

Part C – Conditional Notifications and Reports

Report Type 6	Accidental Discharge of Hazardous Material Report
Report Purpose	Notifies Colorado River Basin Water Board staff that an accidental discharge of hazardous material has occurred.
When to Submit	Within five (5) working days following the date of an accidental discharge. Continue reporting as required by Colorado River Basin Water Board staff.
Report Contents	<ol style="list-style-type: none"> 1. The report shall include the OES Incident/Assessment Form, a full description and map of the accidental discharge incident (i.e. location, time and date, source, discharge constituent and quantity, aerial extent, and photo documentation). If applicable, the OES Written Follow-Up Report may be substituted. 2. If applicable, any required sampling data, a full description of the sampling methods including frequency/dates and times of sampling, equipment, locations of sampling sites. 3. Locations and construction specifications of any barriers, including silt curtains or diverting structures, and any associated trenching or anchoring.

Report Type 7	Violation of Compliance with Water Quality Standards Report
Report Purpose	Notifies Colorado River Basin Water Board staff that a violation of compliance with water quality standards has occurred.
When to Submit	The Permittee shall report any event that causes a violation of water quality standards within three (3) working days of the noncompliance event to Colorado River Basin Water Board staff.
Report Contents	The report shall include: the cause; the location shown on a map; and the period of the noncompliance including exact dates and times. If the noncompliance has not been corrected, include: the anticipated time it is expected to continue; the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and any monitoring results if required by Colorado River Basin Water Board staff.

Report Type 8	In-Water Work and Diversions Water Quality Monitoring Report
Report Purpose	Notifies Colorado River Basin Water Board staff of the completion of in-water work.
When to Submit	Within three (3) working days following the completion of in-water work. Continue reporting in accordance with the approved water quality monitoring plan.
Report Contents	As required by the approved water quality monitoring plan.

Report Type 9	Modifications to Project Report
Report Purpose	Notifies Colorado River Basin Water Board staff if the Project, as described in the application materials, is altered in any way or by the imposition of subsequent permit conditions by any local, state or federal regulatory authority.
When to Submit	If Project implementation as described in the application materials is altered in any way or by the imposition of subsequent permit conditions by any local, state or federal regulatory authority.
Report Contents	A description and location of any alterations to Project implementation. Identification of any Project modifications that will interfere with the Permittee's compliance with the Order.

Report Type 10	Transfer of Long-Term BMP Maintenance Report
Report Purpose	Notifies Colorado River Basin Water Board staff of transfer of long-term BMP maintenance responsibility.
When to Submit	At least 10 working days prior to the transfer of BMP maintenance responsibility.
Report Contents	A copy of the legal document transferring maintenance responsibility of post-construction BMPs.

NOT FOR BID

*Standard and Special Drawings
(Green Pages)*

inserted here

LIST OF STANDARD AND SPECIAL DRAWINGS (GREEN PAGES)

NOTICE TO RESIDENTS (ENGLISH/SPANISH)

2023 CALTRANS STANDARD PLANS

A3A	Abbreviations (Sheet 1 of 3)
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A10B	Legend - Lines and Symbols (Sheet 2 of 5)
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A77N1	Midwest Guardrail System - Wood Post and Wood Block Details
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A77S3	Metal Railing Anchor Cable and Anchor Plate Details
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A84A	Temporary Desert Tortoise Fence
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P76	Pavement Edge Treatments - New Construction
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H1	Landscape and Erosion Control Symbols
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	TEMPORARY CRASH CUSHIONS, RAILING AND TRAFFIC SCREEN
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B0-3 **Bridge Details**

B0-13 **Bridge Details**

CONCRETE BARRIERS

B11-83 **Concrete Barrier Type 85 Details No. 1**

B11-84 **Concrete Barrier Type 85 Details No. 2**

B11-85 **Concrete Barrier Type 85 Details No. 3**

ROADSIDE SIGNS

RS1 **Roadside Signs - Typical Installation Details No. 1**

RS2 **Roadside Signs - Wood Post - Typical Installation Details No. 2**

RS4 **Roadside Signs - Typical Installation Details No. 4**

OVERHEAD AND ROADSIDE SIGNS PANELS

S93 **Framing Details for Framed Single Sheet Aluminum Signs, Rectangular Shape**

S94 **Roadside Framed Single Sheet Aluminum Signs, Rectangular Shape**

S95 **Roadside Single Sheet Aluminum Signs, Diamond Shape**

DOLA DITCH FOUNDATION REPORT

LANZIT DITCH FOUNDATION REPORT

DOLA DITCH AND LANZIT DITCH AS-BUILTS



NOTICE TO THE RESIDENTS OF NATIONAL TRAILS HIGHWAY AT DOLA AND LANZIT DITCHES

The San Bernardino County Department of Public Works has contracted with (Company name) for the (type of work) of (name of road) in the (city) area. The construction shall include (detailed description of work).

This work will be performed between the dates of (start date) and (end date).

Normal working hours will be between the hours of _____ A.M. and _____ P.M. Monday through Friday.

There will be "No Parking Signs" posted on your street indicating the specific dates work will be performed on the street. During the time we are working, access to the public will be limited and we ask the following:

1. Do not park your vehicles on the roadway
2. Do not allow water to run on the roadway
3. Do not allow children to play in the roadway
4. Do not place trash cans or other debris on the roadway

We regret any inconvenience that this work may cause you and we thank you for your cooperation in assisting us in rebuilding your street.

Thank you.
(Company name)
(Company contact name)
(Company phone number)

If you need further assistance contact the Department of Public Works at (909) 387-7920



NOTIFICACIÓN A LOS RESIDENTES DE NATIONAL TRAILS HIGHWAY AT DOLA AND LANZIT DITCHES

El Departamento de Obras Públicas de San Bernardino County, a contratado con (Company name) para (type of work) la calle llamada (name of road) en la ciudad de (city). La construcción va a incluir (detailed description of work).

Este trabajo será hecho entre la fecha de (start date) y (end date). Las horas elegidas para hacer este trabajo serán entre las _____ de la mañana y _____ de la tarde de lunes a viernes.

Habrá letreros indicando que “No Habrá Estacionamiento” en la calle y especificando el horario cuando el trabajo será hecho. Durante el tiempo que estaremos trabajando en la calle, la entrada para el público será limitada y por esta razón pedimos lo siguiente:

- No estacionen sus vehículos en la calle.
- No permita que corre el agua hacia la calle.
- No permita que los niños jueguen en la calle.
- No ponga los botes de basura o cualquier otra basura en la calle.

Lamentamos la inconveniencia que causara este trabajo y les agradecemos por su cooperación y asistencia en el mejoramiento de su calle.

Muchas Gracias.

(Company name)

(Company contact name)

(Company phone number)

Si necesita asistencia favor de hablar al Departamento de Obras Publicas, (909) 387-7920.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS



David M. Mindas
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

A

AB AGGREGATE BASE
 ABBC ASBESTOS BONDED BITUMINOUS COATED
 ABM AIR-BLOWN MORTAR
 Abn ABANDON
 ABS ACRYLONITRILE-BUTADIENE-STYRENE
 Abut+ ABUTMENT
 AC ASPHALT CONCRETE
 AC+ UNGROUNDED CONDUCTOR
 ACB ASPHALT CONCRETE BASE
 ACC ARMOR-CLAD CONDUCTORS
 ACP ASBESTOS CEMENT PIPE
 Adj ADJUST, ADJUSTABLE, ADJACENT
 ADL ADDED DEAD LOAD
 ADT AVERAGE DAILY TRAFFIC
 AFES ALTERNATIVE FLARED END SECTION
 Ahd AHEAD
 AIC AUXILIARY IRRIGATION CONTROLLER
 Ai+ ALTERNATE, ALTERNATIVE
 AM TIME FROM MIDNIGHT TO NOON
 Amend AMENDMENT
 AP ALTERNATIVE PIPE
 APC ALTERNATIVE PIPE CULVERT
 Approx APPROXIMATE
 APS ACCESSIBLE PEDESTRIAN SIGNAL
 APU ALTERNATIVE PIPE UNDERDRAIN
 ARS ACCELERATION RESPONSE SPECTRUM
 ARV AIR RELEASE VALVE
 AS AGGREGATE SUBBASE
 ASP ALTERNATIVE SLOTTED PIPE
 ASRP ALUMINUM SPIRAL RIB PIPE
 Assy ASSEMBLY
 ATPB ASPHALT TREATED PERMEABLE BASE
 ATPM ASPHALT TREATED PERMEABLE MATERIAL
 Auto AUTOMATIC
 Aux AUXILIARY
 AVB ATMOSPHERIC VACUUM BREAKER
 Ave AVENUE
 Avg AVERAGE

B

B & B BALLED AND BURLAPPED
 BAGR BRIDGE APPROACH GUARD RAILING
 Bat+ BATTERY
 BB BEGINNING OF BRIDGE
 B/B BRASS/BRONZE
 B/B/PI BRASS/BRONZE/PLASTIC
 B-B BACK-TO-BACK
 BBS BATTERY BACKUP SYSTEM
 BC BEGIN HORIZONTAL CURVE,
 BOLT CIRCLE
 BCR BEGIN CURB RETURN
 Beg BEGIN
 BFM BONDED FIBER MATRIX
 Bit Ctd BITUMINOUS COATED
 Bk BACK
 Bk+ BACKFILL
 Bldg BUILDING
 Bk BLACK
 BLM BRIDGE-LOG MILE
 Blvd BOULEVARD
 BM BENCH MARK
 BMP BEST MANAGEMENT PRACTICE
 Bot BOTTOM

B continued

BP BOOSTER PUMP, BYPASS
 BPA BACKFLOW PREVENTER ASSEMBLY
 BPB BICYCLE PUSH BUTTON
 BPE BACKFLOW PREVENTER ENCLOSURE
 B/PI BRASS/PLASTIC
 Br BRIDGE
 Brg BEARING
 BTU BRITISH THERMAL UNIT
 BV BALL VALVE
 BVC BEGIN VERTICAL CURVE
 BW BARBED WIRE

C

C CONDUIT, CHANNEL (STRUCTURAL STEEL SHAPE)
 CAA CABLE ANCHOR ASSEMBLY
 CAP CORRUGATED ALUMINUM PIPE
 CAPA CORRUGATED ALUMINUM PIPE ARCH
 CARV COMBINATION AIR RELEASE VALVE
 CAS CONSTRUCTION AREA SIGN
 CB CONCRETE BARRIER, CIRCUIT BREAKER, COUPLING BAND, COMPOST BERM
 CBW CONCRETE BLOCK WALL
 C-C CENTER TO CENTER
 CCA CAM COUPLER ASSEMBLY
 CCTV CLOSED CIRCUIT TELEVISION
 CEC CONTROLLER ENCLOSURE CABINET
 CG CENTER OF GRAVITY
 CHDPE CORRUGATED HIGH DENSITY POLYETHYLENE CHANNEL
 Cni CHANNEL
 CI CAST IRON
 CIDH CAST-IN-DRILLED-HOLE
 CIP CAST-IN-PLACE, CAST IRON PIPE
 CIPCP CAST IN PLACE CONCRETE PIPE
 CISS CAST-IN-STEEL-SHELL
 CJP COMPLETE JOINT PENETRATION
 Ckt CIRCUIT
 CL CHAIN LINK
 CL-6 CHAIN LINK FENCE (6 FT)
 Cl CLASS
 Cir CLEAR, CLEARANCE
 CM CENTER MARGIN LIGHT
 CMP CORRUGATED METAL PIPE
 CMS CHANGEABLE MESSAGE SIGN
 CNC CONTROL AND NEUTRAL CONDUCTORS
 Cnti CONTROL
 Co COUNTY
 Col COLUMN
 Comm COMMUNICATION
 Conc CONCRETE
 Conn CONNECTOR
 Cone+ CONSTRUCT, CONSTRUCTION
 Cont CONTINUOUS
 Coord COORDINATE
 CP CANDLEPOWER, CATCH POINT, COPPER PIPE

C continued

Cr CREEK
 CRCP CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
 CRSP CONCRETED ROCK SLOPE PROTECTION
 CS COMPOST SOCK
 CSP CORRUGATED STEEL PIPE
 CSPA CORRUGATED STEEL PIPE ARCH
 CST CENTER STRIP
 Ct COURT
 CTB CEMENT TREATED BASE
 CTID CALTRANS IDENTIFICATION
 CEMENT TREATED PERMEABLE BASE
 CTPM CEMENT TREATED PERMEABLE MATERIAL
 Ctra CENTERS
 Ctuiv CULVERT
 CV CHECK VALVE

D

D DEPTH, DIRECTION (IN PERCENT) OF HEAVIER TRAFFIC FLOW
 Dbl DOUBLE
 DD DOWNDRAIN
 Deg DEGREE
 Del DELINEATOR
 Det+ DETAIL, DETOUR
 DF DOUGLAS FIR
 DG DECOMPOSED GRANITE
 DHV DESIGN HOURLY VOLUME
 DI DRAINAGE INLET, DROP INLET
 Dia DIAMETER
 Diaph DIAPHRAGM
 DIP DUCTILE IRON PIPE
 Dist+ DISTANCE, DISTRICT
 DIT DRIP IRRIGATION TUBING
 DLC LOOP DETECTOR LEAD-IN CABLE
 DMBB DOUBLE METAL BEAM BARRIER
 DN DIAMETER NOMINAL
 Dr DRIVE
 DTBB DOUBLE THRIE BEAM BARRIER
 DVA DRIP VALVE ASSEMBLY
 Dwy DRIVEWAY

E

E EAST
 Ease+ EASEMENT
 EB END OF BRIDGE, EASTBOUND
 EC END HORIZONTAL CURVE, EROSION CONTROL
 ECR END CURB RETURN
 ECTC EROSION CONTROL TECHNOLOGY COUNCIL
 ED EDGE DRAIN
 EDC EDGE DRAIN CLEANOUT
 EDO EDGE DRAIN OUTLET
 EDV EDGE DRAIN VENT
 Elec ELECTROLIER
 Elect+ ELECTRIC, ELECTRICAL
 Elev ELEVATION

E continued

EII ELBOW
 Emb EMBANKMENT
 EMS EXTINGUISHABLE MESSAGE SIGN
 EncI ENCLOSURE
 Engr ENGINEER
 EOD EDGE OF DECK
 EP EDGE OF PAVEMENT
 Eq EQUATION
 ERS EARTH RETAINING STRUCTURE
 ES EDGE OF SHOULDER
 ESA ENVIRONMENTALLY SENSITIVE AREA
 ESAL EQUIVALENT SINGLE AXLE LOADS
 EST END STRIP
 Estb ESTABLISHMENT
 ETW EDGE OF TRAVELED WAY
 EVC END VERTICAL CURVE
 EVUC EMERGENCY VEHICLE UNIT CABLE
 EUUD EMERGENCY VEHICLE UNIT DETECTOR
 EW ENDWALL
 Exc EXCAVATION
 ExIst+ EXISTING
 Exp EXPANSION
 Exp Jt EXPANSION JOINT
 Ext+ EXTERIOR
 Exwy EXPRESSWAY

F

F FILL, FULL CIRCLE
 F & C FRAME AND COVER
 F & G FRAME AND GRATE
 FB FLOOR BEAM, FLASHING BEACON
 FBE FLASHING BEACON ENCLOSURE
 FBS FLASHING BEACON WITH SLIP BASE
 FCV FLOW CONTROL VALVE
 Fdn FOUNDATION
 FEBT FACING EASTBOUND TRAFFIC
 Fert+ FERTILIZER
 FES FLARED END SECTION
 FF FILTER FABRIC
 FG FINISH GRADE
 FH FIRE HYDRANT, FLEXIBLE HOSE
 FIGURE
 Fig FEMALE IRON PIPE THREAD
 FIPT FERTILIZER INJECTOR SYSTEM
 FIS FLOW LINE
 FNBT FACING NORTHBOUND TRAFFIC
 FO FIBER OPTIC
 FOB FREE ON BOARD
 FOC FACE OF CONCRETE
 F/P FULL/PART CIRCLE
 FR FIBER ROLL
 Fr Rd FRONTAGE ROAD
 FS FAR SIDE, FINISHED SURFACE, FLOW SENSOR
 FSBT FACING SOUTHBOUND TRAFFIC
 FSC FLOW SENSOR CABLE
 Ftg FOOTING
 FV FLUSH VALVE
 FWBT FACING WESTBOUND TRAFFIC
 Fwy FREEWAY

GENERAL RULES:

- Words are preferred over abbreviations and acronyms.
- Use words in notes, except where space is limited on the plan sheet.
- Do not use abbreviations or acronyms where the meaning may be in doubt.
- Abbreviations and acronyms may be used in callouts, dimensions, and tables.
- Use upper and lower case letters for abbreviation of a single word. e.g., Misc = miscellaneous and Bit Ctd = bituminous coated
- Use all upper case letters for acronyms. e.g., BCR = begin curb return

UNITS OF MEASUREMENT:

- See Tables A, B and C on Standard Plan A3C.
- Units of measurement are not part of abbreviations and acronyms. The above abbreviation and acronym general rules do not apply.

SYMBOLS:

- See Table D on Standard Plan A3C.

SLOPES, FLARES, AND TAPERS:

- Slope: X:Y - horizontal:vertical
- Flares and tapers: X:Y - longitudinal:lateral

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
ABBREVIATIONS
(SHEET 1 OF 3)

G

G GROOVE,
EQUIPMENT GROUNDING CONDUCTOR
ACCELERATION DUE TO GRAVITY
Go GAUGE
Galv GALVANIZED
GARV GARDEN VALVE
GARVA GARDEN VALVE ASSEMBLY
GB GROUND BUS
GFCI GROUND FAULT CIRCUIT INTERRUPTER
GM GRAVEL MULCH
GP GRADING PLANE
GPH GALLONS PER HOUR
GPM GALLONS PER MINUTE
GR GUARD RAILING
Grn GREEN
GSP GALVANIZED STEEL PIPE
Gtr GUTTER
GV GATE VALVE

H

H HEIGHT,
HALF CIRCLE
HAR HIGHWAY ADVISORY RADIO
h, hr HOUR
HD HORIZONTAL DRAIN
HDPE HIGH DENSITY POLYETHYLENE
hdwl HEADWALL
Hex HEXAGONAL
Hex Hd HEXAGONAL HEAD
HMA HOT MIX ASPHALT
Horiz HORIZONTAL
HOV HIGH OCCUPANCY VEHICLE
HP HINGE POINT,
HORSEPOWER
HPL HIGH PRESSURE LINE
HPS HIGH PERFORMANCE STEEL,
HIGH PRESSURE SODIUM
HS HIGH STRENGTH
HSS HOLLOW STRUCTURAL SECTION
HW HEADWALL,
HIGH WATER
HWM HIGH WATER MARK
Hwy HIGHWAY

I

IB IMPORTED BORROW
IC IRRIGATION CONTROLLER
ICC IRRIGATION CONTROLLER(S) IN
CONTROLLER ENCLOSURE CABINET
ID INSIDE DIAMETER
IF INSIDE FACE
IFS IRRIGATION FILTRATION SYSTEM
IISNS INTERNALLY ILLUMINATED STREET NAME SIGN
Int INTERIOR
Inv INVERT
IPS IRON PIPE SIZE
IPT IRON PIPE THREAD
Irr IRRIGATION
ISL INDUCTION SIGN LIGHTING

J

Jct JUNCTION
JP JOINT POLE
JPCP JOINTED PLAIN CONCRETE PAVEMENT
JS JUNCTION STRUCTURE
Jt JOINT

K

L

L LENGTH,
ANGLE (STRUCTURAL STEEL SHAPE)
Lat LATITUDE
LCB LEAN CONCRETE BASE
LED LIGHT EMITTING DIODE
LMA LUMINAIRE MAST ARM
Ln LANE
Loc LOCATION
LOL LAYOUT LINE
Long LONGITUDE
Longlt LONGITUDINAL
LPS LOW PRESSURE SODIUM
LS LUMP SUM
Lt LEFT
Ltg LIGHTING
Lum LUMINAIRE

M

M METERED
Maint MAINTENANCE
MAS MAST ARM MOUNTING SIDE ATTACHMENT
MAT MAST ARM MOUNTING TOP ATTACHMENT
Max MAXIMUM
MB METAL BEAM
MBB METAL BEAM BARRIER
MBGR METAL BEAM GUARD RAILING
MBPS MANUAL BYPASS SWITCH
MCV MANUAL CONTROL VALVE
Med MEDIAN
MGS MIDWEST GUARDRAIL SYSTEM
MH MANHOLE
MIC MASTER IRRIGATION CONTROLLER
Min MINIMUM
MIPT MALE IRON PIPE THREAD
Misc MISCELLANEOUS
Misc I & S MISCELLANEOUS IRON AND STEEL
Mkr MARKER
M/M MULTIPLE TO MULTIPLE TRANSFORMER
Mod MODIFIED,
MODIFY
Mon MONUMENT
MP METAL PLATE
MPGR METAL PLATE GUARD RAILING
MR MOVEMENT RANGE
MSE MECHANICALLY STABILIZED EMBANKMENT
Mt MOUNTAIN,
MOUNT
Mtg MOUNTING
Mtl MATERIAL
MV MERCURY VAPOR LIGHTING FIXTURE
MVDS MICROWAVE VEHICLE DETECTION SYSTEM
MVP MAINTENANCE VEHICLE PULLOUT

N

N NORTH,
NEUTRAL (GROUNDED CONDUCTOR)
NB NORTHBOUND,
NEUTRAL BUS
NC NORMALLY CLOSE

N continued

NCN NO COMMON NAME
NL NOZZLE LINE
NO NORMALLY OPEN
No. NUMBER (MUST HAVE PERIOD)
Nos. NUMBERS (MUST HAVE PERIOD)
NPS NOMINAL PIPE SIZE
NPT NATIONAL PIPE THREAD
NS NEAR SIDE
NTS NOT TO SCALE

O

Obir OBLITERATE
OC OVERCROSSING
O/C ON CENTER
OD OUTSIDE DIAMETER
OF OUTSIDE FACE
OG ORIGINAL GROUND
OGAC OPEN GRADED ASPHALT CONCRETE
OGFC OPEN GRADED FRICTION COURSE
OH OVERHEAD
OHWM ORDINARY HIGH WATER MARK
OL OVERLAP
O-O OUT TO OUT
Opp OPPOSITE
OSD OVERSIDE DRAIN

P

P PAGE,
PITCH,
PART CIRCLE,
NUMBER OF POLES FOR A CIRCUIT BREAKER
PAP PERFORATED ALUMINUM PIPE
PB PULL BOX
PBA PUSH BUTTON ASSEMBLY
PC POINT OF CURVATURE,
PRECAST
POINT OF COMPOUND CURVE,
PORTLAND CEMENT CONCRETE
PCMS PORTABLE CHANGEABLE MESSAGE SIGN
PCP PERFORATED CONCRETE PIPE,
PRESTRESSED CONCRETE PIPE
POINT OF COMPOUND VERTICAL CURVE
PCVC POLYETHYLENE
PE PERMIT TO ENTER AND CONSTRUCT,
PHOTOELECTRIC CONTROL
PEDESTRIAN
Perm Permeable Material
PEU PHOTOELECTRIC UNIT
PG PROFILE GRADE
PI POINT OF INTERSECTION
PJP PARTIAL JOINT PENETRATION
Pkt PACKET
Pkw PARKWAY
PL PLATE
PLASTIC
P/L PROPERTY LINE
PLS PURE LIVE SEED
Plt PLANT,
PLANTING
Plt Estb PLANT ESTABLISHMENT

P continued

PM POST MILE,
TIME FROM NOON TO MIDNIGHT
PN PAVING NOTCH
POC POINT OF HORIZONTAL CURVE,
PEDESTRIAN OVERCROSSING
POT POINT OF TANGENT
POVC POINT OF VERTICAL CURVE
PP PIPE PILE,
PLASTIC PIPE,
POWER POLE
PPL PREFORMED PERMEABLE LINER
PPP PERFORATED PLASTIC PIPE
PR PRESSURE RATED
PRC POINT OF REVERSE CURVE
PRF PAVEMENT REINFORCING FABRIC
PRLV PRESSURE RELIEF VALVE
PRV PRESSURE REGULATING VALVE
PRVC POINT OF REVERSE VERTICAL CURVE
PS&E PLANS, SPECIFICATIONS AND ESTIMATES
PS PRESTRESSED
P/S PRESTRESSED
PSP PERFORATED STEEL PIPE
PT POINT OF TANGENCY,
CONDUIT WITH PULL TAPE
PTR POWER TRANSFER RELAY
PUC PEDESTRIAN UNDERCROSSING
PVC POLYVINYL CHLORIDE
Pvmt PAVEMENT

Q

Q QUARTER CIRCLE
QCV QUICK COUPLING VALVE
Qty QUANTITY

R

R RADIUS
R & D REMOVE AND DISPOSE
R & S REMOVE AND SALVAGE
R/C RATE OF CHANGE
RCA REINFORCED CONCRETE ARCH
RCB REINFORCED CONCRETE BOX
RCP REINFORCED CONCRETE PIPE
RCPA REINFORCED CONCRETE PIPE ARCH
RCV REMOTE CONTROL VALVE
RCVM REMOTE CONTROL VALVE (MASTER)
RCVMF REMOTE CONTROL VALVE (MASTER) W/FLOW SENSOR
RCVP REMOTE CONTROL VALVE W/PRESSURE REGULATOR
RCW RECYCLED WATER
Rd ROAD
Rdwy ROADWAY
RE RELOCATED EQUIPMENT
RECP ROLLED EROSION CONTROL PRODUCT
Reinf REINFORCED,
REINFORCEMENT,
REINFORCING

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

Dawinder Minhas
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**ABBREVIATIONS
(SHEET 2 OF 3)**

R continued

Rel RELOCATE
 Repl REPLACEMENT
 Req REQUIRED
 Ret RETAINING
 Rev REVISED,
 REVISION
 RHMA RUBBERIZED HOT MIX ASPHALT
 RICS REMOTE IRRIGATION CONTROL SYSTEM
 Riv RIVER
 RM ROAD-MIXED,
 RAMP METERING
 RP RADIUS POINT,
 REFERENCE POINT
 RR RAILROAD
 RSP ROCK SLOPE PROTECTION,
 REVISED STANDARD PLAN
 Rt RIGHT
 Rte ROUTE
 RW REDWOOD,
 RETAINING WALL
 R/W RIGHT OF WAY
 RWIS ROADSIDE WEATHER INFORMATION SYSTEM
 Rwy RAILWAY

S

S SOUTH,
 SLIP,
 SUPPLEMENT
 SAE STRUCTURE APPROACH EMBANKMENT
 Salv SALVAGE
 SAPP STRUCTURAL ALUMINUM PLATE PIPE
 SB SOUTHBOUND,
 SLIP BASE
 SC SAND CUSHION
 S/C SAW CUT LINE
 Sch SCHEDULE
 SCSP SLOTTED CORRUGATED STEEL PIPE
 SD STORM DRAIN
 Sec SECOND,
 SECTION
 Sep SEPARATION
 SG SUBGRADE
 Shld SHOULDER
 Sht SHEET
 SIC SIGNAL INTERCONNECT CABLE
 Sig SIGNAL
 Sim SIMILAR
 SM SELECTED MATERIAL
 SMA SIGNAL MAST ARM
 SNS STREET NAME SIGN
 SP STAND PIPE,
 SERVICE POINT
 Spec SPECIAL,
 SPECIFICATION(S)
 SPP SLOTTED PLASTIC PIPE

S continued

Sq SQUARE
 SS SLOPE STAKE
 SSBM STRAP AND SADDLE BRACKET METHOD
 SSD STRUCTURAL SECTION DRAIN
 SSPA STRUCTURAL STEEL PLATE ARCH
 SSPP STRUCTURAL STEEL PLATE PIPE
 SSPPA STRUCTURAL STEEL PLATE PIPE ARCH
 SSSRP STEEL SPIRAL RIB PIPE
 SST SIDE STRIP
 St STREET
 Sta STATION
 STBB SINGLE THRIE BEAM BARRIER
 Std STANDARD
 Str STRUCTURE
 Surf SURFACING
 SW SIDEWALK,
 SOUND WALL
 Swr SEWER
 Sym SYMMETRICAL
 S4S SURFACE 4 SIDES

T

T SEMI-TANGENT,
 THIRD CIRCLE,
 THREAD,
 TRUCK TRAFFIC VOLUME (IN PERCENT)
 OF DESIGN HOURLY VOLUME
 Tan TANGENT
 TB TERMINAL BOARD
 TBB THRIE BEAM BARRIER
 Tbr TIMBER
 T&B TOP AND BOTTOM
 TCB TRAFFIC CONTROL BOX
 TCE TEMPORARY CONSTRUCTION EASEMENT
 TDC TELEPHONE DEMARCATION CABINET
 Temp TEMPORARY,
 TEMPERATURE,
 TEMPERED
 TG TOP OF GRADE
 TI TRAFFIC INDEX
 TLS TRUCK LOADING STAND PIPE
 TMS TRAFFIC MONITORING STATION
 TOS TRAFFIC OPERATIONS SYSTEM
 Tot TOTAL
 TP TELEPHONE POLE
 TPB TREATED PERMEABLE BASE
 TPM TREATED PERMEABLE MATERIAL
 TQ THREE-QUARTER CIRCLE
 Trans TRANSITION
 TRM TURF REINFORCEMENT MAT
 TS TRANSVERSE,
 SERVICE SIGNAL,
 TUBULAR STEEL
 TT TWO-THIRDS CIRCLE
 TWSA TREE WELL SPRINKLER ASSEMBLY
 Typ TYPICAL

U

UC UNDERCROSSING
 UD UNDERDRAIN
 UG UNDERGROUND
 UON UNLESS OTHERWISE NOTED
 UP UNDERPASS
 UPS UNINTERRUPTIBLE POWER SUPPLY
 UPSC UNINTERRUPTIBLE POWER SUPPLY CONTROLLER
 UPSM UPS MODE

V

V VALVE,
 DESIGN SPEED
 Var VARIABLE,
 VARIES
 VC VERTICAL CURVE
 VCP VITRIFIED CLAY PIPE
 Veh VEHICLE
 Vert VERTICAL
 Via VIADUCT
 VIVDS VIDEO IMAGE VEHICLE
 DETECTION SYSTEM
 Vol VOLUME

W

W WEST,
 WIDTH
 W/ WITH
 W/O WITHOUT
 WB WESTBOUND
 WH WEEP HOLE
 Whit WHITE
 WIM WEIGH-IN-MOTION
 WM WIRE MESH,
 WATER METER
 WS WATER SURFACE,
 WYE STRAINER
 WSA WYE STRAINER ASSEMBLY
 WSP WELDED STEEL PIPE
 Wt WEIGHT
 Wv WATER VALVE
 WW WINGWALL
 WWLWL WINGWALL LAYOUT LINE
 WWM WELDED WIRE MESH

X

Xfmr TRANSFORMER
 X Sec CROSS SECTION
 Xing CROSSING

Y

Yr YEAR
 Yrs YEARS

Z

UNITS OF MEASUREMENT:

Some of the units used in the project plan quantity tables and in the Bid Item List are:

TABLE A

UNIT	DEFINITION
ACRE	ACRE
CF	CUBIC FOOT
CY	CUBIC YARD
EA	EACH
GAL	GALLON
LB	POUND
LF	LINEAR FOOT
LMI	LANE MILE
LS	LUMP SUM
SOFT	SQUARE FOOT
SOYD	SQUARE YARD
STA	100 FEET
TON	2,000 POUNDS

Some of the units used in the plans other than in the project plan quantity tables are:

TABLE B

UNIT	DEFINITION
kaI	KIPS PER SQUARE INCH
kaF	KIPS PER SQUARE FOOT
paI	POUNDS PER SQUARE INCH
paF	POUNDS PER SQUARE FOOT
lb/ft ³ , pcf	POUNDS PER CUBIC FOOT
taF	TONS PER SQUARE FOOT
mph, MPH #	MILES PER HOUR
oz	OUNCE
lb	POUND
kIb	1,000 POUNDS
cal	CALORIE
ft	FOOT OR FEET
gal	GALLON

* For use on a sign panel only

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

Daivinder Minhas
 REGISTERED CIVIL ENGINEER

May 1, 2023
 PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

Some of the units used in the Electrical plans are:

TABLE C

UNIT	DEFINITION
A	AMPERE
bps	BITS PER SECOND
Bps	BYTES PER SECOND
FC	FOOT-CANDLE
Hz	HERTZ
k #	KILO
kV	KILOVOLT
kVA	KILOVOLT-AMPERE
KW	KILOWATT
M #	MEGA
m #	MILLI
mA	MILLIAMPERE
min	MINUTE
p #	PICO
s	SECOND
V	VOLT
VA	VOLT-AMPERE
V(dc)	VOLT (DIRECT CURRENT)
V(ac)	VOLT (ALTERNATING CURRENT)
W	WATT
Ω	OHM
μ #	MICRO

* Prefix to a unit

SYMBOLS:

Commonly used symbols for U.S. customary units

TABLE D

SYMBOL	DEFINITION
⊙	AT
⊖	CENTERLINE
∅	NOMINAL DIAMETER, DIAMETER, PHASE
⊞	PLATE
⊞	STATIONLINE

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
ABBREVIATIONS
(SHEET 3 OF 3)

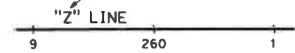
A3C

Return to Table of Contents

2023 STANDARD PLAN A3C

SYMBOLGY FOR DESIGN FEATURES

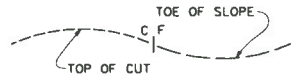
USE THE ACTUAL LINE DESIGNATION



ALIGNMENT LINE
(STATION LINE)



RIGHT OF WAY LINE
(POSITION LABEL OUTSIDE OF CALTRANS R/W)
(NO LEADER LINE OR ARROWHEAD IS NEEDED)



CATCH LINE FOR CUT AND FILL SLOPES



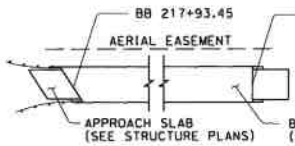
FINISHED GRADE LINE (USE SOLID LINE)



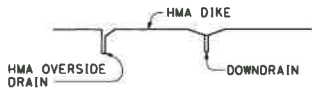
(USED FOR PROFILES AND TYPICAL SECTIONS)



ORIGINAL GROUND LINE
(MAY BE USED ON DETAIL SHEETS)



STRUCTURE (BRIDGE)



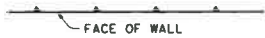
DIKE, DOWNDRAIN AND OVERSIDE DRAIN



PIPE CULVERT - SINGLE LINE
(36" OR LESS IN DIAMETER)
(PLUS - OTHER DRAINAGE FEATURES)



PIPE CULVERT - TWO LINES
(GREATER THAN 36" TO 6' IN DIAMETER
PLUS - OTHER DRAINAGE FEATURES)
(OVER 6' IN DIAMETER, DRAW TO SCALE)



WALL



WALL ON BARRIER



WALL ON RETAINING WALL



CONCRETE (MEDIAN) BARRIER



NEW GUARDRAIL



DOUBLE THREE BEAM BARRIER



TEMPORARY BARRIER SYSTEM



CURB WITHOUT CUTTER



CURB WITH GUTTER
(CURB-LIP, FLOW LINE, TOP-BACK OF CURB)



FENCE



EXISTING WALL - USE ONLY WHEN
WORK IS TO BE PERFORMED ON
EXISTING WALL (DO NOT DROP OUT)



EXISTING GUARDRAIL - USE ONLY
WHEN WORK IS TO BE PERFORMED ON
EXISTING RAILING (DO NOT DROP OUT)



EXISTING CONCRETE BARRIER - USE
ONLY WHEN WORK IS TO BE PERFORMED
ON EXISTING BARRIER (DO NOT DROP OUT)



SOLID TRAFFIC LINE



BROKEN TRAFFIC LINE



CURB RAMP



DIRECTION OF TRAFFIC
(ARROWS ARE TO BE HOLLOW)

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

Srinivasan S. Nijelle
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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STRIPING AND SIGNING

- ROADSIDE SIGN - ONE POST, TWO POSTS (EMBEDDED)
- ROADSIDE SIGN - ATTACHED TO ELECTROLIER, SIGNAL STANDARD, SIGN STRUCTURE POST OR BARRIER
- EXISTING ROADSIDE SIGN - ONE POST, TWO POSTS (EMBEDDED)
- OVERHEAD SIGN - ONE POST
- OVERHEAD SIGN - TWO POST
- SYMBOL FOR ROADSIDE SIGN NUMBER
- SYMBOL FOR OVERHEAD SIGN NUMBERING
- SYMBOL FOR TRAFFIC LINE DETAIL
- SYMBOL FOR DELINEATOR OR OBJECT MARKER
- PAVEMENT MARKING ARROWS (ARROWS ARE TO BE HATCHED)
- BEGIN OR END OF TRAFFIC STRIPE
- TRANSITION FROM ONE TRAFFIC STRIPE TO ANOTHER

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
LEGEND
LINES AND SYMBOLS
(SHEET 1 OF 5)
NO SCALE

A10A

2023 STANDARD PLAN A10A

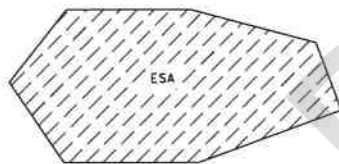
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

Schekman & Nijelle
 REGISTERED CIVIL ENGINEER
 May 1, 2023
 PLANS APPROVAL DATE
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WATER POLLUTION CONTROL

- THVF Temp HIGH-VISIBILITY FENCE
- TSF Temp SILT FENCE
- TRSF Temp Reinf SILT FENCE
- TFR Temp FIBER ROLL
- TCBB Temp GRAVEL BAG BERM
- TSBB Temp STRAW BALE BARRIER
- Slope Drain FLEX PIPE Temp
- Earth BERM Temp
- DITCH/SWALE Temp
- WASH Temp CONCRETE WASHOUT
- Drainage INLET PROTECTION Temp
- Drainage OUTLET PROTECTION Temp
- CHECK DAM Temp
- CONSTRUCTION ENTRANCE Temp
- SP Temp STOCKPILE

ENVIRONMENTALLY SENSITIVE AREA (ESA)



DRAINAGE

- DIRECTION FLOW OF WATER
- DRAINAGE SYSTEM SYMBOL
- DRAINAGE UNIT SYMBOL
- DRAINAGE INLET
- DITCH FLOW LINE

DRAFTING

- TILDE - DESIGNATES AN AREA
- NORTH ARROW
- ADDENDUM SHEET SYMBOL (ADDENDUM NUMBER IS INCLUDED INSIDE THE SYMBOL)
- MATCH LINE
- BREAK LINE

BOUNDARY LINE

- STATE OR COUNTRY
- COUNTY OR RESERVATION BOUNDARY
- CITY OR MILITARY BOUNDARY
- FOREST
- SUBDIVISION, SECTION, GRANT
- RANCHO

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
LEGEND
LINES AND SYMBOLS
 (SHEET 2 OF 5)
 NO SCALE

A10B

2023 STANDARD PLAN A10B

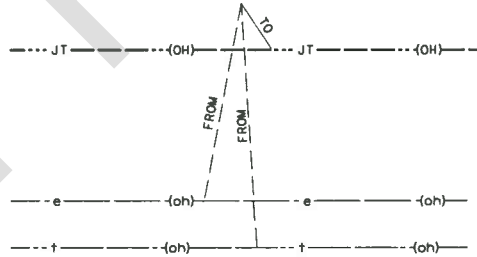
SUBSURFACE FACILITIES

---W---	W	NEW WATER
---v---	v	Exist WATER
---G---	G	NEW NATURAL GAS
---g---	g	Exist NATURAL GAS
---S---	S	NEW SEWER
---s---	s	Exist SEWER
---E---	E	NEW ELECTRICAL
---e---	e	Exist ELECTRICAL
---T---	T	NEW TELEPHONE
---t---	t	Exist TELEPHONE
---GS---	GS	NEW GASOLINE
---gs---	gs	Exist GASOLINE
---O---	O	NEW OIL
---o---	o	Exist OIL
---TV---	TV	NEW TELEVISION
---tv---	tv	Exist TELEVISION
---ST---	ST	NEW STEAM
---st---	st	Exist STEAM
---TC---	TC	NEW TELEMETER CABLE
---tc---	tc	Exist TELEMETER CABLE
---SD---	SD	NEW STORM DRAIN
---sd---	sd	Exist STORM DRAIN
---FO---	FO	NEW FIBER OPTIC
---fo---	fo	Exist FIBER OPTIC
---JT---	JT	NEW JOINT TRENCH
---jt---	jt	Exist JOINT TRENCH
---RCW---	RCW	NEW RECYCLED WATER
---rcw---	rcw	Exist RECYCLED WATER
---IRR-C---	IRR-C	Exist IRRIGATION CONDUIT
---ES-C---	ES-C	Exist ELECTRICAL SYSTEMS CONDUIT

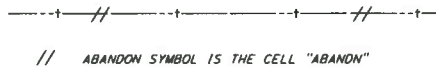
OVERHEAD FACILITIES

---E---	{OH}	NEW ELECTRICAL
---e---	{oh}	Exist ELECTRICAL
---TC---	{OH}	NEW TELEMETER CABLE
---tc---	{oh}	Exist TELEMETER CABLE
---T---	{OH}	NEW TELEPHONE
---t---	{oh}	Exist TELEPHONE
---TV---	{OH}	NEW TELEVISION
---tv---	{oh}	Exist TELEVISION
---FO---	{OH}	NEW FIBER OPTIC
---fo---	{oh}	Exist FIBER OPTIC
---JT---	{OH}	NEW JOINT OVERHEAD
---jt---	{oh}	Exist JOINT OVERHEAD

SHOWING THE RELOCATION OF EXISTING FACILITIES TO THE NEW LOCATION



ABANDONED FACILITY



THERE ARE LINE STYLES FOR ABANDONED UNDERGROUND UTILITIES IN THE CALTRANS LINE STYLE RESOURCE FILE (c:\style\SS3.rsc)

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

Schlesinger & Nigelle
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
Schlesinger & Nigelle
CMBIS
Exp. 3-30-23
STATE OF CALIFORNIA

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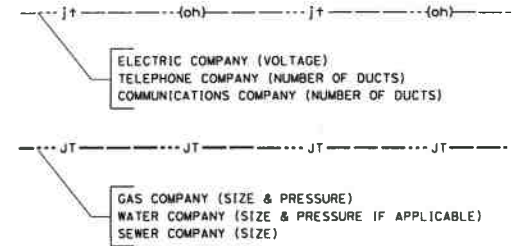
NOTE:

IDENTIFY (LABEL) THE OWNER OF EACH FACILITY PLUS THE SIZE, PRESSURE AND VOLTAGE (IF APPLICABLE) FOR ALL FACILITIES (WHETHER PART OF A JOINT OVERHEAD, JOINT TRENCH OR SOLO INSTALLATION).

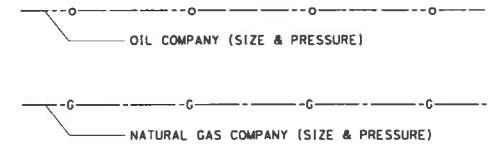
THE TYPE OF FACILITY IS IDENTIFIED BY THE SYMBOLOGY OF THE LINE STYLE CHOSEN (SEE LINE STYLES ON THIS STANDARD PLAN SHEET).

WHEN USING THE JOINT OVERHEAD OR JOINT TRENCH SYMBOLOGY (SEE THE CALTRANS LINE STYLES ON THIS PAGE), USE A BRACKET TO GROUP AND LABEL ALL THE FACILITIES ASSOCIATED WITH THE JOINT OVERHEAD OR TRENCH (SEE THE EXAMPLES BELOW).

JOINT OVERHEAD/TRENCH



SOLO FACILITY



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
LEGEND
LINES AND SYMBOLS
(SHEET 3 OF 5)
NO SCALE

A10C













2023 STANDARD PLAN A10C

EXISTING UTILITY POINT FEATURES

THE LEVEL AND COLOR OF AN EXISTING UTILITY POINT FEATURE SYMBOL MATCHES THE UTILITY TYPE LINE STYLE THAT IT IS ASSOCIATED WITH. THE NAME OF THE STANDARD CELLS FOR EACH SYMBOL VARY SLIGHTLY ACCORDING TO THE FACILITY TYPE (E.G., UT-MH-SEWER, UT-MH-GAS). MULTIPLE VERSIONS OF A PARTICULAR SYMBOL REPRESENTING AN EXISTING UTILITY POINT FEATURE IS USED WHEN EACH IS ASSOCIATED WITH A DIFFERENT FACILITY (E.G., POWER POLE FOR OVERHEAD-ELECTRICAL, TELEPHONE, FIBER OPTIC, JOINT, ETC.). THIS DIFFERENTIATION FACILITATES ASSET MANAGEMENT OF EXISTING UTILITY FEATURES WITHIN THE CALTRANS RIGHT OF WAY.

EXISTING UTILITY CELL SYMBOLOGY REPRESENTING UTILITY POINT FEATURES

ATTRIBUTES (METADATA) FOR UTILITY FEATURES WILL BE LOCATED IN UTILITY DATABASE. ONLY AS-BUILT FACILITIES ARE IN THE UTILITY DATABASE. UTILITY DATABASE DOES NOT INCLUDE NEW FACILITIES TO BE CONSTRUCTED.


-  **CABINET:**
ELECTRICAL, FIBER OPTIC, TELECOMMUNICATION,
TELEPHONE, TELEVISION
-  **DRAINAGE INLET:**
SEWER, STORM DRAIN
-  **FIRE HYDRANT:**
WATER
-  **LAMP POST:**
ELECTRICAL
-  **METER:**
ELECTRICAL, NATURAL GAS, WATER
-  **MANHOLE:**
ELECTRICAL, FIBER OPTIC, GAS, JOINT FACILITY,
NATURAL GAS, OIL, RECYCLED WATER, SEWER,
STEAM, STORM DRAIN, TELECOMMUNICATION,
TELEPHONE, TELEVISION, WATER
-  **PULL BOX:**
ELECTRICAL, FIBER OPTIC, JOINT FACILITY,
TELECOMMUNICATION, TELEPHONE, TELEVISION
-  **POWER POLE:**
ELECTRICAL, FIBER OPTIC, JOINT FACILITY,
TELECOMMUNICATION, TELEPHONE, TELEVISION
-  **TRANSMISSION TOWER:**
ELECTRICAL, FIBER OPTIC, JOINT FACILITY,
TELECOMMUNICATION, TELEPHONE, TELEVISION
-  **VALVE:**
WATER, NATURAL GAS
-  **VENT:**
GAS, NATURAL GAS, SEWER, STEAM
-  **VAULT:**
ELECTRICAL, JOINT FACILITY

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



Schlesinger & Nijelle
REGISTERED CIVIL ENGINEER

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POSITIVE LOCATION

-  POSITIVE LOCATION SYMBOL IDENTIFYING THE POTHOLING NUMBER
-  POTHOLING SYMBOL MARKING THE EXACT LOCATION

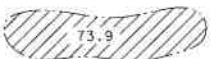
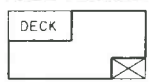









STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LEGEND
LINES AND SYMBOLS
(SHEET 4 OF 5)
NO SCALE









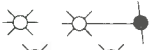








A10D

2023 STANDARD PLAN A10D

TOPOGRAPHIC MAPPING LINES AND SYMBOLS
TOPOGRAPHIC MAPPING IS DROPPED OUT ON FINAL CONTRACT PLANS

- CURB
- LANE STRIPE
- EDGE OF TRAVELED WAY (STATE HIGHWAY)
- EDGE OF TRAVELED WAY (OTHER)
- EDGE OF ASPHALT (SHOULDER)
- CONCRETE
- GUARDRAIL
- MEDIAN BARRIER
- FENCE
- MASONRY WALL
- MASONRY WALL AND FENCE
- RETAINING WALL
- RETAINING WALL AND FENCE
- RETAINING WALL AND MASONRY WALL
- FLOWLINE (NATURAL AND MANMADE)
-  EDGE OF BODY OF WATER, SURFACE HATCHED AND SPOT ELEVATION ON SURFACE
-  DECK
BUILDING
COVERED PORCH OR PARKING
-  DIRT PILE, ROCK
-  POOL, SPA
-  TREES, BRUSH, OR VEGETATION OVER 1/2 CONTOUR INTERVAL IN HEIGHT
-  VINEYARD ROW
-  CATTLE GUARD
-  OVERHEAD SIGN - SINGLE POST
-  OVERHEAD SIGN - TWO POST
-  TRAIL
-  DIRT ROAD




SYMBOLS
ENLARGED FOR CLARITY

-  LEFT TURN LANE ARROW
-  HOV LANE (HIGH OCCUPANCY VEHICLE)
-  DROP INLET, ROUND DROP INLET
-  MANHOLE
-  FIRE HYDRANT
-  VALVE COVER, STAND PIPE, WELL, UTILITY BOX, RAILROAD CROSSING STANDARD
-  UTILITY POLE, POLE AND WIRES, POLE WITH WIRES AND ANCHOR
-  TRANSMISSION TOWER
-  ELECTROLINER, ELECTROLINER ON POLE
-  TRAFFIC SIGNAL, RAILROAD SIGNAL
-  CALL BOX
-  SIGNS - SINGLE POST, TWO POSTS
-  SINGLE TREE, PALM
-  MARSH OR SWAMP
-  CRASH CUSHION
-  TANK
-  VOID - OBSTRUCTED AREA, UNABLE TO OBTAIN GROUND INFORMATION PHOTOGRAMMETRICALLY

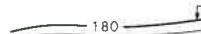
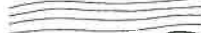
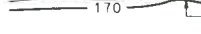




RAILROAD

-  SCALE: 1" = 100'
-  SCALE: 1" = 50', 1" = 20'





CONTROL POINTS

-  HORIZONTAL AND VERTICAL CONTROL POINT
-  HORIZONTAL CONTROL POINT
-  VERTICAL CONTROL POINT

TOPOGRAPHY

-  INDEX CONTOUR
-  INTERMEDIATE CONTOURS
-  INDEX CONTOUR (SCALE: 1" = 50')
-  GNV CONTOUR (GROUND NOT VISIBLE)
-  DEPRESSION CONTOUR
-  GNV DEPRESSION CONTOUR
-  657.2 SPOT ELEVATION (AT DECIMAL POINT)

WATER WAYS

-  RIVERS, STREAMS AND CREEKS - SMALL (ONE LINE)
-  RIVERS, STREAMS AND CREEKS - LARGE (TWO LINES) (WHICH DEFINES THE WATER EDGE)
-  OCEAN - (GRADUATED LINE WEIGHTS)
-  WATER EDGE, LAKE, POND, SWAMP

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
LEGEND
LINES AND SYMBOLS
(SHEET 5 OF 5)
 NO SCALE

A10E

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

Schwaninger & Nijelle
 REGISTERED CIVIL ENGINEER

May 1, 2023
 PLANS APPROVAL DATE

THE STATE OF CALIFORNIA AND ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

2023 STANDARD PLAN A10E

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2022)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
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debut
 CERTIFIED ENGINEERING GEOLOGIST

May 1, 2023
 PLANS APPROVAL DATE

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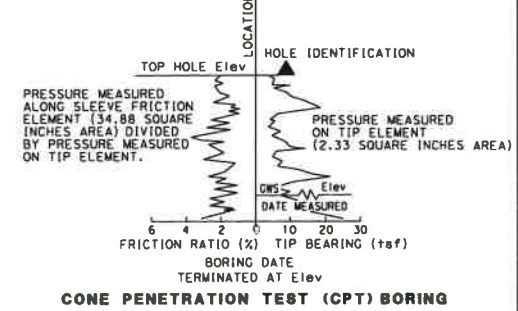
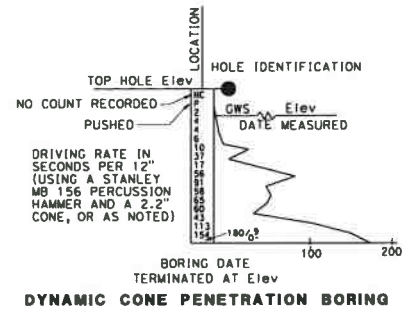
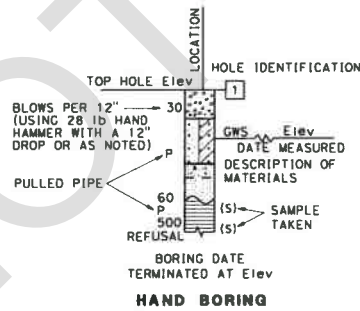
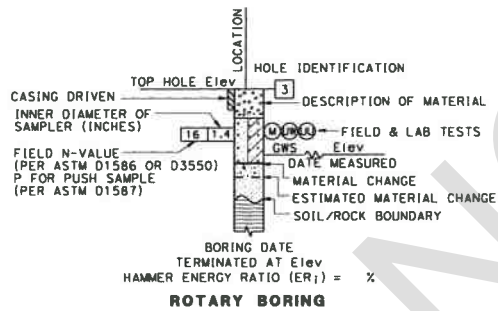
CEMENTATION	
DESCRIPTION	CRITERIA
WEAK	CRUMBLES OR BREAKS WITH HANDLING OR LITTLE FINGER PRESSURE.
MODERATE	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE.
STRONG	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE.

ABBREVIATION:
 GWS - GROUND WATER SURFACE

BOREHOLE IDENTIFICATION		
SYMBOL	HOLE TYPE	DESCRIPTION
	A	AUGER BORING (HOLLOW OR SOLID STEM BUCKET)
	R	ROTARY DRILLED BORING (CONVENTIONAL)
	RW	ROTARY DRILLED WITH SELF-CASING WIRE-LINE
	RC	ROTARY CORE WITH CONTINUOUSLY-SAMPLED, SELF-CASING WIRE-LINE
	P	ROTARY PERCUSSION BORING (AIR)
	R	ROTARY DRILLED DIAMOND CORE
	RC	ROTARY DRILLED DIAMOND CORE, CONTINUOUSLY SAMPLED
	HD	HAND DRIVEN (1-INCH SOIL TUBE)
	HA	HAND AUGER
	D	DYNAMIC CONE PENETRATION BORING
	CPT	CONE PENETRATION TEST (ASTM D5778)
	O	OTHER (NOTE ON LOTB)

NOTE: SIZE IN INCHES.

