

INDEX OF SHEETS

1. TITLE SHEET
2. DETOUR
3. GENERAL PLAN OF SITE
- 4.-5. TYPICAL SECTIONS
- 6.-7. GENERAL PLAN OF STRUCTURE
8. STEEL SHEETING LAYOUT
- 9.-10. CROSS SECTION SHEETS
- 11.-15. GUARDRAIL DETAILS
- SD1.-17. MDOT SPECIAL DETAILS

MDOT SPECIAL DETAILS INCLUDED IN PLAN SET

- R-60-J GUARDRAIL TYPES A, B, BD, T, TD, MGS-8, & MGS-8D
- R-73-F GUARDRAIL OVER BOX OR SLAB CULVERTS
- R-80-F GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS FOR UNDERDRAINS, AND SEWER BULKHEADS
- R-100-I SEEDING AND TREE PLANTING

MDOT DETAILS NOT INCLUDED IN PLAN SET

- R-84-A BOX CULVERT JOINT TIE ASSEMBLIES
- R-96-E SOIL EROSION & SEDIMENTATION CONTROL MEASURES
- B-103-E MOLDING, BEVEL, LIGHT STANDARD ANCHOR BOLT ASSEMBLY AND NAME PLATE DETAILS

GENERAL NOTES

EXCEPT WHERE OTHERWISE INDICATED ON THESE PLANS, OR IN THE PROPOSAL AND SUPPLEMENTAL SPECIFICATIONS CONTAINED HEREIN, ALL MATERIALS AND WORKMANSHIP SHALL BE ACCORDING TO THE MICHIGAN DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION, 2020 EDITION.

THE DESIGN OF THIS STRUCTURE IS BASED ON CURRENT AASHTO LRFD BRIDGE DESIGN, HL-93 LOADING. LIVE LOAD PLUS DYNAMIC LOAD ALLOWANCE DEFLECTION DOES NOT EXCEED 1/800 OF THE SPAN LENGTH.

THE PROPOSED IMPROVEMENTS COVERED BY THESE PLANS ARE IN ACCORDANCE WITH THE AASHTO: A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS, 2011.

BEVEL ALL EXPOSED CONCRETE CORNERS SHOWN SQUARE ON THE PLANS WITH ½” TRIANGULAR MOLDINGS EXCEPT AS OTHERWISE NOTED.

OLD PLANS DO NOT EXIST FOR THIS STRUCTURE.

UNLESS OTHERWISE SHOWN ON THE PLANS, PROVIDE MINIMUM CONCRETE CLEAR COVER FOR REINFORCEMENT ACCORDING TO THE FOLLOWING:

- CONCRETE CAST AGAINST EARTH:3 in.
- PRESTRESSED BEAMS:1 in.
- ALL OTHER UNLESS SHOWN ON PLANS:2 in.

THE DESIGN OF THE STRUCTURAL MEMBERS IS BASED ON MATERIAL OF THE FOLLOWING GRADES AND STRESSES:

- PERMANENT STEEL SHEETING:fy = 50,000 psi
- STRUCTURAL STEELfy = 36,000 psi
- REINFORCING STEELfy = 60,000 psi
- CONCRETE GRADE 3500fc = 3000 psi
- THREADED TIE BACK RODfy = 75,000 psi

HAMLIN TOWNSHIP

PLAN AND PROFILE OF PROPOSED
BRIDGE REPLACEMENT

LAKESHORE DR. OVER SOUTH BAYOU
SECTION 27, HAMLIN TOWNSHIP, T19N, R18W

FOR THE PROTECTION OF UNDERGROUND UTILITIES AND IN CONFORMANCE WITH PUBLIC ACT 174 OF 2013, THE CONTRACTOR SHALL CONTACT MISS DIG SYSTEM, INC. BY PHONE AT 811 OR 800-482-7171 OR VIA THE WEB AT EITHER ELOCATE.MISSDIG.ORG FOR SINGLE ADDRESS OR RTE.MISSDIG.ORG, A MINIMUM OF 3 BUSINESS DAYS PRIOR TO EXCAVATING, EXCLUDING WEEKENDS AND HOLIDAYS. ALL "MISS DIG" PARTICIPATING MEMBERS WILL THUS BE ROUTINELY NOTIFIED. THIS DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF NOTIFYING UTILITY OWNERS WHO MAY NOT BE A PART OF THE "MISS DIG" ALERT SYSTEM.



UTILITIES

ELECTRIC — CONSUMERS ENERGY
ERIC MARR
300 CHESTNUT ST
CADILLAC, MI 49601
231-250-4505
eric.marr@cmsenergy.com

GAS — DTE
LARRY BOURKE
3609 BJORNSON RD.
BIG RAPIDS, MI 49307
231-349-2364
lawrence.bourke@dteenergy.com

CTV — CHARTER
BRAD KULICAMP
315 DAVIS STREET
GRAND HAVEN, MI 49417
616-607-2356
brad.kulicamp@charter.com

DESIGN CRITERIA

DESIGN SPEED	20 MPH
POSTED SPEED	25 MPH
PRESENT ADT (2023)	250
PRESENT COM.	1%
DESIGN ADT (2043)	305
DESIGN COM.	1%
DESIGN LOADING	HL-93
DEFLECTION	L/800

CONTRACT FOR: CULVERT REPLACEMENT AND RELATED APPROACH WORK

HAMLIN TOWNSHIP

NANCY VANDERVEST - TWP SUPERVISOR

DATE



SCOTT CIVIL ENGINEERING COMPANY
1345 MONROE AVENUE, SUITE 136
GRAND RAPIDS, MICHIGAN 49505

PREPARED UNDER THE SUPERVISION OF:

RYAN T. WORDEN, P.E.
REGISTERED PROFESSIONAL ENGINEER NO. 53319

DATE

C

LAKESHORE DR. OVER SOUTH BAYOU

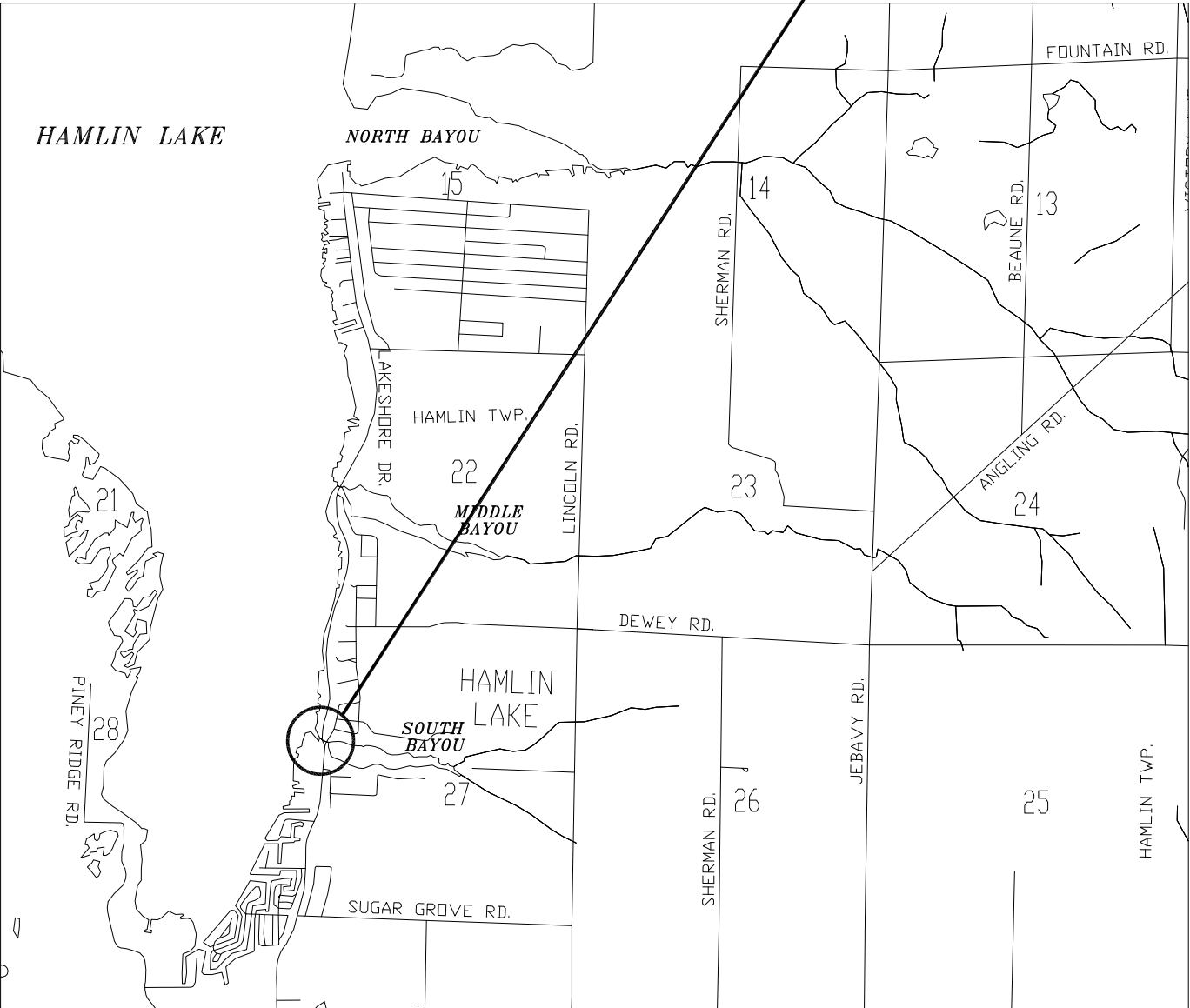


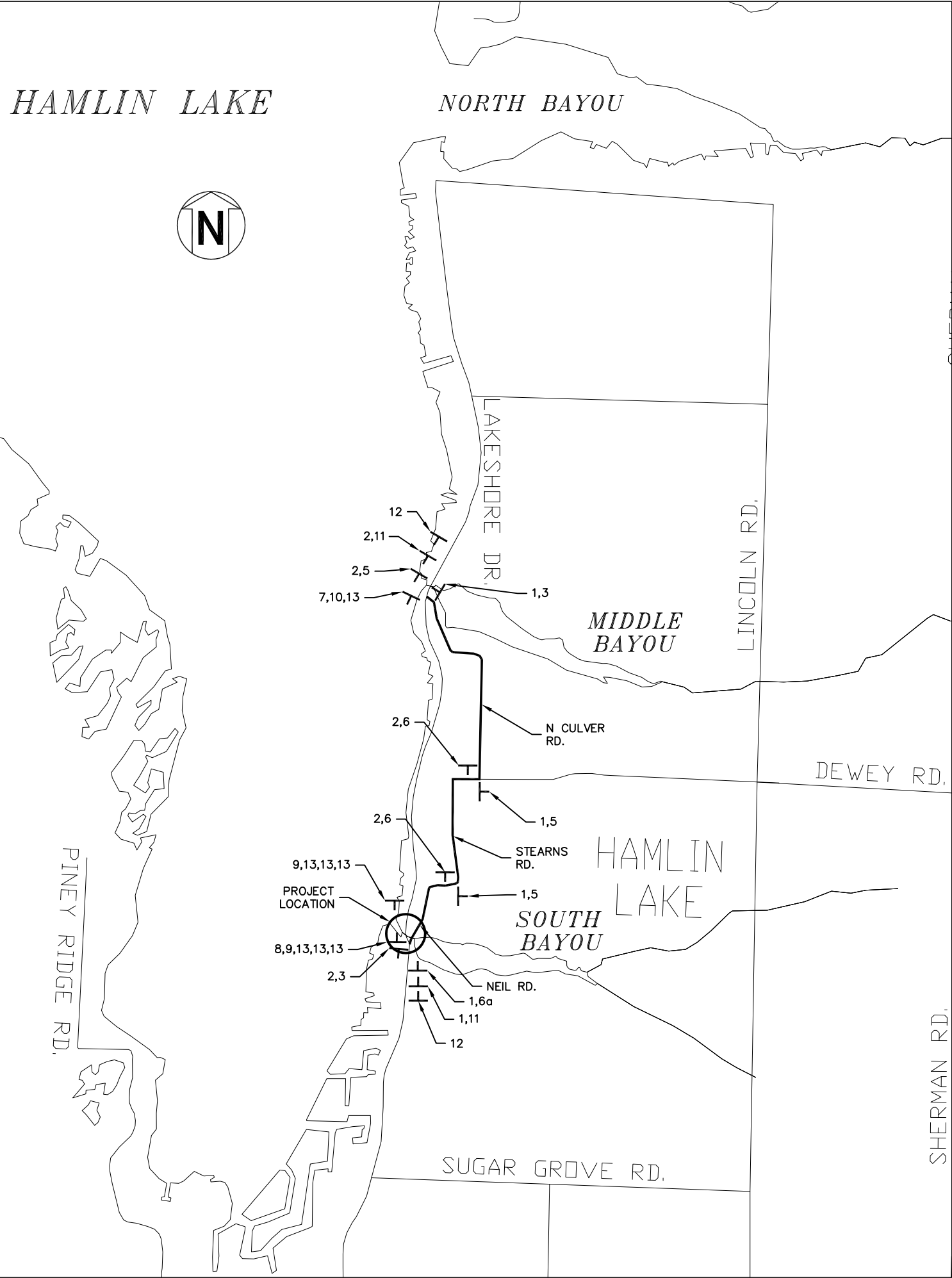
PROJECT LOCATION

POB: 9+60

POE: 12+00

PROJECT LENGTH = 240'





SIGN DETAILS				
REFERENCE NO.	SIGN	SIGN TYPE/SIZE	QUANTITY	PAY QUANTITY (Sft)
*1		D3-2a 3' x 2'	5	30.0
*2		D3-2a 3' x 2'	5	30.0
3		M4-8a 2' x 1.5'	2	6.0
4		M4-9 2.5' x 2'	0	0.0
5		M4-9(L) 2.5' x 2'	3	15.0
6		M4-9(R) 2.5' x 2'	2	10.0
6a		M4-9(UR) 2.5' x 2'	1	5.0
7		M4-10(L) 4' x 1.5'	1	6.0
8		M4-10(R) 4' x 1.5'	1	6.0
9		R11-2 4' x 2.5'	2	20.0
10		R11-4 5' x 2.5'	1	12.5
11		W20-2 4' x 4'	2	32
12		W20-3 4' x 4'	2	32
13		TYPE III BARRICADE	7	-
SIGN, TYPE B, TEMP, PRISMATIC, FURN AND OPER TOTAL				144.5
*SIGN, TYPE B, TEMP, PRISMATIC, SPEC, FURN AND OPER TOTAL				60.0

- NOTES:
1. CONTRACTOR TO FURNISH AND PLACE ALL SIGNS FOR DETOUR ROUTE AS INDICATED ON THIS SHEET OR AS DIRECTED BY THE ENGINEER.
 2. CONTRACTOR TO FURNISH AND PLACE TYPE III BARRICADES, HIGH INTENSITY, LIGHTED, AS SHOWN ON THIS SHEET OR AS DIRECTED BY THE ENGINEER.
 3. ADDITIONAL TYPE III BARRICADES AND TYPE B TEMPORARY SIGNING MAY BE REQUIRED TO SUFFICIENTLY CONTROL AND DIRECT TRAFFIC, AS DIRECTED BY THE ENGINEER.
 4. THE SPECIAL FABRICATION SIGNING WILL BE BLACK LETTERING ON AN ORANGE BACKGROUND.
 5. ALL SIGNS SHALL HAVE BORDERS AS REQUIRED IN THE 2011 MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MMUTCD).
 6. ALL SIGN POSTS MUST BE DRIVEN INTO THE GROUND AS SPECIFIED IN THE PROPOSAL.

TRAFFIC CONTROL QUANTITIES			
PAY ITEM NO.	ITEM OF WORK	UNIT	TOTAL
8120012	Barricade, Type III, High Intensity, Double Sided, Lighted, Furn	Ea	7
8120013	Barricade, Type III, High Intensity, Double Sided, Lighted, Oper	Ea	7
8120170	Minor Traf Devices	LSUM	1
8120350	Sign, Type B, Temp, Prismatic, Furn	Sft	145
8120351	Sign, Type B, Temp, Prismatic, Oper	Sft	145
8120352	Sign, Type B, Temp, Prismatic, Spec, Furn	Sft	60
8120353	Sign, Type B, Temp, Prismatic, Spec, Oper	Sft	60

HAMLIN TOWNSHIP

DETOUR
LAKESHORE DR.
OVER SOUTH BAYOU

SCOTT CIVIL ENGINEERING COMPANY
GRAND RAPIDS, MICHIGAN

DRAWN

AE

CHECKED

RTW

DATE

1/31/24

2

15



SCALES:
1" = 30' HOR
1" = 3' VER

BENCHMARK #1 - ELEV. 597.21
CUT SPIKE IN WEST SIDE OF UTILITY POLE
NORTH OF BOAT LAUNCH DRIVE, RIGHT SIDE
OF LAKESHORE DRIVE.

BENCHMARK #2 - ELEV. 597.39
CUT SPIKE IN WEST SIDE OF TREE
STA. 12+32.41, 29.47' RT

EXISTING STRUCTURE NOTES:

MULTIPLATE CMP PIPE ARCH (14-10" SPAN BY 9'-1" RISE) WITH STEEL SHEET HEAD WALLS. POSTED LOAD LIMIT IS 16/48/56. EXISTING SHEETING IS IN POOR CONDITON WITH HOLES AND LEANING. REMOVAL INCLUDED IN ITEM "STRUCTURES, REMOVE".

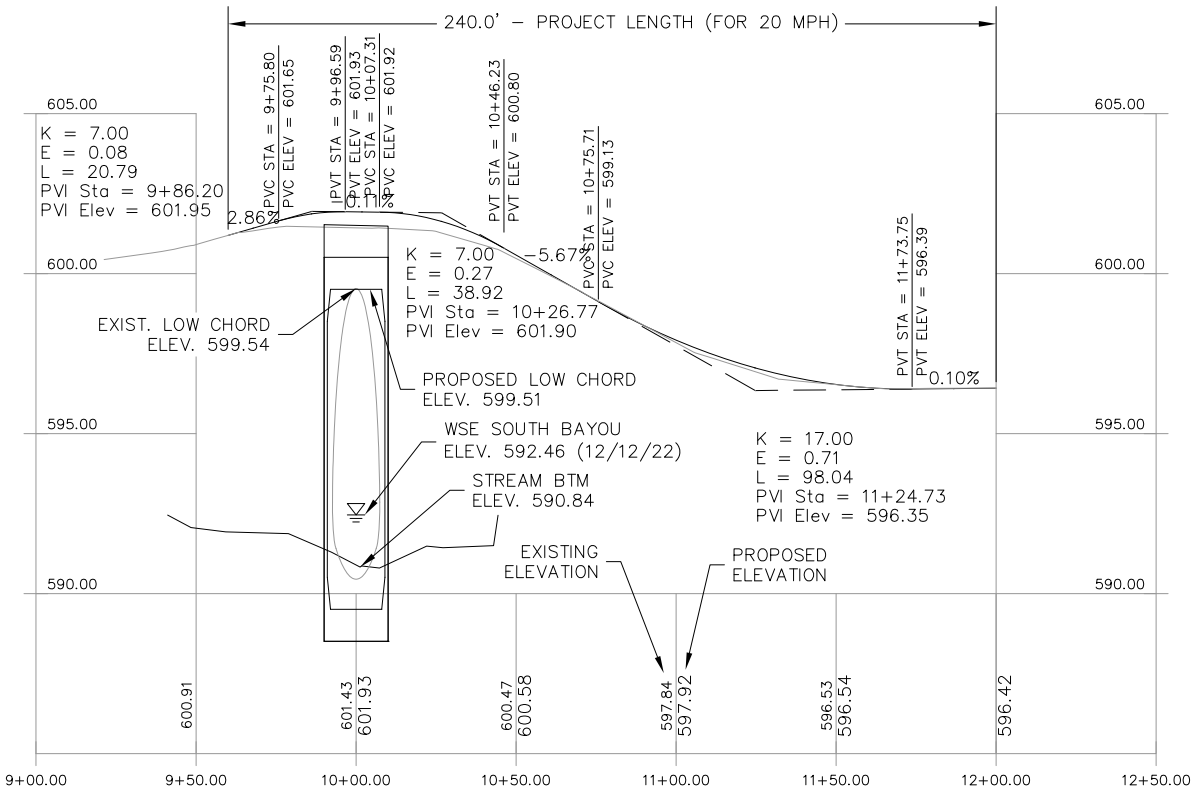
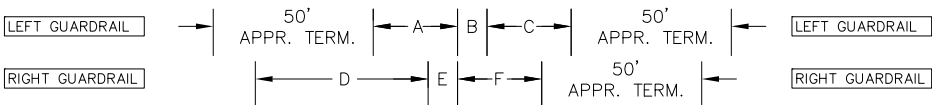
CIRCULAR CURVE #2

T = 89.49'
R = 636.07'
L = 177.81'
E = 6.26'
PI STA = 10+87.34
I = 9°0'28"
PC STA = 9+97.85
PT STA = 11+75.67

CIRCULAR CURVE #1

T = 19.77'
R = 35.45'
L = 36.07'
E = 5.14'
PI STA = 9+55.92
I = 161°36'37"
PC STA = 9+36.15
PT STA = 9+72.22

PLAN



PROFILE

GUARDRAIL LAYOUT		
LEFT		
DIMENSION	STA.- STA.	POST TYPE AND SPACING
A	9+78.1-10+00.0	TYPE B POSTS @ 3'-1.5" SPA.
B	10+00.0-10+09.2	CULV. POST @ 3'-1.5" SPA.
C	10+09.2-10+27.7	TYPE B POSTS @ 3'-1.5" SPA.
RIGHT		
*D	9+75.5-9+90.6	TYPE B POSTS @ 3'-1.5" SPA.
E	9+90.6-10+00.0	CULV. POST @ 3'-1.5" SPA.
F	10+00-10+12.7	TYPE B POSTS @ 3'-1.5" SPA.

NOTE:
STATIONING PERPENDICULAR TO CENTERLINE ALIGNMENT AT FACE OF SPACER BLOCK. CONSTRUCT GUARDRAIL STARTING WITH THE CULVERT RAIL POST PLACEMENT.

*ATTACH INTO EXISTING GUARDRAIL IN SE QUAD. CONTRACTOR TO DETERMINE IF A SHOP BENT PANEL IS NEED, INCLUDED IN ITEM "GUARDRAIL, TYPE B, MODIFIED".

SEE SHEET 7 FOR CULVERT RAIL POST DETAILS.

APPROACH TERMINALS PAID AS "GUARDRAIL APPROACH TERMINAL, TYPE 2B".

GENERAL NOTES

THE WORK COVERED BY THESE PLANS INCLUDES: MAINTAINING TRAFFIC, REMOVAL OF THE EXISTING CULVERT, CONSTRUCTION OF THE PROPOSED BOX CULVERT, STEEL SHEETING REPLACEMENT, SIDEWALK, AND APPROACH ROAD WORK TO THE LIMITS SHOWN.

THE CONTRACTOR SHALL LOCATE ALL ACTIVE UNDERGROUND UTILITIES PRIOR TO STARTING WORK AND SHALL CONDUCT HIS OPERATIONS IN SUCH A MANNER AS TO ENSURE THAT THOSE UTILITIES NOT REQUIRING RELOCATION WILL NOT BE DISTURBED.

VEHICLE TRAFFIC IS TO BE DETOURED OVER OTHER EXISTING ROADS.

MEASURES SHALL BE TAKEN WHEN REMOVING THE EXISTING CULVERT TO ENSURE THAT PORTIONS DO NOT FALL INTO THE WATER. MATERIAL FALLING INTO THE WATER SHALL BE REMOVED WITHIN 24 HOURS. SINCE DISTURBANCE OF THE WATERWAY BOTTOM MAY BE AS HARMFUL AS THE DEBRIS ITSELF, THE PREVENTATIVE MEASURES MUST BE EFFECTIVE.

THE WATER LEVEL OF THE BAYOU IS SUBJECT TO CHANGE BASED ON THE SEASON. THE CONTRACTOR IS RESPONSIBLE FOR MAKING A DETERMINATION OF WATER LEVELS THAT MAY EXIST DURING CONSTRUCTION.

IMMEDIATELY AFTER THE CONSTRUCTION OF THE CULVERT IS COMPLETED, TOPSOIL, SEEDING, FERTILIZER, STRAW MULCH BLANKETS AND SLOPE PROTECTION SHALL BE PLACED ON THE ADJACENT EMBANKMENT SLOPES.

DATUM REFERS TO USGS DATUM.

TEMPORARILY STORED EXCAVATED MATERIAL SHALL NOT BE ALLOWED TO ERODE INTO THE WATERCOURSE.

ROAD COMMISSION TO REINSTALL STOP SIGN.

REMOVAL NOTES:

TOPO ITEMS SHOWN WITH AN ASTERISK (*) SHALL BE REMOVED. PAYMENT FOR REMOVAL SHALL BE INCLUDED IN THE RESPECTIVE REMOVAL ITEMS. ALL OTHERS SHALL REMAIN IN PLACE.

REMOVE AND SALVAGE STOP SIGN AND ROAD NAME PLACARDS AND LOAD POSTING SIGN FOR THE ROAD COMMISSION, INCLUDE PAYMENT IN OTHER ITEMS.

SAW CUTTING AND REMOVAL OF ANY CONCRETE OR HMA PAVEMENT BEHIND THE GUARDRAILS SHALL BE PAID AS "PAVT, REM".

REMOVAL OF MASONRY WALL IN THE NE QUADRANT SHALL BE INCLUDED IN ITEM "STRUCTURE, REM", APPROXIMATELY 18FT LONG BY 4FT TALL AND MISCELLANEOUS PIECES.

UTILITY NOTES:

DTE HAS A GAS MAIN ALONG THE WEST STEEL SHEETING, TO BE ABANDONED BY OTHERS.

CONSUMERS ENERGY HAS OVERHEAD ELECTRIC ARE LOCATED ON A NEIL ROAD POLE AND ROUTED BACK TO LAKESHORE DRIVE POLE AT STATION 10+73 (AS-SHOWN).

CHARTER COMMUNICATION HAS AN AERIAL LINE ALONG THE WEST SIDE THAT WILL FOLLOW THE ELECTRIC RELOCATION PATH. THERE IS A BURIED FIBER OPTIC OUTSIDE OF THE WEST SHEETING TO BE ABANDONED BY OTHERS.

WATER WELL PLACED IN THE NW QUADRANT AND CROSSES UNDER THE ROAD. CONTRACTOR TO VERIFY LOCATION.

