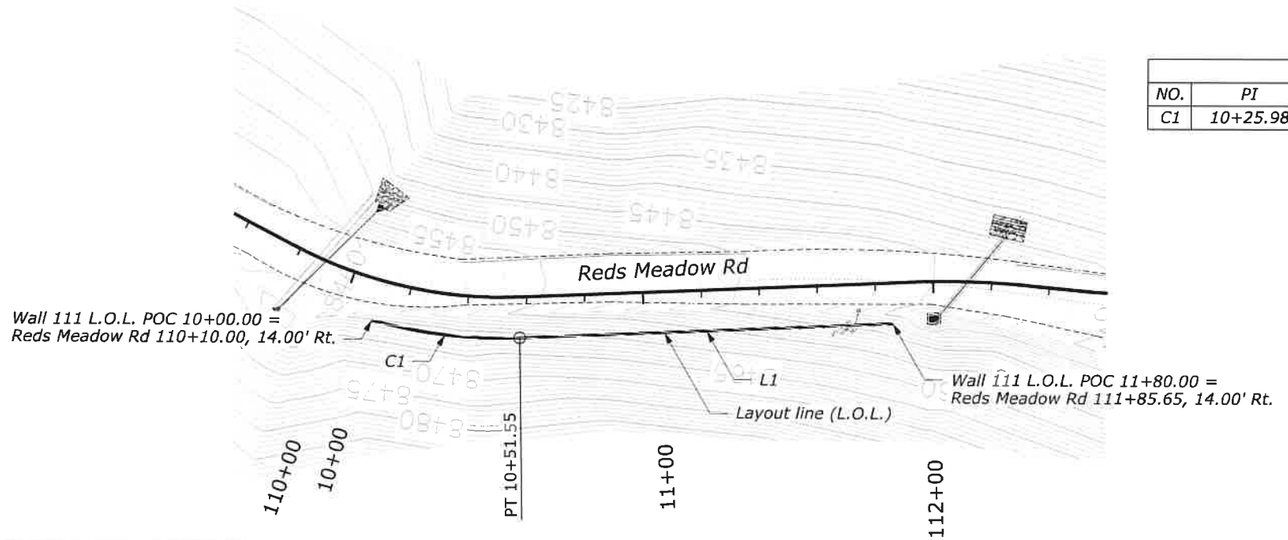
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G17

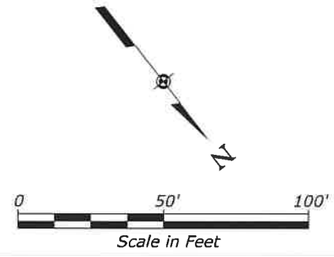
WALL 111 LINE TABLE		
NO.	BEARING	LENGTH
L1	N52°12'10"W	128.45

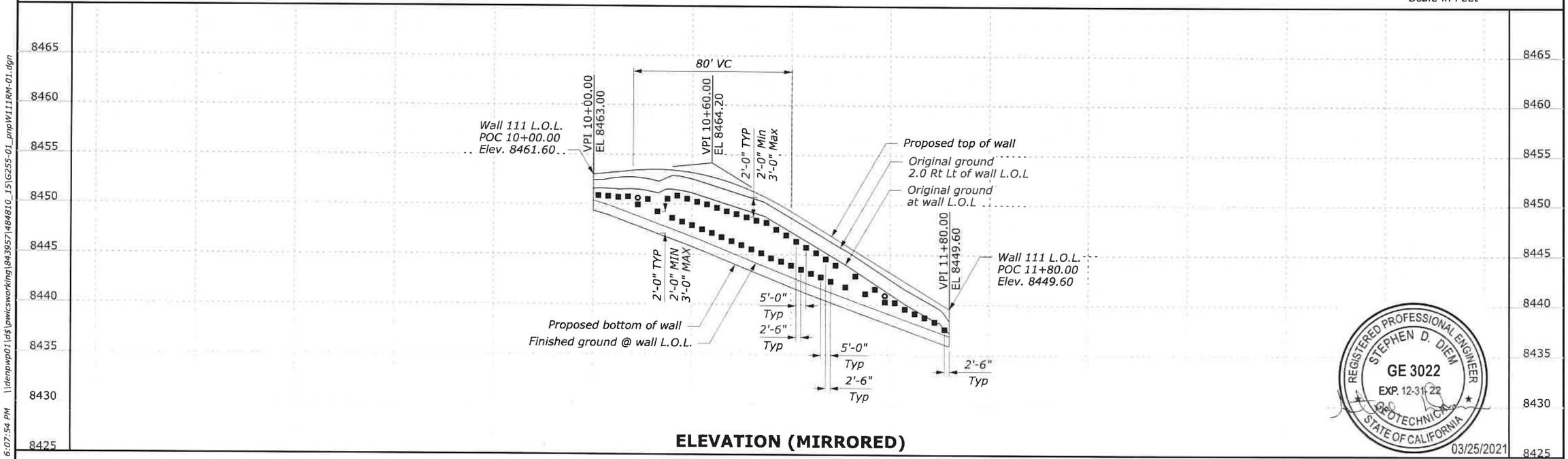
WALL 111 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+25.98	166.00	17°47'35"	51.55	25.98

NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.







ELEVATION (MIRRORED)

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

NOTE:

1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 111 LAYOUT 10+00 TO 11+80

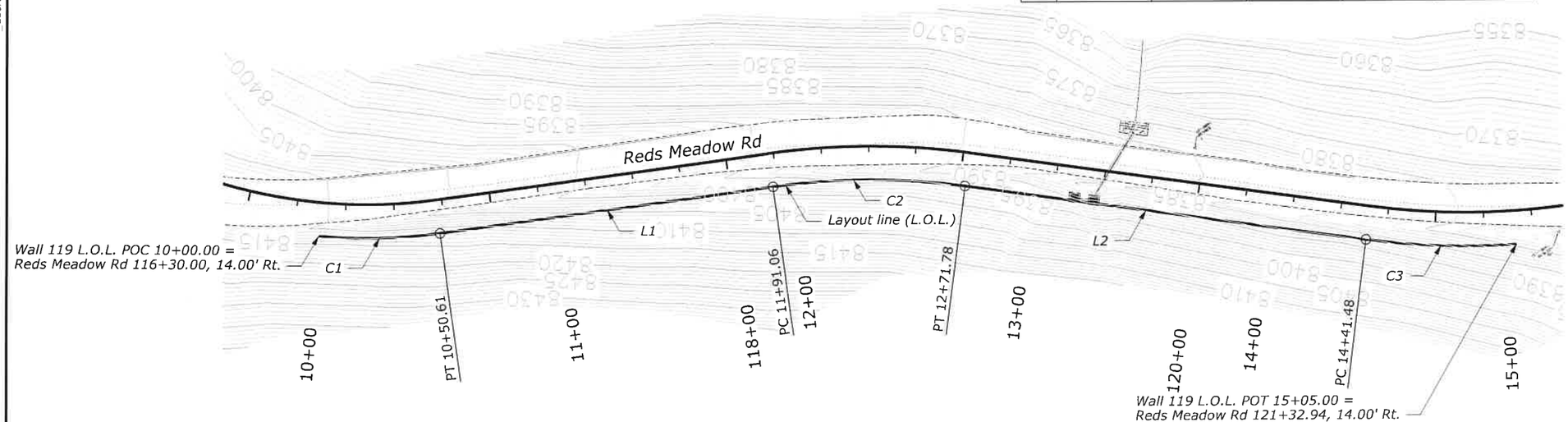
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G18

WALL 119 CURVE TABLE

NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+25.41	226.00	12°49'47"	50.61	25.41
C2	12+31.67	295.00	15°40'37"	80.72	40.61
C2	14+73.34	323.00	11°16'01"	63.52	31.86

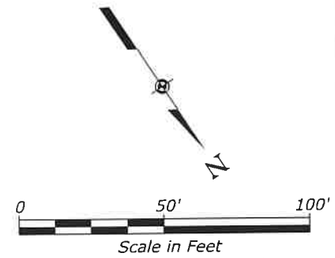
WALL 119 LINE TABLE

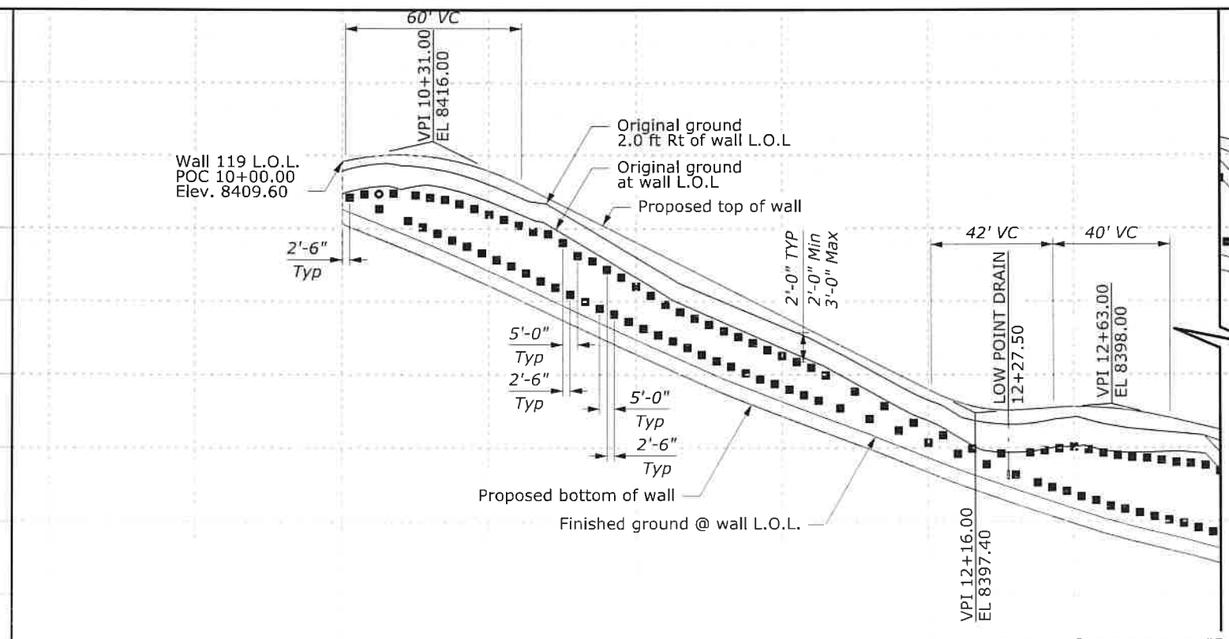
NO.	BEARING	LENGTH
L1	N64°13'14"W	140.46
L2	N48°32'38"W	169.70

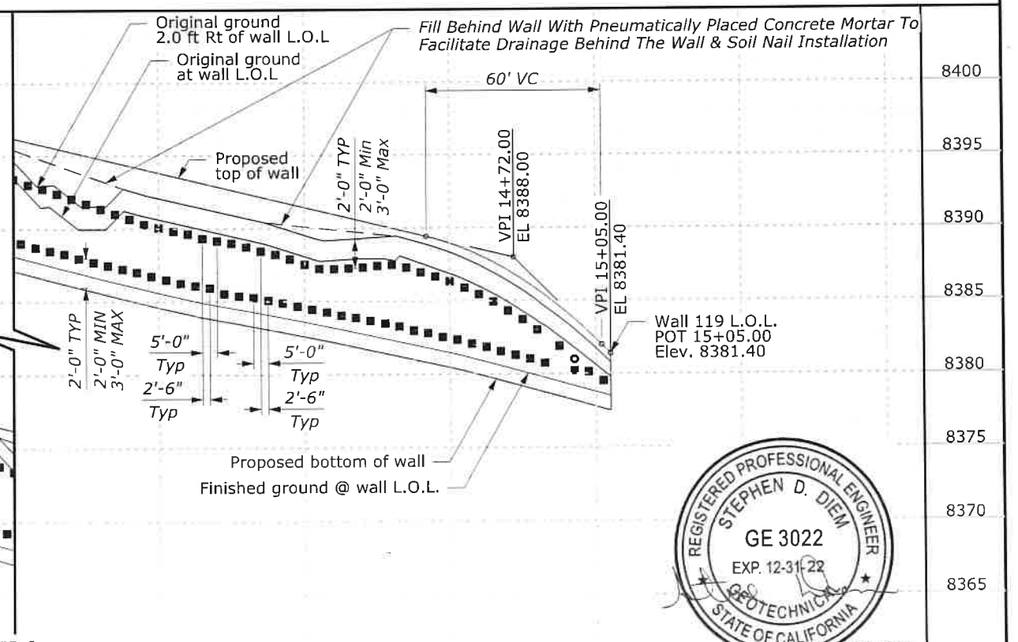


NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.







ELEVATION (MIRRORED)

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

NOTE:

1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

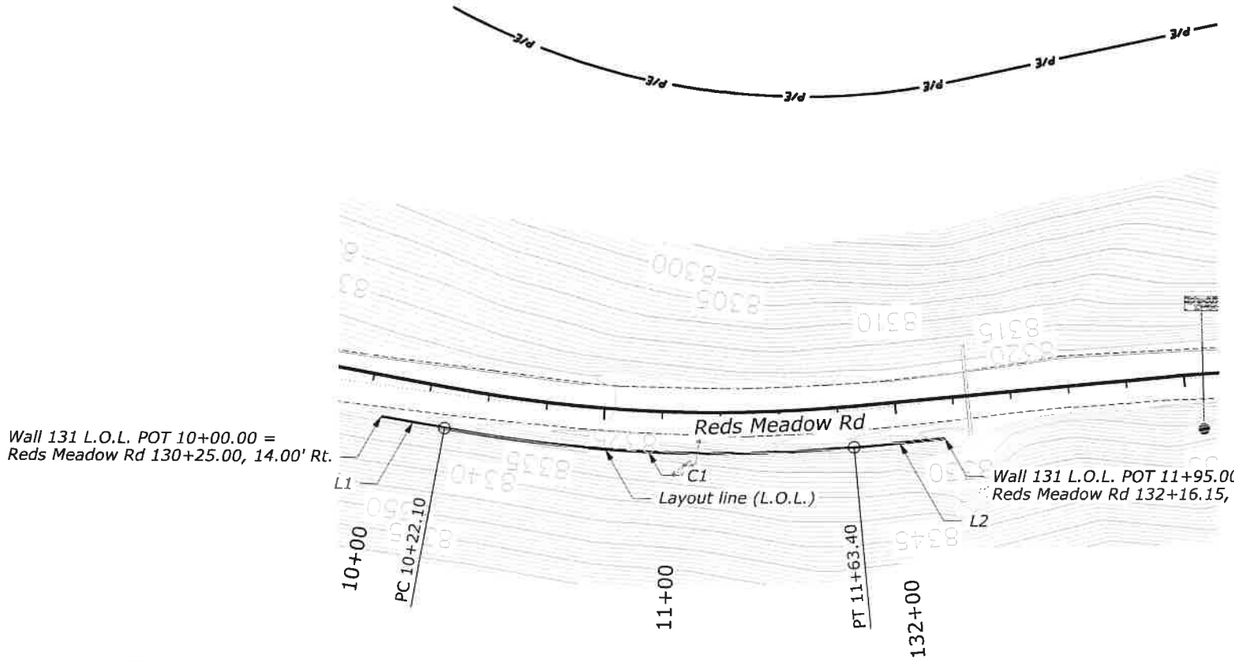
- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 119 LAYOUT 10+00 TO 15+05

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G19

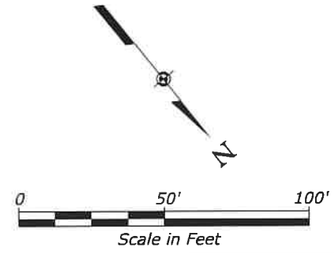
WALL 131 LINE TABLE		
NO.	BEARING	LENGTH
L1	N40°36'24"W	22.10
L2	N40°36'24"W	22.10

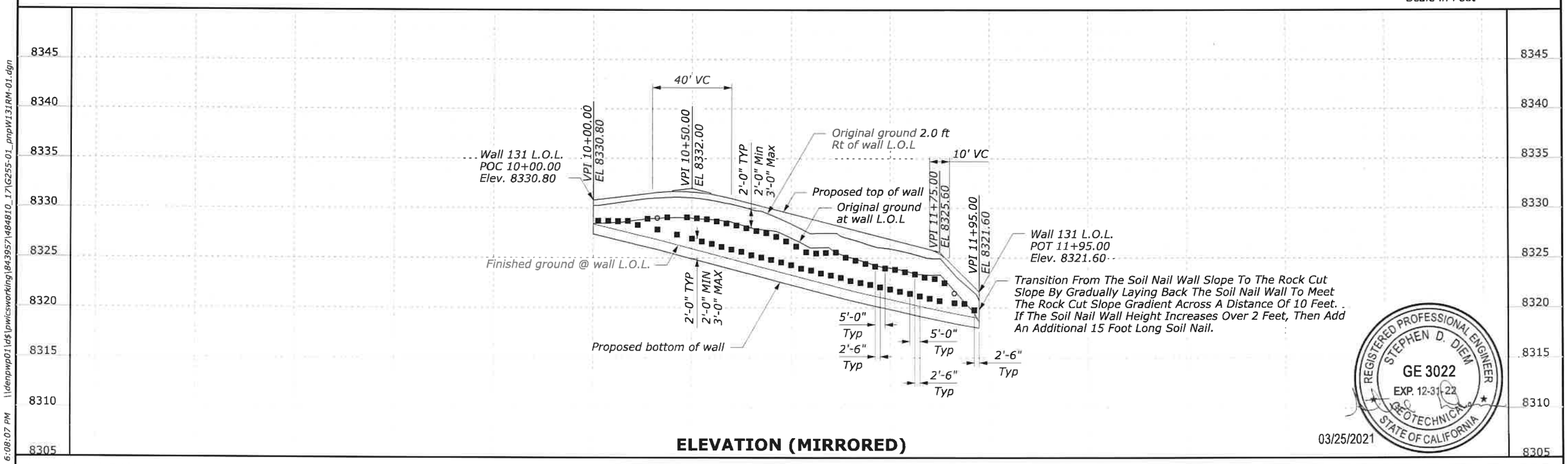
WALL 131 CURVE TABLE					
NO.	PI	RADIUS	DELTA	LENGTH	TANGENT
C1	10+93.20	514.00	15°45'04"	141.30	39.46



NOTES:

1. See Special 259-A For Soil Nail Wall Typical Section.
2. See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.





ELEVATION (MIRRORED)

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

Layout Line (L.O.L)

10+00 11+00 12+00

NOTE:

1. Proof test a minimum of 5% of all soil nails. Locations to be determined by the COR. See specification for proof testing requirements.

LEGEND

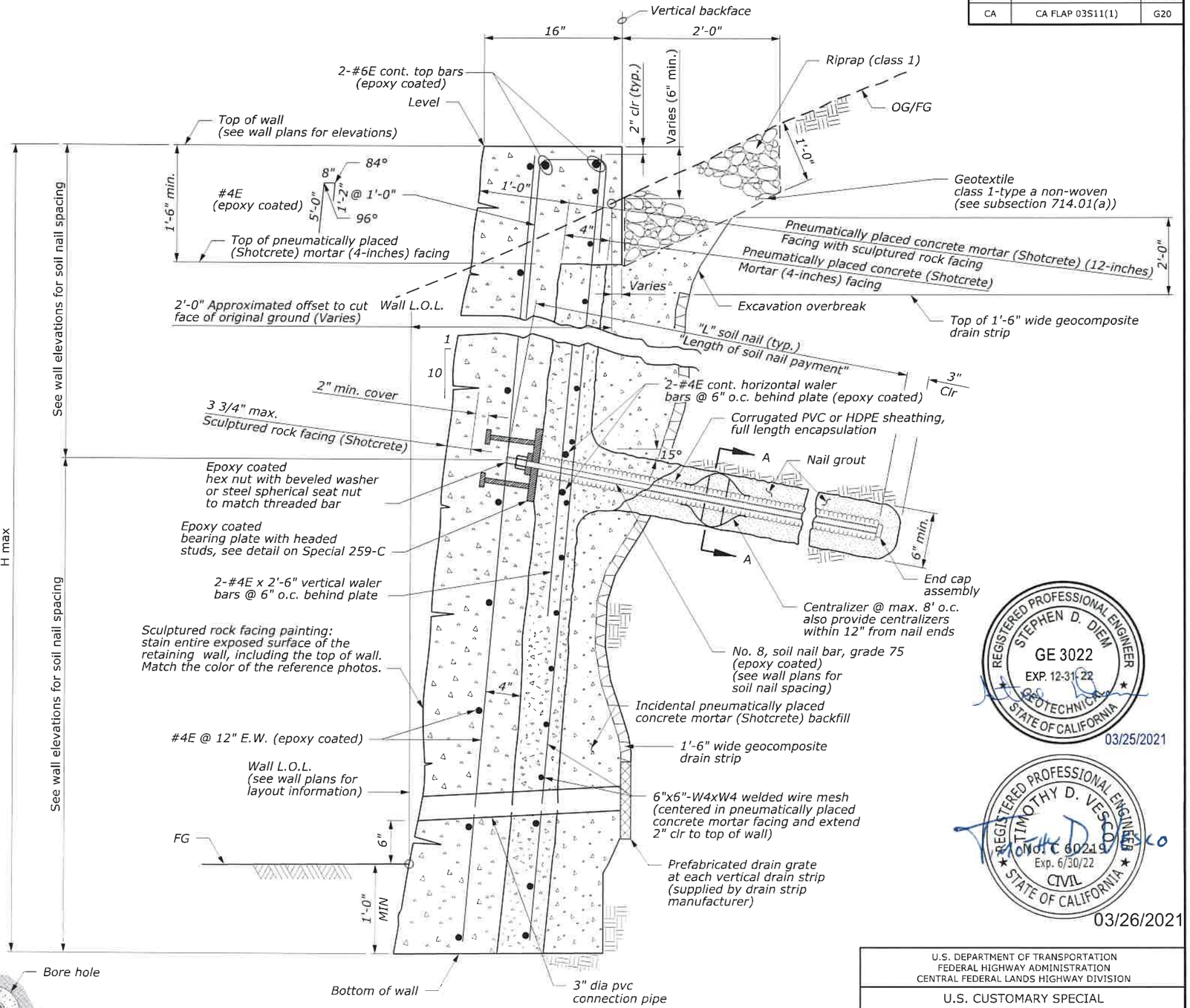
- 10 Foot Long Nail
- 15 Foot Long Nail
- 17 Foot Long Nail
- 20 Foot Long Nail
- 25 Foot Long Nail
- Verification Test Nail

SOIL NAIL WALL 131 LAYOUT 10+00 TO 11+95

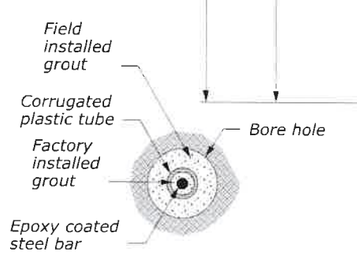
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G20

NOTES:

1. Conform to the specifications for architectural surface treatment of rock sculpted shotcrete surfaces.
2. Prepare the architectural surface treatment to resemble in appearance the texture, pattern, surface relief, strata line detail, and multi-color staining of the existing geology shown in the photos below.
3. The photos below will serve as criteria for determining final approval of the test panel and acceptance of final wall sculpting and staining.



SOIL NAIL WALL TYPICAL SECTION



SECTION A

NOTE:

(1) See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A Rock Cut Slope.

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY D. VESCO
No. C 60219
Exp. 6/30/22
CIVIL
STATE OF CALIFORNIA
03/26/2021

NO SCALE

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

U.S. CUSTOMARY SPECIAL

SOIL NAIL WALL TYPICAL SECTION

SPECIAL 259-A

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G21

SOIL NAIL WALL GENERAL NOTES:

1. Provide all material and workmanship in accordance with the contract plans, standard specifications for construction of roads and bridges on federal highway projects (FP-14), except as noted below and in the special contract requirements.
2. Reinforced pneumatically placed concrete mortar (shotcrete) class wet (AE):
   f'c = 4,000 psi (permanent cip-facing and initial shotcrete facing)
   f'c = 4,000 psi (nail grout)
3. Structural steel: ASTM A36 (fy = 36,000 psi) for bearing plates.
4. Soil nail bars: ASTM A615 grade 75. Hex nut and washer to be compatible with soil nail bar.
5. Wall design life: 75 years
6. Excavation in the vinicity of the wall face requires special care and effort compared to general roadway excavation. See special contract requirements.
7. The contractor is responsible for the stability of the excavations, slopes, and existing structures during construction.
8. The contractor is responsible for survey control during construction.
9. For additional soil nail wall design information, see final geotechnical report "Reds Meadow Road Improvements by Shannon & Wilson, Inc."