CONSISTENCY OF COHESIVE SOILS				
DESCRIPTION	SHEAR STRENGTH (tsf)	POCKET PENETROMETER MEASUREMENT, PP, (tsf)	TORVANE MEASUREMENT, TV, (tsf)	VANE SHEAR MEASUREMENT, VS, (tsf)
VERY SOFT	LESS THAN 0.12	LESS THAN 0.25	LESS THAN 0.12	LESS THAN 0.12
SOFT	0.12 - 0.25	0.25 - 0.5	0.12 - 0.25	0.12 - 0.25
MEDIUM STIFF	0.25 - 0.5	0.5 - 1	0.25 - 0.5	0.25 - 0.5
STIFF	0.5 - 1	1 - 2	0.5 - 1	0.5 - 1
VERY STIFF	1 - 2	2 - 4	1 - 2	1 - 2
HARD	GREATER THAN 2	GREATER THAN 4	GREATER THAN 2	GREATER THAN 2



STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
LEGEND - SOIL
 (SHEET 1 OF 2)
 NO SCALE

A10F

2023 STANDARD PLAN A10F

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2022)

GROUP SYMBOLS AND NAMES			
GRAPHIC/SYMBOL	GROUP NAMES	GRAPHIC/SYMBOL	GROUP NAMES
	GW WELL-GRADED GRAVEL		CL LEAN CLAY
	GP POORLY-GRADED GRAVEL		CL LEAN CLAY WITH SAND
	GW-GM WELL-GRADED GRAVEL WITH SAND		CL LEAN CLAY WITH GRAVEL
	GP-GM POORLY-GRADED GRAVEL WITH SAND		CL SANDY LEAN CLAY
	GW-GC WELL-GRADED GRAVEL WITH SILT		CL SILTY CLAY
	GP-GC POORLY-GRADED GRAVEL WITH SILT		CL SILTY CLAY WITH SAND
	GW-GM WELL-GRADED GRAVEL WITH SILT AND SAND		CL SILTY CLAY WITH GRAVEL
	GP-GM POORLY-GRADED GRAVEL WITH SILT AND SAND		CL SANDY SILTY CLAY
	GW-GC WELL-GRADED GRAVEL WITH CLAY		CL SANDY SILTY CLAY WITH GRAVEL
	GP-GC POORLY-GRADED GRAVEL WITH CLAY		CL GRAVELLY SILTY CLAY
	GW-GC WELL-GRADED GRAVEL WITH CLAY AND SAND		CL GRAVELLY LEAN CLAY
	GP-GC POORLY-GRADED GRAVEL WITH CLAY AND SAND		CL GRAVELLY LEAN CLAY WITH SAND
	GM SILTY GRAVEL		ML SILT
	GC CLAYEY GRAVEL		ML SILT WITH SAND
	GC CLAYEY GRAVEL WITH SAND		ML SILT WITH GRAVEL
	GC-GM SILTY, CLAYEY GRAVEL		ML SANDY SILT
	GC-GM SILTY, CLAYEY GRAVEL WITH SAND		ML SANDY SILT WITH GRAVEL
	SW WELL-GRADED SAND		ML GRAVELLY SILT
	SW WELL-GRADED SAND WITH GRAVEL		ML GRAVELLY SILT WITH SAND
	SP POORLY-GRADED SAND		OL ORGANIC LEAN CLAY
	SP POORLY-GRADED SAND WITH GRAVEL		OL ORGANIC LEAN CLAY WITH SAND
	SW-SM WELL-GRADED SAND WITH SILT		OL ORGANIC LEAN CLAY WITH GRAVEL
	SW-SM WELL-GRADED SAND WITH SILT AND GRAVEL		OL SANDY ORGANIC LEAN CLAY
	SW-SC WELL-GRADED SAND WITH CLAY		OL SANDY ORGANIC LEAN CLAY WITH GRAVEL
	SW-SC WELL-GRADED SAND WITH CLAY AND GRAVEL		OL SANDY ORGANIC LEAN CLAY WITH GRAVEL
	SP-SM POORLY-GRADED SAND WITH SILT		OL GRAVELLY ORGANIC LEAN CLAY
	SP-SM POORLY-GRADED SAND WITH SILT AND GRAVEL		OL GRAVELLY ORGANIC LEAN CLAY WITH SAND
	SP-SC POORLY-GRADED SAND WITH CLAY		CH FAT CLAY
	SP-SC POORLY-GRADED SAND WITH CLAY AND GRAVEL		CH FAT CLAY WITH GRAVEL
	SM SILTY SAND		CH SANDY FAT CLAY
	SM SILTY SAND WITH GRAVEL		CH SANDY FAT CLAY WITH GRAVEL
	SC CLAYEY SAND		CH GRAVELLY FAT CLAY
	SC CLAYEY SAND WITH GRAVEL		CH GRAVELLY FAT CLAY WITH SAND
	SP-SM POORLY-GRADED SAND WITH SILT		MH ELASTIC SILT
	SP-SM POORLY-GRADED SAND WITH SILT AND GRAVEL		MH ELASTIC SILT WITH SAND
	SP-SC POORLY-GRADED SAND WITH CLAY		MH ELASTIC SILT WITH GRAVEL
	SP-SC POORLY-GRADED SAND WITH CLAY AND GRAVEL		MH SANDY ELASTIC SILT
	SM SILTY SAND		MH SANDY ELASTIC SILT WITH GRAVEL
	SM SILTY SAND WITH GRAVEL		MH GRAVELLY ELASTIC SILT
	SC CLAYEY SAND		MH GRAVELLY ELASTIC SILT WITH SAND
	SC CLAYEY SAND WITH GRAVEL		OH ORGANIC FAT CLAY
	SP-SM POORLY-GRADED SAND WITH SILT		OH ORGANIC FAT CLAY WITH SAND
	SP-SM POORLY-GRADED SAND WITH SILT AND GRAVEL		OH ORGANIC FAT CLAY WITH GRAVEL
	SP-SC POORLY-GRADED SAND WITH CLAY		OH SANDY ORGANIC FAT CLAY
	SP-SC POORLY-GRADED SAND WITH CLAY AND GRAVEL		OH SANDY ORGANIC FAT CLAY WITH GRAVEL
	SM SILTY SAND		OH GRAVELLY ORGANIC FAT CLAY
	SM SILTY SAND WITH GRAVEL		OH GRAVELLY ORGANIC FAT CLAY WITH SAND
	SC CLAYEY SAND		OH ORGANIC ELASTIC SILT
	SC CLAYEY SAND WITH GRAVEL		OH ORGANIC ELASTIC SILT WITH SAND
	SP-SM POORLY-GRADED SAND WITH SILT		OH ORGANIC ELASTIC SILT WITH GRAVEL
	SP-SM POORLY-GRADED SAND WITH SILT AND GRAVEL		OH SANDY ORGANIC ELASTIC SILT
	SP-SC POORLY-GRADED SAND WITH CLAY		OH SANDY ORGANIC ELASTIC SILT WITH GRAVEL
	SP-SC POORLY-GRADED SAND WITH CLAY AND GRAVEL		OH GRAVELLY ORGANIC ELASTIC SILT
	SM SILTY SAND		OH GRAVELLY ORGANIC ELASTIC SILT WITH SAND
	SM SILTY SAND WITH GRAVEL		OH ORGANIC SOIL
	SC CLAYEY SAND		OH ORGANIC SOIL WITH SAND
	SC CLAYEY SAND WITH GRAVEL		OH ORGANIC SOIL WITH GRAVEL
	SP-SM POORLY-GRADED SAND WITH SILT		OH SANDY ORGANIC SOIL
	SP-SM POORLY-GRADED SAND WITH SILT AND GRAVEL		OH SANDY ORGANIC SOIL WITH GRAVEL
	SP-SC POORLY-GRADED SAND WITH CLAY		OH GRAVELLY ORGANIC SOIL
	SP-SC POORLY-GRADED SAND WITH CLAY AND GRAVEL		OH GRAVELLY ORGANIC SOIL WITH SAND
	SM SILTY SAND		OL/OH ORGANIC SOIL
	SM SILTY SAND WITH GRAVEL		OL/OH ORGANIC SOIL WITH SAND
	SC CLAYEY SAND		OL/OH ORGANIC SOIL WITH GRAVEL
	SC CLAYEY SAND WITH GRAVEL		OL/OH SANDY ORGANIC SOIL
	SP-SM POORLY-GRADED SAND WITH SILT		OL/OH SANDY ORGANIC SOIL WITH GRAVEL
	SP-SM POORLY-GRADED SAND WITH SILT AND GRAVEL		OL/OH GRAVELLY ORGANIC SOIL
	SP-SC POORLY-GRADED SAND WITH CLAY		OL/OH GRAVELLY ORGANIC SOIL WITH SAND
	SP-SC POORLY-GRADED SAND WITH CLAY AND GRAVEL		OL/OH GRAVELLY ORGANIC SOIL WITH SAND
	PT PEAT		
	PT COBBLES		
	PT COBBLES AND BOULDERS		

FIELD AND LABORATORY TESTING	
(C)	CONSOLIDATION
(CR)	CORROSIIVITY TESTING
(CU)	CONSOLIDATED UNDRAINED TRIAXIAL
(DS)	DIRECT SHEAR
(EI)	EXPANSION INDEX
(HC)	HYDRAULIC CONDUCTIVITY
(OC)	ORGANIC CONTENT-%
(PA)	PARTICLE SIZE ANALYSIS
(PI)	PLASTICITY INDEX
(PL)	POINT LOAD INDEX
(UC)	UNCONFINED COMPRESSION - SOIL
(UU)	UNCONFINED COMPRESSION - ROCK
(W)	200 SIEVE TEST

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

Ch. A. Moore
 CERTIFIED ENGINEERING GEOLOGIST
 No. 10000
 May 1, 2023
 PLAN'S APPROVAL DATE
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APPARENT DENSITY OF COHESIONLESS SOILS	
DESCRIPTION	SPT N ₆₀ (BLOWS/12 INCHES)
VERY LOOSE	0 - 5
LOOSE	5 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	GREATER THAN 50

MOISTURE	
DESCRIPTION	CRITERIA
DRY	NO DISCERNABLE MOISTURE
MOIST	MOISTURE PRESENT, BUT NO FREE WATER
WET	VISIBLE FREE WATER

PERCENT OR PROPORTION OF SOILS	
DESCRIPTION	CRITERIA
TRACE	PARTICLES ARE PRESENT BUT ESTIMATED TO BE LESS THAN 5%
FEW	5% - 10%
LITTLE	15% - 25%
SOME	30% - 45%
MOSTLY	50% - 100%

PARTICLE SIZE		
DESCRIPTION	SIZE	
BOULDER	GREATER THAN 12"	
COBBLE	3" - 12"	
GRAVEL	COARSE	3/8" - 3"
	FINE	1/8" - 3/8"
SAND	COARSE	1/16" - 1/8"
	MEDIUM	1/64" - 1/16"
	FINE	1/300" - 1/64"
SILT AND CLAY	LESS THAN 1/300"	

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
LEGEND - SOIL
 (SHEET 2 OF 2)
 NO SCALE

A10G

2023 STANDARD PLAN A10G

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2022)

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

REC = $\frac{\sum \text{LENGTH OF THE RECOVERED CORE PIECES (INCHES)}}{\text{TOTAL LENGTH OF CORE RUN (INCHES)}} \times 100\%$

RQD = $\frac{\sum \text{LENGTH OF INTACT CORE PIECES} \geq 4 \text{ INCHES}}{\text{TOTAL LENGTH OF CORE RUN (INCHES)}} \times 100\%$

ROD * INDICATES SOUNDNES CRITERIA NOT MET.

ROCK HARDNESS	
DESCRIPTION	CRITERIA
EXTREMELY HARD	CANNOT BE SCRATCHED WITH A POCKETKNIFE OR SHARP PICK. CAN ONLY BE CHIPPED WITH REPEATED HEAVY HAMMER BLOWS.
VERY HARD	CANNOT BE SCRATCHED WITH A POCKETKNIFE OR SHARP PICK. BREAKS WITH REPEATED HEAVY HAMMER BLOWS.
HARD	CAN BE SCRATCHED WITH A POCKETKNIFE OR SHARP PICK WITH DIFFICULTY (HEAVY PRESSURE). BREAKS WITH HEAVY HAMMER BLOWS.
MODERATELY HARD	CAN BE SCRATCHED WITH POCKETKNIFE OR SHARP PICK WITH LIGHT OR MODERATE PRESSURE. BREAKS WITH MODERATE HAMMER BLOWS.
MODERATELY SOFT	CAN BE GROOVED 1/8" DEEP WITH A POCKETKNIFE OR SHARP PICK WITH MODERATE OR HEAVY PRESSURE. BREAKS WITH LIGHT HAMMER BLOW OR HEAVY MANUAL PRESSURE.
SOFT	CAN BE GROOVED OR GOUGED EASILY BY A POCKETKNIFE OR SHARP PICK WITH LIGHT PRESSURE. CAN BE SCRATCHED WITH FINGERNAIL. BREAKS WITH LIGHT TO MODERATE MANUAL PRESSURE.
VERY SOFT	CAN BE READILY INDENTED, GROOVED OR GOUGED WITH FINGERNAIL, OR CARVED WITH A POCKETKNIFE. BREAKS WITH LIGHT MANUAL PRESSURE.

FRACTURE DENSITY	
DESCRIPTION	OBSERVED FRACTURE DENSITY
UNFRACTURED	NO FRACTURES.
VERY SLIGHTLY FRACTURED	CORE LENGTHS GREATER THAN 3 ft.
SLIGHTLY FRACTURED	CORE LENGTHS MOSTLY FROM 1 TO 3 ft.
MODERATELY FRACTURED	CORE LENGTHS MOSTLY FROM 4 INCHES TO 1 ft.
INTENSELY FRACTURED	CORE LENGTHS MOSTLY FROM 1 TO 4 INCHES.
VERY INTENSELY FRACTURED	MOSTLY CHIPS AND FRAGMENTS.

BEDDING SPACING	
DESCRIPTION	THICKNESS/SPACING
MASSIVE	GREATER THAN 10'
VERY THICKLY BEDDED	3' - 10'
THICKLY BEDDED	1' - 3'
MODERATELY BEDDED	4" - 1'
THINLY BEDDED	1" - 4"
VERY THINLY BEDDED	1/4" - 1"
LAMINATED	LESS THAN 1/4"

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

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

Ch. [Signature]
CERTIFIED ENGINEERING GEOLOGIST

May 1, 2023
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WEATHERING DESCRIPTORS FOR INTACT ROCK						
DESCRIPTION	DIAGNOSTIC FEATURES					GENERAL CHARACTERISTICS
	CHEMICAL WEATHERING-DISCOLORATION AND/OR OXIDATION		MECHANICAL WEATHERING-GRAIN BOUNDARY CONDITIONS (DISAGGREGATION) PRIMARILY FOR GRANITICS AND SOME COARSE-GRAINED SEDIMENTS	TEXTURE AND LEACHING		
	BODY OF ROCK	FRACTURE SURFACES		TEXTURE	LEACHING	
FRESH	NO DISCOLORATION, NOT OXIDIZED.	NO DISCOLORATION OR OXIDATION.	NO SEPARATION, INTACT (TIGHT).	NO CHANGE	NO LEACHING	HAMMER RINGS WHEN CRYSTALLINE ROCKS ARE STRUCK.
SLIGHTLY WEATHERED	DISCOLORATION OR OXIDATION IS LIMITED TO SURFACE OF, OR SHORT DISTANCE FROM, FRACTURES; SOME FELDSPAR CRYSTALS ARE DULL.	MINOR TO COMPLETE DISCOLORATION OR OXIDATION OF MOST SURFACES.	NO VISIBLE SEPARATION, INTACT (TIGHT).	PRESERVED	MINOR LEACHING OF SOME SOLUBLE MINERALS.	HAMMER RINGS WHEN CRYSTALLINE ROCKS ARE STRUCK. BODY OF ROCK NOT WEAKENED.
MODERATELY WEATHERED	DISCOLORATION OR OXIDATION EXTENDS FROM FRACTURES USUALLY THROUGHOUT; Fe-Mg MINERALS ARE "RUSTY," FELDSPAR CRYSTALS ARE "CLOUDY."	ALL FRACTURE SURFACES ARE DISCOLORED OR OXIDIZED.	PARTIAL SEPARATION OF BOUNDARIES VISIBLE.	GENERALLY PRESERVED	SOLUBLE MINERALS MAY BE MOSTLY LEACHED.	HAMMER DOES NOT RING WHEN ROCK IS STRUCK. BODY OF ROCK IS SLIGHTLY WEAKENED.
INTENSELY WEATHERED	DISCOLORATION OR OXIDATION THROUGHOUT; ALL FELDSPARS AND Fe-Mg MINERALS ARE ALTERED TO CLAY TO SOME EXTENT; OR CHEMICAL ALTERATION PRODUCES IN-SITU DISAGGREGATION, SEE GRAIN BOUNDARY CONDITIONS.	ALL FRACTURE SURFACES ARE DISCOLORED OR OXIDIZED, SURFACES FRIABLE.	PARTIAL SEPARATION, ROCK IS FRIABLE; IN SEMIARID CONDITIONS GRANITICS ARE DISAGGREGATED.	TEXTURE ALTERED BY CHEMICAL DISINTEGRATION (HYDRATION, ARGILLATION).	LEACHING OF SOLUBLE MINERALS MAY BE COMPLETE.	DULL SOUND WHEN STRUCK WITH HAMMER, USUALLY CAN BE BROKEN WITH MODERATE TO HEAVY MANUAL PRESSURE OR BY LIGHT HAMMER BLOW WITHOUT REFERENCE TO PLANES OF WEAKNESS SUCH AS INCIPENT OR HAIRLINE FRACTURES, OR VEINLETS. ROCK IS SIGNIFICANTLY WEAKENED.
DECOMPOSED	DISCOLORED OR OXIDIZED THROUGHOUT, BUT RESISTANT MINERALS SUCH AS QUARTZ MAY BE UNALTERED; ALL FELDSPARS AND Fe-Mg MINERALS ARE COMPLETELY ALTERED TO CLAY.		COMPLETE SEPARATION OF GRAIN BOUNDARIES (DISAGGREGATED).	RESEMBLES A SOIL, PARTIAL OR COMPLETE REMNANT ROCK STRUCTURE MAY BE PRESERVED; LEACHING OF SOLUBLE MINERALS USUALLY COMPLETE.		CAN BE GRANULATED BY HAND. RESISTANT MINERALS SUCH AS QUARTZ MAY BE PRESENT AS "STRINGERS" OR "DIKES."

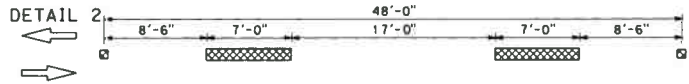
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
LEGEND - ROCK
NO SCALE

A10H

2023 STANDARD PLAN A10H

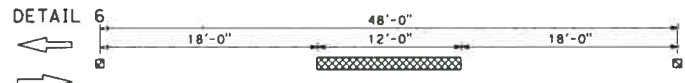
[Return to Table of Contents](#)

CENTERLINES
(2 LANE HIGHWAYS)



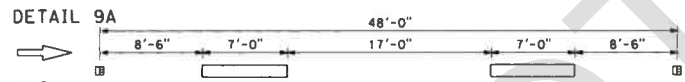
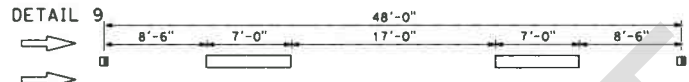
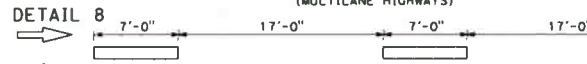
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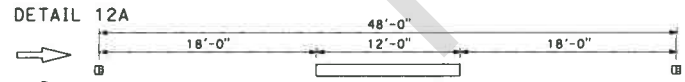


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LANE LINES
(MULTILANE HIGHWAYS)



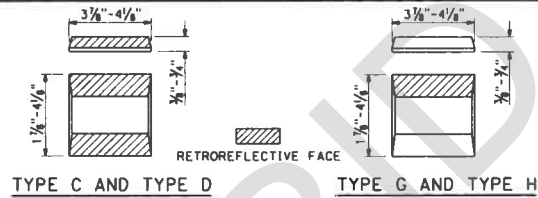
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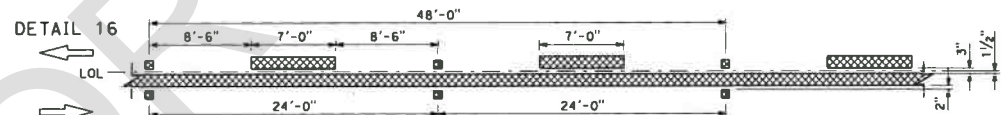
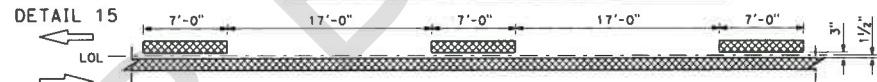
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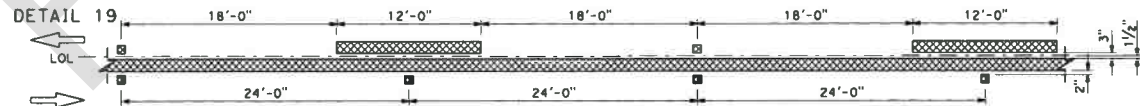
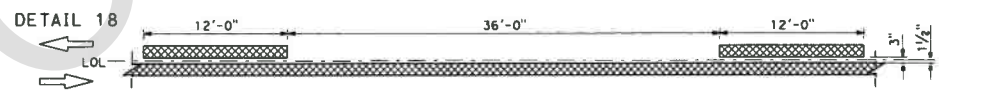


MARKER DETAILS

NO PASSING ZONES - ONE DIRECTION

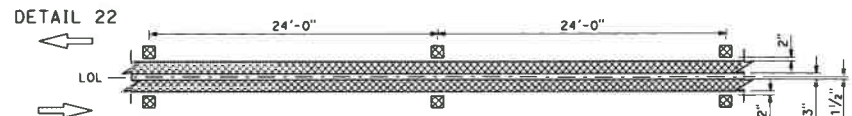


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~~DETAIL 20~~ DETAIL 20 DELETED

NO PASSING ZONES - TWO DIRECTION



~~DETAIL 23~~ DETAIL 23 DELETED

LEGEND:

- TYPE C RED-CLEAR RETROREFLECTIVE MARKER
- TYPE D TWO-WAY YELLOW RETROREFLECTIVE MARKER
- TYPE G ONE-WAY CLEAR RETROREFLECTIVE MARKER
- TYPE H ONE-WAY YELLOW RETROREFLECTIVE MARKER
- 6" WHITE LINE
- 6" YELLOW LINE

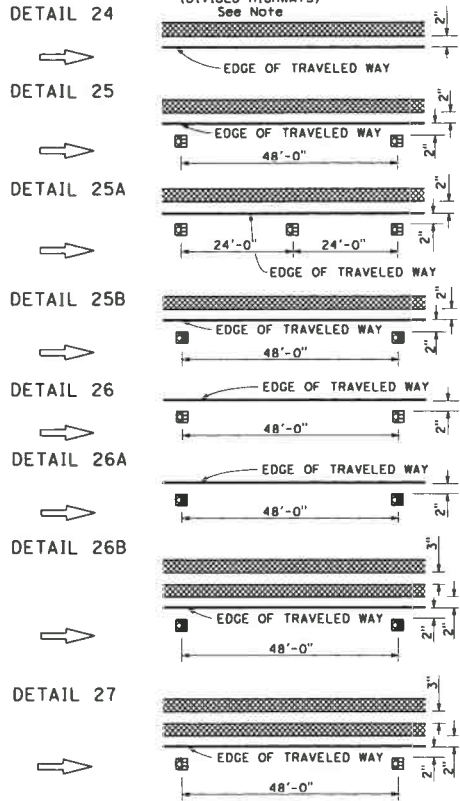
DIST	COUNTY	ROUTE	POST MILES	SHEET	TOTAL
			TOTAL PROJECT	NO.	SHEETS

REGISTERED CIVIL ENGINEER
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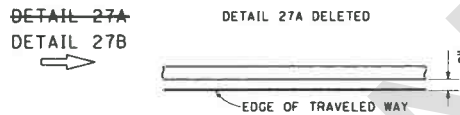
STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
PAVEMENT MARKERS AND TRAFFIC LINES
 TYPICAL DETAILS
 NO SCALE

A20A

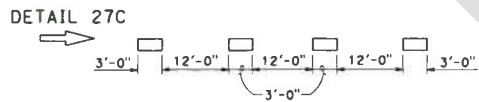
LEFT EDGE LINES



RIGHT EDGE LINES

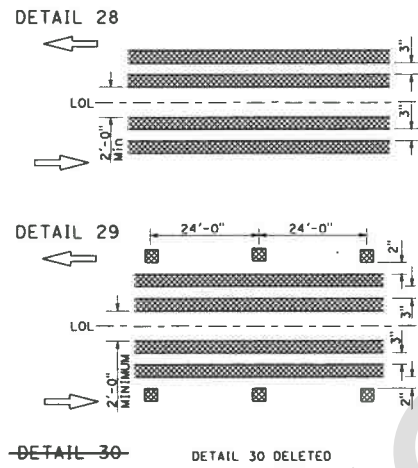


RIGHT EDGE LINE EXTENSION THROUGH INTERSECTIONS

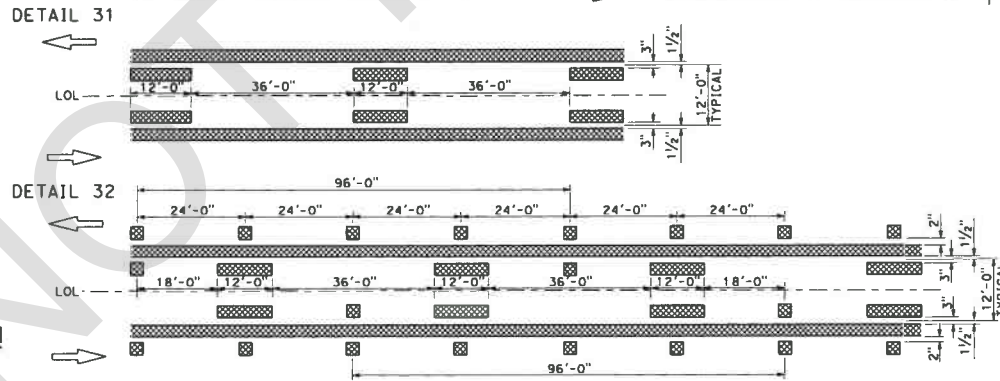


LEFT EDGE LINES NOTE:
On freeways use traffic stripe details with Type RY markers.

MEDIAN ISLANDS



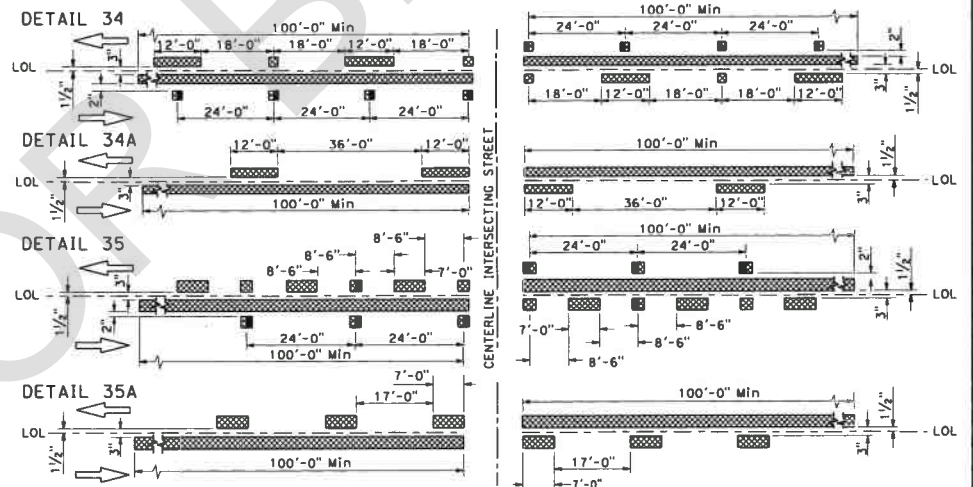
TWO-WAY LEFT TURN LANES



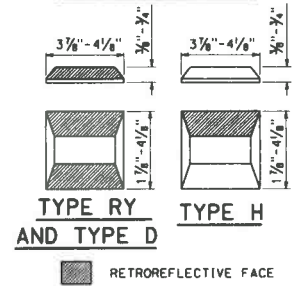
LEGEND:

- TYPE D TWO-WAY YELLOW RETROREFLECTIVE MARKER
- TYPE H ONE-WAY YELLOW RETROREFLECTIVE MARKER
- TYPE RY RED-YELLOW RETROREFLECTIVE MARKER
- 6" WHITE LINE
- 6" YELLOW LINE

INTERSECTION TREATMENTS



MARKER DETAILS



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
PAVEMENT MARKERS AND TRAFFIC LINES
TYPICAL DETAILS
NO SCALE

A20B

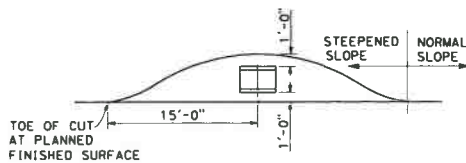
DIST.	COUNTY	ROUTE	POST MILES	SHEET TOTAL
			TOTAL PROJECT	NO. SHEETS

REGISTERED CIVIL ENGINEER

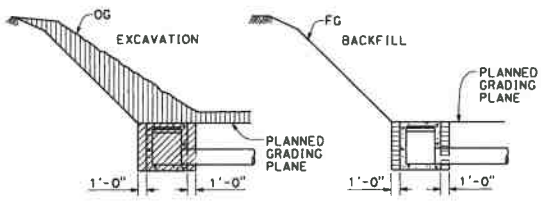
May 1, 2023
PLANS APPROVAL DATE

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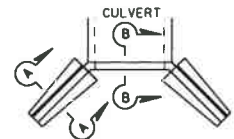
Yuan Hong
CE2065
09-31-24
CIVIL
STATE OF CALIFORNIA



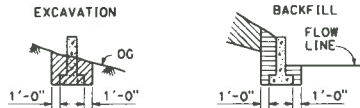
PLAN
See Note 2



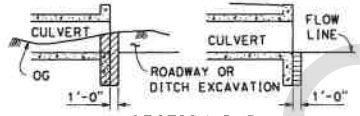
SECTION
RECESSES AT DRAINAGE INLETS



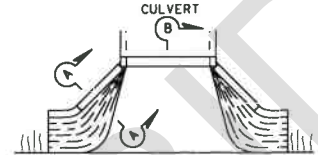
PLAN OF WING WALL



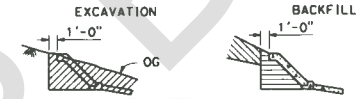
SECTION A-A



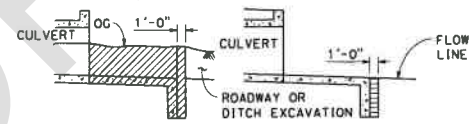
SECTION B-B
WING WALLS



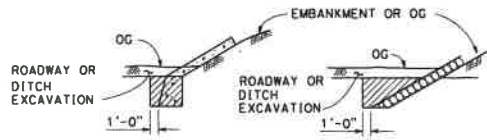
PLAN OF WARPED WING WALL



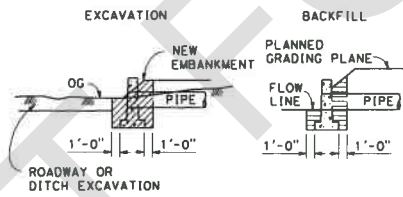
SECTION A-A



SECTION B-B
WARPED WING WALLS



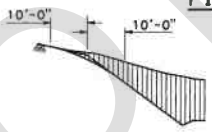
SECTION
SLOPE PROTECTION
See Note 3



SECTION
PIPE HEADWALLS



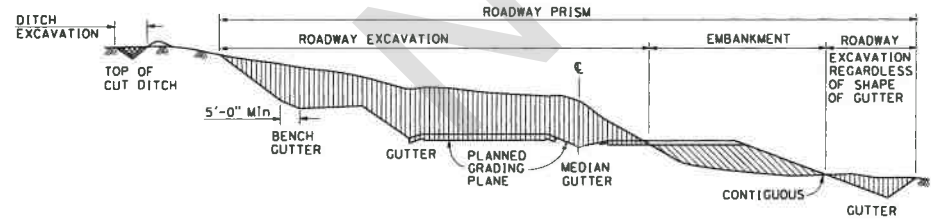
PAVED OR LINED DITCH



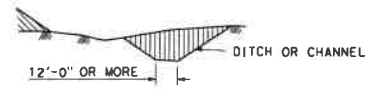
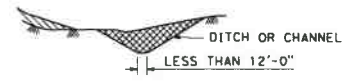
SLOPE ROUNDING



DIKE AND GUTTER



ROADWAY EXCAVATION - DITCH EXCAVATION



NOTES:

1. This drawing indicates the work to be done and limits of payment for:
Roadway Excavation
Ditch Excavation
Structure Excavation for Slope Protection
2. Slopes and dimensions may vary to fit field conditions.
3. Top limit of structure excavation is original ground if ditch is not excavated.

LEGEND

- STRUCTURE EXCAVATION
- STRUCTURE BACKFILL
- DITCH EXCAVATION
- SLOPE PROTECTION
- ROADWAY EXCAVATION
- ROADWAY EMBANKMENT

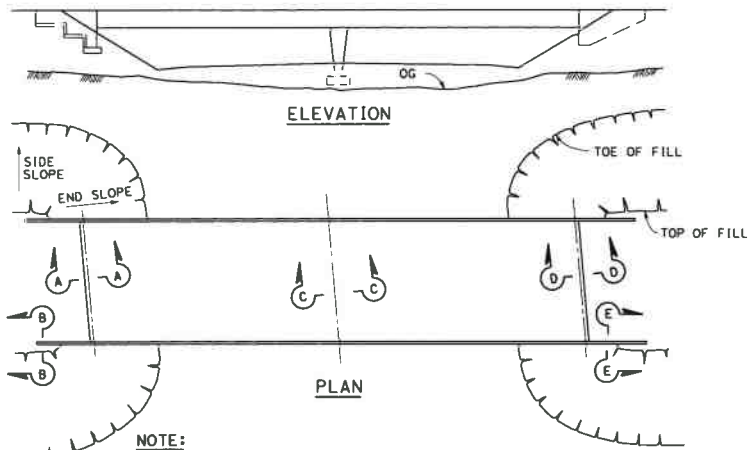
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**EXCAVATION AND BACKFILL
MISCELLANEOUS DETAILS**

NO SCALE

A62A

DIST.	COUNTY	ROUTE	POST MILES	TOTAL PROJECT	SHEET	TOTAL SHEETS

REGISTERED CIVIL ENGINEER
Carl M. Dunn
 May 1, 2023
 PLANS APPROVAL DATE
 C59976
 Exp. 8-30-24
 CIVIL
 STATE OF CALIFORNIA

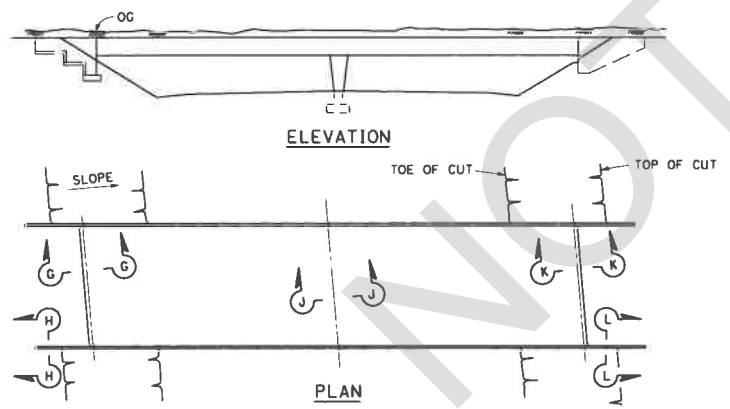


ELEVATION

PLAN

NOTE:
Roadway embankment is not delineated on excavation drawings for clarity. Embankment must be in place before structure excavation is made.

IN FILL

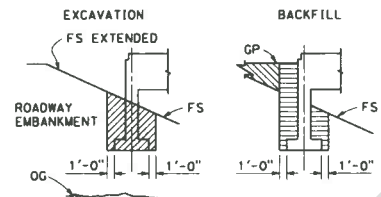


ELEVATION

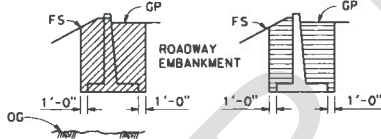
PLAN

NOTE:
If no roadway excavation is involved at bridge, structure excavation is measured from original ground.

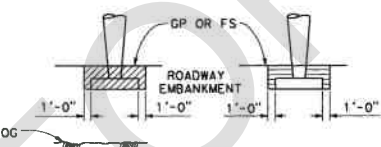
IN CUT



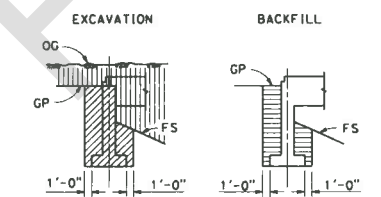
SECTION A-A



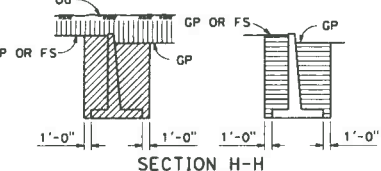
SECTION B-B



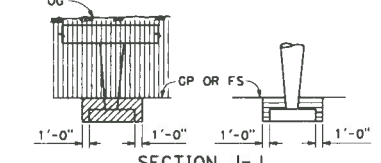
SECTION C-C



SECTION G-G



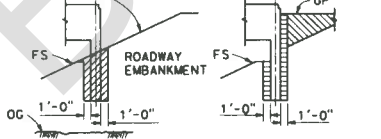
SECTION H-H



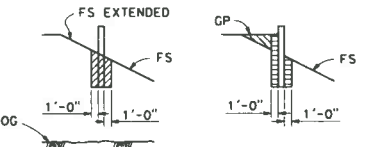
SECTION J-J



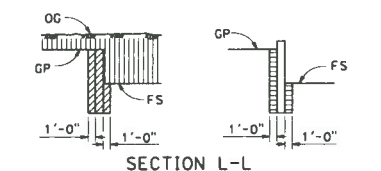
SECTION D-D



SECTION E-E



SECTION K-K



SECTION L-L

DIST.	COUNTY	ROUTE	POST MILES	SHEET TOTAL	TOTAL SHEETS

Jerry Wong
 REGISTERED CIVIL ENGINEER
 No. C56238
 Exp. 8-30-24
 CIVIL
 STATE OF CALIFORNIA

May 1, 2023
 PLANS APPROVAL DATE
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- LEGEND**
- STRUCTURE EXCAVATION
 - STRUCTURE BACKFILL
 - ROADWAY EXCAVATION
 - ROADWAY EMBANKMENT

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
**LIMITS OF PAYMENT
 FOR EXCAVATION AND BACKFILL
 BRIDGE**
 NO SCALE

A62C

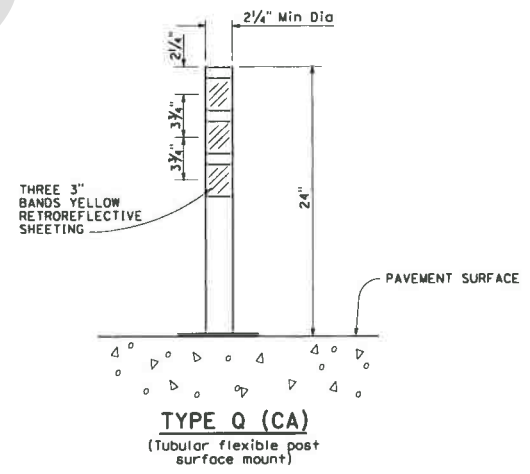
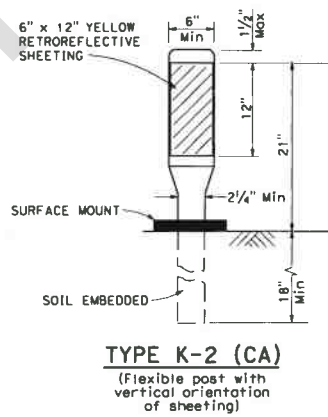
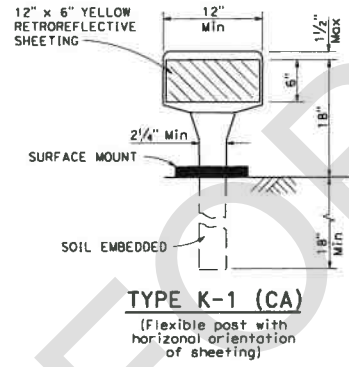
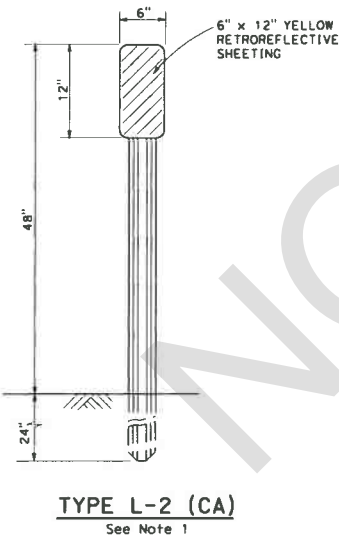
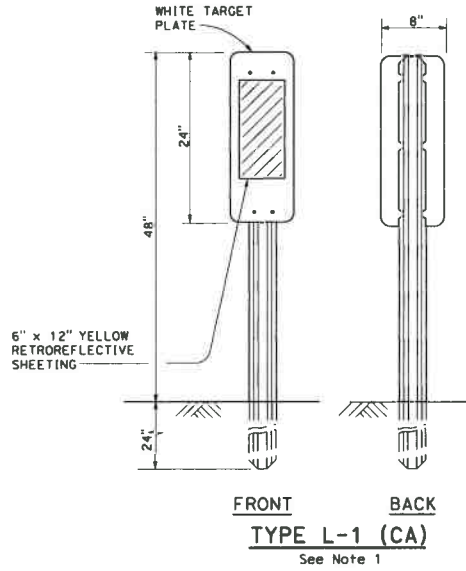
2023 STANDARD PLAN A62C

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

REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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NOTE:
1. See Standard Plan A73B for metal post details and additional markers.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
OBJECT MARKERS
NO SCALE

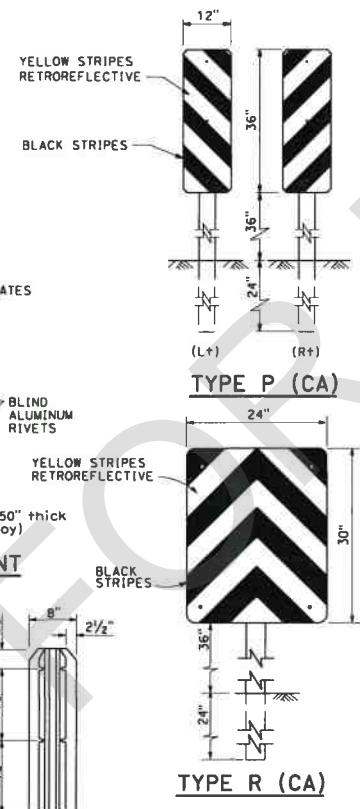
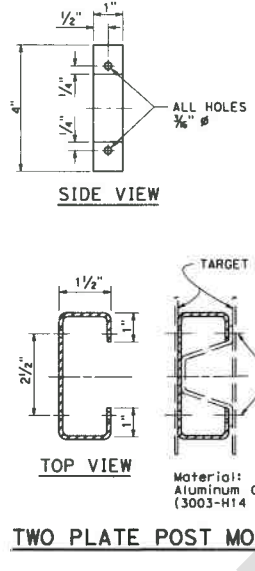
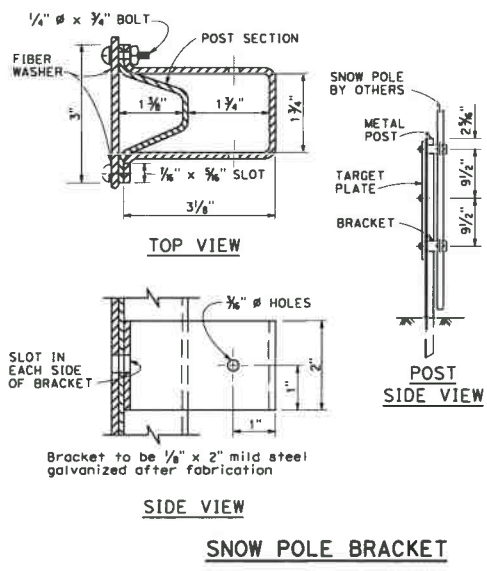
A73A

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

REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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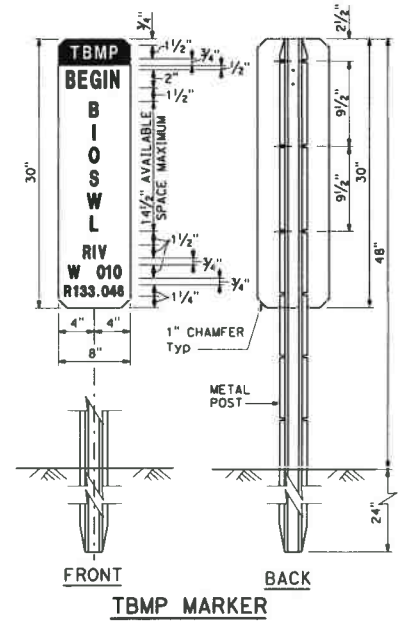


NOTES:

A. See Standard Plan A73A for additional object markers.

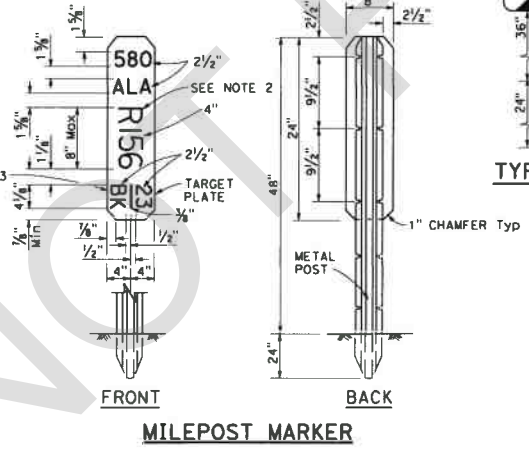
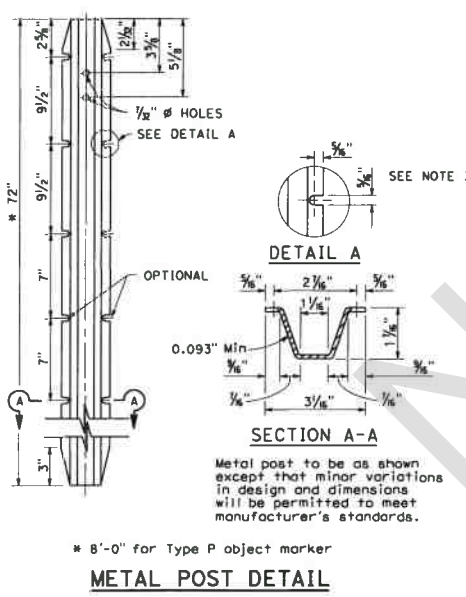
B. Type P(CA) and R(CA) markers shall have orange and white retroreflective stripes in work zones.

C. Diagonal stripes on Type P(CA) markers shall be sloped down in the direction of travel.



NOTES:

- The marker header shall be green (non-reflective) background with white (non-reflective) Series C letters.
- The marker body shall be white (non-reflective) target plate with black Series C numbers and letters.
- "BEGIN" or "END" shall apply as directed by the Engineer.
- TBM abbreviations shall be Series D letters up to a maximum of 2" tall, to fit within the available maximum space of 14.5".
- See Project Plans for TBM abbreviations.



TYPE N-1 (CA), N-2 (CA), N-3 (CA)

N-1(CA). Yellow retroreflective.
N-2(CA). Red retroreflective.
N-3(CA). Orange retroreflective.

OBJECT MARKERS

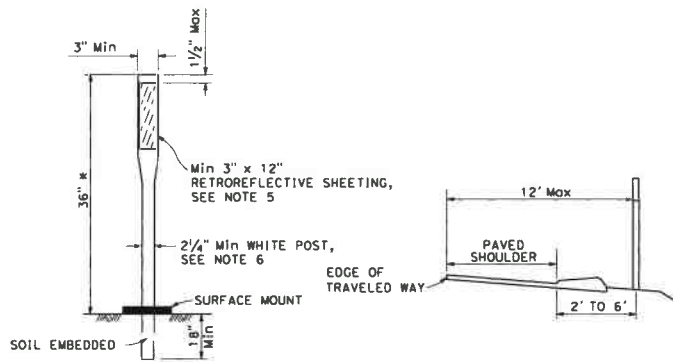
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MARKERS

NO SCALE

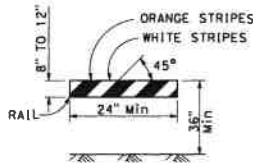
A73B

2023 STANDARD PLAN A73B

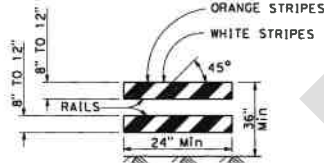


* 36" Min where speeds are 40 miles/h or less.

CHANNELIZERS



TYPE I BARRICADE
See Note A



TYPE II BARRICADE

BARRICADES (See Note 3)

Only face of rails shown. Barricade construction materials and supports as specified in the specifications.

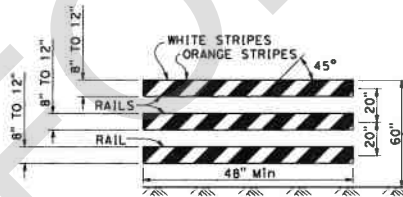
DELINEATORS



CLASS 1 FLEXIBLE POST



CLASS 2 METAL POST
See Note 4



TYPE III BARRICADE

BARRICADE	TYPE I	TYPE II	TYPE III
WIDTH OF RAIL	8" Min - 12" Max #	8" Min - 12" Max #	8" Min - 12" Max #
LENGTH OF RAIL	24" Min	24" Min	48" Min
WIDTH OF STRIPES #	6"	6"	6"
HEIGHT	36" Min	36" Min	60" Min
NUMBER OF RETROREFLECTIVE RAIL FACES	2 (ONE EACH DIRECTION)	4 (TWO EACH DIRECTION)	3 IF FACING TRAFFIC IN ONE DIRECTION 6 IF FACING TRAFFIC IN TWO DIRECTION

For the wooden option dimensions are nominal lumber dimensions.
** For rails less than 36" long, 4" wide stripes shall be used.

NOTE A:

Barricades to have a minimum of 270 square inches of retroreflective area facing traffic when used on freeways, expressways, and other high speed highways.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
REGISTERED CIVIL ENGINEER May 1, 2023 PLANS APPROVAL DATE					
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.					

TYPE	RETROREFLECTIVE SHEETING	
	FRONT	BACK
E	WHITE	WHITE (SEE NOTE 1)
F	WHITE	NONE
G	YELLOW	NONE
J	RED	NONE

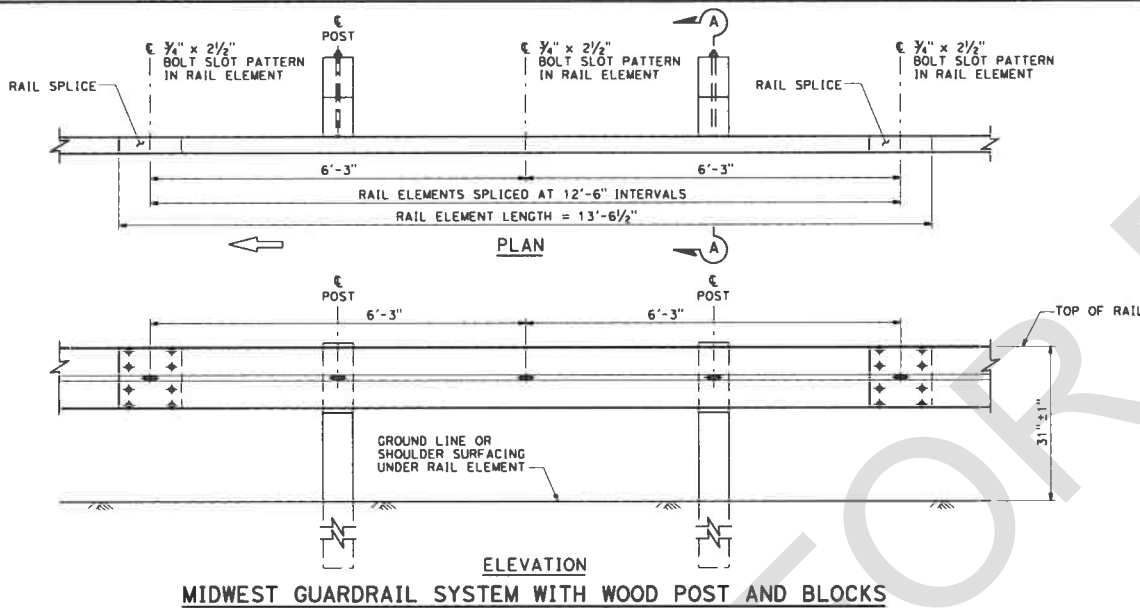
NOTES:

- The retroreflective sheeting used on the back of delineator shall be a minimum size of 3" x 3".
- The type of delineator to be installed will be designated on the plans.
- All barricade stripes shall be retroreflective and sloped downward in the direction of the opened traffic lane.
- See Standard Plan A73B for Metal Post Details.
- Unless shown otherwise on the plans, or as directed by the Engineer, the color of the retroreflective sheeting for permanent channelizers shall conform to the color of the pavement markings it supplements.
- Except, Class 1 (Flexible Post) temporary delineators and temporary channelizers in work zones shall be orange post with white retroreflective sheeting.

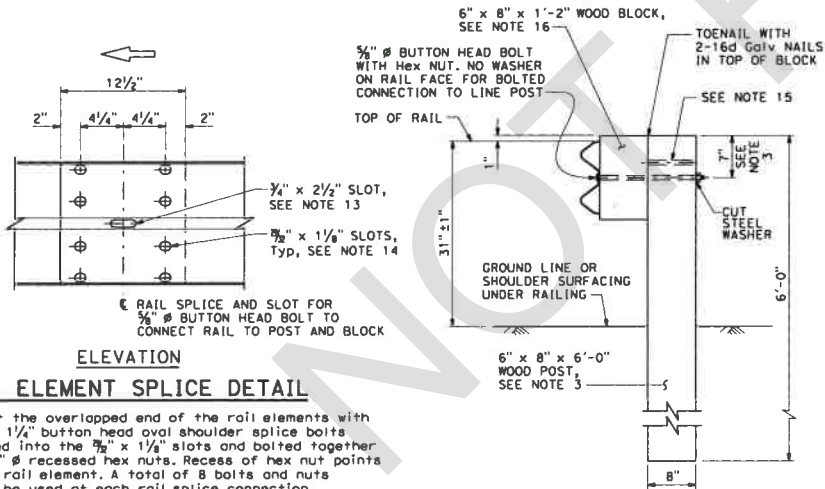
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**DELINEATORS, CHANNELIZERS
AND BARRICADES**

NO SCALE

A73C

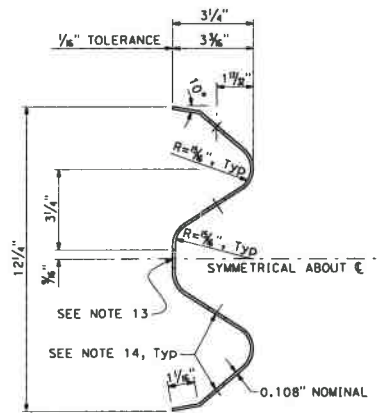


MIDWEST GUARDRAIL SYSTEM WITH WOOD POST AND BLOCKS



RAIL ELEMENT SPLICE DETAIL

**SECTION A-A
TYPICAL WOOD LINE
POST INSTALLATION**



**SECTION THRU
RAIL ELEMENT**

- a) Connect the overlapped end of the rail elements with $\frac{3}{8}$ " ϕ x $\frac{1}{4}$ " button head oval shoulder splice bolts inserted into the $\frac{3}{4}$ " x $\frac{1}{8}$ " slots and bolted together with $\frac{3}{8}$ " ϕ recessed hex nuts. Recess of hex nut points toward rail element. A total of 8 bolts and nuts are to be used at each rail splice connection.
- b) The ends of the rail elements are to be overlapped in the direction of traffic (see details).
- c) Where end cap is to be attached to the end of a rail element, a total of 4 of the above described splice bolts and nuts are to be used.