HAMLIN TOWNSHIP

GENERAL PLAN OF SITE
LAKESHORE DRIVE
OVER SOUTH BAYOU

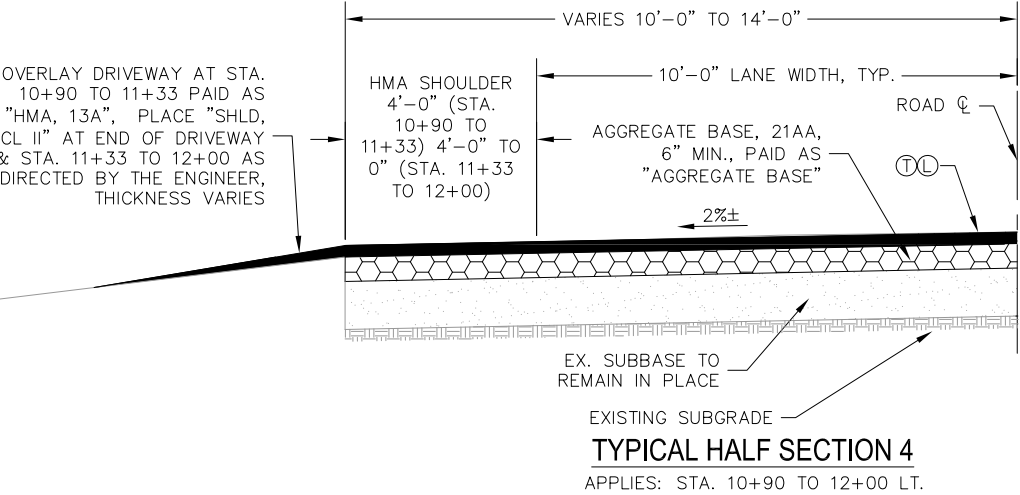
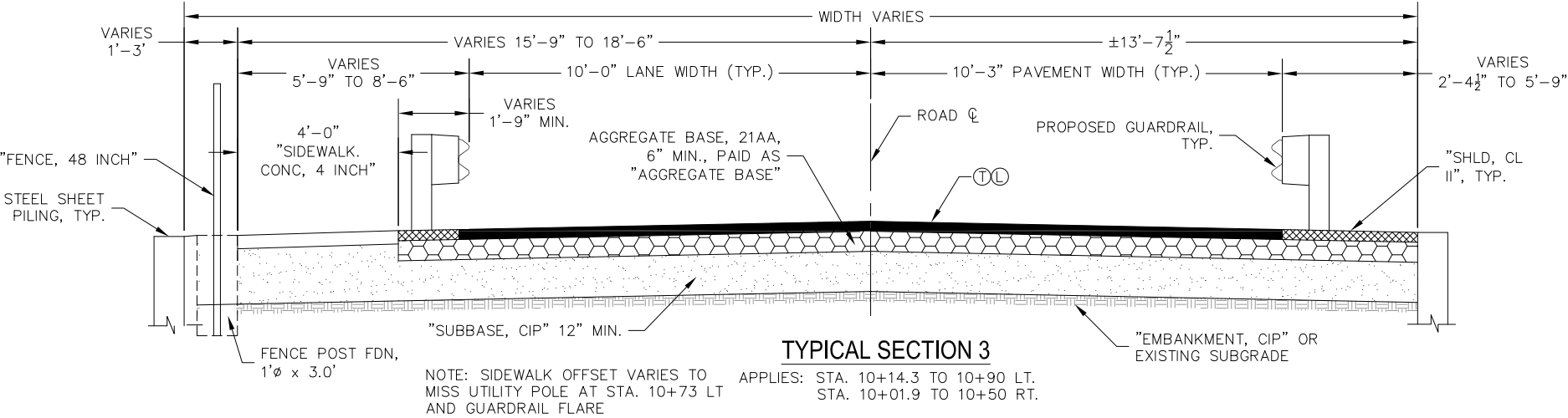
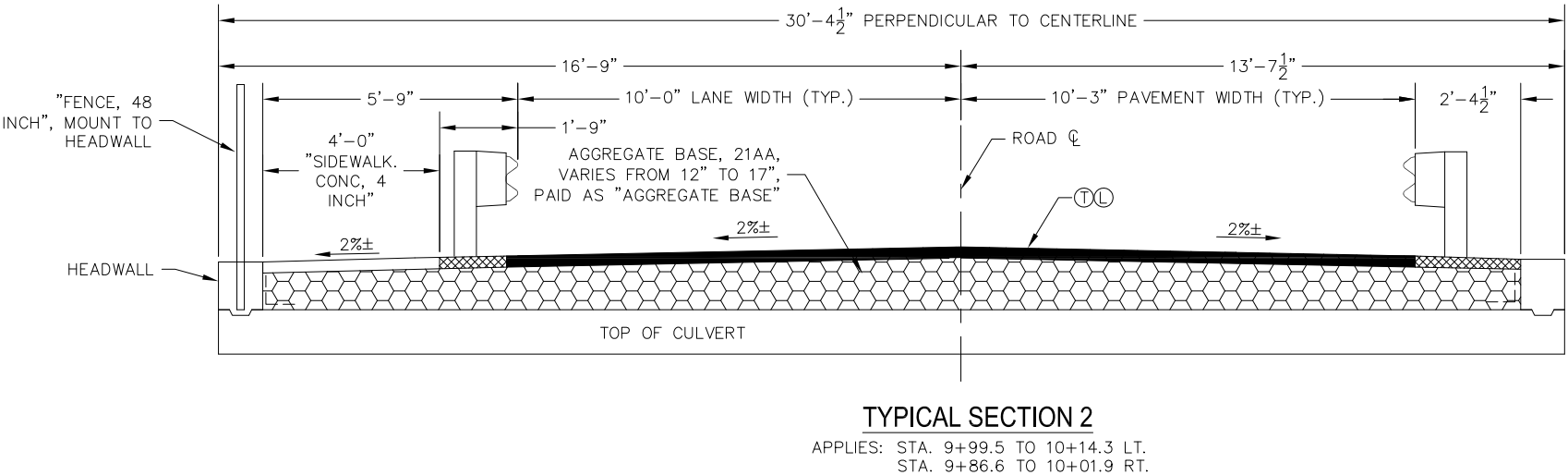
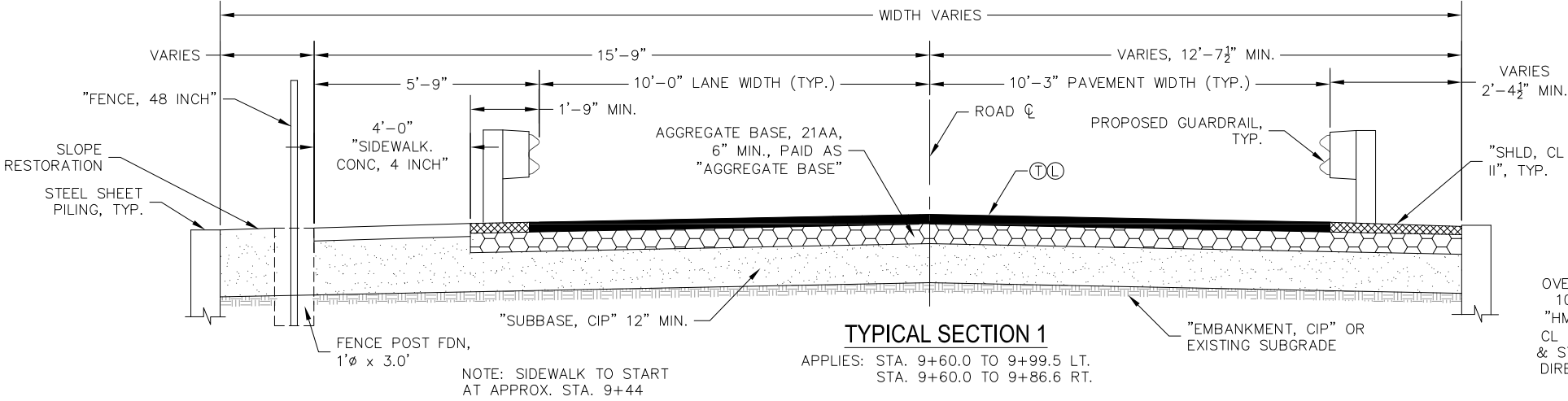
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GRAND RAPIDS, MICHIGAN

DRAWN *AE* CHECKED *RTW* DATE 1/18/24

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NOTES:

PAY QUANTITIES FOR THE ITEMS "EXCAVATION, EARTH", "EMBANKMENT, CIP", AND "SUBBASE, CIP" SHALL BE BASED ON PLAN QUANTITY EXCEPT IN THE CASE OF A DESIGN CHANGE OR DEMONSTRATED ERROR.

PRIOR TO PLACEMENT OF SUBBASE AND EMBANKMENT, TOPSOIL, VEGETATION, AND GRAVEL SHALL BE STRIPPED IN ACCORDANCE WITH THE 2020 MDOT STANDARD SPECIFICATIONS SECTION 205.03. TOPSOIL AND GRAVEL STRIPPING WILL NOT BE PAID FOR SEPARATELY, BUT IS INCLUDED IN THE ITEM "EXCAVATION, EARTH". THE ENGINEER ESTIMATED THE STRIPPING QUANTITY USING A DEPTH OF 6".

AGGREGATE BASE IS TO BE 21AA IN ACCORDANCE WITH SECTION 902 OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION.

SAW CUTTING OF EXISTING PAVEMENT AT LIMITS OF PROJECT IS INCLUDED IN THE PAY ITEM "HMA, 13A".

ALL HMA PAVEMENT (INCLUDES MAINLINE, SHOULDERS, APPROACHES, DRIVEWAYS, PARKING AREAS) IS PAID AS "HMA, 13A", REGARDLESS OF LOCATION PLACED.

SEED MIXTURE SHALL BE THM.

HMA APPLICATION TABLE				
IDENTIFICATION	REMARKS	PAY ITEM DESCRIPTION	RATE OF APPLICATION	PERFORMANCE GRADE
(T)	TOP COURSE	HMA, 13A	165 LB/SYD	58 - 28
(L)	LEVEL COURSE	HMA, 13A	165 LB/SYD	58 - 28
		*HMA BOND COAT	0.05 - 0.15 GAL/SYD	

*WILL BE PAID FOR AS PART OF THE PAY ITEM HMA MIXTURE - NOT A PAY ITEM
NOTE: THE AGGREGATE WEAR INDEX SHALL BE A MINIMUM 220 FOR THE TOP COURSE

HAMLIN TOWNSHIP

TYPICAL SECTIONS
LAKESHORE DRIVE
OVER SOUTH BAYOU

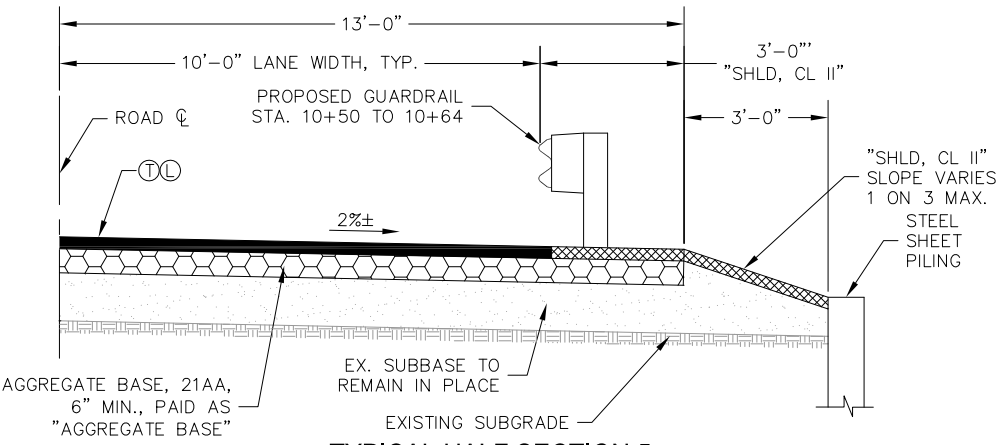
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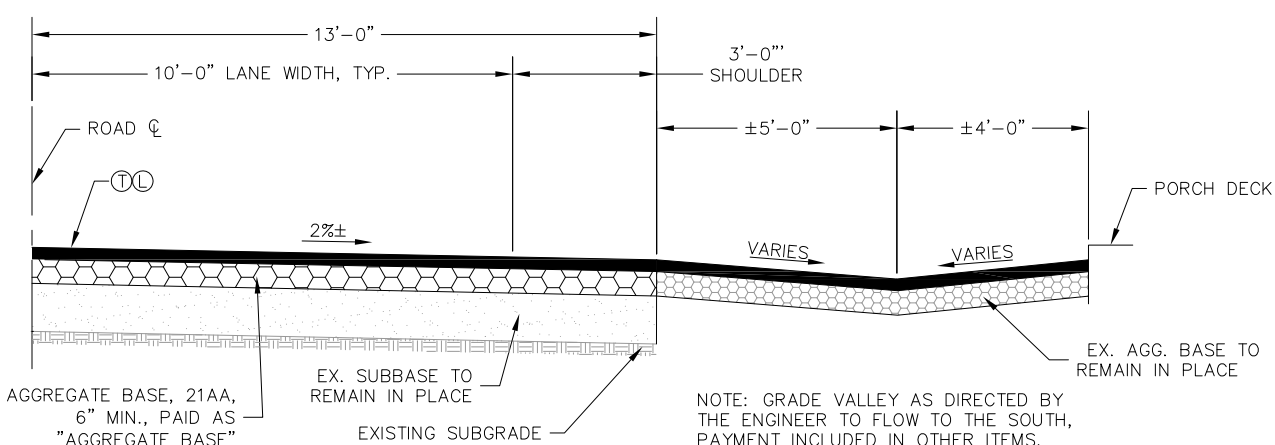
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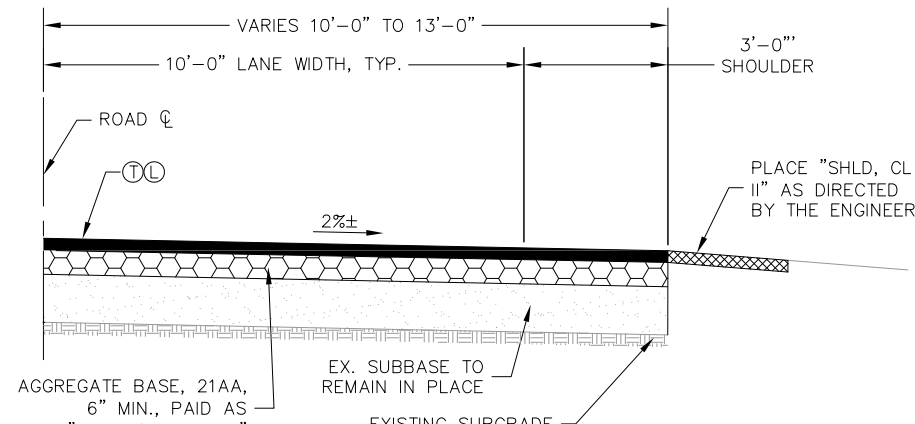
TYPICAL HALF SECTION 5

APPLIES: STA. 10+50 TO 10+71 RT.



TYPICAL HALF SECTION 6

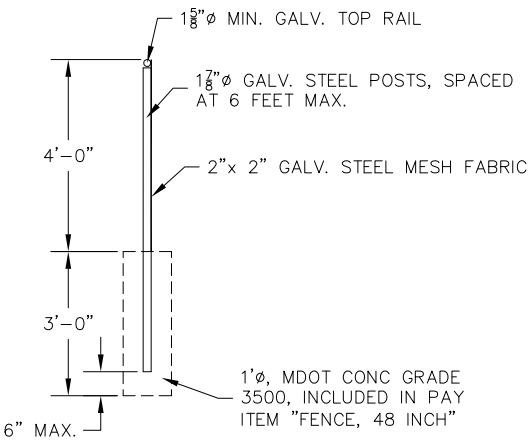
APPLIES: STA. 10+71 TO 10+90 RT.



TYPICAL HALF SECTION 7

APPLIES: STA. 10+90 TO 12+00 RT.

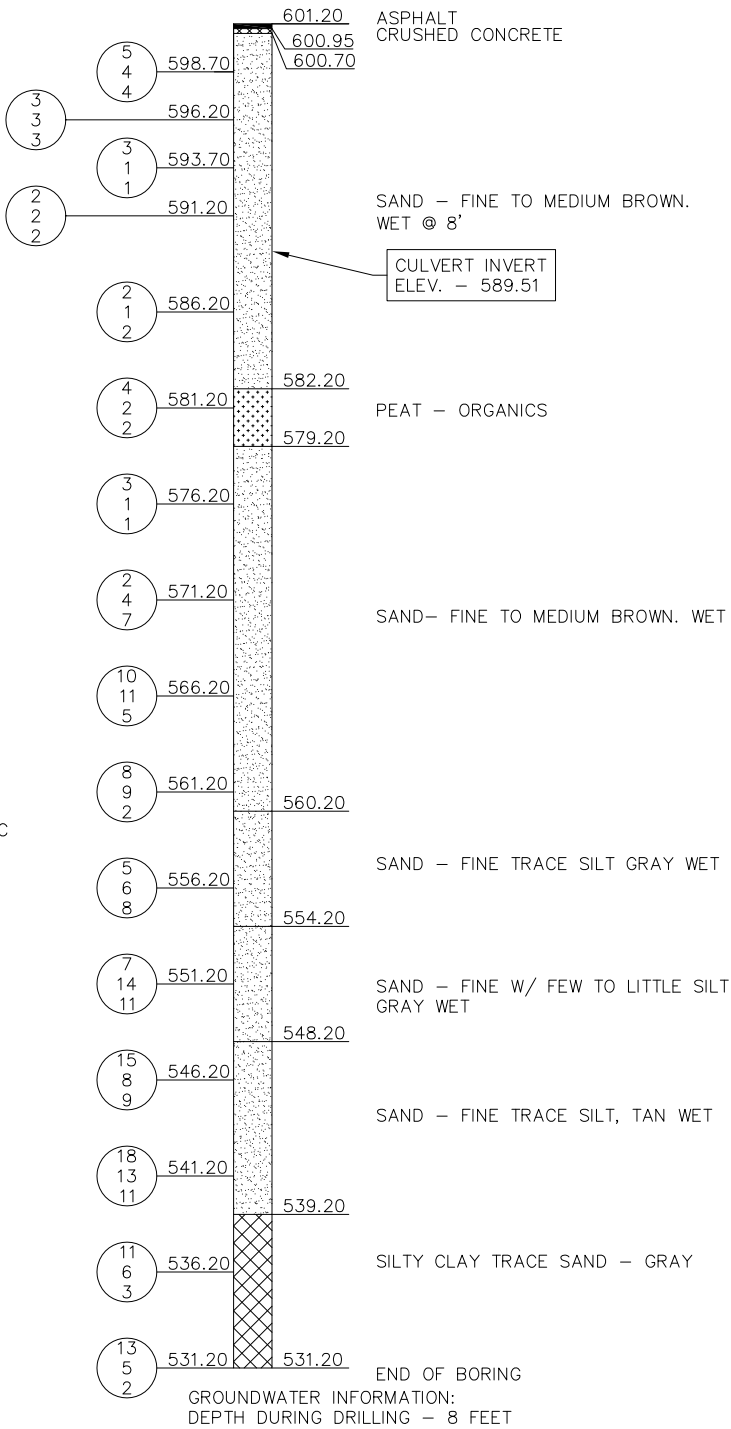
APPROACH QUANTITIES			
PAY ITEM CODE	DESCRIPTION	TOTAL	UNIT
1100001	Mobilization, Max_	LSUM	1
2040025	Fence, Rem	Ft	160
2040035	Guardrail, Rem	Ft	263
2040050	Pavt, Rem	Syd	745
2050010	Embankment, CIP	Cyd	100
2050016	Excavation, Earth	Cyd	676
2050148	Flowable Fill, Non-Structural	Cyd	85
2080036	Erosion Control, Silt Fence	Ft	200
3010002	Subbase, CIP	Cyd	260
3020001	Aggregate Base	Ton	255
3070121	Shld, Cl II	Ton	20
5010033	HMA, 13A	Ton	130
8030044	Sidewalk, Conc, 4 inch	Sft	685
8070080	Guardrail Reflector	Ea	24
8077001	Guardrail, Type B, Modified	Ft	100
8077050	Guardrail Approach Terminal, Type 2B	Ea	3
8087001	Fence, 48 inch	Ft	150
8110232	Pavt Mrkg, Waterborne, 4 inch, Yellow	Ft	500
8162002	Slope Restoration, Non-Freeway, Type B	Syd	250



FENCE DETAIL

SOIL BORING

DATE OF BORING: 05/22/2023
LOCATION: 10' NORTH OF CULVERT EAST LANE



SOIL BORING NOTES

NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" OUTSIDE DIAMETER SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140# HAMMER FALLING 30".

BORINGS FOR SUBSURFACE SOIL CLASSIFICATIONS WERE MADE BY:

PEARSON DRILLING COMPANY
6100 W. BLUE RD.
LAKE CITY, MI 49651
PHONE: (231) 839-4444

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THE INFORMATION IN NO WAY IMPLIES THAT SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

HAMLIN TOWNSHIP

TYPICAL SECTIONS
LAKESHORE DRIVE
OVER SOUTH BAYOU

SCCO

SCOTT CIVIL ENGINEERING COMPANY
GRAND RAPIDS, MICHIGAN

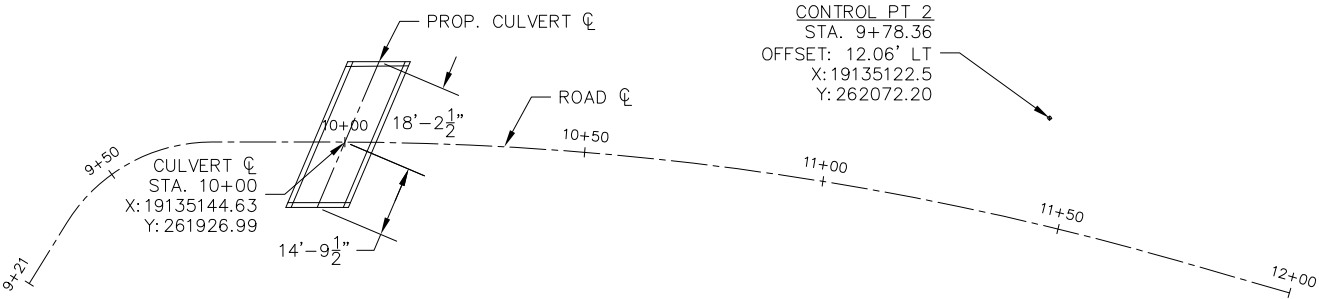
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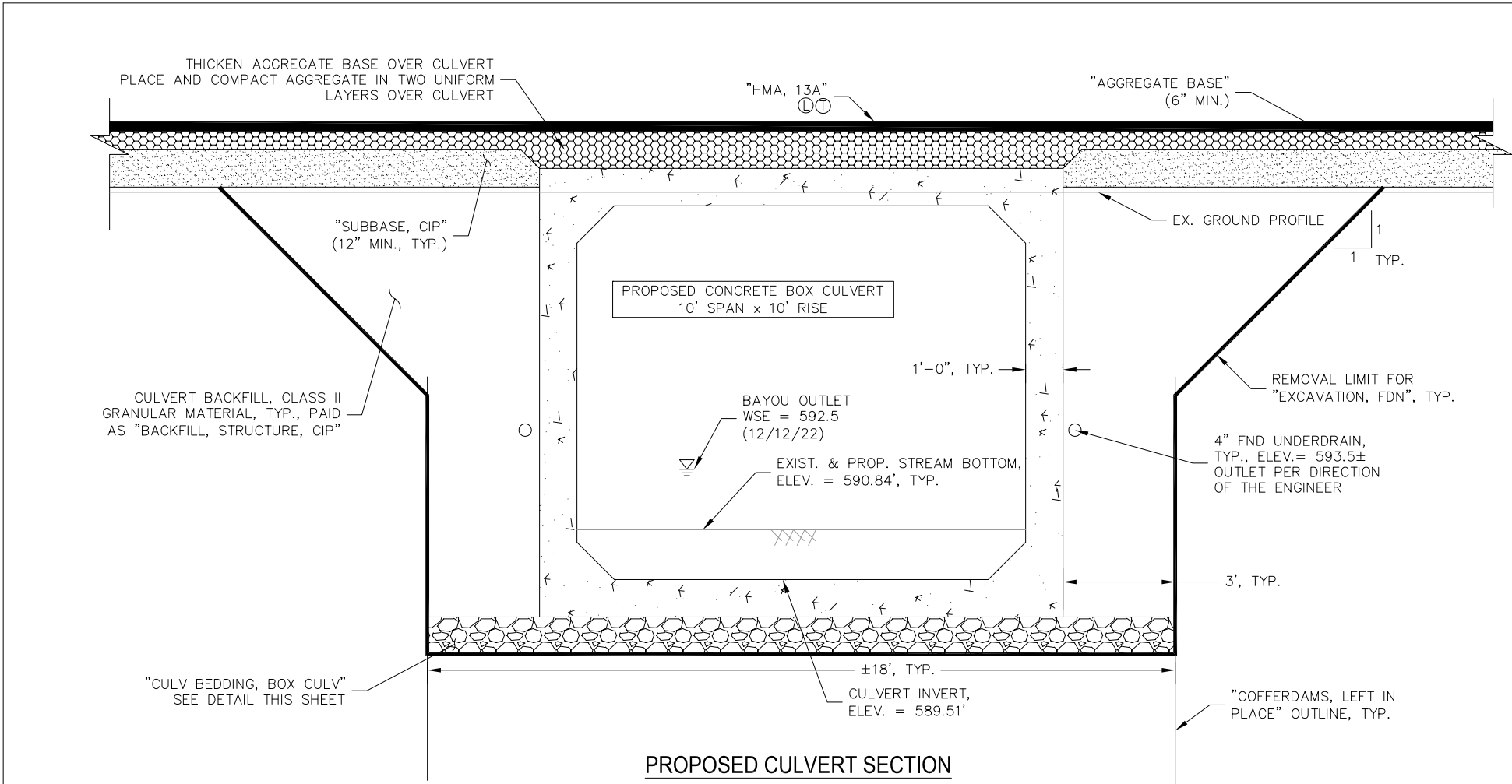


CONTROL PT 1
POINT SET IN PARK
53.8' NE OF UTILITY POLE AT BM "A"
X: 19135236.11
Y: 261741.90



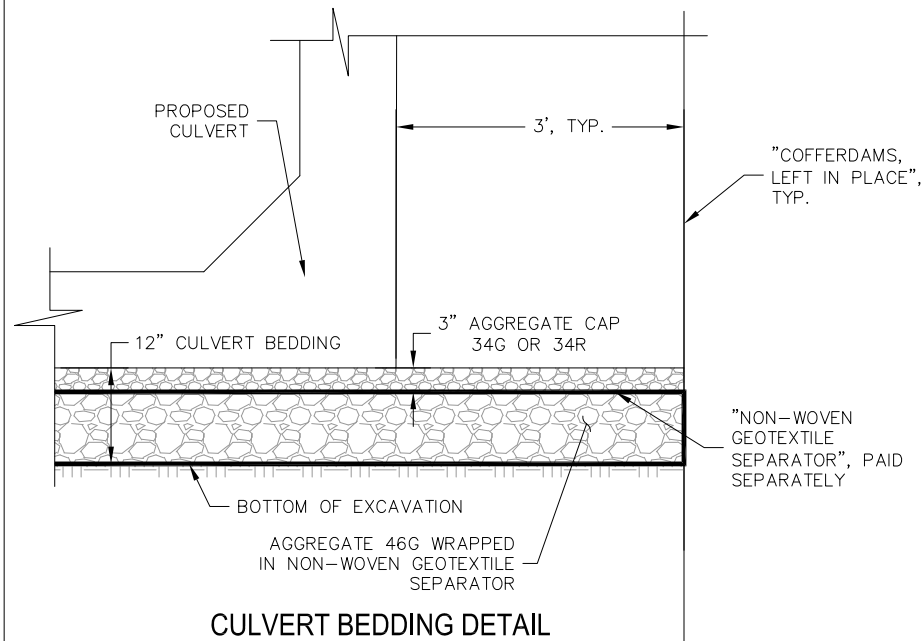
ALIGNMENT DIAGRAM

CONTROL PT 3
POINT SET NEAR LEFT EDGE OF PAVEMENT ABOUT 201FT NORTH OF STA. 12+00 ALONG CENTERLINE
X: 19135184.93
Y: 262325.27



PROPOSED CULVERT SECTION

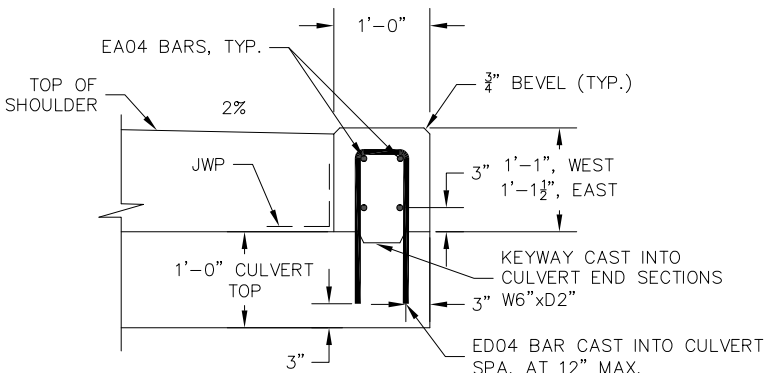
NOTE: OUTLET FOUNDATION UNDERDRAIN PER DIRECTION OF THE ENGINEER



CULVERT BEDDING DETAIL

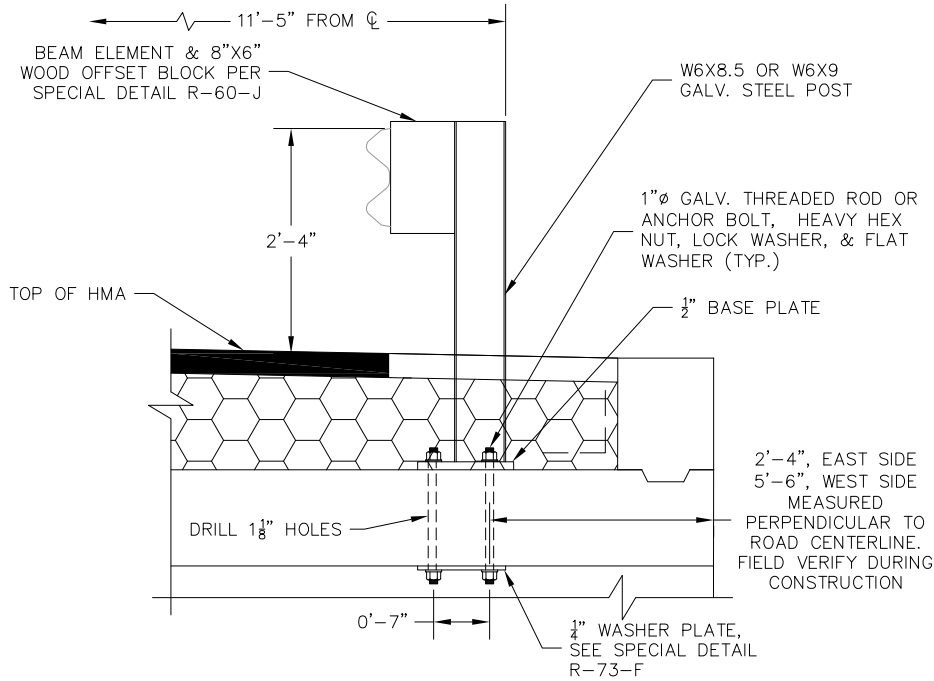
AGGREGATE 46G AND 34G OR 34R ARE NOT PAID FOR SEPARATELY BUT INCLUDED IN ITEM "CULV, BEDDING, BOX CULV"

VIBRATORY SHEETING HAMMERS ARE PROHIBITED



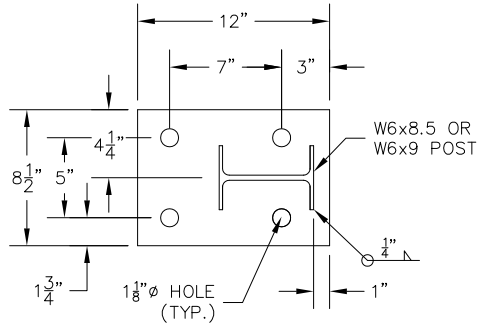
HEADER SECTION

PAYMENT FOR HEADERS AND JOINT WATERPROOFING INCLUDED IN THE ITEM "CULV, PRECAST CONC BOX, 10 FOOT BY 10 FOOT"

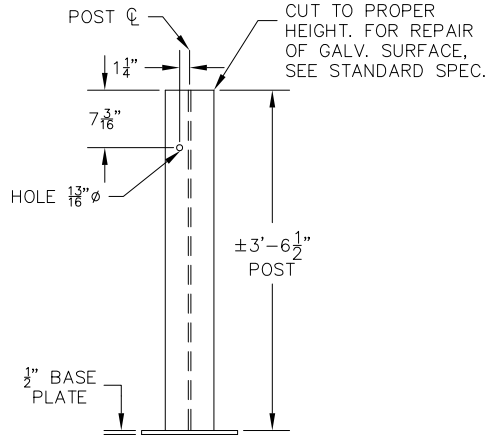


RAIL POST SECTION

GUARDRAIL ATTACHED TO THE CULVERT PAID AS "GUARDRAIL, TYPE B, MODIFIED".