REINFORCING STEEL:

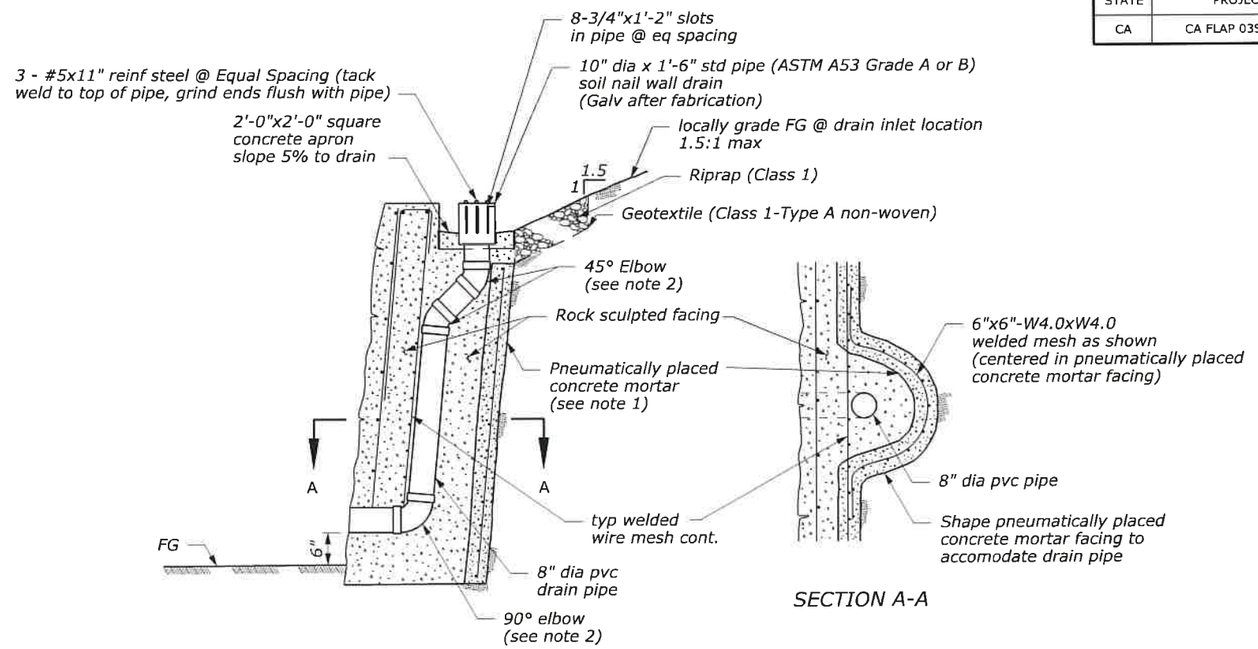
1. ASTM A515 grade 60 or ASTM A706. Dimensions relating to bar spacing are center to center. Bending dimensions are from out to out of the bars.
2. Epoxy Coated: All reinforcing steel as shown in the plans.
3. Minimum bar lap splice: #4E bar to #4E bar = 2'-11", #6 bar to #6 bar = 4'-4".
4. WWM reinforcement: conform to ASTM A1064 grade 60.
5. WWM reinforcement corrosion rate:
   Zinc corrosion rate first 2 years - 0.58 mils/year
   Zinc corrosion to depletion - 0.16 mils/year
   Carbon steel rate - 0.47 mils/year

SOIL NAIL TESTING:

1. See specifications for verification and proof testing requirements. Perform verification tests at locations shown on the wall elevations and proof test locations will be determined by the COR.

SOIL NAIL WALL DESIGN PARAMETERS

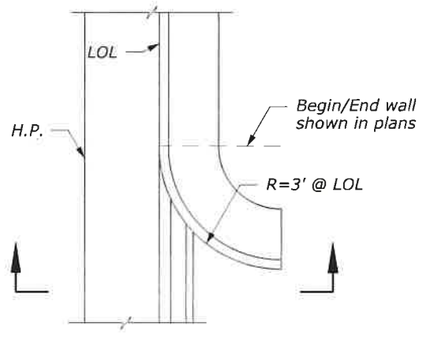
Design	Parameter		Value
Soil parameters	Angle of internal friction (degrees)		32
	Cohesion (psf)		0
	Unit weight (pcf)		120
Seismicity	Peak ground acceleration (g)		0.34
	Horizontal coefficient		0.17
	Vertical coefficient		0
Soil Nails	Bars		No. 8
	Grade (ksi)		75
	Ultimate Pullout Capacity (klf)	Soil	4.5
		Bedrock	36.2



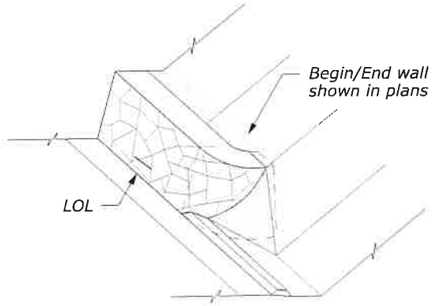
LOW-POINT DRAIN BEHIND SOIL NAIL WALL DETAIL

LOW-POINT DRAIN NOTES:

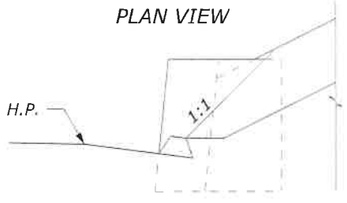
1. See wall plan and elevations for drain locations.



PLAN VIEW



ISOMETRIC VIEW



SECTION VIEW

TYPICAL END OF WALL DETAIL

NO SCALE

03/25/2021

03/26/2021

NOTE:

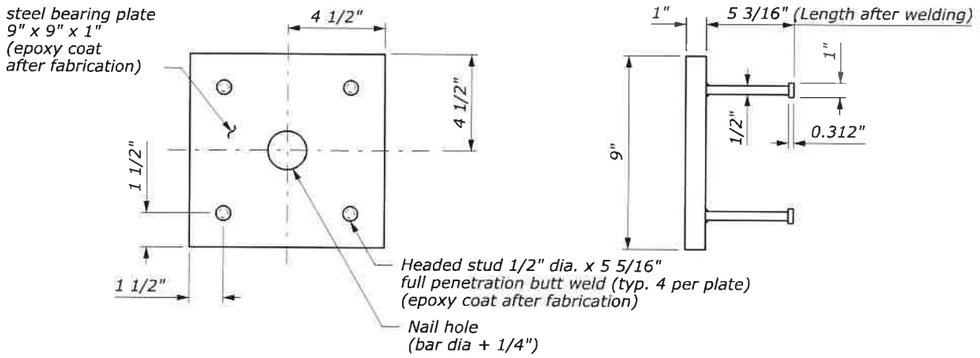
1. See Special 259-A For Soil Nail Wall Typical Section.

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

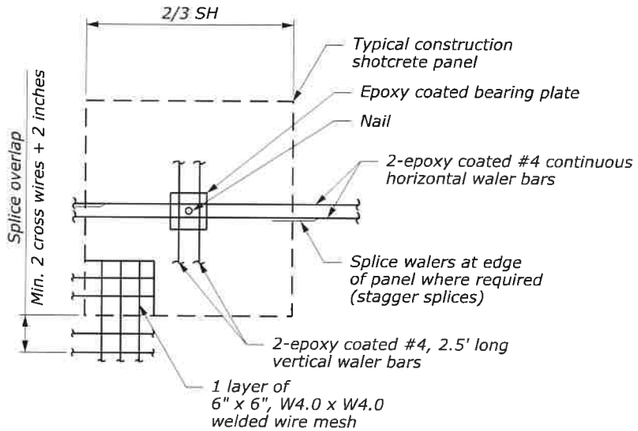
U.S. CUSTOMARY SPECIAL

SOIL NAIL WALL GENERAL NOTES & DETAILS NO. 1

SPECIAL
259-B



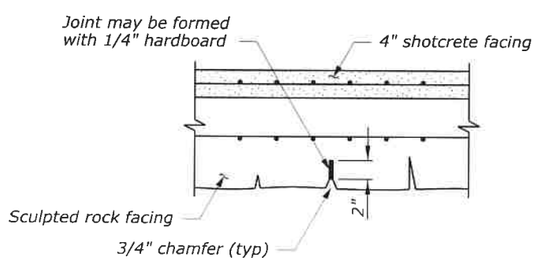
SOIL NAIL BEARING PLATE DETAIL



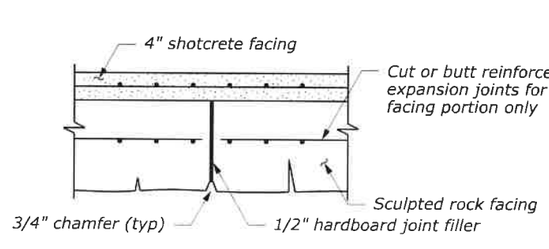
TYPICAL 4-INCH SHOTCRETE REINFORCEMENT

4-INCH SHOTCRETE NOTES:

1. *Install reinforcement for temporary shotcrete throughout the entire shotcrete facing.*
2. *SH = horizontal soil nail spacing.*



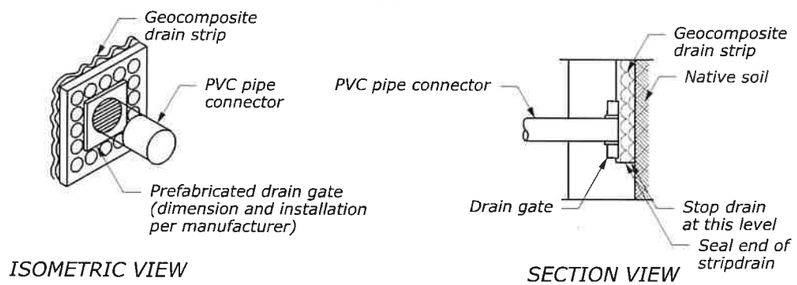
TYPICAL CONTRACTION JOINT



TYPICAL EXPANSION JOINT

CONTRACTION/EXPANSION JOINT NOTES:

1. *Place contraction joints for the full height of the wall at 30-foot intervals. Place expansion joints at every third joint, at wall bends, no less than 2 feet and no more than 10 feet from ends of wall.*
2. *Incorporate expansion and contraction joints with the sculpted shotcrete finish in a manner that minimizes the visual contrast between the joints and the finished shotcrete.*

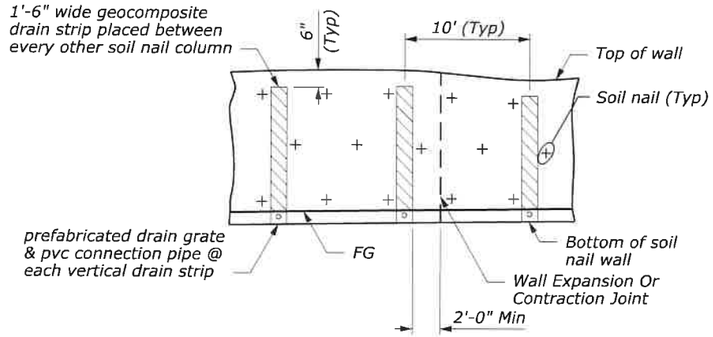


ISOMETRIC VIEW

SECTION VIEW

WEEP HOLE DRAIN DETAILS

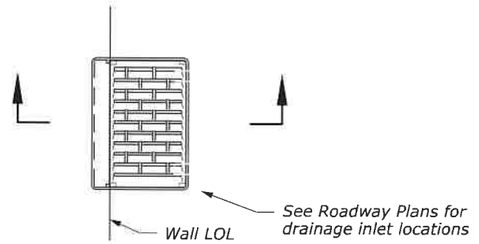
Note: Install drain gate without disrupting the geocomposite drain strip.



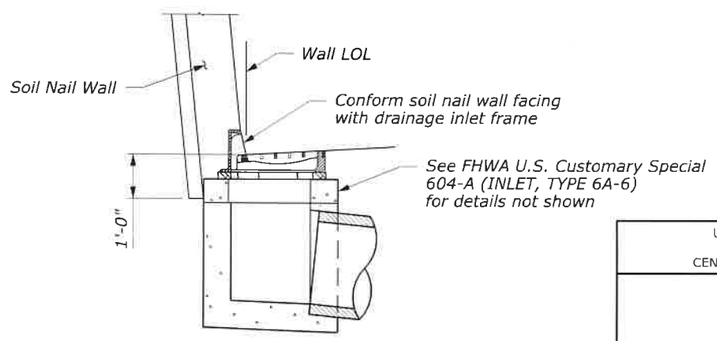
ELEVATION OF GEOCOMPOSITE DRAIN STRIPS

GEOCOMPSITE DRAIN STRIP NOTES:

1. *Splice of the drain strips are made with a minimum of 1'-3" overlap or per manufacturer's specifications.*
2. *Seal top and bottom of drain strips to prevent soil from entering drain.*



PLAN VIEW



SECTION VIEW

DRAINAGE INLET @ SOIL NAIL WALL

NO SCALE

NOTES:

1. *See Special 259-A For Soil Nail Wall Typical Section.*
2. *See Special 259-B For Typical End Of Wall Detail Unless Soil Nail Wall Terminates Into A rock Cut Slope.*

03/26/2021

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G22

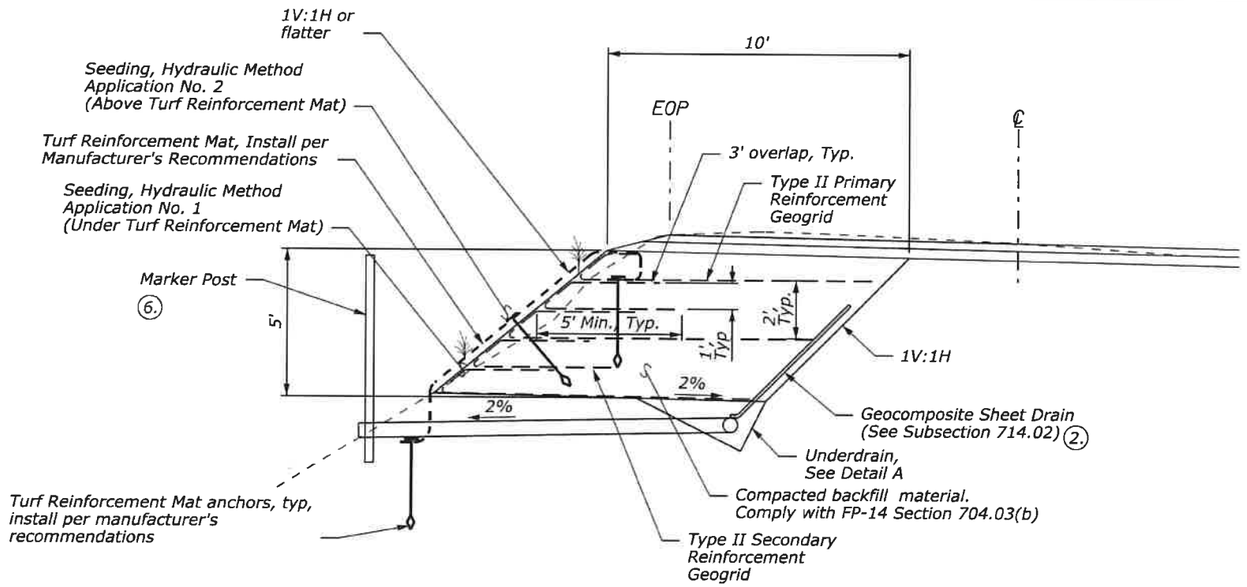
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY SPECIAL

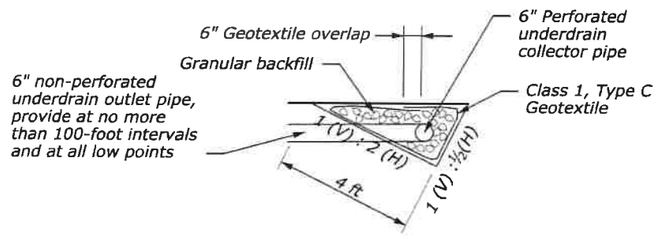
SOIL NAIL WALL DETAILS NO. 2

SPECIAL
259-C

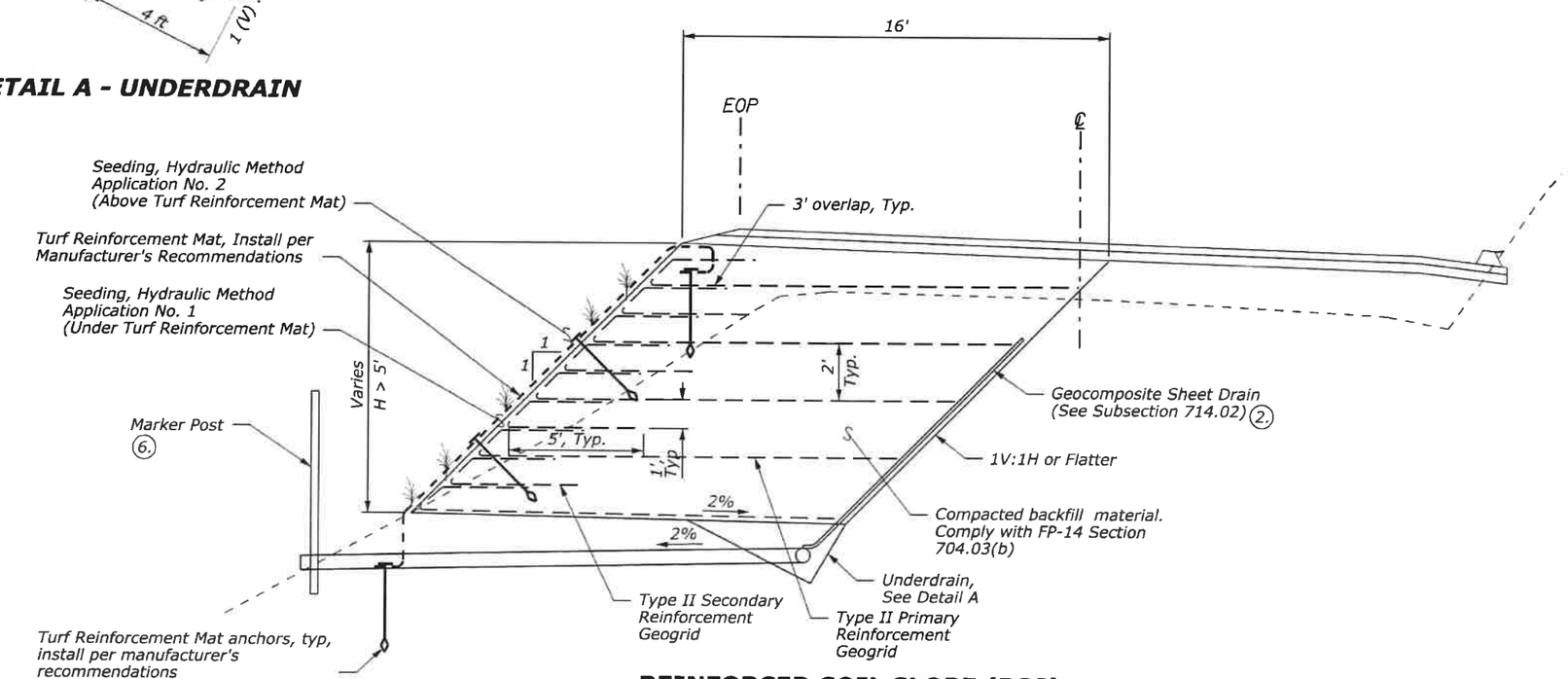
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G23



REINFORCED SOIL SLOPE (RSS) DETAIL NO. 1 (H=5')



DETAIL A - UNDERDRAIN



REINFORCED SOIL SLOPE (RSS) DETAIL NO. 2

NO SCALE

NOTE:

1. If bedrock is encountered within the back cut, the excavation can follow the rock surface and reinforcement length reduced. In no case shall the reinforcement length be less than 0.6H.
2. Only install on back cut where water or evidence of water is observed during construction.
3. Place geocomposite sheet drains in 3' (min.) wide strips with a spacing to achieve 30% ±5% coverage area on excavation backslope to 2/3H.
4. Connect collector pipes to outlet pipes using a t-connector and outlet at low points and at 100' (max.) spacing. Furnish collector pipe, and fittings meeting the requirements of subsection 708.04.
5. Cover the end of the outlet pipe with screen according to subsection 605.03. Hold the screen securely in place with standard coupling bands or by other approved means with securing screws.
6. Mark the outlet of the outlet pipe with a 4' long post or other suitable marker. Place post within 12" of the end of the pipe.

08/22/2022

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

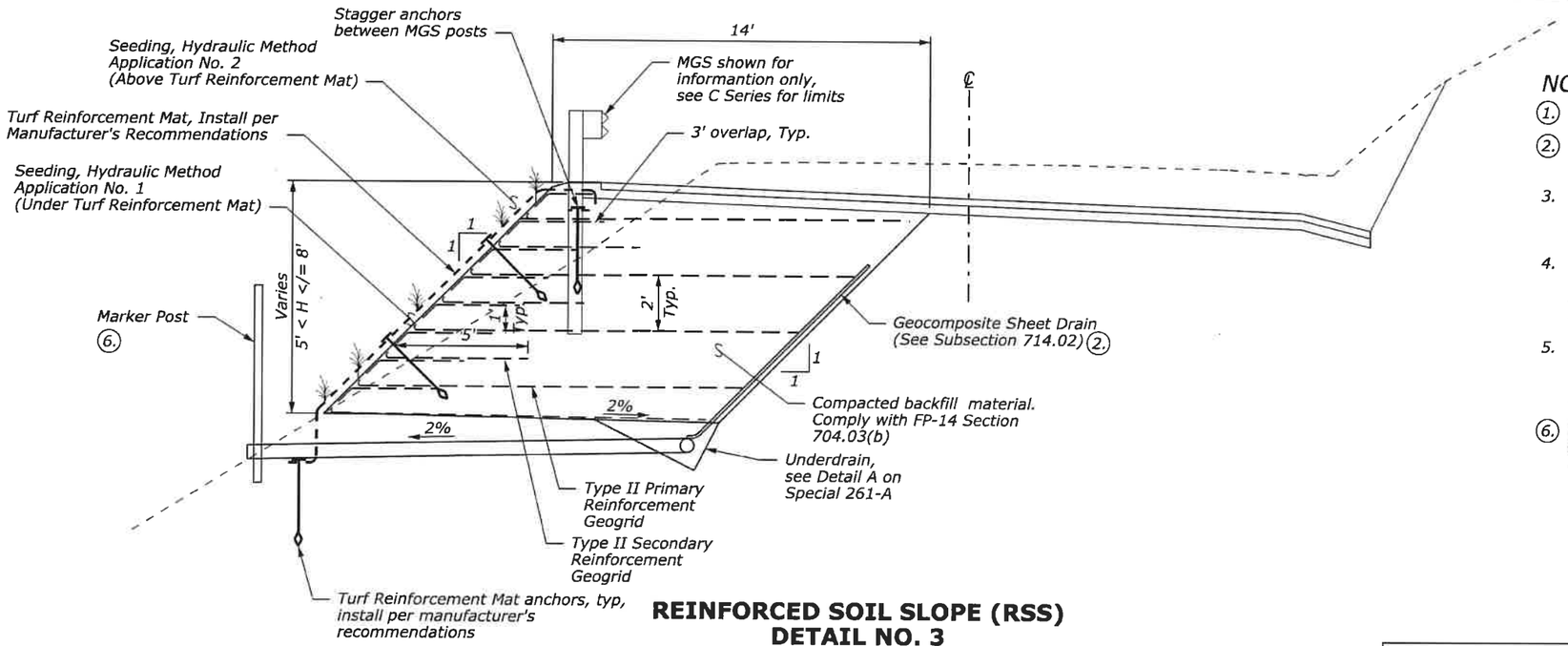
U.S. CUSTOMARY SPECIAL

REINFORCED SOIL SLOPE

Sheet 1 of 2

SPECIAL
261-A

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G24



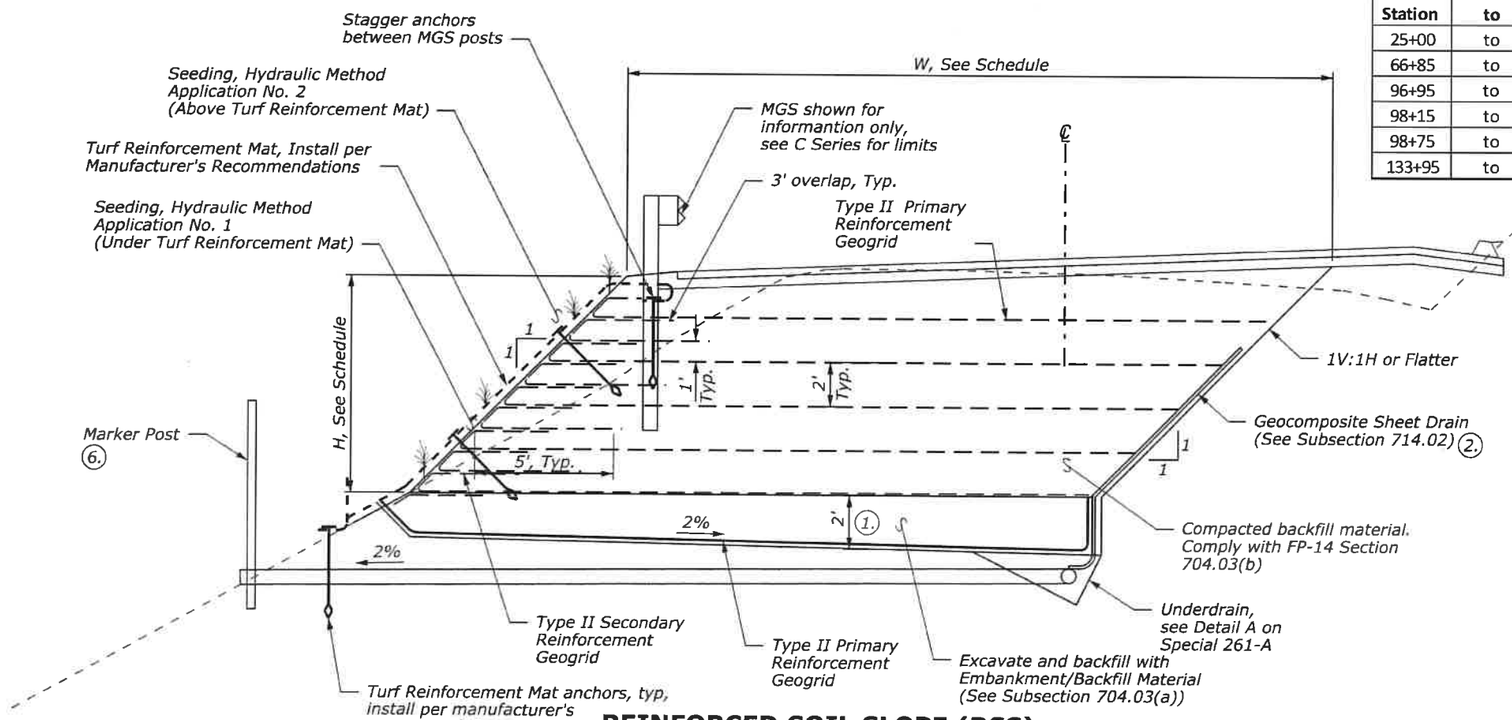
REINFORCED SOIL SLOPE (RSS)
DETAIL NO. 3

NOTE:

1. Excavate 2' or to top of bedrock, whichever is less.
2. Only install on back cut where water or evidence of water is observed during construction.
3. Place geocomposite sheet drains in 3' (min.) wide strips with a spacing to achieve 30% ±5% coverage area on excavation backslope to 2/3H.
4. Connect collector pipes to outlet pipes using a t-connector and outlet at low points and at 100' (max.) spacing. Furnish collector pipe, and fittings meeting the requirements of subsection 708.04.
5. Cover the end of the outlet pipe with screen according to subsection 605.03. Hold the screen securely in place with standard coupling bands or by other approved means with securing screws.
6. Mark the outlet of the outlet pipe with a 4' long post or other suitable marker. Place post within 12" of the end of the pipe.