See Note 4

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

Mark Ballentine
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

WESTERN PROFESSIONAL ENGINEERING
Mark Ballentine
C64101
Exp. 09-30-24
CIVIL
STATE OF CALIFORNIA

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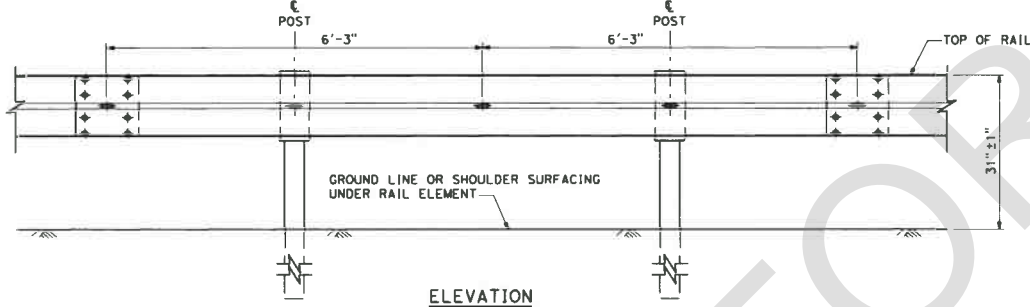
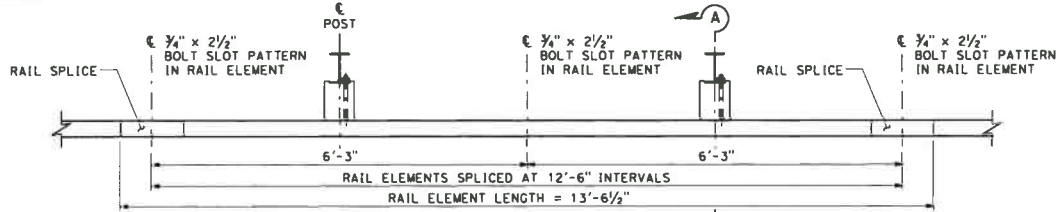
NOTES:

1. For details of steel post installations, see Standard Plan A77L2.
2. For details of standard hardware used to construct MGS, see Standard Plan A77M1.
3. For details of wood posts and wood blocks used to construct MGS, see Standard Plan A77N1.
4. For additional installation details, see Standard Plan A77N3.
5. MGS post spacing to be 6'-3" center to center, except as otherwise noted.
6. For MGS typical layouts, see the A77P, A77O and A77R series of Standard Plans.
7. If railing is connected to terminal system end treatment, use 31" height terminal system end treatment.
8. For MGS end anchor details, see Standard Plans A77S1 and A77T2.
9. For details of MGS transition to bridge railing, see Standard Plan A77U4.
10. For additional details of MGS connection to bridge railing, see Standard Plans A77U1, A77U2 and A77V1.
11. For MGS connection details to abutments and walls, see Standard Plans A77U3A and A77U3B.
12. For typical MGS delineation and dike positioning details, see Standard Plan A77N4.
13. Slotted hole for bolted connection of rail element to block and post.
14. Slotted holes for splice bolts to overlap ends of rail element.
15. Additional hole in uppermost portion of line post is for potential future adjustments of railing height. See Standard Plan A77N1.
16. 6" x 12" x 1'-2" block must be used with 6" Type A dike.
17. Install posts in soil.

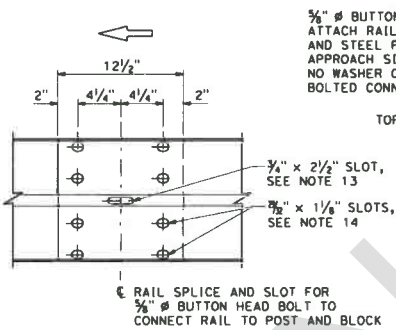
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**MIDWEST GUARDRAIL SYSTEM
STANDARD RAILING SECTION
(WOOD POST WITH WOOD BLOCK)**
NO SCALE

A77L1

2023 STANDARD PLAN A77L1



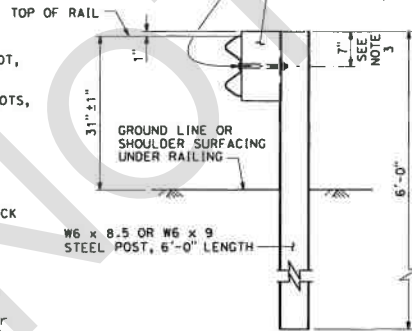
**MIDWEST GUARDRAIL SYSTEM WITH STEEL POSTS
AND NOTCHED WOOD OR NOTCHED RECYCLED PLASTIC BLOCKS**



RAIL ELEMENT SPLICE DETAIL

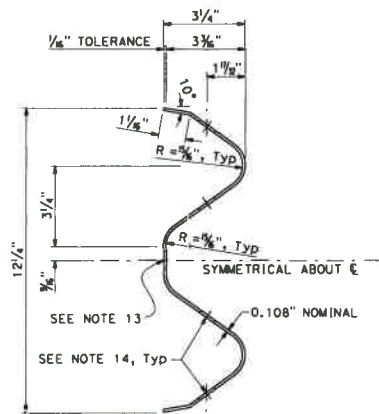
- Connect the overlapped end of the rail elements with $\frac{3}{4}$ " ϕ x $1\frac{1}{4}$ " button head oval shoulder splice bolts inserted into the $\frac{3}{4}$ " x $1\frac{1}{8}$ " slots and bolted together with $\frac{3}{4}$ " ϕ recessed hex nuts. Recess of hex nut points toward rail element. A total of 8 bolts and nuts are to be used at each rail splice connection.
- The ends of the rail elements are to be overlapped in the direction of traffic (see details).
- Where end cap is to be attached to the end of a rail element, a total of 4 of the above described splice bolts and nuts are to be used.

$\frac{3}{8}$ " ϕ BUTTON HEAD BOLT WITH Hex NUT. ATTACH RAIL ELEMENT TO WOOD BLOCK AND STEEL POST WITH BOLT ON TRAFFIC APPROACH SIDE OF POST WEB. NO WASHER ON RAIL FACE FOR BOLTED CONNECTION TO LINE POST



**SECTION A-A
TYPICAL STEEL LINE
POST INSTALLATION**

See Note 4



**SECTION THRU
RAIL ELEMENT**

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**MIDWEST GUARDRAIL SYSTEM
STANDARD RAILING SECTION
(STEEL POST WITH NOTCHED WOOD
OR NOTCHED RECYCLED PLASTIC BLOCK)**
NO SCALE

A77L2

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

Mark Ballantine
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

Mark Ballantine
C64101
Exp. 09-30-24
LEVEL

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NOTES:

- For details of wood post installations, see Standard Plan A77L1.
- For details of standard hardware used to construct MGS, see Standard Plan A77M1.
- For details of steel posts and notched wood blocks used to construct MGS, see Standard Plan A77N2.
- For additional installation details, see Standard Plan A77N3.
- MGS post spacing to be 6'-3" center to center, except as otherwise noted.
- For MGS typical layouts, see the A77P, A77O and A77R series of Standard Plans.
- If railing is connected to terminal system end treatment, use 31" height terminal system end treatment.
- For MGS end anchor details, see Standard Plans A77S1 and A77T2.
- For details of MGS transition to bridge railing, see Standard Plan A77U4.
- For additional details of MGS connection to bridge railings, see Standard Plans A77U1, A77U2 and A77V1.
- For dike positioning and MGS delineation details, see Standard Plan A77N4.
- Notched face of block faces steel post.
- Slotted hole for bolted connection of rail element to block and post.
- Slotted holes for splice bolts to overlap ends of rail element.
- 6" x 12" x 1'-2" block must be used with 6" Type A dike.
- Install posts in soil.

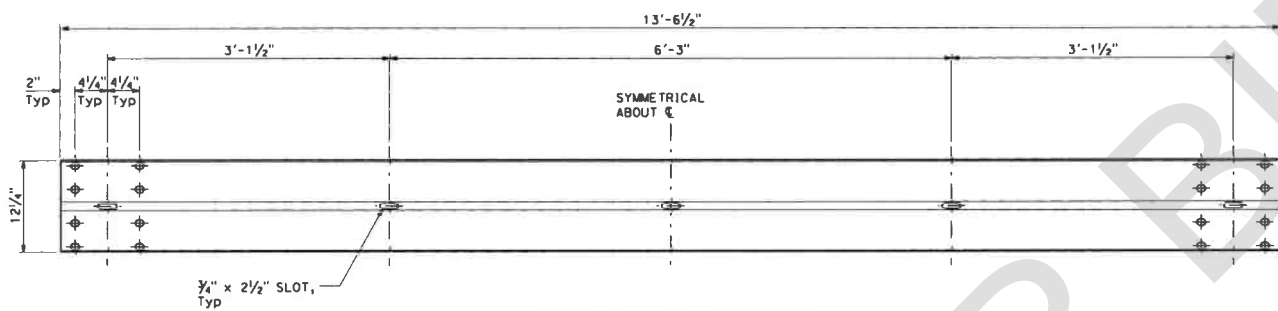
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS

Mark Ballantine
REGISTERED CIVIL ENGINEER

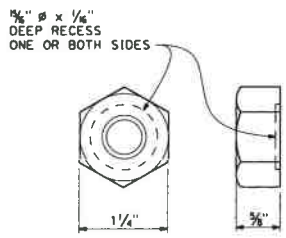
May 1, 2023
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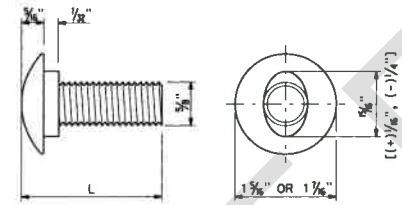
NOTE:
1. Slotted holes for splice bolts to overlap ends of rail element.



TYPICAL RAIL ELEMENT



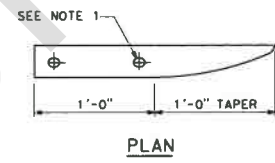
5/8" Ø RECESS NUT



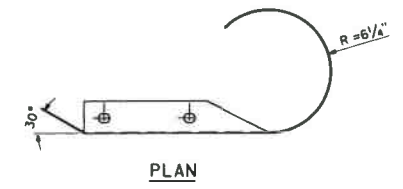
5/8" Ø BUTTON HEAD BOLT

BUTTON HEAD BOLT	
L	THREAD LENGTH
1 1/4"	FULL THREAD LENGTH
2"	FULL THREAD LENGTH
10"	4" Min THREAD LENGTH
18"	4" Min THREAD LENGTH
20"	4" Min THREAD LENGTH
22"	4" Min THREAD LENGTH
26"	4" Min THREAD LENGTH
36"	4" Min THREAD LENGTH
** 2 3/4"	2" Min THREAD LENGTH
** 19"	4" Min THREAD LENGTH

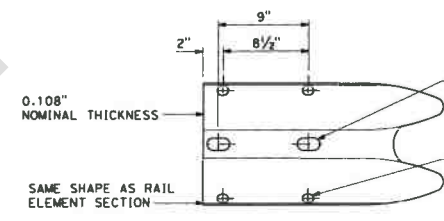
** For nested rail applications



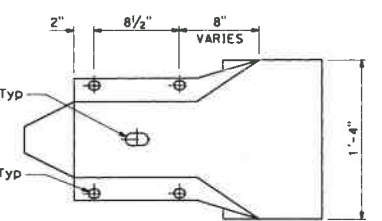
PLAN



PLAN



**ELEVATION
END CAP (TYPE A)**



**ELEVATION
END CAP (TYPE B)**

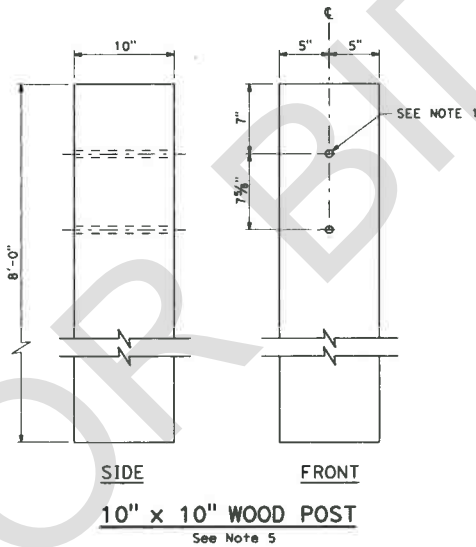
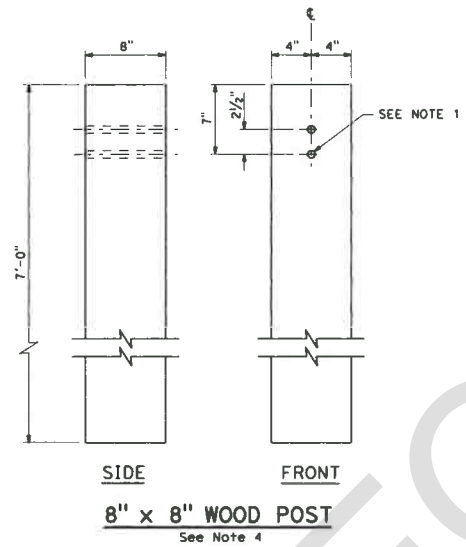
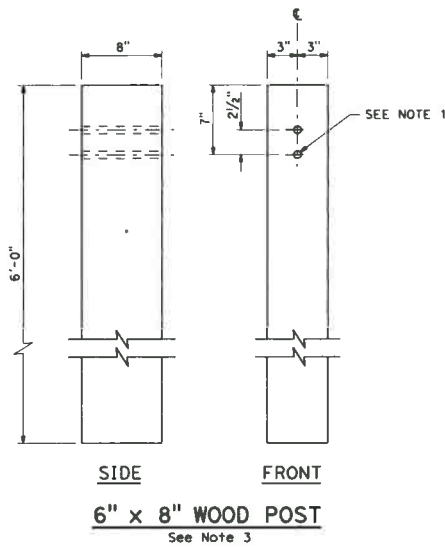
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**MIDWEST GUARDRAIL SYSTEM
STANDARD HARDWARE**
NO SCALE

A77M1

DATE	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL SHEETS

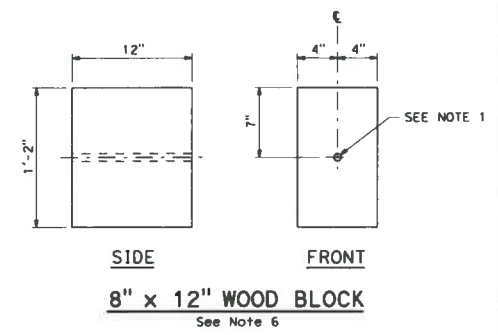
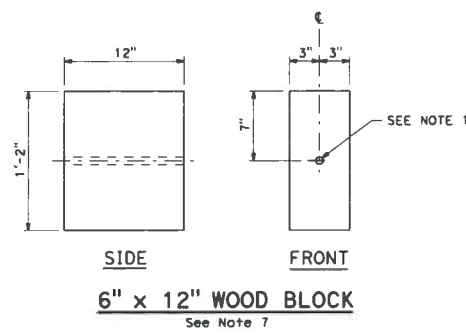
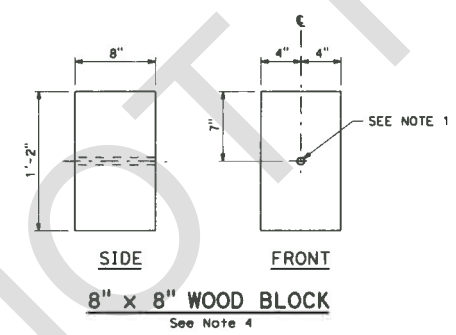
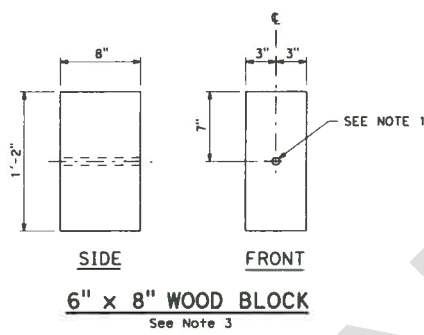
Mark Ballantine
 REGISTERED CIVIL ENGINEER
 No. CE4101
 Exp. 09-30-24
 STATE OF CALIFORNIA

May 1, 2023
 PLANS APPROVAL DATE
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NOTES:

1. All holes in wood posts and blocks shall be 3/4" Dia ±1/16".
2. Dimensions shown for wood post are nominal.
3. This post and block combination used for standard line post sections of MGS.
4. This post and 8" x 8" block combination used for line post sections of MGS on narrow roadways.
5. This post used with the WB-31 transition. See Standard Plan A77U4.
6. To be used with 8" x 8" x 7'-0" wood post if installed with 6" height dike.
7. To be used with 6" x 8" x 6'-0" wood post if installed with 6" height dike.



STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
MIDWEST GUARDRAIL SYSTEM
WOOD POST AND
WOOD BLOCK DETAILS
 NO SCALE

A77N1

Dist.	County	Route	Post Miles Total Project	Sheet No.	Total Sheets

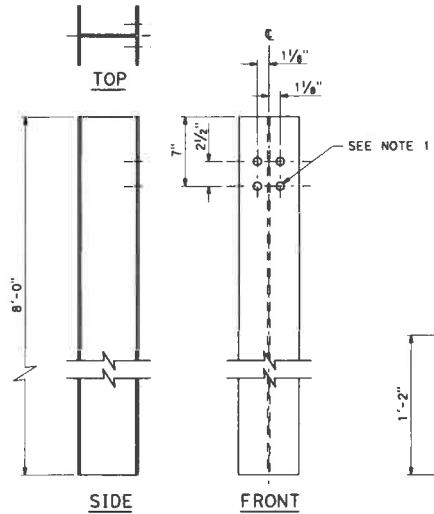
Mark Ballantine
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

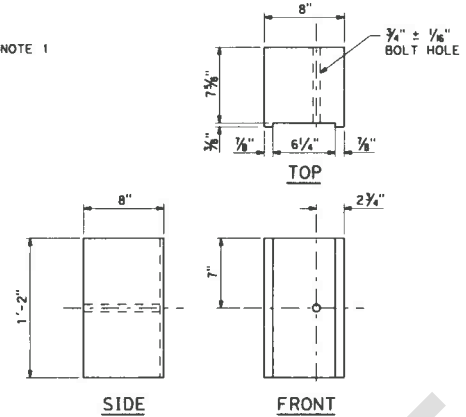
544101
Exp. 09-30-24
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER

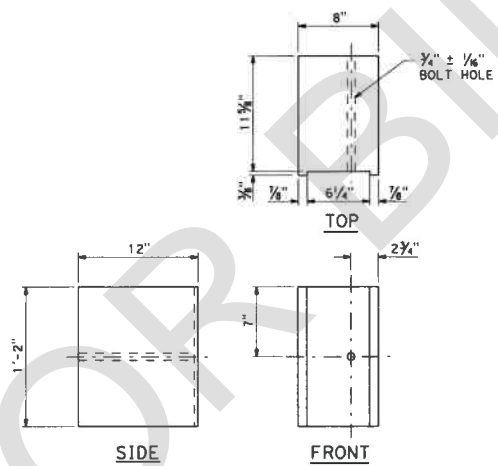
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**W6 x 15
STEEL POST**

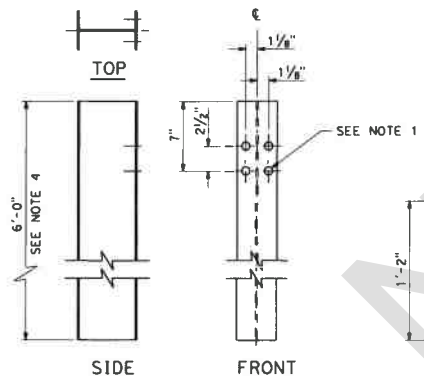


**8" x 8"
NOTCHED WOOD OR PLASTIC BLOCK**
See Note 8

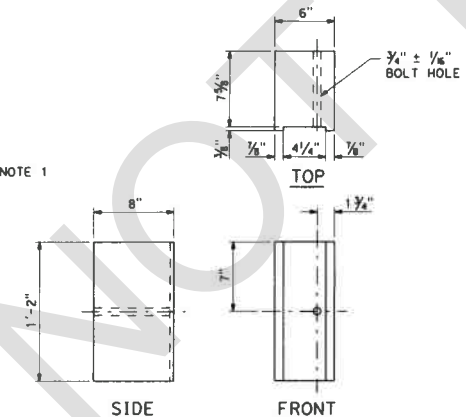


**8" x 12"
NOTCHED WOOD OR PLASTIC BLOCK**
See Notes 2, 3, 7, and 8

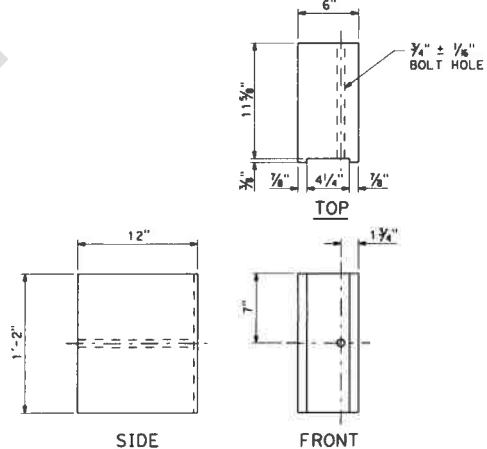
- NOTES:**
1. All holes in steel post shall be 1/8" ϕ maximum.
 2. Dimensions shown for wood block are nominal.
 3. Notched face of block faces steel post.
 4. 6'-0" length posts to be used for typical roadway installation. See Standard Plan A77N3.
 5. The standard block on W8 x 6.5 or W6 x 9 steel post separates the metal beam guardrail element 8" from the post. The 12" block is an option to the 8" block.
 6. This post to be used for line post sections of MGS on narrow roadways. Post longer than 6' must be labeled on post web with 2" letters using black acrylic paint.
 7. 6" x 12" notched wood block and 8" x 12" notched wood block must be used with 6" Type A dike.
 8. 8" x 8" or 8" x 12" notched wood or plastic blocks are used with W6 x 15 steel post.



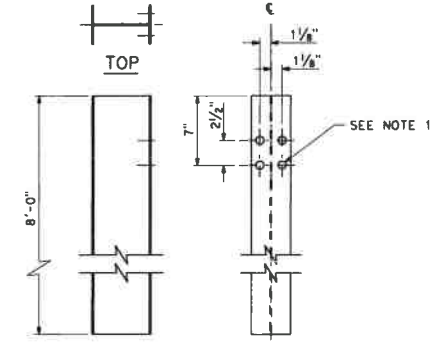
**W6 x 8.5 OR W6 x 9
STEEL POST**
See Note 4



**6" x 8"
NOTCHED WOOD OR PLASTIC BLOCK**
See Note 4



**6" x 12"
NOTCHED WOOD OR PLASTIC BLOCK**
See Notes 2, 3 and 7



**W6 x 9 OR W6 x 8.5
STEEL POST**
See Note 6

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**MIDWEST GUARDRAIL SYSTEM
STEEL POST AND
NOTCHED WOOD BLOCK DETAILS**
NO SCALE

A77N2

2023 STANDARD PLAN A77N2

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

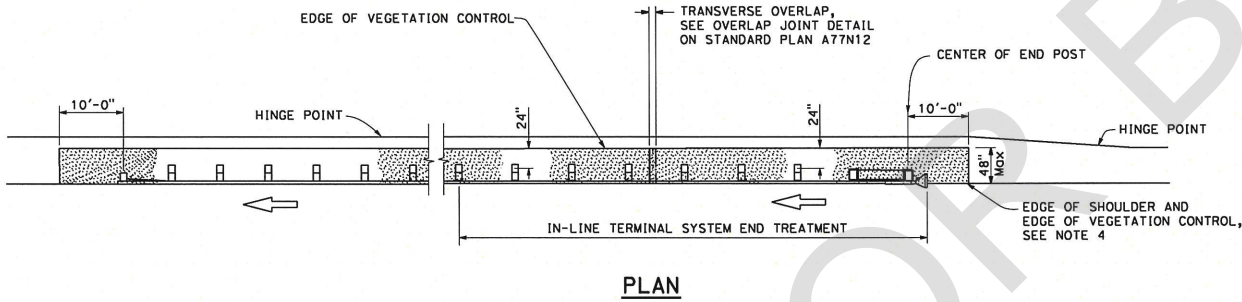
Chi H. Wong
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

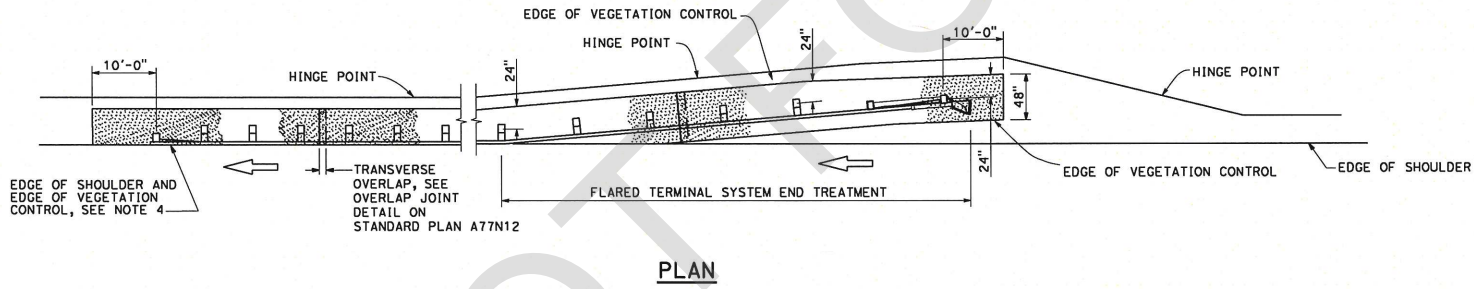
Chi H. Wong
No. C54738
Exp. 12-31-23
CIVIL
STATE OF CALIFORNIA

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2023 STANDARD PLAN A77N14



PLAN



PLAN

NOTES:

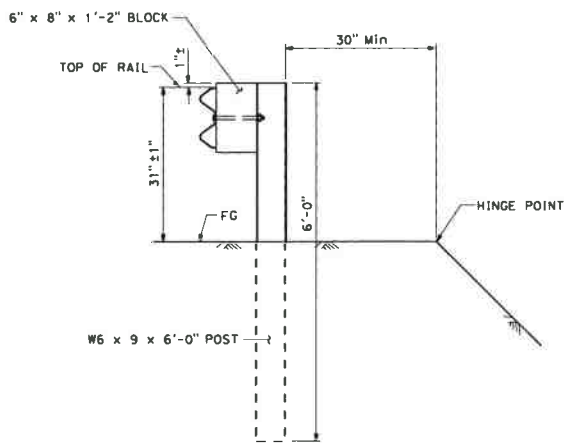
1. For additional vegetation control details, see Standard Plan A77N12.
2. Vegetation control must slope in direction of water flow.
3. This plan for vegetation control installation only.
4. Caulk longitudinal and transverse edges of vegetation control mat where it abuts to paved surface or man-made fixed objects, except guardrail posts.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**FIBER OR RUBBER MAT VEGETATION CONTROL
GUARDRAIL SYSTEM
FOR TERMINAL SYSTEM END TREATMENTS**

NO SCALE

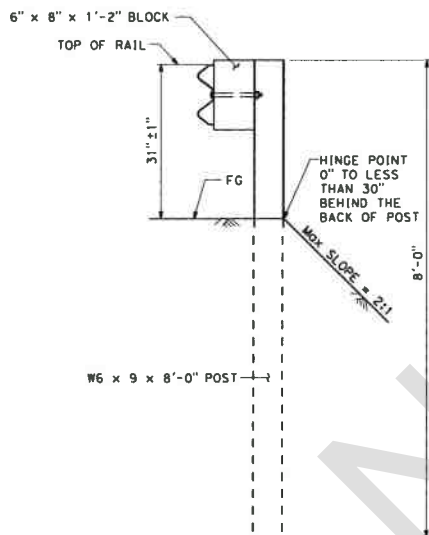
A77N14



DETAIL A

TYPICAL ROADWAY INSTALLATION

See Note 1

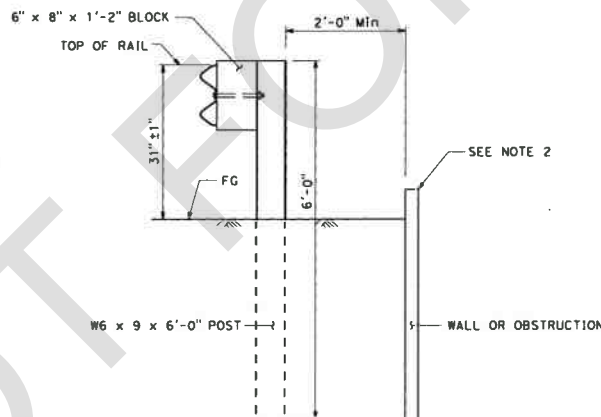


DETAIL B

NARROW ROADWAY INSTALLATION

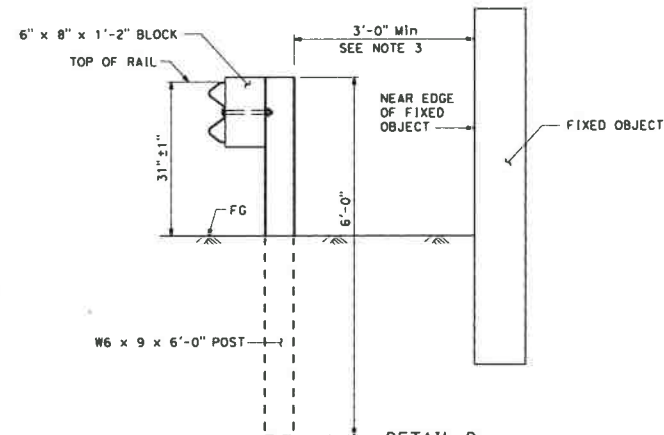
See Note 1

POST EMBEDMENT



DETAIL C

At or below grade



DETAIL D

Above grade

INSTALLATION AT WALLS OR OBSTRUCTIONS

NOTES:

1. These installation details are also applicable to wood line post installations. For Detail A, C, and D, where wood line post installations are constructed, 6" x 8", 6'-0" in length, with 6" x 8" x 1'-2" blocks are to be used in place of steel post and block. For Detail B, where wood line post installations are constructed, 6" x 8" post, 8'-0" in length, with blocks are to be used in place of the steel post and block shown. For additional installation details, see Standard Plans A77L1 and A77L2.
2. When maximum height of obstruction behind guardrail post is 6" above grade, see Detail D.
3. If distance from back of post to the near edge of fixed object is less than 3'-0", see Strengthened Rail Section as shown in layout pages.
4. For dike positioning with MGS installations, see Standard Plan A77N4.
5. Typical 6" x 8" notched wood or plastic block shown, 6" x 12" notched wood or plastic block is interchangeable in these details if 6" dike is placed.

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

Mark Ballentine
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
Mark Ballentine
C64101
Exp. 09-30-24
L110
STATE OF CALIFORNIA

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**MIDWEST GUARDRAIL SYSTEM
TYPICAL LINE POST EMBEDMENT
AND HINGE POINT OFFSET DETAILS**

NO SCALE

A77N3

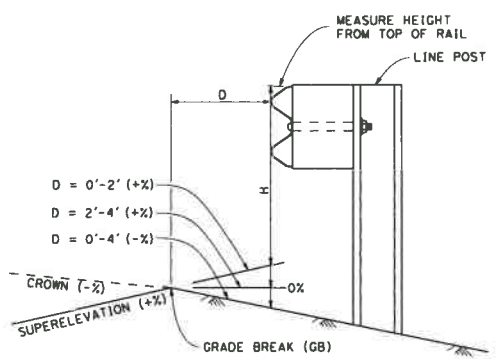
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

Mark Ballentine
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

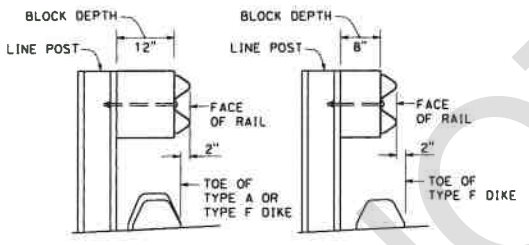
664101
09-30-24
CIVIL

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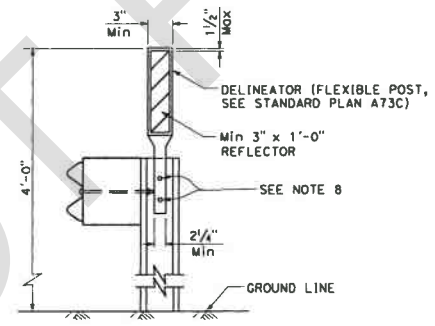
D = DISTANCE, GB TO FACE OF RAIL
H = HEIGHT AT FACE OF RAIL FROM EXTENDED LINE, BASED ON D
H = 31" ± 1" FOR MGS
H = 32" ± 1" FOR THRIE BEAM (NOT SHOWN)

MEASURE HEIGHT DETAIL AT GRADE BREAK (GB)

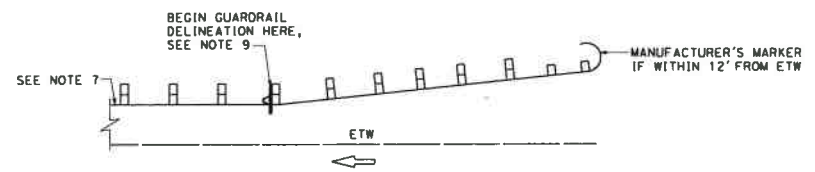


GUARDRAIL DIKE POSITIONING

Standard position for new or existing dike or curb, see Notes 2 through 6



GUARDRAIL DELINEATION



MARKER PLACEMENT GUARDRAIL DELINEATION

NOTES:

1. Details shown on this sheet apply to w-beam guardrail and thrie beam.
2. Dike must be placed in the standard position unless otherwise shown. For curb and dike details, see Standard Plans A87A and A87B.
3. See Standard Plans for dike type and placement within and near terminal systems.
4. See Standard Plan A77S1 for dike placement near SFT-M end anchor.
5. The maximum height of the dike or curb shall be 6" for MGS with 12" blocks.
6. When shown on plans, front toe of dike may extend up to 7" in front of rail face when used with 12" blocks.
7. Do not install marker on the trailing end of a guardrail run.
8. Use 1/4" - 20 self-tapping screws in 0.22" ϕ holes or 1/4" bolts in 1/2" ϕ holes for steel post, or use 16d galv nails for wood post.
9. When guardrail end treatment is placed in a flared or offset configuration, always use at least one delineator at location shown. See project plans for other placement of guardrail delineation.
10. When installing MGS with dike in areas requiring snow removal or frequently plowed areas, use 12" blocks.
11. Do not place mountable dike under guardrail.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**MIDWEST GUARDRAIL SYSTEM
TYPICAL RAILING DELINEATION
AND DIKE POSITIONING DETAILS**

NO SCALE

A77N4

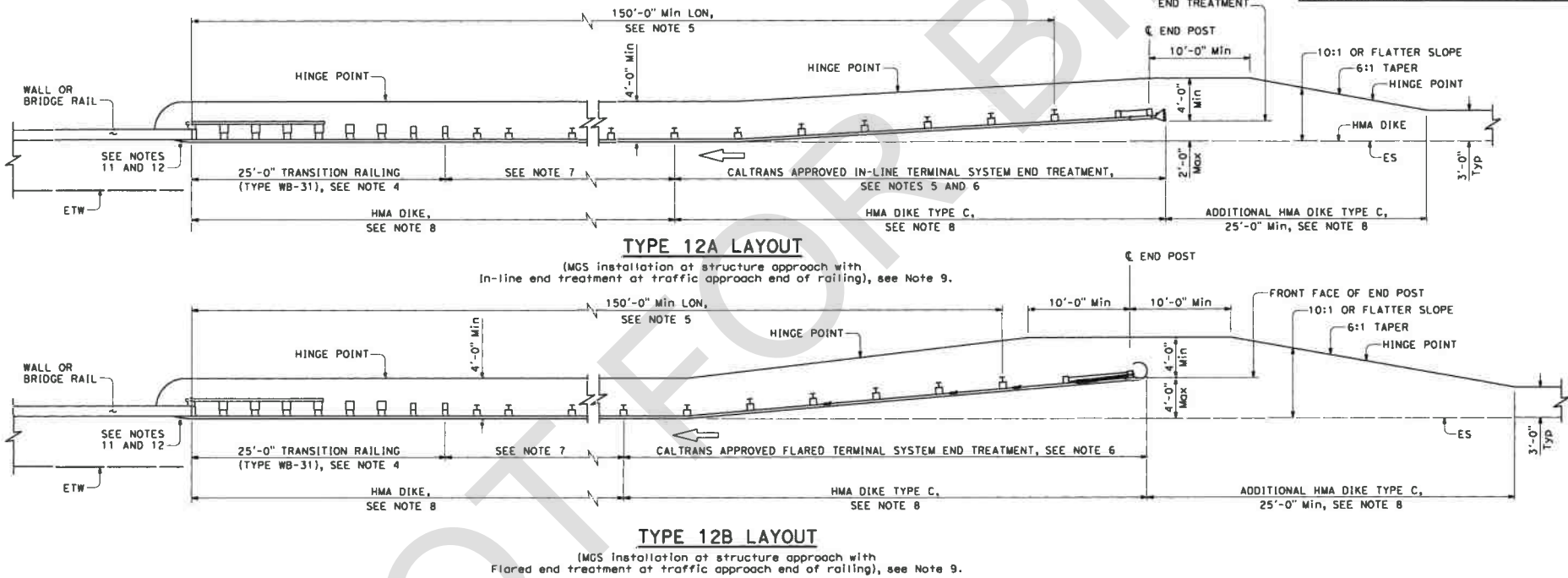
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS

Mark Ballentine
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
Mark Ballentine
C64191
Exp. 09-30-24
CIVIL
STATE OF CALIFORNIA



NOTES:

- Line post, blocks and hardware to be used are shown on Standard Plans A77L1, A77L2, A77M1, A77N1 and A77N2.
- MGS post spacing to be 6'-3" center to center, except as otherwise noted.
- Except as noted, in-line posts are 6'-0" long Steel W6 x 9 or W6 x 8.5 with blocks, or 6" x 8" x 6'-0" wood with blocks.
- For Transition Railing (Type WB-31) details for Types 12A and 12B Layouts, see Standard Plan A77U4.
- A minimum of 150'-0" of MGS is needed to develop Length of Need (LON).
- The type of terminal system end treatment to be used will be shown on the Project Plans.
- Dependent on site conditions (embankment height, side slopes or other fixed objects), it may be advisable to construct additional guard railing (a length equal to multiples of 12'-6" with 6'-3" post spacing) between the transition railing and end treatment.
- Where placement of dike is required with guard railing installations, see Standard Plan A77N4 for dike positioning details.
- Type 12A or Type 12B Layouts are typically used at the approach end of a structure, to the right or left on two-lane conventional highway where the roadbed width across the structure is 40 feet or less.
- See Standard Plan A7703 for typical layout used left of approaching traffic at the ends of each structure on multilane freeways or expressways with separate adjacent or parallel bridges.
- For additional details of typical connections to bridge rail, see Connection Detail AA on Standard Plans A77U1 and A77U2 and Connection Detail FF on Standard Plans A77V1 and A77V2.
- For additional details of a typical connection to walls or abutments, see Standard Plans A77U3A and A77U3B.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**MIDWEST GUARDRAIL SYSTEM
TYPICAL LAYOUTS
FOR STRUCTURE APPROACH**
NO SCALE

A77Q1

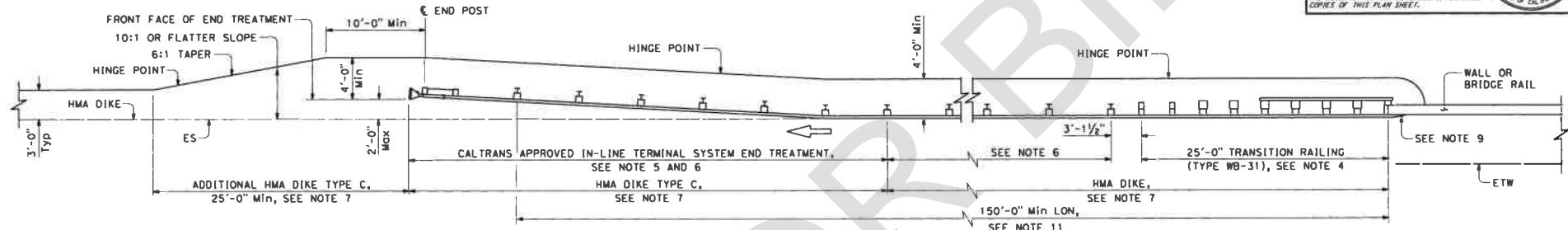
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

Mark Ballantine
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

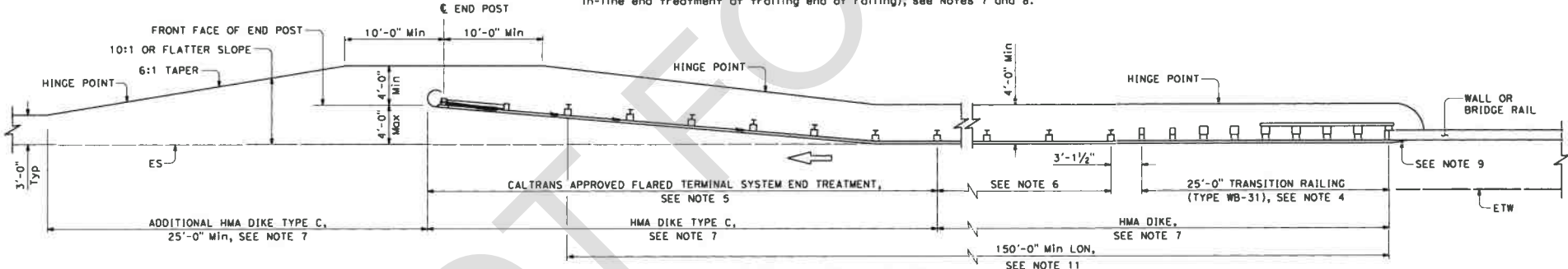
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REGISTERED PROFESSIONAL ENGINEER
Mark Ballantine
CE4101
Exp. 09-30-24
CIVIL
STATE OF CALIFORNIA



TYPE 12AA LAYOUT

(MGS installation at structure departure with in-line end treatment at trailing end of railing), see Notes 7 and 8.



TYPE 12BB LAYOUT

(MGS installation at structure departure with flared end treatment at trailing end of railing), see Notes 7 and 8.

NOTES:

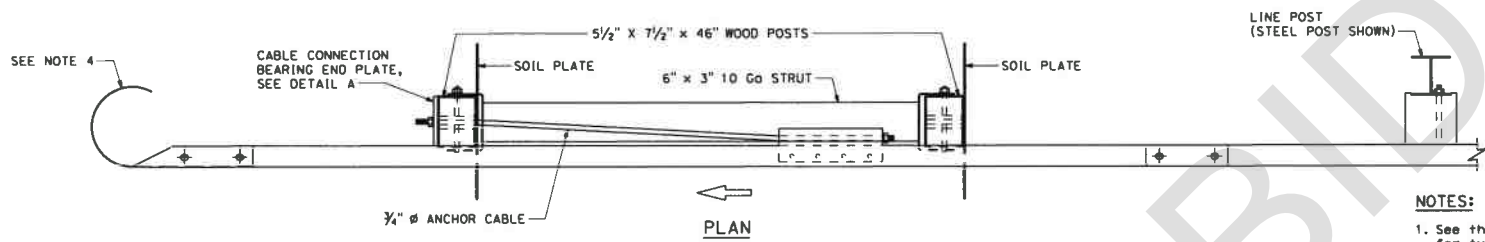
- Line post, blocks and hardware to be used are shown on Standard Plans A77L1, A77L2, A77M1, A77N1 and A77N2.
- MGS post spacing to be 6'-3" center to center, except as otherwise noted.
- Except as noted, line posts are 6'-0" long Steel W6 x 9 or W6 x 8.5 with blocks, or 6" x 8" x 6'-0" wood with blocks.
- For Transition Railing (Type WB-31) details for Types 12AA and 12BB Layouts, see Standard Plan A77U4.
- The type of terminal system to be used will be shown on the Project Plans.
- Dependent on site conditions (embankment height, side slopes, other fixed objects), it may be advisable to construct additional MGS (a length equal to multiples of 12'-6" with 6'-3" post spacing) between the transition railing and end treatments.
- Where placement of dike is required with MGS installations, see Standard Plan A77N4 for dike positioning details.
- Type 12AA or Type 12BB Layouts are typically used to the right or left of traffic departing a structure on two-way conventional highways where the roadbed width across the structure is less than 40 feet.
- For additional details of typical connections to bridge rail, see Connection Detail CC on Standard Plan A77U2 and Connection Detail HH on Standard Plan A77V2.
- For roadways with parallel structures and non traversable medians, the Type 12AA or Type 12BB layout may be used.
- A minimum of 150'-0" of MGS is needed to develop Length of Need (LON).

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**MIDWEST GUARDRAIL SYSTEM
TYPICAL LAYOUTS
FOR STRUCTURE DEPARTURE**

NO SCALE

A77Q4

2023 STANDARD PLAN A77Q4



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

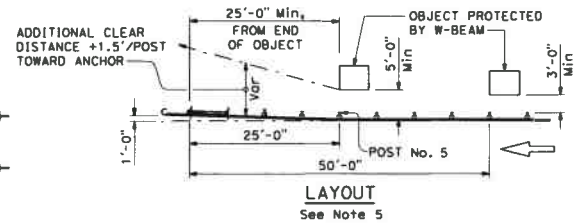
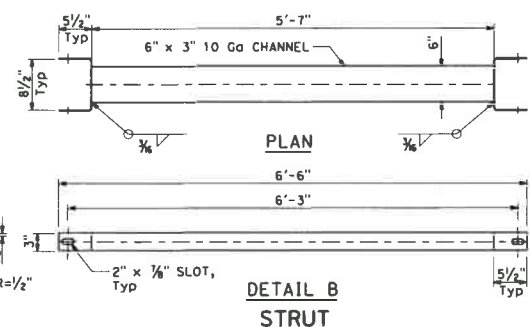
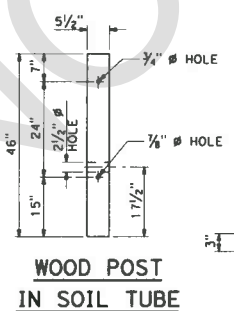
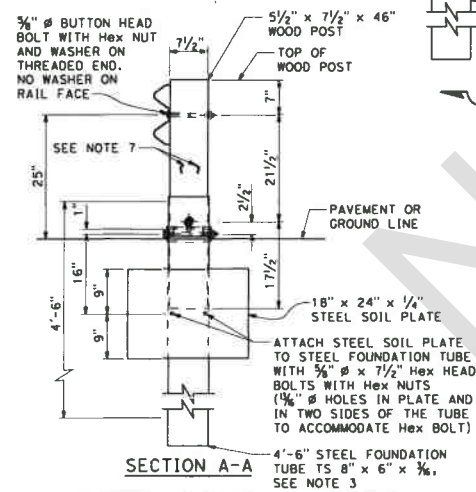
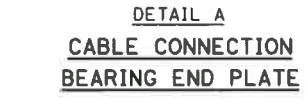
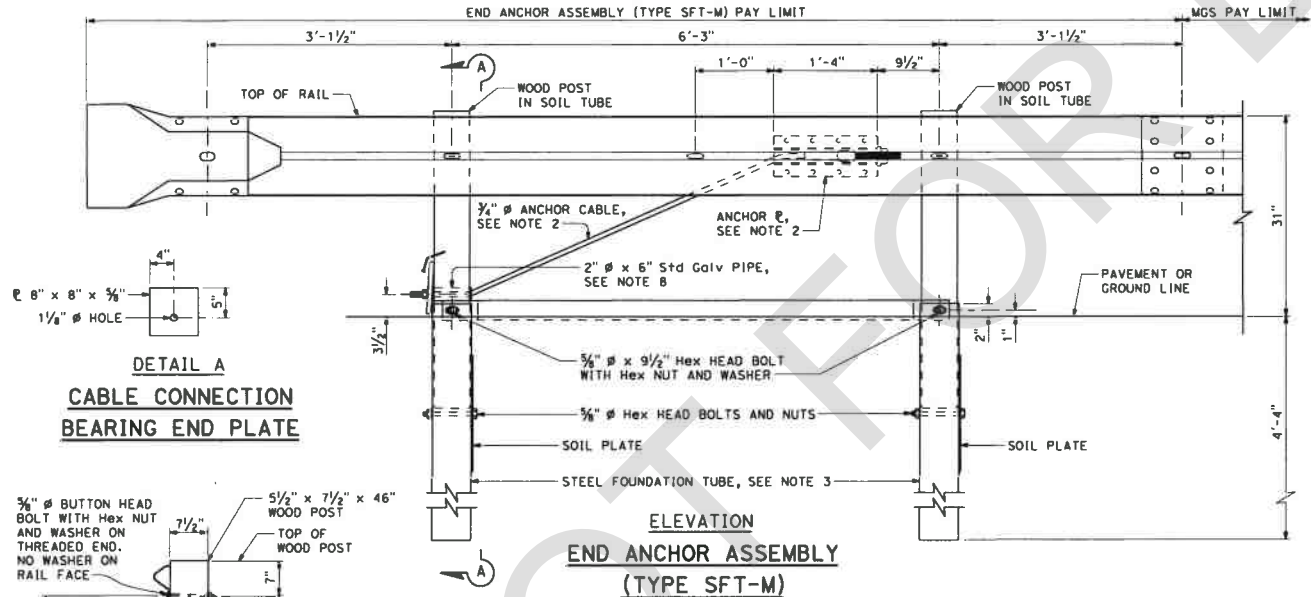
Mark Ballentine
 REGISTERED CIVIL ENGINEER
 No. C64191
 Exp. 09-30-24
 STATE OF CALIFORNIA

May 1, 2023
 PLANS APPROVAL DATE

RECEIVED PROFESSIONAL ENGINEER
 CIVIL
 STATE OF CALIFORNIA

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- NOTES:**
- See the Standard Plans A77P, A77O and A77R series for typical use of End Anchor Assembly (Type SFT-M).
 - For details of the anchor plate and 3/4" cable, see Standard Plan A77S3.
 - A 6'-0" length steel foundation tube, TS 8" x 6" x 3/8", without a soil plate, may be furnished and installed in place of the 4'-6" length steel foundation tube and soil plate shown. Minimum embedment of the 6'-0" length tube shall be 5'-9". A 3/8" Hex head bolt and nut shall be installed in the hole in the 6'-0" length tube to keep the wood post from dropping into the tube.
 - Place End Cap Type B when pedestrians, bicycles or traffic is within contact of the trailing end of the exposed element. Rail element may be cut 1" past the end of the post. Clean, treat and remove sharp edges.
 - Increased clear distance behind the rail is required from 50' prior to the last post of the End Anchor Assembly (Type SFT-M). Beginning at 50' upstream of the last post of the End Anchor Assembly, the required clear distance increases to 5' at post No. 5. From post No. 5 to the last post of the End Anchor Assembly, the required clear distance increases at a rate of 1.5' for each post.
 - Dike with a maximum height of 4" may be placed under or in front of the End Anchor Assembly (Type SFT-M). If the anchor posts are in conflict with the 4" high dike, the last 25' of rail may be tapered back a maximum of 1'-0" to allow the dike to maintain alignment.
 - Secure End Plate with two 16d nails to maintain alignment.
 - 2" Standard Galvanized Pipe or 2 3/8" Galvanized Pipe.
 - See Standard Plan A77R1 for placing SFT-M when there is a fixed object within 50'-0" of the end anchor and the distance behind the post is less than 3'-0".

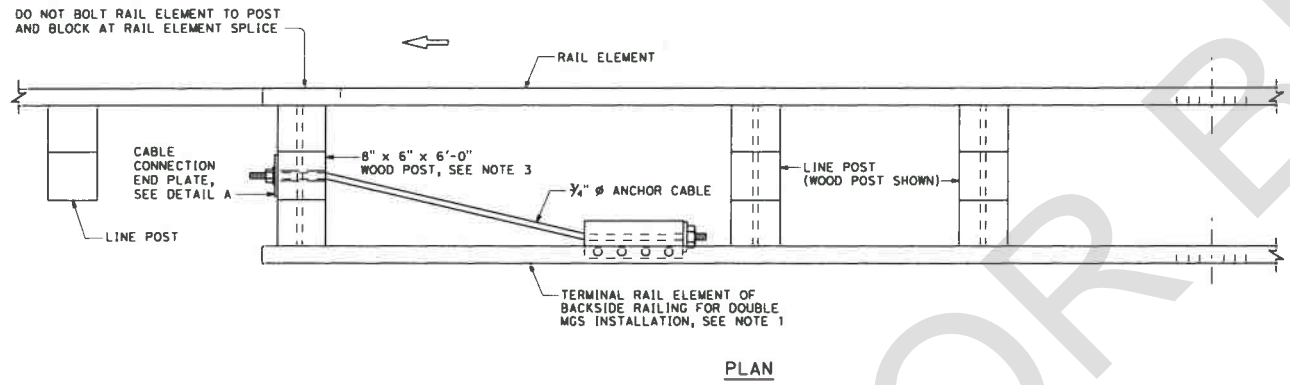


STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
MIDWEST GUARDRAIL SYSTEM
END ANCHOR ASSEMBLY
(TYPE SFT-M)
 NO SCALE
A77S1

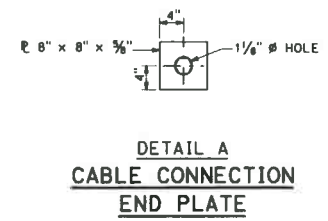
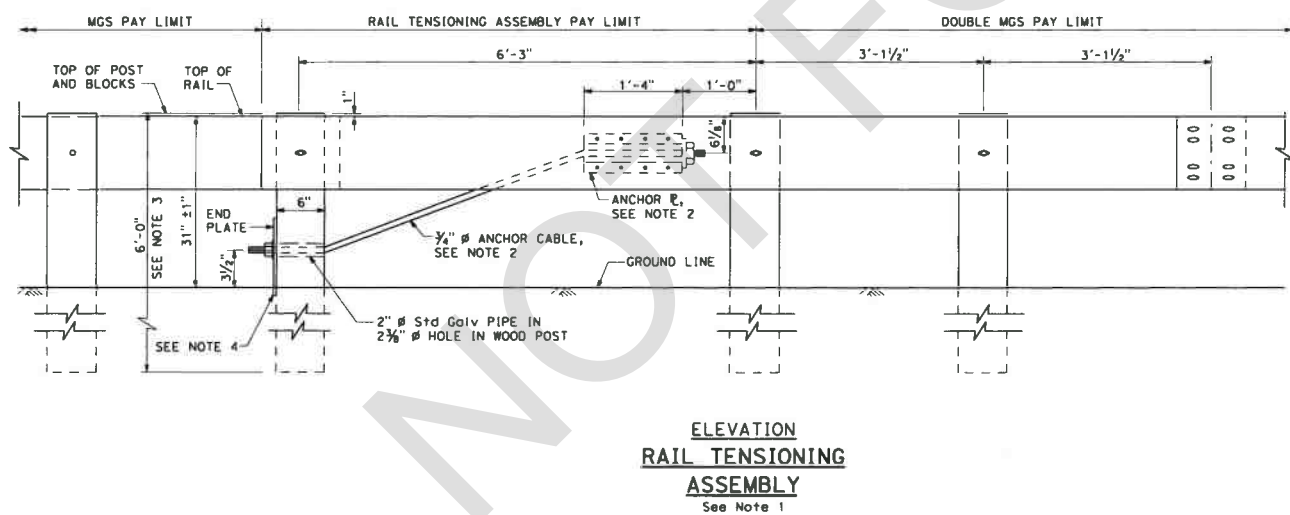
2023 STANDARD PLAN A1731

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS
<i>Mark Bellantone</i> REGISTERED CIVIL ENGINEER				
May 1, 2023 PLANS APPROVAL DATE				
ONE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.				

REGISTERED PROFESSIONAL ENGINEER
 Mark Bellantone
 No. C64101
 Exp. 09-30-24
 CIVIL
 STATE OF CALIFORNIA



- NOTES:**
1. See Standard Plans A7703 and A77R1 for typical use of rail tensioning assembly.
 2. For details of the anchor plate and 1/4" cable, see Standard Plan A7753.
 3. A steel foundation tube with a wood post as shown on A7751 may be used in place of the 8" x 6" x 6" wood post shown.
 4. Cable connection end plate must not be encased in HMA, concrete, or any other material that could restrict the plate from releasing.