BASE PLATE DETAIL



STEEL POST DETAIL

POST HEIGHT SUBJECT TO CHANGE BASE ON SHOP DRAWING DIMENSIONS

STRUCTURE QUANTITIES			
PAY ITEM NO.	ITEM OF WORK	UNIT	TOTAL
2040060	Structures, Rem	LSum	1
2060002	Backfill, Structure, CIP	Cyd	135
2060010	Excavation, Fdn	Cyd	230
2080014	Erosion Control, Filter Bag	Ea	2
2080042	Erosion Control, Turbidity Curtain, Deep	Ft	200
3082000	Geotextile, Separator, Non-Woven	Sft	1410
4040031	Underdrain, Fdn, 4 inch	Ft	300
4040091	Underdrain Outlet, 4 inch	Ft	40
4040111	Underdrain, Outlet Ending, 4 inch	Ea	4
4060005	Culv Bedding, Box Culv	Cyd	25
4060134	Culv, Precast Conc Box, 10 foot by 10 foot	Ft	33
7040001	Steel Sheet Piling, Permanent	Sft	5000
7040009	Cofferdams, Left in Place	LSum	1
7047051	Sheeting Tie System	LSum	1
7077030	Structural Steel, Furn, Fab, and Erect	Lb	6400
7120043	Bolt, Adhesive Anchored, 7/8 inch	Ea	32

HAMLIN TOWNSHIP

GENERAL PLAN OF STRUCTURE
LAKESHORE DRIVE
OVER SOUTH BAYOU

SCECO

SCOTT CIVIL ENGINEERING COMPANY

GRAND RAPIDS, MICHIGAN

DRAWN

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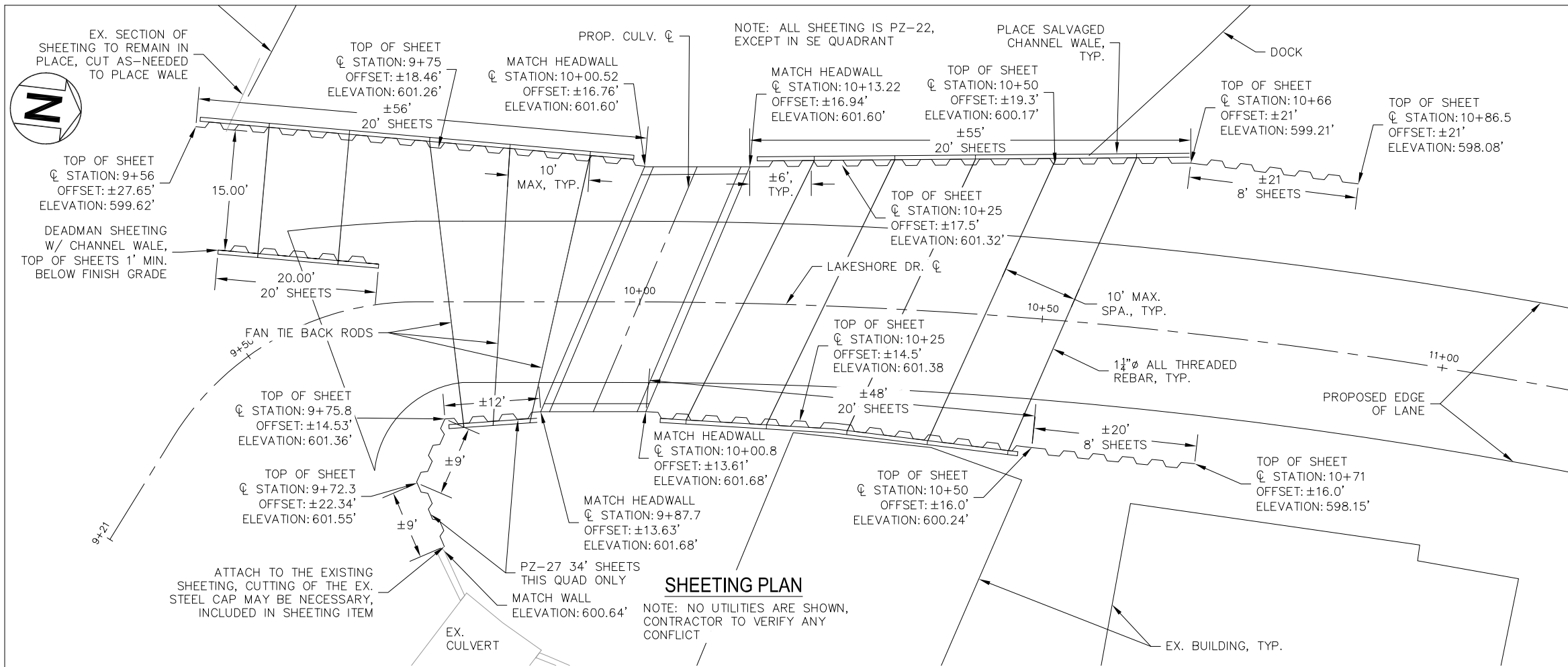
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DATE

1/18/24

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NOTES:

EXISTING WALES ARE DOUBLE C6x10.5 WITH 10"x10"x $\frac{5}{8}$ " BEARING PLATES. SALVAGING WALES INCLUDED IN ITEM "STRUCTURES, REM". EXCAVATION AND EMBANKMENT WILL NOT BE PAID FOR IF SALVAGING EXISTING SOIL ANCHORS.

CUTTING OR REMOVING EXISTING SHEETING FOR TIE-ROD PLACEMENT SHALL BE INCLUDED IN ITEM "STRUCTURES, REM".

TIE-RODS ARE 1 $\frac{1}{2}$ " NOMINAL DIAMETER, ALL-THREADED REBAR, F_y = 75 ksi. SPLICE WITH STOP-TYPE COUPLINGS. ANCHOR WITH HEAVY HEX NUT WITH HARDENED AND BEVELED WASHERS, AND ADD A JAM NUT. PLACEMENT OF SALVAGED WALES AND TIE-RODS PAID AS "SHEETING TIE SYSTEM". IF ADDITIONAL WALE LENGTH IS NEEDED, THE FURNISHING, FABRICATING, AND ERECTING OF THE STEEL SHALL BE PAID AS "STRUCTURAL STEEL, FURN, FAB, AND ERECT". ADDITIONAL WALES SHALL MATCH THE EXIST SALVAGED MATERIALS AND DIMENSIONS.

ESTIMATED TIE-ROD TOTAL LENGTH IS 360'.

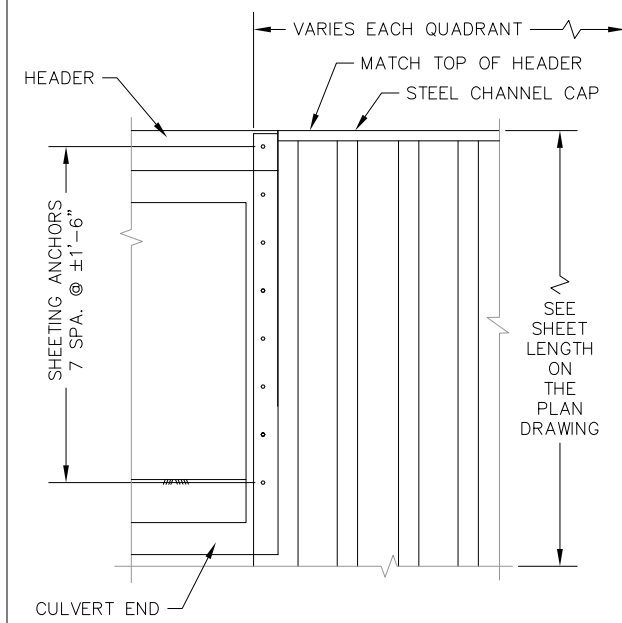
STEEL SHEETING IN SE QUADRANT SHALL HAVE A MINIMUM SECTION MODULUS OF 30.2 IN³/FT (PZ-27). THE REMAINING QUADRANTS SHALL MEET A MINIMUM SECTION OF 18.1 IN³/FT (PZ-22). ALL SHEETING SHALL BE GRADE 50 STEEL. CONTRACTOR MAY PROPOSE AN ALTERNATE SHEET SECTION FOR THE ENGINEER'S APPROVAL.

MINIMUM TOE LENGTH IS 8 FEET FOR PZ-22 SHEETING (EXCEPT THE 8FT LONG SHEETS) AND 23 FEET FOR PZ-27.

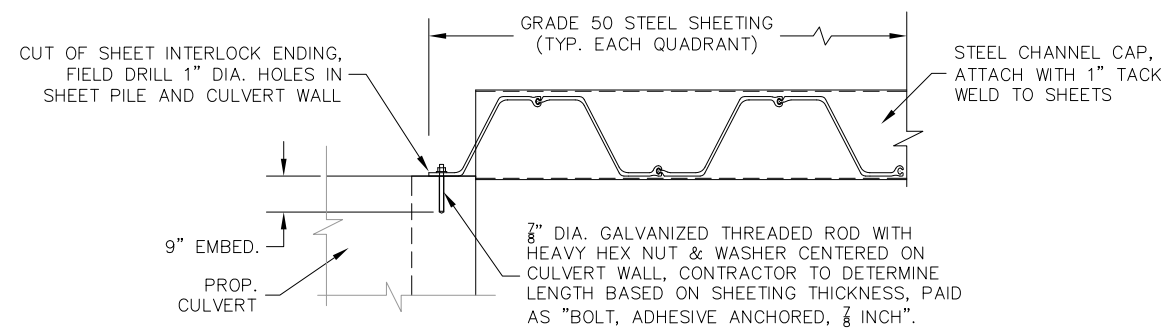
INSTALL ALL SHEETING WITH AN IMPACT HAMMER, NO VIBRATORY HAMMERS ALLOWED.

PLACE STEEL CAP ON ALL SHEETING EXCEPT DEADMAN SHEETS. THE CAP SHALL BE C15x33.9 FOR PZ-27 SHEETS AND C12X20.7 FOR PZ-22, PAID AS "STRUCTURAL STEEL, FURN, FAB, AND ERECT".

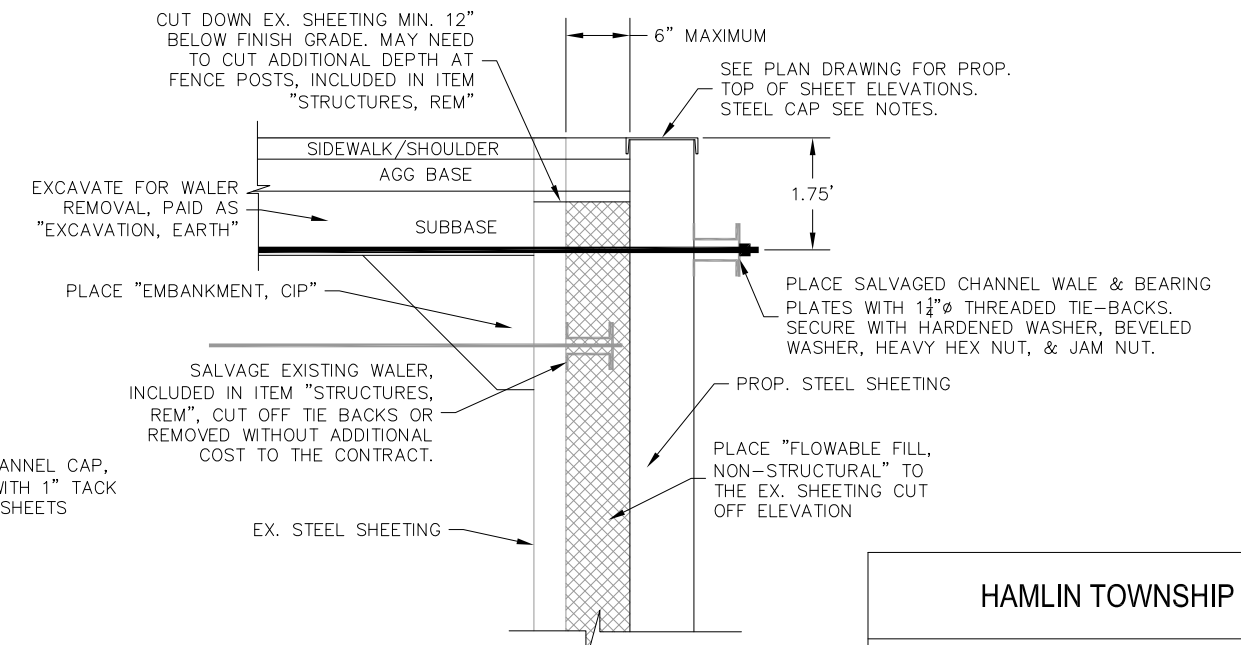
VIBRATORY SHEETING HAMMERS ARE PROHIBITED



SHEET PILE WALL ELEVATION



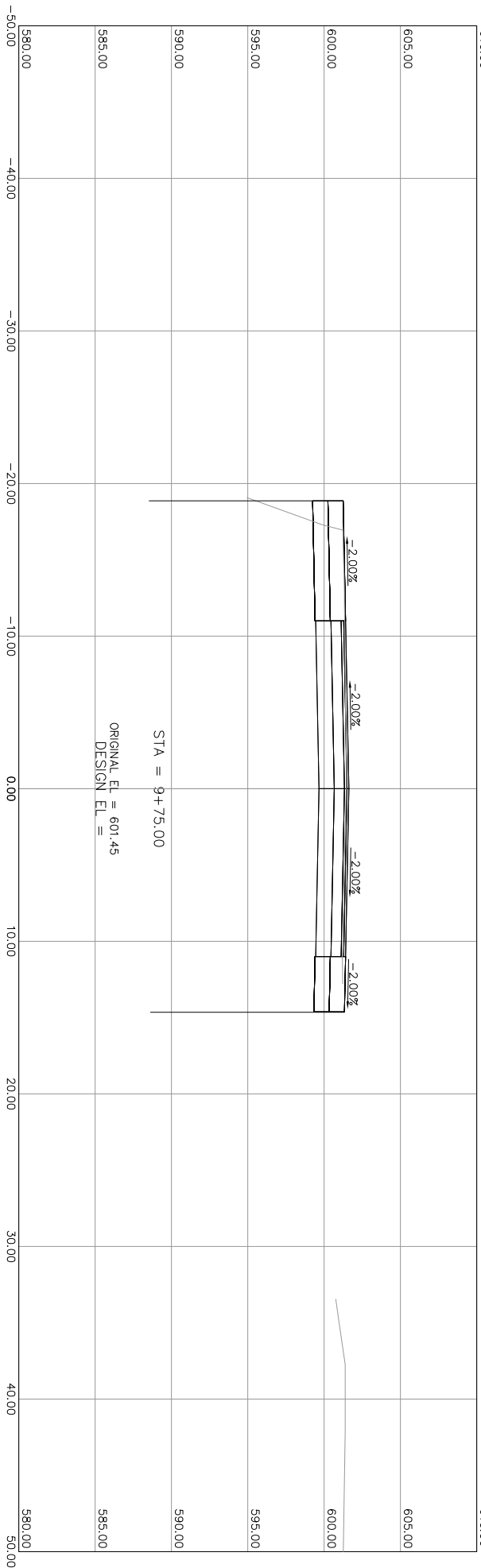
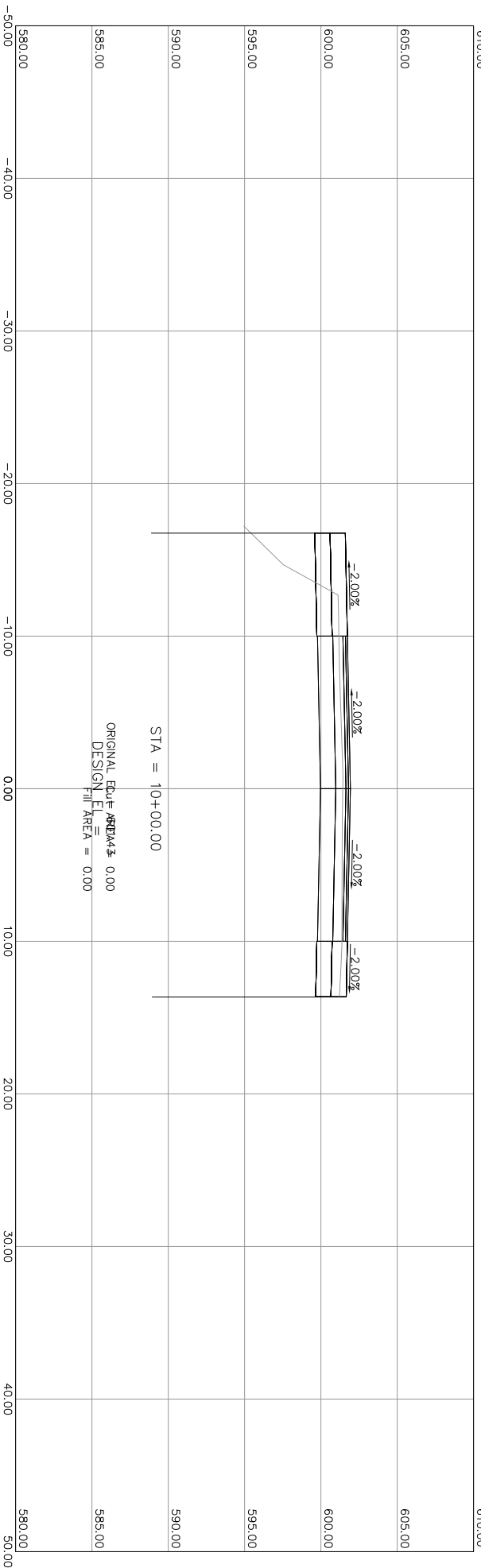
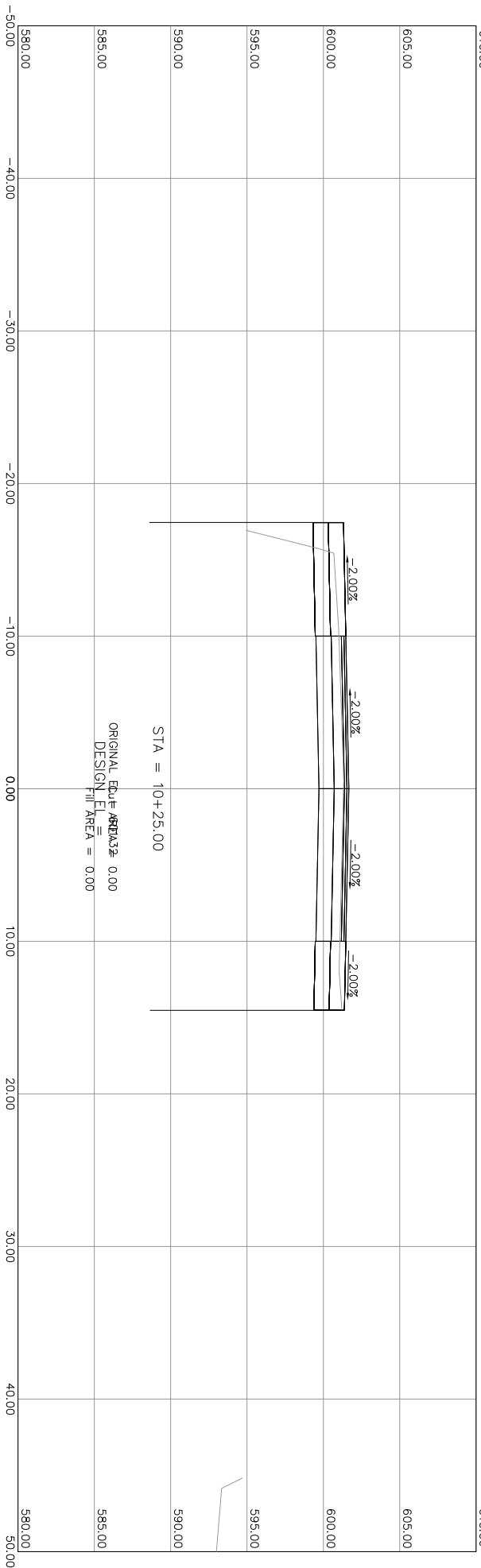
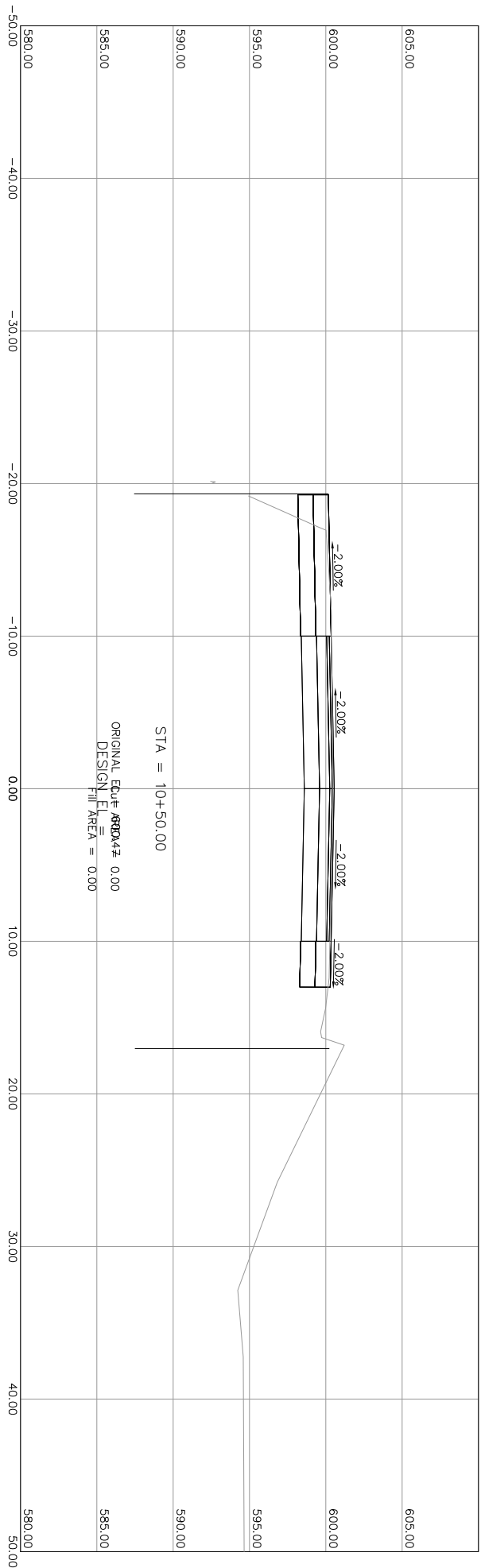
SHEET PILE WALL CULVERT CONNECTION DETAIL

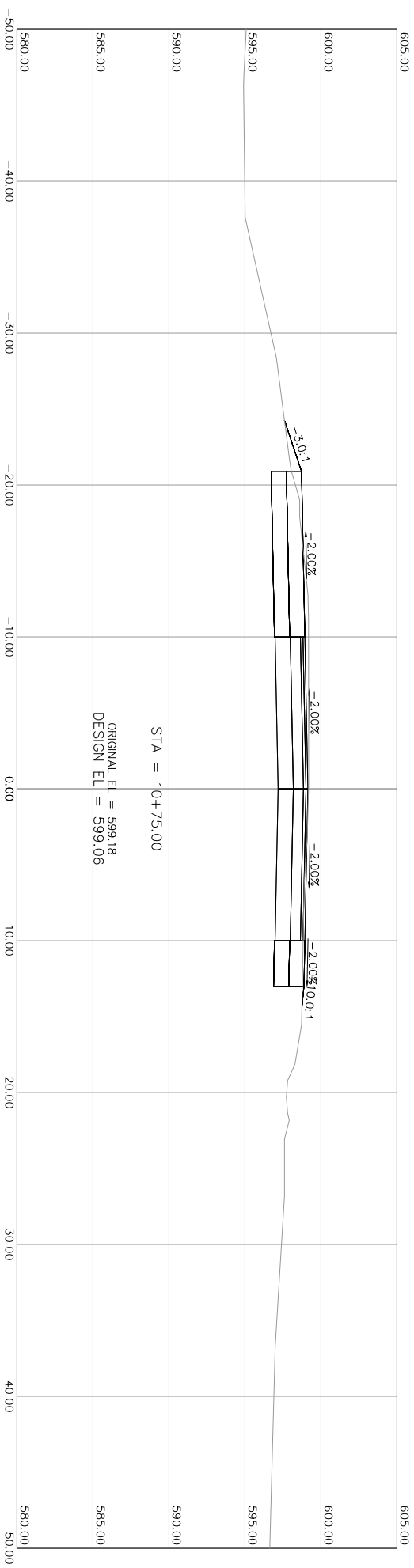
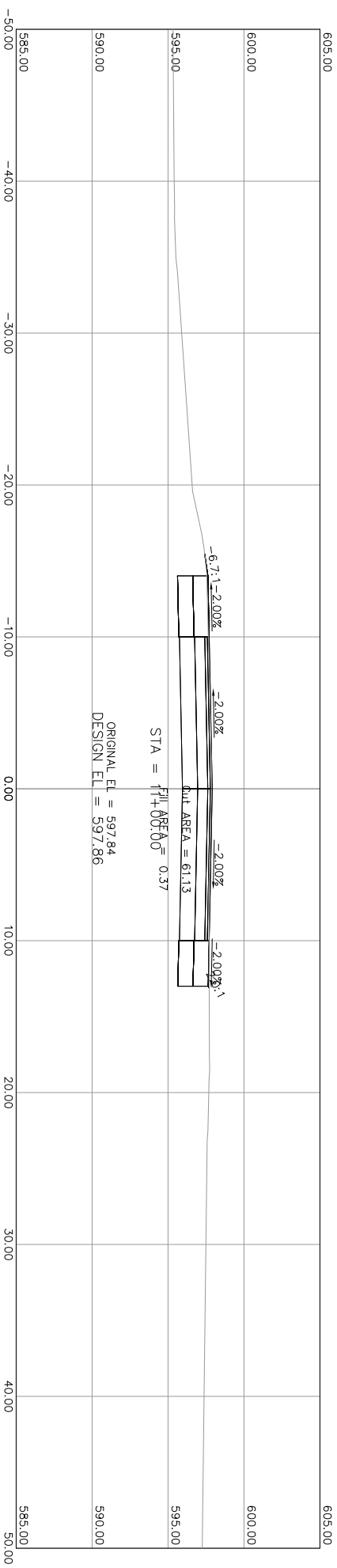
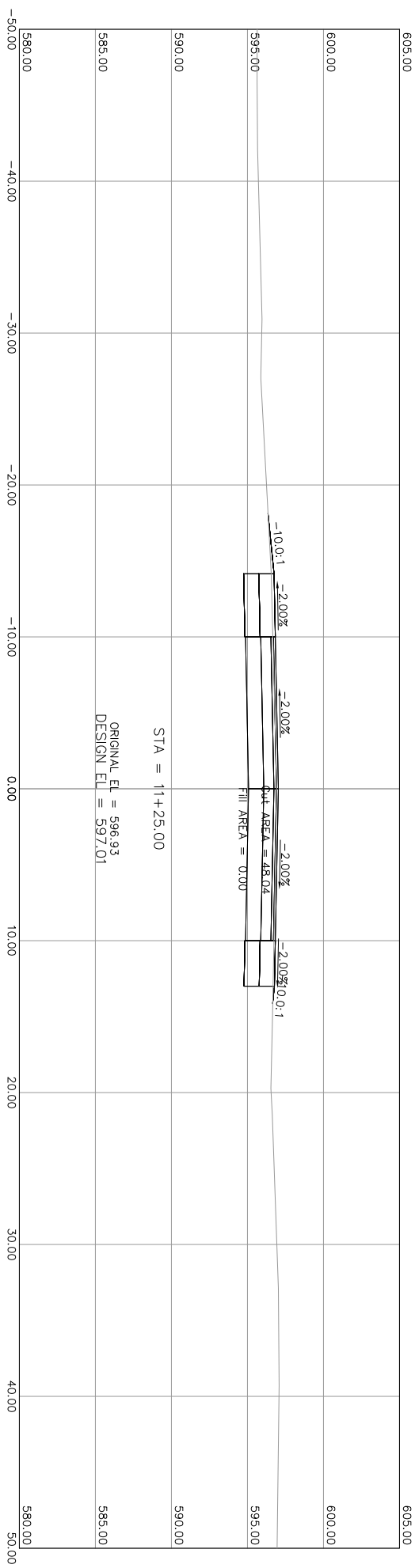
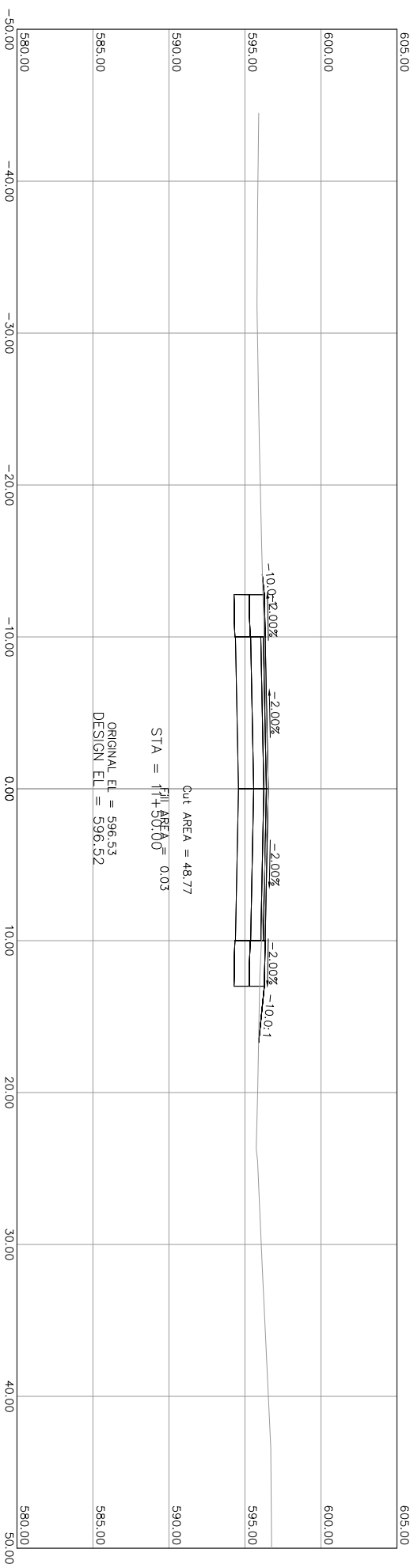
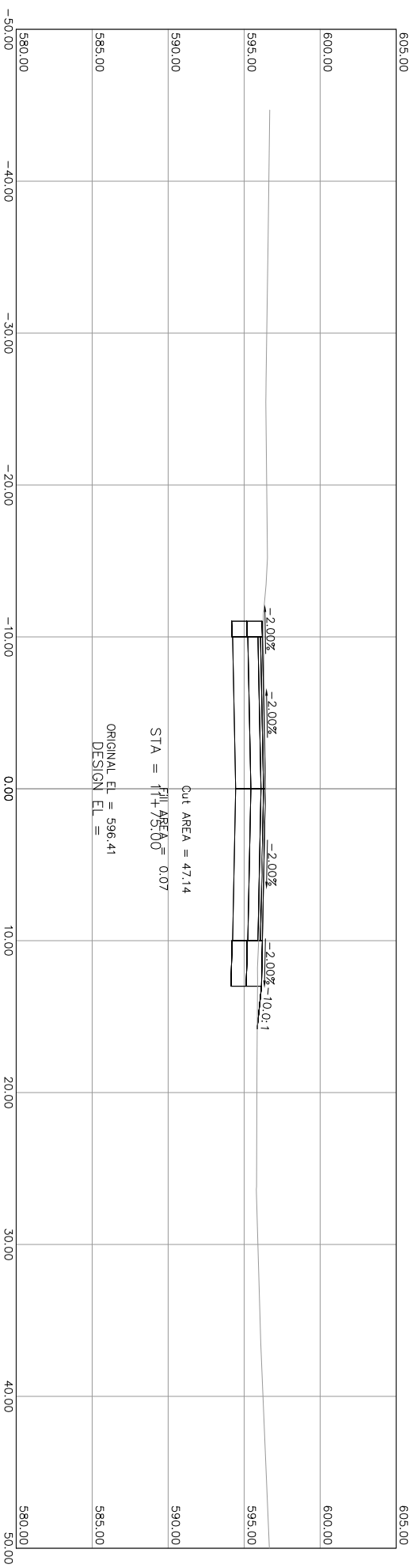