DETAIL NO. 4 SCHEDULE

Station	to	Station	Length	H (Max Height, Ft)	W (Grid Width, Ft)
25+00	to	25+60	60	12	16
66+85	to	67+25	40	16	24
96+95	to	97+25	30	12	22
98+15	to	98+40	25	12	18
98+75	to	99+35	60	18	22
133+95	to	134+70	75	12	20



REINFORCED SOIL SLOPE (RSS)
DETAIL NO. 4

NO SCALE

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA

08/22/2022

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

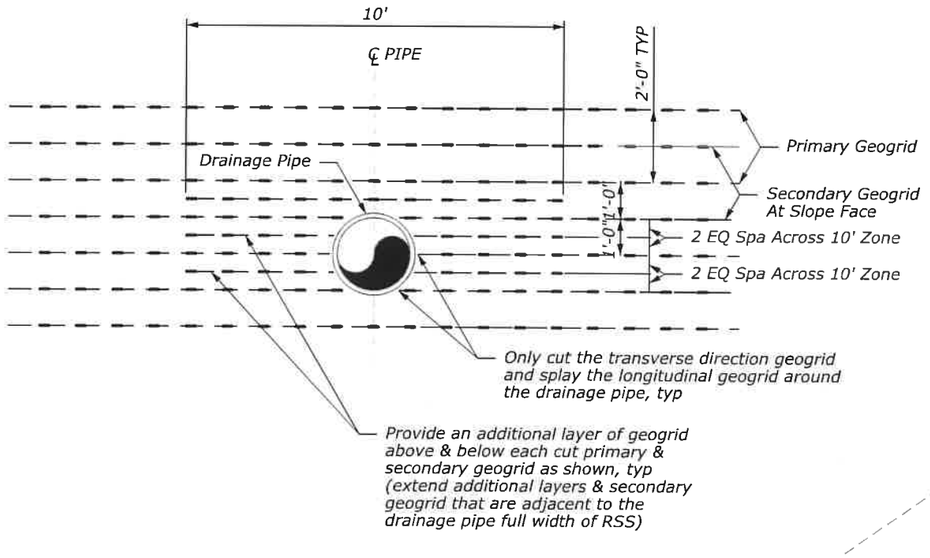
U.S. CUSTOMARY SPECIAL

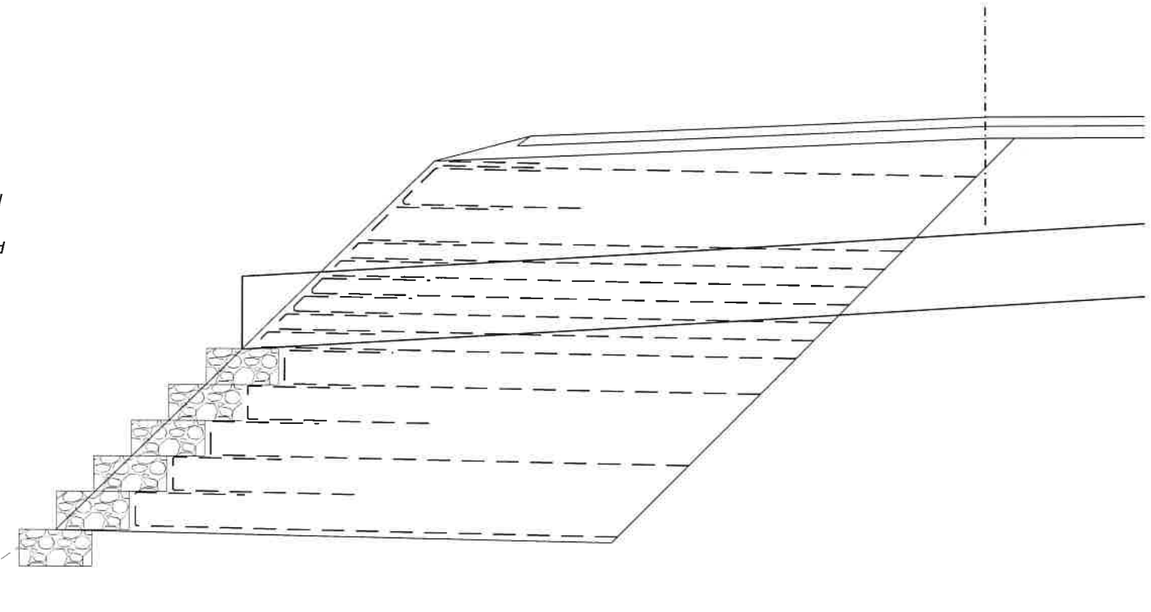
REINFORCED SOIL SLOPE

Sheet 2 of 2

SPECIAL
261-B

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	G25





DRAINAGE PIPE THROUGH RSS

REGISTERED PROFESSIONAL ENGINEER
STEPHEN D. DIEM
GE 3022
EXP. 12-31-22
GEOTECHNICAL
STATE OF CALIFORNIA
03/25/2021

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

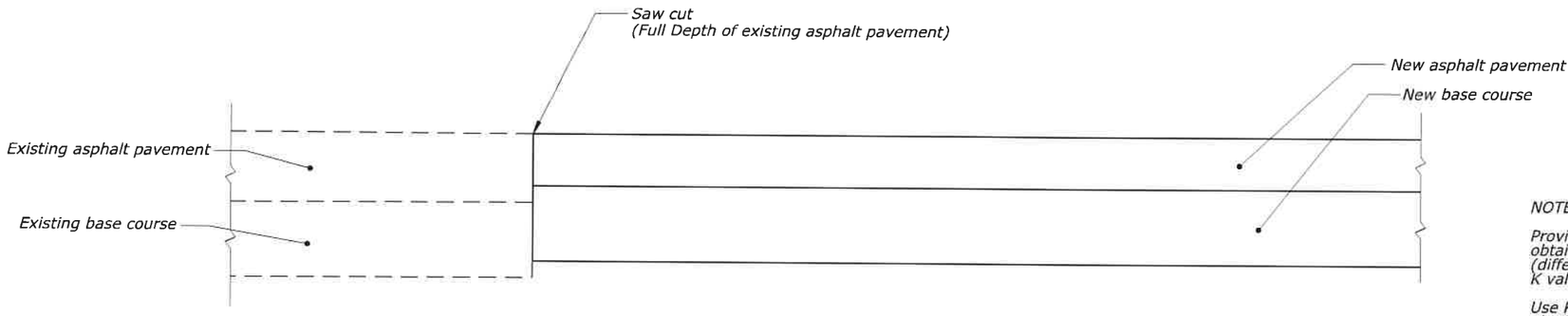
U.S. CUSTOMARY SPECIAL

DRAINAGE PIPE THROUGH RSS

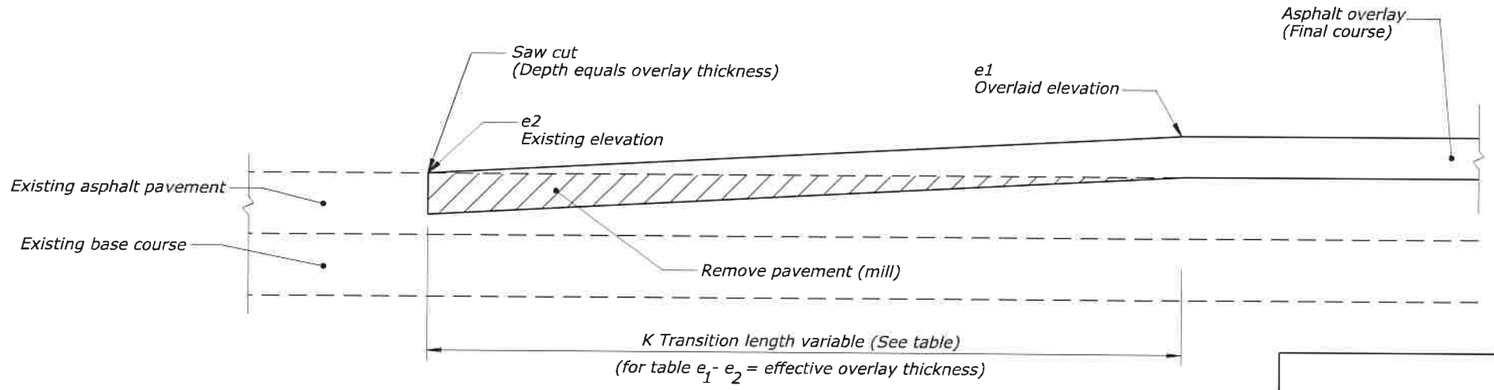
NO SCALE

SPECIAL
261-C

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	K1



NEW PAVEMENT



OVERLAY

NOTE :

Provide a transition length in feet that is not less than the value obtained by multiplying the effective overlay thickness in inches (difference between the existing and overlaid elevations) by the K value from the Table for the posted speed of the roadway.

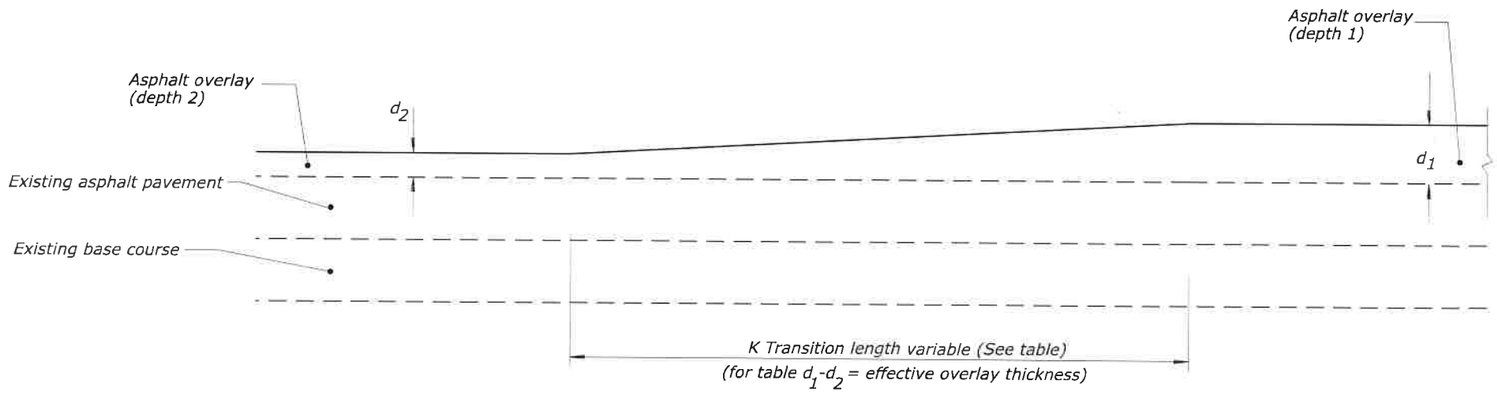
Use K*[e1-e2]=T, or K*[d1-d2]=T (whichever applies), to obtain the transition length.
(Minimum transition length=30 feet)

Example :
If the posted speed is 55 MPH
Effective overlay thickness = 2 inches
Then the minimum transition length =
2 inches x 42.5 ft./in. = 85 feet.

K VALUE TABLE (ft/in)

POSTED SPEED (MPH) *	30	35	40	45	50	55	60	65	70	75
K	30	32.5	35	37.5	40	42.5	45	47.5	50	52.5

* Use a K Value of 30 for speeds less than 30 MPH.



OVERLAY - DEPTH TRANSITIONS

NO SCALE

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021
FOR SELECTION ONLY

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

U.S. CUSTOMARY DETAIL

PAVEMENT TRANSITIONS

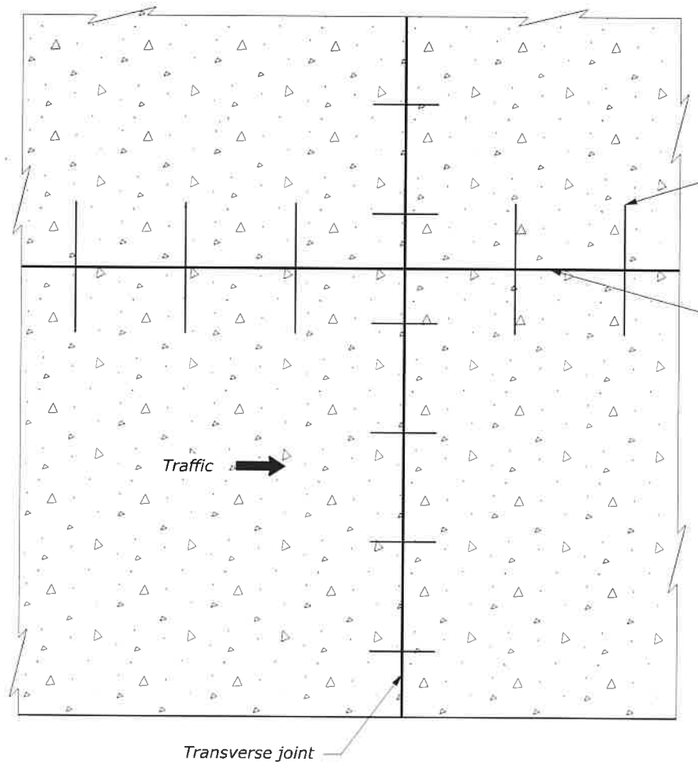
DETAIL APPROVED FOR USE
APPROVED : FEBRUARY 2013

DETAIL
E401-01

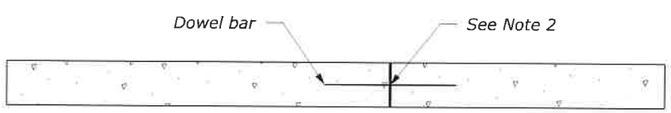
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	R1

NOTE:

1. *Provide the same type of dowel assemblies and tie bars for joints in plain portland cement concrete pavement as shown for joints in reinforced pavement.*
2. *See Standard 501-2 for joint and joint sealing details.*
3. *Lap longitudinal and transverse reinforcement not less than 15 inches.*

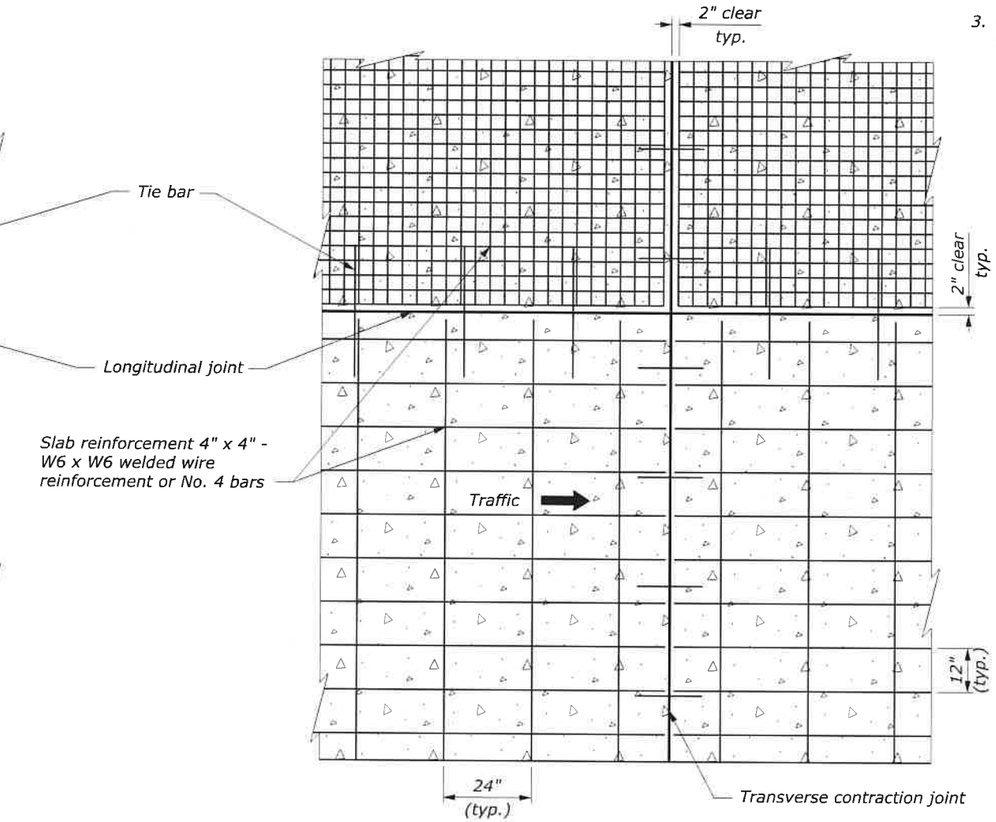


PLAN

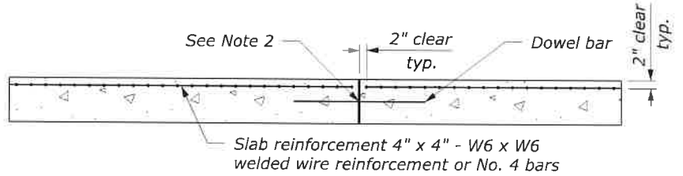


PROFILE

PLAIN MINOR CONCRETE PAVEMENT



PLAN



PROFILE

REINFORCED MINOR CONCRETE PAVEMENT

PAVEMENT THICKNESS (in)	TRANSVERSE JOINT SPACING (ft)
T < 6	10
6 ≤ T <12	15

NO SCALE

03/26/2021

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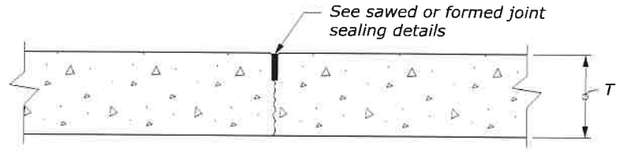
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL LANDS HIGHWAY OFFICE

U.S. CUSTOMARY STANDARD

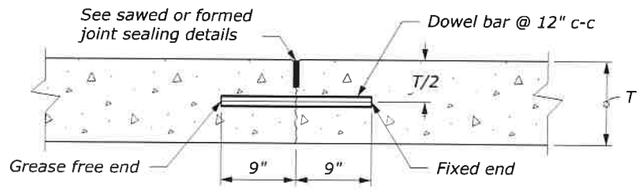
MINOR CONCRETE PAVEMENT

STANDARD APPROVED FOR USE	STANDARD
REVISED: 9/2016	501-1

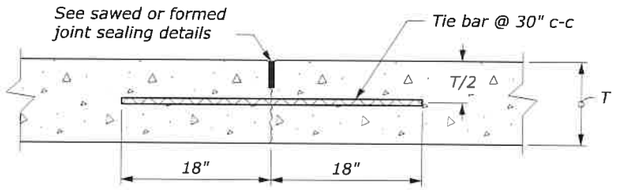
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	R2



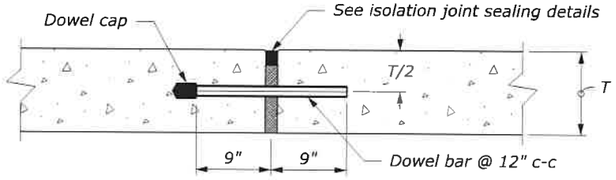
CONTRACTION JOINT
UNDOWELED - TRANSVERSE and UNTIED - LONGITUDINAL



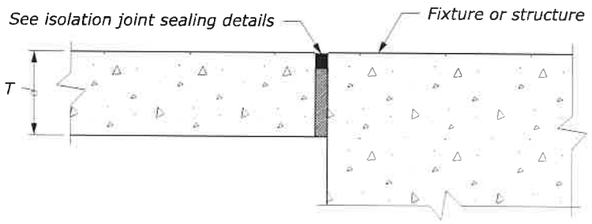
CONTRACTION JOINT
DOWELED - TRANSVERSE



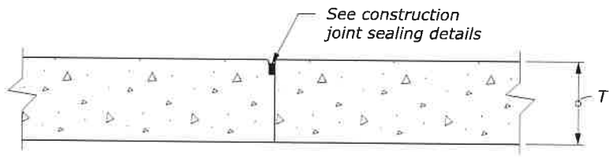
CONTRACTION JOINT
TIED - LONGITUDINAL



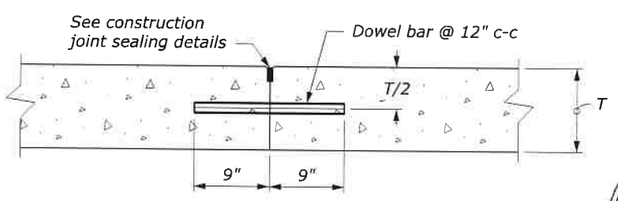
ISOLATION/EXPANSION JOINT
DOWELED - TRANSVERSE



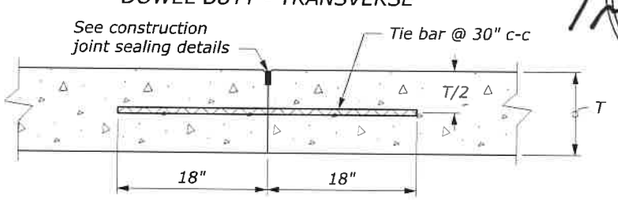
ISOLATION JOINT
UNDOWELED - LONGITUDINAL



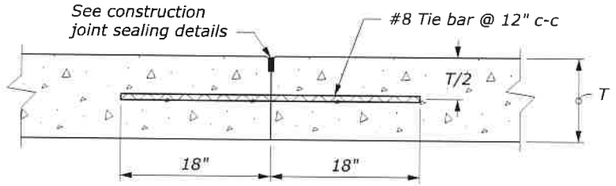
CONSTRUCTION JOINT
PLAIN - TRANSVERSE or LONGITUDINAL