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**MIDWEST GUARDRAIL SYSTEM
RAIL TENSIONING ASSEMBLY**
NO SCALE

A77S2

116

A77S STANDARD PLAN A/1/24

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

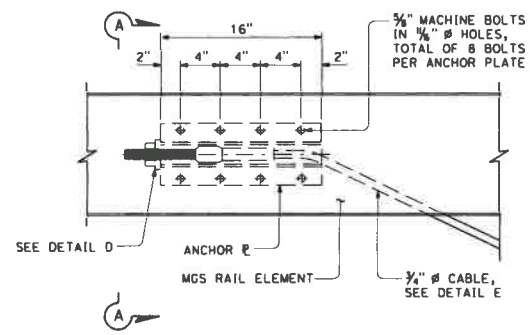
Mark Ballantine
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

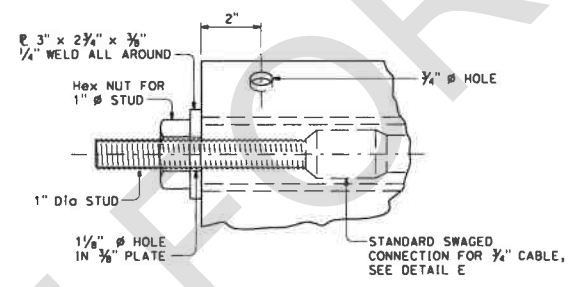
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REGISTERED PROFESSIONAL ENGINEER
Mark Ballantine
C.E. 4191
Exp. 09-30-24
CIVIL
STATE OF CALIFORNIA

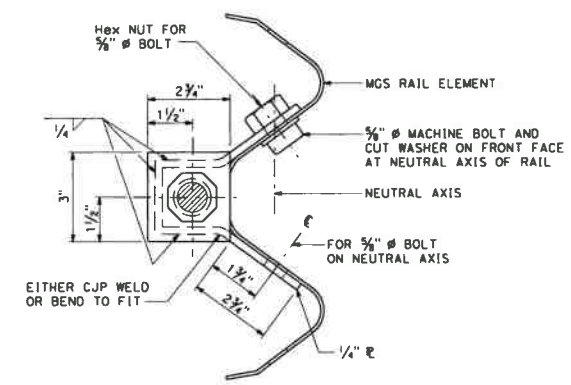
NOTE:
See Standard Plans A7751, A7752 and A7771 for typical use of anchor cable and anchor plate.



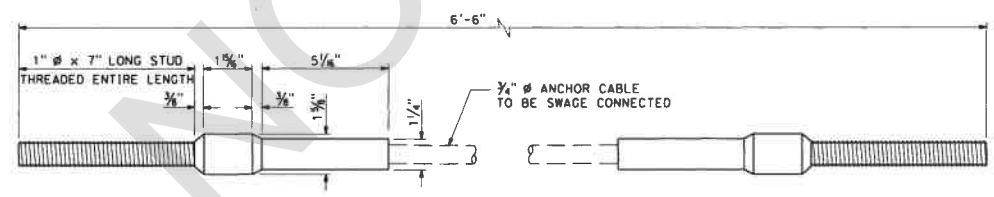
ANCHOR PLATE DETAIL
(MGS shown, TBB similar)



DETAIL D



SECTION A-A



DETAIL E
ANCHOR CABLE WITH SWAGED FITTING AND STUD

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**METAL RAILING
ANCHOR CABLE AND
ANCHOR PLATE DETAILS**
NO SCALE

A77S3

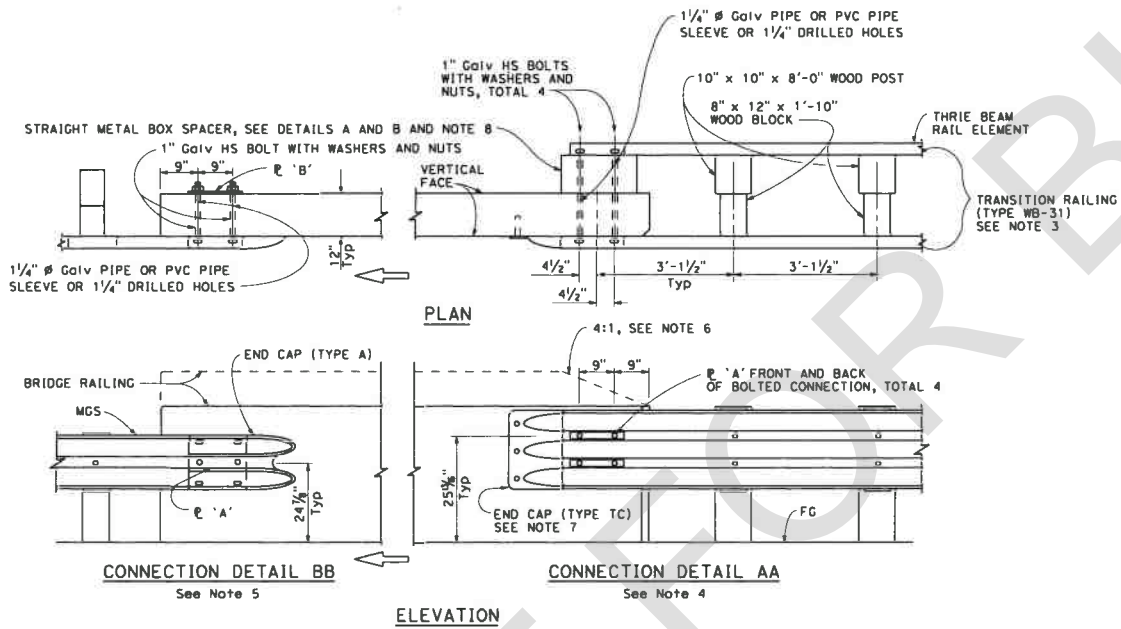
117

2023 STANDARD PLAN A1753

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

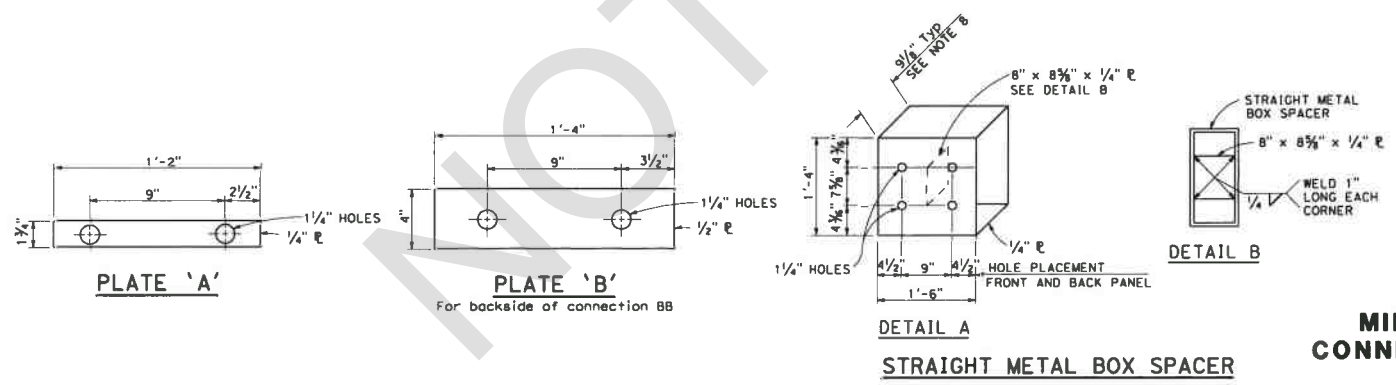
REGISTERED CIVIL ENGINEER
 May 1, 2023
 PLANS APPROVAL DATE

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- NOTES:**
1. See Standard Plan A77U2 for additional connection details to bridges without sidewalks.
 2. Additional details of posts, blocks and hardware are shown on Standard Plans A77M1, A77N1 and A77N2.
 3. For additional details of Transition Railing (Type WB-31), see Standard Plan A77U4. Transition Railing (Type WB-31) transitions the 12 gauge MGS railing section to a heavier gauge nested thrie beam railing section which is connected to the concrete bridge railing.
 4. For typical use of Connection Detail AA, see Layout Types 12A and 12B on Standard Plan A7701, Layout Types 12C and 12D on Standard Plan A7702, and Layout Type 12E on Standard Plan A7703.
 5. For typical use of Connection Detail BB, see Layout Type 12D (structure departure railing connection) on Standard Plan A7702 and Layout Type 12DD on Standard Plan A7705.
 6. Where the height of the bridge railing exceeds the height of the thrie beam railing by more than 1" at Connection Detail AA, taper the top of the end of the bridge railing at 4:1 to match the top elevation of the thrie beam rail.
 7. For details of End Cap (Type TC), see Standard Plan A77U4.
 8. See Standard Plan A77U4 for additional details regarding depth dimension for straight metal box spacer.

MIDWEST GUARDRAIL SYSTEM CONNECTION TO BRIDGE RAILING WITHOUT SIDEWALK




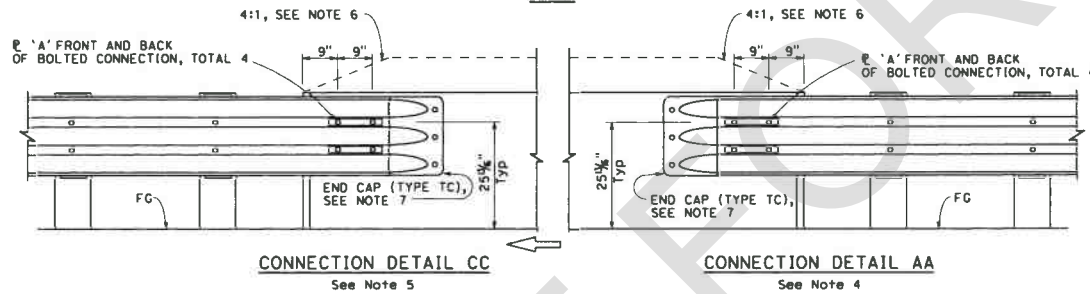
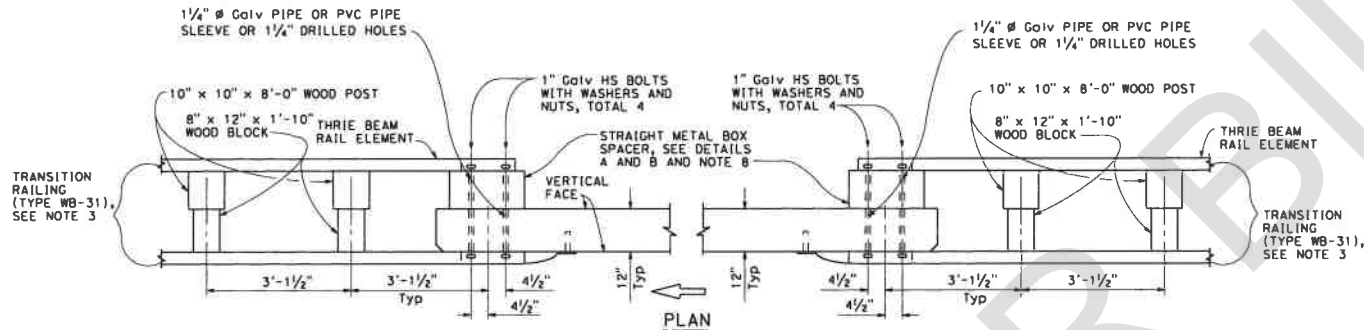
STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION

**MIDWEST GUARDRAIL SYSTEM
 CONNECTIONS TO BRIDGE RAILINGS
 WITHOUT SIDEWALKS
 DETAILS No. 1**

NO SCALE

A77U1

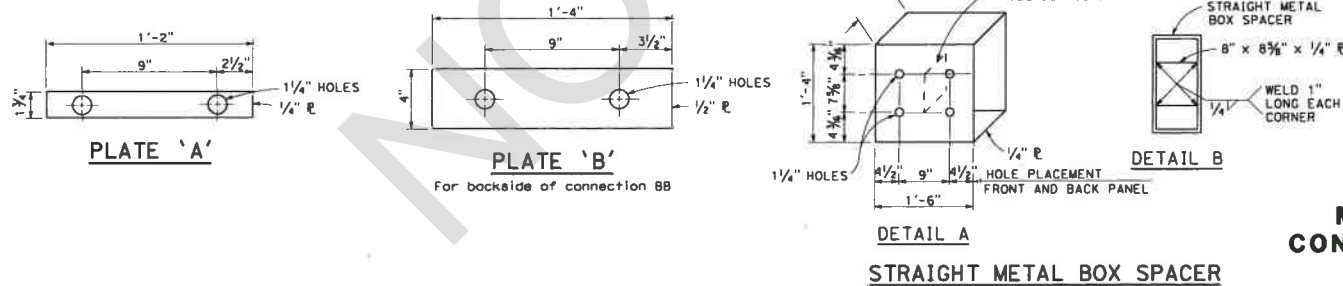
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
REGISTERED CIVIL ENGINEER  May 1, 2023 PLANS APPROVAL DATE THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.					



MIDWEST GUARDRAIL SYSTEM CONNECTION TO BRIDGE RAILING WITHOUT SIDEWALK

NOTES:

1. See Standard Plan A77U1 for additional connection details to bridges without sidewalks.
2. Additional details of posts, blocks and hardware are shown on Standard Plans A77M1, A77N1 and A77N2.
3. For additional details of Transition Railing (Type WB-31), see Standard Plan A77U4. Transition Railing (Type WB-31) transitions the 12 gauge MGS railing section to a heavier gauge nested thrie beam railing section which is connected to the concrete bridge railing.
4. For typical use of Connection Detail AA, see Layout Types 12A and 12B on Standard Plan A77U1, Layout Types 12C and 12D on Standard Plan A77U2, and Layout Type 12E on Standard Plan A77U3.
5. For typical use of Connection Detail CC, see Layout Types 12AA and 12BB on Standard Plan A77U4 and Layout Type 12CC on Standard Plan A77U5.
6. Where the height of the bridge railing exceeds the height of the thrie beam railing by more than 1" at Connection Detail AA and connection Detail CC, taper the top of the end of the bridge railing at 4:1 to match the top elevation of the thrie beam railing.
7. For details of End Cap (Type TC), see Standard Plan A77U4.
8. See Standard Plan A77U4 for additional details regarding depth dimension for straight metal box spacer.



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**MIDWEST GUARDRAIL SYSTEM
CONNECTIONS TO BRIDGE RAILINGS
WITHOUT SIDEWALKS
DETAILS No. 2**
NO SCALE

A77U2

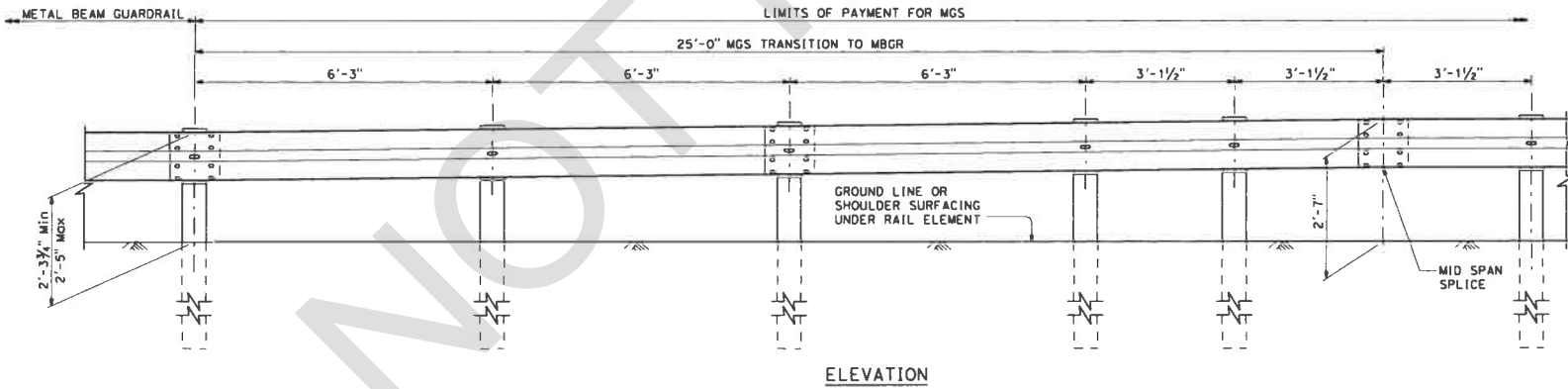
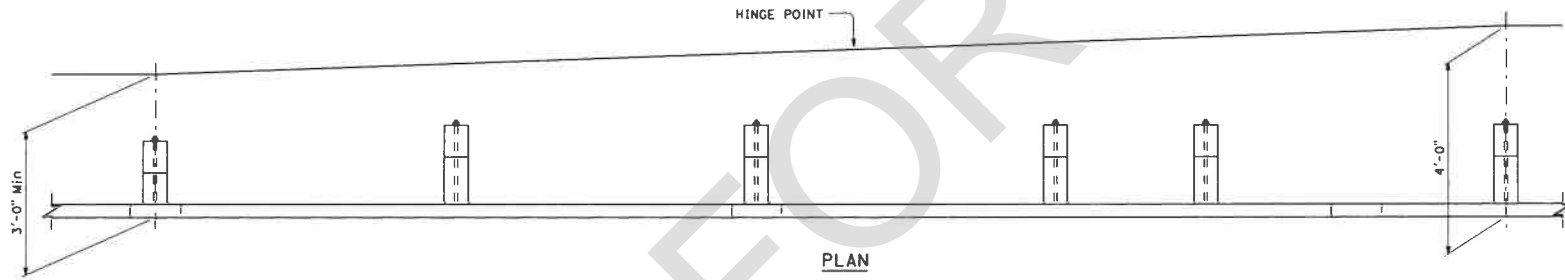
Dist.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL NO. SHEETS

Mark Ballantine
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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NOTE:
1. Refer to Standard Plans A77L1 and A77L2 for component details for MGS not shown on this plan.



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**MIDWEST GUARDRAIL SYSTEM
TRANSITION TO METAL BEAM GUARDRAIL**

NO SCALE

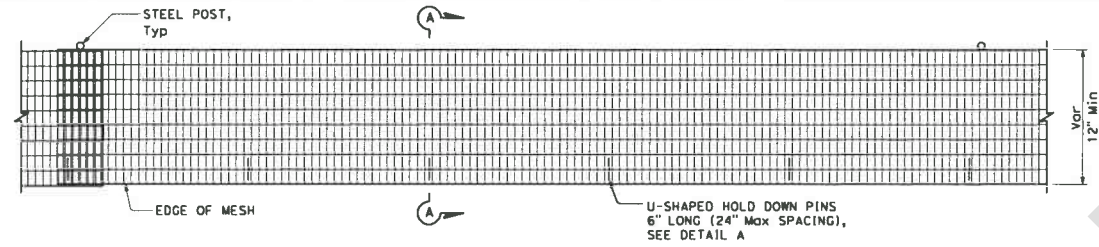
A77U5

2023 STANDARD PLAN A/109

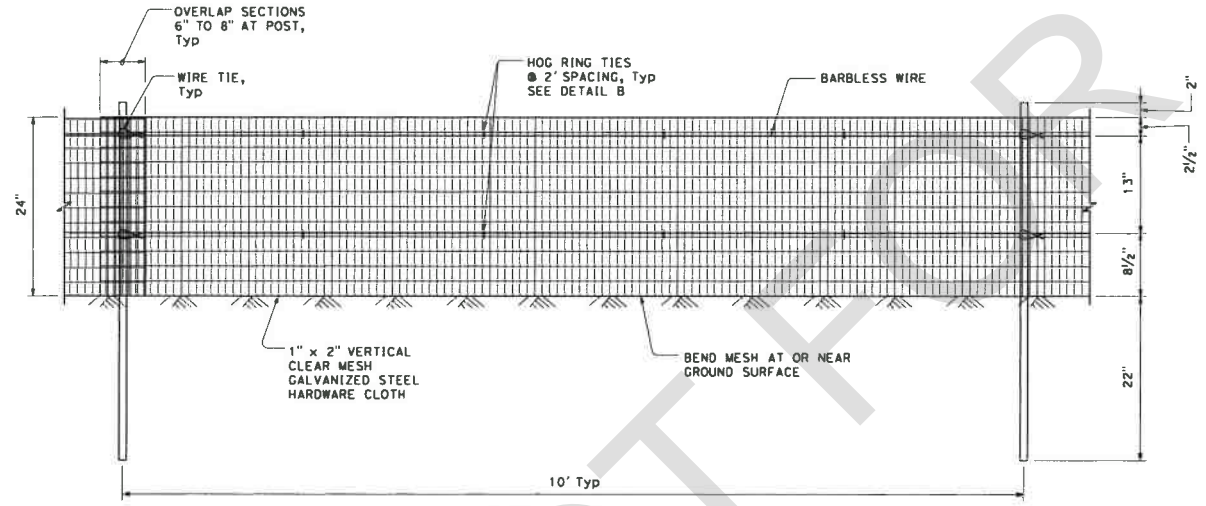
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER May 1, 2023 PLANS APPROVAL DATE	
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.	

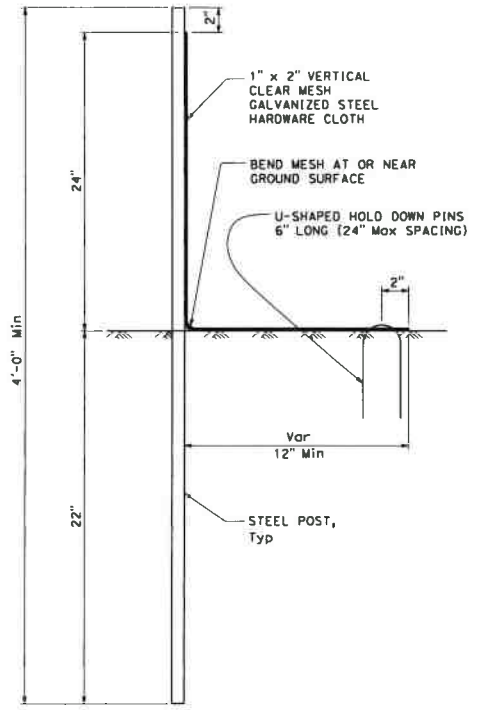
- NOTES:**
- Exact locations for temporary desert tortoise fence are shown on the plans.
 - Horizontal portion of hardware cloth must be on habitat side of posts.



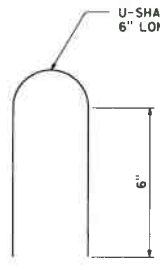
PLAN VIEW



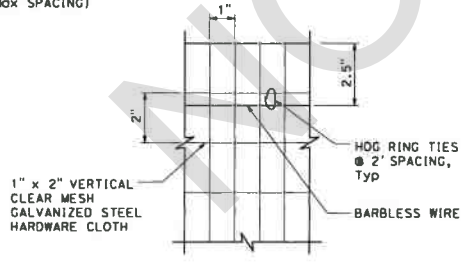
FRONT VIEW



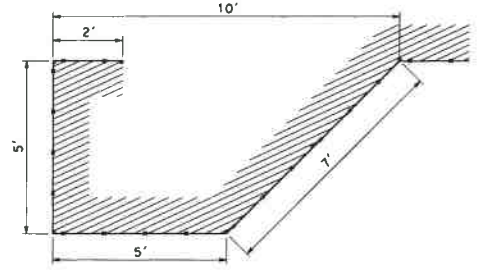
SECTION A-A



DETAIL A



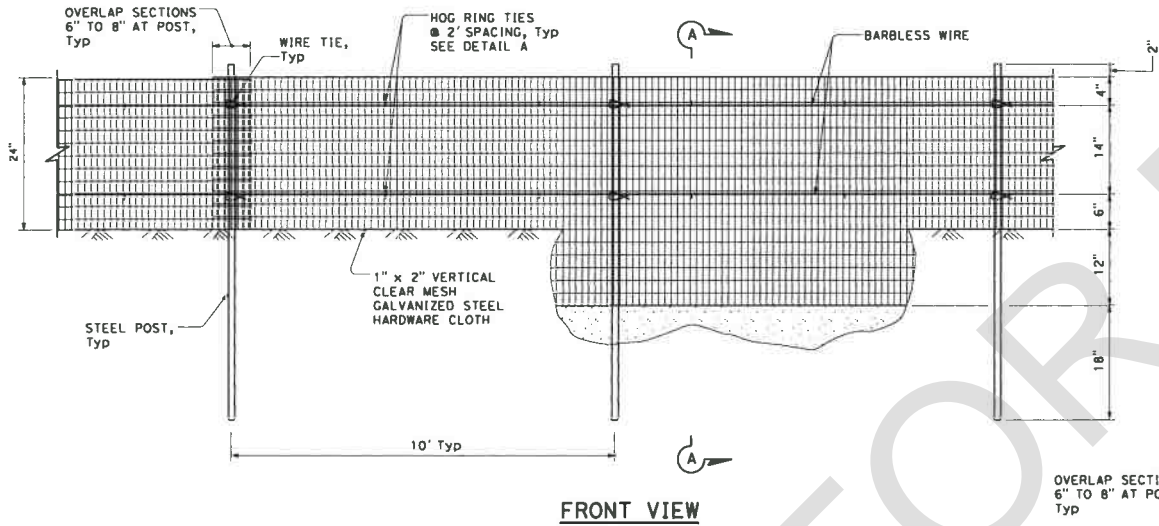
DETAIL B



REDIRECTIONAL CONFIGURATION PLAN VIEW

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
**TEMPORARY DESERT
 TORTOISE FENCE**
 NO SCALE

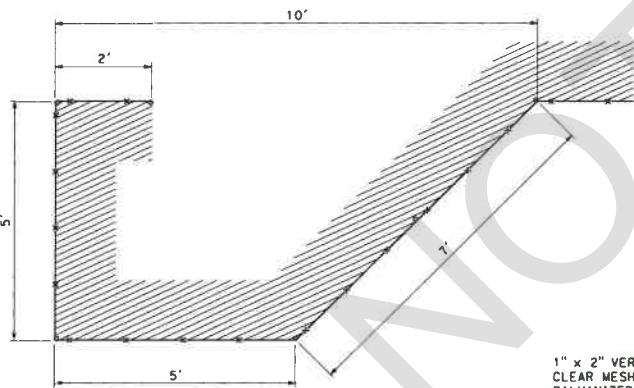
A84A



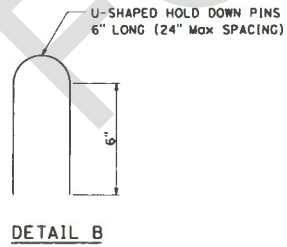
FRONT VIEW

NOTE:
1. Exact locations for desert tortoise fence are shown on the plans.

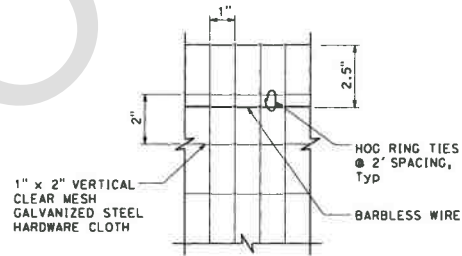
LEGEND:
 DESERT TORTOISE HABITAT



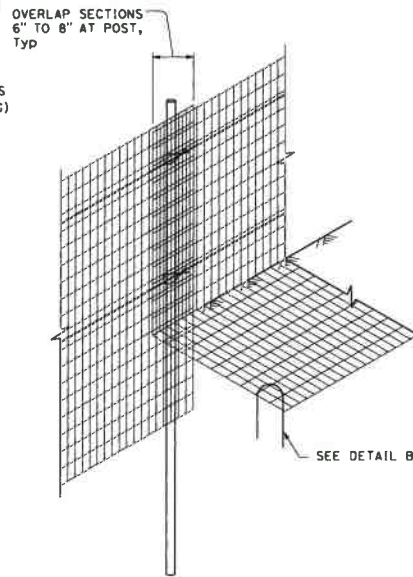
REDIRECTIONAL CONFIGURATION PLAN VIEW



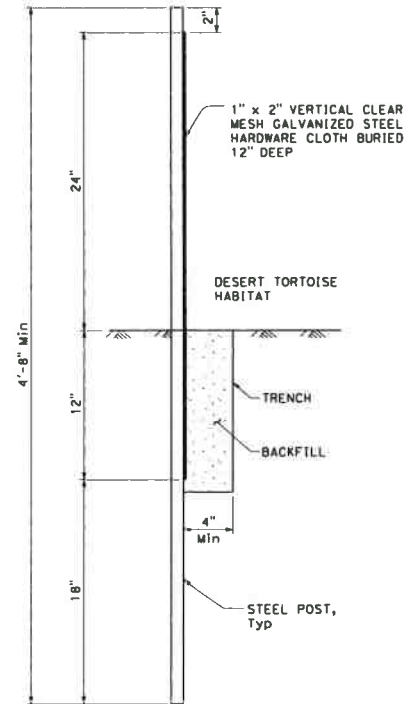
DETAIL B



DETAIL A



FENCE TRANSITION FOR BEDROCK OR CALICHE SUBSTRATE



SECTION A-A

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

REGISTERED CIVIL ENGINEER
 N. Rezo Velizodon
 CS1902
 Exp. 8-30-24
 CIVIL
 STATE OF CALIFORNIA

May 1, 2023
 PLANS APPROVAL DATE
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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DESERT TORTOISE FENCE
NO SCALE

A84B

2023 STANDARD PLAN A84B

NOTES:

- Additional details of posts, blocks and hardware are shown on Revised Standard Plan A79A3.
- For additional details of Transition Railing (Type AGT), see Revised Standard Plans RSP A79A1 and RSP A79A2.
- For typical use of Connection Detail AA, see Layout Types 12A and 12B on Revised Standard Plan RSP A7701, Layout Types 12C and 12D on Revised Standard Plan RSP A7702, and Layout Type 12E on Revised Standard Plan RSP A7703. Layout Types 12AA and 12BB on Revised Standard Plan RSP A7704 and Layout Type 12CC on Revised Standard Plan RSP A7705.
- For typical use of Connection Detail BB, see Layout Type 12D (Structure Departure Railing Connection) on Revised Standard Plan RSP A7702 and Layout Type 12DD on Revised Standard Plan RSP A7705.
- Typical use of Connection Detail CC is for use with thrie beam at structure departure where AGT connection is not needed. For AGT connection at structure departure, see Connection Detail HH on Revised Standard Plan RSP A79B2.
- Where the height of the railing at the structure connection exceeds the height of the thrie beam railing by more than 1" at Connection Detail AA or Detail CC, taper the top of the end of the concrete railing at 6:1 to be within 1" of the top elevation of the thrie beam rail.
- Taper top of AGT anchor block to 5'-0" high at approach to structure walls and columns, see Revised Standard Plan RSP A79C1.
- For details of End Cap (Type TC-M), see Revised Standard Plan RSP A79A3.
- If not able to place Plate B due to connection to wall or abutment, drill 1" ϕ hole 9" deep and bond with epoxy anchors, see Revised Standard Plan RSP A79C2.
- Hollow Structural Section (HSS) refers to a galvanized metal sleeve.
- On conventional highways, when trailing end of structure is within 20' of the center line of opposing traffic, place AGT for opposing direction of traffic.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS

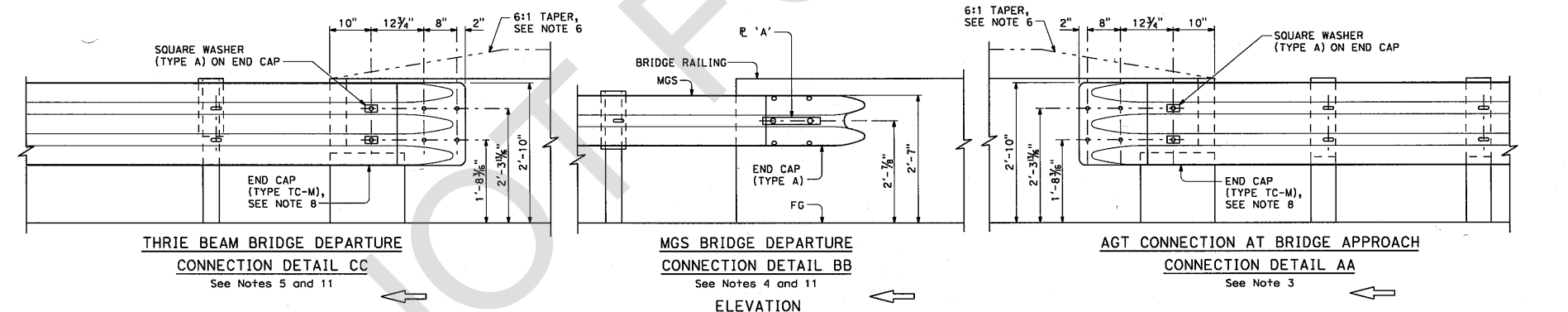
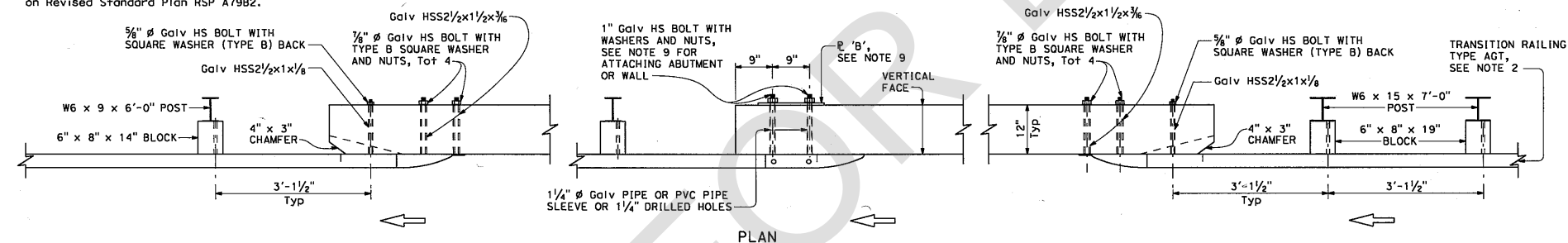
Mark Ballentine
REGISTERED CIVIL ENGINEER

January 22, 2024
PLANS APPROVAL DATE

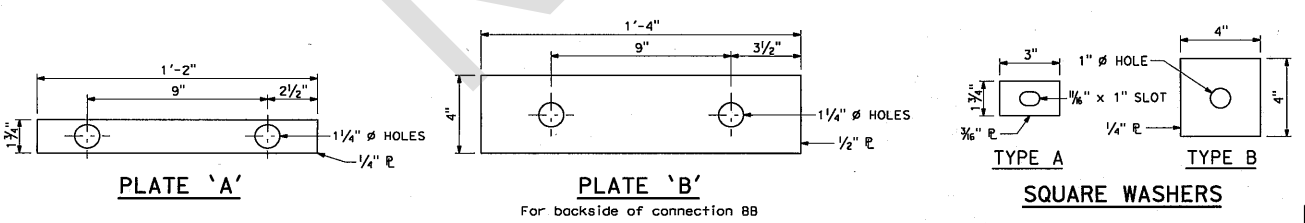
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REGISTERED PROFESSIONAL ENGINEER
No. C64101
Exp. 9-30-24
CIVIL
STATE OF CALIFORNIA

TO ACCOMPANY PLANS DATED _____



MIDWEST GUARDRAIL SYSTEM CONNECTION TO BRIDGE RAILING ABUTMENT OR WALL



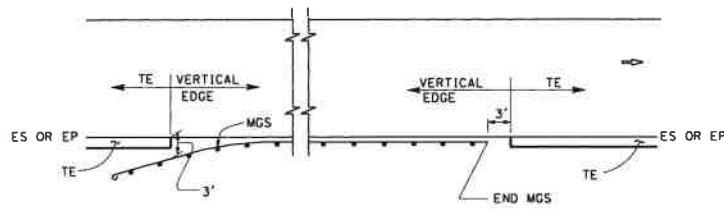
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**TRANSITION RAILING (TYPE AGT)
TO BRIDGE RAILINGS
WITHOUT SIDEWALKS**

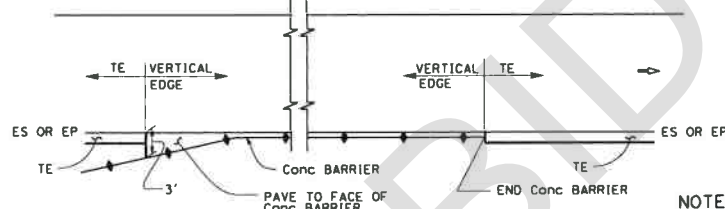
NO SCALE

RSP A79B1 DATED JANUARY 22, 2024 SUPPLEMENTS THE STANDARD PLANS BOOK DATED 2023.
REVISED STANDARD PLAN RSP A79B1

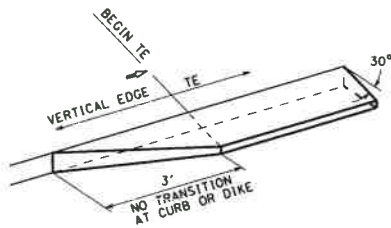
2023 REVISED STANDARD PLAN RSP A79B1



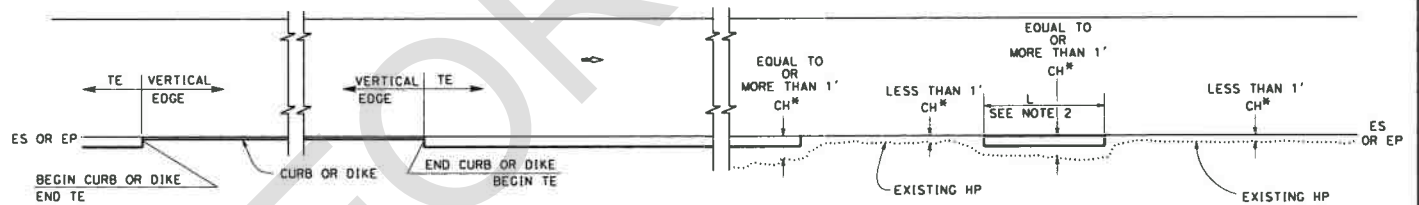
MGS



CONCRETE BARRIER



TRANSITION DETAIL FOR CONCRETE ONLY



CURB OR DIKE

NOTES:

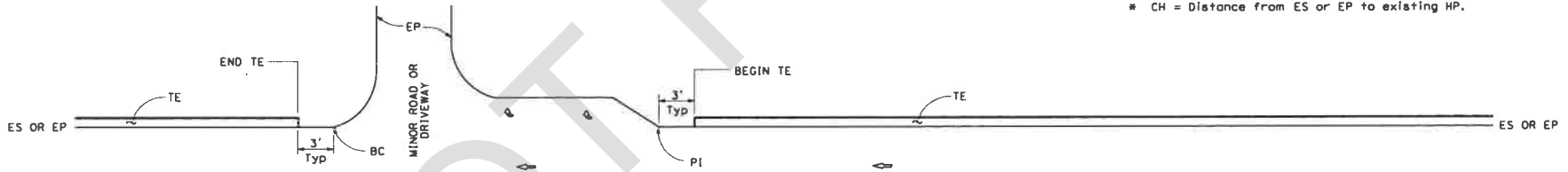
- 1. For details not shown, see Standard Plans P75 and P76.
- 2. Tapered edge is optional when L is less than 30'.

ABBREVIATIONS:

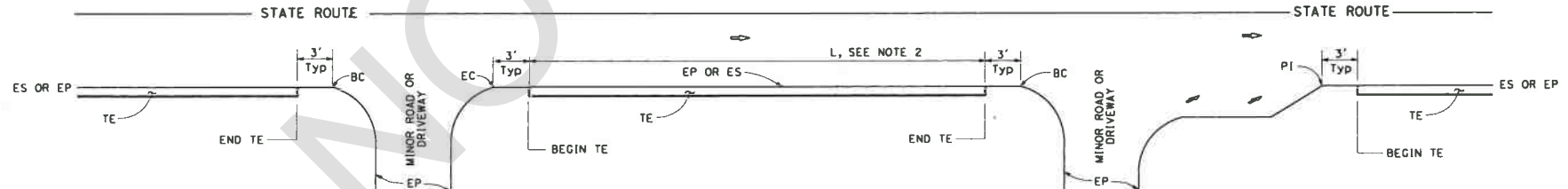
TE - TAPERED EDGE

NARROW SIDE SLOPE

* CH = Distance from ES or EP to existing HP.



INTERSECTION



DRIVEWAY AND INTERSECTION

MINOR ROADWAY OR DRIVEWAY

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

Cathrine Davis Jones Inc.
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
PAVEMENT EDGE TREATMENTS
NO SCALE

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




Cathrine Barros Dwyer
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

Cathrine Barros Dwyer
No. 47048
Exp. 12-31-23
CIVIL
STATE OF CALIFORNIA

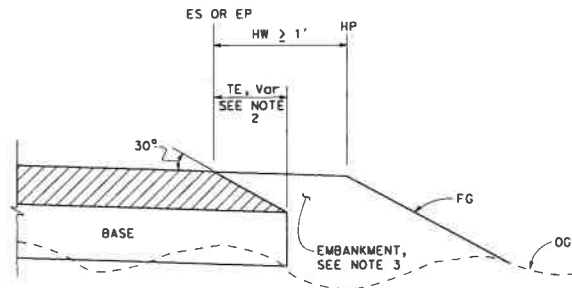
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LEGEND:

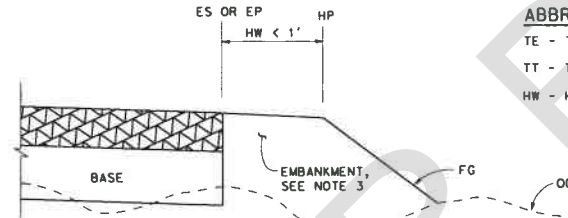
-  HMA PAVEMENT
-  HMA OR CONCRETE PAVEMENT
-  CONCRETE PAVEMENT

ABBREVIATIONS:

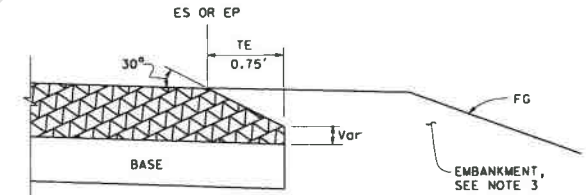
- TE - TAPERED EDGE
- TT - TOTAL THICKNESS OF TE
- HW - HINGE WIDTH, DISTANCE FROM ES OR EP TO HP



CASE K
Tapered Edge - Fill Section, HW $\geq 1'$

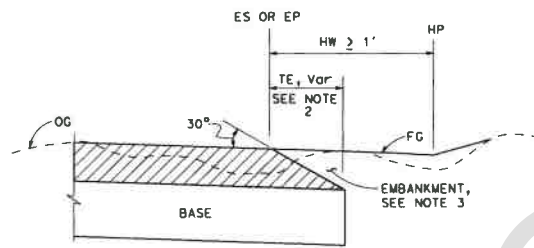


CASE L
Vertical Edge - Fill Section, HW $< 1'$

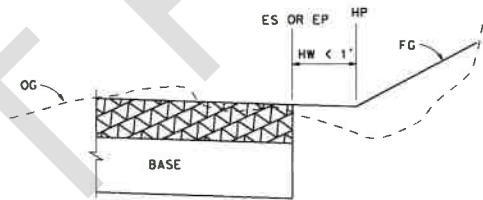


DETAIL B
For HMA pavement thickness more than 0.43' or concrete pavement

FILL SECTION

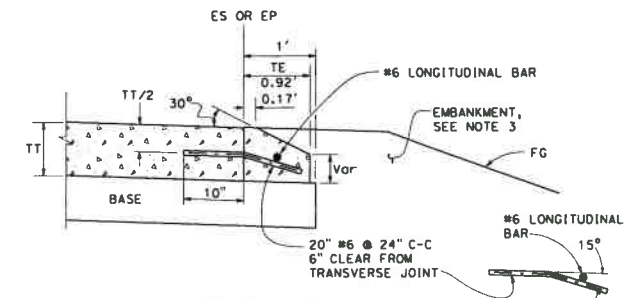


CASE M
Tapered Edge - Cut Section, HW $\geq 1'$



CASE N
Vertical Edge - Cut Section, HW $< 1'$

CUT SECTION



OPTIONAL DETAIL B
For concrete pavement, see Note 4

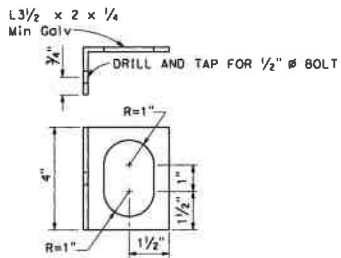
NOTES:

1. For limits of tapered edge and vertical edge treatments, see Standard Plan P74.
2. Details shown for HMA pavement thickness less than 0.43'. See Detail B for HMA pavement thickness more than 0.43' or concrete pavement.
3. For locations and limits of embankment, see project plans.
4. Tapered edge transverse joint must match pavement transverse joint. End of #6 longitudinal bar must be 2' \pm 1/2" clear from transverse joint.
5. Tapered edge is not needed in the area of MGS, barrier, right turn lane and acceleration lane. See Standard Plan P74.

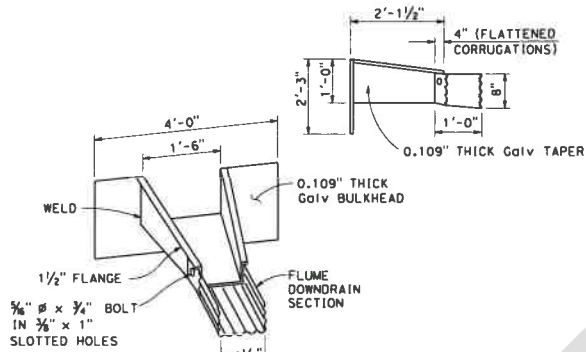
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**PAVEMENT EDGE TREATMENTS
NEW CONSTRUCTION**

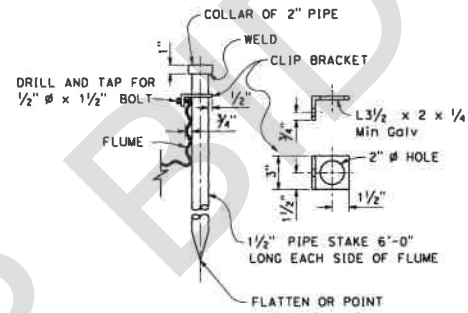
NO SCALE



ALTERNATIVE CLIP BRACKET DETAIL



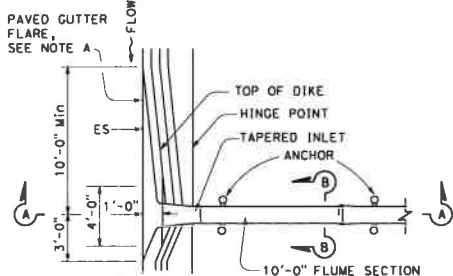
TAPERED INLET



PIPE STAKE ANCHOR DETAIL

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

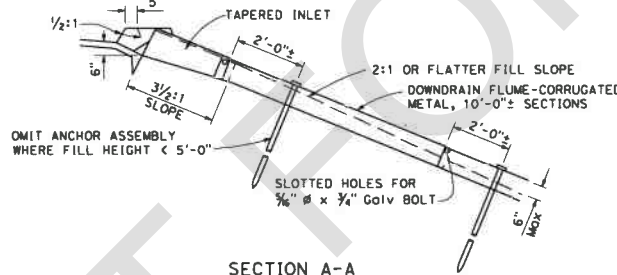
Sean T. Perders
 REGISTERED CIVIL ENGINEER
 May 1, 2023
 PLANS APPROVAL DATE
 THE STATE OF CALIFORNIA OR ITS OFFICERS OF AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.



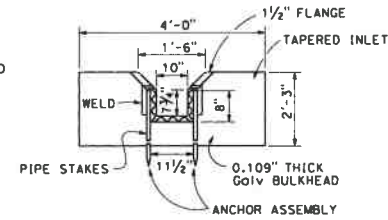
NOTE A
 In sag location, use 10'-0" length of paved gutter flare on both sides of inlet.

PLAN

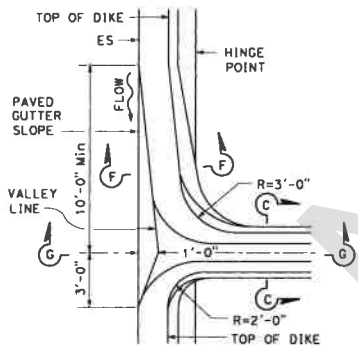
TAPERED INLET AND FLUME DOWNDRAIN



SECTION A-A



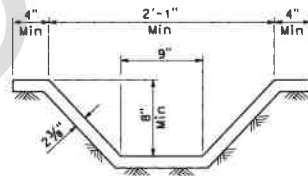
SECTION B-B



PLAN

MOUNTABLE DIKE

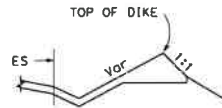
HOT MIX ASPHALT OVERSIDE DRAINS



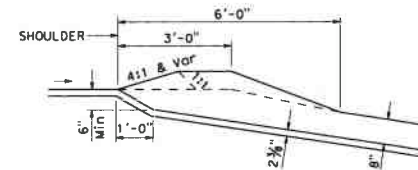
SECTION C-C

See Note 1

NOTE:
 1. Cross section of slope ditch may be semicircular, vee or trapezoidal.



SECTION F-F



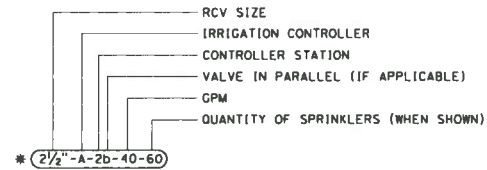
SECTION G-G

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
OVERSIDE DRAINS
 NO SCALE

D87D

EXISTING	NEW	ITEM DESCRIPTION
		WATER METER (WM)
		BACKFLOW PREVENTER ASSEMBLY (BPA)
		BACKFLOW PREVENTER ENCLOSURE (BPE)
		BOOSTER PUMP (BP)
		TRUCK LOADING STANDPIPE (TLS)
		FLOW SENSOR (FS)
		MASTER IRRIGATION CONTROLLER (MIC)
		AUXILIARY IRRIGATION CONTROLLER (AIC)
		IRRIGATION CONTROLLER (IC) (BATTERY)
		IRRIGATION CONTROLLER (IC) (SOLAR)
		IRRIGATION CONTROLLER (IC) (TWO WIRE)
		IRRIGATION CONTROLLER(S) IN CONTROLLER ENCLOSURE CABINET (ICC)
		ARMOR-CLAD CONDUCTORS (ACC)
		CONTROL AND NEUTRAL CONDUCTORS (CNC)
		IRRIGATION CONDUIT
		IRRIGATION SLEEVE
		DUCTILE IRON PIPE (SUPPLY LINE) (MAIN) (DIP)
		GALVANIZED STEEL PIPE (SUPPLY LINE) (MAIN) (GSP)
		GALVANIZED STEEL PIPE (SUPPLY LINE) (LATERAL) (GSP)
		PLASTIC PIPE (SUPPLY LINE) (MAIN)
		PLASTIC PIPE (SUPPLY LINE) (LATERAL)
		COPPER PIPE (SUPPLY LINE)
		DRIP IRRIGATION TUBING
		REMOTE CONTROL VALVE (RCV)
		REMOTE CONTROL VALVE (MASTER) (RCVM)
		REMOTE CONTROL VALVE (MASTER) W/FLOW METER (RCVMF)
		REMOTE CONTROL VALVE W/PRESSURE REGULATOR (RCVP)
		EXISTING MANUAL CONTROL VALVE (MCV)
		DRIP VALVE ASSEMBLY (DVA)
		WYE STRAINER ASSEMBLY (WSA)

EXISTING	NEW	ITEM DESCRIPTION
		GATE VALVE (GV)
		BALL VALVE (BV)
		QUICK COUPLING VALVE (QCV)
		CAM COUPLER ASSEMBLY (CCA)
		GARDEN VALVE ASSEMBLY (GARVA)
		PRESSURE REGULATING VALVE (PRV)
		PRESSURE RELIEF VALVE (PRLV)
		FLOW CONTROL VALVE (FCV)
		COMBINATION AIR RELEASE VALVE (CARV)
		CHECK VALVE (CV)
		FLUSH VALVE (FV)
		EXISTING NOZZLE LINE W/TURNING UNION
		EXISTING IRRIGATION SYSTEM
		EXISTING IRRIGATION SYSTEM TO BE REMOVED
		CHAIN LINK GATE
		QUICK COUPLING VALVE W/SPRINKLER PROTECTOR
		SPRINKLER W/SPRINKLER PROTECTOR
		CONNECT TO EXISTING SYSTEM
		CAP
		CAP EXISTING
		FIBER ROLL
		COMPOST SOCK



* 2 1/2" - A-2b-40-60

VALVE CODE

* VALVE CODES FOR EXISTING VALVES ARE SHOWN IN A DASHED ENCLOSURE.

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

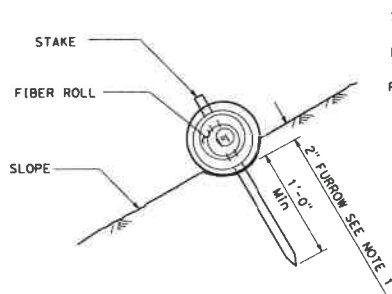
Michael J. ...
LICENSED LANDSCAPE ARCHITECT

May 1, 2023
PLANS APPROVAL DATE

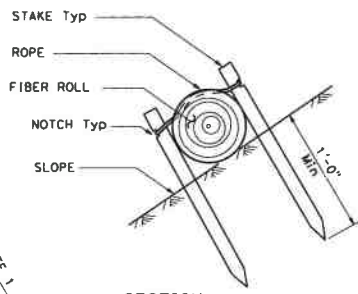
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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
LANDSCAPE AND EROSION CONTROL SYMBOLS
NO SCALE

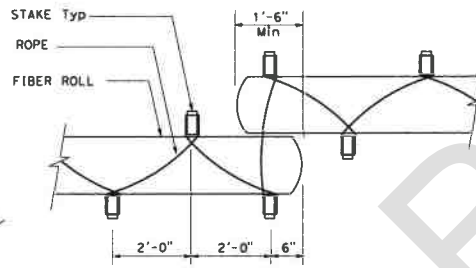
H1



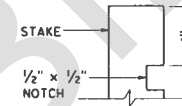
SECTION
FIBER ROLL (TYPE 1)



SECTION
FIBER ROLL (TYPE 2)



PLAN



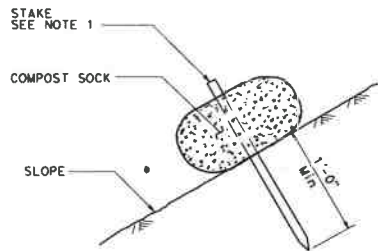
ELEVATION

STAKE NOTCH DETAIL

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

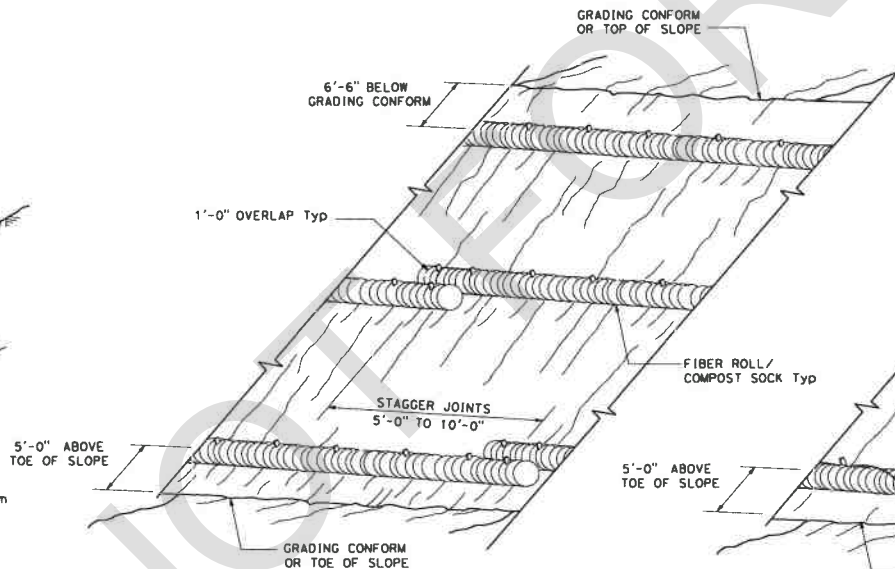
[Signature]
 LICENSED LANDSCAPE ARCHITECT
 May 1, 2023
 PLANS APPROVAL DATE
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NOTE:
 1. Installations shown in the perspectives are for slope inclination of 10:1 (Horiz:Vert) and steeper.