TYP. SHEET WALL SECTION

HAMLIN TOWNSHIP			
STEEL SHEETING LAYOUT LAKESHORE DRIVE OVER SOUTH BAYOU			
SCCECO			8
SCOTT CIVIL ENGINEERING COMPANY			15
GRAND RAPIDS, MICHIGAN			
DRAWN	AE	CHECKED	NNN
DATE			10/23/23

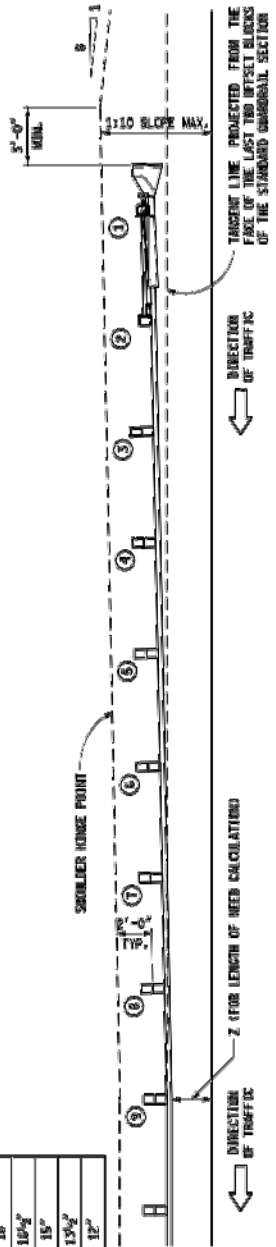
Out AREA = 0.00
Fill AREA = 0.00





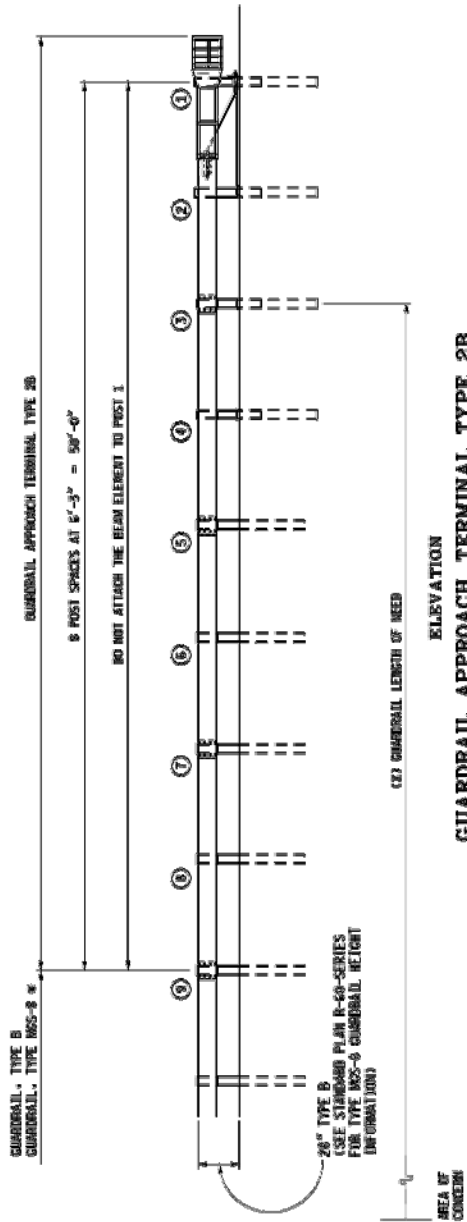
*** USING 1:50 FLARE

POST	POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	16"
2	14 1/2"
3	21"
4	19 3/4"
5	18"
6	16 1/2"
7	15"
8	13 1/2"
9	12"



OPTION 1
(DETAILED ON SHEETS 1 THROUGH 4)

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL TYPE MS-8 TO GUARDRAIL APPROACH TERMINAL TYPE 2B

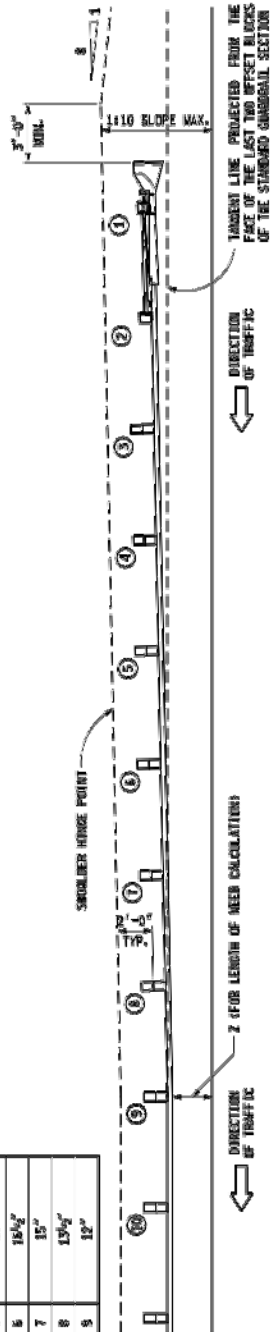


**GUARDRAIL APPROACH
TERMINAL TYPES 2B & 2T
(SKT & ET-PLUS)**

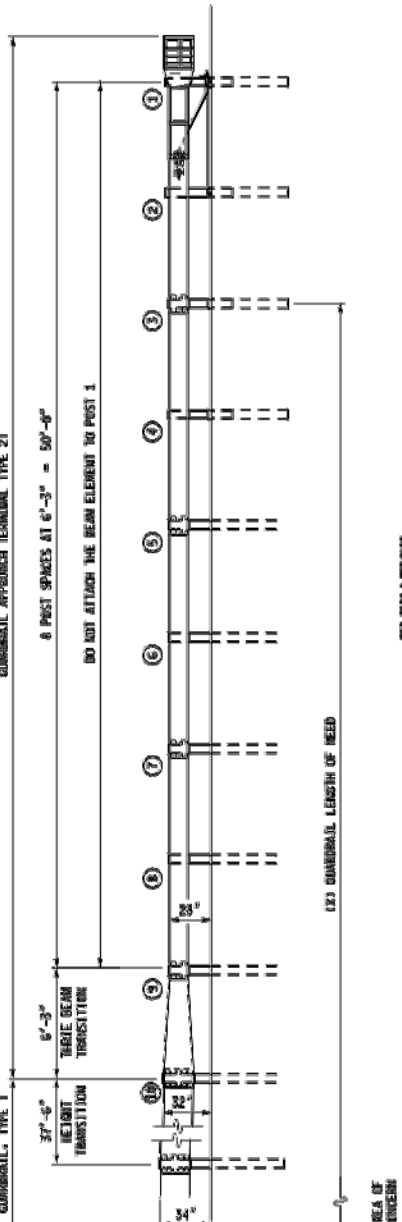
R-62-H-LAP SHEET
1 OF 9

*** USING 1:50 FLARE

POST	POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	16"
2	14 1/2"
3	21"
4	19 3/4"
5	18"
6	16 1/2"
7	15"
8	13 1/2"
9	12"



GUARDRAIL, TYPE 2T
8 POST SPACES AT 6'-3" = 50'-0"
DO NOT ATTACH THE BEAM ELEMENT TO POST 1



**GUARDRAIL APPROACH
TERMINAL TYPES 2B & 2T
(SKT & ET-PLUS)**

R-62-H-LAP SHEET
2 OF 9

HAMLIN TOWNSHIP

GUARDRAIL DETAILS
LAKESHORE DRIVE
OVER SOUTH BAYOU

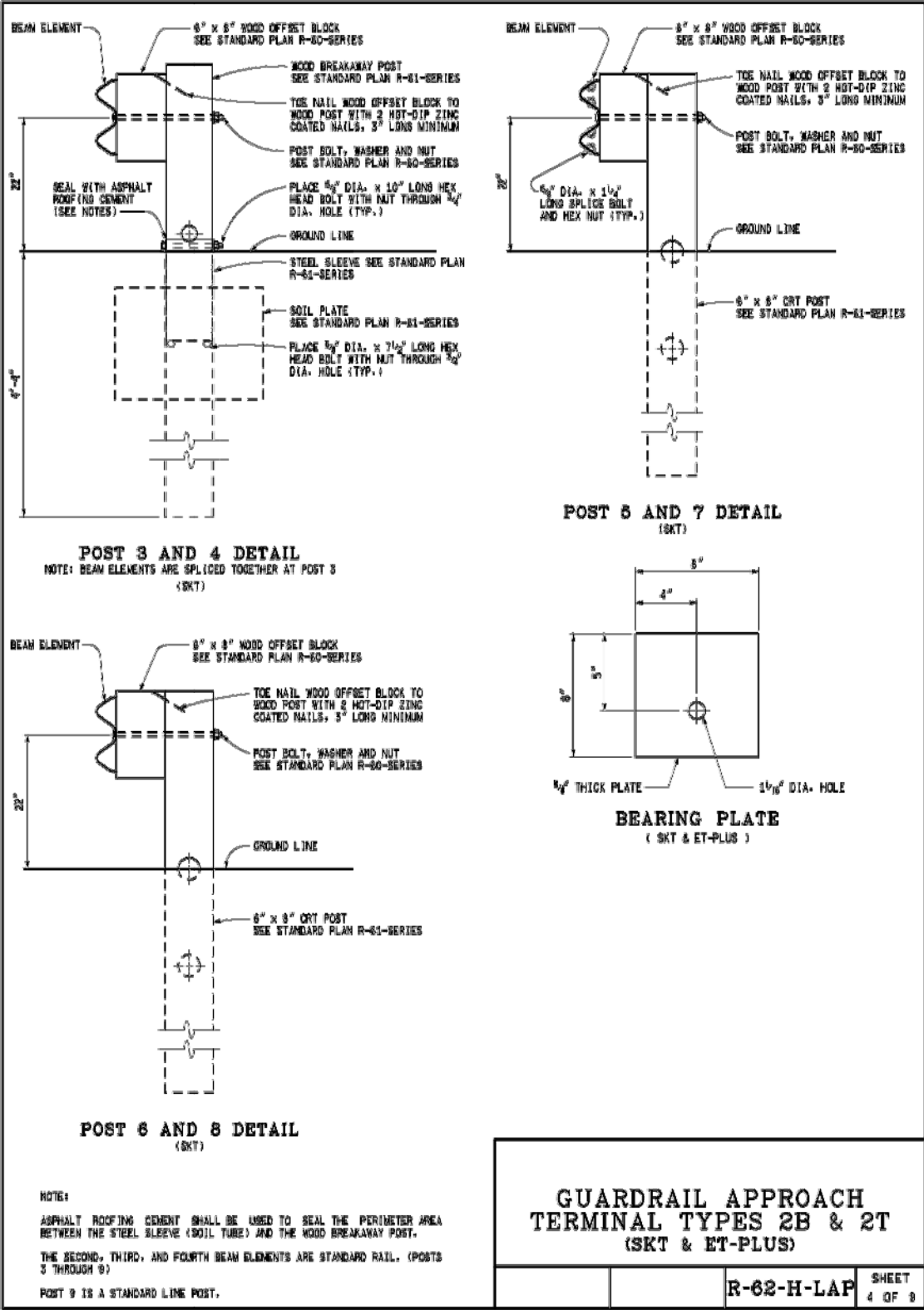
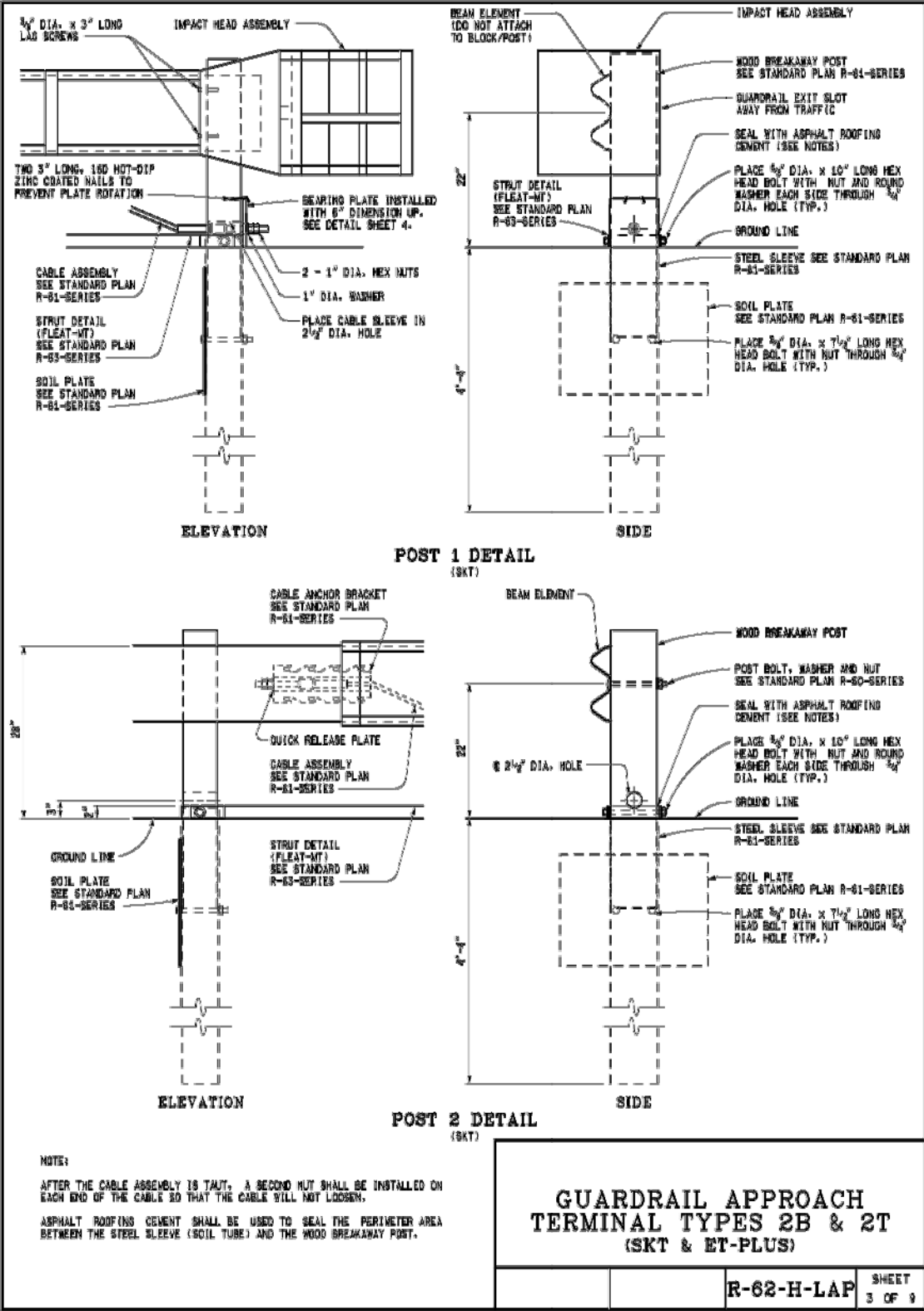
SCECO

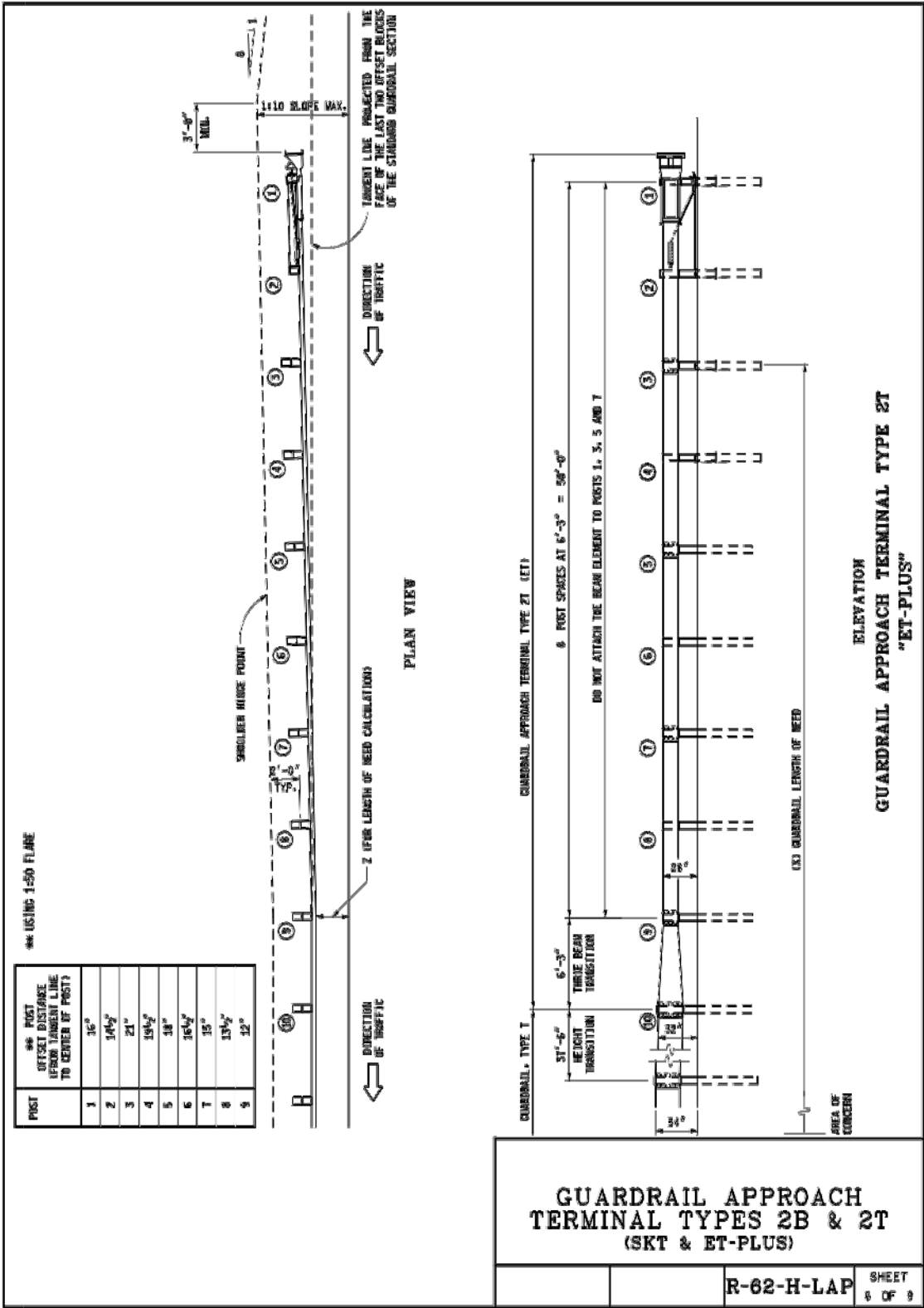
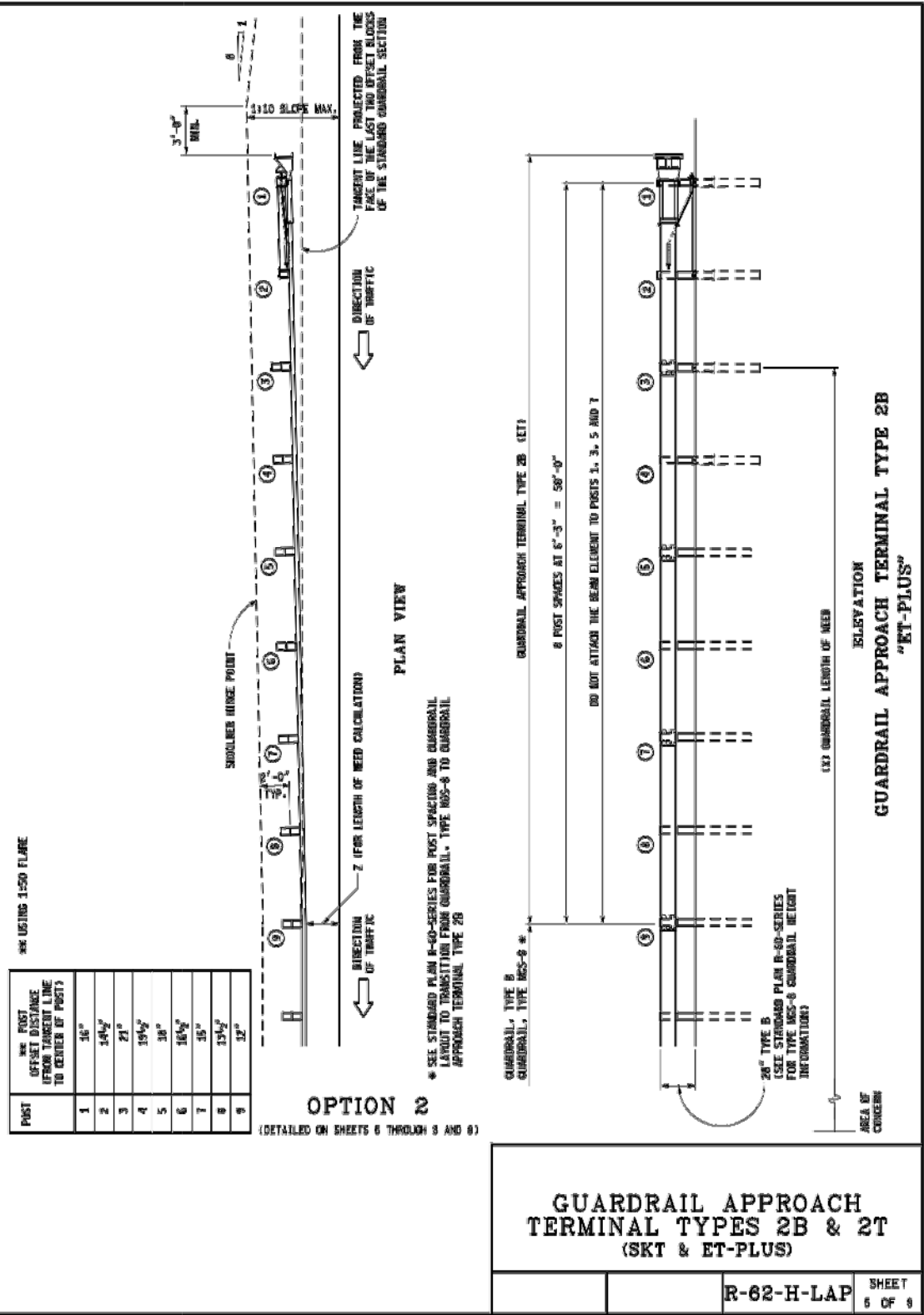
SCOTT CIVIL ENGINEERING COMPANY
GRAND RAPIDS, MICHIGAN