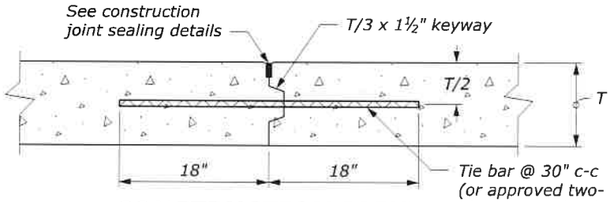
CONSTRUCTION JOINT
DOWEL BUTT - TRANSVERSE



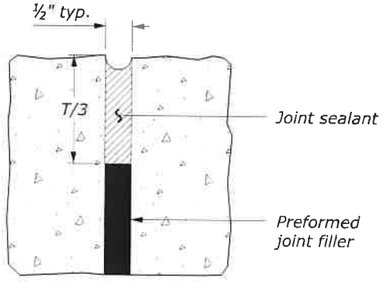
CONSTRUCTION JOINT
TIED BUTT - LONGITUDINAL



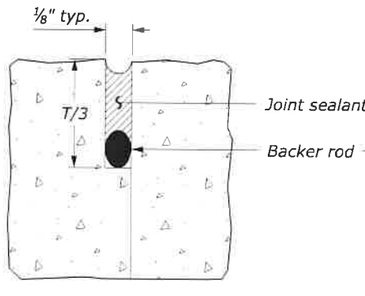
CONSTRUCTION JOINT
TIED BUTT - TRANSVERSE



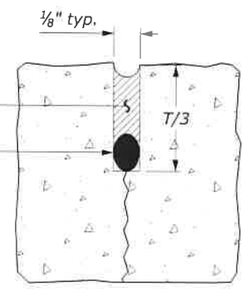
CONSTRUCTION JOINT
KEYWAY - LONGITUDINAL



ISOLATION JOINT



CONSTRUCTION JOINT



SAWED OR FORMED JOINT

NOTE:

1. *Use epoxy-coated material for all tie bars, dowels, and other steel used in the construction of concrete pavement.*
2. *Deformed reinforcing bars or hook bolts may be used for tie bars.*
3. *Do not place tie bars within 15 inches of transverse joints.*
4. *Install isolation joints when abutting a fixed structure. Use expansion joint material extending the full depth and length of the concrete surface.*
5. *Transverse and longitudinal construction joints are not included in the joint layout plan. Use transverse and longitudinal construction joints sparingly. Submit planned construction joint locations for approval.*
6. *For construction joints, if tie bars and dowels are not set into concrete during placement, drill and anchor the tie bars and dowels into the existing concrete construction with epoxy resin.*
7. *Maintain joint sealant shape factor of 1:1; except when silicone sealant is used maintain the width to depth shape factor of 2:1 or as recommended by sealant manufacturer.*
8. *See Section 712 for joint material requirements.*
9. *See Standards 501-1 or 502-1 for reinforcement details.*

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021
FOR SELECTION ONLY

BAR SIZES		
PAVEMENT THICKNESS (T) (in)	TIE BAR	DOWEL BAR DIAMETER (in)
T ≤ 8	#5	1
8 < T ≤ 10	#5	1¼
10 < T ≤ 12	#6	1½

MINOR CONCRETE PAVEMENT JOINT SEALING DETAILS

NO SCALE

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

U.S. CUSTOMARY STANDARD

MINOR CONCRETE PAVEMENT JOINTS

STANDARD APPROVED FOR USE
REVISED: 9/2016

STANDARD 501-2

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T1

METAL ROUND PIPE CULVERT

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

STEEL

PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	2⅔" x ½" CORRUGATIONS					3" x 1" CORRUGATIONS					5" x 1" CORRUGATIONS				
		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
		MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE (FEET)														
12	12	100	100	100	100	100										
15	12	100	100	100	100	100										
18	12	100	100	100	100	100										
21	12	100	100	100	100	100										
24	12	100	100	100	100	100										
30	12	85	100	100	100	100										
36	12	71	89	100	100	100	81	100	100	100	100					
42	12	61	76	100	100	100	70	87	100	100	100					
48	12	53	66	93	100	100	61	76	100	100	100	54	68	95	100	100
54	12		59	83	100	100	54	68	95	100	100	48	60	85	100	100
60	12			74	97	100	49	61	86	100	100	43	54	76	98	100
66	12				87	100	44	55	78	100	100	39	49	69	89	100
72	12				80	97	40	51	71	92	100	36	45	63	82	100
78	12					87	37	47	66	85	100	33	42	58	75	92
84	12					75	35	43	61	78	96	31	39	54	70	86
90	12						32	40	57	73	90	29	36	51	65	80
96	12							38	53	69	84		34	48	61	75
102	18							36	50	65	79		32	45	57	71
108	18								47	61	75			42	54	67
114	18								45	58	71			40	52	63
120	18								43	55	67			38	49	60
126	18									52	64				47	57
132	18									50	61				44	54
138	18									48	58				42	52
144	18										56					50

ALUMINUM

PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	2⅔" x ½" CORRUGATIONS					3" x 1" CORRUGATIONS				
		METAL THICKNESS (INCH/GAGE)									
		0.060/16	0.075/14	0.105/12	0.135/10	0.164/8	0.060/16	0.075/14	0.105/12	0.135/10	0.164/8
		MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE (FEET)									
12	12	100	100	100	100	100					
15	12	100	100	100	100	100					
18	12	100	100	100	100	100					
21	12	88	100	100	100	100					
24	12	77	97	100	100	100					
30	12	62	77	100	100	100	71	89	100	100	100
36	12	52	64	90	100	100	59	74	100	100	100
42	12	44	55	77	99	100	51	64	89	100	100
48	12			67	87	100	44	56	78	100	100
54	18			54	71	88	39	50	69	93	100
60	18				57	72	35	45	62	83	98
66	18					58	32	40	56	76	89
72	18					45	30	37	55	70	82
78	24							34	48	64	75
84	24								44	59	70
90	24								41	62	65
96	24								38	51	61
102	24									46	55
108	24									42	50
114	24										45
120	24										40

NOTE:

1. 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.
2. Fill heights exceeding 100 feet require special analysis by the CO.
3. 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.
4. 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

PIPE ARCH SIZE SPAN x RISE INCHES	EQUI-VALENT DIAMETER INCHES	MINIMUM CORNER RADIUS INCHES	MINIMUM COVER INCHES	2⅔" x ½" CORRUGATIONS					3" x 1" CORRUGATIONS					5" x 1" CORRUGATIONS				
				METAL THICKNESS (INCH/GAGE)														
				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		
				MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE (FEET)														
17 x 13	15	3	12	13														
21 x 15	18	3	12	12														
24 x 18	21	3	12	13														
28 x 20	24	3	12	13														
35 x 24	30	3	12	12														
42 x 29	36	3.5	12	12														
49 x 33	42	4	12		12													
57 x 38	48	5	12			12												
60 x 46	54	8	15							21					21			
64 x 43	54	6	12			12												
66 x 51	60	9	15							21					21			
71 x 47	60	7	12				12											
73 x 55	66	12	18							20					20			
77 x 52	66	8	12					12										
81 x 59	72	14	18						17				17					
83 x 57	72	9	12					12										
87 x 63	78	14	18						17				17					
95 x 67	84	16	18						17				17					
103 x 71	90	16	18							17			17					
112 x 75	96	18	21							16					16			
117 x 79	102	18	21							16					16			
128 x 83	108	18	24								16					16		
137 x 87	114	18	24								16					16		
142 x 91	120	18	24									16						16

ALUMINUM

PIPE ARCH SIZE SPAN x RISE INCHES	EQUI-VALENT DIAMETER INCHES	MINIMUM CORNER RADIUS INCHES	MINIMUM COVER INCHES	2⅔" x ½" CORRUGATIONS				3" x 1" CORRUGATIONS			
				METAL THICKNESS (INCH/GAGE)							
				0.060/16	0.075/14	0.105/12	0.135/10	0.060/16	0.075/14	0.105/12	0.135/10
				MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE (FEET)							
17 x 13	15	3	12	13							
21 x 15	18	3	12	12							
24 x 18	21	3	12	13							
28 x 20	24	3	12		13						
35 x 24	30	3	12		12						
42 x 29	36	3.5	15			12					
49 x 33	42	4	15			12					
57 x 38	48	5	15				12				
60 x 46	54	8	15					21			
64 x 43	54	6	18				12				
66 x 51	60	9	18					21			
73 x 55	66	12	18						20		
81 x 59	72	14	21							17	
87 x 63	78	14	21							17	
95 x 67	84	16	24							17	
103 x 71	90	16	24								17

NO SCALE

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021
FOR SELECTION ONLY

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

U.S. CUSTOMARY STANDARD

METAL PIPE CULVERT

STANDARD APPROVED FOR USE 12/1993	STANDARD
REVISED: 4/1994 6/2005	602-1

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T2

COUPLING BANDS FOR METAL PIPE CULVERT [1]

CORRUGATION SIZE [2] INCHES	ROUND PIPE DIAMETER INCHES	PIPE ARCH SPAN × RISE INCHES	MINIMUM BAND WIDTH (INCHES) ANNULAR CORRUGATED BANDS [3]	HELICALLY CORRUGATED BANDS [4]	SEMI-CORRUGATED BANDS [5]
1½ × ¼	underdrain [6]	-	10.5	7	10.5
2⅔ × ½	12 to 36	17 × 13 to 42 × 29	7	12	
	42 to 72	49 × 33 to 83 × 57	10.5	12	
	78 to 84	-	10.5	12	10.5
3 × 1	36 to 72	60 × 46 to 81 × 59	12	14	10.5
	78 to 144	87 × 64 to 142 × 91	12	14	10.5
5 × 1	36 to 72	60 × 46 to 81 × 59	20	22	
	78 to 144	87 × 64 to 142 × 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:
⅜" for 18" round culvert (21" × 15" pipe arch) or less
½" for 21" round culvert (24" × 18" pipe arch) or more

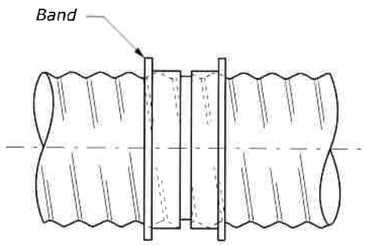
[2] For helically corrugated pipe with rerolled ends, the nominal corrugations size refers to the dimension of the end corrugation in the pipe.

[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 2⅔" × ½" corrugations. A 12 inch band is acceptable on pipe ends rerolled with 3" × 1" pipe corrugations.

[4] Use helical corrugated bands with pipes having helically corrugated ends.

[5] The minimum band widths shown for 3" × 1" and 5" × 1" corrugated sizes apply to 2⅔" × ½" corrugations on rerolled pipe ends.

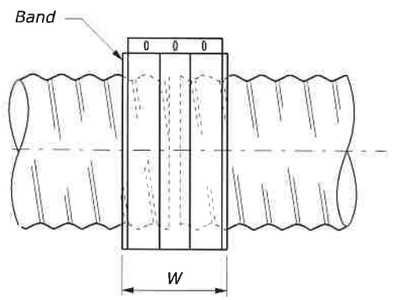
[6] Smooth sleeve-type couplers and flat bands may be used for pipe diameters of 12" or less. Use a matching metal having a nominal thickness of not less than 0.040 inch for steel, or 0.036 inch for aluminum, or a plastic with an equivalent strength to metal.



SLEEVE JOINT

Smoother sleeve with center stop.
Stab type joint

SMOOTH SLEEVE BAND



FLAT BAND

NOTE:

1. Watertight pipe joints are not required unless specified in the Special Contract Requirements.
2. 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.

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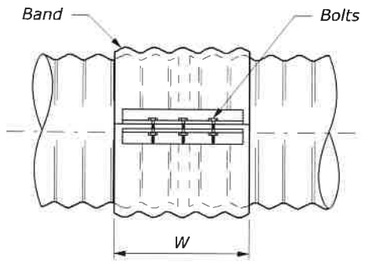
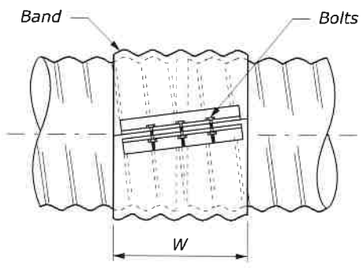
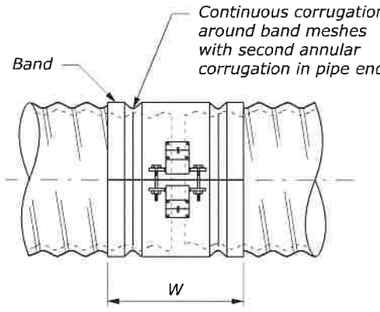


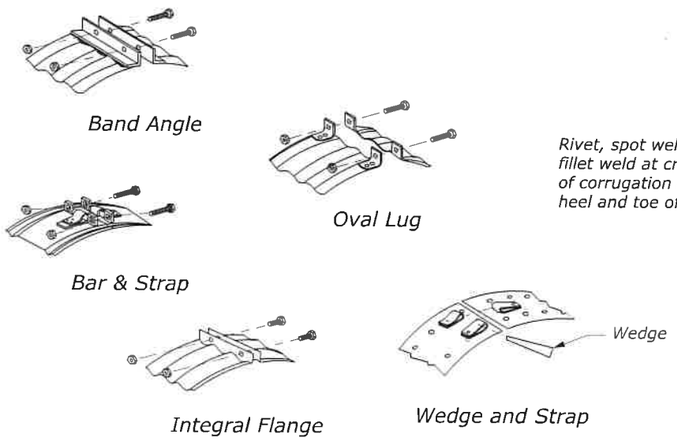
SIDE VIEW



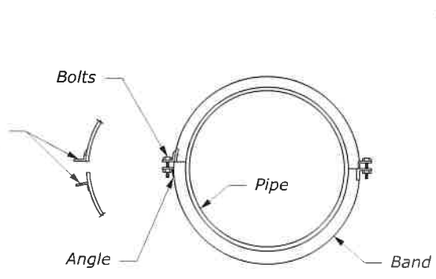
SIDE VIEW



SIDE VIEW



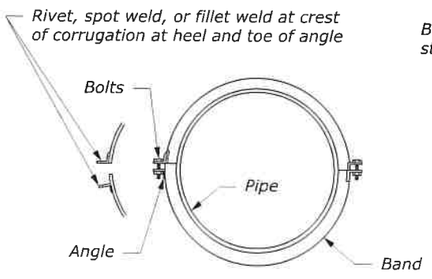
STANDARD BAND CONNECTIONS



END VIEW

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

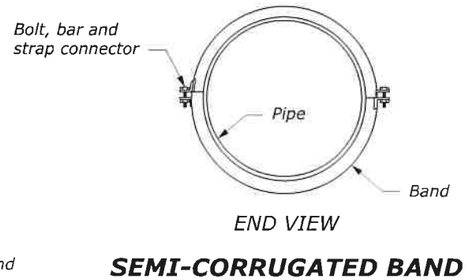
ANNULAR BAND



END VIEW

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

HELICAL BAND



END VIEW

SEMI-CORRUGATED BAND

NO SCALE

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

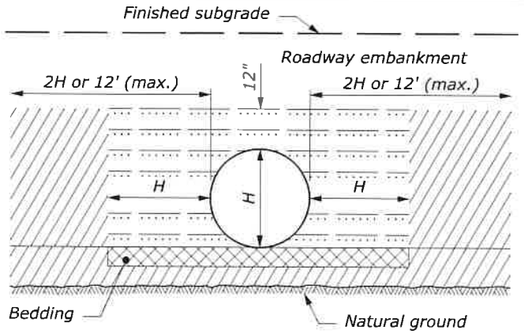
U.S. CUSTOMARY STANDARD

METAL PIPE CULVERT COUPLING BAND

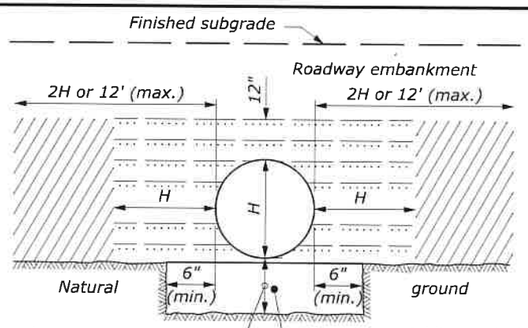
STANDARD APPROVED FOR USE 12/1993
REVISED: 4/1994 6/2005

STANDARD 602-2

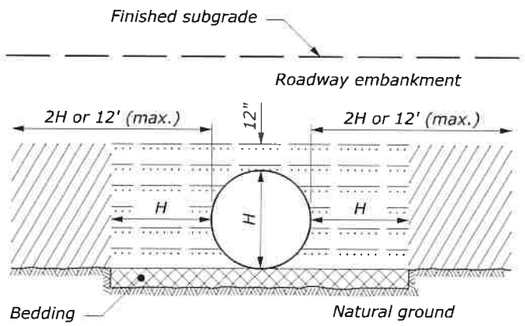
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T3



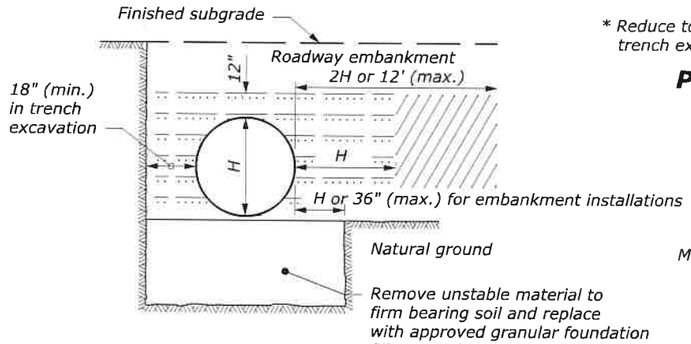
ABOVE NATURAL GROUND



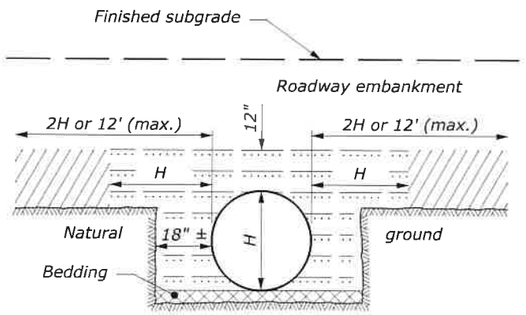
ON UNYIELDING MATERIAL



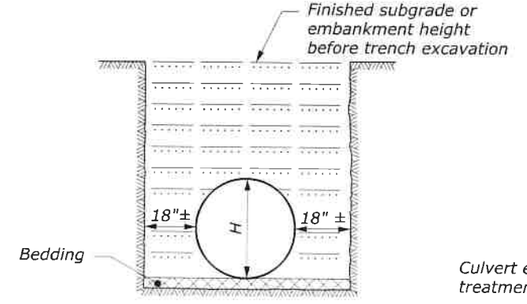
ON NATURAL GROUND



ON UNSTABLE MATERIAL

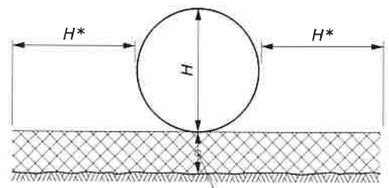


ABOVE AND BELOW NATURAL GROUND



BELOW NATURAL GROUND OR TRENCH EXCAVATION IN EMBANKMENT

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

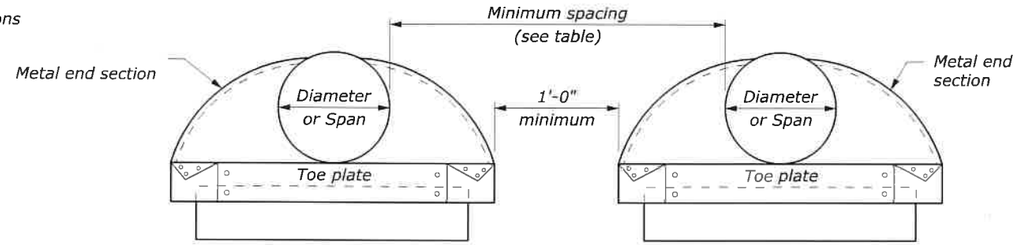


PIPE BEDDING

NOTE:

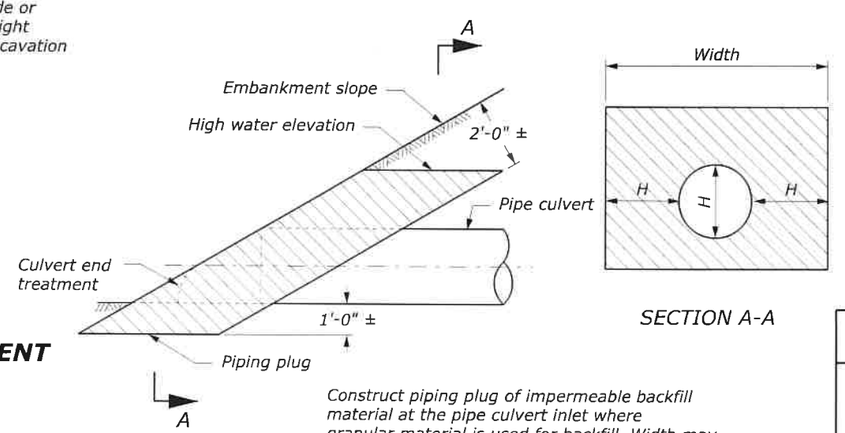
1. When directed, camber pipe culverts upward from a chord through the inlet and outlet inverts an ordinate amount equal to 1% of the pipe length. Develop camber on a parabolic curve. If the midpoint elevation on the parabolic curve as designed exceeds the elevation of the inlet invert, reduce the amount of camber or increase the pipe culvert gradient.
2. H equals the diameter of all round pipe culverts or the rise dimension of all pipe arch culverts.
3. See Section 704 for bedding and backfill requirements.
4. Use lean concrete backfill for culverts with cover less than 12 inches. Minimum allowable cover is 6 inches.

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



ELEVATION

MULTIPLE PIPE INSTALLATION



SECTION A-A

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

PIPING PLUG

NO SCALE

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.