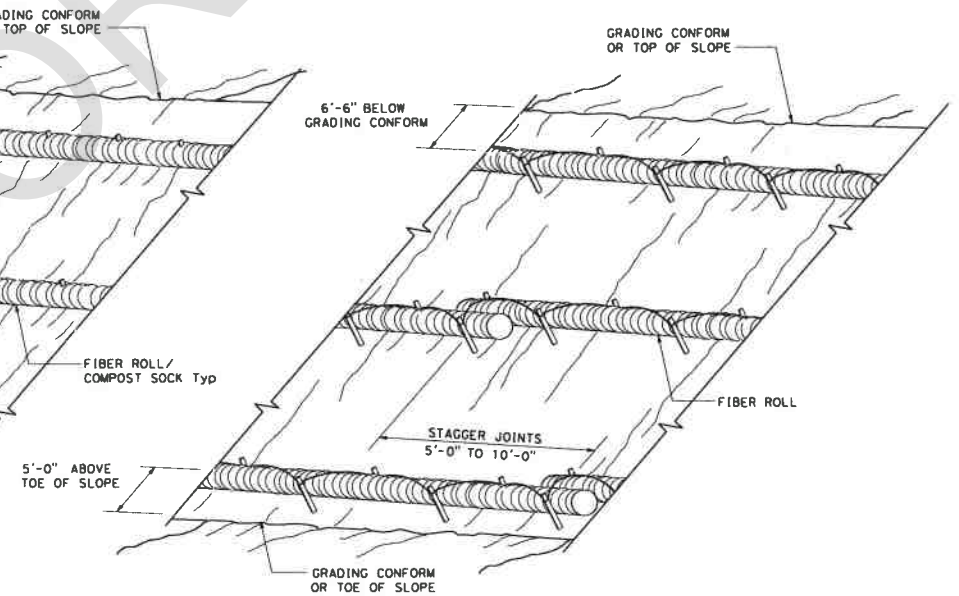


SECTION
COMPOST SOCK

NOTE:
 1. May install stake adjacent to bottom edge of compost sock.



PERSPECTIVE
FIBER ROLL (TYPE 1)
COMPOST SOCK

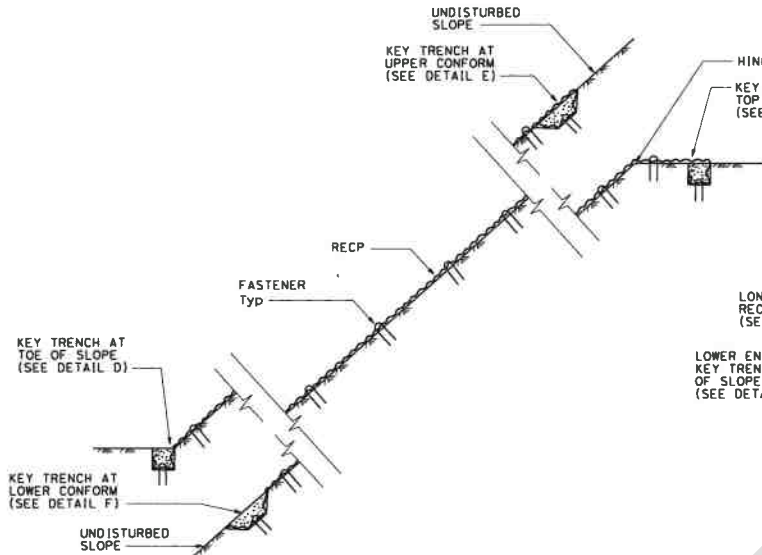


PERSPECTIVE
FIBER ROLL (TYPE 2)

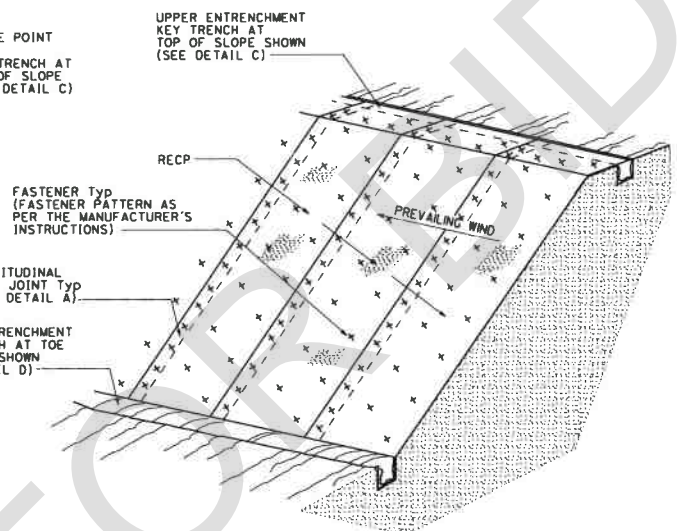
STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
EROSION CONTROL DETAILS
FIBER ROLL AND COMPOST SOCK

NO SCALE

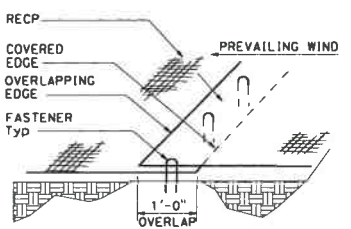
H51



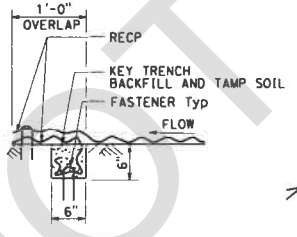
SECTION
ROLLED EROSION CONTROL PRODUCT
ON SLOPE WITH VARIOUS KEY ENTRENCHMENTS



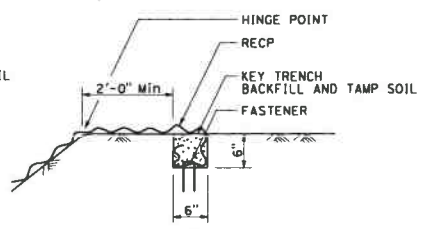
ISOMETRIC
ROLLED EROSION CONTROL PRODUCT
ON SLOPE



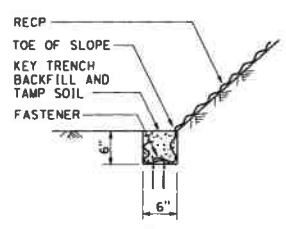
PERSPECTIVE
DETAIL A
LONGITUDINAL ROLLED EROSION
CONTROL PRODUCT JOINT



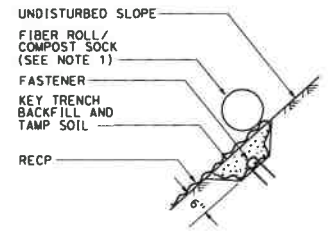
SECTION
DETAIL B
TRANSVERSE ROLLED EROSION
CONTROL PRODUCT JOINT



SECTION
DETAIL C
KEY TRENCH AT
TOP OF SLOPE



SECTION
DETAIL D
KEY TRENCH AT
TOE OF SLOPE

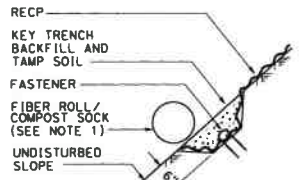


SECTION
DETAIL E
KEY TRENCH AT
UPPER CONFORM

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

[Signature]
 LICENSED LANDSCAPE ARCHITECT
 May 1, 2023
 PLANS APPROVAL DATE
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- NOTES:**
1. Fiber Roll/Compost Sock shown for reference purposes only.
 2. If transverse rolled erosion control product joints are required on slopes, see Detail B.



SECTION
DETAIL F
KEY TRENCH AT
LOWER CONFORM

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
ROLLED EROSION CONTROL PRODUCT
 NO SCALE

H52

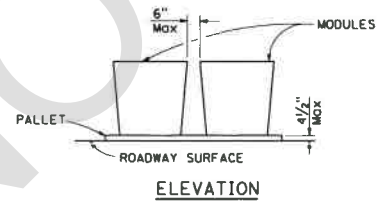
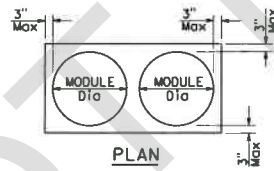
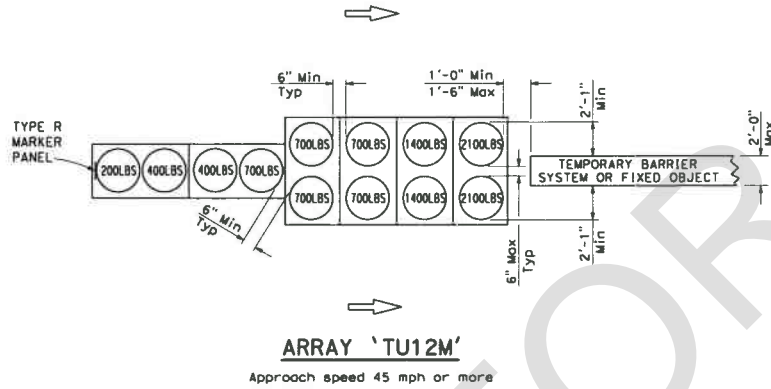
ZUS3 STANDARD PLAN H02

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

Chas. P. Syho
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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CRASH CUSHION PALLET DETAIL

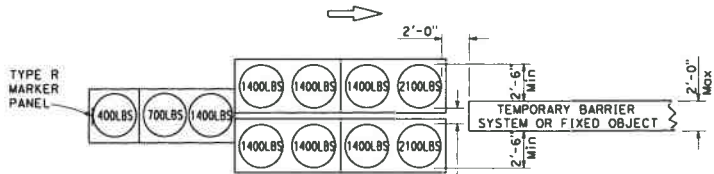
NOTES:

1. (XXX) indicates sand filled module location and weight of sand in pounds for each module. Module spacing is based on the greater diameter of the module.
2. All sand weights are nominal. Sand must contain no more than 7 percent water.
3. Refer to Standard Plan A73B for marker details.
4. Approach speeds indicated conform to MASH criteria.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**TEMPORARY CRASH CUSHION,
SAND FILLED
(UNIDIRECTIONAL)**

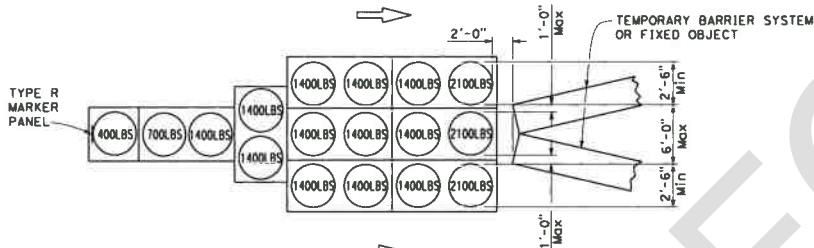
NO SCALE

T1A



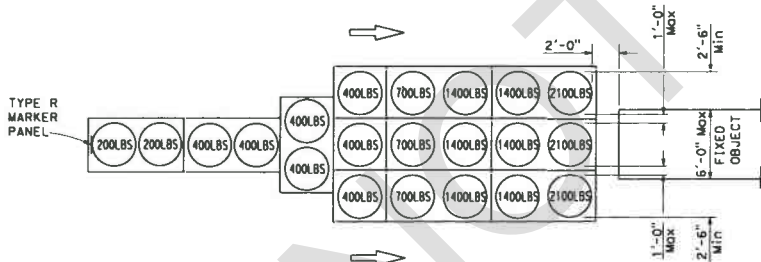
ARRAY 'TU11'

Approach speed less than 45 mph



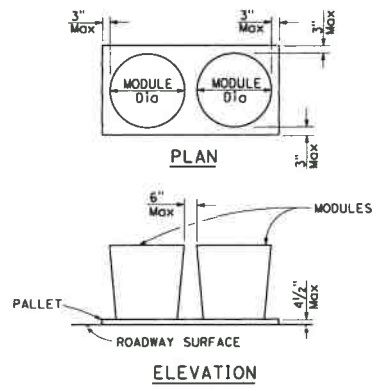
ARRAY 'TU17'

Approach speed less than 45 mph



ARRAY 'TU21'

Approach speed 45 mph or more



CRASH CUSHION PALLET DETAIL

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

Charles P. Sisko
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
Charles P. Sisko
No. 54329
Exp. 3-31-24
CIVIL
STATE OF CALIFORNIA

NOTES:

1. (XXX) Indicates sand filled module location and weight of sand in pounds for each module. Module spacing is based on the greater diameter of the module.
2. All sand weights are nominal. Sand must contain no more than 7 percent water.
3. Refer to Standard Plan A73B for marker details.
4. Approach speeds indicated conform to NCHRP Report 350 criteria.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**TEMPORARY CRASH CUSHION,
SAND FILLED
(UNIDIRECTIONAL)**
NO SCALE

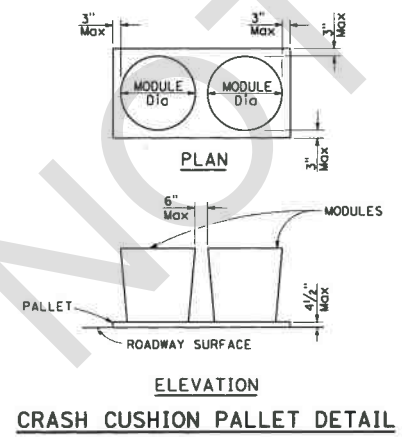
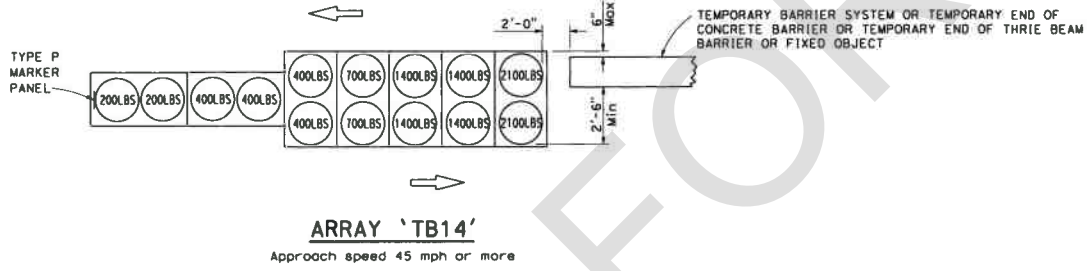
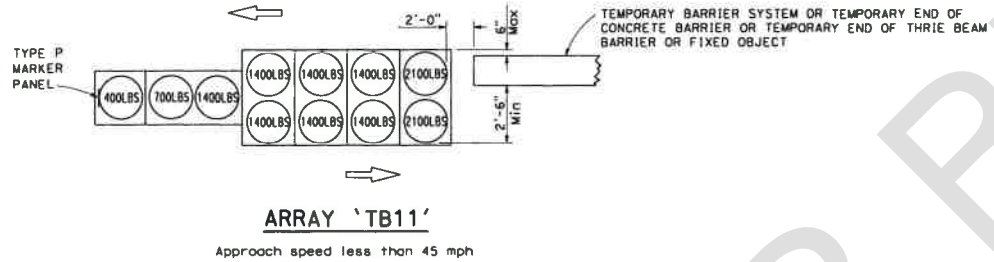
T1A1

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

Ch. P. L. Ho
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

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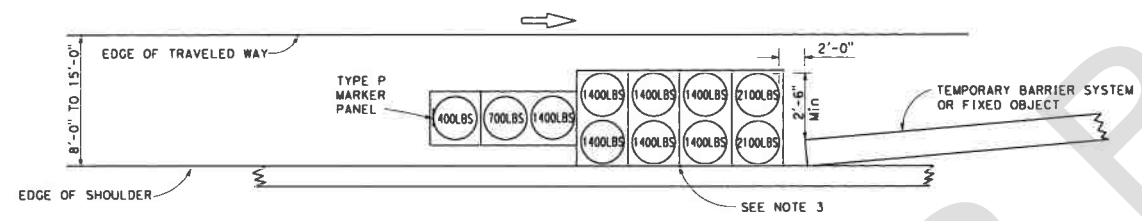
NOTES:

1. (xxx) Indicates sand filled module location and weight of sand in pounds for each module. Module spacing is based on the greater diameter of the modules.
2. All sand weights are nominal. Sand must contain no more than 7 percent water.
3. Refer to Standard Plan A73B for marker details.
4. Approach speeds indicated conform to NCHRP Report 350 criteria.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**TEMPORARY CRASH CUSHION,
SAND FILLED
(BIDIRECTIONAL)**
NO SCALE

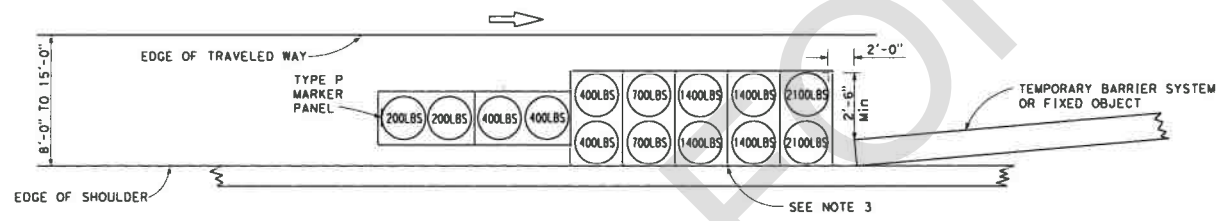
T1B

Dist:	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL NO. SHEETS
May 1, 2023 PLANS APPROVAL DATE <small>THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.</small>				



ARRAY 'TS11'

Approach speed less than 45 mph,
See Note 6

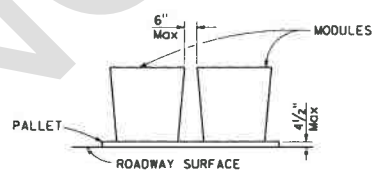
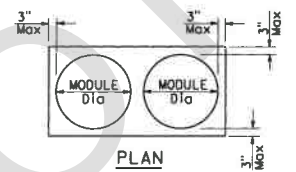


ARRAY 'TS14'

Approach speed 45 mph or more,
See Note 6

NOTES:

1. (xxx) Indicates sand filled module location and weight of sand in pounds for each module. Module spacing is based on the greater diameter of the module.
2. All sand weights are nominal. Sand must contain no more than 7 percent water.
3. The temporary crash cushion arrays shown on this plan shall be used only in locations where there will be traffic on one side of the temporary crash cushion array.
4. Arrays for median shoulders shall conform to details shown on this plan for outside shoulders.
5. Refer to Standard Plan A738 for marker details.
6. For shoulder widths less than 8'-0", appropriate approved crash cushion protection, other than sand filled modules, shall be provided at fixed objects and at approach ends of temporary railing. The specific type of crash cushion shall be as shown on the project plans or as specified in the Special Provisions, or if not shown on the project plans or specified in the Special Provisions, shall be as approved by the Engineer.
7. Approach speeds indicated conform to NCHRP Report 350 criteria.



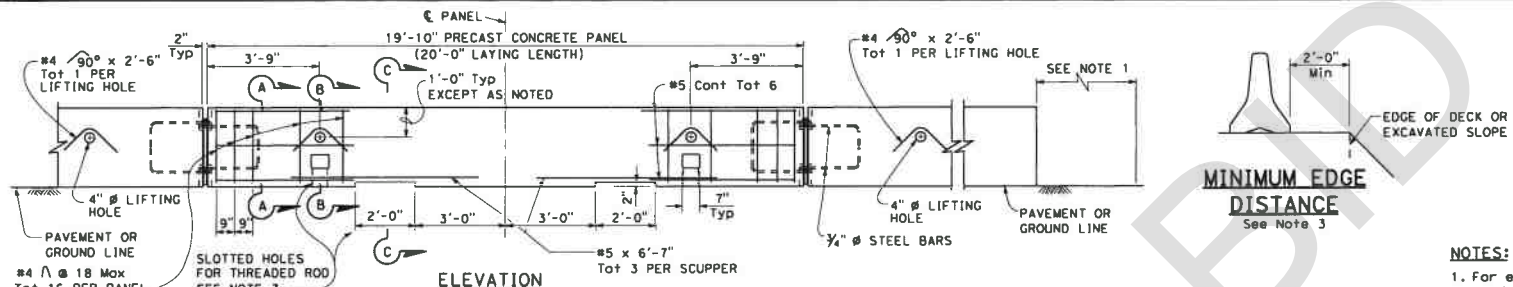
CRASH CUSHION PALLET DETAIL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**TEMPORARY CRASH CUSHION,
SAND FILLED
(SHOULDER INSTALLATIONS)**
NO SCALE

T2

314

2023 STANDARD PLAN 12



TYPICAL PANEL
Weight per panel: 3.9 tons

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

Chab P. S. S. S.
REGISTERED CIVIL ENGINEER

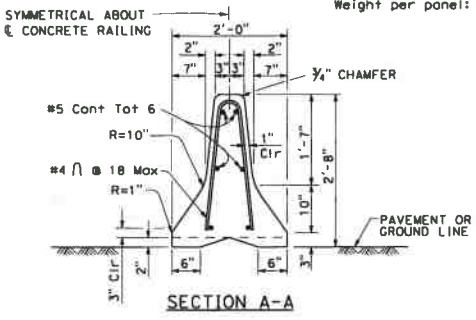
May 1, 2023
PLANS APPROVAL DATE

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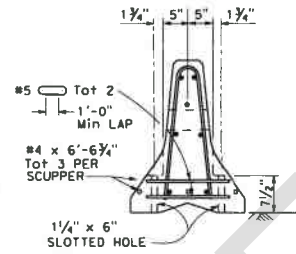
REGISTERED PROFESSIONAL ENGINEER
PAULINE S. SMITH
CIVIL
STATE OF CALIFORNIA

NOTES:

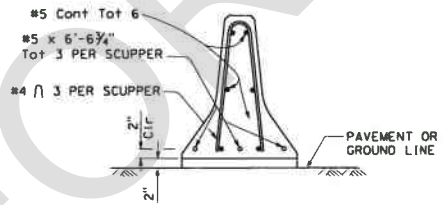
- For end treatment, layout and crash cushions, where needed, see Project Plans or Special Provisions.
- All 3/2" gaps at removable panels are to be backed at the base with #8 x 10" dowel or 1" # pin each side of joint, see Section G-G.
- Where the offset distance from the exposed edge of deck to the closest edge of the temporary railing is less than 2'-0", attach each panel to deck slab with 1" diameter threaded rods (total four per panel) inserted through the slotted holes of the panel and bond in drilled holes 6" deep in the deck slabs. See "Bridge Memo to Designers" Manual.



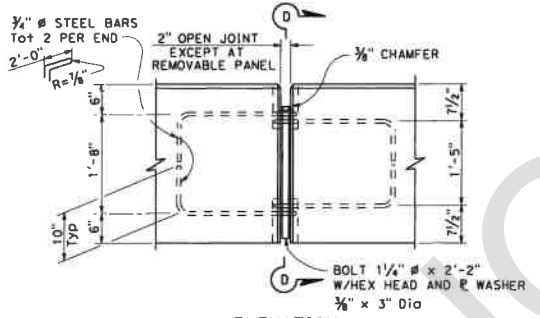
SECTION A-A



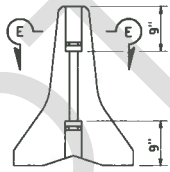
SECTION B-B



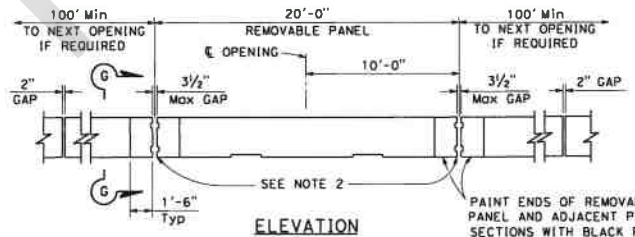
SECTION C-C



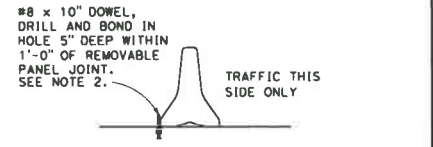
ELEVATION



SECTION D-D

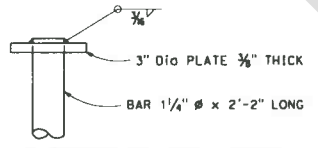


ELEVATION
TYPICAL OPENING DETAIL

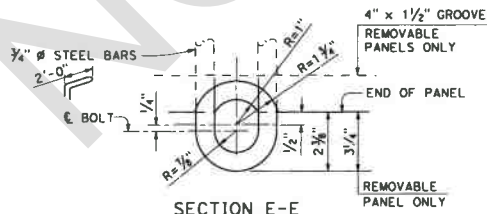


SECTION G-G *

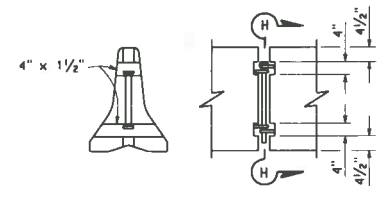
* Section G-G is for concrete pavement. Alternative detail, 1" # pins 2'-0" long driven in existing AC or HMA.



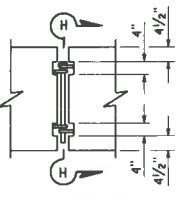
ALTERNATIVE HEAD DETAIL



SECTION E-E



SECTION H-H



ELEVATION

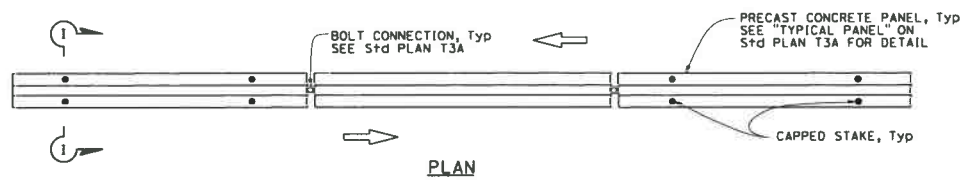
REMOVABLE PANEL GROOVE DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY RAILING
(TYPE K)

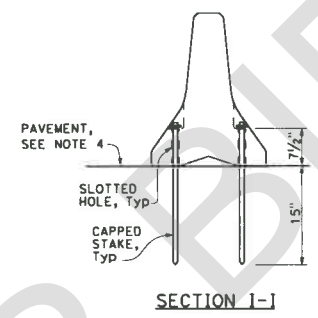
NO SCALE

T3A

DIST	COUNTY	ROUTE	POST MILES	SHEET TOTAL
			TOTAL PROJECT	NO. SHEETS
<i>Chas. P. Szylo</i> REGISTERED CIVIL ENGINEER				
May 1, 2023 PLANS APPROVAL DATE				
<small>THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.</small>				



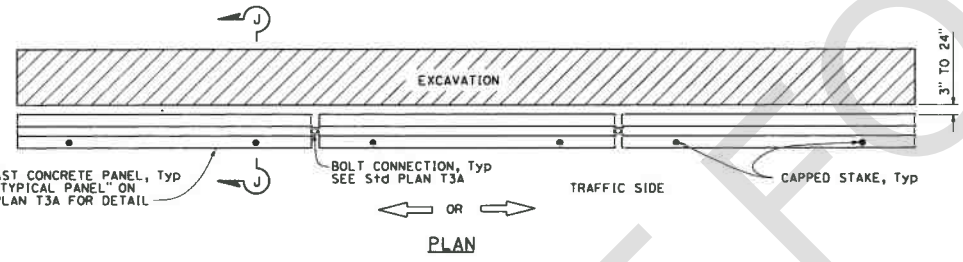
RAILING STAKING CONFIGURATION FOR TWO-WAY TRAFFIC
See Note 2



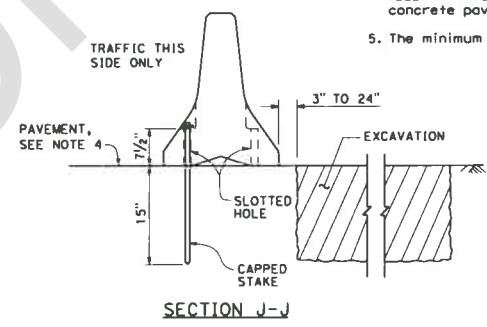
SECTION I-I

NOTES:

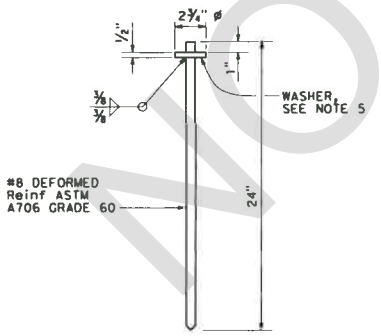
1. Where Type K Temporary Railing is placed on curves and radii that are too severe to connect panels with bolted joints, the railing must be backed continuously with earth fill. See Section F-F.
2. Where Type K Temporary Railing is placed as a temporary or long term barrier in two-way traffic on highways with less than 24" from the edge of traveled way, use four capped stakes per every other panel with end panels staked.
3. Where Type K Temporary Railing is placed 3" to 24" from the edge of an excavation on highways, use two capped stakes per panel along the traffic side.
4. Staked Type K Temporary Railing must be supported by at least 4" thick concrete, hot mix asphalt or existing asphalt concrete pavement.
5. The minimum yield strength for the washer must be 60,000 psi.



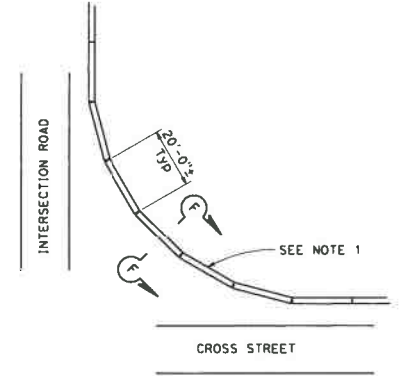
RAILING STAKING CONFIGURATION ADJACENT TO AN EXCAVATION
See Note 3



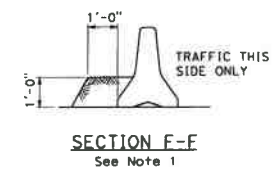
SECTION J-J



CAPPED STAKE DETAIL



CURVED LAYOUT



SECTION F-F
See Note 1

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY RAILING (TYPE K)
NO SCALE

T3B

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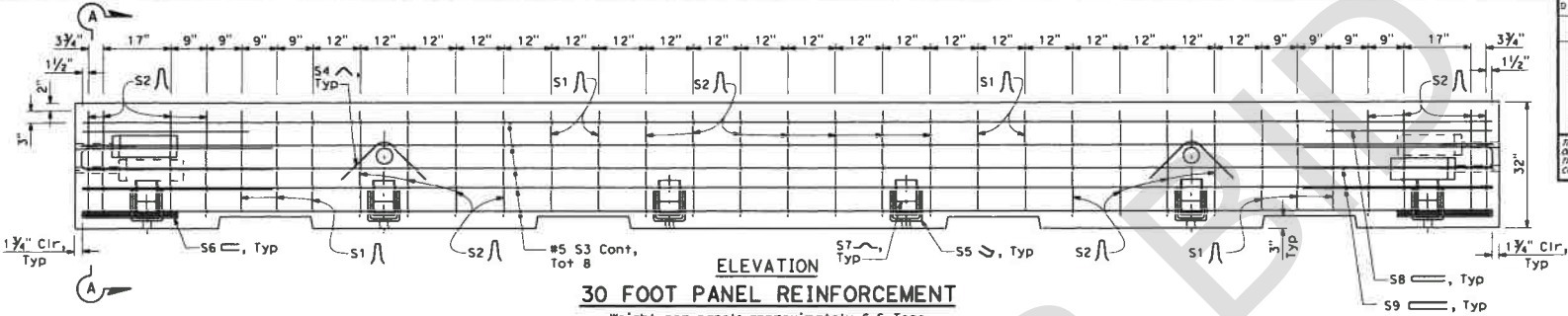
2023 STANDARD PLAN T3B

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

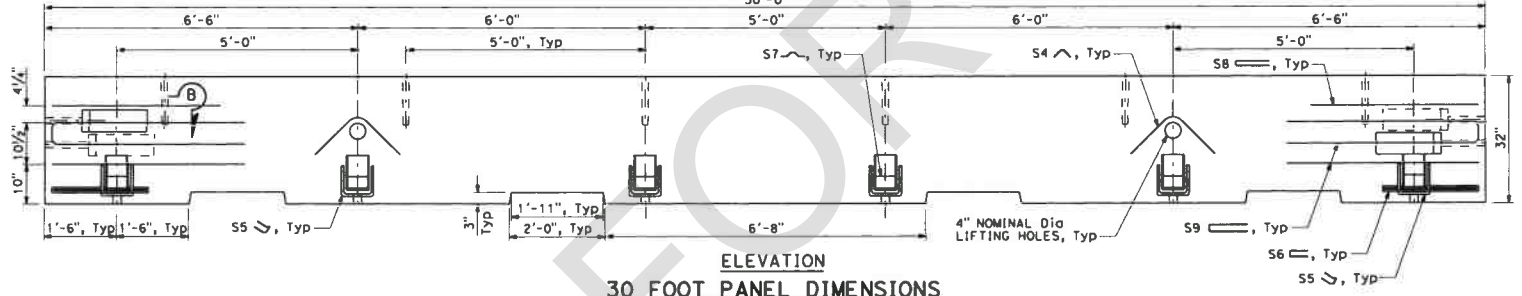
Chas. P. Szylo
 REGISTERED CIVIL ENGINEER
 No. 243029
 STATE OF CALIFORNIA

May 1, 2023
 PLANS APPROVAL DATE
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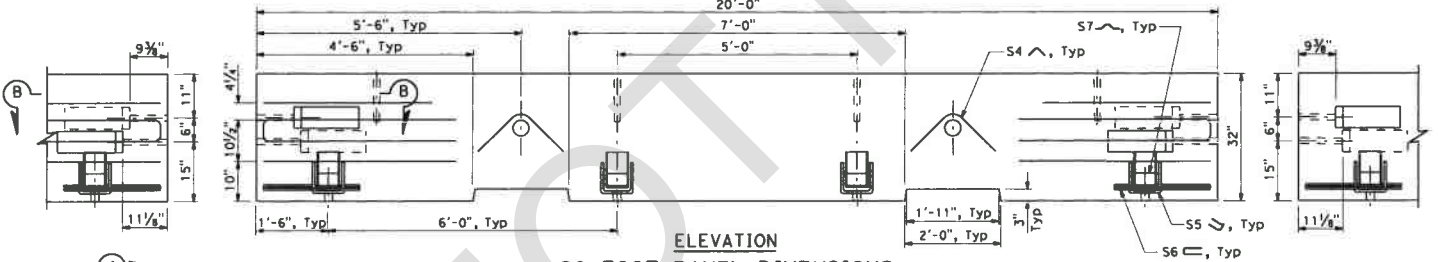
Thomas G. Smith
 REGISTERED PROFESSIONAL ENGINEER
 No. 32312-L
 (118)
 STATE OF CALIFORNIA



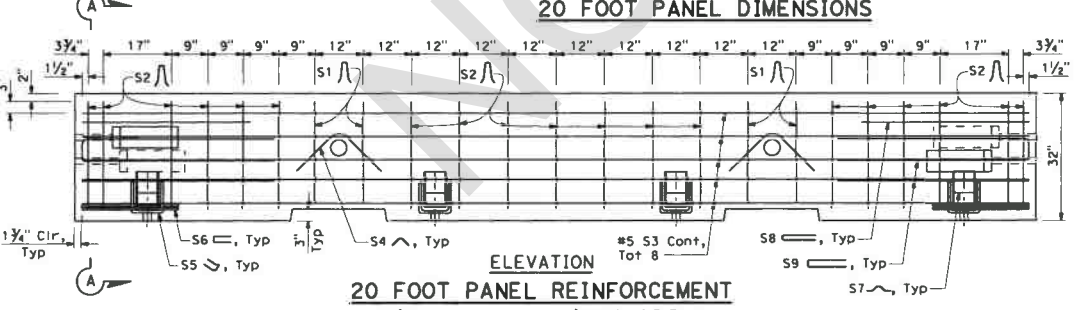
ELEVATION
30 FOOT PANEL REINFORCEMENT
 Weight per panel: approximately 6.5 Tons



ELEVATION
30 FOOT PANEL DIMENSIONS



ELEVATION
20 FOOT PANEL DIMENSIONS



ELEVATION
20 FOOT PANEL REINFORCEMENT
 Weight per panel: approximately 4.5 Tons

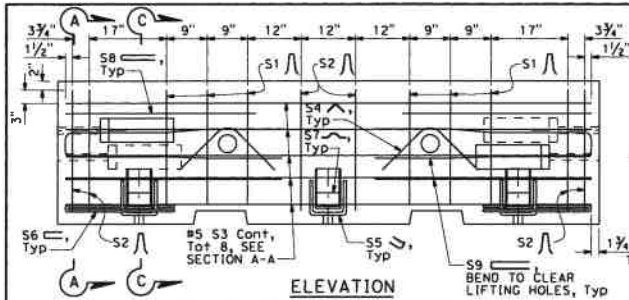
- NOTES:**
1. For Section A-A and Section C-C, see Standard Plan T3D.
 2. For Section B-B, see Standard Plan T3E.

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
TEMPORARY BARRIER SYSTEM
(CROSS BOLT)
 NO SCALE

T3C

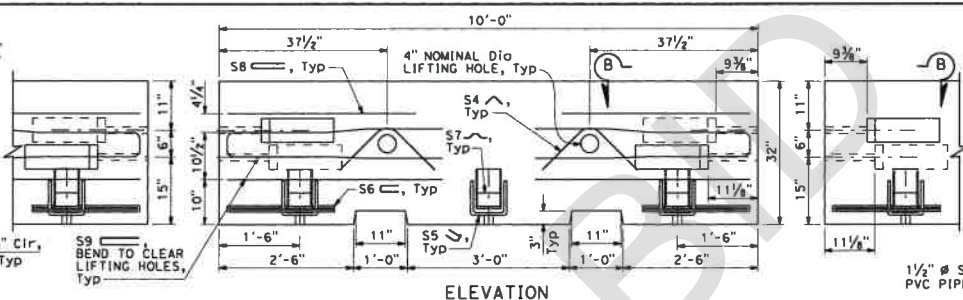
317

2025 STANDARD PLAN 130C

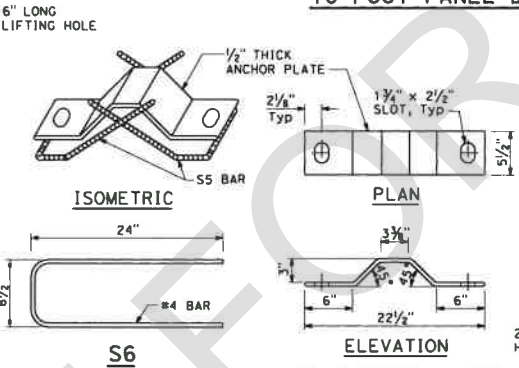
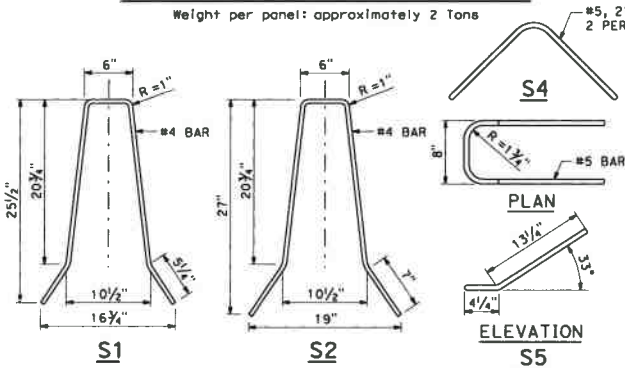


ELEVATION
10 FOOT SEGMENT REINFORCEMENT

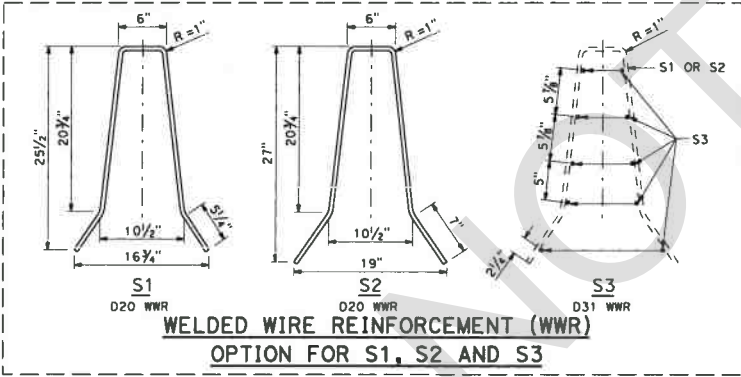
Weight per panel: approximately 2 Tons



ELEVATION
10 FOOT PANEL DIMENSIONS



ELEVATION
S7 ANCHOR PLATE

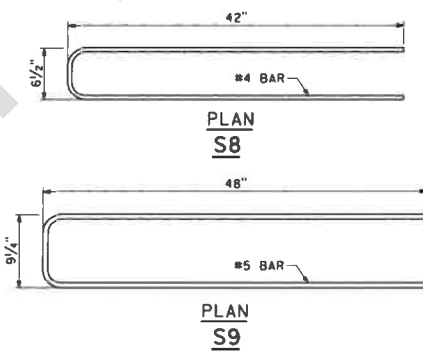
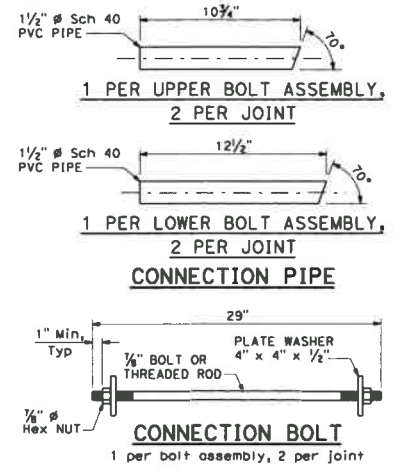


WELDED WIRE REINFORCEMENT (WWR)
OPTION FOR S1, S2 AND S3

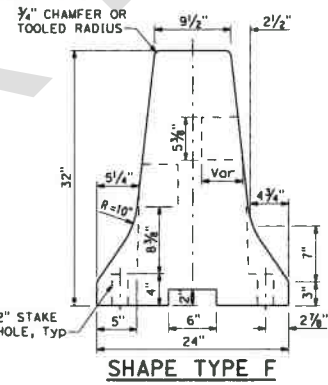
- NOTES:**
1. Steel reinforcement may be bent and WWR may be cut or bent to accommodate joint connection hardware, leave-outs, staking holes, drain holes, and lifting holes.
 2. Distance from the end of the barrier to the first wire must not exceed 3 inches.
 3. Steel reinforcement must have a minimum 1 inch concrete coverage.
 4. S5, S6, and S7 must be galvanized post fabrication.
 5. For Section B-B, see Standard Plan T3E.

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL SHEETS

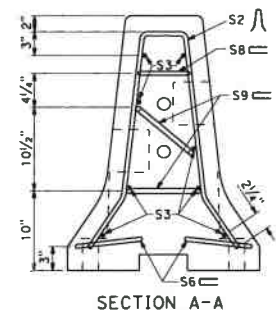
May 1, 2023
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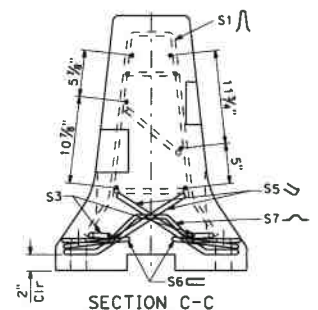
PLAN
S9



SHAPE TYPE F



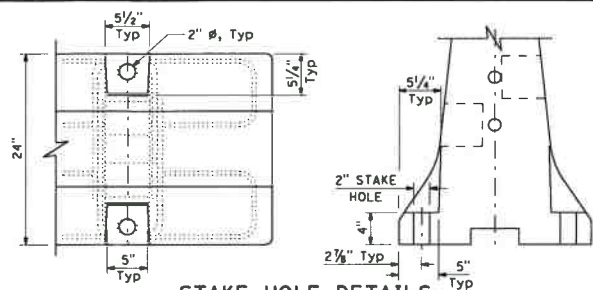
SECTION A-A



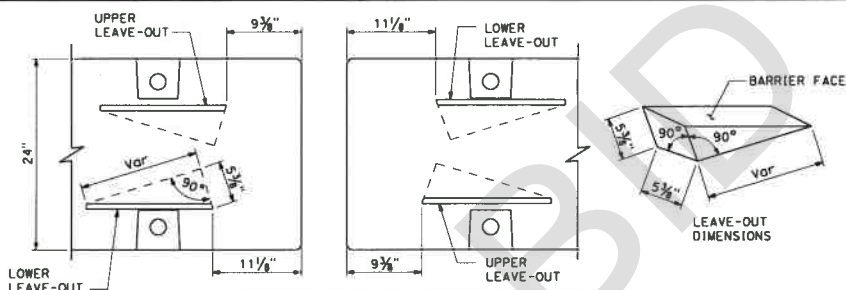
SECTION C-C

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
TEMPORARY BARRIER SYSTEM
(CROSS BOLT)
 NO SCALE

T3D



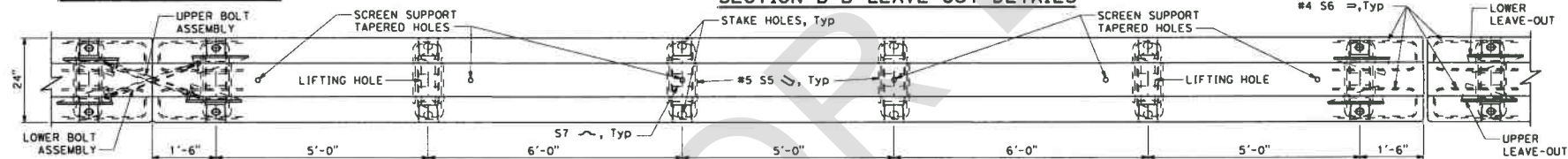
STAKE HOLE DETAILS



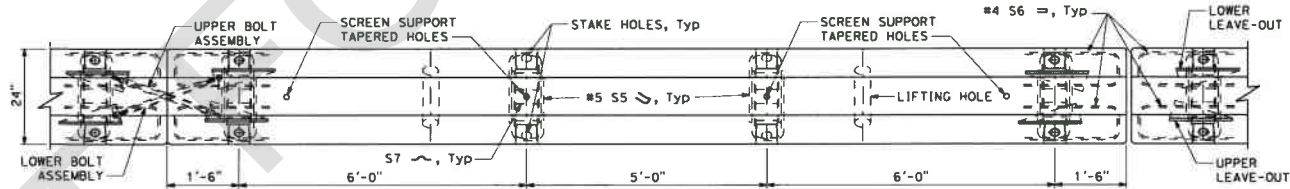
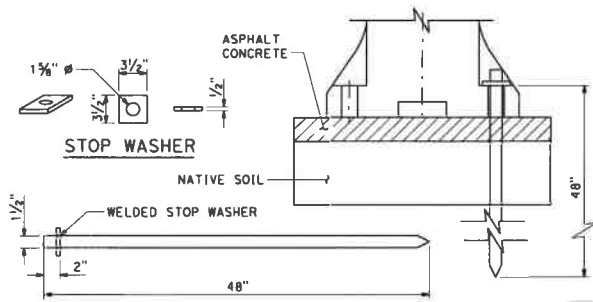
SECTION B-B LEAVE-OUT DETAILS

DT-1	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
May 1, 2023 PLANS APPROVAL DATE					
<small>THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENCIES SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.</small>					

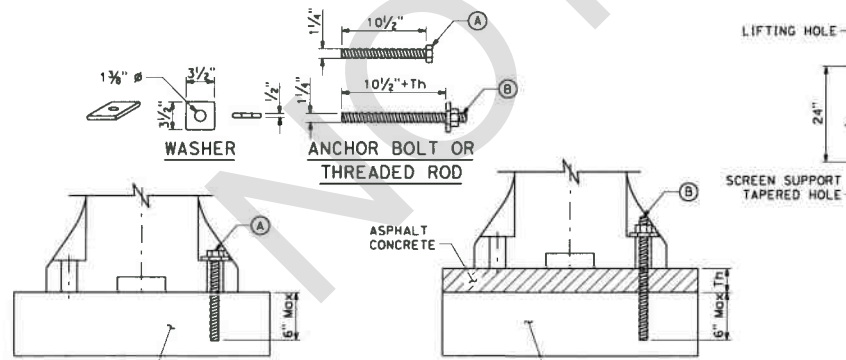
NOTE:
1. For Section B-B, see Standard Plan 13C.



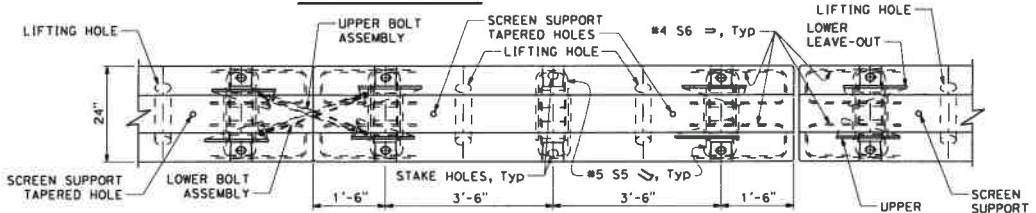
PLAN 30 FOOT PANEL



PLAN 20 FOOT PANEL



ANCHORING DETAILS



PLAN 10 FOOT PANEL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**TEMPORARY BARRIER SYSTEM
(CROSS BOLT)**
NO SCALE

T3E

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2023 STANDARD PLAN 13E

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

Charles D. Sarno
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

Charles D. Sarno
No. CA3029
Exp. 3-31-24
CIVIL
STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

TABLE 1

SPEED (S)	MINIMUM TAPER LENGTH * FOR WIDTH OF OFFSET 12 FEET (W)				MAXIMUM CHANNELIZING DEVICE SPACING		
	TANGENT 2L	MERGING L	SHIFTING L/2	SHOULDER L/3	X	Y	Z **
					TAPER	TANGENT	CONFLICT
mph	ft	ft	ft	ft	ft	ft	ft
20	160	80	40	27	20	40	10
25	250	125	63	42	25	50	12
30	360	180	90	60	30	60	15
35	490	245	123	82	35	70	17
40	640	320	160	107	40	80	20
45	1080	540	270	180	45	90	22
50	1200	600	300	200	50	100	25
55	1320	660	330	220	50	100	25
60	1440	720	360	240	50	100	25
65	1560	780	390	260	50	100	25
70	1680	840	420	280	50	100	25
75	1800	900	450	300	50	100	25

* - For other offsets, use the following merging taper length formula for L:
For speed of 40 mph or less, $L = WS^2/60$
For speed of 45 mph or more, $L = WS$

Where: L = Taper length in feet
W = Width of offset in feet
S = Posted speed limit, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

** - Use for taper and tangent sections where there are no pavement markings or where there is a conflict between existing pavement markings and channelizers (CA).

TABLE 2

SPEED *	Min D **	DOWNGRADE Min D ***		
		-3%	-6%	-9%
		mph	ft	ft
20	115	116	120	126
25	155	158	165	173
30	200	205	215	227
35	250	257	271	287
40	305	315	333	354
45	360	378	400	427
50	425	446	474	507
55	495	520	553	593
60	570	598	638	686
65	645	682	728	785
70	730	771	825	891
75	820	866	927	1003

* - Speed is posted speed limit, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

** - Longitudinal buffer space or flagger station spacing

*** - Use on sustained downgrade steeper than -3 percent and longer than 1 mile.

TABLE 3

ROAD TYPE	DISTANCE BETWEEN SIGNS *		
	A	B	C
	ft	ft	ft
URBAN - 25 mph OR LESS	100	100	100
URBAN - MORE THAN 25 mph TO 40 mph	250	250	250
URBAN - MORE THAN 40 mph	350	350	350
RURAL	500	500	500
EXPRESSWAY / FREEWAY	1000	1500	2640

* - The distances are approximate, are intended for guidance purposes only, and should be applied with engineering judgment. These distances should be adjusted by the Engineer for field conditions, if necessary, by increasing or decreasing the recommended distances.

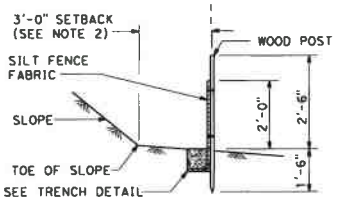
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**TRAFFIC CONTROL SYSTEM TABLES
FOR LANE AND RAMP CLOSURES**

323

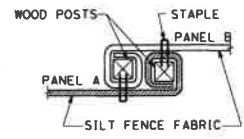
2023 STANDARD PLAN T9

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

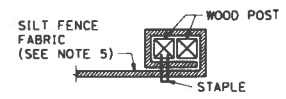
Sean Palmer
 REGISTERED CIVIL ENGINEER
 May 1, 2023
 PLANS APPROVAL DATE
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.



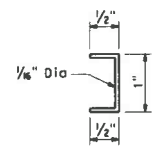
**SECTION A-A
TEMPORARY SILT FENCE**



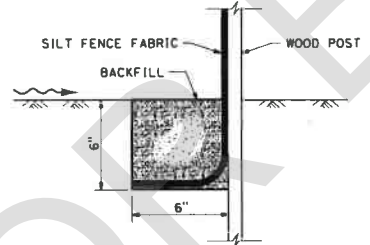
**PLAN
POST AT JOINTS**
(SEE NOTE 3)



**PLAN
END POST DETAIL**



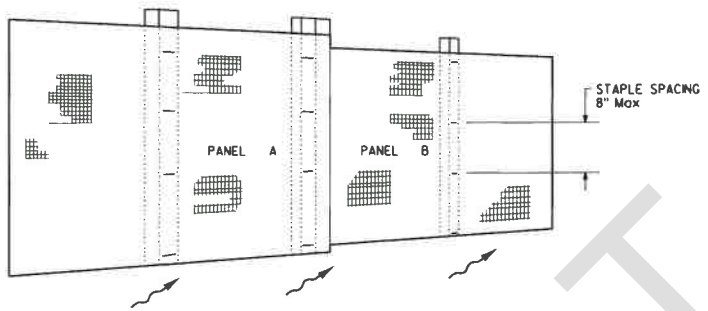
STAPLE DETAIL
(SEE NOTE 6)



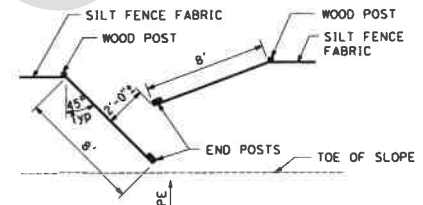
**SECTION
TRENCH DETAIL**

NOTES:

1. The down stream end of the temporary silt fence shall have the last 8' angled up slope.
2. Setback dimensions may vary to fit field conditions.
3. Posts to overlap and fence fabric to fold around each post one full turn. Secure fabric with 4 staples for each post.
4. Posts shall be driven tightly together to prevent potential flow-through of sediment at the joint. The tops of the posts shall be secured to each other with wire.
5. For each end post, fence fabric shall be folded around two posts one full turn and secured with 4 staples.
6. Minimum of 4 staples shall be installed per post. Dimensions shown are typical.
7. Maintenance openings shall be constructed in a manner to ensure that sediment is retained by the temporary silt fence.
8. Joint sections shall not be placed at sump locations.