DRAWN: JEC CHECKED: NNN DATE: 10/19/23

11

15





HAMLIN TOWNSHIP

GUARDRAIL DETAILS
LAKESHORE DRIVE
OVER SOUTH BAYOU

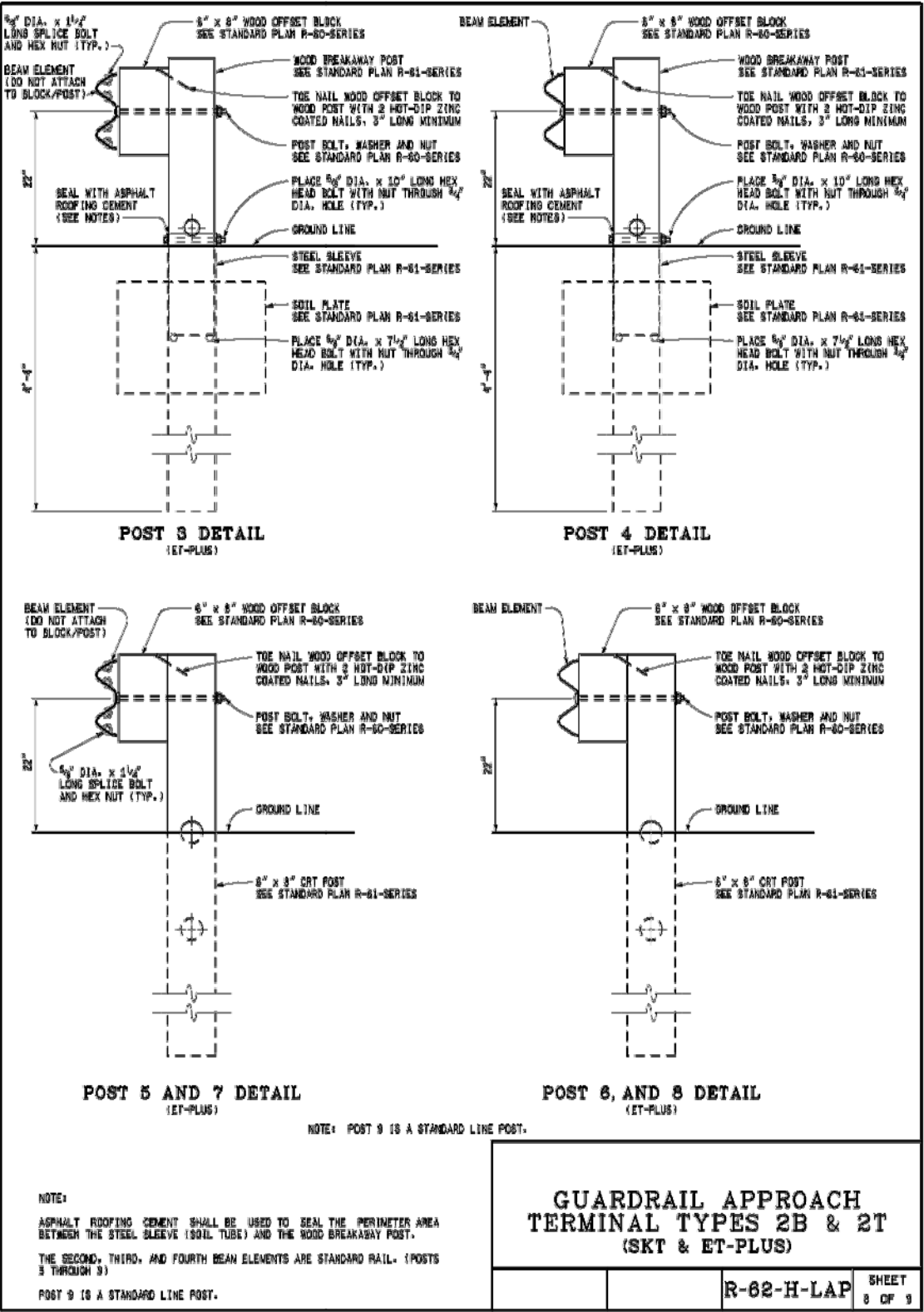
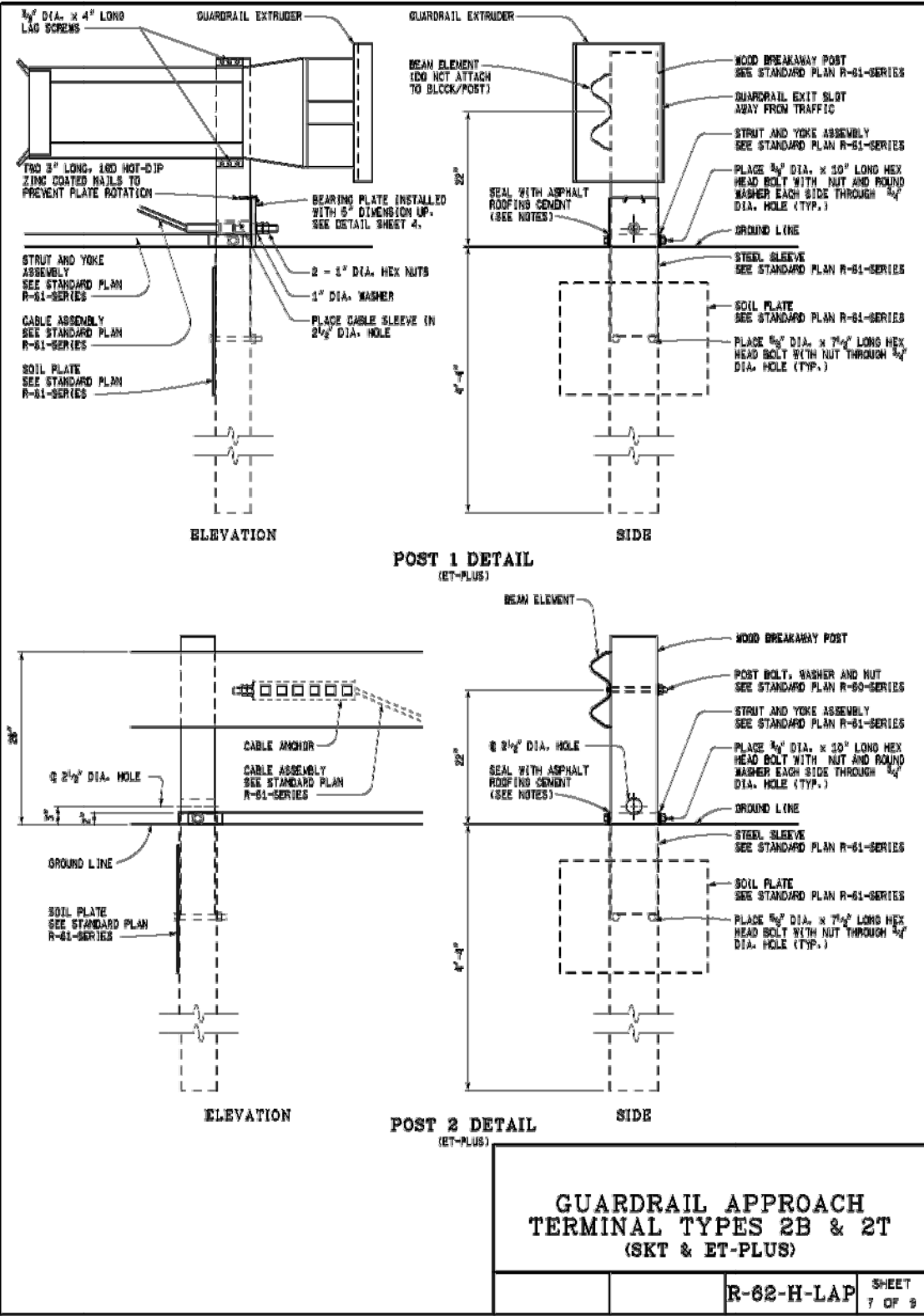
SCECO

SCOTT CIVIL ENGINEERING COMPANY
GRAND RAPIDS, MICHIGAN

DRAWN *AE* CHECKED *NNN* DATE 10/19/23

13

15



HAMLIN TOWNSHIP

GUARDRAIL DETAILS
LAKESHORE DRIVE
OVER SOUTH BAYOU

SCECO

SCOTT CIVIL ENGINEERING COMPANY
GRAND RAPIDS, MICHIGAN

DRAWN *AE* CHECKED *NNN* DATE 10/19/23

14

15

NOTES:

ALL POSTS, OFFSET BLOCKS, BEAM ELEMENTS, AND HARDWARE (INCLUDING BOLTS, NUTS, AND WASHERS) SHALL CONFORM TO THE CURRENT STANDARD SPECIFICATIONS AND TO THE CURRENT STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT AS SPECIFIED ON THIS STANDARD.

ALL 1:10 SLOPES SHALL BE GRADED TO CLASS A SLOPE TOLERANCES.

WHEN SITE CONDITIONS WARRANT AND WITH THE APPROVAL OF THE ENGINEER, GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T CAN BE INSTALLED STRAIGHT WITHOUT THE 1'-0" OFFSET FROM THE TANGENT LINE TO THE TRAFFIC FACE OF POST 1).

GUARDRAIL REFLECTORS AND OTHER ATTACHMENTS ARE NOT TO BE USED ON THE GUARDRAIL APPROACH TERMINAL. PLACE REFLECTORS BEGINNING ON STANDARD RUN OF GUARDRAIL.

USE REFLECTIVE SHEETING ACCORDING TO THE FOLLOWING TRAFFIC CONDITIONS:
(NOTE: ALTERNATE 3" BLACK AND 3" YELLOW STRIPES ON A 45° ANGLE)



TRAFFIC PASSING ON
THE LEFT SIDE



TRAFFIC PASSING ON
BOTH SIDES



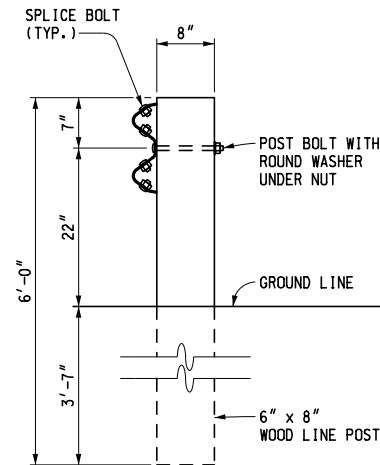
TRAFFIC PASSING ON
THE RIGHT SIDE

THE PORTION OF THE IMPACT HEAD ASSEMBLY FACING TRAFFIC SHALL BE COMPLETELY COVERED WITH HIGH INTENSITY ADHESIVE REFLECTIVE SHEETING.

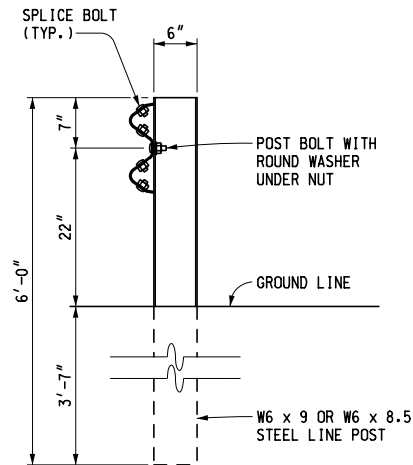
GUARDRAIL APPROACH
TERMINAL TYPES 2B & 2T
(SKT & ET-PLUS)

		R-62-H-LAP	SHEET 8 OF 8
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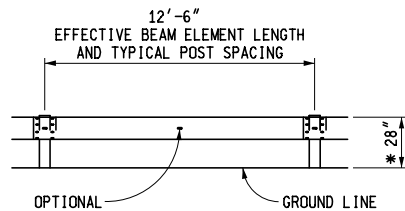
HAMLIN TOWNSHIP			
GUARDRAIL DETAILS LAKESHORE DRIVE OVER SOUTH BAYOU			
 SCOTT CIVIL ENGINEERING COMPANY GRAND RAPIDS, MICHIGAN			15
DRAWN	AE	CHECKED	DATE 10/19/23



WOOD POST



STEEL POST



ELEVATION SHOWING POST SPACING
* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE A



PREPARED
BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Paul C. Ajegba

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

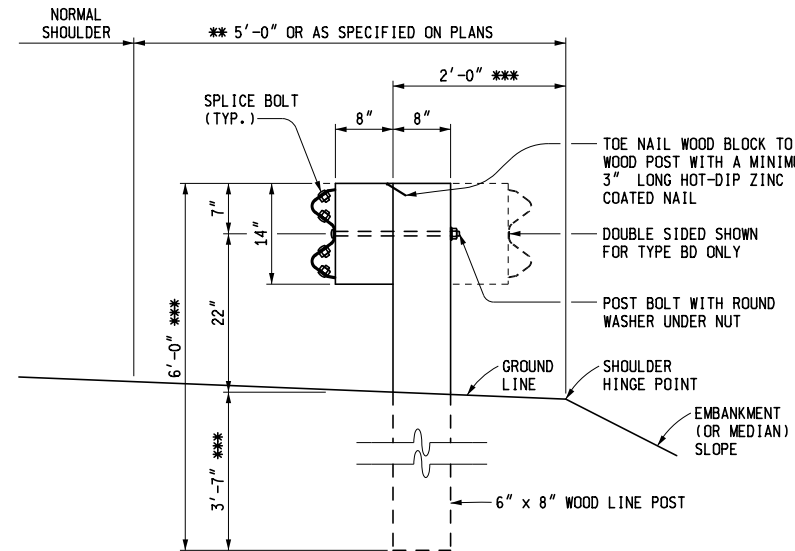
GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D

F.H.W.A. APPROVAL

12-3-2021
PLAN DATE

R-60-J

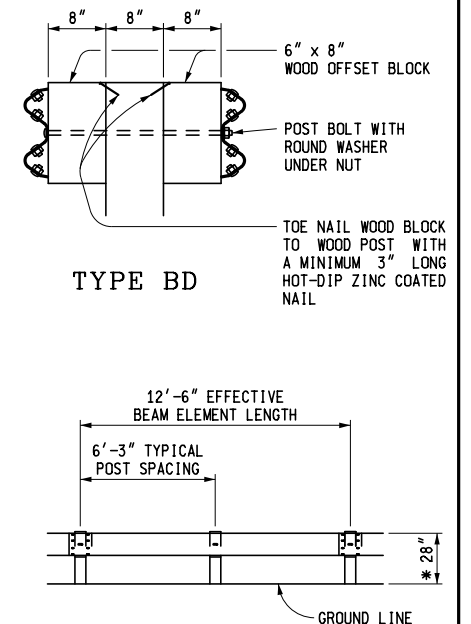
SHEET
1 OF 16



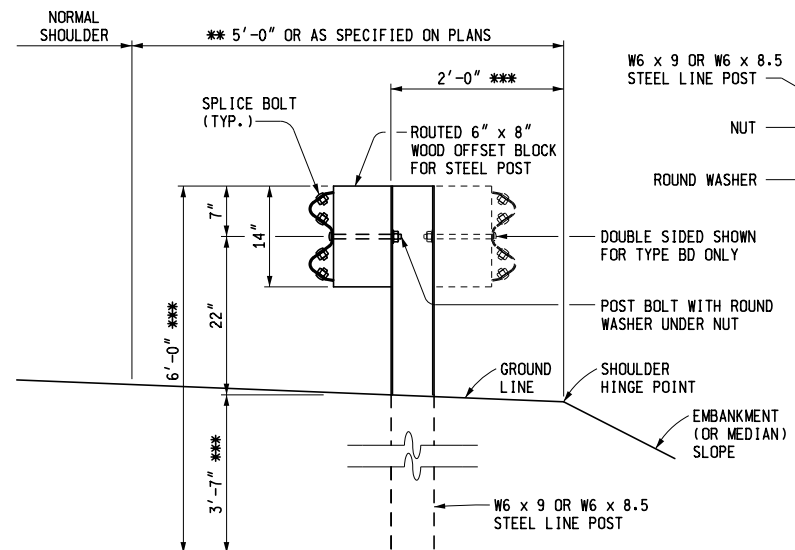
** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12', USE 3'-0".

*** IF THE OFFSET FROM THE FACE OF POST TO THE SHOULDER HINGE POINT IS LESS THAN 2'-0" AND THE EMBANKMENT (OR MEDIAN) SLOPE IS STEEPER THAN 1:10, USE 8'-0" POST WITH THE ADDITIONAL LENGTH EMBEDDED.

GUARDRAIL, TYPE B (OR BD)
(WOOD POST)



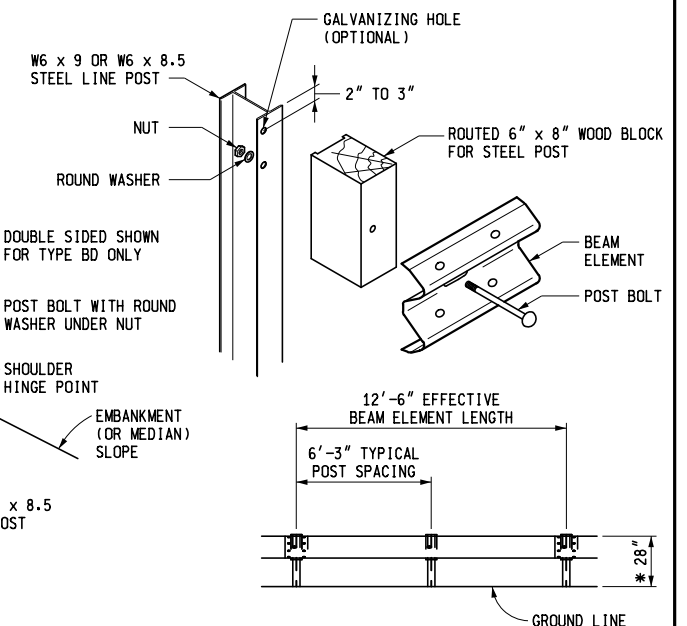
ELEVATION SHOWING POST SPACING
* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB



** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12', USE 3'-0".

*** IF THE OFFSET FROM THE FACE OF POST TO THE SHOULDER HINGE POINT IS LESS THAN 2'-0" AND THE EMBANKMENT (OR MEDIAN) SLOPE IS STEEPER THAN 1:10, USE 8'-0" POST WITH THE ADDITIONAL LENGTH EMBEDDED.

GUARDRAIL, TYPE B (OR BD)
(STEEL POST)



ELEVATION SHOWING POST SPACING
* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D

F.H.W.A. APPROVAL

12-3-2021
PLAN DATE

R-60-J

SHEET
2 OF 16

FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)					
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE



NO SCALE

FILE:

DATE:

DESIGN UNIT:

TSC:

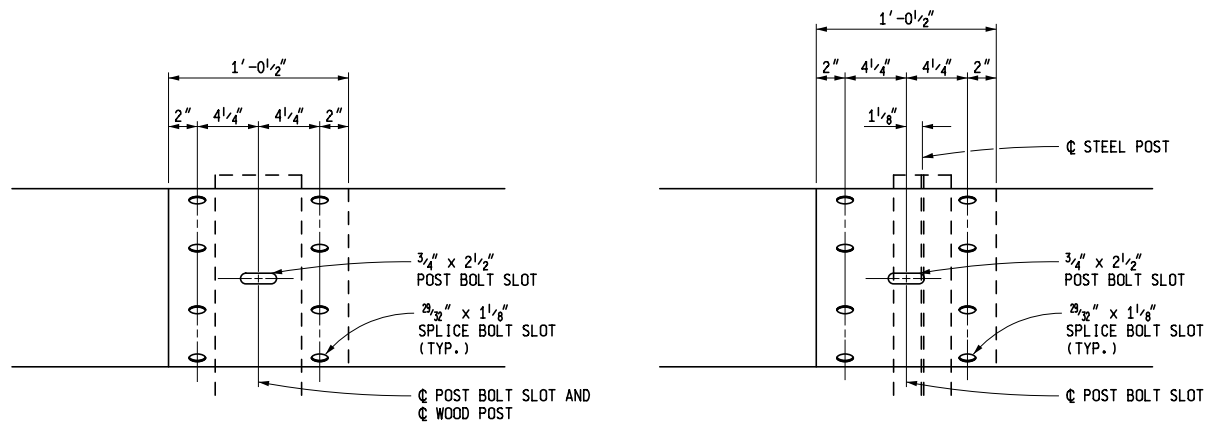
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JN:

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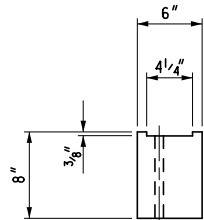
SHEET

SD1 of 17

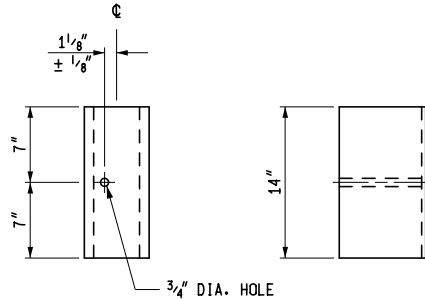


WOOD POST STEEL POST

BEAM ELEMENT SPLICE DETAILS

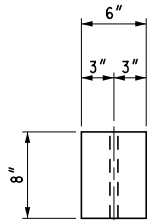


TOP

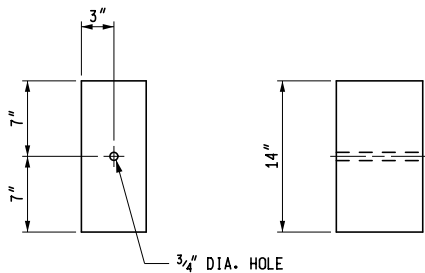


FRONT SIDE

FOR USE ON STEEL POSTS



TOP



FRONT SIDE

FOR USE ON WOOD POSTS

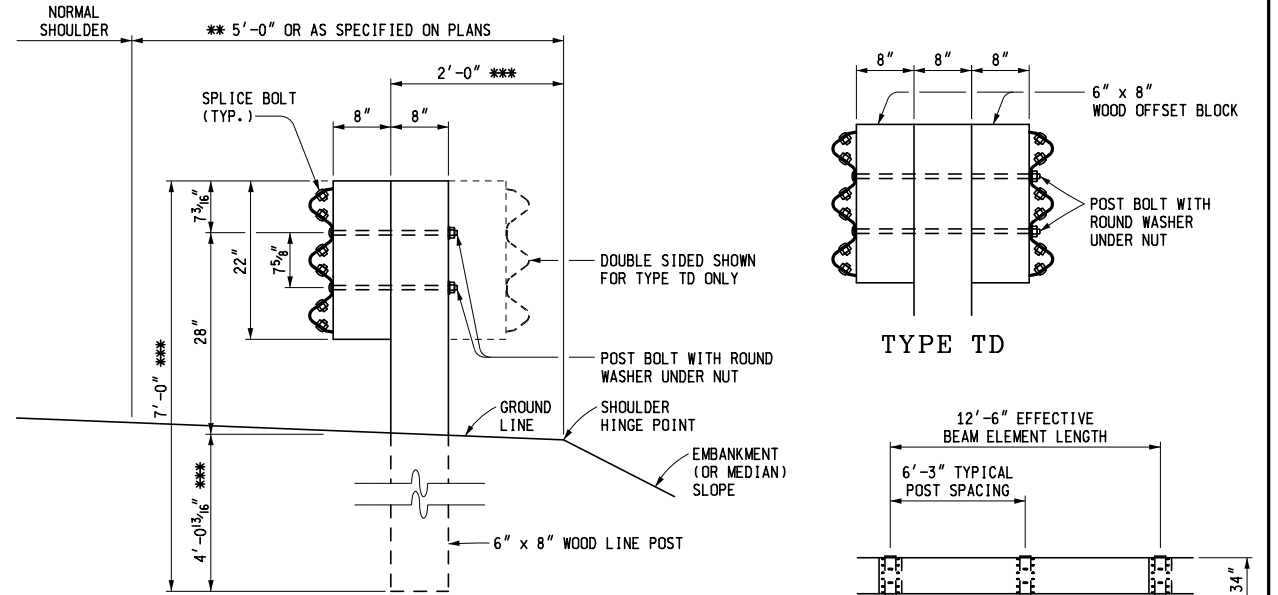
(SEE NOTES ON SHEET 16 OF 16)

WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE B AND TYPE BD

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D

F.H.W.A. APPROVAL	12-3-2021 PLAN DATE	R-60-J	SHEET 3 OF 16
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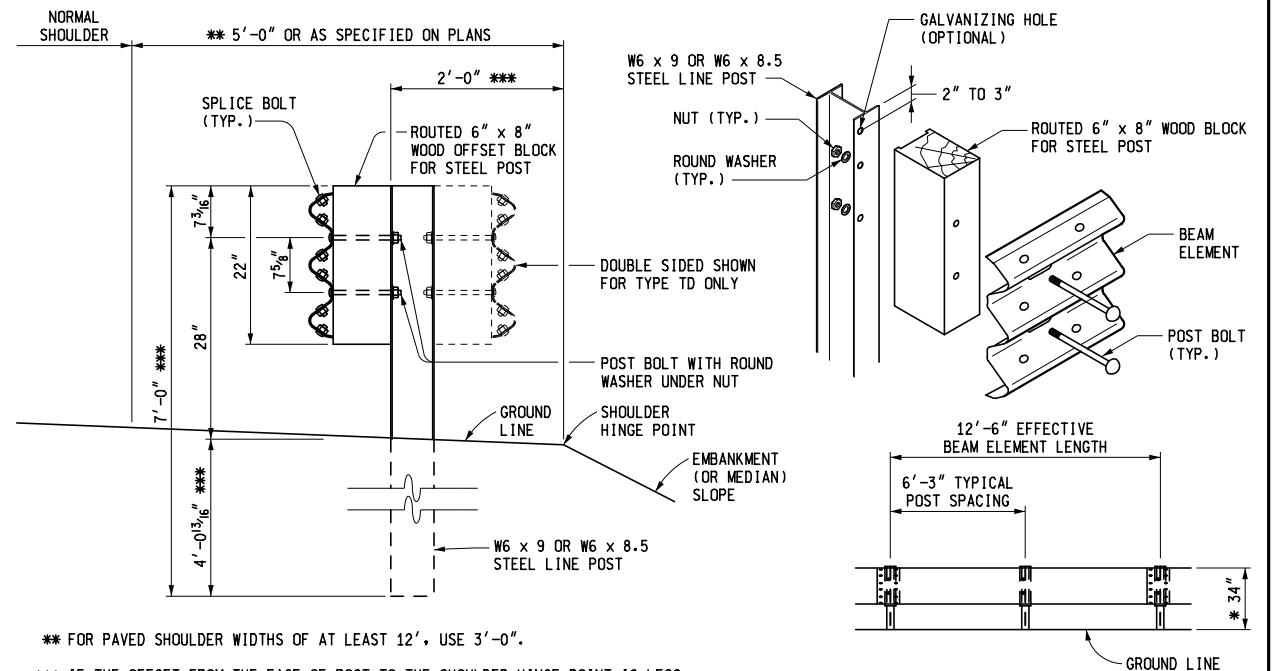
** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12', USE 3'-0".

*** IF THE OFFSET FROM THE FACE OF POST TO THE SHOULDER HINGE POINT IS LESS THAN 2'-0" AND THE EMBANKMENT (OR MEDIAN) SLOPE IS STEEPER THAN 1:10, USE 8'-0" POST WITH THE ADDITIONAL LENGTH EMBEDDED.

GUARDRAIL, TYPE T (OR TD)
(WOOD POST)

ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB



** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12', USE 3'-0".

*** IF THE OFFSET FROM THE FACE OF POST TO THE SHOULDER HINGE POINT IS LESS THAN 2'-0" AND THE EMBANKMENT (OR MEDIAN) SLOPE IS STEEPER THAN 1:10, USE 8'-0" POST WITH THE ADDITIONAL LENGTH EMBEDDED.

GUARDRAIL, TYPE T OR TD
(STEEL POST)

ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D

F.H.W.A. APPROVAL	12-3-2021 PLAN DATE	R-60-J	SHEET 4 OF 16
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FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)					
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE

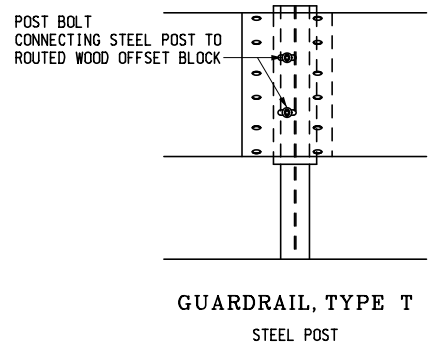
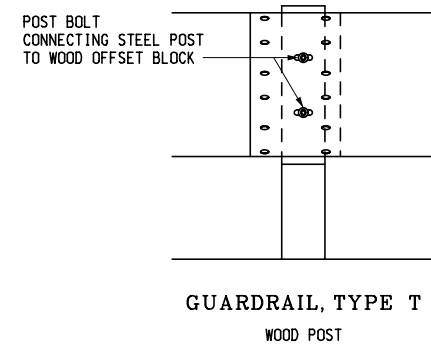
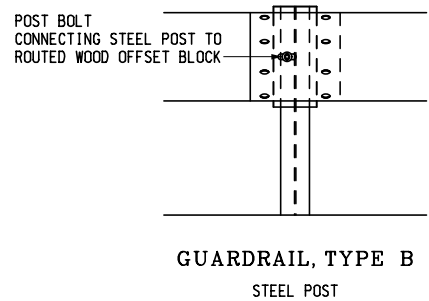
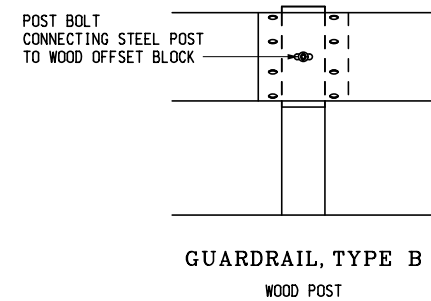


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DESIGN UNIT:	JN:
TSC:	

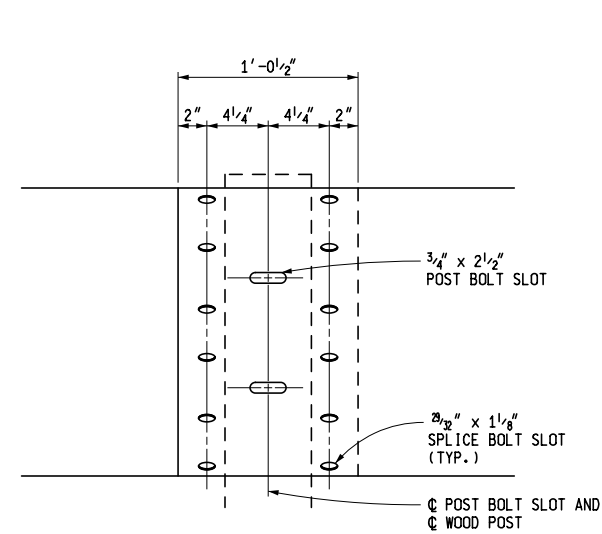
DRAWING	SHEET
SD2	of 17



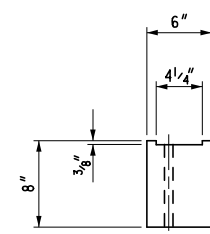
BLOCK AND POST CONNECTION DETAILS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
**GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D**

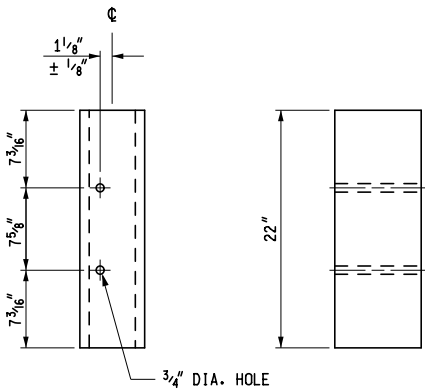
F.H.W.A. APPROVAL	12-3-2021 PLAN DATE	R-60-J	SHEET 5 OF 16
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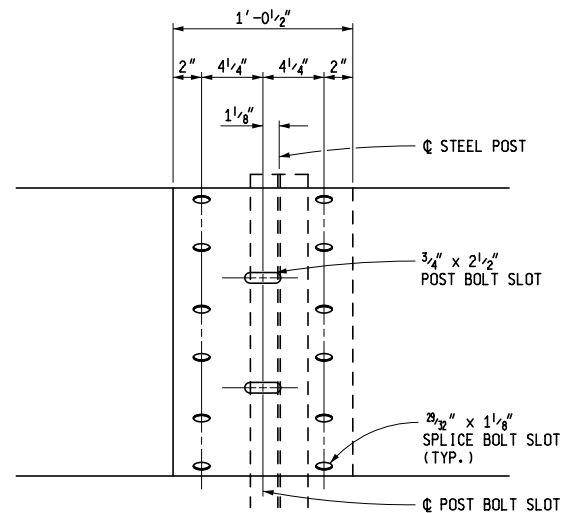
WOOD POST
THRIE BEAM ELEMENT SPLICE DETAILS