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TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA
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FEDERAL HIGHWAY ADMINISTRATION
FEDERAL LANDS HIGHWAY OFFICE

U.S. CUSTOMARY STANDARD

METAL AND PLASTIC PIPE CULVERT BEDDING

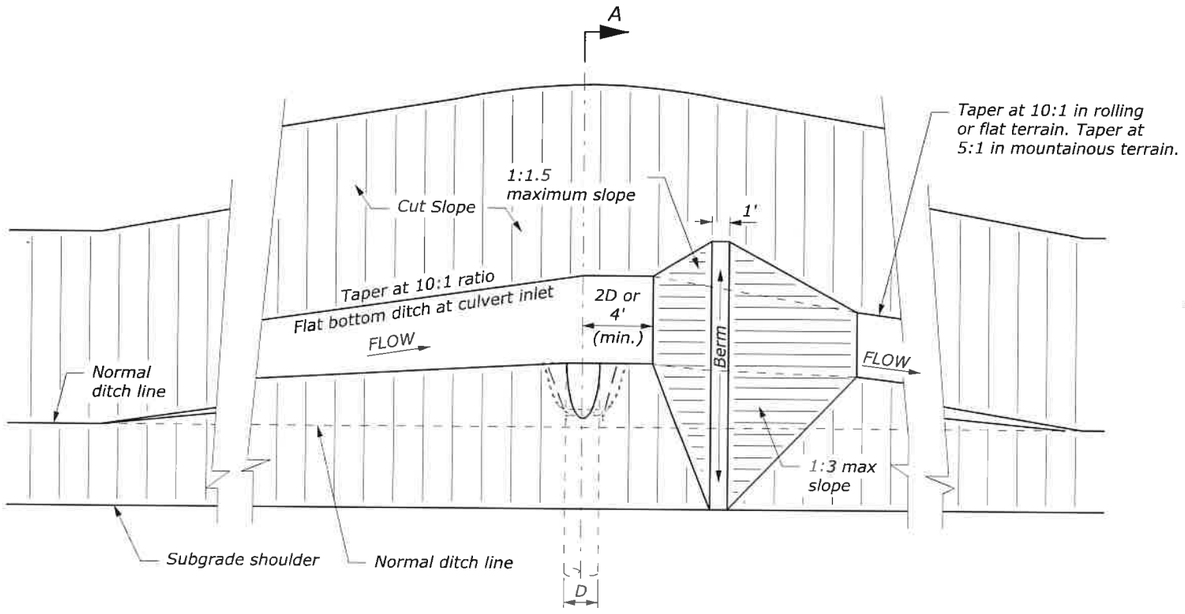
STANDARD APPROVED FOR USE 12/1993
REVISED: 4/1994 6/2005
DRAFT: 10/2017

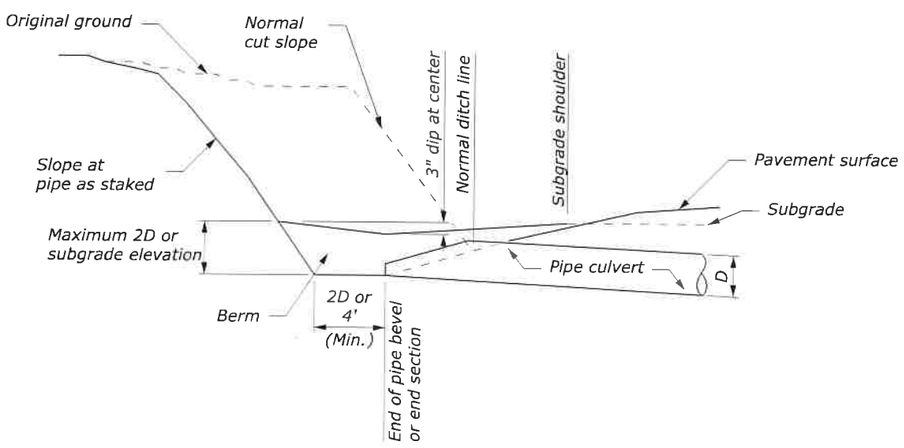
STANDARD 602-3

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T4

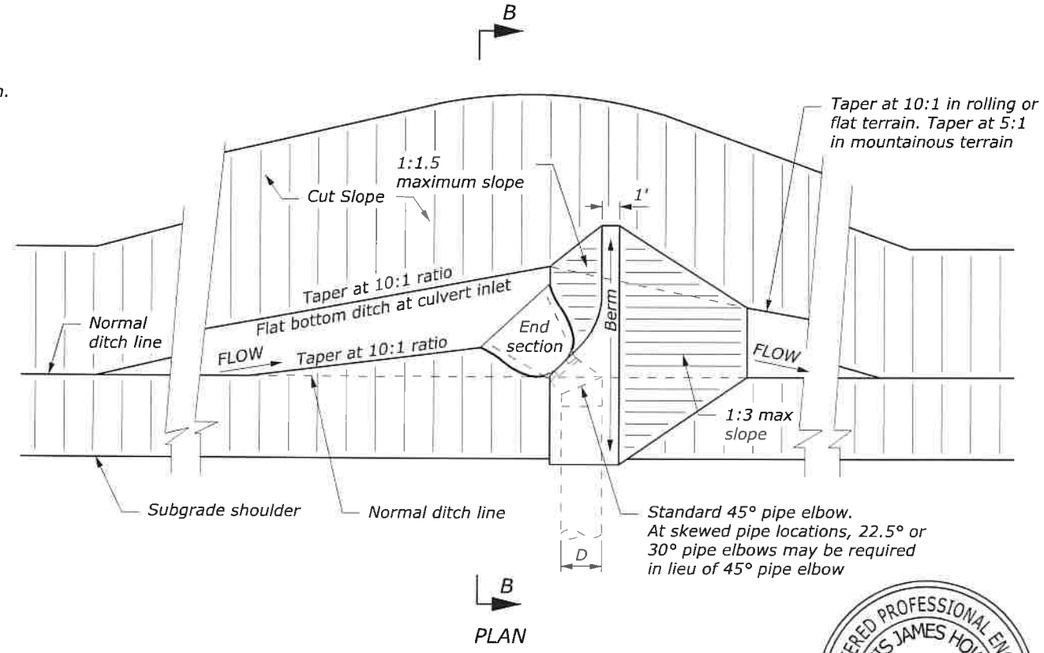
NOTE:

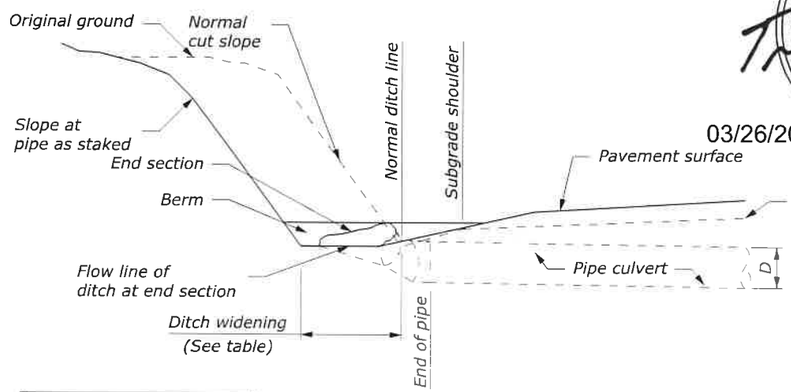
1. D equals the diameter of all round pipe or the rise dimension of all pipe arch culverts.





SECTION A-A
TYPE I





DITCH WIDENING	
PIPE SIZE (D)	WIDENING
18"	5'
24"	6'
30"	7'

SECTION B-B
TYPE II

NO SCALE

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
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03/26/2021

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FEDERAL HIGHWAY ADMINISTRATION
FEDERAL LANDS HIGHWAY OFFICE

U.S. CUSTOMARY STANDARD

PIPE CULVERT INLET TREATMENT IN CUT SLOPES

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

STANDARD 602-6

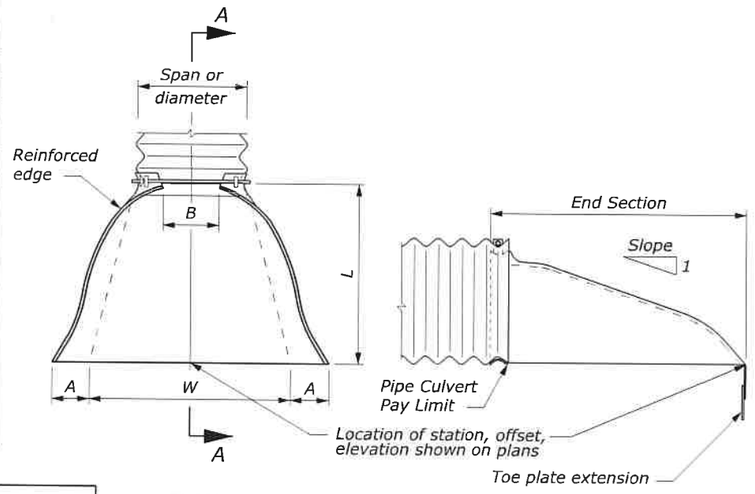
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T5

END SECTIONS FOR ROUND PIPE CULVERT

PIPE SIZE DIAMETER INCHES	METAL THICKNESS				DIMENSIONS INCHES					SLOPE Approx.
	STEEL		ALUMINUM							
	INCHES	GAGE	INCHES	GAGE	A (min)	B (max)	H (min)	L (±2")	W (max)	
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	2⅛
21	0.064	16	0.060	16	8	12	6	36	66	2⅛
24	0.064	16	0.060	16	9	13	6	41	72	2⅛
30	0.079	14	0.075	14	11	16	8	51	88	2⅛
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	2⅛
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	1⅞
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	1⅜
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	1⅛

END SECTIONS FOR PIPE ARCH CULVERT

PIPE SIZE SPAN × RISE INCHES	EQUI-VALENT DIAM. (INCHES)	METAL THICKNESS				DIMENSIONS INCHES					SLOPE Approx.
		STEEL		ALUMINUM							
		INCHES	GAGE	INCHES	GAGE	A (min)	B (max)	H (min)	L (±2")	W (max)	
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

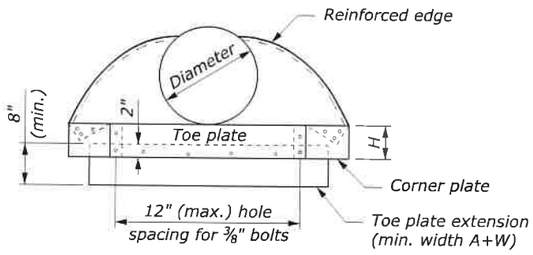


PLAN SECTION A-A

ROUND OR PIPE ARCH CULVERT

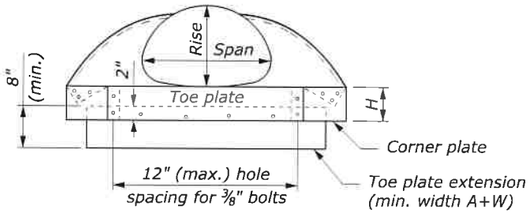
NOTE:

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 ⅜" 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 2½" × 2½" × ¼" 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 2½" × 2½" × ¼" 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.



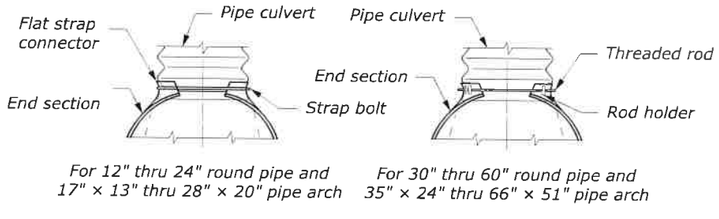
ELEVATION

ROUND PIPE CULVERT



ELEVATION

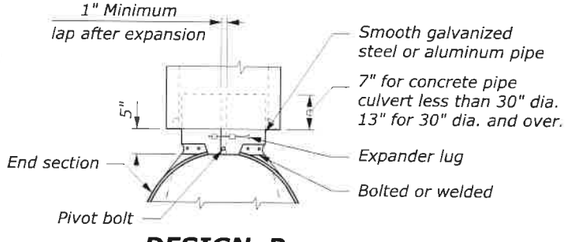
PIPE ARCH CULVERT



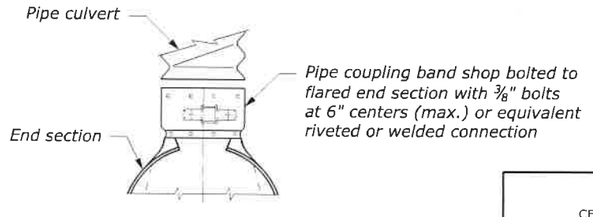
For 12" thru 24" round pipe and 17" × 13" thru 28" × 20" pipe arch

For 30" thru 60" round pipe and 35" × 24" thru 66" × 51" pipe arch

DESIGN A
CONNECTION TO ANNULAR CORRUGATED METAL PIPE



DESIGN B
CONNECTION TO CONCRETE PIPE INLET END



For all sizes of round pipe and pipe arch

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

NO SCALE

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021

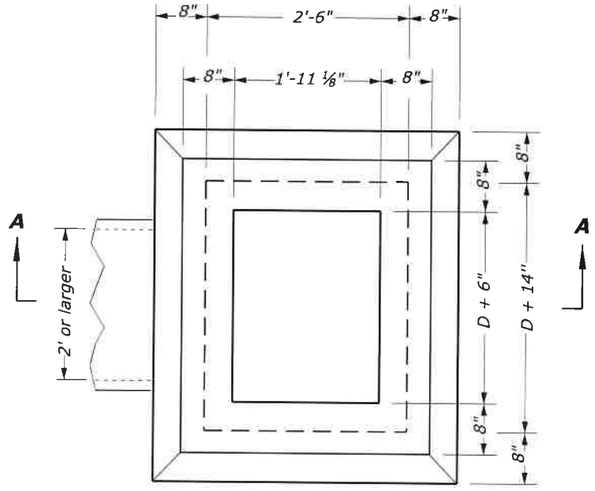
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY SPECIAL

METAL END SECTIONS

SPECIAL
602-A

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T6



NOTES:

1. At the option of the Contractor walls less than 4 feet may be of either concrete block or concrete as shown.

2. Construct Type 6A-A inlets for pipes 24 inch and larger for "Limited Headroom", unless otherwise directed by the CO.

3. Construct inlets parallel to the roadway centerline and grade. For pipes on skew, adapt inlets as directed by the CO.

4. Construct ladder rungs of 3/4" round or 3/4" square steel or wrought iron where depth exceeds 4'-0".

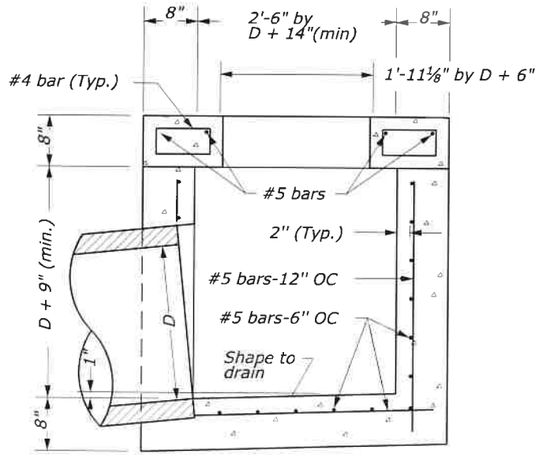
5. For frames and gratings, minor variations in design and dimensions are permitted to allow manufacturers standards. All grates are to be bicycle safe.

6. Orient curved vanes toward direction of stormwater flow. In a sump condition, orientation of curved vanes can be in either direction. Contractor is responsible for correct grate orientation towards stormwater flow.

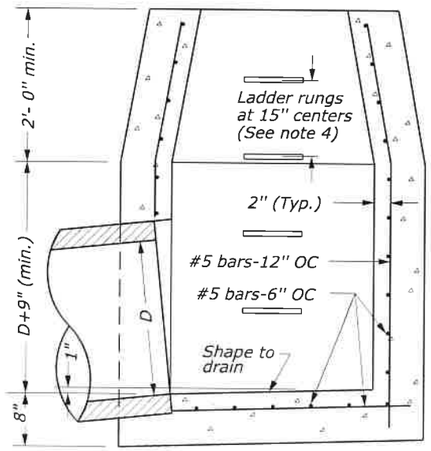
7. Construct Type 6A-6 metal frame and grading for 6" reveal, unless otherwise directed by the CO.

8. Type 6A-6 Inlets are paid for as an Each item under 60403-0000, Inlet.

03/26/2021



Limited headroom

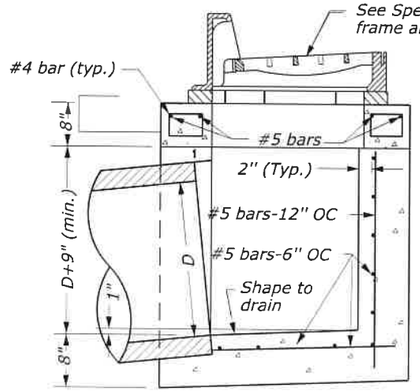


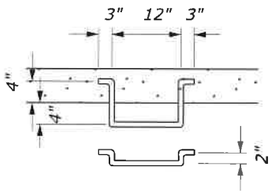
Ample headroom

SECTION A-A

TYPE 6A-A INLET

(for 24" or larger pipes)





LADDER RUNG

SECTION A-A

TYPE 6A-6 INLET

(up to 24" pipes)

NO SCALE

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

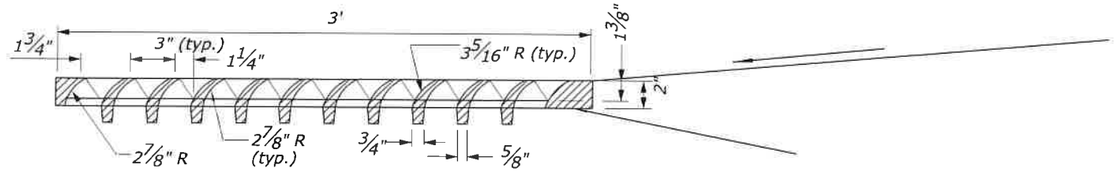
U.S. CUSTOMARY SPECIAL

INLET, TYPE 6A-6

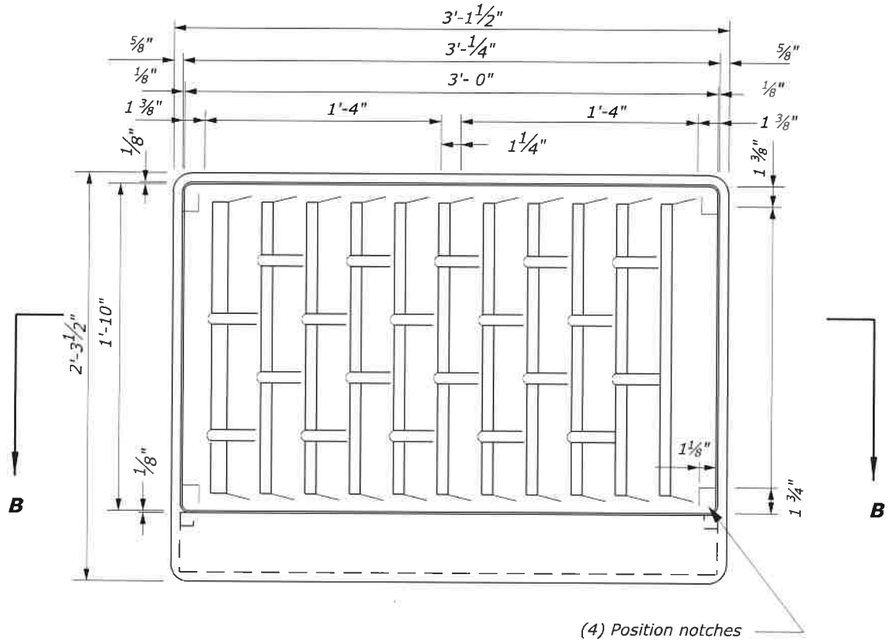
Sheet 1 of 2

SPECIAL
604-A

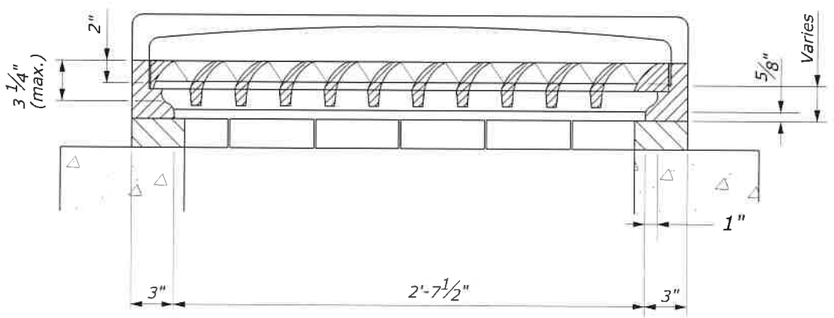
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T7



FRONT ELEVATION GRATE TYPE 6A-6 MOUNTED (CURVED VANE GRATINGS)

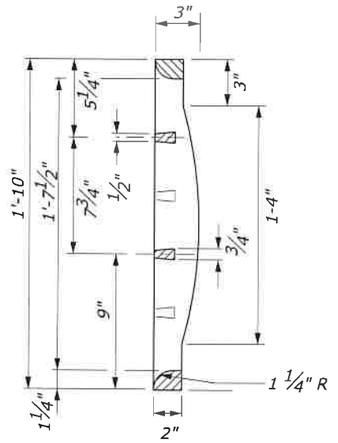


TOP VIEW FRAME GRATE TYPE 6A-6 MODIFIED (CURVED VANE GRATINGS)

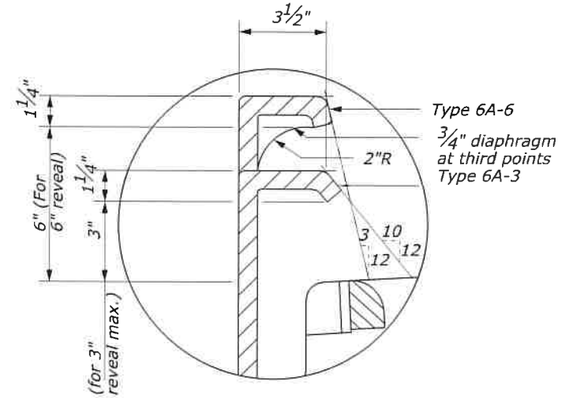


SECTION B-B

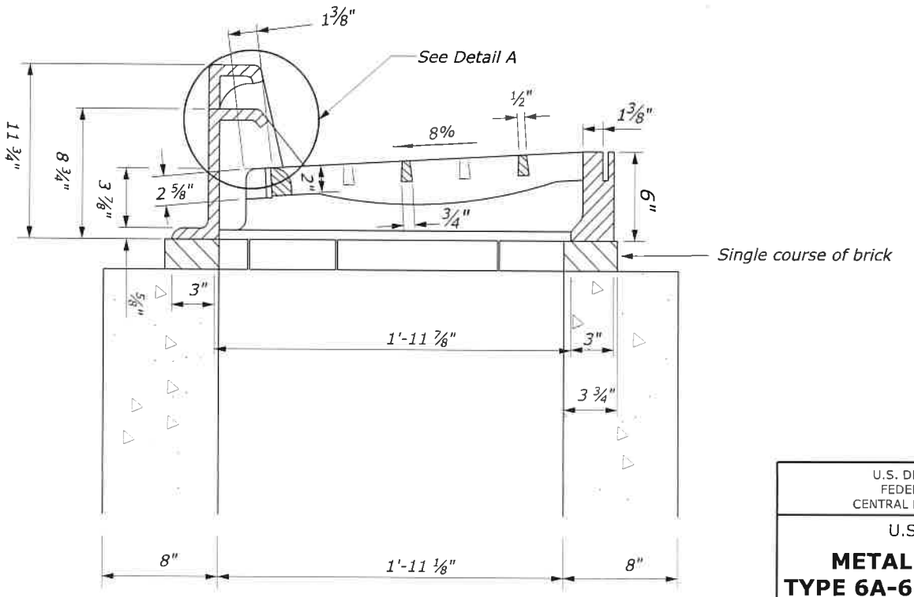
METAL FRAMES AND GRATING TYPE 6A-6 MODIFIED



SIDE ELEVATION GRATE TYPE 6A-6 MODIFIED (CURVED VANE GRATINGS)



DETAIL A



NO SCALE

NOTES:

1. *For frames and gratings, minor variations in design and dimensions are permitted to allow manufacturers standards. All grates are to be bicycle safe.*

2. *Orient curved vanes toward direction of stormwater flow. In a sump condition, orientation of curved vanes can be in either direction. Contractor is responsible for correct grate orientation towards stormwater flow.*

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021

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

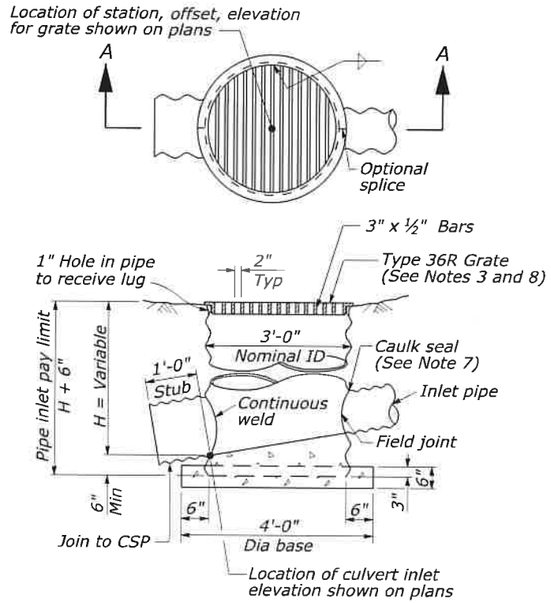
U.S. CUSTOMARY SPECIAL

METAL FRAME AND GRATE, TYPE 6A-6 (CURVED VANE GRATE)

Sheet 2 of 2

SPECIAL
604-A

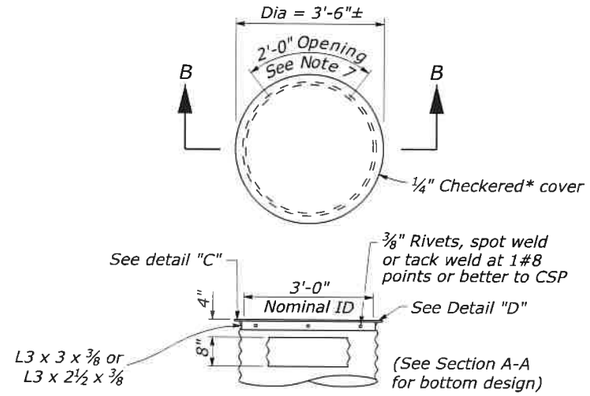
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T8