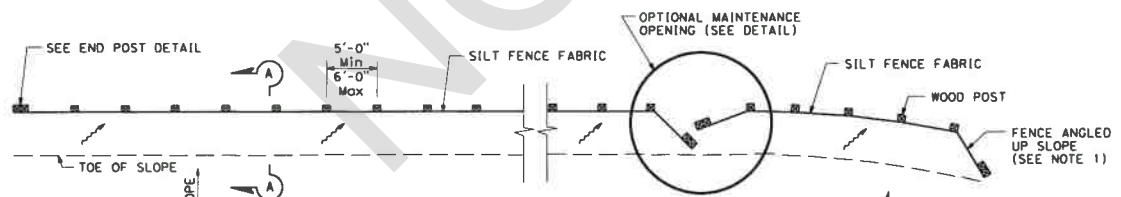
**PERSPECTIVE
SILT FENCE PANELS AT JOINTS**



**PLAN
OPTIONAL MAINTENANCE OPENING DETAIL**

LEGEND

- TAMPED BACKFILL
- SLOPE DIRECTION
- DIRECTION OF FLOW



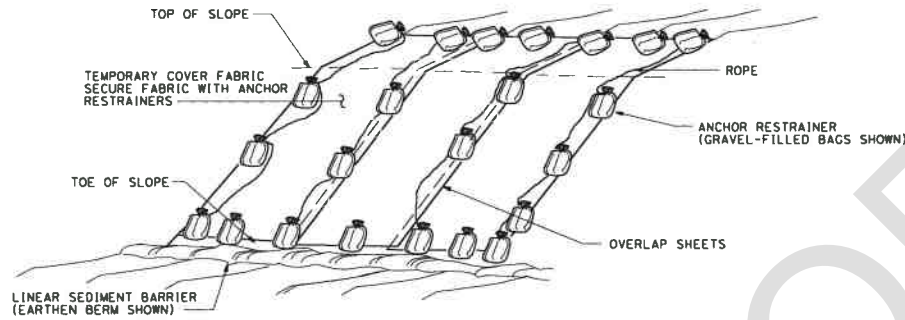
**PLAN
TEMPORARY SILT FENCE**

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**TEMPORARY WATER POLLUTION
CONTROL DETAILS
(TEMPORARY SILT FENCE)**
NO SCALE

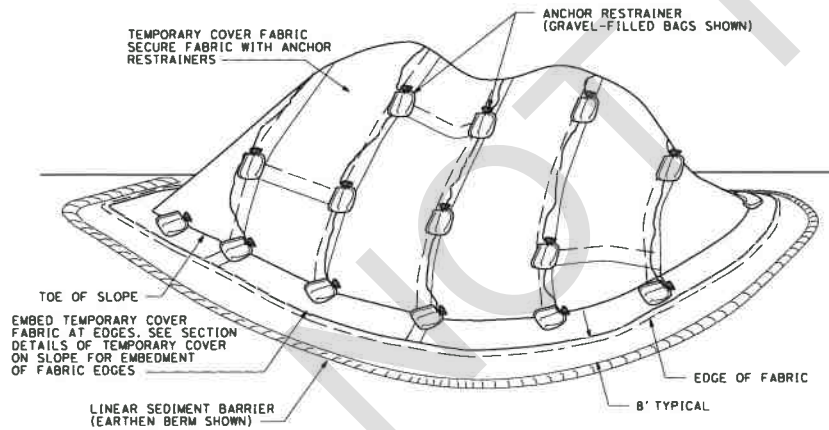
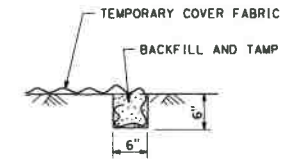
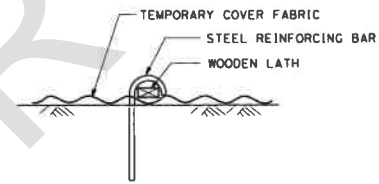
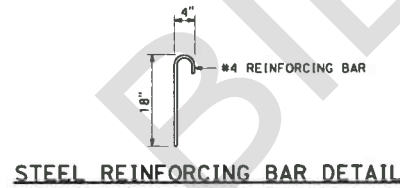
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Sean T. Pender
 REGISTERED CIVIL ENGINEER
 May 1, 2023
 PLANS APPROVAL DATE
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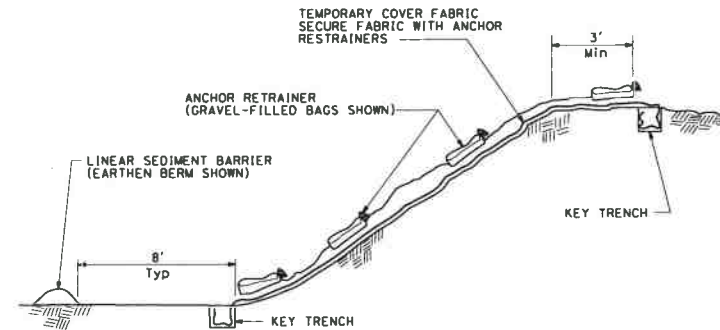
REGISTERED PROFESSIONAL ENGINEER
 Sean T. Pender
 CE3744
 Exp. 8-30-24
 CIVIL
 STATE OF CALIFORNIA



**PERSPECTIVE
TEMPORARY COVER ON SLOPE**



**PERSPECTIVE
TEMPORARY COVER ON STOCKPILE**



SECTION TEMPORARY COVER ON SLOPE

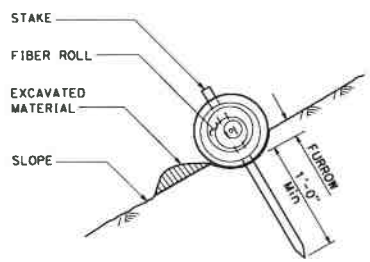
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY WATER POLLUTION CONTROL DETAILS (TEMPORARY COVER)

NO SCALE

T53

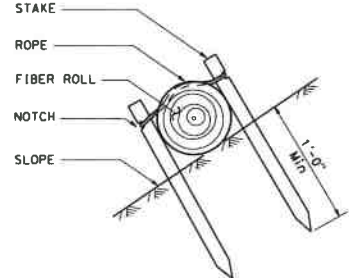
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

Sean T. Penders
 REGISTERED CIVIL ENGINEER
 May 1, 2023
 PLANS APPROVAL DATE
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.



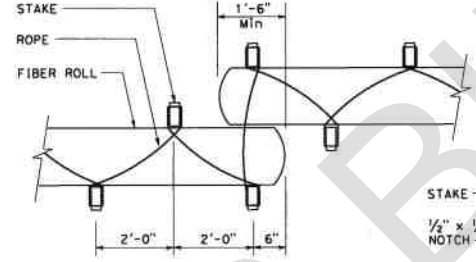
SECTION

TEMPORARY FIBER ROLL (TYPE 1)



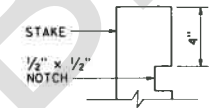
SECTION

TEMPORARY FIBER ROLL (TYPE 2)



PLAN

TEMPORARY FIBER ROLL (TYPE 2)

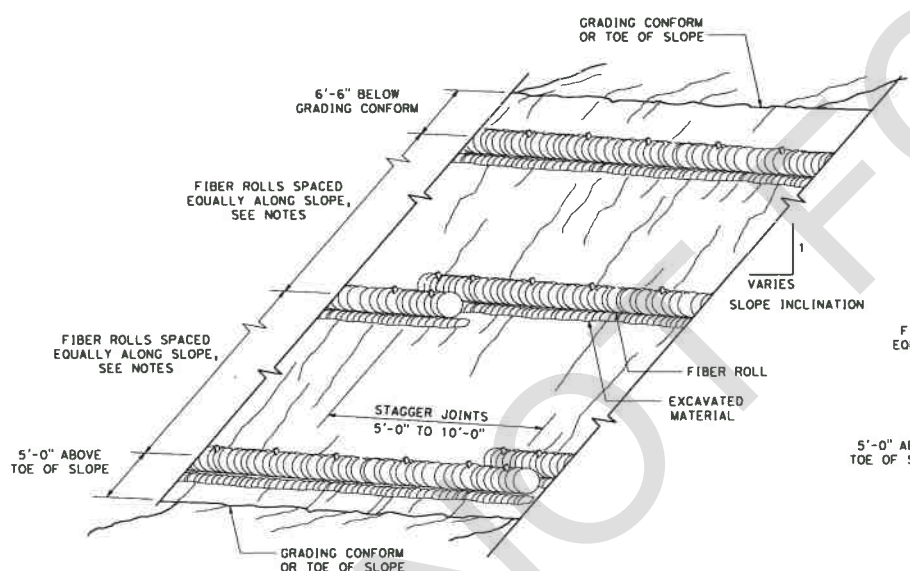


ELEVATION

STAKE NOTCH DETAIL

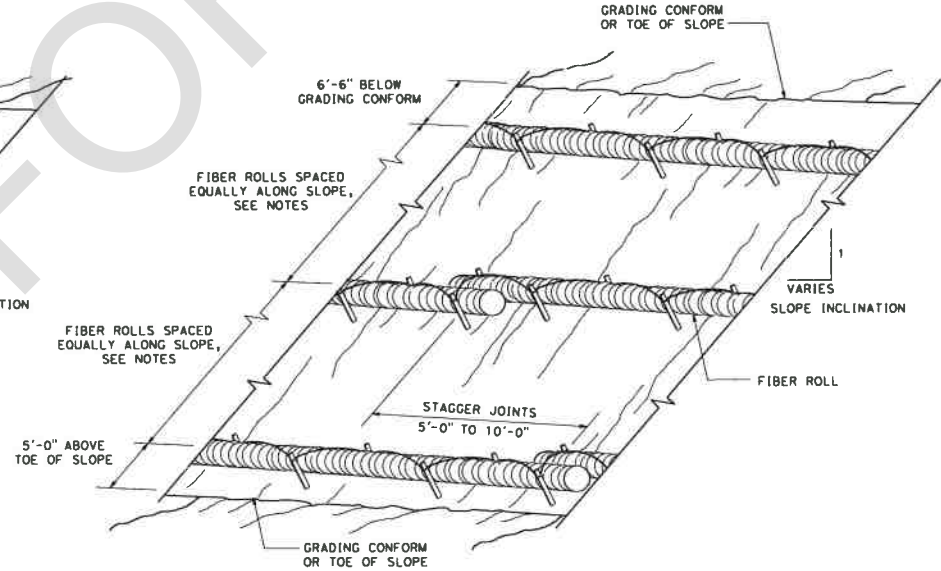
NOTES:

1. Temporary fiber roll spacing varies depending upon slope inclination.
2. Installations shown in the perspectives are for slope inclination of 10:1 and steeper.



PERSPECTIVE

TEMPORARY FIBER ROLL (TYPE 1)



PERSPECTIVE

TEMPORARY FIBER ROLL (TYPE 2)

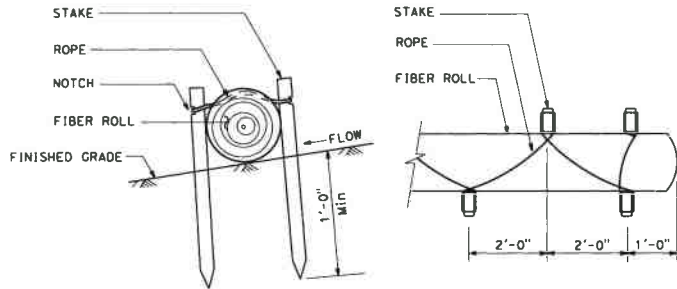
STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
TEMPORARY WATER POLLUTION CONTROL DETAILS
(TEMPORARY FIBER ROLL)

NO SCALE

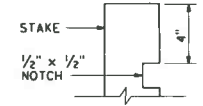
T56

355

2023 STANDARD PLAN T56



SECTION
PLAN
STAKING AND LASHING DETAIL



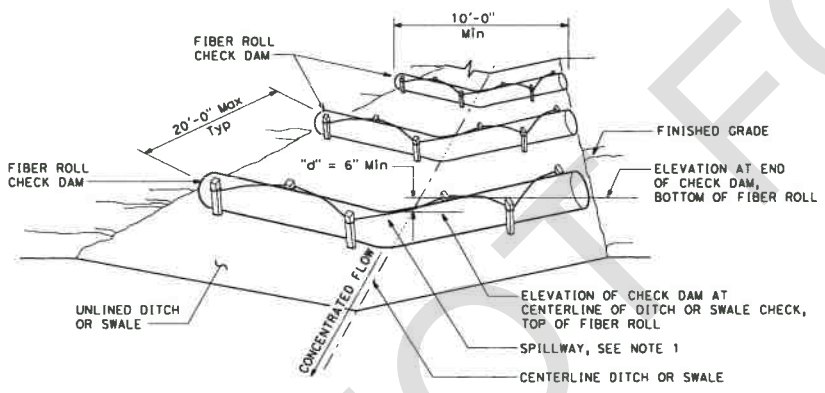
ELEVATION
STAKE NOTCH DETAIL



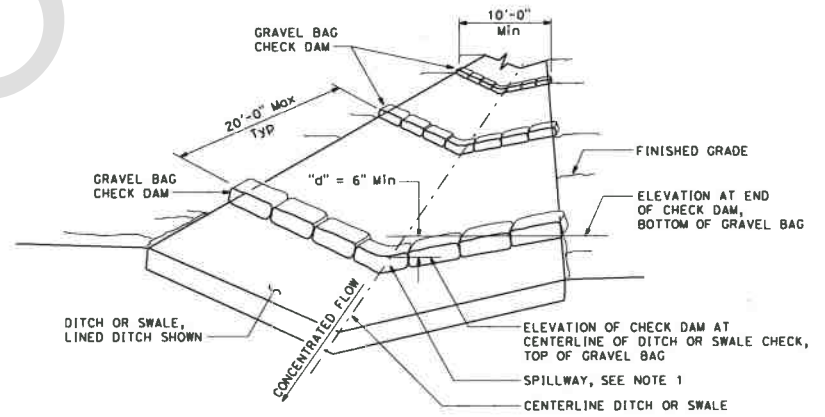
SECTION
TEMPORARY CHECK DAM (TYPE 2)

DIST.	COUNTY	ROUTE	POST MILES	SHEET TOTAL
			TOTAL PROJECT	No. SHEETS
REGISTERED CIVIL ENGINEER Sean T. Penders No. C63744 Exp. 9-30-24 STATE OF CALIFORNIA				
May 1, 2023 PLANS APPROVAL DATE				
<small>THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.</small>				

NOTE:
1. Spillway depth "d" shall be maintained to prevent flanking of concentrated flow around the ends of each check dam.



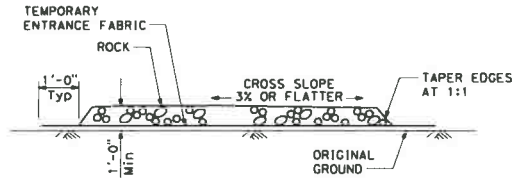
PERSPECTIVE
TEMPORARY CHECK DAM (TYPE 1)
Total of 3 check dams shown



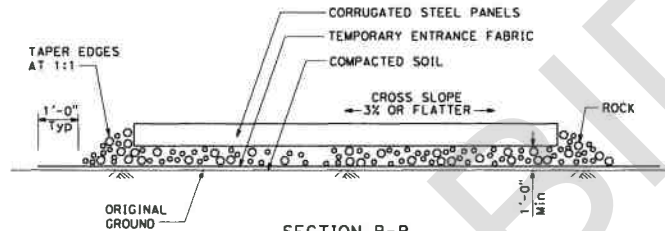
PERSPECTIVE
TEMPORARY CHECK DAM (TYPE 2)
Total of 3 check dams shown

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**TEMPORARY WATER POLLUTION
CONTROL DETAILS
(TEMPORARY CHECK DAM)**
NO SCALE

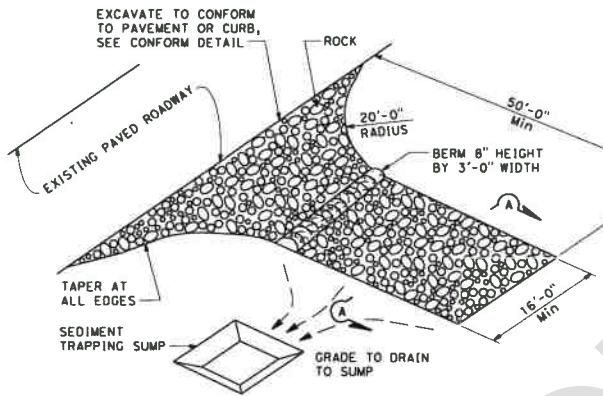
357



SECTION A-A

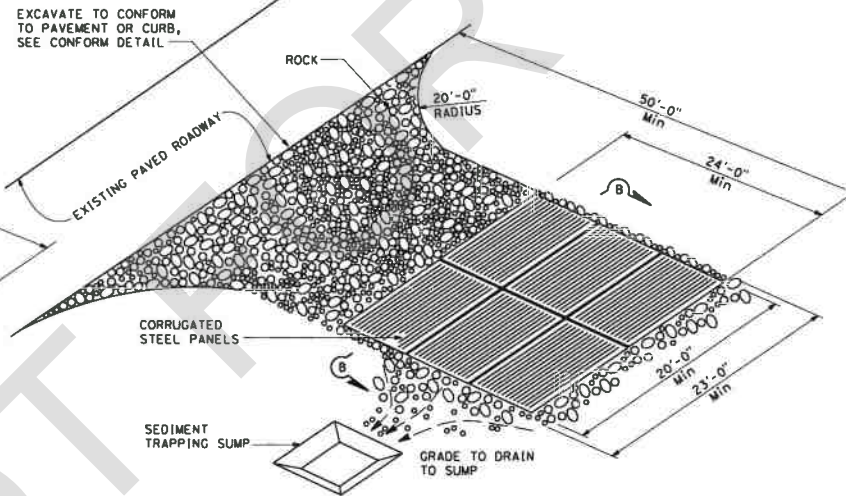


SECTION B-B



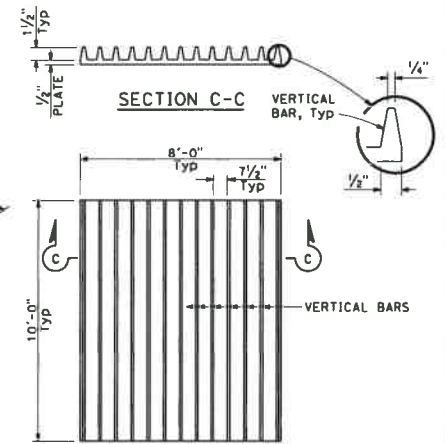
PERSPECTIVE

TEMPORARY CONSTRUCTION ENTRANCE (TYPE 1)



PERSPECTIVE

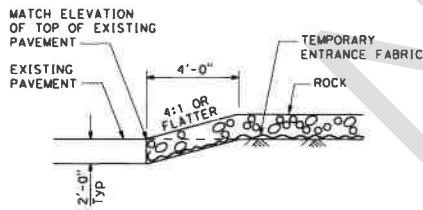
TEMPORARY CONSTRUCTION ENTRANCE (TYPE 2)



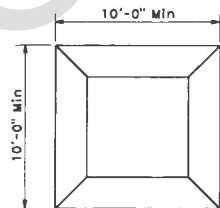
SECTION C-C

PLAN

TYPICAL CORRUGATED STEEL PANEL DETAIL



SECTION CONFORM DETAIL



PLAN

SEDIMENT TRAPPING SUMP




ELEVATION

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY WATER POLLUTION CONTROL DETAILS
(TEMPORARY CONSTRUCTION ENTRANCE)

NO SCALE

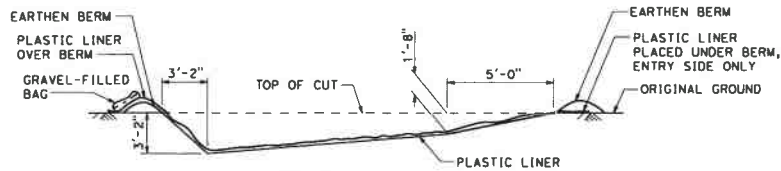
T58

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

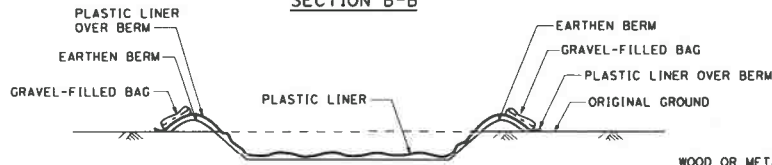

 REGISTERED CIVIL ENGINEER
 May 1, 2023
 PLANS APPROVAL DATE
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REGISTERED PROFESSIONAL ENGINEER
 Sean T. Penders
 C63744
 Exp. 9-30-24
 CIVIL
 STATE OF CALIFORNIA

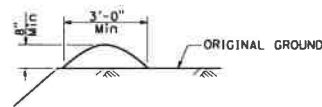
2023 STANDARD PLAN 158



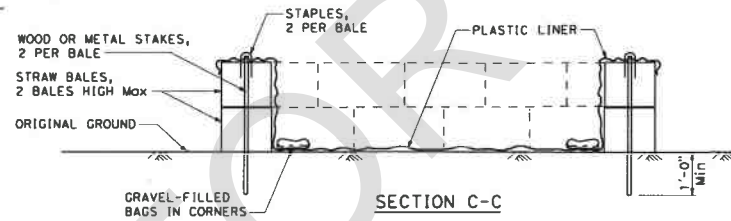
SECTION B-B



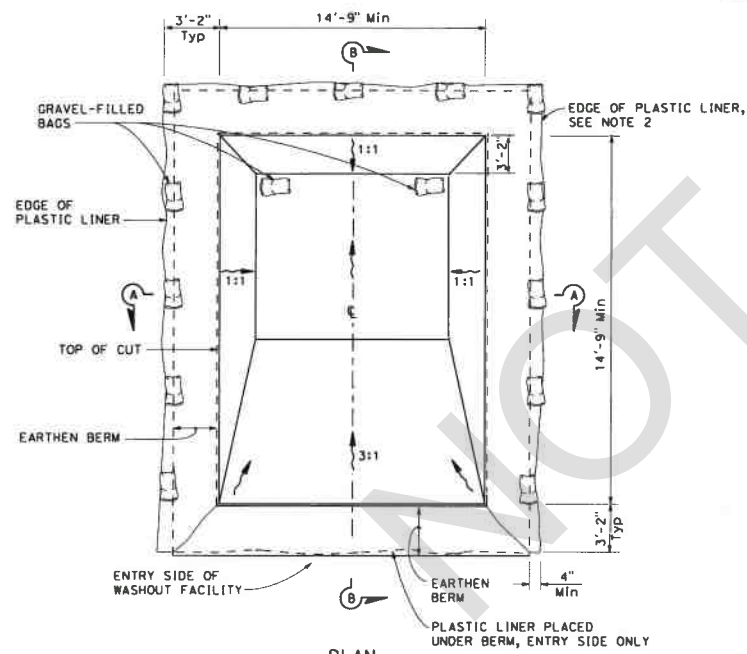
SECTION A-A



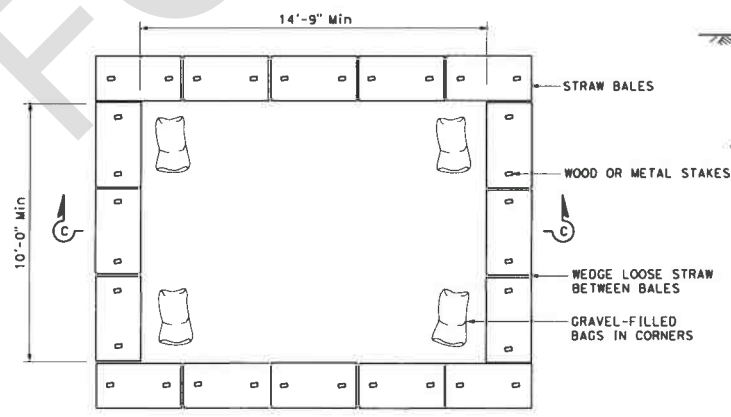
TYPICAL SECTION
EARTHEN BERM



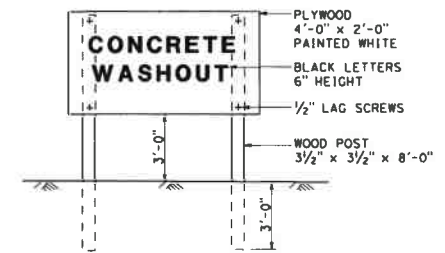
SECTION C-C



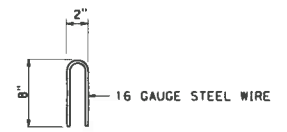
PLAN
TEMPORARY CONCRETE WASHOUT FACILITY
Below Grade



PLAN
TEMPORARY CONCRETE WASHOUT FACILITY
On Grade



CONCRETE WASHOUT
SIGN DETAIL



STAPLE DETAIL

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

Sean T. Penders
 REGISTERED CIVIL ENGINEER
 May 1, 2023
 PLANS APPROVAL DATE
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- NOTES:
1. The concrete washout sign shall be installed within 32'-10" of the temporary concrete washout facility.
 2. Plastic liner shall be anchored with gravel-filled bags for below grade concrete washout facility.

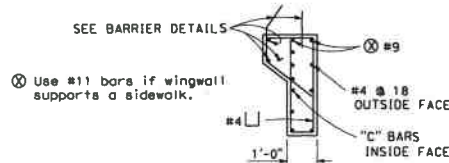
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY WATER POLLUTION CONTROL DETAILS
(TEMPORARY CONCRETE WASHOUT FACILITY)
NO SCALE

T59

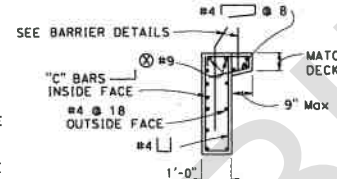
BRIDGE DESIGNATIONS AND ABBREVIATIONS

See Standard Plans A3A, A3B, and A3C for additional or standard abbreviations

- J Outer, outer left bridge
- K Outer left bridge
- S Outer right bridge
- T Outer, outer right bridge
- RWLOL Retaining Wall Layout Line
- WWLOL Wingwall Layout Line



SECTION J-J
Without overhang



SECTION J-J
With overhang

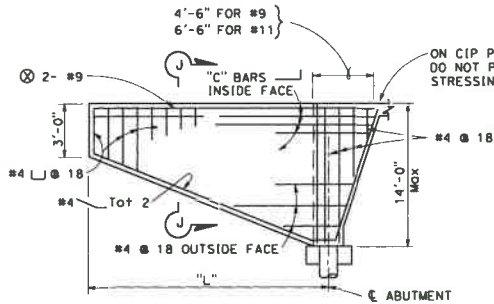
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS

Peter W. Theloe
REGISTERED CIVIL ENGINEER

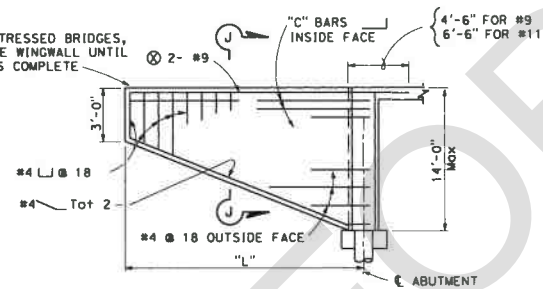
May 1, 2023
PLANS APPROVAL DATE

Peter W. Theloe
CST519
Exp. 12-31-25
CIVIL
STATE OF CALIFORNIA

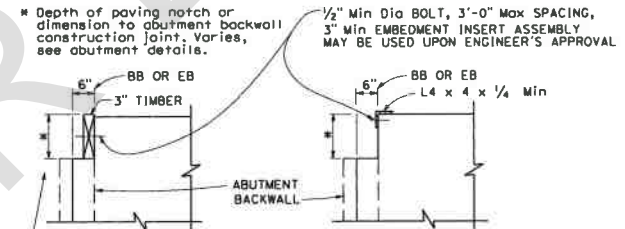
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ELEVATION
SLOPING ABUTMENT



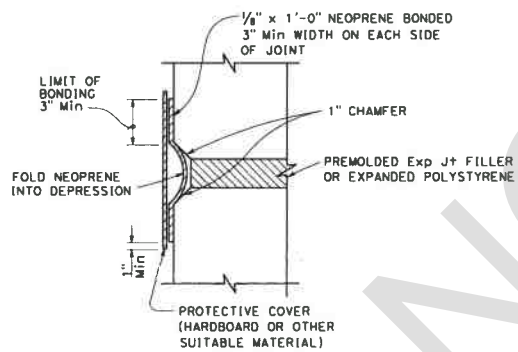
ELEVATION
VERTICAL ABUTMENT



TEMPORARY BUMPERS
BRIDGE DETAIL 1-2

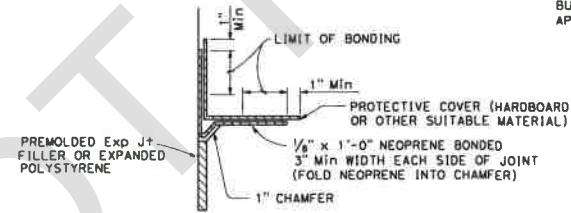
ALTERNATIVE 1 **ALTERNATIVE 2**

TOP OF BUMPER TO BE AT OR ABOVE THE TOP OF DECK CONCRETE. BUMPERS AND BOLTS TO BE REMOVED IMMEDIATELY PRIOR TO PLACING APPROACH PAVEMENT



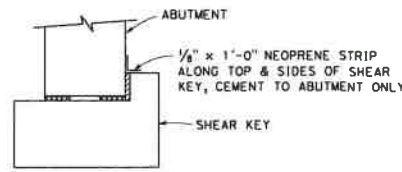
BRIDGE DETAIL 1-3
STRIP WATERSTOP DETAIL

When used on CIP prestressed bridges, do not apply waterstop until stressing is complete.

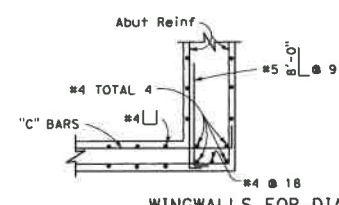


BRIDGE DETAIL 1-4
STRIP WATERSTOP CORNER DETAIL

When used on CIP prestressed bridges, do not apply waterstop until stressing is complete.

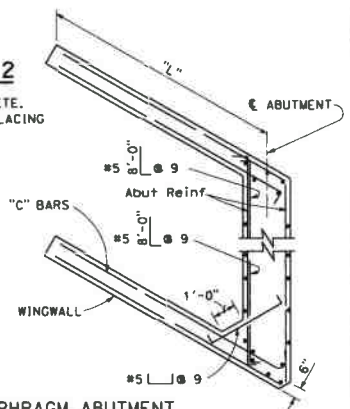


BRIDGE DETAIL 1-6
SHEAR KEY JOINT PROTECTION



CORNER DETAIL
FOR SKEW 20° AND LESS

"L"	"C" BARS
12'-0"	#5 @ 9"
14'-0"	#6 @ 9"
16'-0"	#7 @ 9"
18'-0"	#8 @ 9"
20'-0"	#9 @ 9"



CORNER DETAIL
FOR SKEW OVER 20°

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
BRIDGE DETAILS
NO SCALE

BO-1

367

2023 STANDARD PLAN BO-1

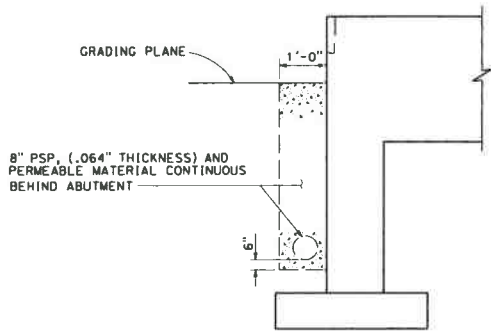
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Gary Wong
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

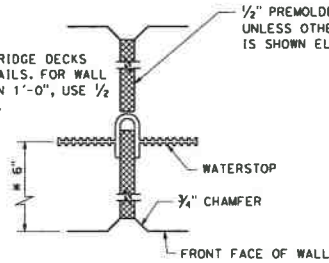
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Gary Wong
CSE998
PAR. 8-30-24
STATE OF CALIFORNIA

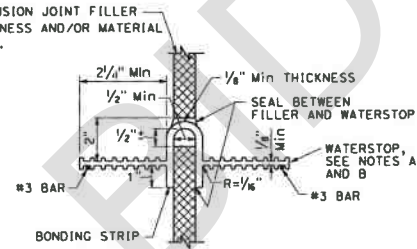


BRIDGE DETAIL 3-5
8" PSP AND PERMEABLE MATERIAL

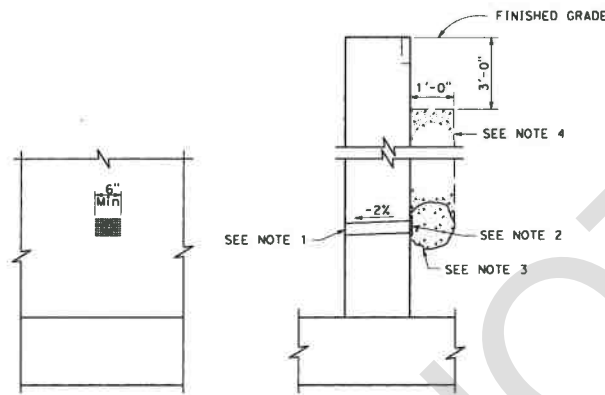
* FOR PLACEMENT IN BRIDGE DECKS SEE JOINT SEAL DETAILS. FOR WALL THICKNESS LESS THAN 1'-0", USE 1/2 THE WALL THICKNESS.



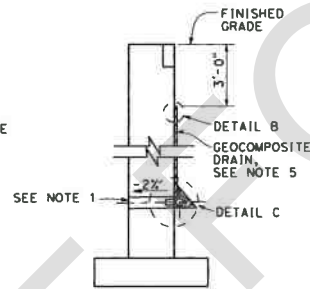
BRIDGE DETAIL 3-4
WALL EXPANSION JOINT



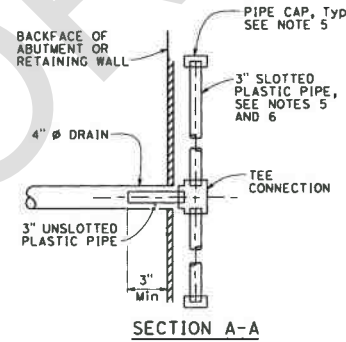
BRIDGE DETAIL 3-6
WATERSTOP



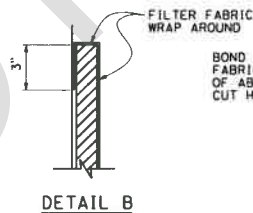
BRIDGE DETAIL 3-1
WEEP HOLE, PERVIOUS BACKFILL AND GEOCOMPOSITE DRAIN



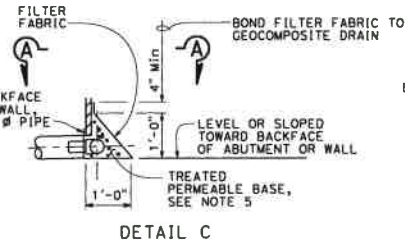
WALL SECTION



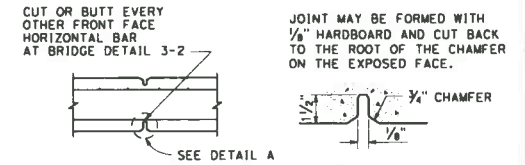
SECTION A-A



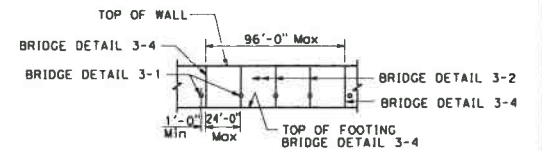
DETAIL B



DETAIL C



SECTION **DETAIL A**
BRIDGE DETAIL 3-2
WEAKENED PLANES

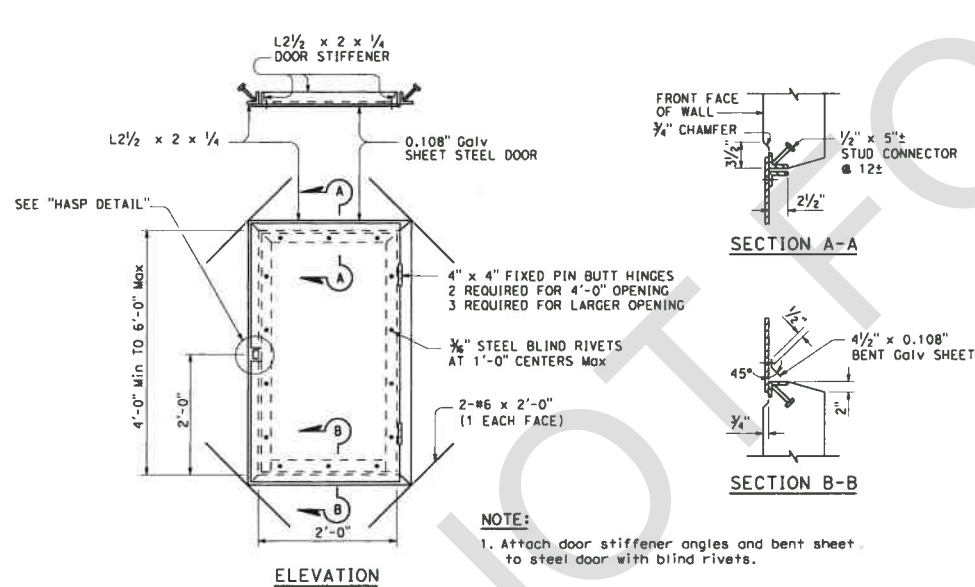
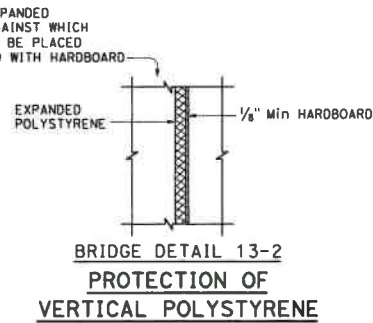
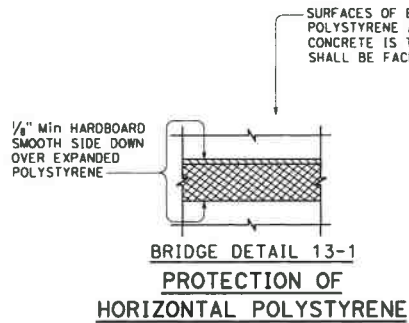


BRIDGE DETAIL 3-3
WALL EXPANSION JOINTS AND WEAKENED PLANES

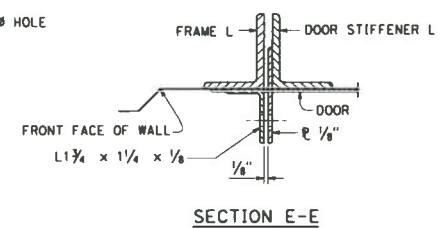
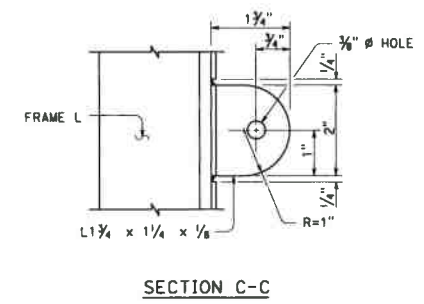
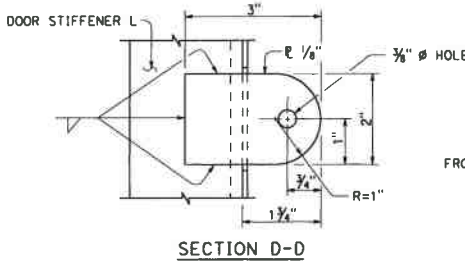
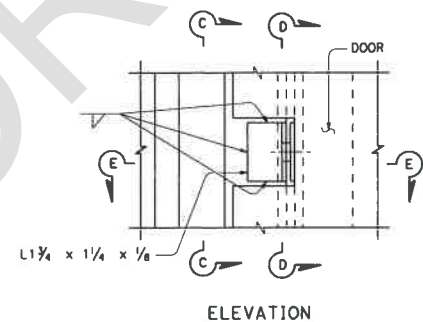
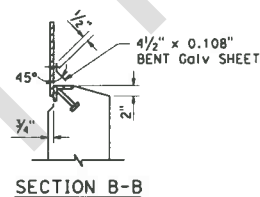
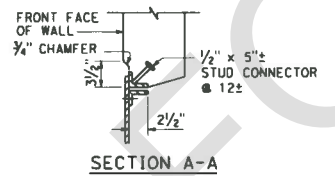
NOTES:

- 4" ϕ Drains at intermediate sag points and 25'-0" maximum center to center. For walls adjacent to sidewalks or curbs, provide 4" plastic pipe under the sidewalk to discharge thru curb face. Exposed wall drains shall be located 3"± above finished grade.
- 6" square aluminum or galvanized steel wire 1/4" mesh hardware cloth, minimum wire diameter 0.025". Anchor firmly to backface.
- One cubic foot pervious backfill material in a nonwoven filter fabric, securely tied.
- Pervious backfill material continuous behind retaining wall or abutment.
- Geocomposite drain, treated permeable base and 3" ϕ slotted plastic pipe continuous behind retaining wall or abutment. Cap ends of pipe. Provide "Tee" connection at each 4" ϕ drain.
- Connect the low end of plastic pipe to the main outlet pipe as applicable.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
BRIDGE DETAILS
NO SCALE



NOTE:
1. Attach door stiffener angles and bent sheet to steel door with blind rivets.



HASP DETAIL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
BRIDGE DETAILS
NO SCALE

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

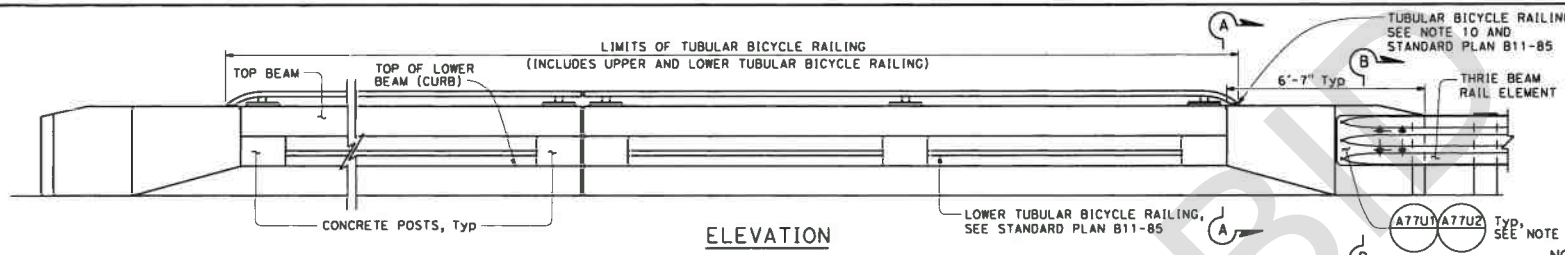
Peter W. Norton
REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

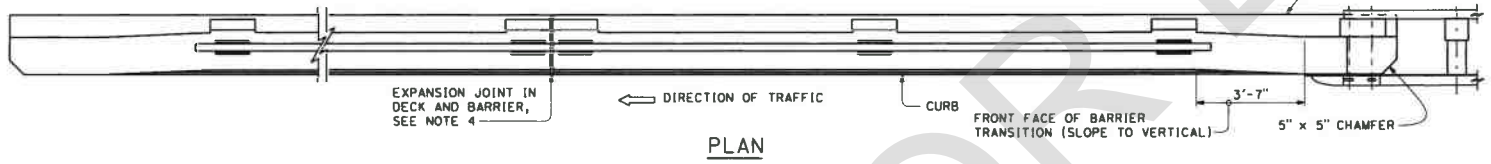
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Peter W. Norton
REGISTERED PROFESSIONAL ENGINEER
C87518
Exp. 12-31-23
CIVIL
STATE OF CALIFORNIA

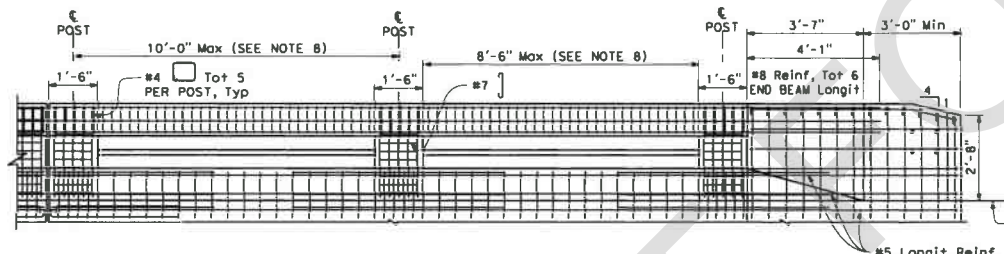
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS



ELEVATION

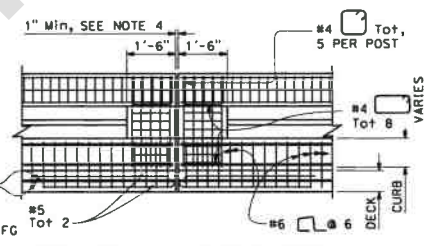


PLAN



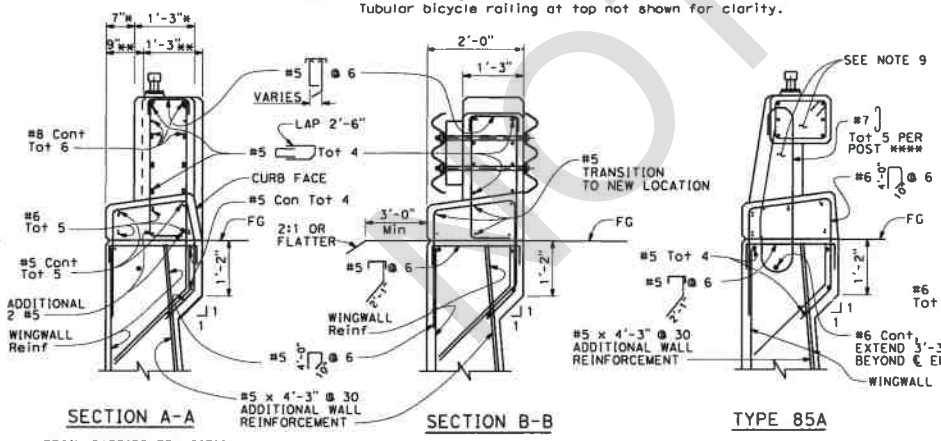
LONGITUDINAL SECTION

NOTES: Deck and wing wall reinforcement not shown.
Tubular bicycle railing at top not shown for clarity.



EXPANSION JOINT DETAIL

NOTE: Not all reinforcement shown.

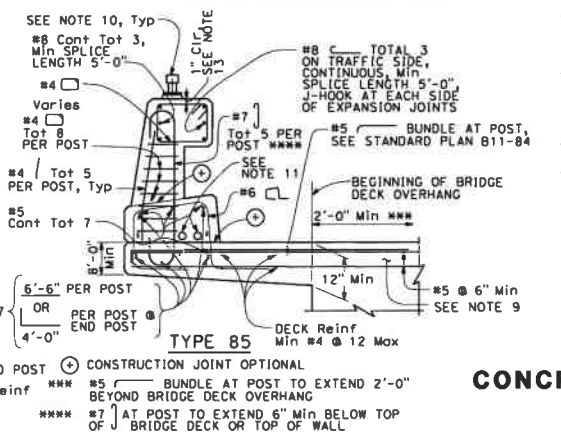


SECTION A-A

SECTION B-B

TYPE 85A

* BEGIN BARRIER TRANSITION
** END BARRIER TRANSITION



TYPE 85 CONSTRUCTION JOINT OPTIONAL

* #5 BUNDLE AT POST TO EXTEND 2'-0" BEYOND BRIDGE DECK OVERHANG
** #7 AT POST TO EXTEND 6" Min BELOW TOP OF BRIDGE DECK OR TOP OF WALL

NOTE 6

NOTES:

1. Walls are to be backfilled before the barrier is placed.
2. Longitudinal reinforcing steel to stop at all expansion joints.
3. The front face dimensions are to be constant above the finished roadway profile, but the overall height will vary with certain thicknesses of surfacing and roadway slopes.
4. Bridge rail expansion joint to match deck joint, 1" Min.
5. Butt welds are acceptable alternative splice to lap splicing #8 bars. No portion of a lap splice can encroach on the post location.
6. For typical metal railing connection details not shown, see Standard Plans A77U1 and A77U2.
7. Chain link railing is not allowed on Type 85 Barriers, except over railroads and for locations with security concerns.
8. Posts to be spaced equally, typically 10'-0" spacing. Post spacing may be reduced where location of expansion joints or the length of wingwalls will not accommodate the 10'-0" spacing. Maximum see-through availability is to be strived for, where 10'-0" post spacing can not be achieved.
9. For additional reinforcement details, see Standard Plan B11-84.
10. Tubular bicycle railing to extend to where level bench elevation along exterior face of wing wall is within 1'-0" of roadway shoulder FG.
11. The maximum number of conduits is limited to two 1/2" Dia and must be placed in front half of the lower beam/curb. See also Standard Plan B14-3 Conduit In Bridge Rolling detail.
12. For reinforcement not shown, see other details.
13. 1" clearance, typical for bridge rail except for 2" clearance at traffic face and back side of lower beam (curb).

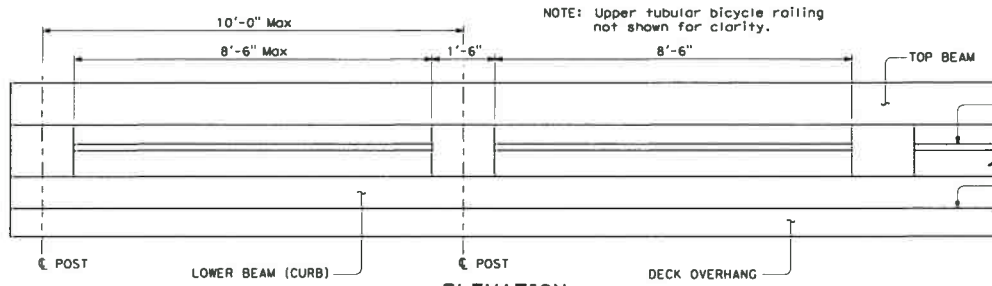
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**CONCRETE BARRIER TYPE 85
DETAILS No. 1**

NO SCALE

B11-83

417

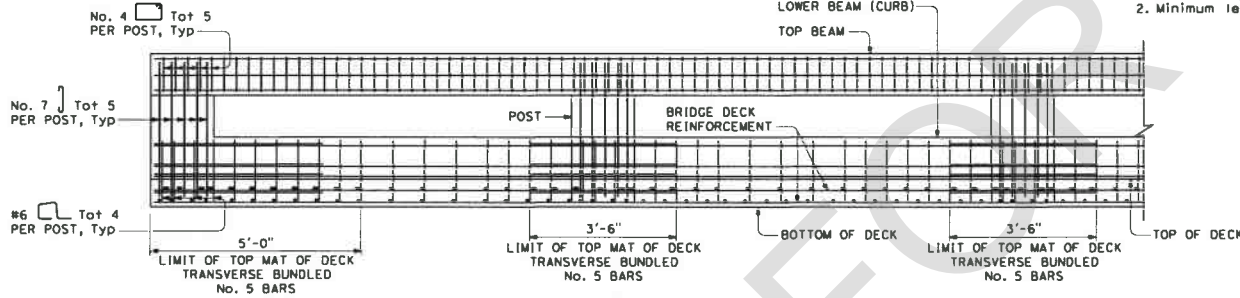
CONCRETE BARRIER TYPE 85 PLAN B11-83



LOWER TUBULAR BICYCLE RAILING WITHIN OPENING BETWEEN CONCRETE POSTS, SEE STANDARD PLAN B11-85

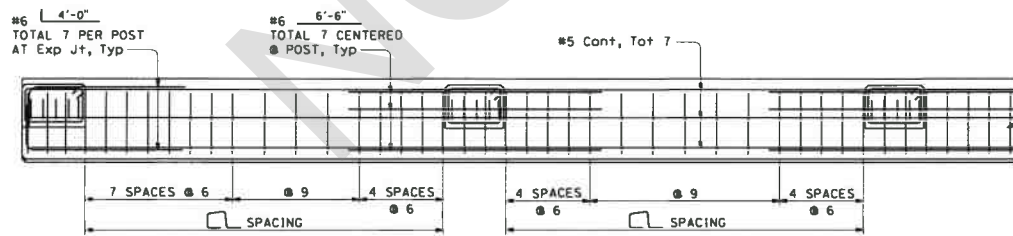
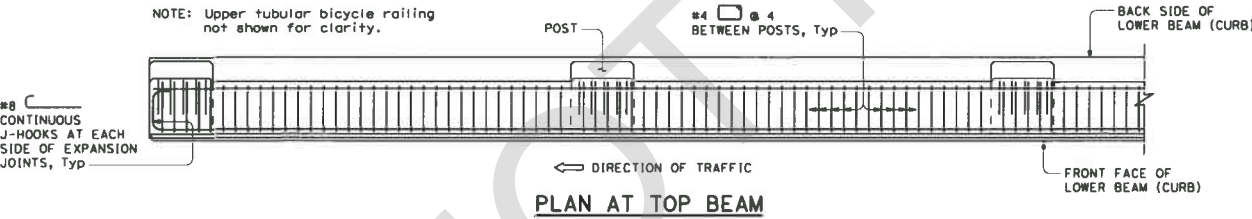
TOP OF DECK OR FINISH GRADE

ELEVATION



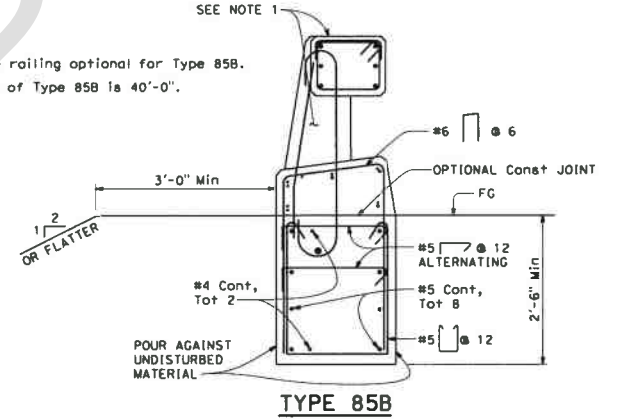
ELEVATION

NOTE: Tubular bicycle railing not shown for clarity.

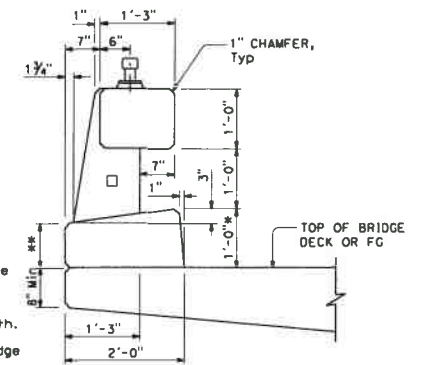


NOTES:

1. Tubular bicycle railing optional for Type 85B.
2. Minimum length of Type 85B is 40'-0".



TYPE 85B



TYPICAL SECTION

* Dimension must be 1'-0" above top of Bridge Deck or FG (including overlay). Increase lower beam (curb) height by 2" Max to match overlay depth.