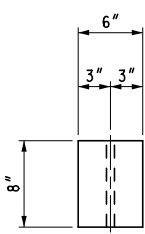
TOP



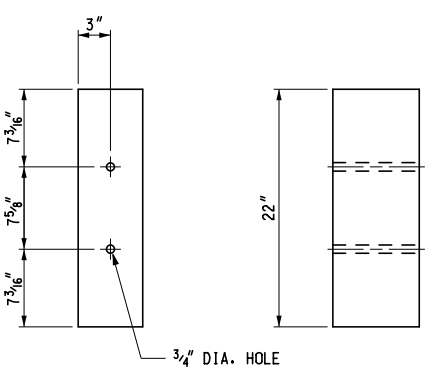
FRONT SIDE
FOR USE ON STEEL POSTS



STEEL POST



TOP



FRONT SIDE
FOR USE ON WOOD POSTS
(SEE NOTES ON SHEET 16 OF 16)

WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE T AND TYPE TD

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
**GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D**

F.H.W.A. APPROVAL	12-3-2021 PLAN DATE	R-60-J	SHEET 6 OF 16
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FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION



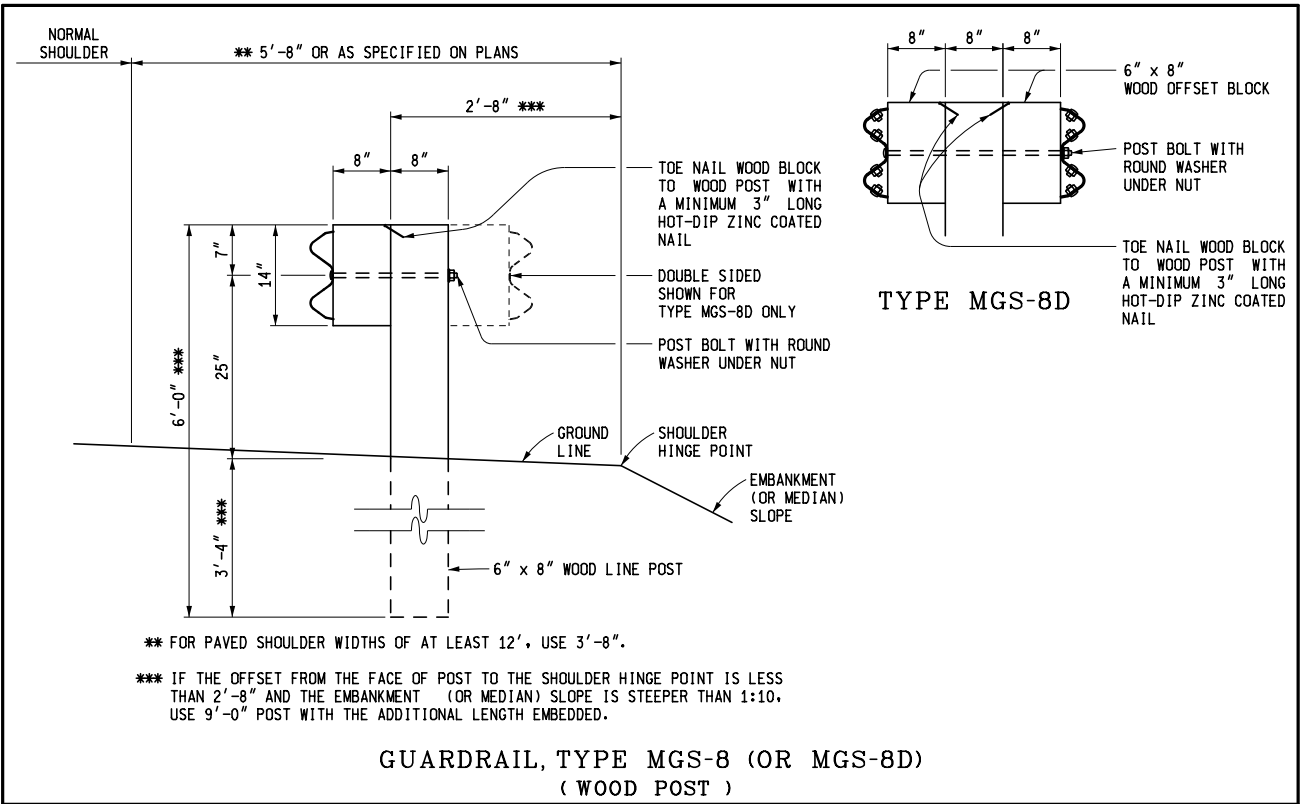
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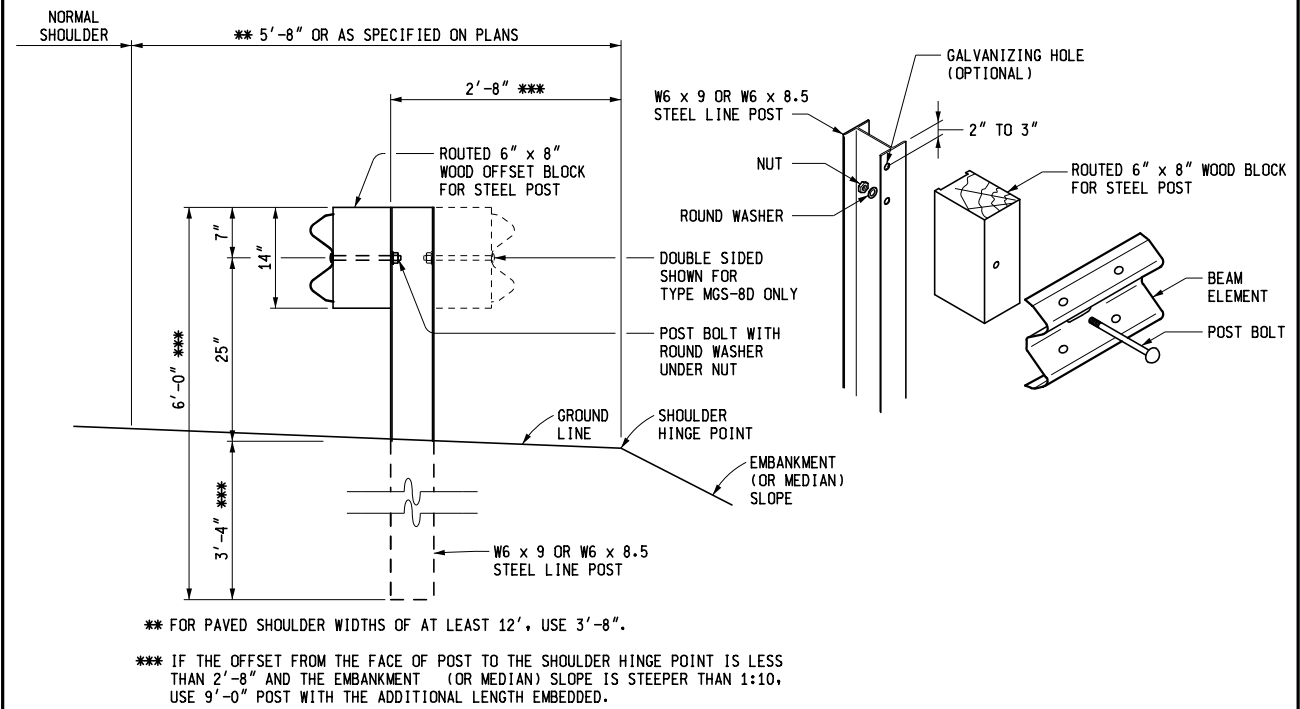
DATE:
DESIGN UNIT:
TSC:

CS:
JN:

DRAWING SHEET
SD3 of 17



GUARDRAIL, TYPE MGS-8 (OR MGS-8D)
(WOOD POST)

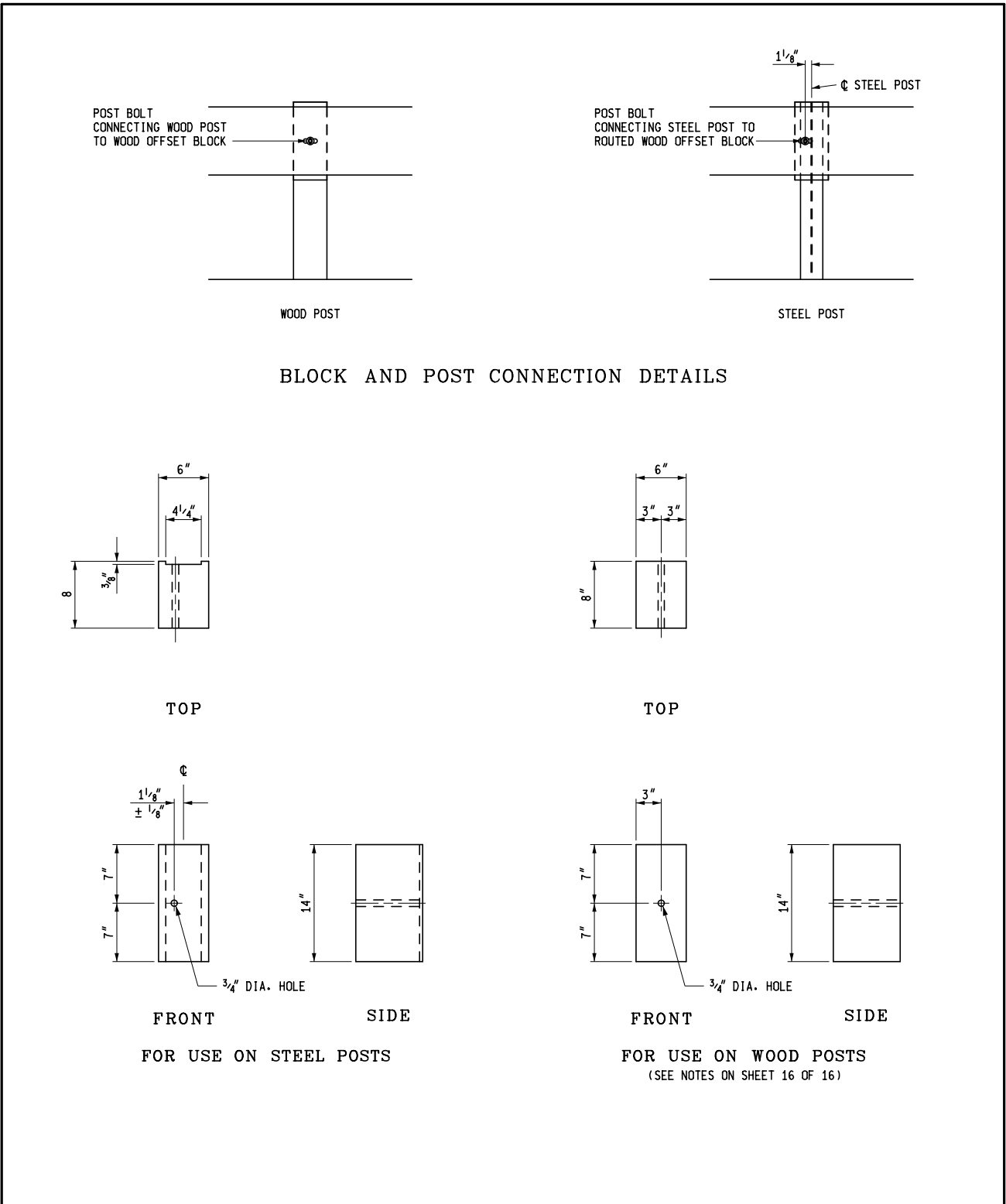


GUARDRAIL, TYPE MGS-8 (OR MGS-8D)
(STEEL POST)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D**

F.H.W.A. APPROVAL	12-3-2021 PLAN DATE	R-60-J	SHEET 7 OF 16
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WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE MGS-8 AND TYPE MGS-8D

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D**

F.H.W.A. APPROVAL	12-3-2021 PLAN DATE	R-60-J	SHEET 8 OF 16
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FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION



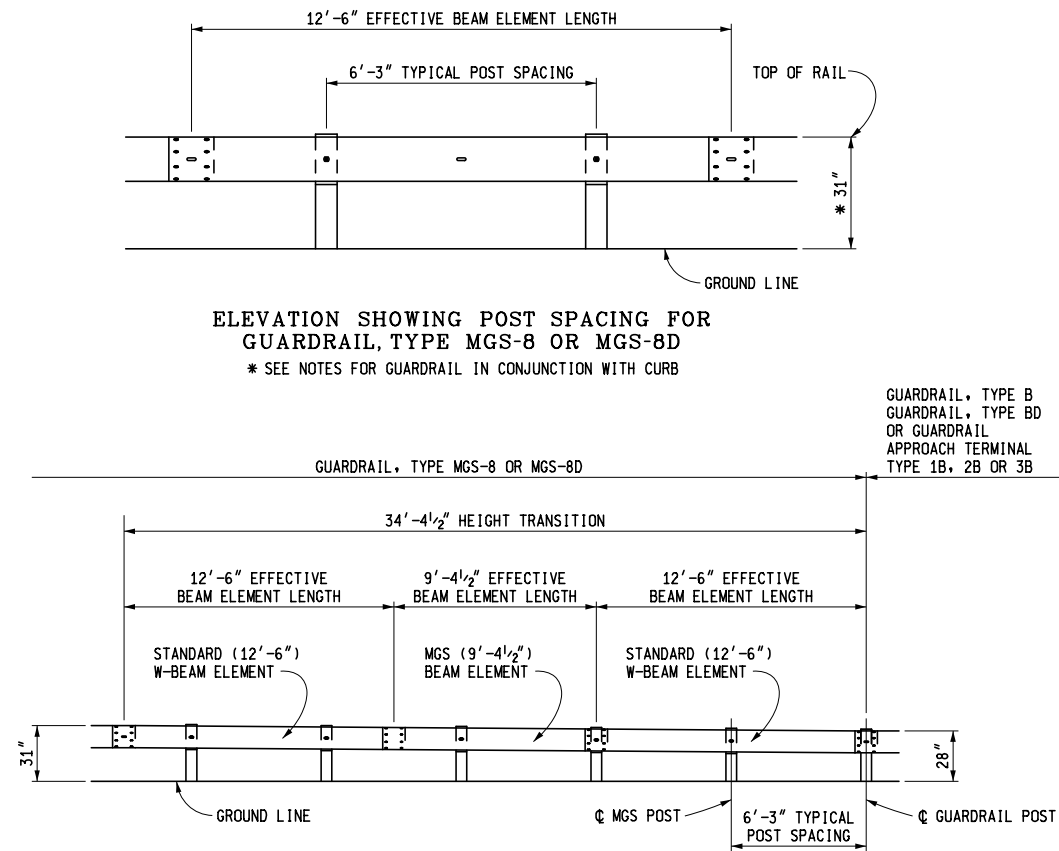
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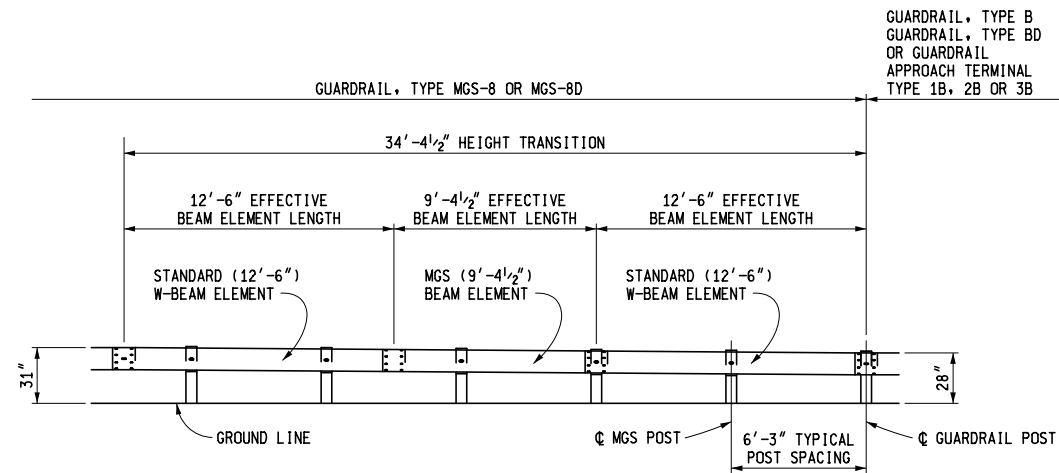
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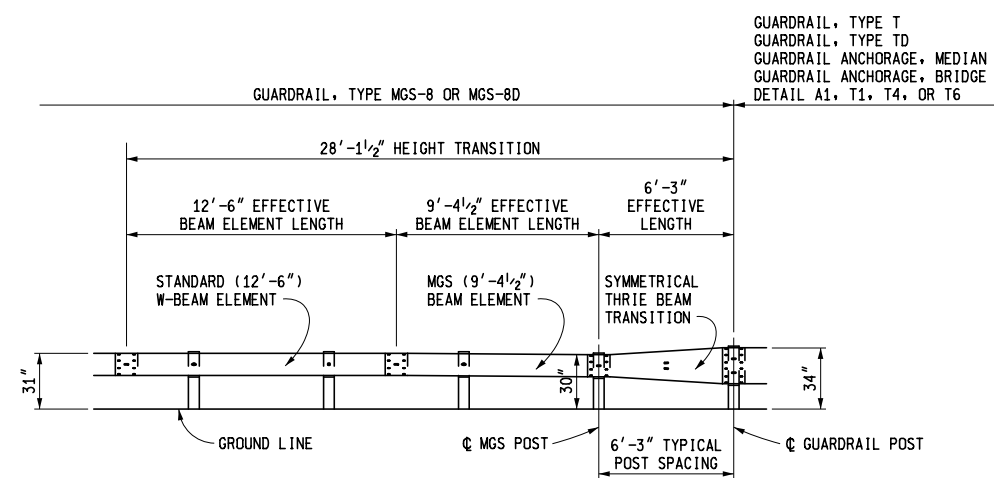
DRAWING
SHEET
SD4
of 17



ELEVATION SHOWING POST SPACING FOR
GUARDRAIL, TYPE MGS-8 OR MGS-8D
* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB



ELEVATION SHOWING TRANSITION DETAIL FOR CONNECTING
GUARDRAIL, TYPE MGS-8 OR MGS-8D TO
GUARDRAIL, TYPE B, GUARDRAIL, TYPE BD, OR
GUARDRAIL APPROACH TERMINAL TYPE 1B, 2B, OR 3B



ELEVATION SHOWING TRANSITION DETAIL FOR CONNECTING
GUARDRAIL, TYPE MGS-8 OR MGS-8D TO
GUARDRAIL, TYPE T, GUARDRAIL, TYPE TD,
GUARDRAIL ANCHORAGE, MEDIAN,
GUARDRAIL ANCHORAGE, BRIDGE DETAIL A1, T1, T4 OR T6

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

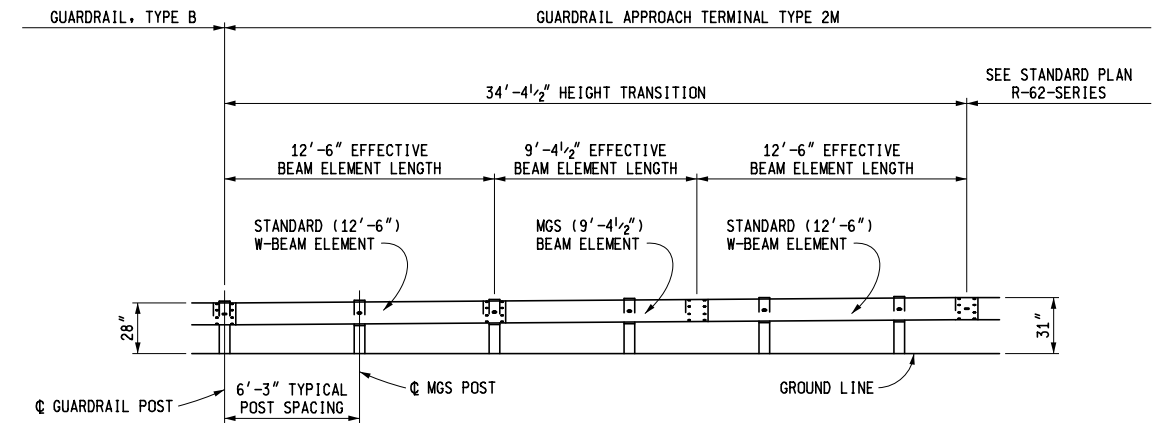
GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D

F.H.W.A. APPROVAL

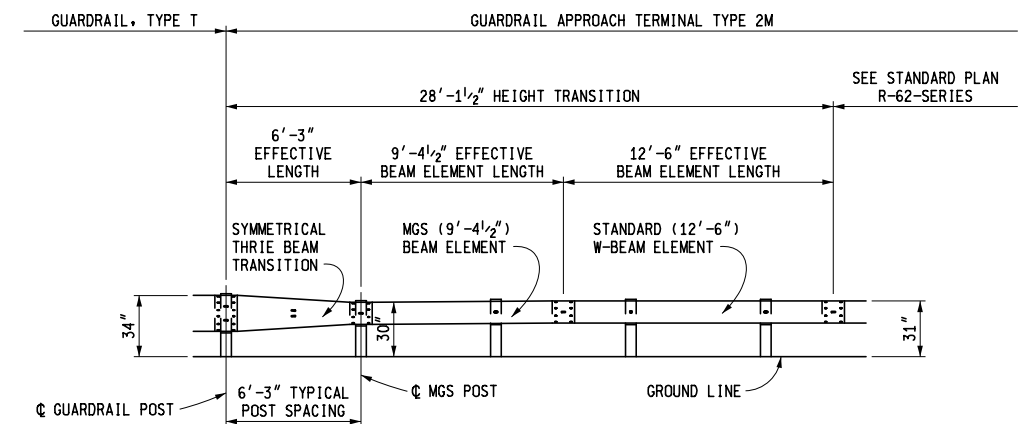
12-3-2021
PLAN DATE

R-60-J

SHEET
9 OF 16



ELEVATION SHOWING TRANSITION DETAIL FOR CONNECTING
GUARDRAIL, TYPE B TO
GUARDRAIL APPROACH TERMINAL TYPE 2M



ELEVATION SHOWING TRANSITION DETAIL FOR CONNECTING
GUARDRAIL, TYPE T TO
GUARDRAIL APPROACH TERMINAL TYPE 2M

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D

F.H.W.A. APPROVAL

12-3-2021
PLAN DATE

R-60-J

SHEET
10 OF 16

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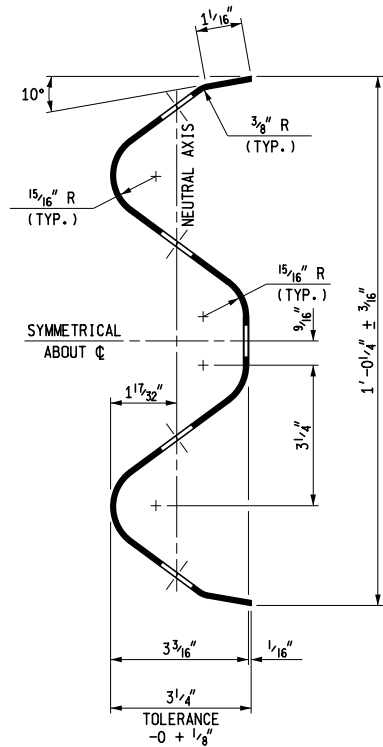
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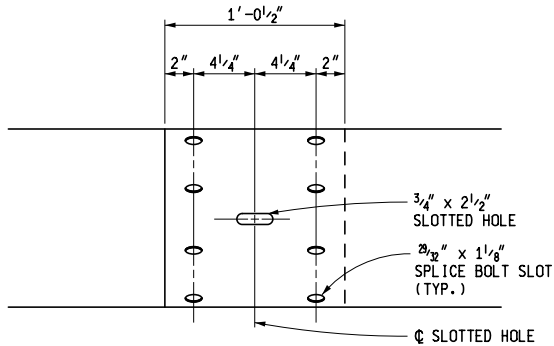
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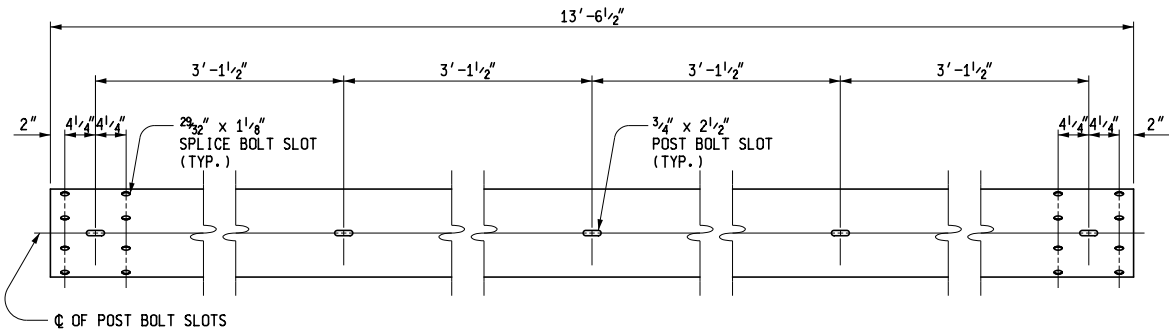
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SD5 of 17



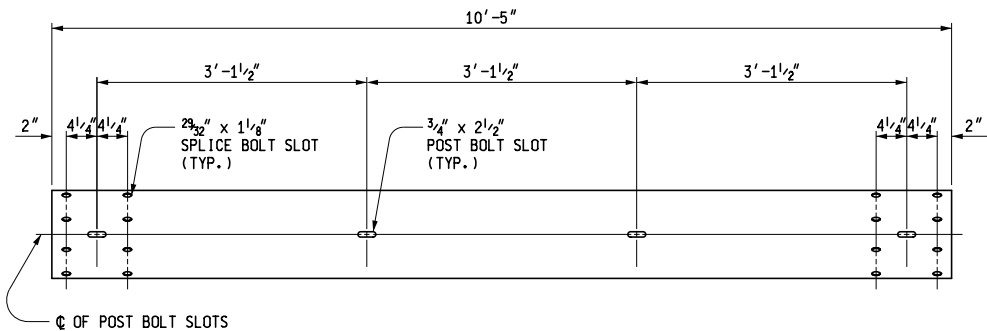
SECTION THROUGH BEAM ELEMENT



BEAM ELEMENT SPLICE DETAILS



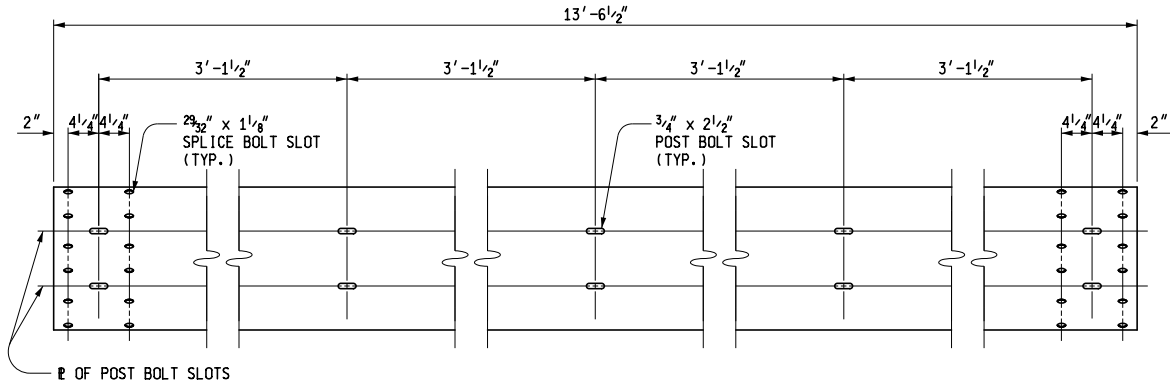
FRONT ELEVATION OF BEAM ELEMENT



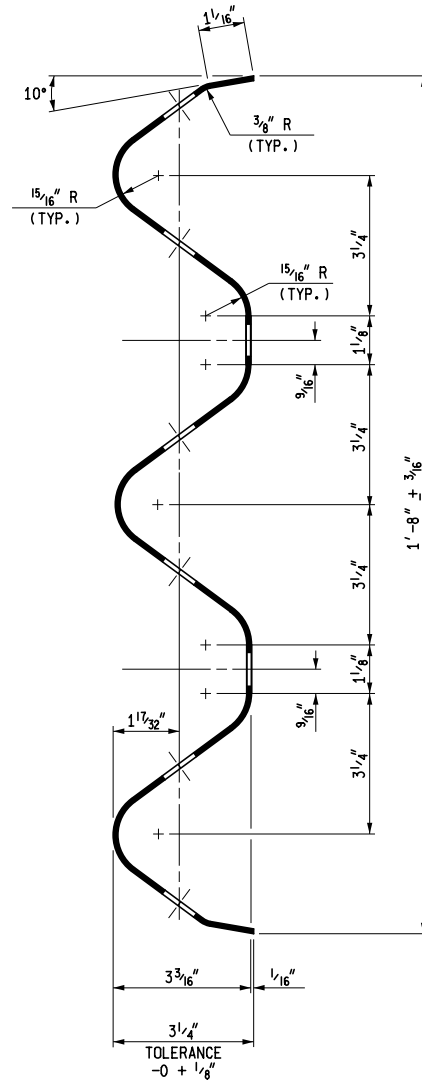
FRONT ELEVATION OF MGS (9'-4 1/2") BEAM ELEMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
**GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D**