SECTION A-A

TYPE GMP

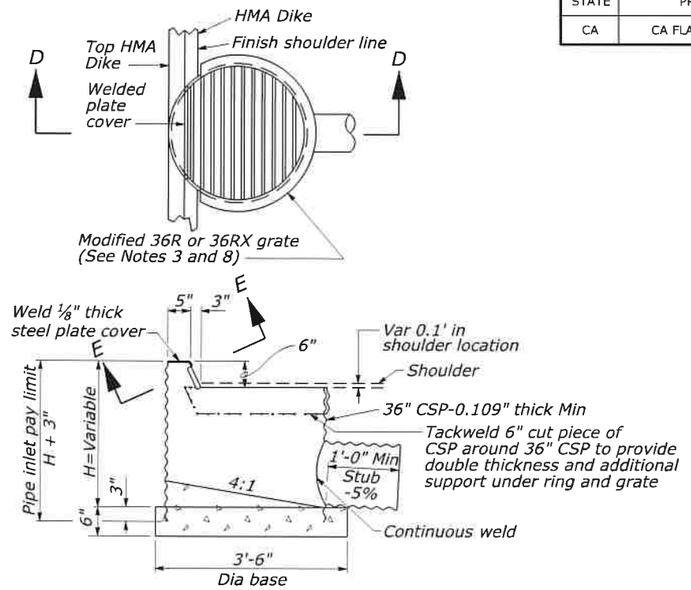
Steel pipe inlet with grate



SECTION B-B

TYPE OMP or OMPI

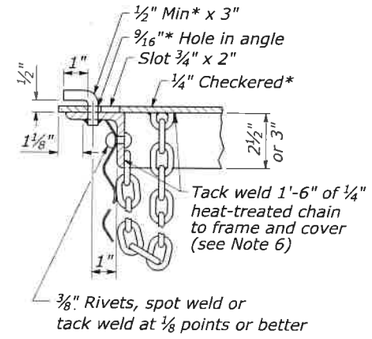
Steel pipe inlet with side opening and steel cover (see Note 6)



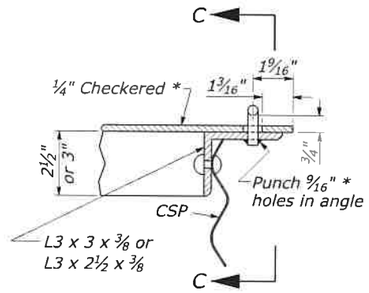
SECTION D-D

TYPE ODI

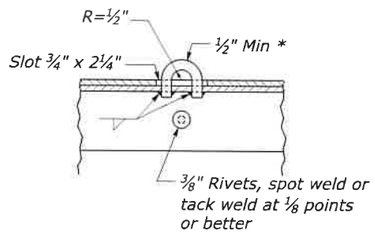
Steel pipe inlet with grate and raised opening at HMA dike flowline



DETAIL "C"



DETAIL "D"

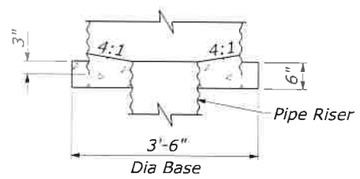


SECTION C-C

NOTES:

1. *Inlet pipes shall not protrude into basin.*
2. *Except for inlets used for junction boxes, basin floors shall have minimum slope of 4:1 from all directions toward outlet pipe, and a wood trowel finish.*
3. *See Standard Plans D77B for Grate and Frame Details and weights of Miscellaneous Iron and Steel.*
4. *Designation of Type OMPI pipe inlets on plans indicates trash racks are to be furnished and installed on all side openings. See Standard Plan D75C for trash rack details.*
5. *More than one side opening may be required. Location and number as ordered by the Engineer.*
6. *Chain to be provided when specified.*
7. *Caulk seal with pliable mixture of sand, portland cement, and emulsified asphalt (Mixture of 1 part portland cement, 3-5 parts sand, and 11/2" parts SSI emulsified asphalt).*
8. *Place pipe so bars of grate will be parallel with main surface flow.*
9. *Steel pipe inlets are paid for as an Each item under 60404-0000, Catch Basin.*

SECTION E-E



TYPE ODI BASE DETAIL FOR PIPE RISER CONNECTION

03/26/2021

ADAPTED FROM CALTRANS STANDARD PLAN D75A

NO SCALE

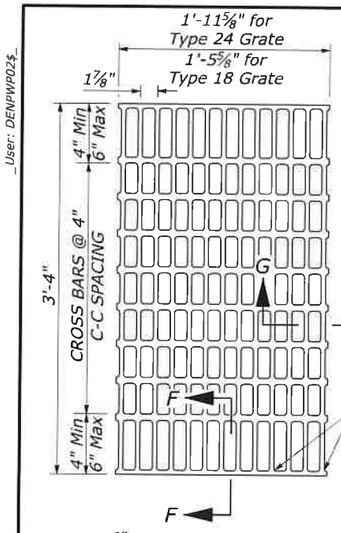
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY SPECIAL

STEEL PIPE INLETS

SPECIAL
604-B

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T9



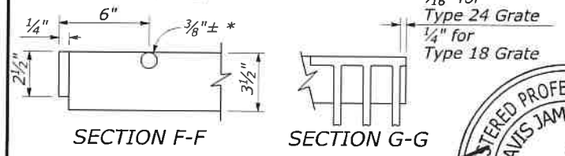
NOTES:

Bearing bars to be 3½" x ¼" bars on 1⅞" centers.

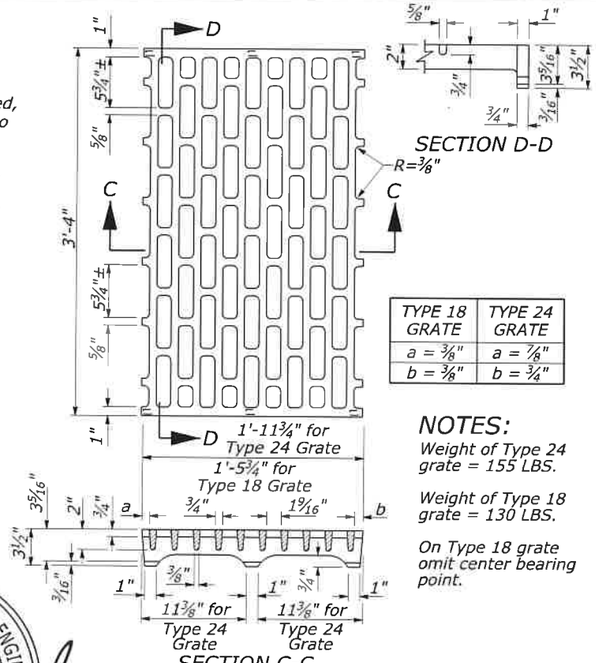
*⅜"± * Cross bars may be fillet welded, resistance welded or electroforged to bearing bars.*

Weight of Type 24 grate = 141 LBS.

Weight of Type 18 grate = 107 LBS. (Type 24 grate shown).



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



TYPE 18 GRATE	TYPE 24 GRATE
a = ⅜"	a = ⅞"
b = ⅜"	b = ¾"

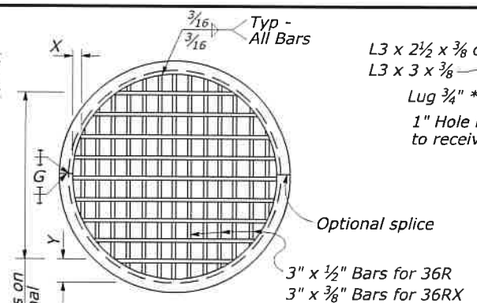
NOTES:

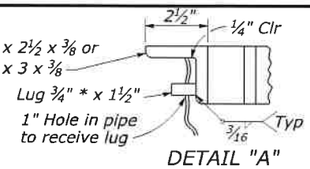
Weight of Type 24 grate = 155 LBS.

Weight of Type 18 grate = 130 LBS.

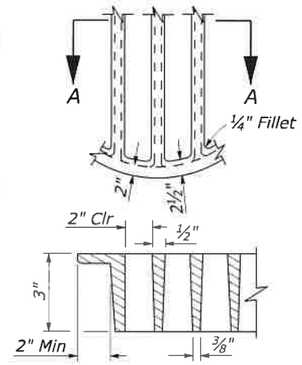
On Type 18 grate omit center bearing point.

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



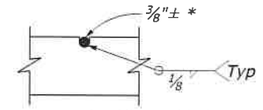


TYPE 36R AND 36RX GRATE DETAILS



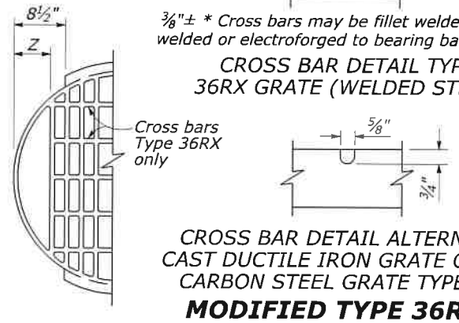
SECTION A-A

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



⅜"± * Cross bars may be fillet welded, resistance welded or electroforged to bearing bars.

CROSS BAR DETAIL TYPE 36RX GRATE (WELDED STEEL)



CROSS BAR DETAIL ALTERNATIVE CAST DUCTILE IRON GRATE OR CAST CARBON STEEL GRATE TYPE 36RX

MODIFIED TYPE 36R AND 36RX GRATE FOR ODI INLET

NOTES:

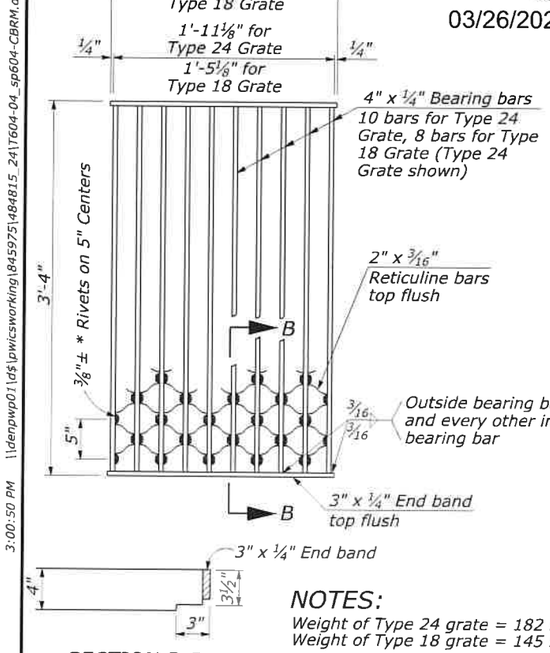
1. *When alternative grates are allowed - Final pay based on alternative with the lesser weight.*
2. *Use frame shown on Standard Plan D74A, D74B or D77A as appropriate.*
3. *When Type 24-10S, 24-12X or 24-13 grates are used with GDO Inlets, a ¼" x 3½" x 3'-4⅞" steel bar shall be welded across the center 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.*

GRATE BAR SPACING TABLE

TYPE	No. OF BARS	CLEAR BAR SPACING	X	Y 4" SPACING	Y 6" SPACING	Z
36R	13	2"	2⅛"	-	-	-
36RX (STEEL)	15	2"	9/16"	3¾"	5¾"	-
36RX (CAST)	13	2"	2⅛"	3¾"	5¾"	-
36R Mod	12	2"	2⅛"	-	-	5"
36RX Mod (STEEL)	13	2"	9/16"	3¾"	5¾"	5 11/16"
36RX Mod (CAST)	12	2"	2⅛"	3¾"	5¾"	5"

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

INLET TYPE	GRATE TYPE	No. OF GRATES	WEIGHT LB
GDO (SEE NOTE 4)	24-10C	2	391
	24-10S	2	456
	24-12X	2	473
	24-13	2	374
G0,G0L,G1,G2, G3,G4 (TYPE 24)	24-10C	1	202
	24-10S	1	229
	24-12X	1	239
	24-13	1	188
G4 (TYPE 18) G5,G6	18-8S	1	187
	18-9X	1	187
	18-10	1	149
GT1,GT2	18-8S	2	374
	18-9X	2	374
	18-10	2	298
GT3,GT4	24-10C	2	404
	24-10S	2	458
	24-12X	2	478
	24-13	2	376
ODI	36RX (Mod)	1	196
GMP,GCP,GCPI	36RX	1	215
ODI	36R (Mod)	1	220
GMP,GCP,GCPI	36R	1	236
TRASH RACK			22
GRATE CHAIN			3

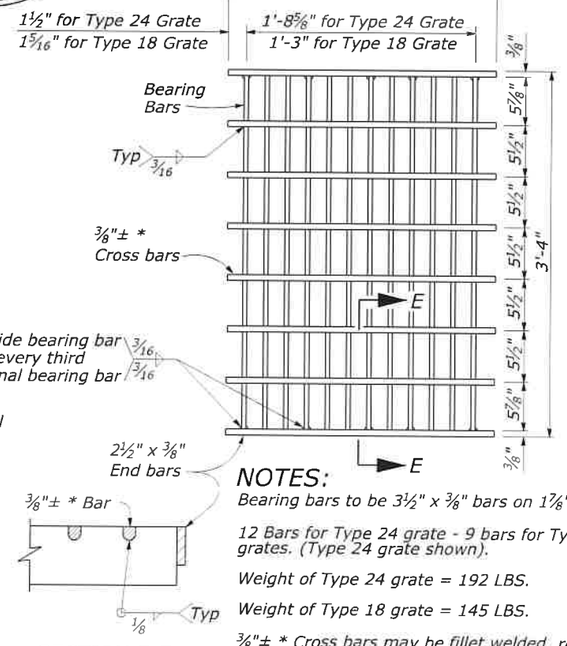


SECTION B-B

NOTES:

Weight of Type 24 grate = 182 LBS.
Weight of Type 18 grate = 145 LBS.

TYPE 18-8S AND 24-10S GRATE
(Welded Steel) Reticuline type



SECTION E-E

NOTES:

Bearing bars to be 3½" x ⅜" bars on 1⅞" 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.

*⅜"± * Cross bars may be fillet welded, resistance welded or electroforged to bearing bars.*

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

ADAPTED FROM CALTRANS STANDARD PLAN D77B
NO SCALE

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

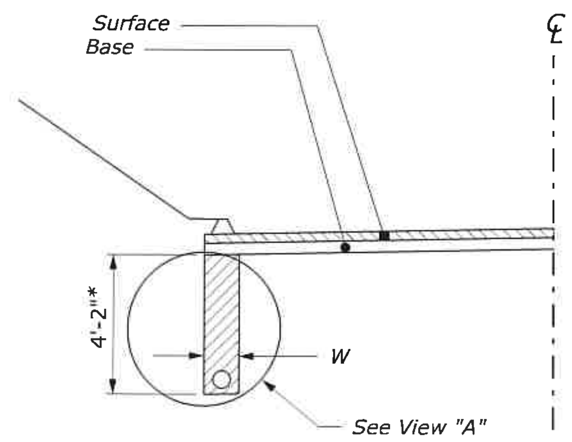
U.S. CUSTOMARY SPECIAL

GRATE DETAILS

SPECIAL
604-C

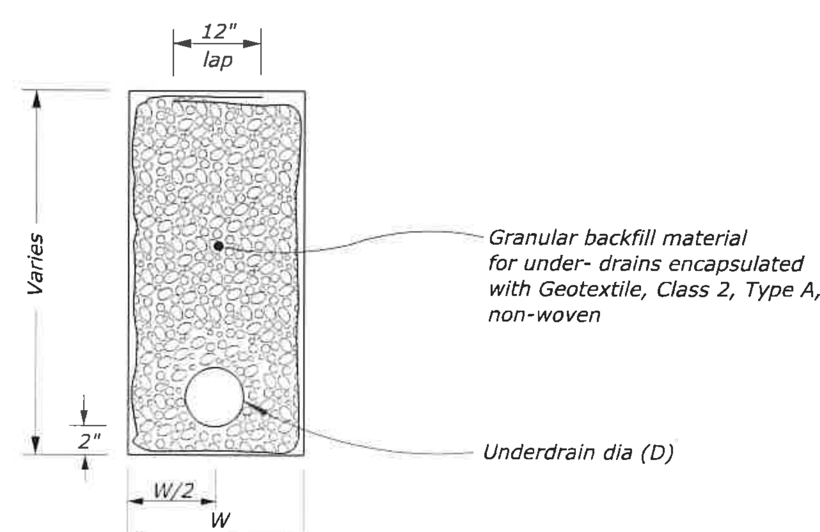
REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA
03/26/2021

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T10



PAVED DITCH

* Adjust depth to meet field conditions



VIEW A

NOTES:

1. *Location of pipe underdrains may be adjusted by the CO.*
2. *Minimum underdrain grade is 0.5 percent.*

DIAMETER (D)	MINIMUM WIDTH (W)
6"	15"

REGISTERED PROFESSIONAL ENGINEER TRAVIS JAMES HOWARD C74036 CIVIL STATE OF CALIFORNIA

03/26/2021

NO SCALE

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

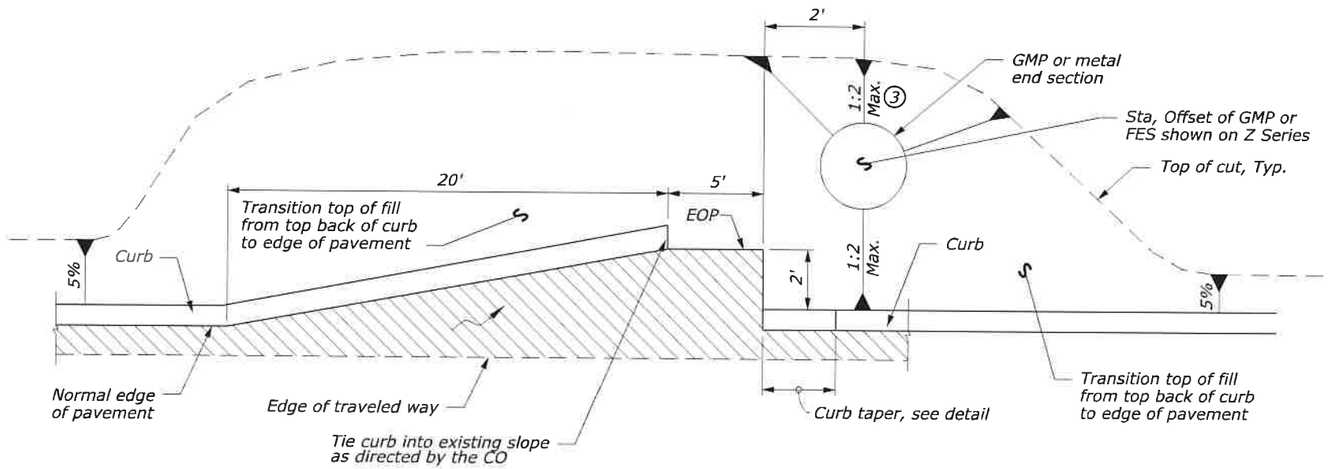
U.S. CUSTOMARY SPECIAL

UNDERDRAIN, FOR PAVEMENT AND DITCHES

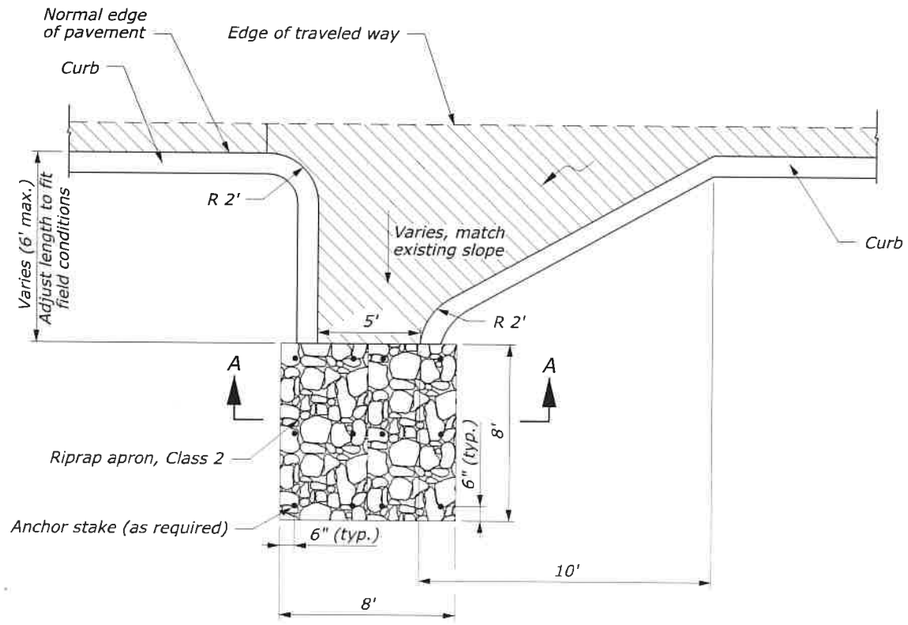
SPECIAL 605-A

3/25/2021 3:00:46 PM \\denpwp01\d$\pwicsworking\845975\484815_2\T605-04_sp605-01RM.dgn _User: DENPWP03$_

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T11



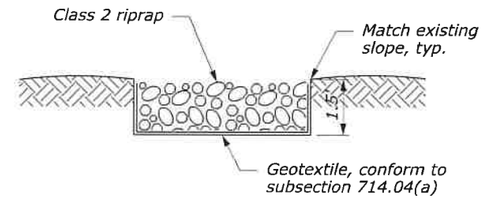
CUT SIDE CURB CUT



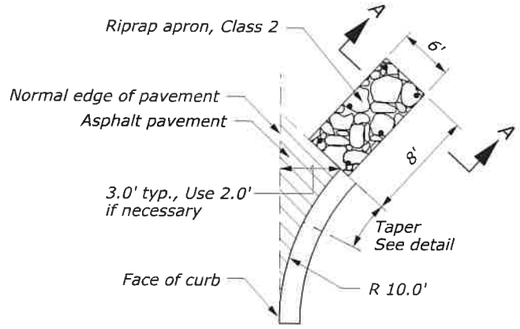
FILL SIDE CURB CUT

NOTES:

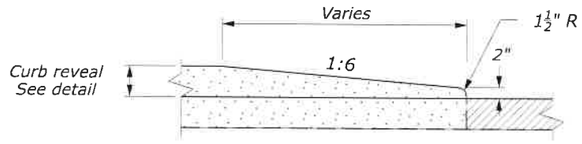
1. Curb for flared curb terminus will be measured under curb items. Adjust as necessary to fit field conditions.
2. Riprap and revet mattress for curb terminus on mainline will be measured under their respective pay items.
3. Cut slope may exceed 1:2 in rock excavation locations as shown on the plans and as approved by the CO.
4. Additional curb for curb cuts on mainline will be measured under curb items. Riprap and revet mattress for curb cuts will be measured under their respective pay items.