** Dimension determined by bridge cross-slope and whether or not there is an overlay.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**CONCRETE BARRIER TYPE 85
DETAILS No. 2**
NO SCALE

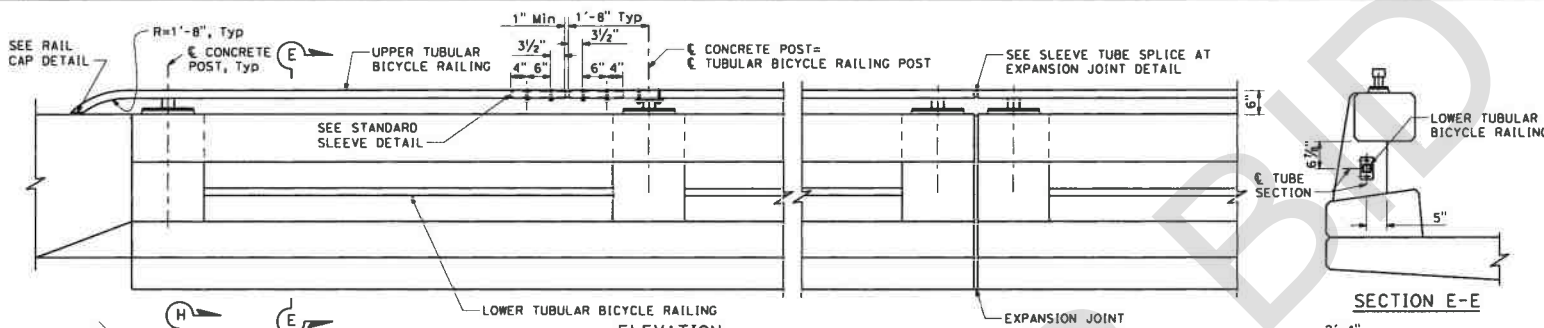
B11-84

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

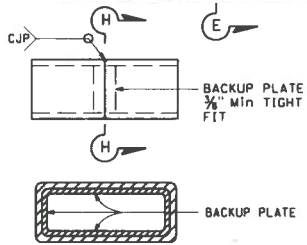
Gregory J. Soderstrom
 REGISTERED CIVIL ENGINEER
 May 1, 2023
 PLANS APPROVAL DATE
 THE STATE OF CALIFORNIA AND ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

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

REGISTERED CIVIL ENGINEER
 May 1, 2023
 PLANS APPROVAL DATE
 THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

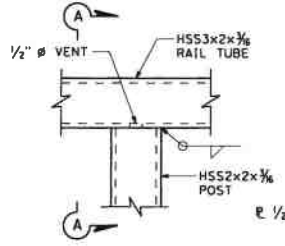


- NOTES:**
1. Tubular bicycle railing posts shall be normal to railing.
 2. Tube splices shall be located in the tubes spanning deck or wall joints. Increase joint width in tubes to match expansion joint width and increase sleeve length accordingly.
 3. Upper tubular bicycle railing shall be continuous over not less than two posts.



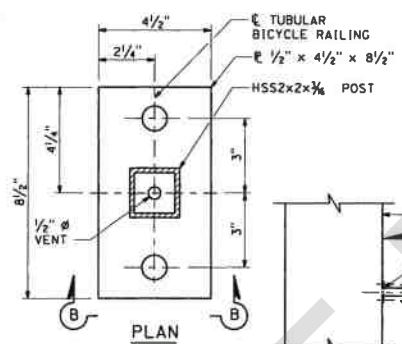
**SECTION H-H
ALTERNATIVE TUBE
WELDED STANDARD SPLICE**

NOTE: FOR SPLICES NOT AT EXPANSION JOINTS

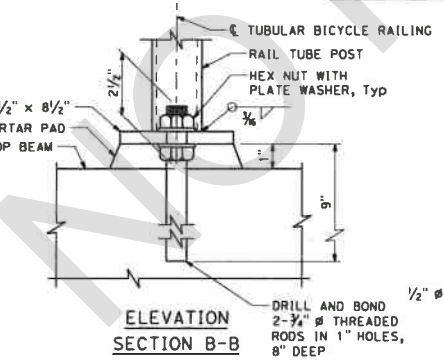


ELEVATION

SECTION A-A

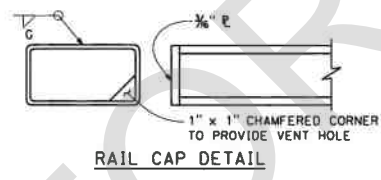


PLAN

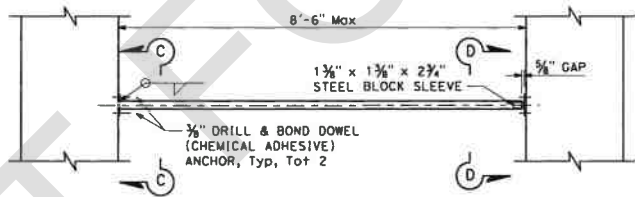


**ELEVATION
SECTION B-B**

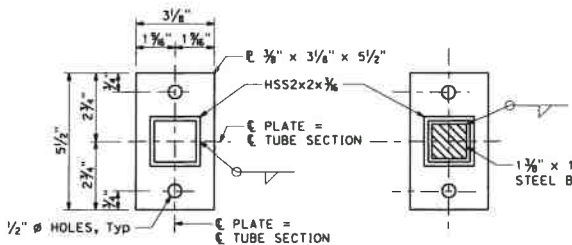
TUBULAR BICYCLE RAILING DETAILS



RAIL CAP DETAIL



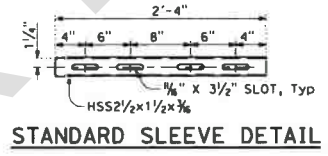
LOWER TUBULAR BICYCLE RAILING DETAIL



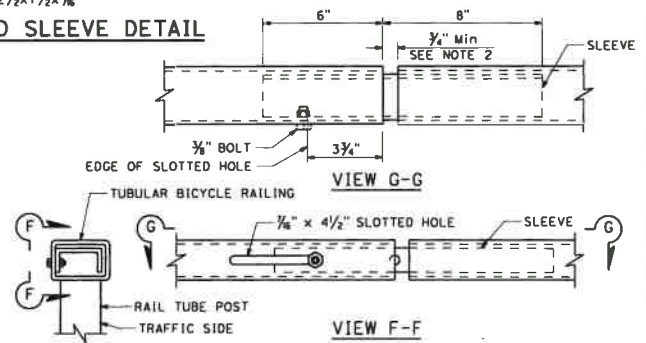
SECTION C-C

See Section C-C for details not shown.

SECTION D-D

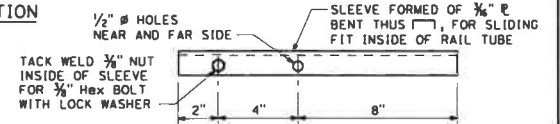


STANDARD SLEEVE DETAIL



ELEVATION

**SLEEVE TUBE SPLICE
AT EXPANSION JOINT DETAIL**



**CONCRETE BARRIER TYPE 85
DETAILS No. 3**

NO SCALE

B11-85

2023 STANDARD PLAN B11-85

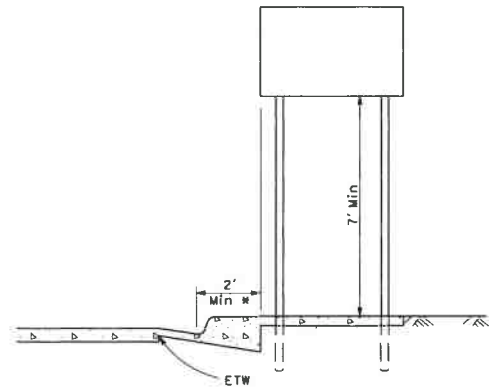
DT#	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS

REGISTERED CIVIL ENGINEER

May 1, 2023
PLANS APPROVAL DATE

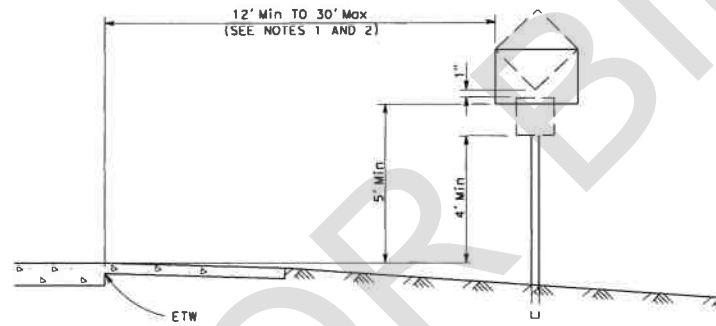
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Shonglla Horn
CS1846
Exp. 8-30-24
CIVIL ENGINEER
STATE OF CALIFORNIA



* 1' Min WHERE LATERAL CLEARANCE LIMITED

URBAN LOCATIONS



RURAL LOCATIONS

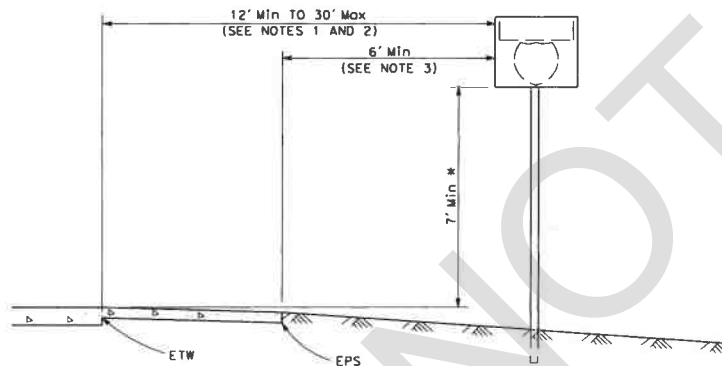
CONVENTIONAL HIGHWAYS AND INTERCHANGE AREAS

NOTES:

1. When clear roadside recovery areas are provided, signs shall be placed as far from the edge of traveled way as possible, up to a maximum of 30'. When possible, they shall be placed in protected locations.
2. Signs in medians shall be placed at midpoint of median up to a maximum distance of 30' from edge of traveled way. When appropriate, signs for opposing directions shall be placed back to back.
3. Does not apply at locations where minimum horizontal distance is not reasonable due to terrain characteristics, steep slopes, roadway features, or when signs are installed on structures or signal or lighting standards.

ABBREVIATION:

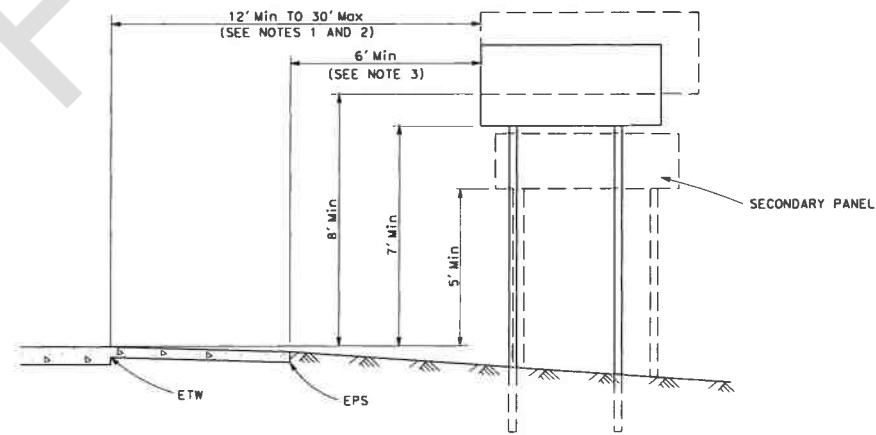
EPS = Edge of Paved Shoulder



* 5' Min AT 30' FROM ETW

REGULATORY AND WARNING SIGNS AND ROUTE SHIELDS

FREEWAY AND EXPRESSWAY LOCATIONS



GUIDE SIGNS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**ROADSIDE SIGNS
TYPICAL INSTALLATION
DETAILS No. 1**

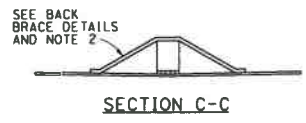
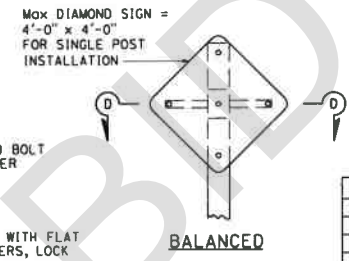
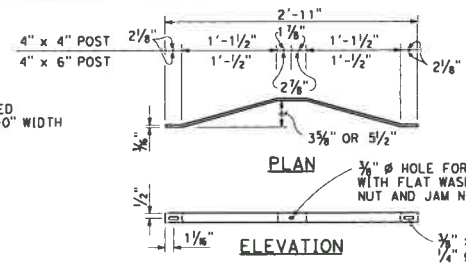
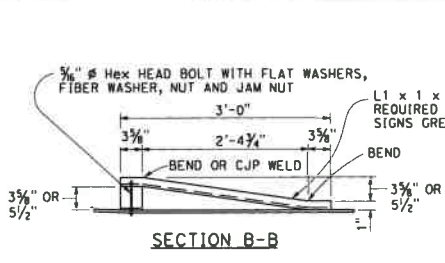
NO SCALE

RS1

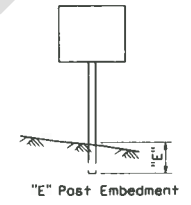
DATE	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

May 1, 2023
 PLANS APPROVAL DATE

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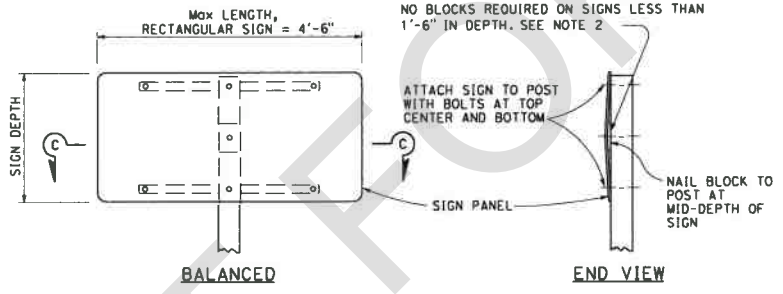
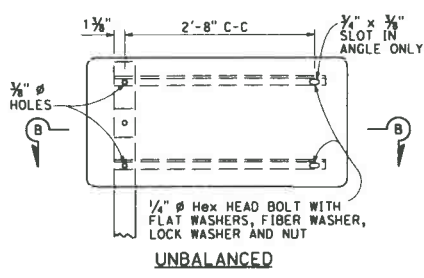


WOOD BLOCK SPACER -
 3/4" x 4" x 6" FOR
 2'-0" - 3'-0" WIDTH SIGNS
 1 1/2" x 4" x 6" FOR
 3'-1" - 4'-6" WIDTH SIGNS
 NO BLOCKS REQUIRED ON SIGNS LESS THAN
 1'-6" IN DEPTH. SEE NOTE 2

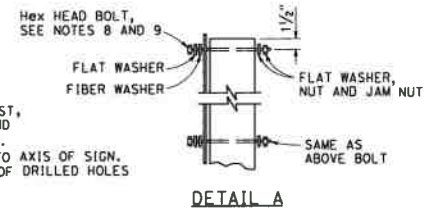
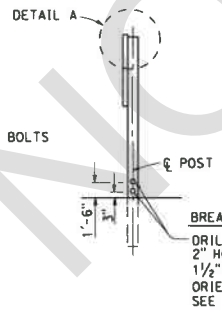
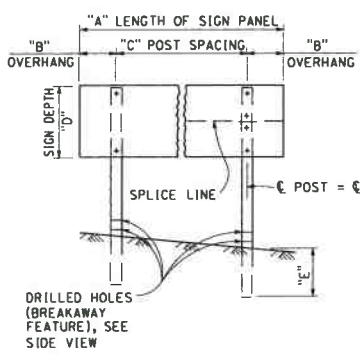


POST SIZE	"E"
4" x 4"	3.5'
4" x 6"	4.5'
6" x 6"	5.0'
6" x 8"	6.0'

POST SPACING TABLE		
SIGN PANEL LENGTH	SIGN PANEL OVERHANG	POST SPACING
"A"	"B"	"C"
4'-6"	6"	3'-6"
4'-8" TO 5'-6"	7" TO 1'-0"	3'-6"
6'-0" & 6'-6"	1'-0" & 1'-3"	4'-0"
7'-0" & 7'-6"	1'-3" & 1'-6"	4'-6"
8'-0"	1'-6"	5'-0"
8'-6"	1'-8"	5'-2"
9'-0"	1'-10"	5'-4"
9'-6"	1'-11"	5'-8"
10'-0"	2'-0"	6'-0"
10'-6"	2'-0"	6'-6"
11'-0", 11'-6", 12'-0"	2'-0", 2'-3", 2'-6"	7'-0"
12'-6"	2'-6"	7'-6"
13'-0"	2'-6"	8'-0"
13'-6", 14'-6"	2'-6", 3'-0"	8'-6"
14'-0", 15'-0"	2'-6", 3'-0"	9'-0"
15'-6", 16'-0"	3'-0", 3'-3"	9'-6"
16'-6"	3'-3"	10'-0"
17'-0", 17'-6"	3'-3", 3'-6"	10'-6"
18'-0", 18'-6"	3'-6", 3'-9"	11'-0"
19'-0"	3'-9"	11'-6"
19'-6", 20'-0"	3'-9", 4'-0"	12'-0"
20'-6", 21'-0"	4'-0", 4'-3"	12'-6"
21'-6"	4'-3"	13'-0"
22'-0", 22'-6"	4'-3", 4'-6"	13'-6"
23'-0"	4'-6"	14'-0"
23'-6", 24'-0"	4'-6", 4'-9"	14'-6"



SINGLE POST INSTALLATION
 See Note 5 regarding breakaway feature for single post installations.



TWO POST INSTALLATION

- NOTES:**
- Place long dimension of post cross section normal to sign axis. See Section C-C.
 - Balanced single post installations of unframed single sheet aluminum panel signs shall have block spacers if 1'-6" or more in depth and a combination of block spacers and back braces if 1'-6" or more in depth and 2'-10" or more in width. Sign panels less than 1'-6" in depth and 2'-10" or more in width shall have back braces only.
 - For post size see sign layout, format or quantity sheets.
 - Balanced single post installations of laminated panel and framed single sheet panel signs require back braces when 2'-10" or more in length.
 - Breakaway feature for single post installation shall be the same as the breakaway feature shown for the two post installation.
 - Tolerance for diameter of drilled holes in breakaway feature is ±1/8".
 - Bolt hole layout is dependent on type of panel. Drill holes in post to match panel.
 - 3/8" for single sheet aluminum panel signs.
 - 3/8" for laminated panel signs or framed single sheet aluminum panel signs.

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
ROADSIDE SIGNS
WOOD POST
TYPICAL INSTALLATION
DETAILS No. 2
 NO SCALE

RS2

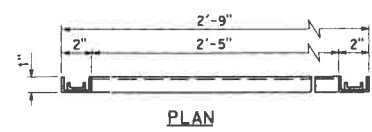
440

2023 STANDARD PLAN RS2

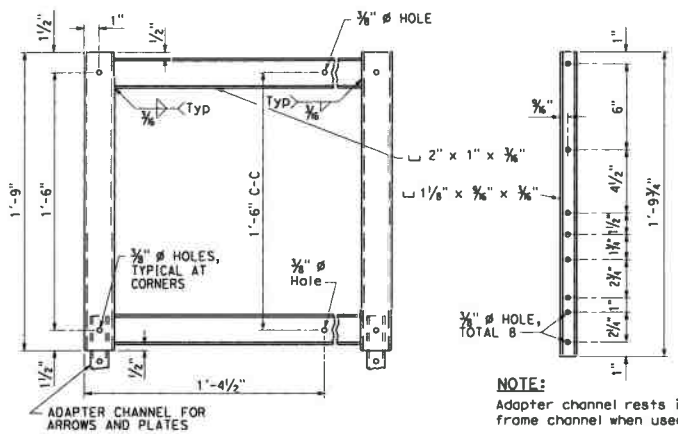
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS

Stanley P. Johnson
 REGISTERED CIVIL ENGINEER
 No. 537193
 STATE OF CALIFORNIA

May 1, 2023
 PLANS APPROVAL DATE
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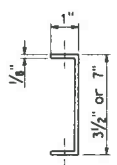


PLAN

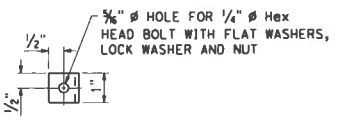


ELEVATION

GALVANIZED STEEL FRAME

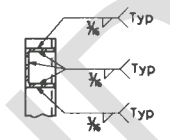


PLAN

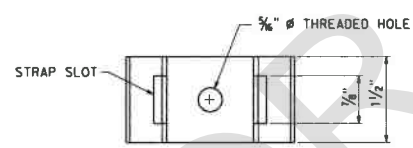


ELEVATION

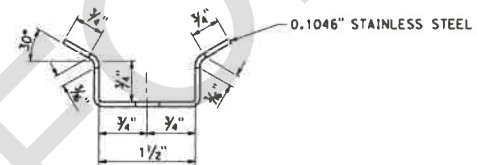
SPECIAL BRACKET



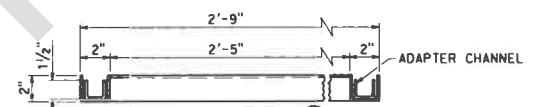
SECTION A-A



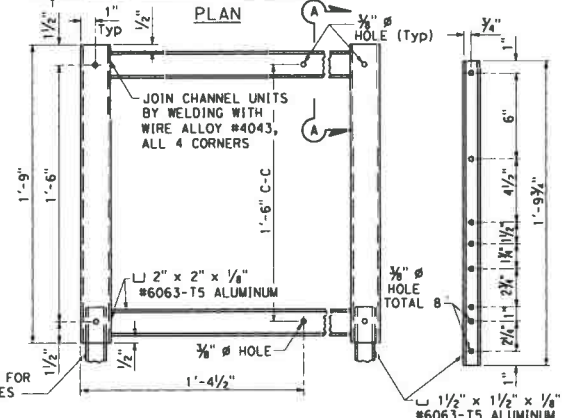
STRAP SLOT



SADDLE BRACKET

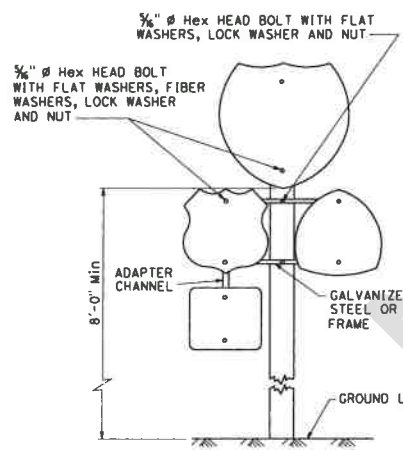


PLAN



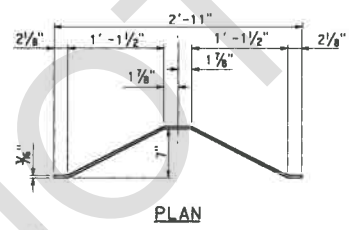
ELEVATION

ALUMINUM FRAME

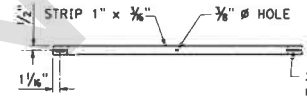


ELEVATION

MULTIPLE SIGN INSTALLATION

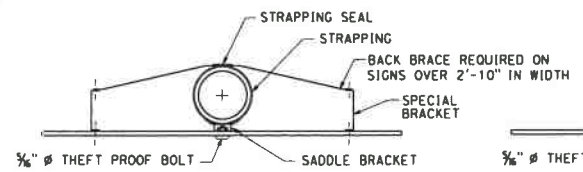


PLAN



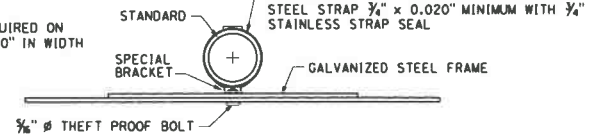
ELEVATION

BACK BRACE DETAILS



SINGLE SIGN

INSTALLATION ON ELECTROLIER, SIGNAL STANDARD



MULTIPLE SIGN

OR SIGN STRUCTURE POST

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
ROADSIDE SIGNS
TYPICAL INSTALLATION
DETAILS No. 4
 NO SCALE

RS4

442

2023 STANDARD PLAN RS4

CHANNEL SIZES

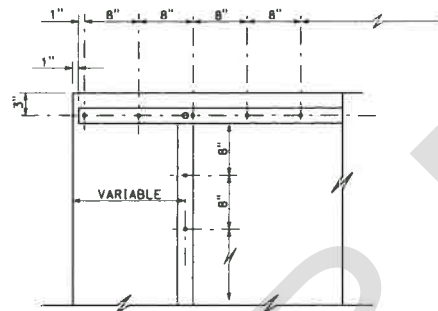
SIGN LENGTH	SIGN DEPTH	PANEL THICKNESS	No. OF HORIZONTAL MEMBERS	No. OF VERTICAL MEMBERS	Horiz MEMBER TYPE	Vert MEMBER TYPE
UP TO 3'-11"		0.063"	NO FRAME REQUIRED			
4'-0" TO 4'-7"		0.080"	NO FRAME REQUIRED			
4'-8" TO 5'-10"	1'-0" TO 2'-0"	0.063"	2		A	
	2'-1" TO 3'-0"	0.063"	2	2	A	A
	3'-1" TO 4'-0"	0.063"	2	3	A	A
	4'-1" TO 8'-0"	0.063"	3	3	B	A
6'-0" TO 6'-6"	1'-0" TO 2'-0"	0.063"	2		A	
	2'-1" TO 3'-0"	0.063"	2	2	A	A
	3'-1" TO 4'-0"	0.063"	2	3	A	A
	4'-1" TO 6'-0"	0.063"	3	3	B	B
	6'-1" TO 8'-0"	0.063"	3	3	C	C
6'-8" TO 7'-6"	1'-6" TO 4'-0"	0.080"	2	3	B	B
	4'-1" TO 6'-0"	0.080"	3	3	B	B
	6'-1" TO 8'-0"	0.080"	3	3	C	C
7'-8" TO 8'-6"	1'-6" TO 4'-0"	0.080"	2	3	B	B
	4'-1" TO 8'-0"	0.080"	3	3	C	C
8'-8" TO 9'-6"	1'-6" TO 4'-0"	0.080"	2	3	B	B
	4'-1" TO 8'-0"	0.080"	3	3	C	C
9'-8" TO 11'-0"	1'-6" TO 4'-0"	0.080"	2	3	C	C
	4'-1" TO 8'-0"	0.080"	3	3	C	C
	8'-1" TO 11'-0"	0.080"	4	3	C	C

NOTES:

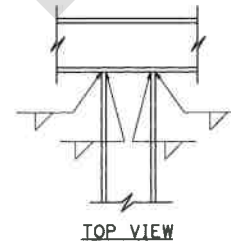
1. Type A - 1/4" x 1/4" x 1/8" Channel to be aluminum alloy 6063-T5.
2. Type B - 2 3/8" x 1/4" x 3/8" Channel to be aluminum alloy 6063-T6.
3. Type C - 2" x 2" x 1/4" Channel to be aluminum alloy 6063-T6.
4. 1 1/2" x 1/2" x 1/8" Rectangular tubing aluminum alloy 6063-T6 may be substituted for Types B and C, but more than one type of framing material used on one sign is unacceptable.
5. For rectangular tubing, weld all around and grind beads flush where weld contacts sign panel.

POST SPACING

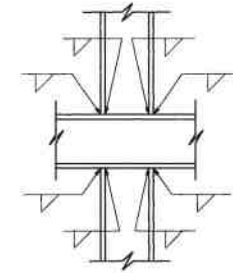
SIGN LENGTH	CENTERLINE SPACING
4'-8" TO 5'-8"	3'-6"
5'-10" TO 6'-8"	4'-0"
6'-10" TO 7'-8"	4'-6"
7'-10" TO 8'-2"	5'-0"
8'-4" TO 8'-8"	5'-2"
8'-10" TO 9'-2"	5'-4"
9'-4" TO 9'-8"	5'-8"
9'-10" TO 10'-2"	6'-0"
10'-4" TO 10'-10"	6'-6"
10'-11" TO 11'-0"	7'-0"



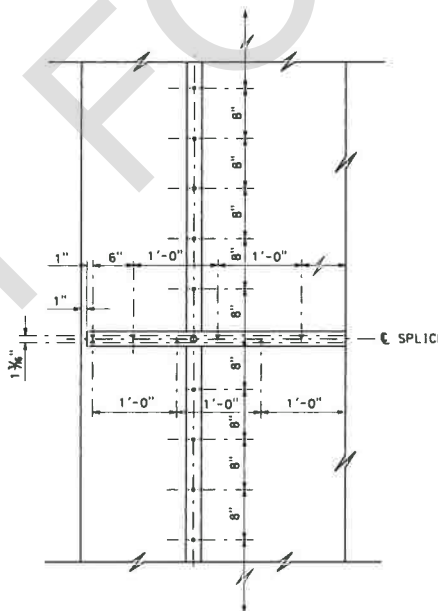
**TYPICAL RIVET
DETAIL A**



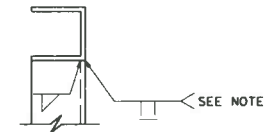
TOP VIEW



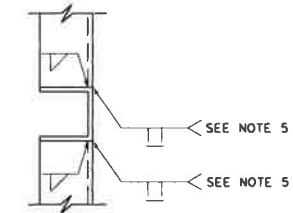
TOP VIEW



**RIVET AT SPLICE
DETAIL B**



**SIDE VIEW
WELD DETAIL No. 1**



**SIDE VIEW
WELD DETAIL No. 2**

TYPICAL WELD DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**FRAMING DETAILS
FOR FRAMED SINGLE SHEET
ALUMINUM SIGNS,
RECTANGULAR SHAPE**

NO SCALE

S93

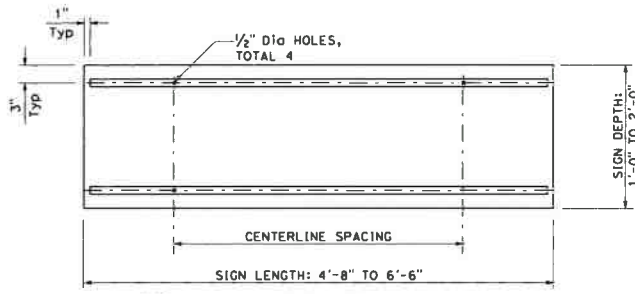
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REGISTERED CIVIL ENGINEER

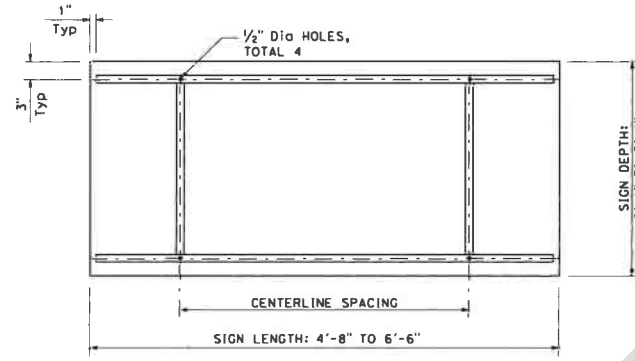
May 1, 2023
PLANS APPROVAL DATE

Shangita Horn
No. C51846
Exp. 6-30-24
CIVIL
STATE OF CALIFORNIA

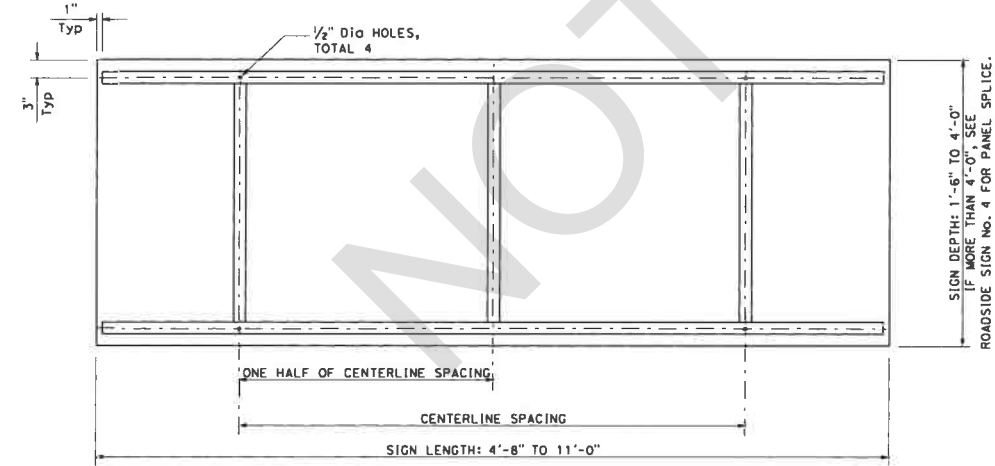
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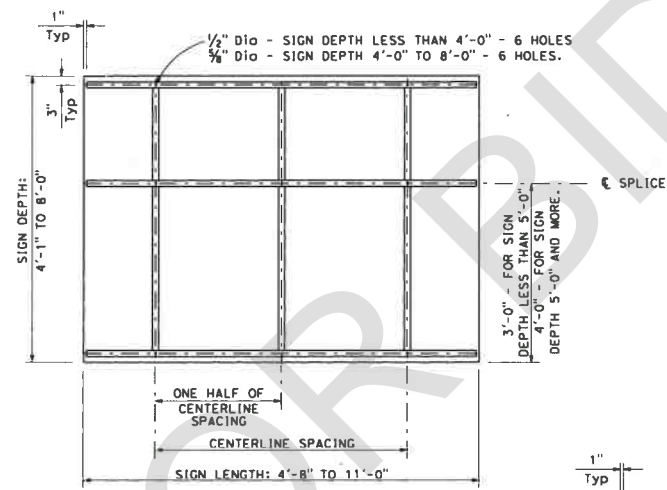
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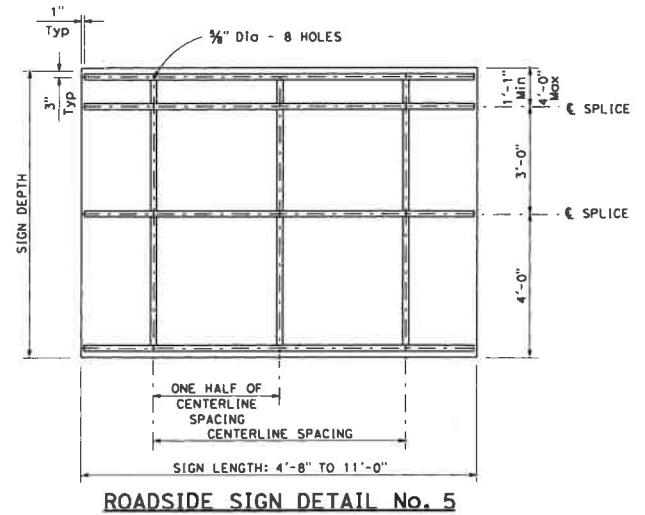
ROADSIDE SIGN DETAIL No. 2



ROADSIDE SIGN DETAIL No. 3



ROADSIDE SIGN DETAIL No. 4



ROADSIDE SIGN DETAIL No. 5

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

REGISTERED CIVIL ENGINEER
 May 1, 2023
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REGISTERED PROFESSIONAL ENGINEER
 Shonqia Horn
 C51846
 Exp. 6-30-24
 CIVIL
 STATE OF CALIFORNIA

- NOTES:**
1. See Standard Plan S93 for framing details.
 2. All members welded at joints as shown on Standard Plan S93.

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
**ROADSIDE FRAMED SINGLE SHEET
 ALUMINUM SIGNS,
 RECTANGULAR SHAPE**
 NO SCALE

S94

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS

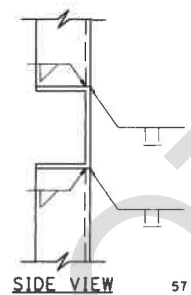
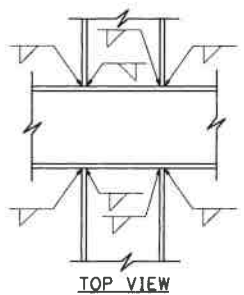
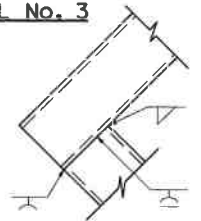
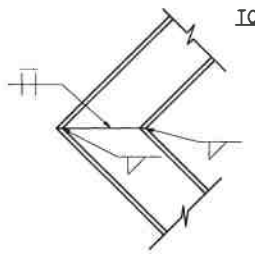
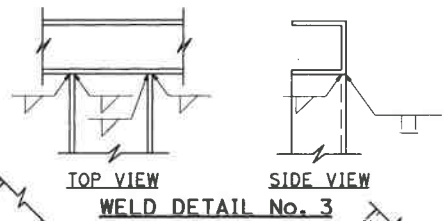
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May 1, 2023
PLANS APPROVAL DATE

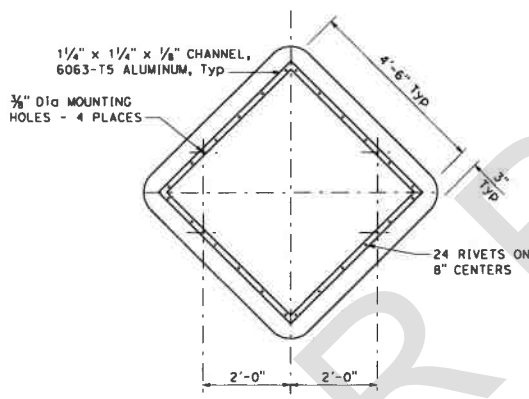
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C51846
Exp. 8-30-24
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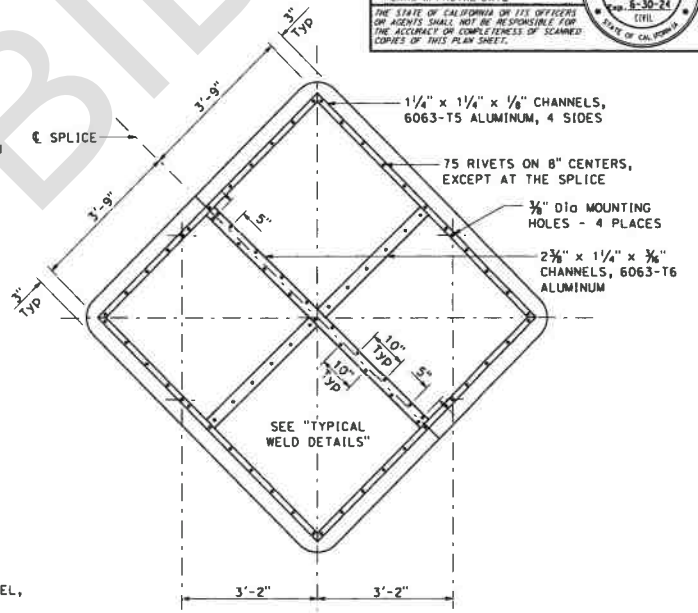
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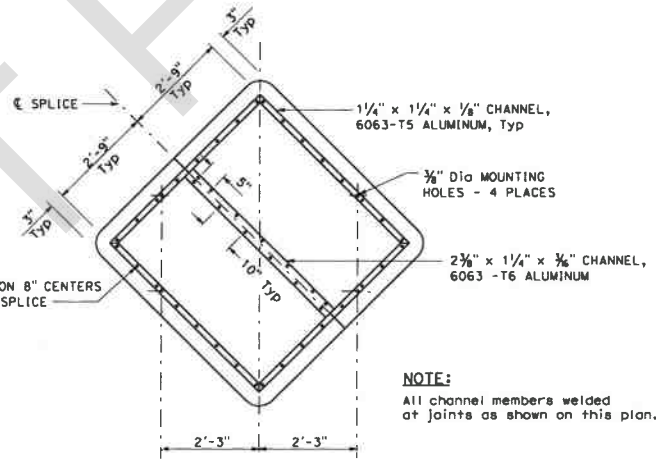
TYPICAL WELD DETAILS



ROADSIDE SIGN DETAIL No. 6
Framing detail for 5'-0" x 5'-0" diamond



ROADSIDE SIGN DETAIL No. 8
Framing detail for 8'-0" x 8'-0" diamond. Made from 2 - 4'-0" x 8'-0" panels, spliced and braced by channels as shown.



ROADSIDE SIGN DETAIL No. 7
Framing detail for 6'-0" x 6'-0" diamond. Made from 2 - 3'-0" x 6'-0" panels, spliced and braced by channels as shown.

NOTE:
All channel members welded at joints as shown on this plan.

CHANNEL SIZES		
SIGN SIZE	PANEL THICKNESS	FRAME TYPE
4'-0" x 4'-0"	0.063"	NO FRAME REQUIRED
4'-0" x 4'-0"	0.080"	NO FRAME REQUIRED
5'-0" x 5'-0"	0.080"	SEE ROADSIDE SIGN No. 6
6'-0" x 6'-0"	0.080"	SEE ROADSIDE SIGN No. 7
8'-0" x 8'-0"	0.080"	SEE ROADSIDE SIGN No. 8

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**ROADSIDE SINGLE SHEET
ALUMINUM SIGNS,
DIAMOND SHAPE**
NO SCALE

S95

491

Foundation Report
Dola Ditch Bridge
County Local Bridge No. 81
Caltrans State Bridge No. 54C0285
San Bernardino County, California



Prepared for:

County of San Bernardino
Transportation Design Division
825 East 3rd Street
San Bernardino, CA 92415-0835

Prepared by:

Tetra Tech
21700 Copley Drive Suite 200
Diamond Bar, California 91765



Project No. coSB 23-03E
November 22, 2023

Mr. Noel Mondragon
County of San Bernardino
Transportation Design Division
825 East 3rd Street, Room 145
San Bernardino, CA 92415-0835

SUBJECT: DOLA DITCH BRIDGE FOUNDATION REPORT
National Trails Highway SR66
San Bernardino County, California
2.1 miles East of Kelbaker Road

Dear Mr. Mondragon:

Presented herein is Tetra Tech's Foundation Report for the replacement of the existing timber Dola Ditch Bridge, County Local Bridge No. 81, Caltrans State Bridge No. 54C0285, located in San Bernardino County, with a new concrete bridge. This report summarizes Tetra Tech's scope of work, project description, seismic design recommendations, and provides recommendations for bridge foundations, and structural design.

We appreciate the opportunity to provide our professional services on this project. If you have any questions regarding this report or if we can be of further service, please do not hesitate to contact the undersigned.

Respectfully submitted,
Tetra Tech BAS, Inc

Fernando A. Cuenca M

Fernando Cuenca, Ph.D., G.E.
Senior Engineer



Peter Skopek

Peter Skopek, Ph.D., G.E.
Principal Engineer



Distribution: Noel Mondragon – pdf to noel.mondragon@dpw.sbcounty.gov
Rosa Griggs – pdf to rgriggs@dokkenengineering.com

Filename: 2023-11-22 FINAL DOLA Foundation Report.docx.

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- Figure 1 – Project Location Map
- Figure 2 – Boring Location Map
- Figure 3 – Regional Geology Map
- Figure 4 – Regional Fault Map
- Figure 5 – Quaternary Faults and Earthquake Epicenter Map

Figures (within the text of this report):

- Figure 6 – Design ARS
- Figure 7 – Loading Diagram of Geostatic Pressures on Abutment/Wing Wall
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- Appendix A – Boring Logs
- Appendix B – Results of Laboratory Testing
- Appendix C – Dynamic Settlement Analyses
- Appendix D – Spreadsheets with Calculations of Axial CIDH Pile Capacities

1. INTRODUCTION

This Foundation Report (FR) presents the results of Tetra Tech’s geotechnical engineering evaluation and geotechnical design recommendations for the construction of the replacement Dola Ditch Bridge, County Local Bridge No. 81, Caltrans State Bridge No. 54C0285, located in San Bernardino County (see Figure 1 – Project Location Map). The existing timber bridge was built in 2017, and the proposed project entails its removal and replacement with a new, longer, reinforced concrete bridge.

The purpose of this study was to provide recommendations for the design and construction of the proposed replacement bridge. This report presents our findings, conclusions, and foundation design recommendations.

NOT FOR BID

2. SCOPE OF SERVICES

Tetra Tech’s scope of services for this project consisted of the following tasks:

- Review of available background data, geologic maps, and seismic hazard maps relevant to the subject site.
- Review of local seismic sources and development of a Design Acceleration Response Spectrum (ARS) for the site.
- Engineering evaluation of the geotechnical data collected to develop geotechnical recommendations for the design and construction of the proposed structure. Consideration including the following items:
 - ♦ An evaluation of the liquefaction potential and dynamic settlement of the on-site granular materials.
 - ♦ Recommendations for the design of Cast-In-Drilled-Hole (CIDH) pile foundation systems for the bents including axial resistance, lateral resistance parameters, and settlement estimates.
 - ♦ Recommendations for the design of footing foundations for the abutments including allowable bearing pressures and settlement estimates.
 - ♦ An evaluation of the corrosion potential of the on-site soils to buried concrete.
- Preparation of this report, including conclusions, and geotechnical recommendations for the design and construction of the proposed project.

3. PROPOSED DEVELOPMENT AND SITE DESCRIPTION

The existing Dola Ditch Bridge is located in the county of San Bernardino on Route 66 (a.k.a National Trails Highway), approximately 11.3 miles south of I-40, 7.9 miles east of the city of Amboy, and approximately 2.1 miles east of the intersection with Kelbaker Road. The bridge spans from Station 13+09.44 to Station 13+68.10, i.e., is about 60 feet long. The bridge is constructed of timber and was completed in 2017. The approximate location of the project is shown on Figure 1.

The proposed concrete bridge will replace the existing timber bridge and will match the existing skew angle of 30 degrees and effective roadway width of 30 feet (total width of 34 feet). The new bridge will be 100 feet long (from Station 12+68.44 to Station 13+68.44) as it will extend the existing bridge about 40 feet to the west. The replacement bridge will consist of 3 spans, which from west to east will be 33.5, 33, and 33.5 feet long, respectively. The abutments will be supported on concrete footings about 10 feet wide by 41.3 feet long, and the 2 bents will be supported on a single row of 6 CIDH piles 24 inches in diameter spaced 6.5 feet on-center. The 2(H):1(V) abutment slopes will be protected from scour with a riprap revetment extending below the streambed. The new bridge grading will include westward widening of the Dola Ditch as well as excavations for the construction of the abutment foundations and the riprap revetment.

4. FIELD EXPLORATION AND LABORATORY TESTING

4.1. Field Exploration

The subsurface soil and groundwater conditions at the site were explored on May 19, 2014, and March 20, 2015 and included drilling, logging, and sampling of 3 hollow stem auger borings designated as B-1, B-2, and B-3 (see Figure 2 – Boring Location Map). This exploration was performed for the design of the existing timber bridge, but the collected data and findings are directly applicable to the design of the proposed concrete bridge.

The borings were excavated using a limited access truck-mounted CME 75 drill rig equipped with an 8-inch diameter hollow stem auger. Soil borings B-1 and B-3 were excavated to a depth of approximately 51.5 feet. Effective refusal was met at B-2 at a depth of approximately 43 feet where presence of cobbles prevented further advancement.

Both driven ring-type and bulk samples were retrieved at selected depths during drilling. The driven samples were collected utilizing a 2.5-inch-outside diameter California-type sampler driven by a 140-pound automatic trip hammer with a drop of 30 inches. Standard Penetration Testing (SPT) was also performed using the same hammer and drop in general accordance with ASTM D1586. The hammer efficiency was estimated from AASHTO (2012) Section 10.4.6.2.4 to be about 75 percent.

The soil borings were surface-logged by a California Professional Geologist, who also prepared the recovered samples for subsequent reference and laboratory testing. At the completion of drilling, the borings were backfilled with tamped soil cuttings. The soil boring logs are presented in Appendix A.

4.2. Laboratory Testing

Laboratory tests were performed on selected samples recovered from the boring to aid in the classification of soils and to evaluate pertinent engineering properties of the foundation soils. The following tests were performed:

- In-situ Moisture Content and Dry Density, ASTM D2937;
- Percent Passing #200 Sieve, ASTM D1140;
- Grain Size Distribution, ASTM D422;
- Atterberg Limits, ASTM D4318;
- Direct Shear Strength, ASTM D3080;
- Water Soluble Sulfate Content, CTM 417.

Testing was performed in general accordance with the referenced ASTM Standards, UBC, and California Test Methods. Results of all laboratory tests are presented in Appendix B. For convenient referral to the soil profile, selected laboratory results, including moisture and density determinations, have also been included on the boring logs in Appendix A.

5. GEOLOGIC CONDITIONS

5.1. Regional Geology

Regionally the subject site is located within the eastern Mojave Desert portion of San Bernardino County, California. This region is known as the Mojave Desert Geomorphic Province (MDGP), which is characterized by a series of structural and topographic basins bounded by relatively linear mountain ranges. The MDGP exists throughout eastern and southeastern California, Nevada, and western to southern Arizona. The alternating mountains and valley topography primarily resulted from extensional (pulling apart) tectonics that occurred during the Miocene (5.3 to 23 million years ago). Most of the valleys within the MDGP are truly basins collecting sediments eroded from the local mountain ranges. Streams remain trapped within the MDGP basins and do not terminate to the Pacific Ocean and/or Gulf of California (Sea of Cortez). All surface water flow and groundwater flow within basin drainages remains within the hydraulically closed basins, eventually flowing to playas at the lowest elevations, creating dry lakes where flows gather, become saline, and evaporate. Bristol Lake, located 5 miles southwest of the subject site, is the nearest closed basin.

Based on the regional mapping published by the USGS (Bedford and Miller, 2010), the subject site is mostly covered by surficial Quaternary younger alluvial fan deposits (Q_{yg}) that rest on late to middle Pleistocene intermediate alluvial fan deposits (Q_{ia}). The surficial materials are typically made up of loose to moderately dense poorly to well graded sand and gravel clasts derived from granitic sources that have been weathered to grus and have been eroded from the surrounding mountains and deposited on a centennial to millennial basis. The late to middle Pleistocene sediments generally consist of dense well to poorly graded sands, gravels, and cobbles characterized by surfaces abandoned for tens of thousands of years. These Quaternary sediments rest on Tertiary volcanic and fanglomerate units and Archean to Jurassic granitic and metamorphic rocks. A geologic map with description of the main surficial geologic units within the subject site is shown on Figure 3 – Regional Geology Map.

5.2. Site Specific Geology

The site geology is characterized by surficial younger alluvial deposits. Locally, these fan deposits are sub-classified by their age of deposition and predominance of clay, silt, sand, and gravels. Based upon the findings from our subsurface investigation, the project site at the bridge abutments is mantled by artificial fill soils (af). Beneath the artificial fill, younger alluvial (Q_y) soils of sand and gravel, were encountered to the base of the explorations. Within the ditch area beneath the bridge, active alluvium (Q_a) soils of loose channelized sand deposits were encountered. Generalized descriptions of the encountered units are provided below. Detailed descriptions of the encountered soil conditions are presented on the boring logs in Appendix A.

5.3. Fill

Artificial embankment road fill (af) associated with Route 66 roadway and bridge embankments was encountered in the 2 roadway borings (B-1 and B-2) to depths ranging from 6 to 7 feet. The fills consisted of light brown to brown, medium dense to dense poorly graded sands to poorly

graded sands with silt and gravels that were typically dry. In boring B-1 cobbles up to 4 inches were encountered in the upper 2 feet.

5.4. Active Alluvium

Active alluvial deposits were encountered in stream ditch area below the bridge (boring B-3) to a depth of 5 feet. These soils consisted of light yellowish brown, medium dense well graded sands. In boring B-3 gravel and cobbles were encountered to a depth of 2 feet. These soils were observed to be damp, due to previous week's winter storm.

5.5. Younger Alluvium

Younger alluvial soils were encountered below the fill soils and active alluvial soils. They typically consisted of medium dense to very dense silty sand to sands, poorly graded sand with silt and gravel, and silty gravel with sand. The soils were typically pale brown to light brown to yellowish brown in color. These younger alluvial soils extended to the total depth of the exploratory borings. In boring B-2 a cobble zone was encountered at a depth between 32 and 43 feet and effective refusal on cobbles occurred at a depth of 43 feet.

5.6. Groundwater

Mapping by the State of California and Cadiz Groundwater Modeling and Impact Analysis, prepared by Geoscience, 2011, indicates that the groundwater level near the site is estimated to be deeper than 700 feet. Groundwater was not encountered in any of the borings undertaken in this exploration. It should be noted that groundwater levels may fluctuate due to seasonal variations, rainfall, or other factors. Evaluation of such factors is beyond the scope of our services.

6. ENGINEERING SEISMOLOGY

6.1. General Seismic Setting

The Southern California region is known to be seismically active. Earthquakes occurring within approximately 60 miles of the site are generally capable of generating ground shaking of engineering significance to the proposed construction. The project area is located in the general proximity of several holocene-active faults, as shown on Figure 4 – Regional Fault Map. Holocene-active faults are defined as those that have experienced surface displacement within Holocene period (approximately the last 11,700 years).

The project site is located in eastern margin of the Eastern California Shear Zone, a broad seismically active region dominated by northwest trending right-lateral strike-slip faulting. Several named fault zones showing evidence of Quaternary movement have been identified and are illustrated on the generalized fault map on Figure 5 – Quaternary Faults and Earthquake Epicenter Map. Superimposed on this map are recorded earthquake epicenters recorded by the USGS between 1900 and 2023. The closest faults to the subject site mapped by the CGS are the South Bristol Mountains fault and the Broadwell Lake fault. These faults are located approximately 5 and 17 miles northwest of the subject site, respectively. However, neither of these faults is considered to be active.

Very few earthquake epicenters have been recorded in the immediate area of the subject site. A large amount of seismic activity and associated events with their epicenters have been recorded west of the project site at a distance of about 35 miles, as shown in Figure 5. There have been 5 notable historic earthquakes of significance to the site as listed in Table 1. The most notable historic earthquakes occurred in 1992 (Landers earthquake) and 1999 (Hector Mine earthquake). The Landers earthquake is considered one of the 4 largest earthquakes to have occurred in Southern California in the past century.

Table 1
Significant Historical Earthquakes

Year	Date	Location	Mag.	Approximate Epicenter Location	EQ Name	Distance from Site
1999	16-Oct	Hector Mine	7.1	34.59°N, -116.27°W	Hector Mine	37.9 miles W
1992	28-Jun	Big Bear	6.5	34.17°N, -116.83°W	Big Bear	75.1 miles SW
1992	29-Jun	Landers Region	7.3	34.21°N, -116.44°W	Landers	53.1 miles SW
1992	23-Apr	Joshua Tree	6.2	33.96°N, -116.32°W	Joshua Tree	56.6 miles SW
1947	10-Apr	Newberry Springs	6.5	34.98°N -116.55°W	1947 Manix	60.6 miles NW

6.2. Seismic Hazards and Potential for Surface Fault Rupture

The engineering seismology study for the subject site included reviewing local and regional fault maps and the review of historical earthquake data. Specifically, the following engineering seismology issues were addressed:

6.2.1. Seismic Hazard Zones

Maps of seismic hazard zones are issued by the California Geological Survey (CGS, formerly California Department of Conservation, Division of Mines and Geology (CDMG)) in accordance with the Seismic Hazards Mapping Act enacted in April 1997. The intent of the Seismic Hazards Mapping Act is to provide for a statewide seismic hazard mapping and technical advisory program to assist cities and counties in developing compliance requirements to protect the public health and safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure and other seismic hazards caused by earthquakes.

Based on the review of available Maps of Seismic Hazard Zones in the State of California developed by the State of California Department of Conservation (<https://maps.conservation.ca.gov/cgs/EQZApp/app/>), the proposed development is located in an area that has not yet been mapped for susceptibility to the hazard of liquefaction or earthquake-induced landslides.

6.2.2. Surface Fault Rupture

Official Maps of Earthquake Fault Zones were reviewed to evaluate the location of the project site relative to active fault zones. Earthquake Fault Zones (known as Special Studies Zones prior to 1994) have been established in accordance with the Alquist-Priolo Special Studies Zones Act enacted in 1972. The Act directs the State Geologist to delineate the regulatory zones that encompass surface traces of active faults that have a potential for future surface fault rupture. The purpose of the Alquist-Priolo Act is to regulate development near active faults in order to mitigate the hazard of surface fault rupture.

Based on a review of Fault Maps from the Department of Conservation (<https://maps.conservation.ca.gov/cgs/EQZApp/app/>) the site is not located within a designated Earthquake Fault Zone for fault surface rupture hazard. The closest Earthquake Fault Zones with surface rupture hazard to the subject site mapped by the CGS are the Lavic Lake Fault Zone and the Pisgah-Bullion Fault Zone. These fault zones are both found at approximately 35 miles west and southwest of the subject site, respectively.