F.H.W.A. APPROVAL	12-3-2021 PLAN DATE	R-60-J	SHEET 11 OF 16
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FRONT ELEVATION OF THRIE BEAM ELEMENT



SECTION THROUGH THRIE BEAM ELEMENT
(FOR GUARDRAIL, TYPE T AND TD)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
**GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D**

F.H.W.A. APPROVAL	12-3-2021 PLAN DATE	R-60-J	SHEET 12 OF 16
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FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)					
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE



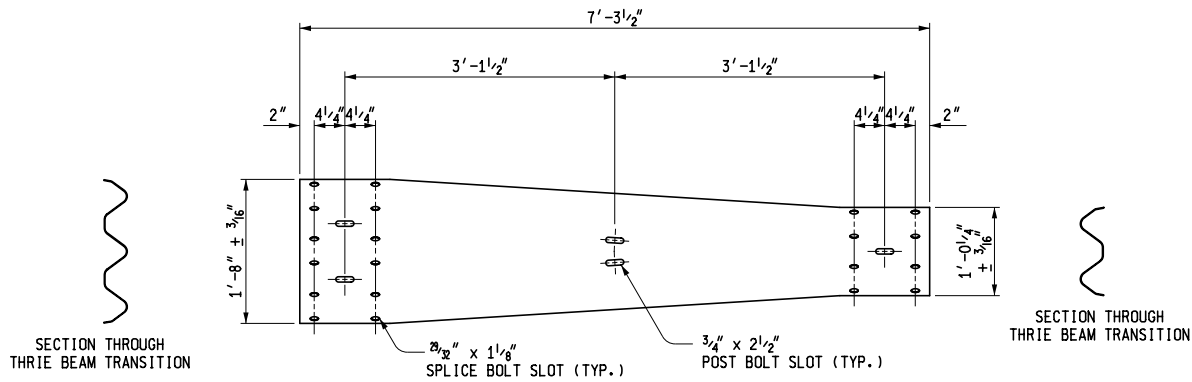
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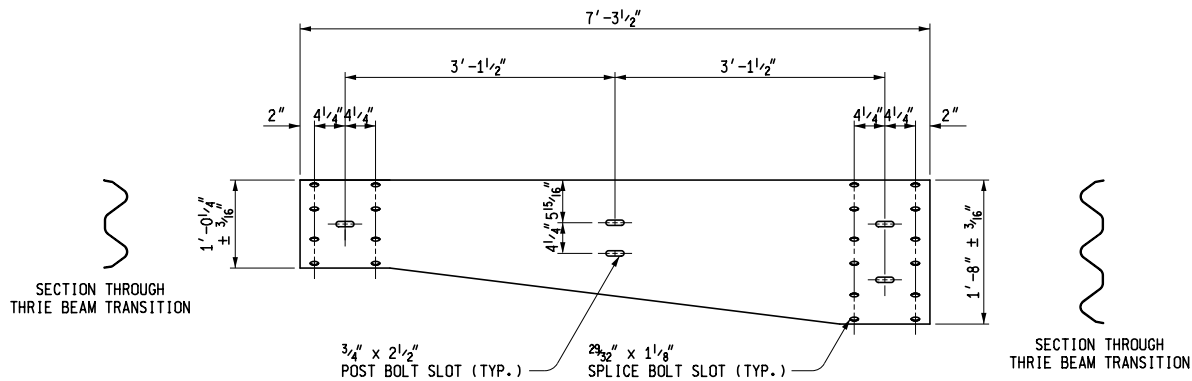
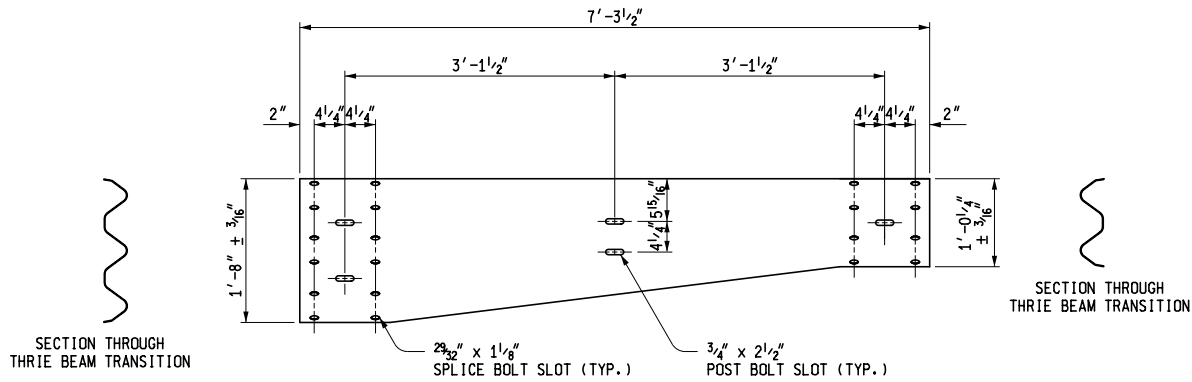
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DRAWING SHEET
SD6 of 17



SYMMETRICAL THRIE BEAM TRANSITIONS



ASYMMETRICAL THRIE BEAM TRANSITIONS
NOTE: ASYMMETRICAL TRANSITION TYPE WILL VARY BY LOCATION DEPENDING ON GUARDRAIL LAYOUT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

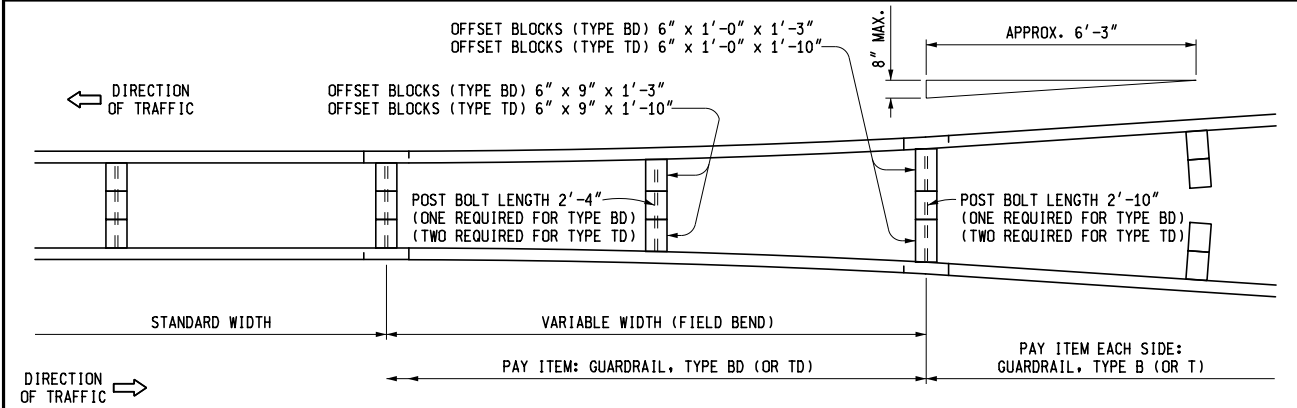
GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D

F.H.W.A. APPROVAL

12-3-2021
PLAN DATE

R-60-J

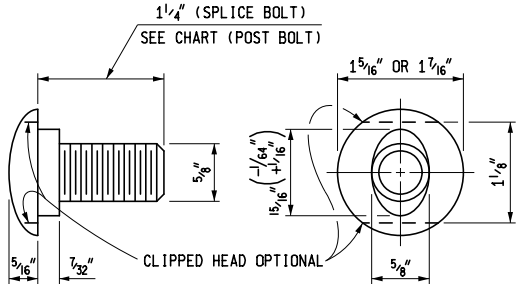
SHEET
13 OF 16



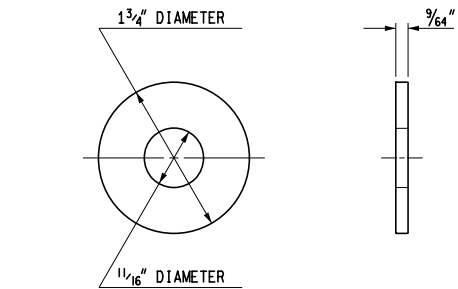
DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE B (OR TYPE T)
TO GUARDRAIL, TYPE BD (OR TYPE TD)

POST BOLTS, SPLICE BOLTS AND WASHERS AT BEAM ELEMENT SPLICE POSTS AND AT INTERMEDIATE POSTS						
GUARDRAIL TYPE	POST	OFFSET BLOCK	POST BOLTS		SPLICE BOLTS (1 1/4" LONG) (NO. REQ'D)	WASHERS (ROUND) (NO. REQ'D)
			NO. REQ'D	LENGTH		
A	WOOD	N/A	1	9 1/2"	8	1
	STEEL	N/A	1	2"		1
B	WOOD	WOOD	1	18"	8	1
	STEEL	WOOD	1	9 1/2"		1
BD	WOOD	WOOD	1	*26 1/2"	16	—
	STEEL	WOOD	2	9 1/2"		2
T	WOOD	WOOD	2	18"	12	2
	STEEL	WOOD	2	9 1/2"		2
TD	WOOD	WOOD	2	*26 1/2"	24	—
	STEEL	WOOD	4	9 1/2"		4

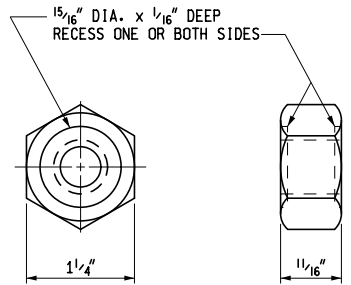
MINIMUM POST BOLT THREAD LENGTH	
BOLT LENGTH	MINIMUM THREAD LENGTH
9 1/2"	1 3/4"
18"	2 1/2"
26 1/2"	3"



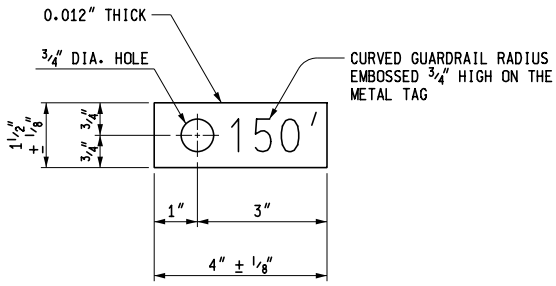
SPLICE BOLT AND POST BOLT



ROUND WASHER



NUT



METAL TAG

FOR CURVED GUARDRAIL WITH RADIUS OF 150' OR LESS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, & MGS-8D

F.H.W.A. APPROVAL

12-3-2021
PLAN DATE

R-60-J

SHEET
14 OF 16

FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)					
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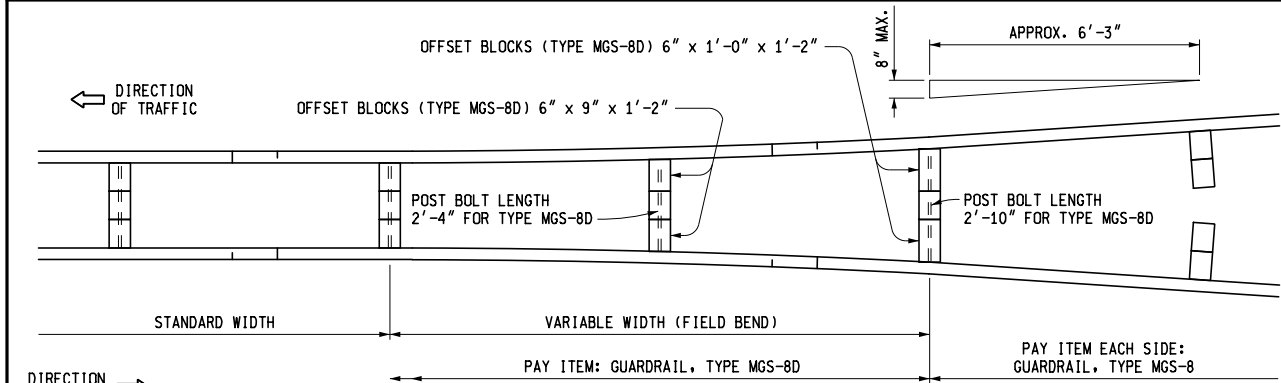
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SD7 of 17



DETAIL SHOWING TRANSITION FROM
GUARDRAIL, TYPE MGS-8 TO GUARDRAIL, TYPE MGS-8D

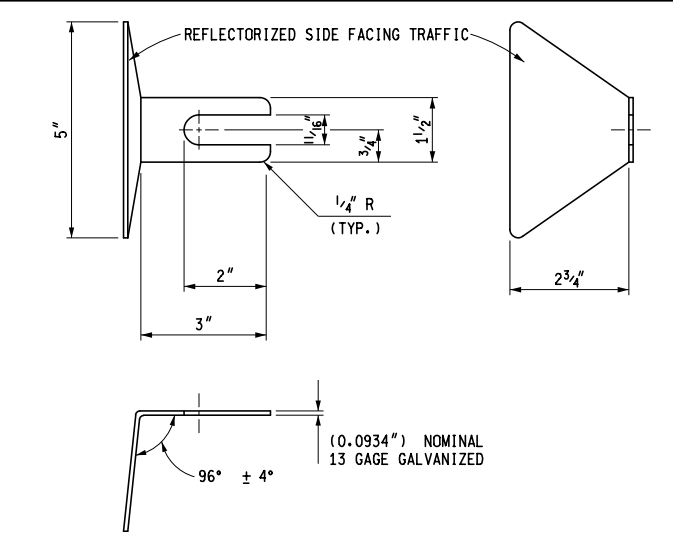
POST BOLTS, SPLICE BOLTS AND WASHERS AT BEAM ELEMENT SPLICE POSTS AND AT INTERMEDIATE POSTS						
GUARDRAIL TYPE	POST	OFFSET BLOCK	POST BOLTS		SPLICE BOLTS (1 1/4" LONG) (NO. REQ'D)	WASHERS (ROUND) (NO. REQ'D)
			NO. REQ'D	LENGTH		
MGS-8	WOOD	WOOD	1	18"	8	1
	STEEL	WOOD	1	9 1/2"		1
MGS-8D	WOOD	WOOD	1	*26 1/2"	16	—
	STEEL	WOOD	2	9 1/2"		2

THRIE BEAM TRANSITIONS REQUIRE 20 SPLICE BOLTS EACH (12 ON TYPE T END AND 8 ON TYPE MGS END).

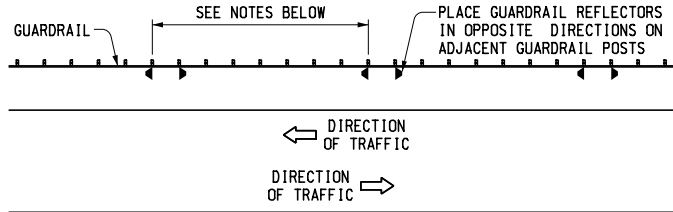
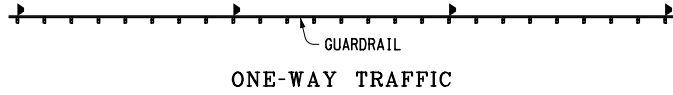
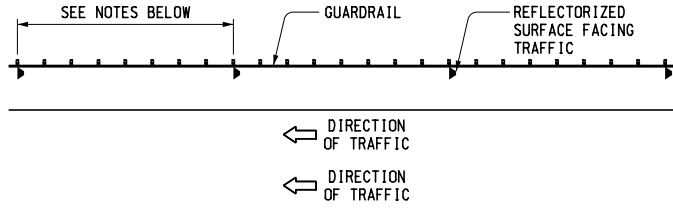
* EXCEPT AS SPECIFIED ON DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL, TYPE MGS-8D POST BOLTS SHALL NOT EXTEND MORE THAN 1/2" BEYOND NUT.

MINIMUM POST BOLT THREAD LENGTH	
BOLT LENGTH	MINIMUM THREAD LENGTH
9 1/2"	1 3/4"
18"	2 1/2"
26 1/2"	3"

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D			
F.H.W.A. APPROVAL	12-3-2021 PLAN DATE	R-60-J	SHEET 15 OF 16



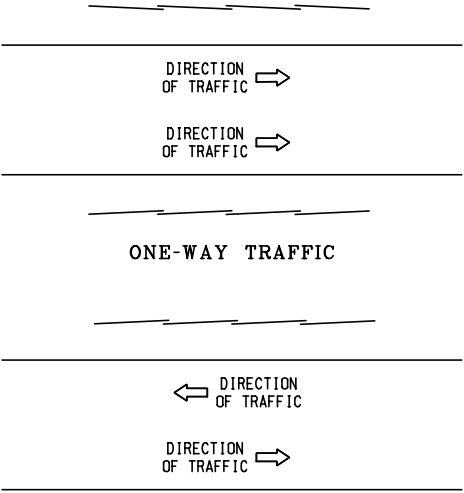
GUARDRAIL REFLECTOR



TWO-WAY TRAFFIC
PLACEMENT OF GUARDRAIL REFLECTORS

NOTES GOVERNING THE USE OF GUARDRAIL REFLECTORS

- GUARDRAIL REFLECTORS SHALL BE USED ON ALL STANDARD GUARDRAIL RUNS, REGARDLESS OF ROADWAY LIGHTING.
- GUARDRAIL REFLECTORS ARE TO BE SPACED AT THE FOLLOWING INTERVALS:
 - 50'-0" ON TANGENT SECTIONS AND CURVES WITH A RADIUS OF 1150' OR MORE.
 - 25'-0" ON CURVES WITH A RADIUS LESS THAN 1150'.
- FOR GUARDRAIL REFLECTOR PLACEMENT ON APPROACH TERMINALS, SEE THE APPROPRIATE GUARDRAIL APPROACH TERMINAL STANDARD PLAN.
- A GUARDRAIL REFLECTOR IS TO BE PLACED ON THE SECOND POST FROM THE GUARDRAIL DEPARTING TERMINAL.
- ON GUARDRAIL, TYPE T AND TYPE TD GUARDRAIL REFLECTORS ARE TO BE PLACED ON THE UPPER POST BOLT.
- GUARDRAIL REFLECTORS SHALL MATCH COLOR OF EDGE LINE.



ONE-WAY TRAFFIC

TWO-WAY TRAFFIC
DIRECTION OF RAIL LAP

NOTES:

DETAILS SPECIFIED ON THIS STANDARD ARE ACCORDING TO THE AASHTO-AGC-ARTBA JOINT COMMITTEE, TASK FORCE 13 PUBLICATION TITLED "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE."

BEAM ELEMENTS SHALL BE SHOP BENT TO PLAN RADIUS FOR CURVE RADII 150' OR LESS. A TAG IDENTIFYING THE CURVATURE OF THE SHOP BENT SECTION WILL BE REQUIRED FOR EACH CURVED ELEMENT.

SEE STANDARD PLAN R-62-SERIES OR R-63-SERIES FOR GUARDRAIL APPROACH TERMINALS, STANDARD PLAN R-66-SERIES FOR GUARDRAIL DEPARTING TERMINALS AND STANDARD PLAN R-67-SERIES FOR GUARDRAIL ANCHORAGE, BRIDGE.

WOOD POSTS WITH 1/2" BEVELS AT THE TOP MAY BE USED IN LIEU OF WOOD POSTS WITHOUT BEVELS SPECIFIED. THE LENGTH, WIDTH AND DEPTH OF THE POST SHALL BE AS SPECIFIED ON THIS STANDARD AND THE POST BOLT HOLES SHALL BE LOCATED TO ENSURE PROPER RAIL HEIGHT.

WOOD OFFSET BLOCKS WITH 1/2" BEVELS AT THE TOP AND BOTTOM OR A 1" BEVELED TOP MAY BE USED IN LIEU OF WOOD BLOCKS WITHOUT BEVELS SPECIFIED. THE LENGTH (FRONT AND BACK FACE), WIDTH AND DEPTH OF THE BLOCK SHALL BE AS SPECIFIED ON THIS STANDARD AND THE POST BOLT HOLES SHALL BE LOCATED TO ENSURE PROPER RAIL HEIGHT AND COMPATIBILITY WITH POST HOLES.

WHEN THE FACE OF GUARDRAIL IS PLACED FLUSH WITH FACE OF CURB, THE RAIL HEIGHT SHOULD BE MEASURED FROM THE FRONT EDGE OF THE GUTTER PAN, WHICH IS THE POINT ON THE GUTTER PAN THAT IS CLOSEST TO THE EDGE OF THE TRAVELED LANE. WHEN THE FACE OF THE GUARDRAIL PANEL IS LOCATED BEHIND THE CURB THE RAIL HEIGHT SHOULD BE MEASURED FROM THE GROUND JUST IN FRONT OF THE GUARDRAIL.

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D			
F.H.W.A. APPROVAL	12-3-2021 PLAN DATE	R-60-J	SHEET 16 OF 16

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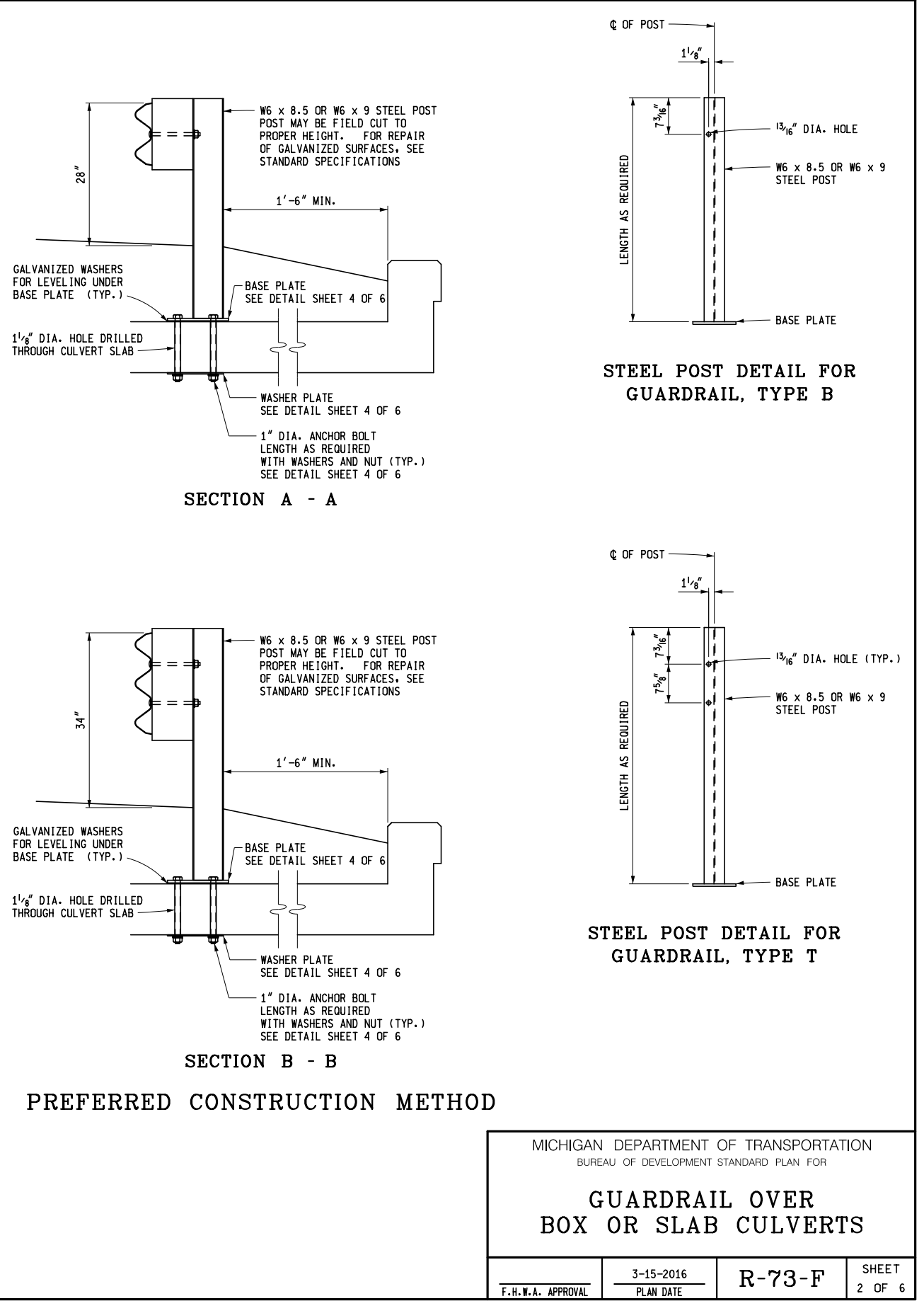
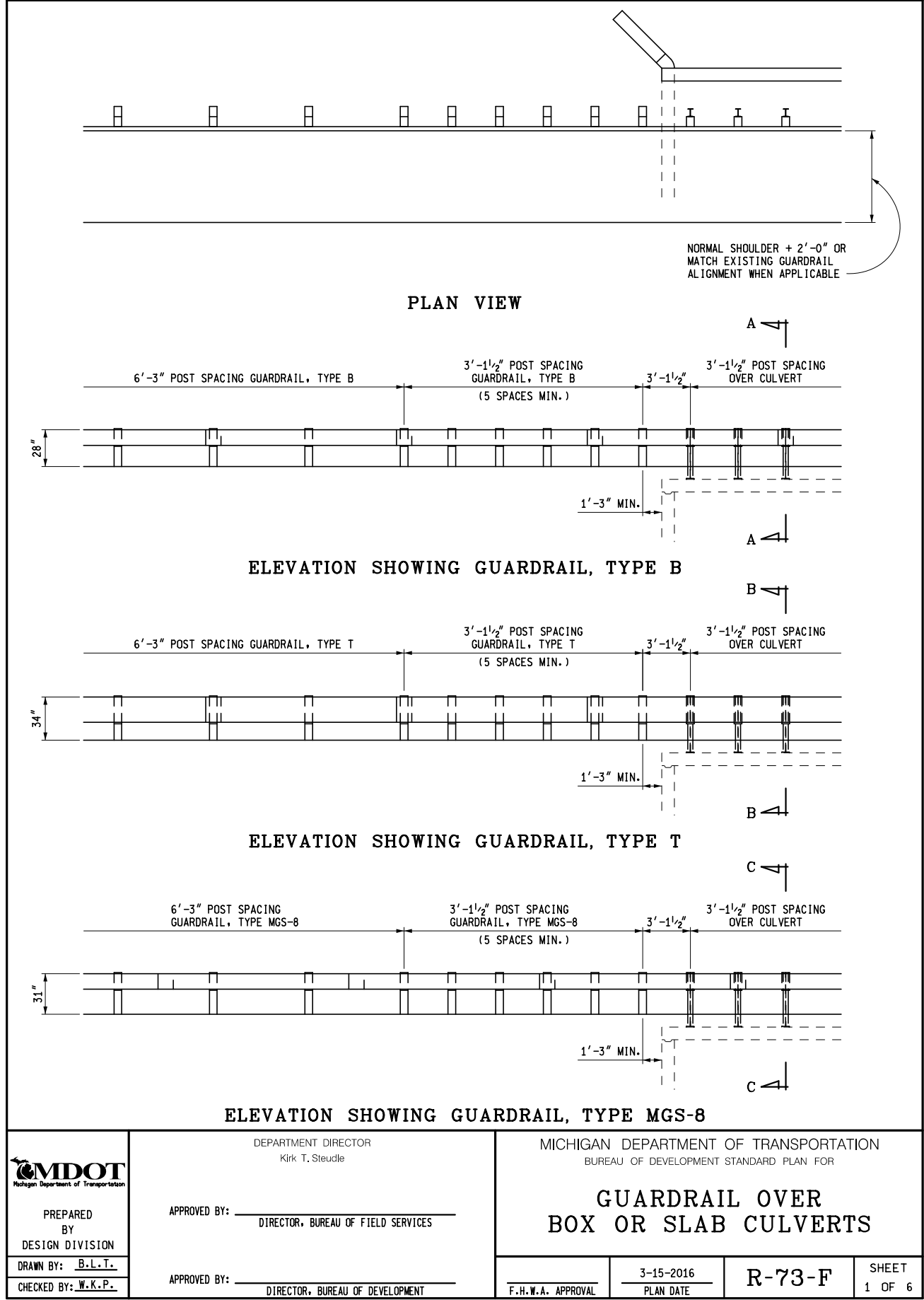
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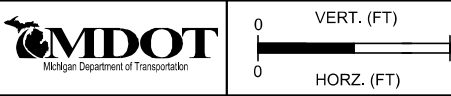
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SD8 of 17