SECTION A-A



FLARED CURB TERMINUS (1)



CURB TAPER

09/06/2022

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

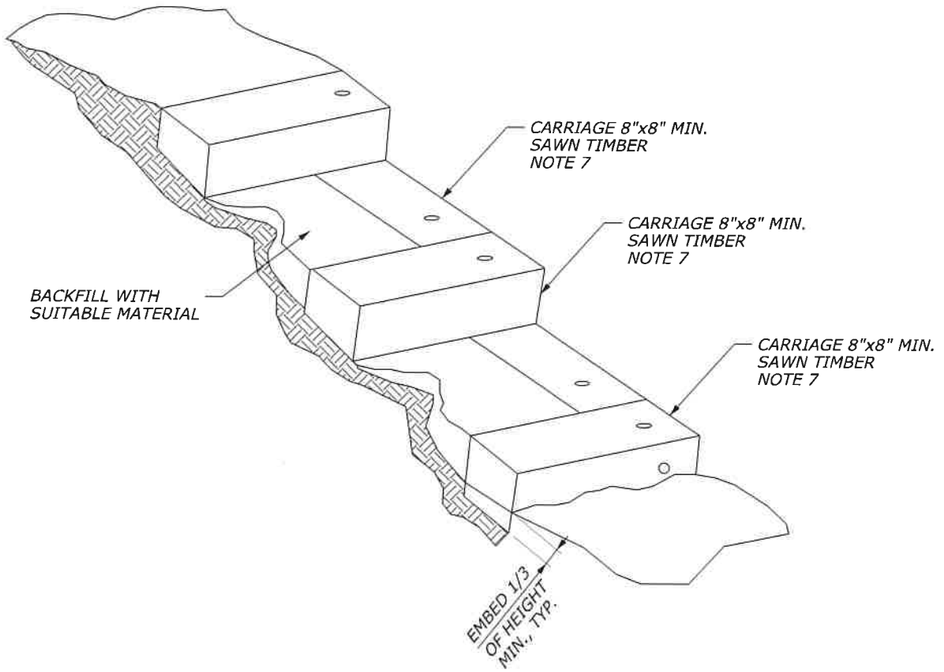
U.S. CUSTOMARY SPECIAL

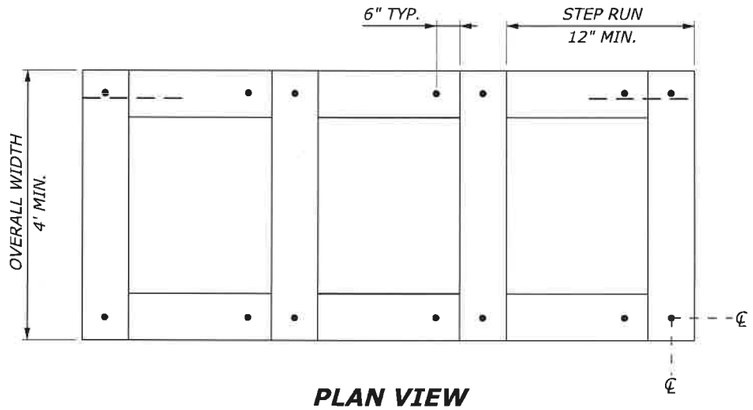
CURB DETAILS

NO SCALE

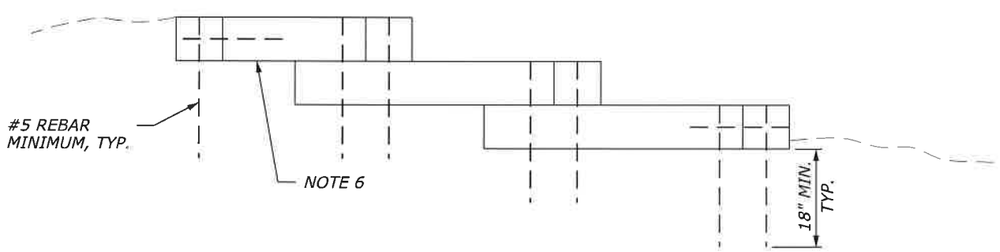
SPECIAL
609-A

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T12





PLAN VIEW



ELEVATION VIEW

NOTES:

1. PRE-DRILL HOLES FOR REBAR AND PINS TO PREVENT SPLITTING OF TIMBERS.
2. RECESS END OF REBAR 1/2" BELOW TOP OF TIMBER.
3. COMPACT BACKFILL IN 6" LIFTS UNTIL NO VISUAL DISPLACEMENT.
4. MINIMUM OVERLAP OF BOTTOM CARRIAGE IS THE SAME AS THE STEP RUN LENGTH.
5. PROVIDE RISERS AND CARRIAGE WITH THE SAME CROSS SECTIONAL DIMENSIONS.
6. NO DIRECT PAYMENT FOR EXCAVATION.
7. PROVIDE SAWN TIMBER PRESSURE TREATED WITH A WATERBORNE PRESERVATIVE COMPLIANT WITH APWA USE CATEGORY UC4A.

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021

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

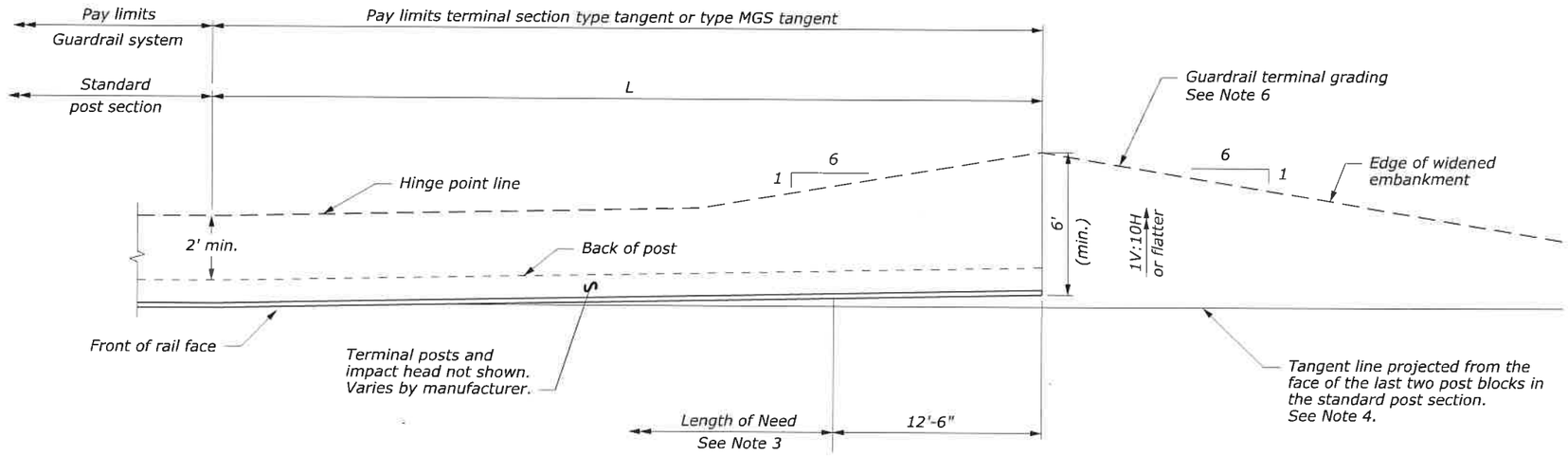
U.S. CUSTOMARY SPECIAL

STAIR DETAILS

NO SCALE

SPECIAL
609-B

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T13



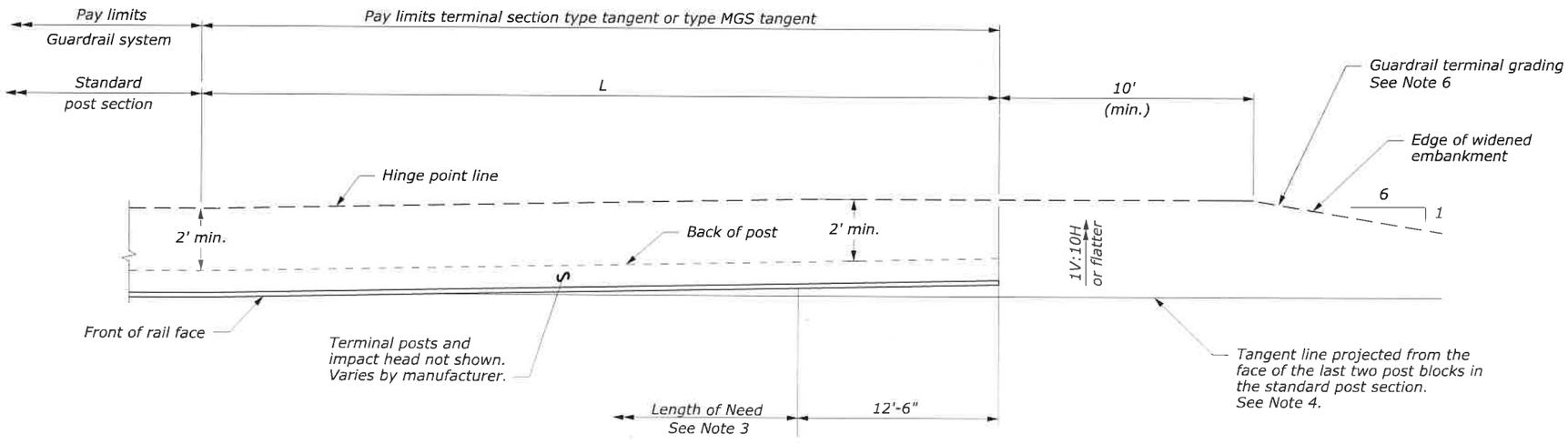
PLAN

PREFERRED GRADING

NOTE:

1. *Install tangent terminal according to the manufacturer's recommendations. See manufcturer'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 (≤ 45 mph)	25
3 (> 45 mph)	37.5 or 50 (for G4)
	50 (for MGS)



PLAN

ALTERNATIVE GRADING

NO SCALE

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021
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FEDERAL HIGHWAY ADMINISTRATION
FEDERAL LANDS HIGHWAY OFFICE

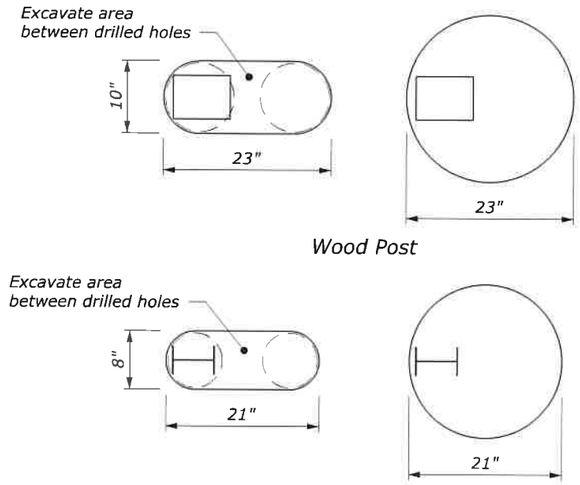
U.S. CUSTOMARY STANDARD

G4 AND MGS W-BEAM GUARDRAIL TYPE TANGENT TERMINAL AND GRADING

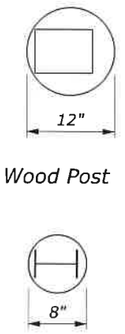
STANDARD APPROVED FOR USE 6/2005
REVISED:
DRAFT: 03/2018

STANDARD
617-20

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T14



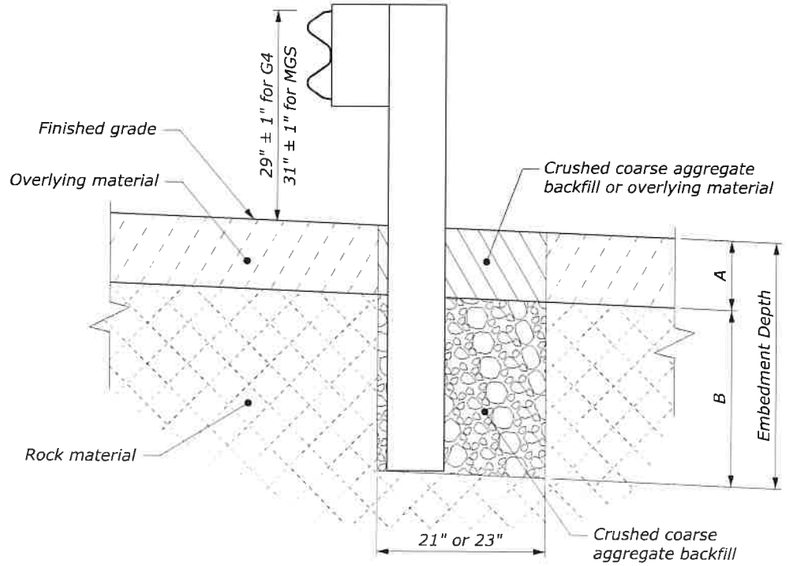
PLAN VIEW



PLAN VIEW

NOTE:

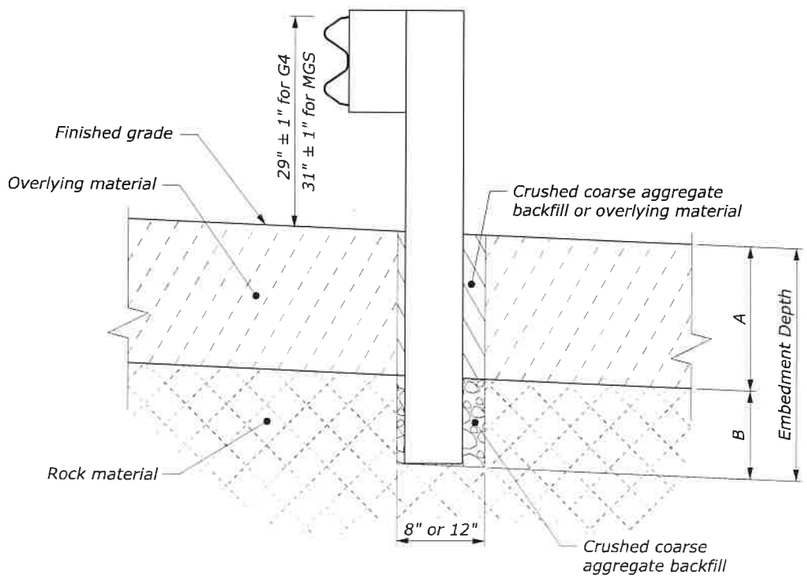
1. *Use this standard when posts cannot be embedded to the minimum depth shown on Special 617-A.*
2. *Unless otherwise specified, use either the circular or the oblong hole configuration for Case 1 conditions.*
3. *Use crushed coarse aggregate backfill that conforms to "coarse aggregate for concrete" 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".

NO SCALE

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U.S. CUSTOMARY DETAIL

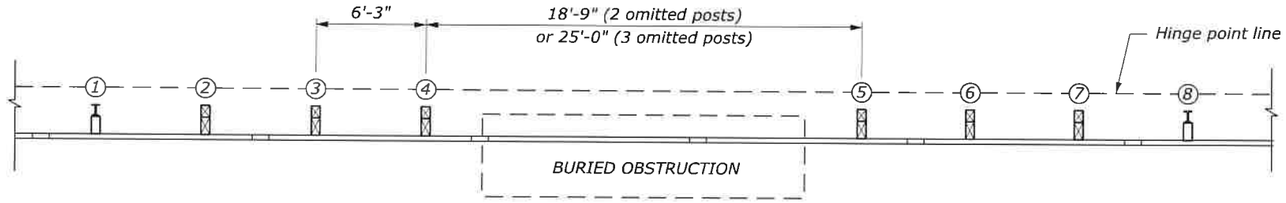
MGS AND G4 W-BEAM GUARDRAIL INSTALLATION IN ROCK

DETAIL APPROVED FOR USE 04/2020

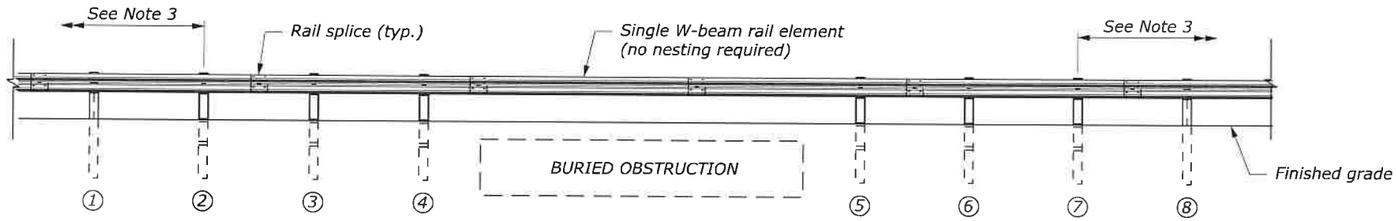
REVISED:

DETAIL C617-13

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T15



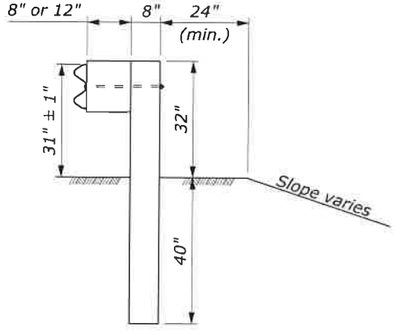
PLAN



ELEVATION

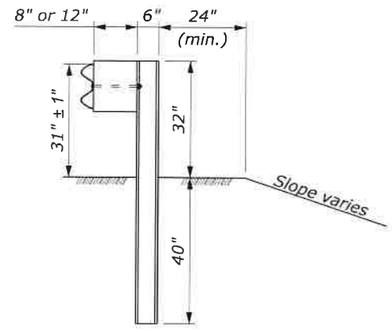
NOTE:

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 Special 617-A for other assembly details.



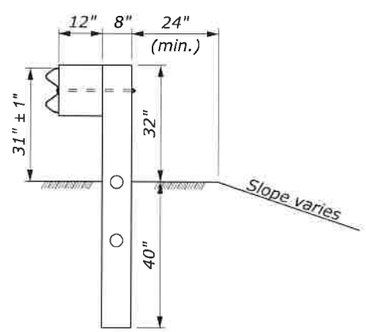
WOOD POST DETAIL

POST ① AND ⑧
See Note 1



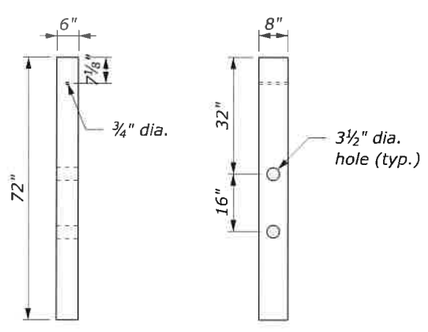
STEEL POST DETAIL

POST ① AND ⑧
See Note 1

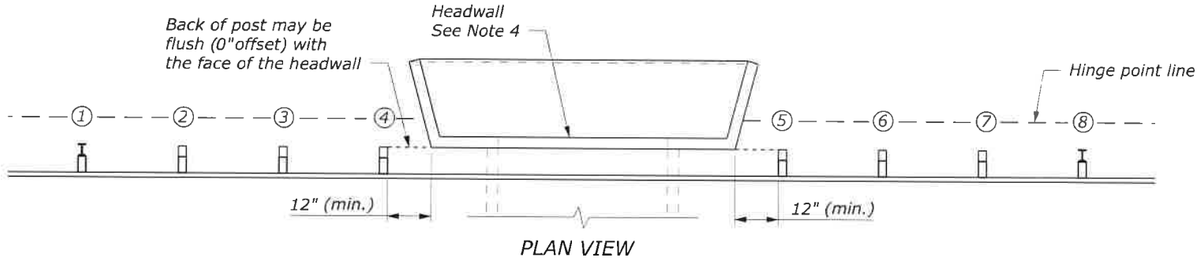


CRT POST DETAIL

POST ② THRU ⑦
See Note 2



CRT WOOD POST



PLAN VIEW

SPAN WITH HEADWALL DETAIL

TOP

03/26/2021
FOR SELECTION ONLY

NO SCALE

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

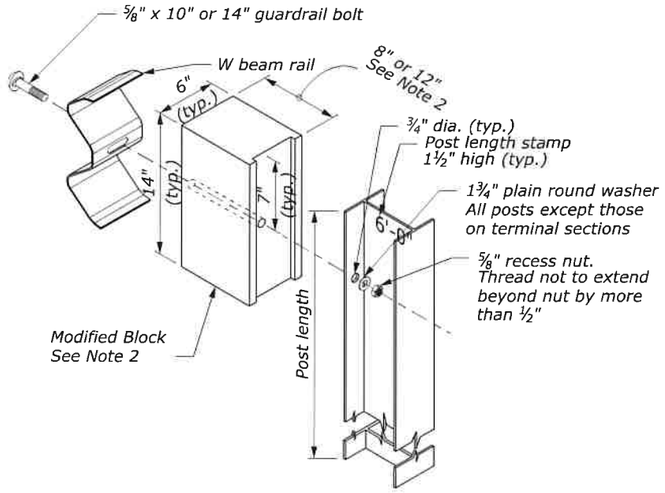
U.S. CUSTOMARY DETAIL

MGS W-BEAM GUARDRAIL LONG-SPAN SYSTEM

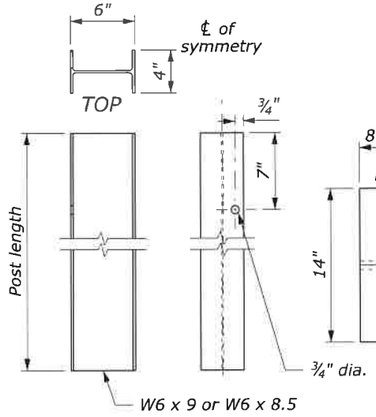
DETAIL APPROVED FOR USE 04/2020
REVISED:

DETAIL C617-37

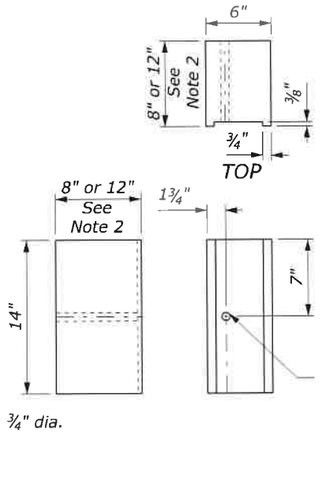
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T16



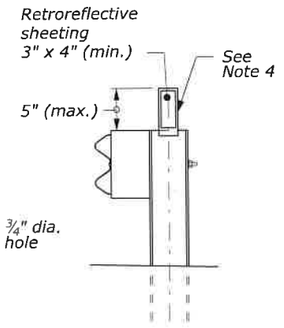
POST AND BLOCK



STRUCTURAL SHAPE POST



BLOCK

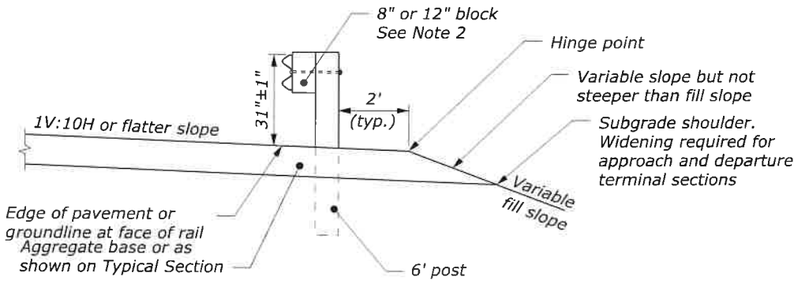


FLEXIBLE DELINEATOR GUARDRAIL MOUNT

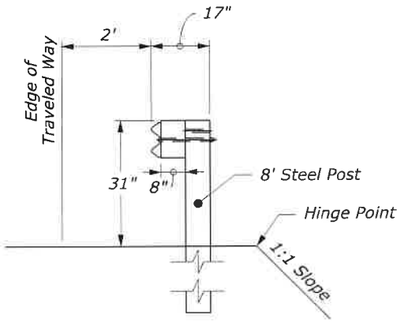
NOTE:

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 Details C617-13 or C617-37.*
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.*

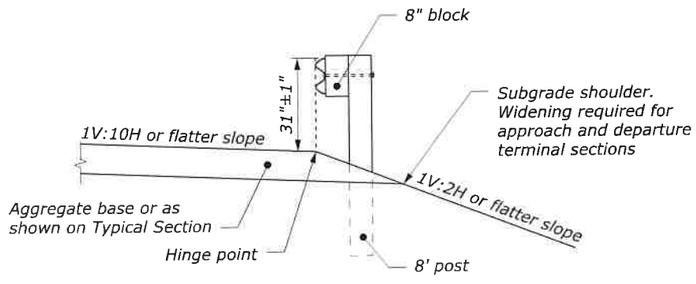
03/26/2021



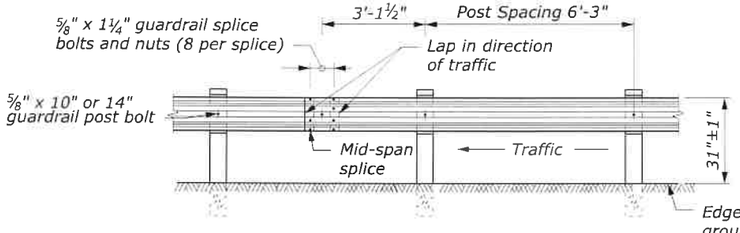
TYPICAL GUARDRAIL CROSS SECTION
6' POST, 8" OR 12" BLOCK
(Use at Terminal Sections)



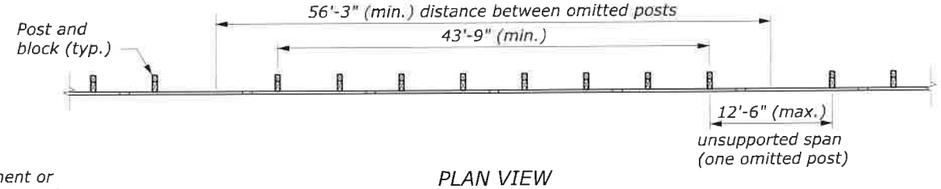
GUARDRAIL DETAIL 2
Use on RSS



TYPICAL GUARDRAIL CROSS SECTION
8' POST ON SLOPE, 8" BLOCK
(Use on 1:2 or Flatter Slopes)