Surface traces of active or potentially active faults are not known to pass directly through or towards the site. Neither our field exploration nor literature review disclosed an active fault trace projecting to the ground surface in the project area. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low.

6.2.3. Seismogenic Sources

The principal seismic hazard at the subject site is the potential for ground shaking associated with large earthquakes on distant faults. Of these, the most important is the San Andreas Fault Zone, an active fault of regional significance located approximately 70 miles southwest of the subject site.

In addition to the San Andreas Fault Zone, other regional fault zones that have been active in Holocene time include the Lavic Lake Fault Zone and the Pisgah-Bullion Fault Zone (mentioned above) and the Bullion Mountain and Calico-Hidalgo Fault Zones. The latter 2 fault zones are located approximately 33 and 40 miles west of the project area, respectively. The maximum earthquake magnitudes on these faults are estimated to be similar or slightly higher than those on the San Andreas Mojave Fault Zone (M_w 7.1). However, the recurrence interval of large earthquakes in the Eastern California Shear Zone is considered to be on the order of thousands of years. Therefore, the potential for a seismic event along these faults during the design life of the project is considered to be low.

The Ludlow Fault Zone is located approximately 25 miles west of the project area. The Ludlow Fault Zone has displaced alluvium as young as late Pleistocene but not Holocene. As shown in Figure 4, the Ludlow, Sheephole and Cleghorn Lakes and Cleghorn Pass Fault Zones appear to be associated with a relatively high amount of micro-seismic activity, however, none of these fault zones are classified as active, and none trend toward the subject site.

6.3. Design Acceleration Response Spectrum

Per Caltrans Seismic Design Criteria (Version 2, 2019), the Design Acceleration Response Spectrum (ARS) is defined as a probabilistic spectrum developed for ground motions with a probability of exceedance of 5 percent in 50 years (or 975-year return period). The design ARS was developed using the Caltrans ARS online tool v.3.1.0 (<https://arsonline.dot.ca.gov/>) using the following parameters:

- Site coordinates for the Dola Ditch bridge of N34.5608°, W-115.6062°;
- Site Class D based on a shear wave velocity of 310 m/s. This shear wave velocity was estimated based on the correlation with Standard Penetration Test (SPT) blowcounts presented in a 2010 UCLA study, and included in the Caltrans Geotechnical Manual, Design Acceleration Response Spectrum” (Caltrans, January 2021). Since there was no information available beyond the maximum depth of exploration, the characteristic value of V_{s30} for the upper 100 feet (30 meters) was computed by extrapolation using the David and Boore (2004) formula, included in the same document. It is noted that the blowcounts at the maximum depth of exploration (50 feet) indicate the presence of dense to very dense sands. It is possible that the likely denser soils below the depth could result in changing the site from Site Class D to Class C. However, since the investigation for this study did not extend to such depths, Site Class D was conservatively assumed in the analyses.

- No adjustments were made for near fault-factors since the bridge is located more than 10 miles from any active faults in the area; no directivity adjustments were applied either as there are no near active faults or active faults that project towards the site;
- Basin amplification factors were not applied since the Dola Ditch basin is expected to be less than 1.9 miles deep, which is the minimum depth to bedrock considered to apply basin factors.

Figure 6 – Design ARS, presents the developed design ARS. The tabulated values of the recommended Design ARS are summarized in Table 2.

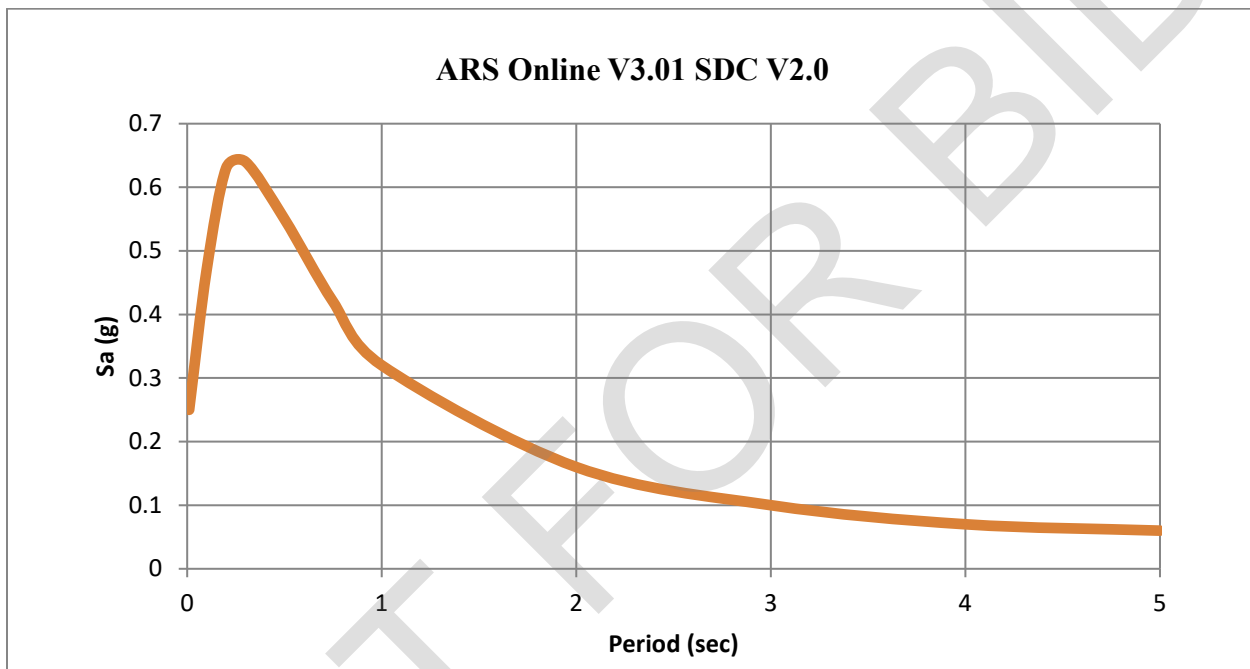


Figure 6. Design ARS

Table 2
Tabulated Values for Design ARS

Period (sec)	Spectral Acceleration RotD₅₀ (g)
0.01	0.25
0.1	0.47
0.2	0.63
0.3	0.64
0.5	0.55
0.75	0.42
1	0.32
2	0.16
3	0.1
4	0.07
5	0.06

6.4. Liquefaction Potential and Seismically Induced Settlement

Liquefaction and the associated loss of strength can be caused by ground shaking during earthquakes. Research and historical data indicate that loose, relatively clean granular soils and low plasticity silts are susceptible to liquefaction and dynamic settlement whereas the stability of the majority of clayey silts, silty clays and clays is not typically adversely affected by ground shaking. Liquefaction is generally known to occur in saturated or near-saturated cohesionless soils at depths shallower than about 50 feet.

6.4.1. Soil Description

Evaluation of liquefaction potential for the on-site materials was performed based on soil stratigraphy encountered in our field explorations and isolated lenses of soils susceptible to liquefaction were identified in all 3 of the exploratory borings generally between the depths of approximately 5 to 25 feet. The materials consisted of medium dense sands with SPT uncorrected blowcounts ranging from 19 to 25 per foot. However, when these blowcounts were corrected for hammer energy efficiency, the blowcounts fall above or right at the limit where liquefaction is not considered to be an issue per AASHTO (2017) Section 10.5.4.2 when soils with corrected blowcounts greater than 25 blows per foot are not considered to be susceptible to liquefaction.

6.4.2. Groundwater Level

Mapping by the State of California and Cadiz Groundwater Modeling and Impact Analysis, prepared by Geoscience (2011), indicates that the groundwater level near the site is estimated to be deeper than 700 feet. Groundwater was not encountered in any of the borings undertaken in this exploration. AASHTO (2017) considers that if the groundwater level is anticipated to be deeper than 50 feet the site is not susceptible to liquefaction.

6.4.3. Seismic Demand for Liquefaction and Dynamic Settlement Analyses

The seismic demand to evaluate liquefaction and dynamic settlements is established by ASSHTO (2017) Section 10.5.4.2 based on ground motions with a 975-year return period (i.e., probability of exceedance of 5 percent in 50 years). Based on the USGS Seismic Hazard Interactive Deaggregation website (<https://earthquake.usgs.gov/hazards/interactive/>) for site coordinates latitude 34.5608°N and longitude -115.6062°W the RotD₅₀ peak ground acceleration (PGA) for the site was estimated to be approximately 0.25g for a Site Class D (assumed V_{s30} = 310 m/s). This ground motion corresponds to a predominant earthquake magnitude of M_w 6.4 located at a distance of approximately 11.8 km. These ground motion parameters were used in the dynamic settlement analyses.

6.4.4. Evaluation of Liquefaction and Loss of Strength Potential

The liquefaction potential was evaluated based on the liquefaction design requirements presented in AASHTO (2017) Section 10.5.4.2. Liquefaction is not considered a hazard at the site because the groundwater depth is greater than 50 feet.

It is noted and recognized that the groundwater levels will be affected by occasional seasonal flooding. However, the likelihood of simultaneous occurrence of a triggering seismic event and flooding is considered low and thus liquefaction is still not considered a hazard at the site.

Since the liquefaction potential is considered to be negligible, the potential for lateral spreading, or slope instability caused by flow failure are also considered to be negligible.

6.4.5. Seismically Induced Settlement

Seismically induced settlement can occur in both dry and saturated soils when loose to medium-dense granular soils undergo volumetric changes during ground shaking. Dynamic settlement can occur in saturated soils due to liquefaction or in dry soils due to densification of the soil matrix. As discussed above, the on-site soils are not susceptible to liquefaction, and therefore liquefaction-induced settlement is not anticipated. The potential for dry dynamic settlement was calculated using the procedures outlined in the Pradel (1998a and 1998b). Table 3 presents the results of the dynamic settlement estimates based on the information collected from soil borings B-1 through B-3.

Table 3
Results of Dry Seismic Settlement Analyses

Boring No.	Settlement of Dry Sands (inches)
B-1	negligible
B-2	
B-3	

As shown in Table 3, the combined seismically induced settlement of the on-site soils was calculated to be negligible. It is our opinion that the seismically induced settlement will not adversely impact the proposed bridge. The seismically induced settlement analyses are presented in Appendix C.

NOT FOR BID

7. DESIGN RECOMMENDATIONS

7.1. General

Based on the results of the field exploration and engineering analyses, it is Tetra Tech’s opinion that the proposed construction utilizing CIDH piles at the bents and spread footings at the abutments is feasible from a geotechnical standpoint, provided that the recommendations contained in this report are incorporated into the design plans and implemented during construction.

The design recommendations presented below are based on Tetra Tech’s current understanding of the project. Once the project configuration is finalized and the design is complete, Tetra Tech should review the plans and specifications to evaluate if the geotechnical design recommendations have been incorporated as intended.

7.2. Clearing and Grubbing and Site Preparation

Prior to commencement of the earthwork, the construction area should be cleared of vegetation, trash, debris, and the existing structures including the existing bridge foundations, deadman and deadman tierods, and abutment slope protection. Any subterranean installations not to be preserved should be abandoned per the Geotechnical Engineer’s recommendations and in accordance with applicable regulations. The existing rock slope protection not interfering with the proposed construction may remain in place in place.

Disturbed soils at structural and non-structural areas will likely occur after demolition of existing site improvements. These soils should be overexcavated and recompacted to the total depth of the disturbed material. The specific type of remediation and associated area limits will need to be evaluated in the field by the Geotechnical Engineer.

All structural backfill associated with the replacement of overexcavated soils, and all the structural backfill to be placed in the zone between the abutment foundations/walls and the approach embankments should have a Sand Equivalent of at least 20, comply with the gradation requirements presented in Table 4, and be compacted at least the optimum moisture content to at least 95 percent relative compaction per ASTM D1557. It is anticipated that the existing embankment materials and native soils can be used in the new construction.

The upper 2.5 foot of soils below finished grade within the width of the travelled way plus 3 feet on each side should be processed and compacted to at least 95 percent relative compaction.

Table 4
Structural Backfill Gradation Requirements (95% compaction)

Sieve Size	Percent Passing
3”	100
No. 4	35-100
No. 30	20-100

Except for materials mentioned above, any other embankment fill including fill placed to achieve finish grade or subgrade, utility trench backfill, and backfill of the riprap slope protection at the streambed shall comply with the gradation requirements presented in Table 5 and be compacted at least the optimum moisture content to at least 90 percent relative compaction per ASTM D1557.

Table 5
Structural Backfill Gradation Requirements (90% compaction)

Sieve Size	Percent Passing
3"	100

Excavated on-site soils may be re-used as compacted fill provided they are free of organics, deleterious materials, debris and particles over 3 inches in largest dimension. Locally, particles up to 6 inches in largest dimension may be incorporated in the fill soils based on specific approval and placement recommendations provided by the Geotechnical Engineer during grading.

In the event that any soil materials (including backfill or base course materials) are imported to the site, such soils should be sampled, tested, and approved by the Geotechnical Engineer prior to arrival on-site. In general, any soils imported to the site for use as fill should be predominantly granular and have an Expansion Index less than 20. Additional recommendations for site grading are provided in the “General Site Grading Recommendations” section of this report.

7.3. Rock Slope Protection (Riprap Revetment)

The rock slope protective cover to minimize scour problems at the abutments must comply with the rock gradation requirements and method placement specifications presented in the Caltrans Standard Specifications (2022) Section 72-2.

7.4. Temporary Slope and Trench Excavations

The on-site soils are not expected to pose unusual excavation difficulties, and therefore, conventional earth-moving equipment may be used. Localized sloughing/raveling of exposed soil intervals should be anticipated. All trench excavations should be performed in accordance with Cal/OSHA regulations. The on-site soils may be considered a Type C soil, as defined by the current Cal/OSHA soil classification.

Unsurcharged excavations: Sides of temporary, unsurcharged excavations less than 20 feet deep should be sloped back at an inclination of 1.5(H):1(V) or flatter. Where space for sloped sides is not available, shoring will be necessary. This office can provide appropriate shoring recommendations, once the excavation configuration is known.

Surcharge setback recommendations: Stockpiled (excavated) materials should be placed no closer than 4 feet from the top of the trench. A greater setback may be necessary when considering surcharge loads such as heavy vehicles, concrete trucks and cranes. Tetra Tech should be advised of such heavy vehicle loadings so that specific setback requirements can be established for the used equipment. Alternatively, a shoring system may be designed to allow reduction in the setback distance.

7.5. Embankment Slope Stability

The stability of the side slopes of the embankment was evaluated based on the proposed configuration of a 2(H):1(V) slope and a maximum slope height of 7 feet. The soil properties for the embankment include an angle of friction of 34°, cohesion of 50 psf and a unit weight of 120 pcf. The static Factor of Safety was computed as 2.2 for dry conditions and 2.8 for submerged conditions.

7.6. Scour Evaluation

Scour is the process of erosion of the streambed or bank material due to flowing water. The total scour to be expected at a bridge location is the sum of long-term degradation, contraction scour, and local scour.

Aggradation and degradation are long-term streambed elevation changes due to natural or man-induced causes which can affect the reach of the river where the bridge is located. Aggradation involves the process of deposition of material eroded from the channel or watershed upstream of the bridge, and it is not considered a component of total scour. Degradation involves erosion of the streambed over relatively long reaches due to a deficit in sediment supply from upstream and contributes to total scour. For this bridge the degradation scour has been assumed to be negligible per County of San Bernardino.

Contraction scour is a lowering of the streambed across all or most of the channel width at the bridge due to contraction of the flow and the associated increase in flow velocity.

Local scour involves removal of material from around piers and abutments due to acceleration of flow and resulting vortices created by obstructions to the flow.

The evaluation of the contraction scour and the local scour was performed by the County of San Bernardino and the provided results are summarized in Table 6.

Table 6
Scour Analysis

Limit State	Contraction Scour (feet)	Local Scour (feet)	Total Scour ¹ (feet)
Strength (construction) (100-year flood)	1.9	4.6	6.5
Service (100-year flood)	3.3	7.7	11
Extreme Event I (100-year flood) ²	1.0	2.3	3.3
Extreme Event II (check flood) ³	3.3	7.7	11.0
Notes:			
¹ Total scour is the sum of the contraction scour and the local scour for each Limit State.			
² For the extreme event I limit state half of the total scour is to be considered in conjunction with the earthquake loads.			
³ Per AASHTO (2017) Section 3.4.1, the case of check floods should not be combined with other loadings			

7.7. Bent CIDH Pile Foundations

The bents for the proposed bridge may be supported on 24-inch-diameter CIDH piles. The foundation design data and CIDH pile loads as provided by the structural engineer are presented in Tables 7 and 8.

Table 7
24-inch CIDH Pile Design Data
Permissible Settlement under Service Load ... 1 inch
No. of Piles per Support ... 6

Support No.	Elevation (feet)			Pile Cap Size (feet)	
	Finished Grade	Bottom of Cap	Cut-Off	B	L
Pier 2	869.50	875.3	862.50	4	39.26
Pier 3		875.15			

Table 8
Pile Design Factored Loads in kips

Support No.	Service-I Limit State		Strength Limit State (Controlling Group)		Extreme Event Limit State	
	Total Load	Permanent Load	Compression	Tension	Compression	Tension
	Per Support / Max. per pile	Per Support	Per Support / Max. per pile			
Pier 2	701 / 120	374	1,066 / 198	Not applicable		
Pier 3	684 / 117	370	1,050 / 195			

7.7.1. Static Axial Capacity

The considered foundations at each bent include a single row of 6 CIDH piles spaced 3.25 pile diameters on-center. The static axial capacity of CIDH piles was estimated based on SPT N values using the beta method outlined in Section 10.3 of FWHA GEC 010 (2010).

Pile tip elevations were calculated for the required pile capacity at the bents. For each Limit State, the soil above the scour depth was assumed to be completely removed and the groundwater was assumed to be at the streambed elevation. The upper 10 feet of soil below the finished grade was conservatively assumed to be composed of recompacted native soils. Copies of pile capacities calculations including the utilized strength parameters used for each Limit State are provided in Appendix D.

**Table 9A
 Design CIDH Pile Tip Elevations**

Support Location	Pile Type	Cut-off Elev. (ft)	Service-I Limit State Load per Support (kips)		c Total Permissible Settlement (inches)	Required Factored Nominal Resistance (kips)				Pile Tip Elevations (ft)	
			Total	Permanent		Strength/Construction		Extreme Event		Design	Specified
						a1 Comp ($\phi_{qs}=0.7$, $\phi_{qp}=0.5$)	b1 Tension ($\phi=0.7$)	a2 Comp ($\phi=1.0$)	b2 Tension ($\phi=1.0$)		
Pier 2	24-inch CIDH	862.5	701	374	1	198	-	-	-	803.5 (a1) - (b1) 839.5 (c) 830 (d)	801.5
Pier 3			684	370		195	-	-	-	804.5 (a1) - (b1) 839.5 (c) 830 (d)	

Notes:

- Design tip elevations are controlled by: (a1) compression (Strength Limit), (b1) Tension (Strength Limit), (a2) Compression (Extreme Event), (b2) Tension Extreme Event, (c) Settlement, (d) Lateral Load
- The specified tip elevation shall not be raised. Per Caltrans Geotechnical Manual (2021) the specified tip elevation should be lowered a minimum of 2 feet below the calculated bottom of the side resistance zone to account for limitations in the pile integrity testing methods. Thus, the specified tip elevations are 2 feet lower than the controlling tip elevations.
- Design tip elevation for Lateral Load is typically provided by SD.

The design and specified pile tip elevations are presented in Table 9A. Per Caltrans Geotechnical Manual (2021) the specified tip elevation should be lowered a minimum of 2 feet below the calculated bottom of the side resistance zone to account for limitations in the pile integrity testing methods. Thus, the specified tip elevations are 2 feet lower than the controlling tip elevations. The pile data is also summarized in Table 9B.

The pile capacities and estimated tip elevations consider pile group effects by modifying the axial capacity of each individual pile by a reduction factor of 0.8 based on the on-center pile spacing of 3 diameters as required by Section 11.4.1.2 of FHWA GEC 010 (2018).

**Table 9B
Pile Data Table**

Support No.	Pile Type	Nominal Resistance (kips)		Pile Tip Elevations (ft)	
		Compression	Tension	Design	Specified
Pier 2	24-inch CIDH	320	-	803.5 (a1)	801.5
Pier 3				- (b1)	
	839.5 (c)				
830 (d)					
				804.5 (a1)	802.5
				- (b1)	
				839.5 (c)	
				830 (d)	

7.7.2. p-y Curve Soil Parameters

Table 10 presents the recommended soil parameters to be used with LPile software for the analysis and design of laterally loaded piles. The provided parameters are conservatively estimated assuming that the soils are fully saturated.

As indicated in Note 3 in Table 10, scour and soil disturbance effects may be modeled in LPile by specifying a near-zero p-multiplier (i.e., 10^{-06}) which effectively eliminates any soil lateral resistance, and by specifying a negligible unit weight (i.e., 10^{-06} pcf) so that the soils within the scour/disturbance interval do not provide any overburden surcharge to the soils below.

The presented parameters and elevations are deemed applicable for both bent locations. It is recognized that the parameters are based on investigation carried out within the existing streambed while the new Bent #2 will be located farther west in the area of the existing west abutment where the soils could be possibly less impacted by the flood flows. However, in the absence of appropriate data the presented parameters are deemed appropriately conservative.

Table 10
p-y Curve Parameters for LPile Analyses ¹

Elevation ² (ft)	Depth (ft)	ϕ (deg)	k (pci)	Effective Unit Weight ³ (pcf)	p-multiplier ³
869.5 – 867.5	0 – 2 (near surface disturbance zone)	33	60	10 ⁻⁰⁶	10 ⁻⁰⁶
867.5 – 858.5	2 – 11	33	60	58	1
858.5 – 853.5	11 – 16	38	120	50.1	
853.5 – 848.5	16 – 21	39	140	58	
848.5 – 843.5	21 – 26	38	120	48.3	
843.5 – 838.5	26 – 31	34	70		
838.5 – 819.5	31 – 50	37	105	51.8	

Notes:
¹. API Sand soil model to be used for all layers
². Ground surface (i.e., finished grade / streambed) elevation of 869.50 feet provided by Dokken
³. Within the 2-foot disturbance depth and the scour depth for each Limit State use an effective unit weight of 10⁻⁶ pcf and a p-multiplier of 10⁶

The parameters provided in Table 10 are for a single pile subjected to lateral load. Since closely spaced piles are considered, the lateral load capacity should be reduced to consider the pile group interaction as discussed below.

For lateral load parallel to the pile bent row, there would be a reduction of the lateral load capacity if the center-to-center spacing between piles is less than 8 times the diameter (D) of a single pile. The p-multipliers presented in Table 11a are recommended by Caltrans California Amendments to AASHTO LRFD Bridge Design Specifications (2022), Section 10.7.2.4. These p-multipliers for the leading pile row, 2nd, and 3rd and subsequent pile rows, should be used in by multiplying the p-multipliers provided in Table 10.

Table 11a
Pile p-multipliers for Closely Spaced Piles
Static Loading Parallel with the Pile Row

Pile Center to Center spacing (in the direction of loading)	p-multiplier		
	Row 1	Row 2	Row 3 and higher
2 D	0.60	0.35	0.25
3 D	0.75	0.55	0.40
5 D	1.00	0.85	0.70
7 D	1.0	1.0	0.90

For lateral load is normal (perpendicular) to the pile row, there would be a reduction of the lateral load capacity if the center-to-center spacing between piles is less than 4 times the diameter of a single pile. The p-multipliers presented in Table 11b are recommended by Caltrans California Amendments to AASHTO LRFD Bridge Design Specifications (2022), Section 10.7.2.4. These p-multipliers should be used by multiplying the p-multipliers provided in Table 10.

Table 11b
Pile p-multipliers for Closely Spaced Piles
Static Loading Perpendicular to the Pile Row

Pile Center to Center spacing (in the direction perpendicular to the loading)	p-multiplier
2.5 D	0.8
3 D	0.9
4 D	1.0

Under cyclic conditions (earthquake loading), FHWA-NHI-11-032 (2011) Section 10.6.4 recommends for lateral load parallel to a pile row p-multipliers as shown in Table 11c. These p-multipliers should be used by multiplying these p-multipliers with the scour/disturbance zone p-multipliers listed in Table 10. The p-multipliers provided in Table 11a should not be used because the shading effect is already included in the cyclic p-multipliers.

Table 11c
Pile p-multipliers for Closely Spaced Piles
Cyclic Loading Parallel with the Pile Row

Pile Center to Center spacing (in the direction of loading)	p-multiplier
3 D	0.5
4 D	0.7
5 D	0.9

7.7.3. Pile Construction Recommendations

The performance and capacities of CIDH piles can be significantly influenced by the used construction methods and procedures. Construction methods that create large zones of disturbance around the drilled pile boreholes can lead to lower-than-expected skin friction and/or lateral support. Therefore, it is recommended that an experienced contractor be retained for installation of the CIDH piles.

The pile construction will include the drilling of 24-inch-diameter boreholes. It is anticipated that conventional drilling equipment can be used considering that the exploratory borings were previously excavated with a regular hollow stem auger without excessive effort. It is expected that

groundwater will likely not be encountered as long as the drilling is performed during the dry season and therefore, it is not expected to impact the drilling progress. However, it is expected that some zones of coarse-grained materials may cave during drilling. Consequently, the Contractor should be prepared to address and minimize the impact of such adverse conditions. Since the CIDH axial pile capacity relies on the end bearing, it will be necessary for the Contractor to remove any disturbed materials from the bottom of the pile hole.

The CIDH piles should be checked for alignment and plumbness. The amount of acceptable misalignment of a pile is approximately 2 to 3 inches from the exact location and it is usually acceptable to be out of plumb 1 inch over 10 feet of the length of the pile.

Tremie method of concrete placement should be used so that the concrete delivery begins at the bottom of the hole and is always below the rising level of concrete so that all water and/or drilling fluid is removed from the boring. The concrete should be first placed to develop a minimum head of 5 feet of concrete above the bottom of the tremie and then the tremie pipe can be withdrawn in step with the placement of concrete, always maintaining a head of concrete of at least 5 feet above the delivery point. If casing is used, the pipe should be pulled by keeping a positive concrete head above the bottom of the casing. The concrete should not be allowed to fall freely more than 5 feet and to prevent concrete from striking the walls of the borehole possibly causing caving and contamination of the concrete with sloughed material. Concrete should be placed and vibrated throughout the full length of the pile so that voids in pile concrete are minimized. The pile drilling, the steel cage installation, and the concrete pour should be completed within the same day, that is, pile excavations should not be left open overnight.

7.8. Abutment Footing Foundations

At the abutments the bridge will be supported on an abutment wall supported on buried concrete pad footing. The abutment design configuration data are provided in Table 12.

**Table 12
 Abutment Foundation Design Data**

Support No.	Finished Grade Elevation (feet)	Bottom of Footing Elevation (feet)	Footing Dimension (feet)		Permissible Settlement under Service Load (inch)
			B	L	
Abut 1 (west)	875	860	10	41.7	1
Abut 4 (east)	869.5				

The anticipated loads on the abutment foundations provided by Dokken are summarized in Tables 13a through 13d, and the foundation bearing pressures are provided in Table 14.

Table 13a
Abutment Service I Limit State Loads
Total Loads

Support No.	P ^{TOTAL} Gross (kips)	P ^{TOTAL} Net (kips)	M _x (kips-ft)	M _y (kips-ft)	V _x (kips)	V _y (kips)
Abut 1	1,325	807	956	0	0	458
Abut 4	1,269	840	711	0	0	451

Table 13b
Abutment Service I Limit State Loads
Permanent Loads

Support No.	P ^{PERMANENT} Net (kips)	M _x (kips-ft)	M _y (kips-ft)	V _x (kips)	V _y (kips)
Abut 1	663	117	0	0	428
Abut 4	696	112	0	0	410

Table 13c
Abutment Strength, Construction Limit State Loads

Support No.	P ^{TOTAL} Gross (kips)	M _x (kips-ft)	M _y (kips-ft)	V _x (kips)	V _y (kips)
Abut 1	1,770	1,364	0	0	639
Abut 4	1,688	1,035	0	0	631

Table 13d
Abutment Extreme Event Limit State Loads

Support No.	P ^{TOTAL} Gross (kips)	M _x (kips-ft)	M _y (kips-ft)	V _x (kips)	V _y (kips)
Abut 1	Not applicable				
Abut 4					

Table 14
Abutment Bearing Stresses

Support No.	Service Limit State		Strength Limit State		Extreme Event Limit State	
	B' (feet)	Bearing Stress (ksf)	B' (feet)	Bearing Stress (ksf)	B' (feet)	Bearing Stress (ksf)
Abut 1	8.8	4.1	8.7	5.6	Not applicable	
Abut 4	8.9	4.0	8.8	5.3		
B' – Effective Width						

7.8.1. Bearing Capacity

The foundation design recommendations for the footings at the abutments are provided in Table 15. It is assumed the rock slope protection remains in place during the design storm event and so no scour will take place at the abutments. Furthermore, it is assumed that the soils are fully saturated.

Table 15
Abutment Foundation Design Recommendations

Support Location	Footing Size (feet)		Footing Bottom Elevation (feet)	Minimum Footing Embedment Depth (feet)	Total Permissible Settlement (inches)	Service Limit State	Strength Limit State ($\phi_b=0.45$)	Extreme Event Limit State ($\phi_b=1.0$)
	B	L				Permissible Net Contact Pressure (ksf)	Factored Gross Nominal Bearing Resistance (ksf)	Factored Gross Nominal Bearing Resistance (ksf)
Abut 1	10	41.7	860	9.5	1	4.1 (B' = 8.8 feet)	10 (B'=8.7 feet)	Not applicable
Abut 4						4.0 (B'=8.9 feet)	10 (B'=8.8 feet)	

Additional geotechnical design parameters for the abutment footings are provided in Table 16.

Table 16
Additional Design Parameters
Abutment Footings

Allowable Coefficient of Friction (incorporates $\phi_1 = 0.8$)	<ul style="list-style-type: none"> • 0.44 mass concrete on soil • 0.32 formed concrete on soil
Allowable Lateral Passive Resistance (incorporates $\phi_{cp} = 0.5$)	<ul style="list-style-type: none"> • 110 pcf (EFD, equivalent fluid density, for saturated compacted fill with $\phi=34^\circ$) • The passive resistance derived from the upper 12 inches should be neglected.
Allowable Combined Lateral Resistance	<ul style="list-style-type: none"> • Total allowable resistance to lateral loads can be calculated by combining lateral resistance due to friction at the base and lateral passive resistance. • Passive resistance values may be increased by one-third when considering transient wind or seismic loading

7.8.2. Lateral Pressures on Abutment and Wing Walls

The space behind the abutment/wing walls will be backfilled with engineered fill. The following lateral loads need to be considered for both the abutment walls and the wing walls:

- Geostatic loads after backfill placement;
- Surcharge loads due to embankment and pavement placed above the top of the abutment/wing wall;
- Traffic loads; and,
- Seismically induced loads.

These loads are to be applied to the abutment and wing walls between the bottom of the footing and the top of the wall and be factored by appropriate loading factors for each Limit State.

For the design it is assumed that the embankment fill behind the abutment and wing walls is saturated but no pore pressures develop behind the wall as the design should include a backdrain system consisting of a geocomposite drain connected to a collector pipe to convey the water to a proper outlet. If drainage behind the abutment/wing walls cannot be provided, the walls should be designed to account for full hydrostatic pressure in addition to all the other lateral earth pressures calculated based on buoyant unit weights. The individual lateral loading components should be computed as indicated in the following sections. These loads need to be considered with the appropriate load factors for the different Limit States as indicated in Table 17 per AASHTO (2017) Section 3.4.

Table 17
Factored Load Combinations Involving Earth Loads

Load Combination Limit State	EH ₁ , EH ₂ , ES	LS	EQ
Strength I	$\gamma_{pEH} \cdot EH_2 + \gamma_{pES} \cdot ES$	1.75•LS	-
Strength II	$\gamma_{pEH} \cdot EH_2 + \gamma_{pES} \cdot ES$	1.35•LS	-
Strength III	$\gamma_{pEH} \cdot EH_2 + \gamma_{pES} \cdot ES$	-	-
Strength IV	$\gamma_{pEH} \cdot EH_2 + \gamma_{pES} \cdot ES$	-	-
Strength V	$\gamma_{pEH} \cdot EH_2 + \gamma_{pES} \cdot ES$	1.35•LS	-
Extreme Event I	$\gamma_{pEH} \cdot EH_2 + \gamma_{pES} \cdot ES$	0.5•LS	1.0•EQ
Extreme Event II	$\gamma_{pEH} \cdot EH_2 + \gamma_{pES} \cdot ES$	0.5•LS	-
Service I	1.0•EH ₂ + 1.0•ES	1.0•LS	-
Service II	1.0•EH ₂ + 1.0•ES	1.30•LS	-
Service III	1.0•EH ₂ + 1.0•ES	0.80•LS	-
Service IV	1.0•EH ₂ + 1.0•ES	-	-
Fatigue I	-	1.50•LS	-
Fatigue II	-	0.75•LS	-

Where:
 EH₂ is the horizontal Earth Pressure after backfill placement
 ES is the Earth Surcharge
 LS is the Live Load Surcharge due to vehicular traffic
 EQ is the Earthquake Seismic Increment
 γ_{pEH} is the limit state coefficient and has a maximum value of 1.35 and a minimum of 0.90
 γ_{pES} is the limit state coefficient has a maximum value of 1.5 and a minimum of 0.75
 This Table only presents the load components and factors applicable to earth loads. Other loads and load combinations must be considered by designer in accordance with AASHTO (2017) Section 3.4.

7.8.2.1. Lateral Geostatic Earth Pressure (EH₂)

The walls will be loaded laterally by the backfill as indicated by the expression below:

$$P_{TOTALGeostatic} = 0.5 * K_l * \gamma * H_w^2 \text{ (lbf/ft of wall length)}$$

where: K_l ... for wingwalls use active pressure coefficient for the engineered backfill soils considering a level grade behind the wall of 0.28; for diaphragm abutment walls use at-rest pressure coefficient for the engineering backfill soils considering a level grade behind the wall of 0.44;
 γ ... unit weight of the embankment soil behind the abutment/wing wall; use 125 pcf;
 H_w ... abutment/wing wall height above the bottom of footing elevation.

The lateral earth pressure distribution is triangular as shown in Figure 7 – Loading Diagram of Geostatic Pressures on Abutment/Wing Wall, and the maximum ordinate for the lateral earth pressures p_l can be determined as follows:

$$p_a = \frac{2P_{TOTALGeostatic}}{H_w} = K_l \gamma H_w$$

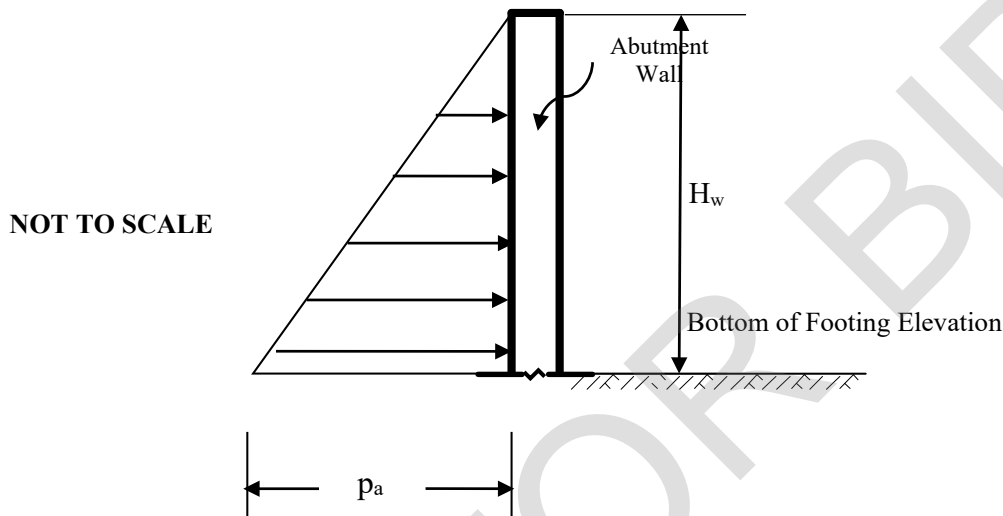


Figure 7. Loading Diagram of Geostatic Pressures on Abutment/Wing Wall

7.8.2.2. Lateral Pressure due to the Embankment above Top of Wall (ES)

The total force due to the embankment and pavement section surcharge can be calculated as shown below:

$$P_{TOTAL Embankment} = K_l \gamma H_{Embankment} H_w \quad (\text{lb/ft of wall width})$$

- Where:
- K_l ... for wingwalls use active pressure coefficient for the engineered embankment fill considering a level grade behind the wall; use 0.28; for diaphragm abutment walls use at-rest pressure coefficient for the engineered embankment soils considering a level grade behind the wall, use 0.44;
 - γ ... unit weight of the embankment soil behind the wall; use 125 pcf;
 - $H_{Embankment}$... height of the embankment (including pavement section) above the top of the wall;
 - H_w ... wall height above the bottom of footing elevation.

The lateral earth pressure distribution is uniform rectangular as depicted in Figure 8 – Loading Diagram of Lateral Earth Pressures Induced by the Embankment Surcharge behind the Abutment/Wing Wall, and the pressure diagram ordinate p_a can be determined as follows:

$$p_a = K_l \gamma H_{Embankment}$$

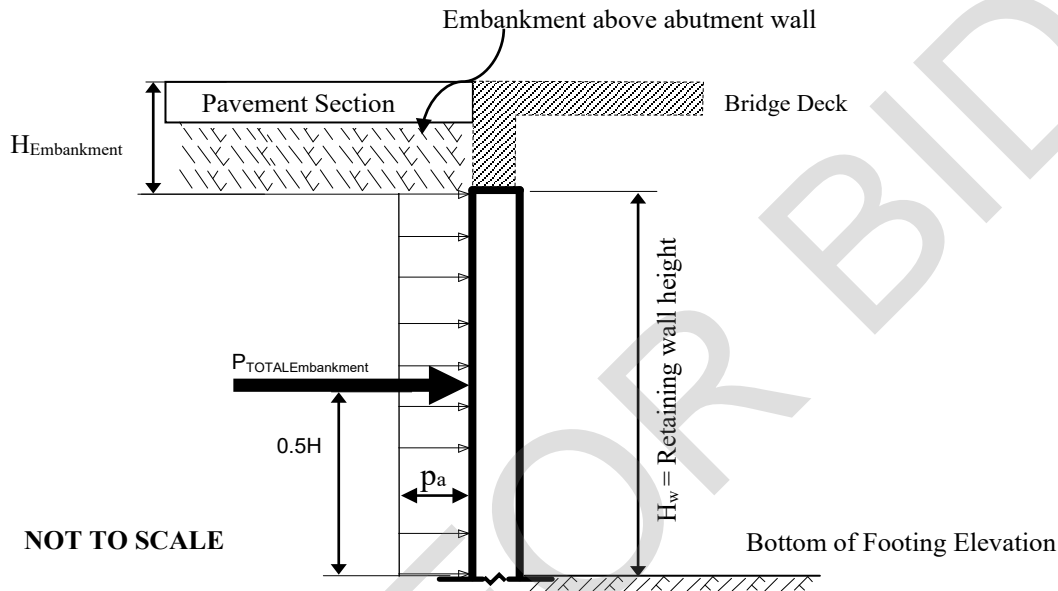


Figure 8. Loading Diagram of Lateral Earth Pressures Induced by the Embankment Surcharge behind the Abutment/Wing Wall

7.8.2.3. Lateral Pressure due to the Live Load Surcharge (LS)

The total force due to the vehicular traffic loading is determined based on the AASHTO LRFD Bridge Design Specifications (2017) Section 3.11.6.4 as an equivalent surcharge load. The total force due to the live load surcharge can be calculated as shown below:

$$P_{TOTAL\ Traffic} = K_l \gamma H_{Traffic} H_w \quad (\text{lbf/ft of wall width})$$

- Where:
- K_l ... for wingwalls use active pressure coefficient for the engineered embankment soils considering a level grade behind the wall, use 0.28;
 for diaphragm abutment walls use at-rest pressure coefficient for the engineering embankment soils considering a level grade behind the wall; use 0.44;
 - γ ... unit weight of the embankment soil behind the wall; use 125 pcf;
 - $H_{Traffic}$... equivalent height of soil for vehicular traffic; use 4 feet for loading on abutment/wing walls perpendicular to traffic and 2 feet for walls parallel to traffic;

H_w ... wall height above the bottom of footing elevation.

The lateral earth pressure distribution is uniform rectangular as depicted in Figure 9 – Loading Diagram of Lateral Earth Pressures Induced by Traffic Loading, and the pressure diagram ordinate p_a can be determined as follows:

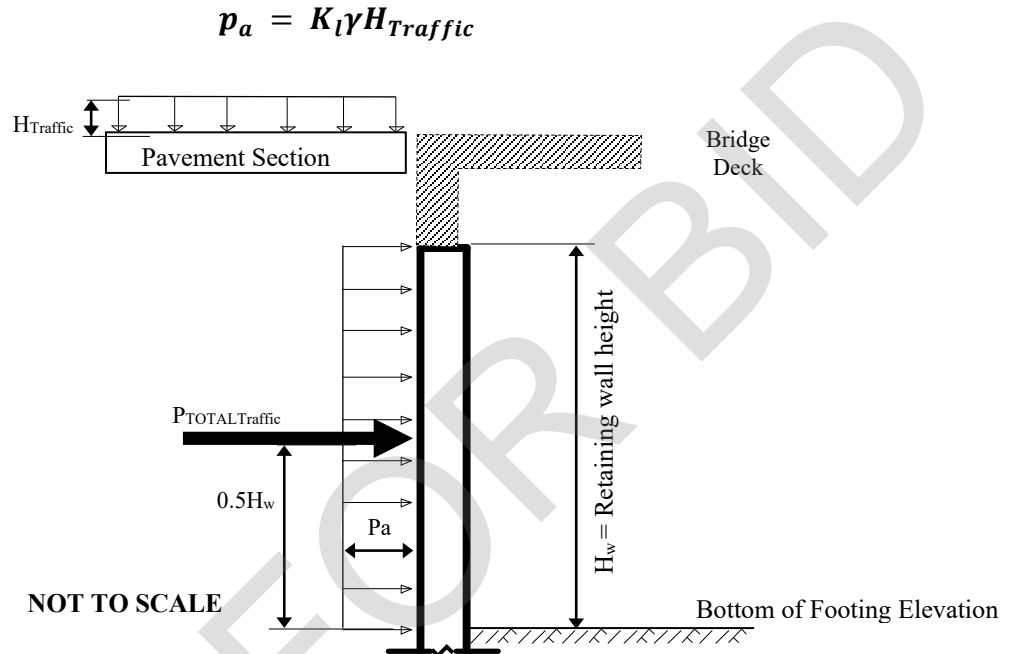


Figure 9. Loading Diagram of Lateral Earth Pressures Induced by Traffic Loading

7.8.2.4. Lateral Earth Pressure Increment due to Seismic Loading (EQ)

The Mononobe-Okabe (1929, 1926) approach was used to determine the coefficient of active seismic pressure on the abutment/wing wall and for subsequent calculation of the total (geostatic + seismic increment) lateral load. A horizontal seismic coefficient k_h of 0.33 was used as recommended by AASHTO (2017) Section 11.6.5.3 for non-yielding walls. This total lateral load includes the effects of the seismically induced loading from the wall backfill as well as the embankment above the top of the abutment/wing wall and can be computed as follows:

$$P_{TOTAL SEISMIC} = 0.5 \gamma K_a'' H^2 \quad (\text{lb/ft of wall width})$$

Where: K_a'' ... total seismic coefficient of active earth pressure for the embankment soils calculated using the Mononobe-Okabe approach for a horizontal seismic coefficient of 0.33; use 0.52 for a backfill friction angle of 34° and an interface angle of friction δ of 0° ;

γ ... unit weight of the embankment soil behind the abutment/wing wall; use 125 pcf;

H ... total height of soil retained above the bottom of the footing elevation, $H_{embankment} + H_w$ as depicted in Figure 10.

The total lateral earth pressure distribution is triangular (similar to Figure 7), and the maximum ordinate for the lateral earth pressures p_a for the seismic case, can be determined as follows:

$$p_a = 2 \frac{P_{TOTAL SEISMIC}}{H}$$

Because the net seismic increment load due to the soil retained behind and above the top of the wall is required for the LRFD procedure rather than the total seismic lateral load, the seismic increment can be computed by subtracting the active static force from the total lateral seismic force and redistributing into a uniform rectangular distribution as shown in Figure 10 – Loading Diagram of Seismic Pressure Increment of Earth Pressure. The net seismic increment force can be computed as follows:

$$P_{SEISMIC\ increment} = 0.5 \gamma K_a'' H^2 - 0.5 \gamma K_a H^2 = 15.7 H^2 \quad (\text{lb/ft of wall width})$$

Where: K_a ... coefficient of active earth pressure for the embankment soils; use 0.28
 K_a'' ... total seismic coefficient of active earth pressure for the embankment soils calculated using the Mononobe-Okabe approach for horizontal seismic coefficient 0.33; use 0.52 for a backfill friction angle of 34° and an interface angle of friction δ of 0° .

The uniform rectangular seismic increment distribution ordinate p_a can be determined as follows:

$$p_a = 15.7 \frac{H^2}{H_w}$$

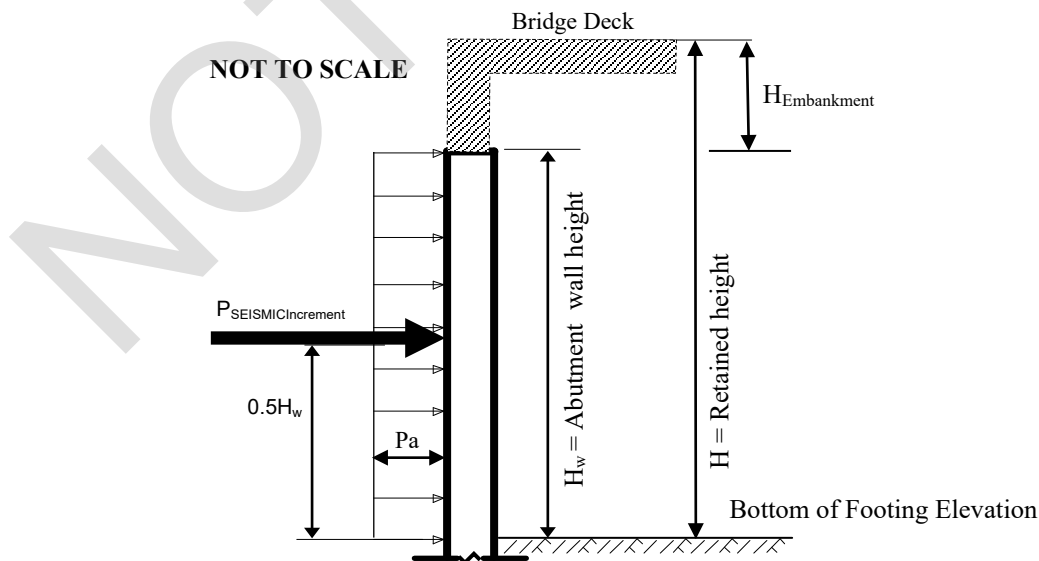


Figure 10. Loading Diagram of Seismic Pressure Increment of Earth Pressures

7.8.2.5. Passive Lateral Resistance

The maximum passive force resisting the movement of a diaphragm abutment (*dia*) in the longitudinal direction can be computed according to Caltrans Seismic Design Criteria (2019) Section 6.3 as follows:

$$P_{dia} = w_{dia} * e^{-\theta/45} * \frac{5.5 * h_{dia}^{2.5}}{1 + 2.37 h_{dia}} \text{ (kips)}$$

Where: w_{dia} ... abutment width along the skew direction in feet;
 h_{dia} ... height of the diaphragm abutment in feet;
 θ ... abutment skew angle (degrees);

The abutment stiffness for fill material meeting the requirements of Caltrans Standard Specifications (2022) can be computed as follows:

$$K_{dia} = w_{dia} * (5.5 * h_{dia} + 20) * e^{-\theta/45} \text{ (kips/inch)}$$

Bridge abutments are only effective in compression. The structural designer will have to consider the contributions of other structural elements in the longitudinal direction.

The magnitude of the transverse stiffness can be taken into consideration by the structural designer in accordance with SDC Caltrans (2019) as described in Section 6.3.2.

7.9. Soil Corrosion

Laboratory testing was performed on representative soil samples to determine soluble sulfate content, pH, minimum resistivity, and chlorides content. Table 18 below presents the results of the corrosivity testing.

The corrosion potential of the on-site materials to buried concrete and steel was evaluated in accordance with Caltrans corrosive environment evaluation criteria. Caltrans considers a site to be corrosive, if at least one of the following conditions exists:

- Chloride content ≥ 500 ppm;
- Soluble sulphate content $\geq 2,000$ ppm;
- $\text{pH} \leq 5.5$.

Minimum resistivity serves only as an indicator parameter for the possible presence of soluble salts and thus higher propensity for corrosion.

Table 18
Corrosivity Results

Location	Sample ID	Depth	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content / Sulfate Exposure CTM 417
B-1	SK-1	0 – 5 feet	16,200	7.7	6 ppm
B-3	SK-3	0 – 6 feet	Not tested	Not tested	14 ppm

Observations and laboratory tests indicate that based on the Caltrans’ criteria the soils at the site are not considered corrosive. The corrosion potential of the on-site soils should be verified during construction for each encountered soil type. Any imported fill materials should be tested to confirm that their corrosion potential is not more severe than those assumed herein.

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8. GENERAL SITE GRADING RECOMMENDATIONS

The intent of this section is to provide general information regarding the site grading. Site grading operations should conform with applicable local building and safety codes and to the rules and regulations of those governmental agencies having jurisdiction over the subject construction.

The grading contractor is responsible for notifying governmental agencies, as required, and the Geotechnical Engineer of Record at the start of site cleanup, at the initiation of grading, and any time that grading operations are resumed after an interruption. Each step of the grading should be accepted by the Geotechnical Engineer of Record, and where required, should be approved by the applicable governmental agencies prior to proceeding with subsequent work.

The following site grading recommendations should be regarded as minimal. The site grading recommendations should be incorporated into the project plans and specifications.

1. Prior to grading, existing vegetation, trash, surface structures and debris should be removed and disposed off-site at a legal dumpsite. Any existing utility lines, or other subsurface structures which are not to be utilized, should be removed, destroyed, or abandoned in compliance with current governmental regulations.
2. Subsequent to cleanup operations, and prior to initial grading, a reasonable search should be made for subsurface obstructions and/or possible loose fill or detrimental soil types. This search should be conducted by the contractor, with advice from and under the observation of a representative of the geotechnical engineer of record.
3. Prior to installation of foundations or any placement of fill, the site should be prepared in accordance with the recommendations presented in the section “Site Preparation” of this report. All undocumented fill or disturbed soils within the construction area should be removed and processed as recommended by the Geotechnical Engineer of Record.
4. The exposed subgrade and/or excavation bottom for the abutment footings should be observed and approved by the Geotechnical Engineer of Record for conformance with the intent of the recommendations presented in this report and prior to any further construction or fill placement. It should be understood that the actual encountered conditions may warrant excavation and/or subgrade preparation beyond the extent recommended and/or anticipated in this report.
5. On-site inorganic granular soils that are free of debris or contamination are considered suitable for placement as compacted fill.
6. Any imported fill material required for backfill or grading should be tested and approved prior to delivery to the site.
7. Visual observations and field tests should be performed during grading and pile and foundations construction by the Geotechnical Engineer of Record.

8. Wherever, in the opinion of the Geotechnical Engineer of Record, an unsatisfactory geotechnical grading or foundation condition is being created in any area, the work should not proceed in that area until the condition has been corrected.

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9. DESIGN REVIEW AND CONSTRUCTION MONITORING

Geotechnical review of plans and specifications and participation during construction are an integral part of the geotechnical design practice. The following sections present our recommendations relative to the review of construction documents and the monitoring of construction activities.

9.1. Plans and Specifications

Upon completion, the civil and structural design plans and specifications should be reviewed and approved by Tetra Tech prior to submittal for issuance of grading and construction permit and prior to bidding of construction tasks as the geotechnical recommendations may need to be re-evaluated based on the actual design configuration and loads. This review is necessary to evaluate whether the recommendations contained in this report have been incorporated into the project plans and specifications as intended.

9.2. Construction Monitoring

The objective of the construction quality assurance (CQA) is to assist in the construction of the soils and soils-structure interaction components of the project. Continuous observation of site excavation, processing and assessment of fill materials, fill placement, foundation installation, and other site grading operations by the Geotechnical Engineer should be implemented during construction to allow for evaluation of the geotechnical-related conditions as they are encountered. This process provides the Geotechnical Engineer with the opportunity to recommend appropriate revisions as needed.

9.2.1. Grading Observations

The Geotechnical Engineer should observe the excavation, subgrade preparation for foundations, pavements, and fill placement so that appropriate modifications to the design, extent, or procedure may be provided, as necessary, should conditions encountered during grading differ from the design assumptions. The grading observations by the Geotechnical Engineer are also recommended to assist the Contractor in obtaining the proper moisture content and required degree of compaction.

9.2.2. Foundation Subgrade Observations

The Geotechnical Engineer should observe and evaluate the presence of satisfactory materials at the foundation subgrade. The foundations excavations should be observed by the Geotechnical Engineer to verify if soft or loose soils or other unsatisfactory materials are encountered, and whether or not such materials should be removed and replaced with compacted fill prior to pouring the foundation.

9.2.3. CIDH Pile Installation Observations

The installation of the CIDH piles should be carried out under the continuous observation of the Geotechnical Engineer to verify the installation configuration, design assumptions and conformance with the intent of the recommendations contained herein, and to provide additional recommendations as appropriate.

CIDH pile acceptance testing should also be performed in accordance with California Test 233 (Caltrans, 2005), “Method of Ascertaining the Homogeneity of Concrete in CIDH Piles Using the Gamma-Gamma Test Method”.

9.2.4. Pavement Construction Observations

Preparation of the pavement subgrade and the placement of base course and pavement sections should be observed by the Geotechnical Engineer. Careful observation is recommended to evaluate that the pavement subgrade is uniformly compacted, and the recommended pavement and base course thicknesses are achieved.

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10. LIMITATIONS

The recommendations and opinions expressed in this report are based on Tetra Tech’s review of background documents and on information obtained from limited field explorations and the associated laboratory testing. It should be noted that this study did not evaluate the possible presence of hazardous materials on any portion of the site.

Due to the limited nature of the field explorations, conditions not observed and described in this report may be present on the site. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation and laboratory testing can be performed upon request. It should be understood that conditions different from those anticipated in this report may be encountered during construction operations, for example, the extent of unsuitable soil and the associated additional effort required to mitigate them or a presence of difficult grading or drilling conditions.

Site conditions, including groundwater level, can change with time as a result of natural processes or the activities of man at the subject site or at nearby sites. Changes to the applicable laws, regulations, codes, and standards of practice may occur as a result of government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Tetra Tech has no control. Therefore, this report should be reviewed and recertified if it were to be used for a project design commencing more than 1 year after the date of issuance of this report.

Tetra Tech’s recommendations for this site are, to a high degree, dependent upon appropriate quality control of subgrade preparation, fill placement, and foundation construction. Accordingly, the recommendations are made contingent upon the opportunity for Tetra Tech to observe grading operations and foundation excavations for the proposed construction. If parties other than Tetra Tech are engaged to provide such services, such parties are automatically assuming complete responsibility as the Geotechnical Engineer of Record for the project and are deemed concurring with the recommendations in this report or are obligated to provide alternative recommendations.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Tetra Tech should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document. Reliance by others on the data presented herein or for purposes other than those stated in the text is authorized only if so permitted in writing by Tetra Tech. It should be understood that such an authorization may incur additional expenses and charges.

Tetra Tech has endeavored to perform its evaluation using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil conditions. No other warranty, either expressed or implied, is made as to the conclusions and recommendations contained in this report.

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Figures

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