TYPICAL GUARDRAIL ELEVATION



PLAN VIEW

OMITTED POST DETAIL
See Note 1

NO SCALE

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

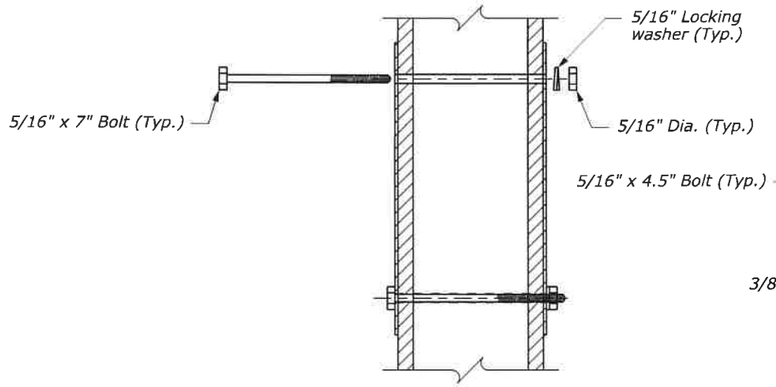
U.S. CUSTOMARY SPECIAL

MGS W-BEAM GUARDRAIL STEEL POSTS

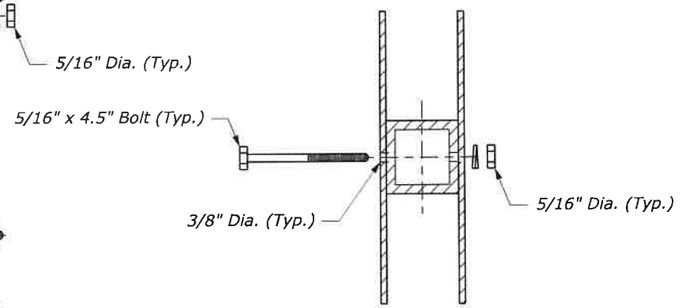
	SPECIAL
	617-A

STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T17

METAL SIGN PLATE MOUNTING DETAIL



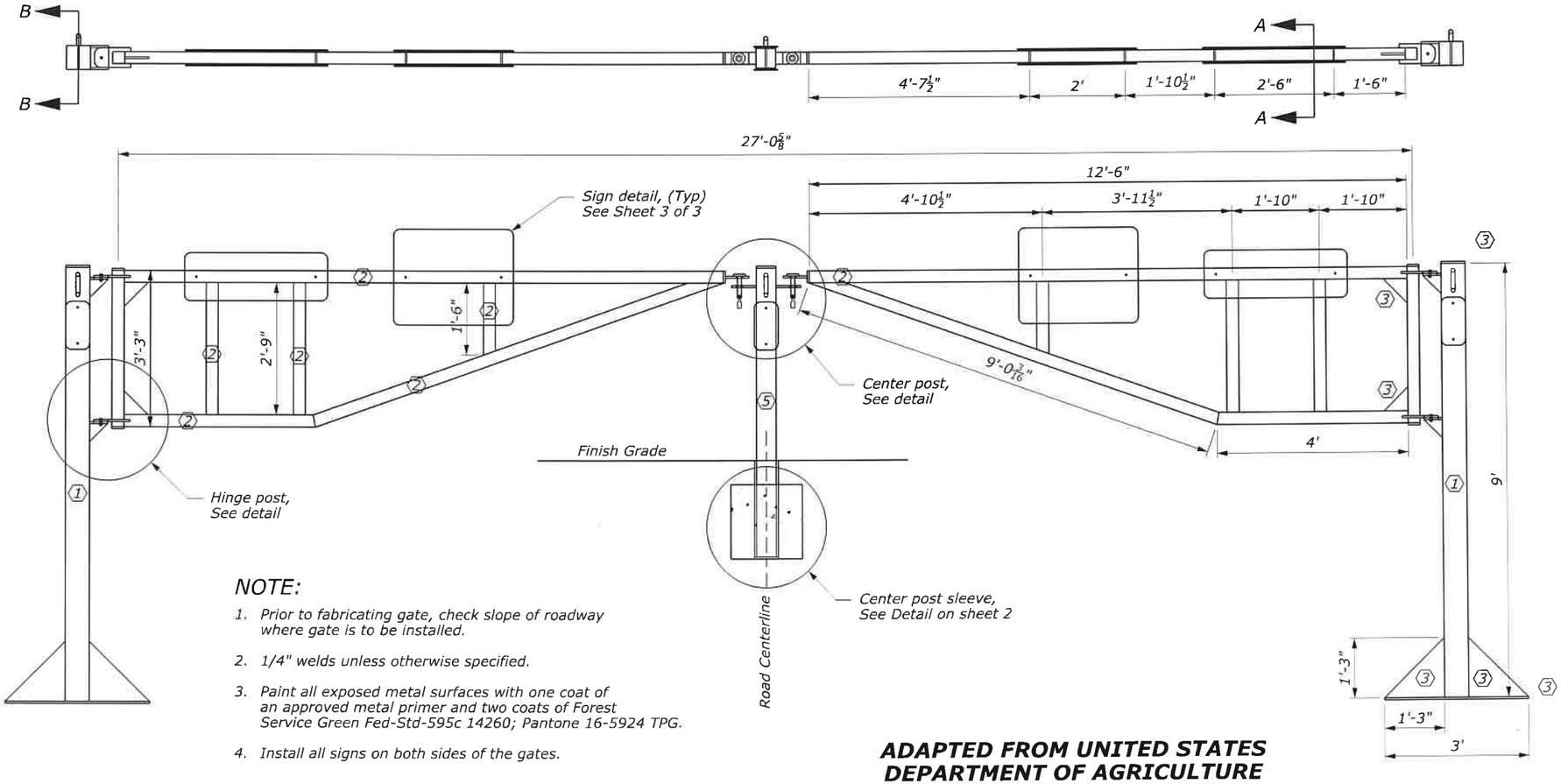
SECTION A-A



SECTION B-B

MATERIALS:

1. 6" HSS square tube
2. 3" HSS square tube
3. ½" Thick steel plate
4. 1" Dia. steel rod
5. 5" HSS square tube



NOTE:

1. Prior to fabricating gate, check slope of roadway where gate is to be installed.
2. 1/4" welds unless otherwise specified.
3. Paint all exposed metal surfaces with one coat of an approved metal primer and two coats of Forest Service Green Fed-Std-595c 14260; Pantone 16-5924 TPG.
4. Install all signs on both sides of the gates.

ADAPTED FROM UNITED STATES DEPARTMENT OF AGRICULTURE FOREST DIVISION DETAIL

NO SCALE

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021

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

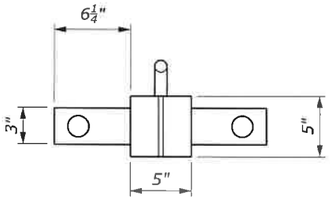
U.S. CUSTOMARY SPECIAL

27' METAL GATE

Sheet 1 of 3

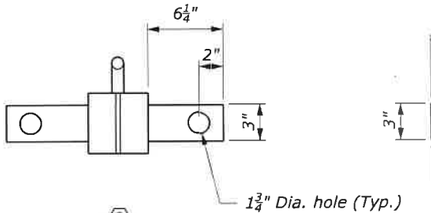
SPECIAL
619-A

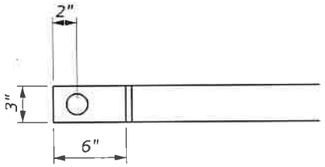
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T18

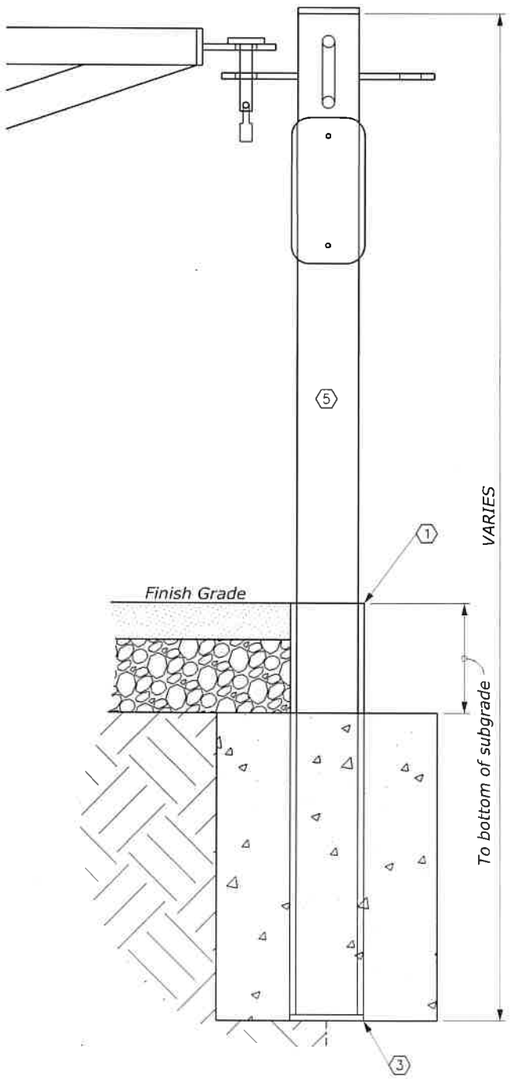


NOTE:

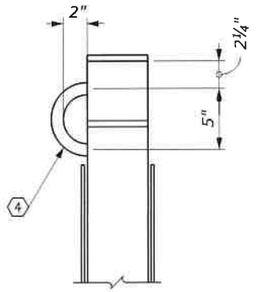
1. *Materials list found on Sheet 1 of 3.*

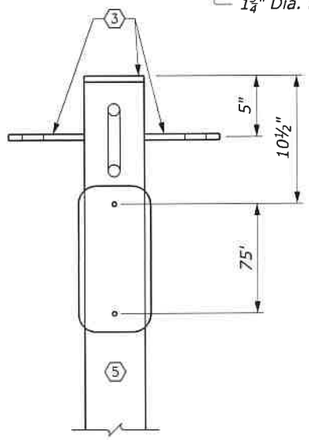


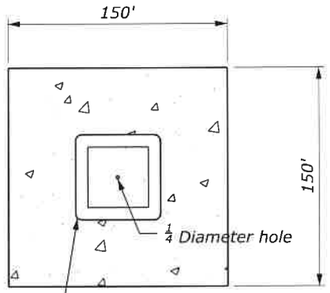


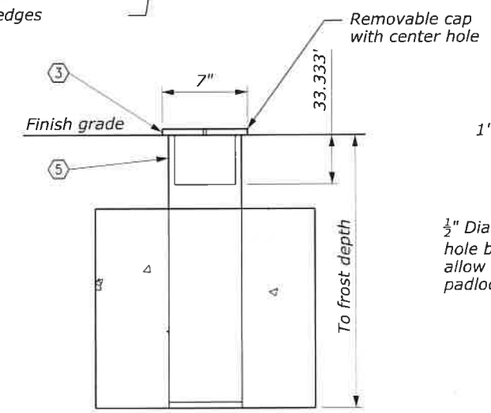


CENTER POST WITH SLEEVE DETAIL

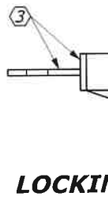




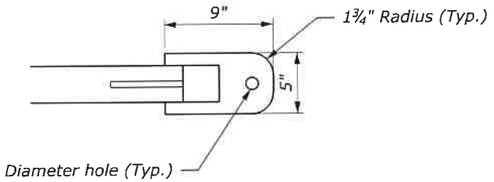


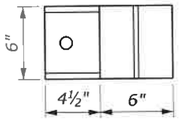


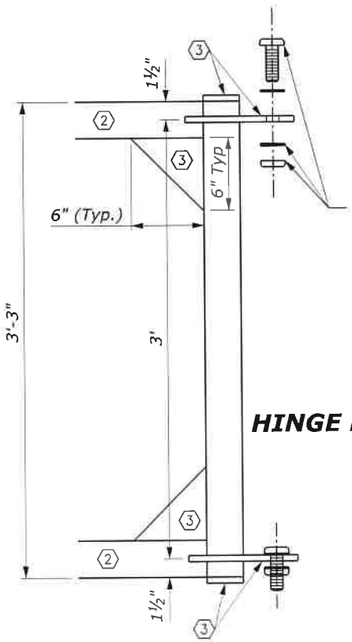
CENTER POST SLEEVE & CAP DETAIL



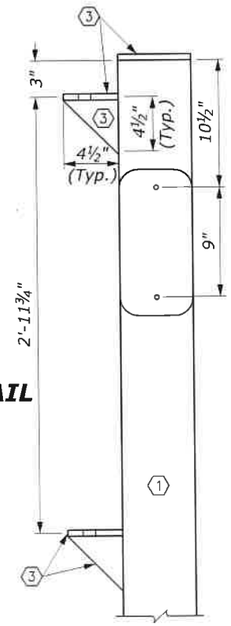
LOCKING DETAIL

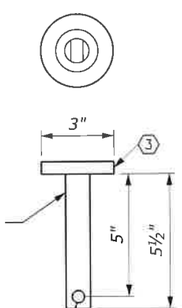






HINGE POST DETAIL





LOCK CAP DETAIL

ADAPTED FROM UNITED STATES DEPARTMENT OF AGRICULTURE FOREST DIVISION DETAIL

NO SCALE

REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021

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

U.S. CUSTOMARY SPECIAL

27' METAL GATE

Sheet 2 of 3

SPECIAL
619-A

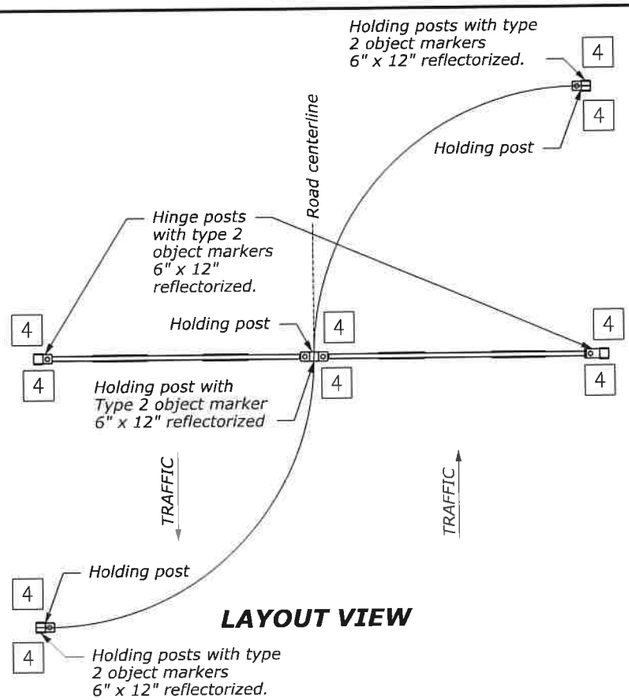
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T19

NOTE:

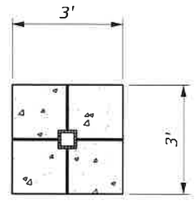
1. Field locate holding posts to support gate in open position.
2. If holes for posts are over excavated, the contractor must fill the over excavated holes with concrete at no extra cost to the government.
3. Slope exposed top portion of each concrete base a minimum of 2% to drain away from post.

SIGN SCHEDULE

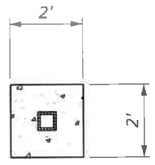
Sign	Qty.	Description	Size
1	4	R11-2	30" x 24"
2	2	OM3-R	36" x 12"
3	2	OM3-L	36" x 12"
4	10	OM2-2V	6" x 12"



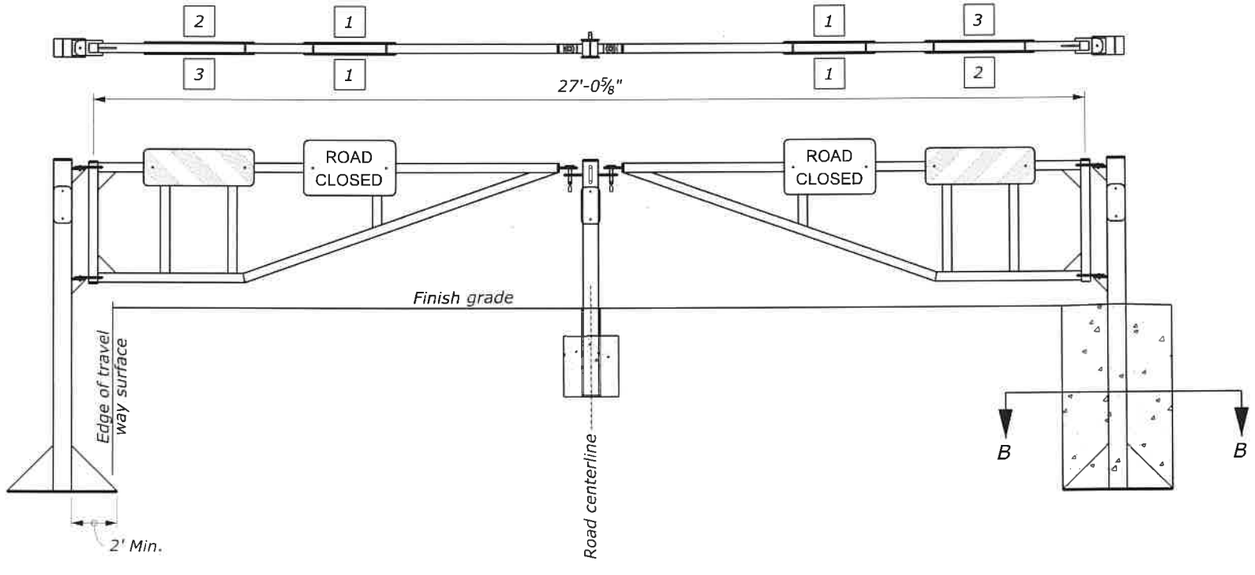
LAYOUT VIEW

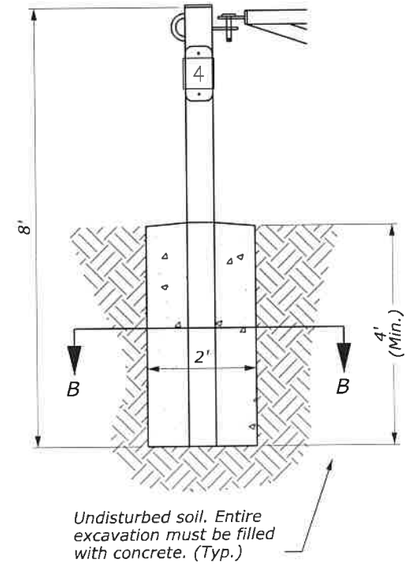


SECTION A-A

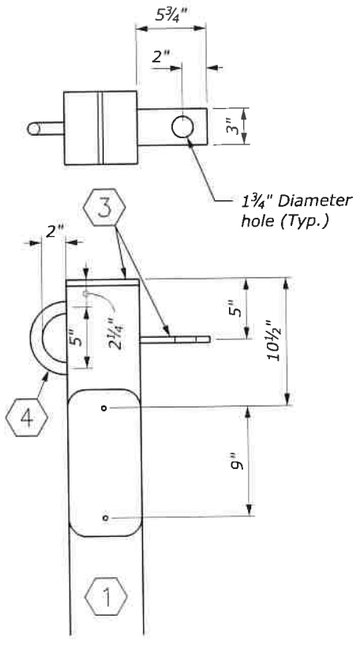


SECTION B-B





HOLDING POST DETAIL



REGISTERED PROFESSIONAL ENGINEER
TRAVIS JAMES HOWARD
C74036
CIVIL
STATE OF CALIFORNIA

03/26/2021

ADAPTED FROM UNITED STATES DEPARTMENT OF AGRICULTURE FOREST DIVISION DETAIL

NO SCALE

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

U.S. CUSTOMARY SPECIAL

27' METAL GATE

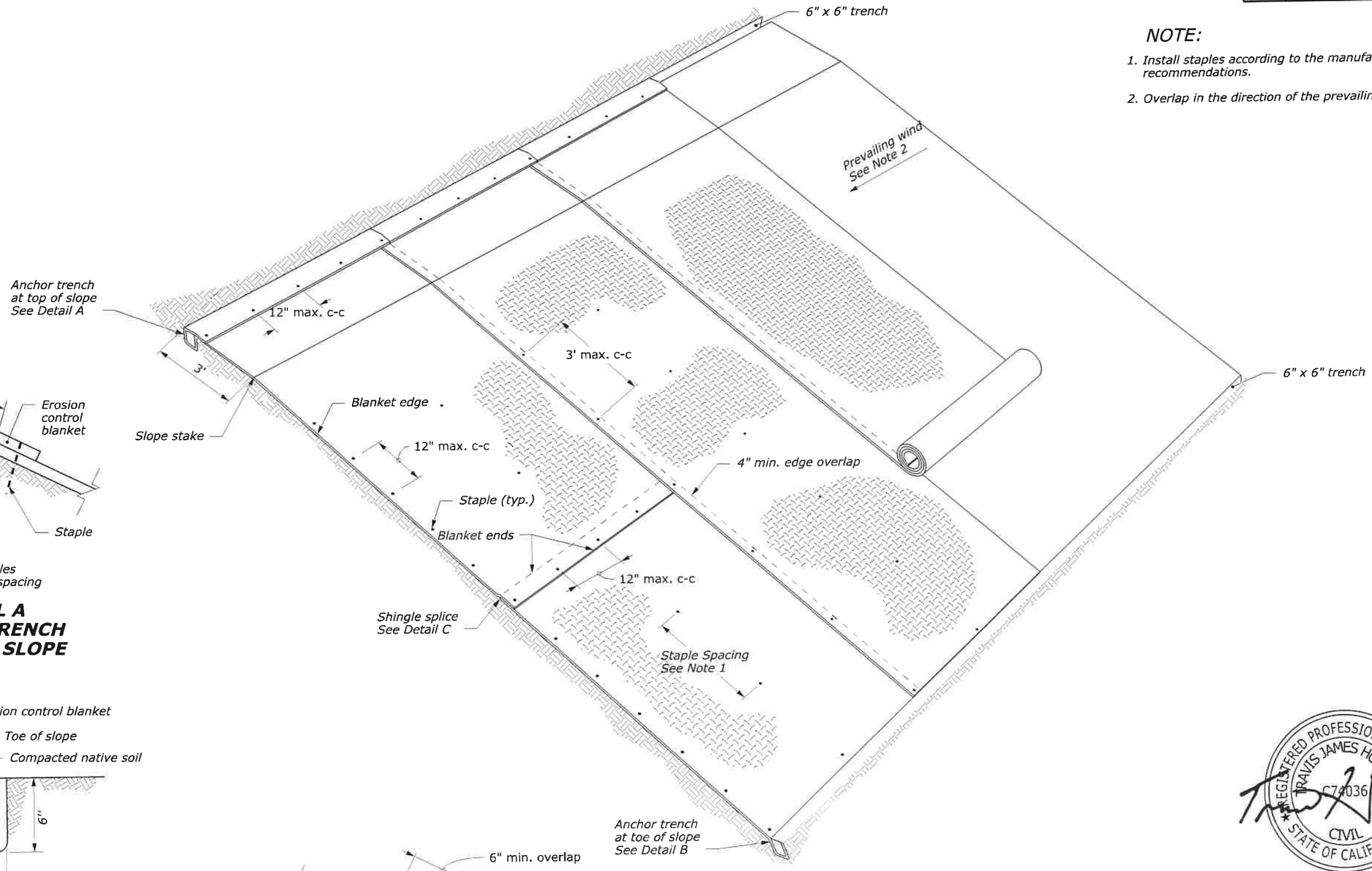
Sheet 3 of 3

SPECIAL
619-A

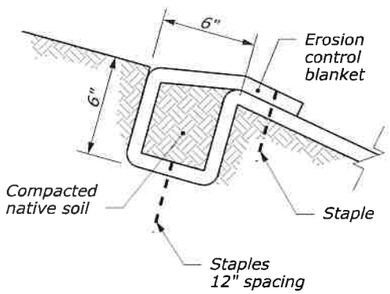
STATE	PROJECT	SHEET NUMBER
CA	CA FLAP 03S11(1)	T20

NOTE:

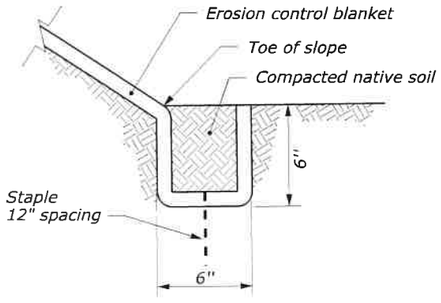
1. Install staples according to the manufacturer's recommendations.
2. Overlap in the direction of the prevailing wind.



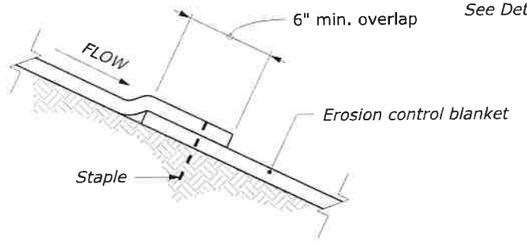
PERSPECTIVE VIEW



DETAIL A
ANCHOR TRENCH
AT TOP OF SLOPE



DETAIL B
ANCHOR TRENCH
AT TOE OF SLOPE



DETAIL C
SHINGLE SPLICE

NO SCALE

03/26/2021
FOR SELECTION ONLY

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

U.S. CUSTOMARY DETAIL

ROLLED EROSION CONTROL PRODUCT ON SLOPES

DETAIL APPROVED FOR USE 01/2011
REVISED: 08/2014

DETAIL
C629-50