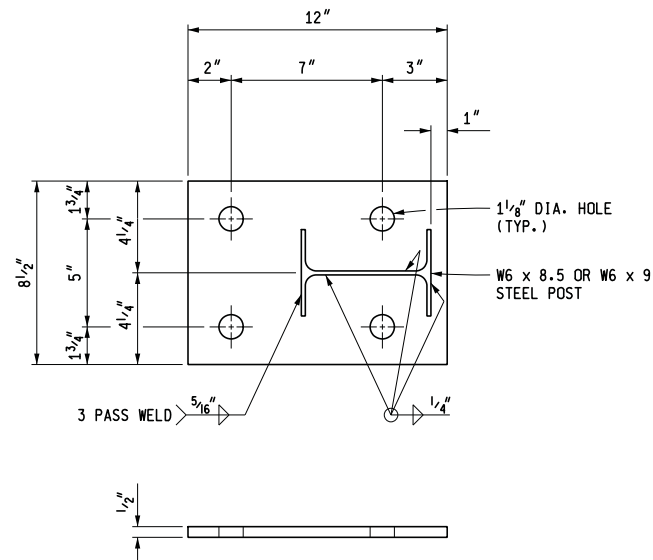
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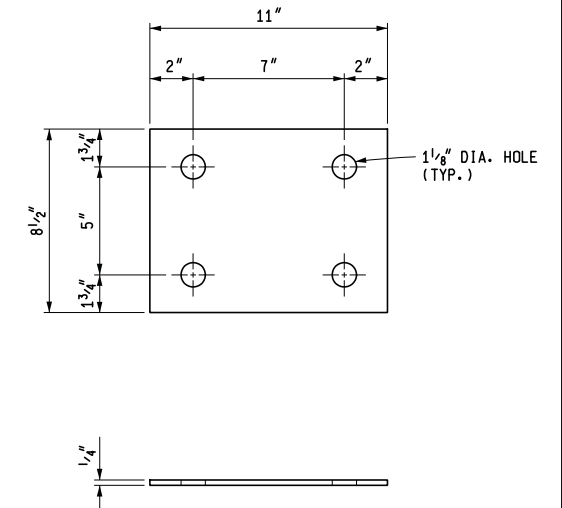
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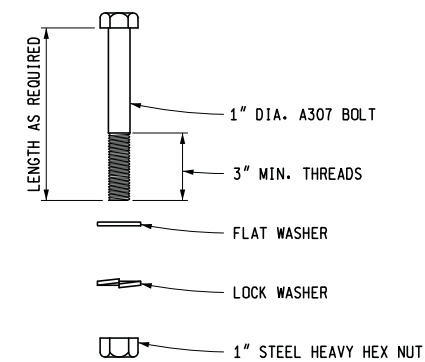
STEEL POST DETAIL FOR
GUARDRAIL, TYPE MGS-8



BASE PLATE DETAIL



WASHER PLATE DETAIL

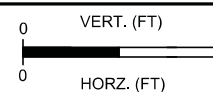


ANCHOR BOLT DETAIL

GUARDRAIL OVER BOX OR SLAB CULVERTS

<u>F.H.W.A. APPROVAL</u>	<u>3-15-2016</u> PLAN DATE	R-73-F	SHEET 4 OF 6
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AS-LET PLAN REVISIONS							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION



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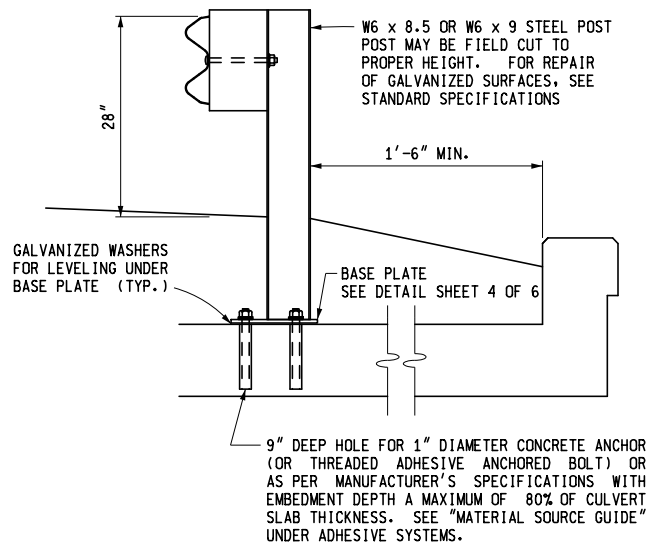
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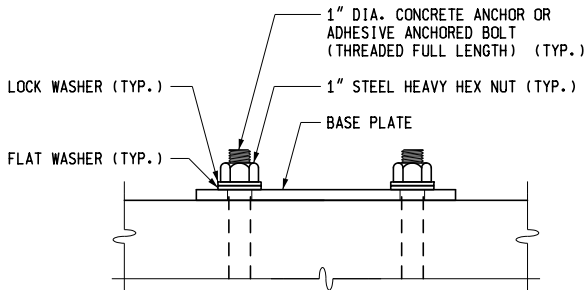
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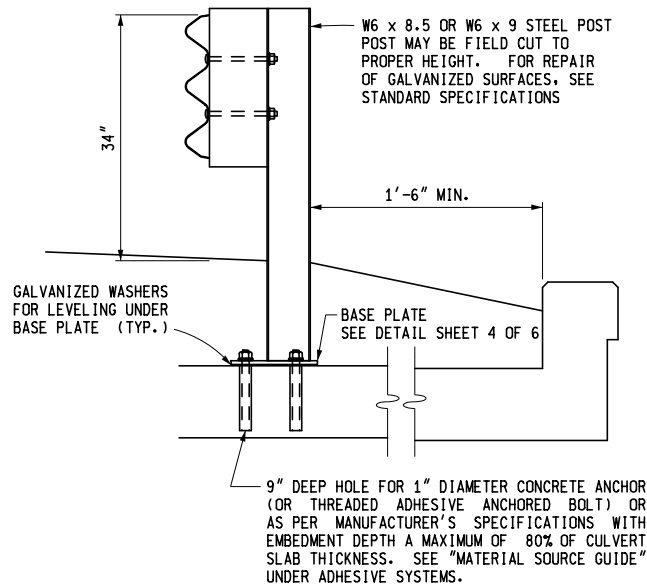
SD10 of 17



SECTION A - A



ANCHOR DETAIL



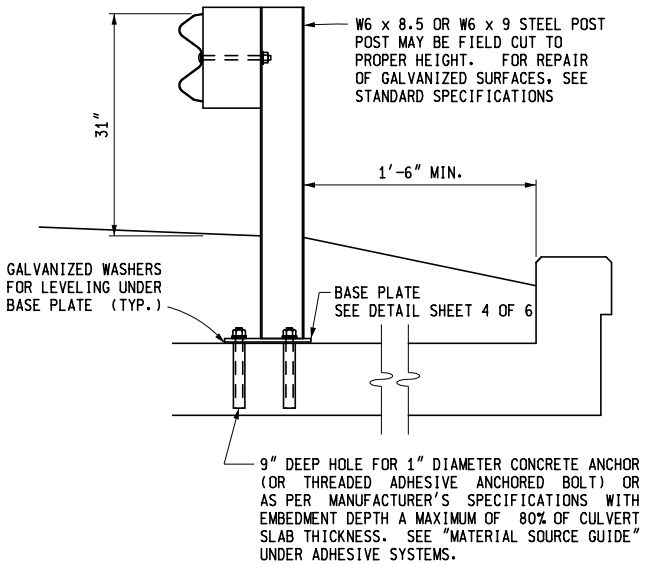
SECTION B - B

ALTERNATE CONSTRUCTION METHOD

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

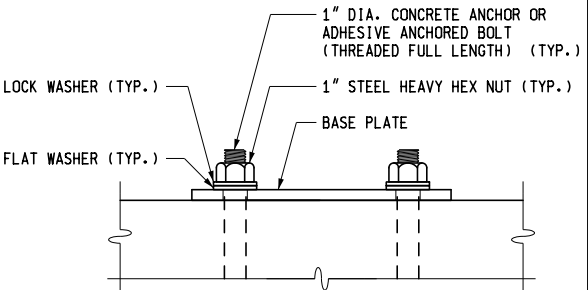
GUARDRAIL OVER
BOX OR SLAB CULVERTS

F.H.W.A. APPROVAL	3-15-2016 PLAN DATE	R-73-F	SHEET 5 OF 6
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SECTION C - C
GUARDRAIL, TYPE MGS-8

ALTERNATE CONSTRUCTION METHOD



ANCHOR DETAIL

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL OVER
BOX OR SLAB CULVERTS

F.H.W.A. APPROVAL	3-15-2016 PLAN DATE	R-73-F	SHEET 6 OF 6
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AS-LET PLAN REVISIONS							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

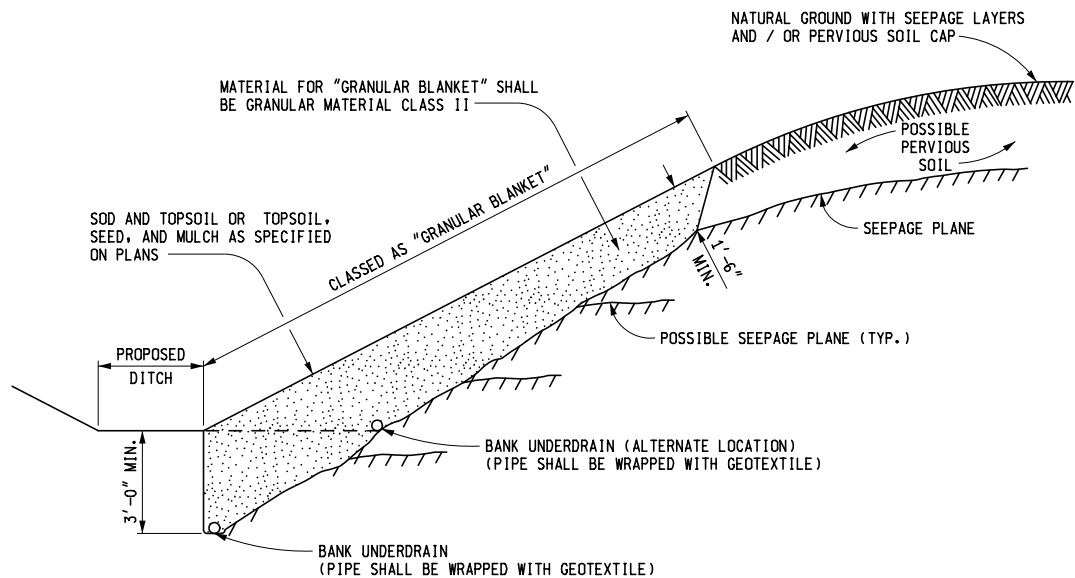


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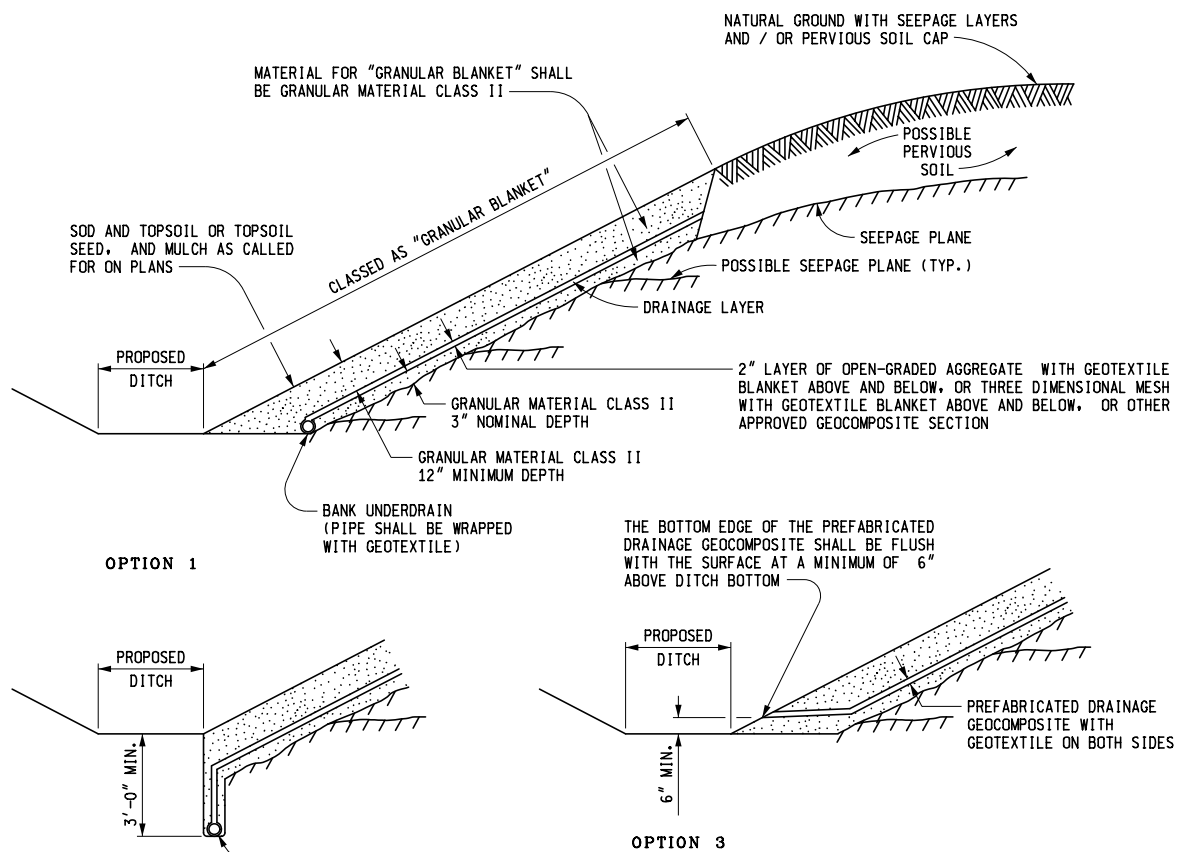
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SD11 of 17

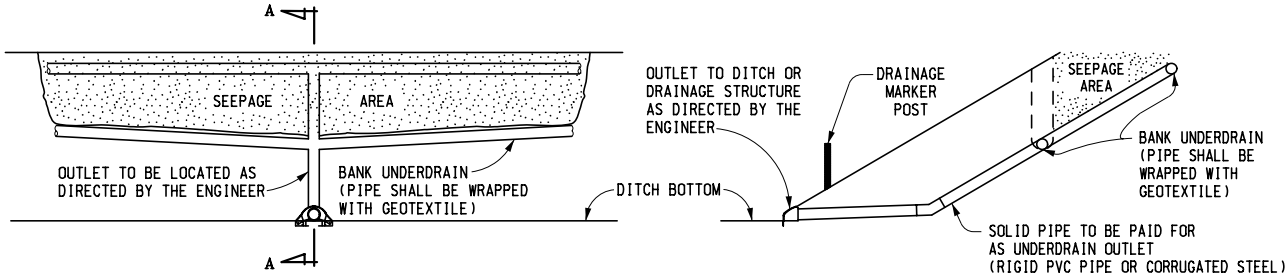


GRANULAR BLANKET TYPE 1



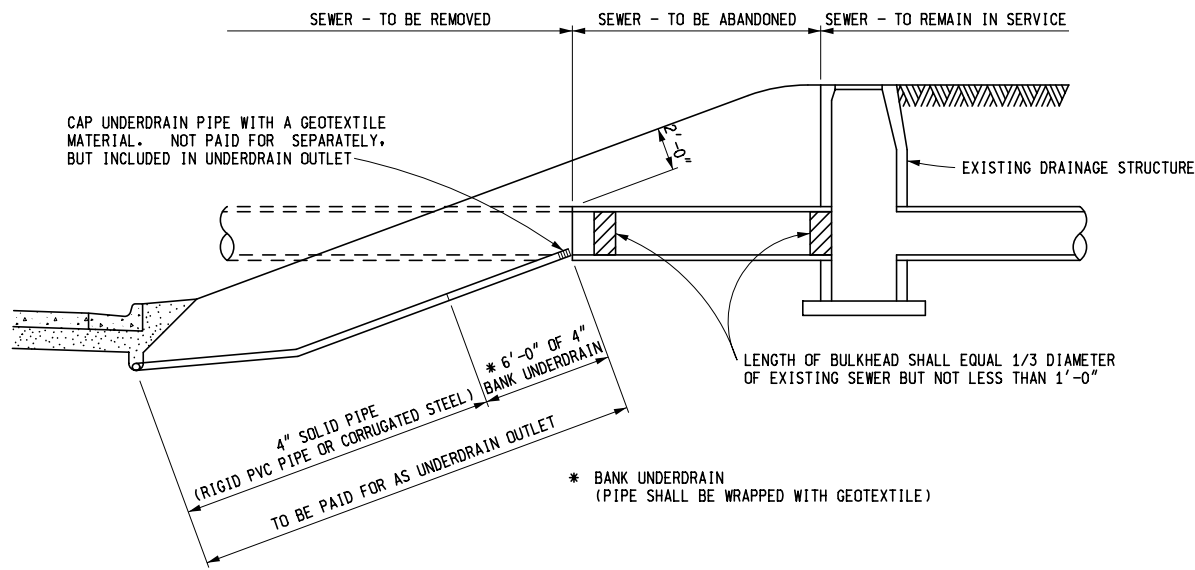
GRANULAR BLANKET TYPE 2

 Michigan Department of Transportation	DEPARTMENT DIRECTOR Paul C. Ajegba	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR			
	APPROVED BY: _____ DIRECTOR, BUREAU OF FIELD SERVICES	GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS FOR UNDERDRAINS, AND SEWER BULKHEADS			
	APPROVED BY: _____ DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT	F.H.W.A. APPROVAL	6-28-2021 PLAN DATE	R-80-F	SHEET 1 OF 8



SECTION A - A

BANK UNDERDRAIN OUTLET



WEEPER UNDERDRAIN AND BULKHEADING SEVERED SEWER

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR				
GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS FOR UNDERDRAINS, AND SEWER BULKHEADS				
F.H.W.A. APPROVAL	6-28-2021 PLAN DATE	R-80-F	SHEET 2 OF 8	

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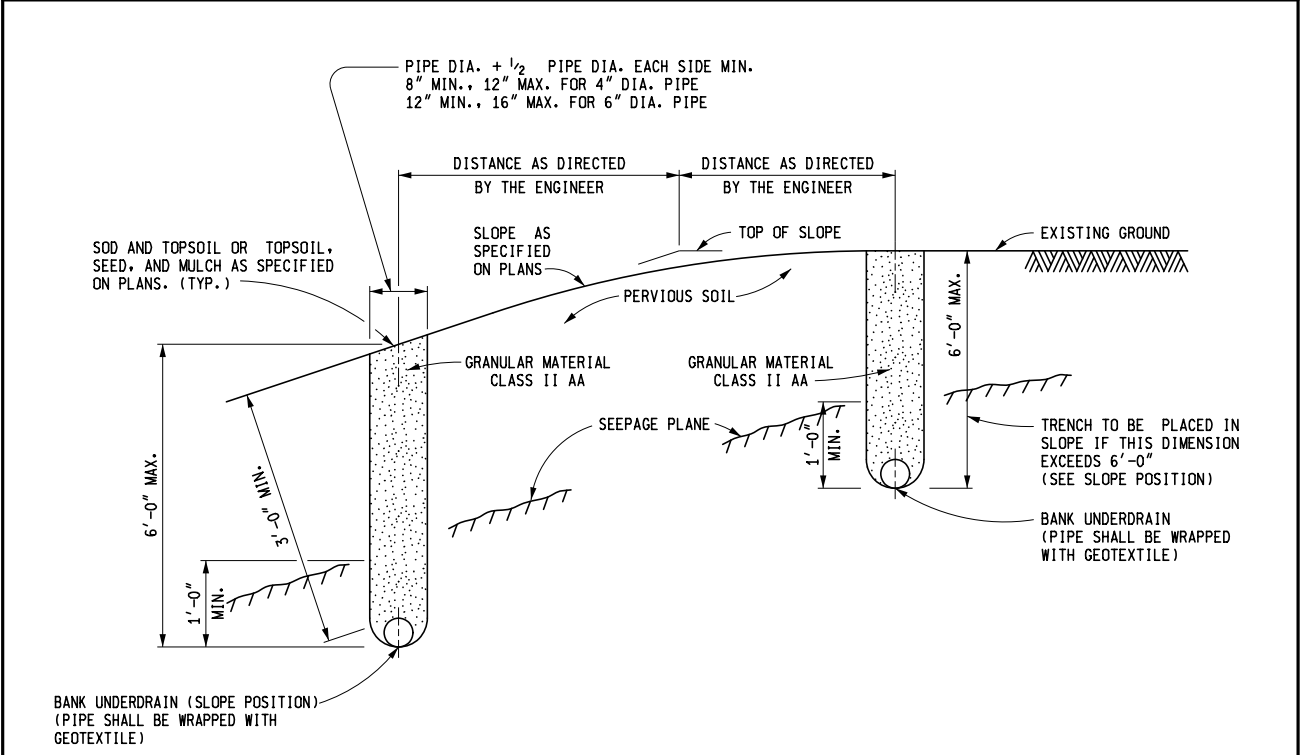
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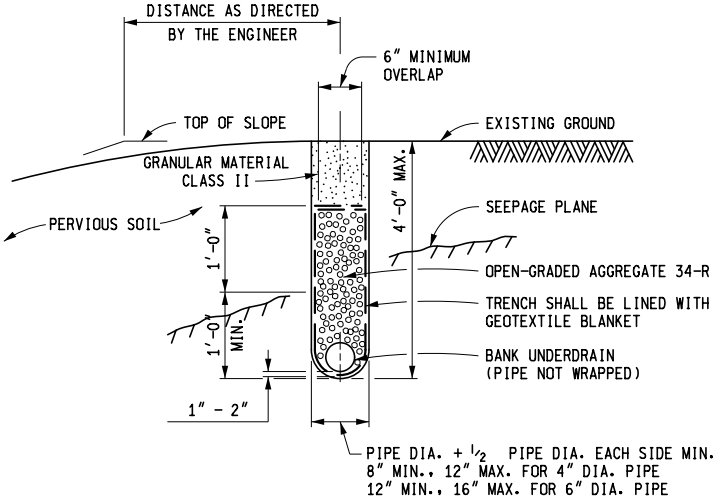
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SHEET
SD12
of 17



BANK UNDERDRAINS

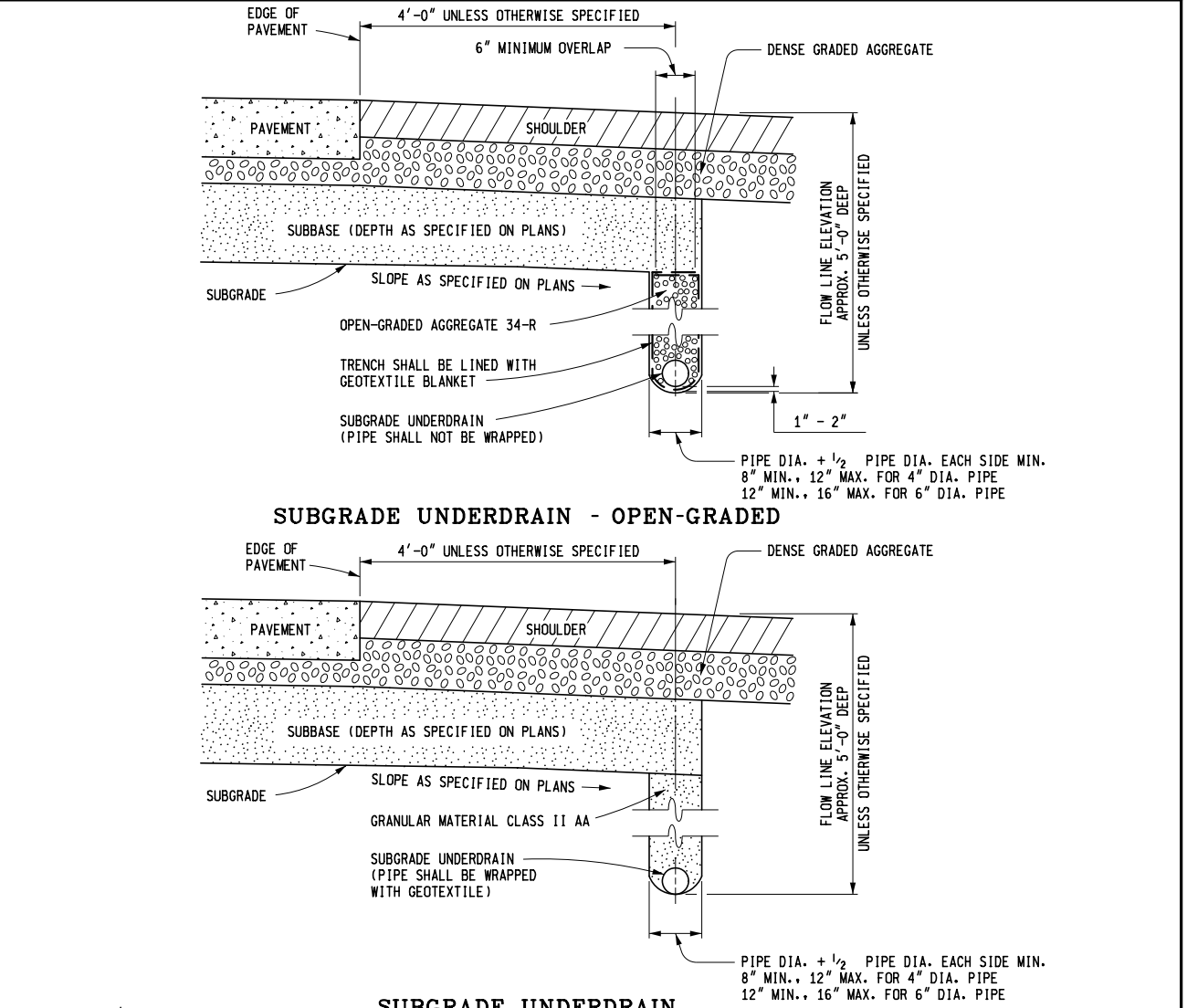


BANK UNDERDRAIN, OPEN-GRADED

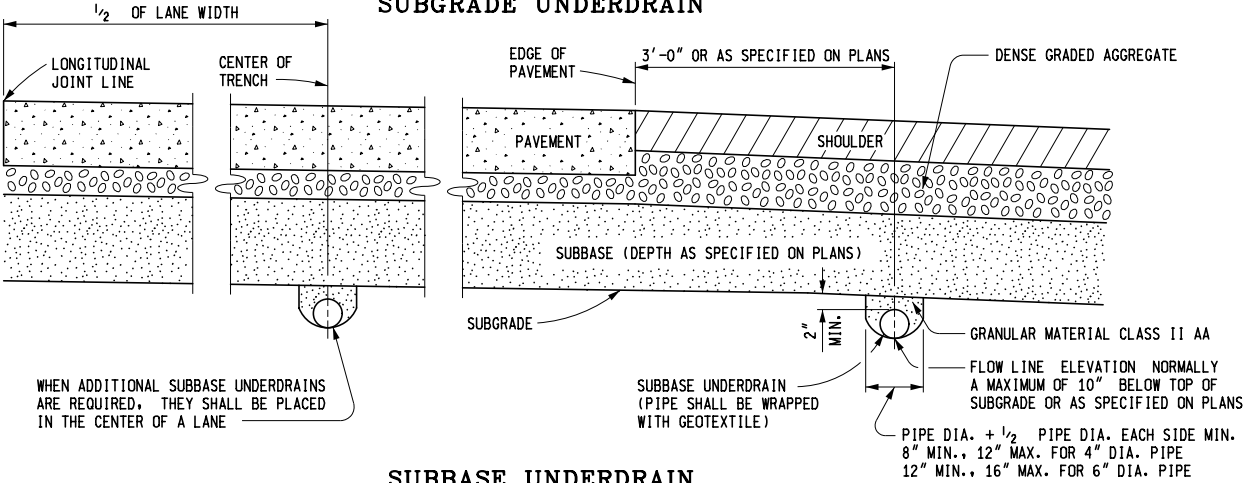
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GRANULAR BLANKET, UNDERDRAINS,
OUTLET ENDINGS FOR UNDERDRAINS,
AND SEWER BULKHEADS

F.H.W.A. APPROVAL	6-28-2021 PLAN DATE	R-80-F	SHEET 3 OF 8
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SUBGRADE UNDERDRAIN



SUBBASE UNDERDRAIN

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

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OUTLET ENDINGS FOR UNDERDRAINS,
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F.H.W.A. APPROVAL	6-28-2021 PLAN DATE	R-80-F	SHEET 4 OF 8
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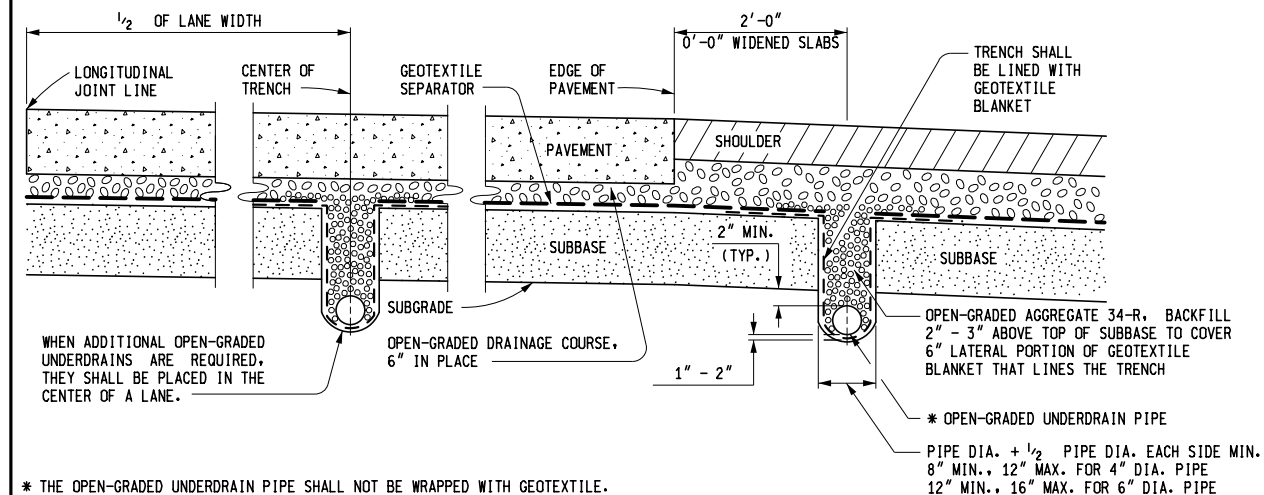
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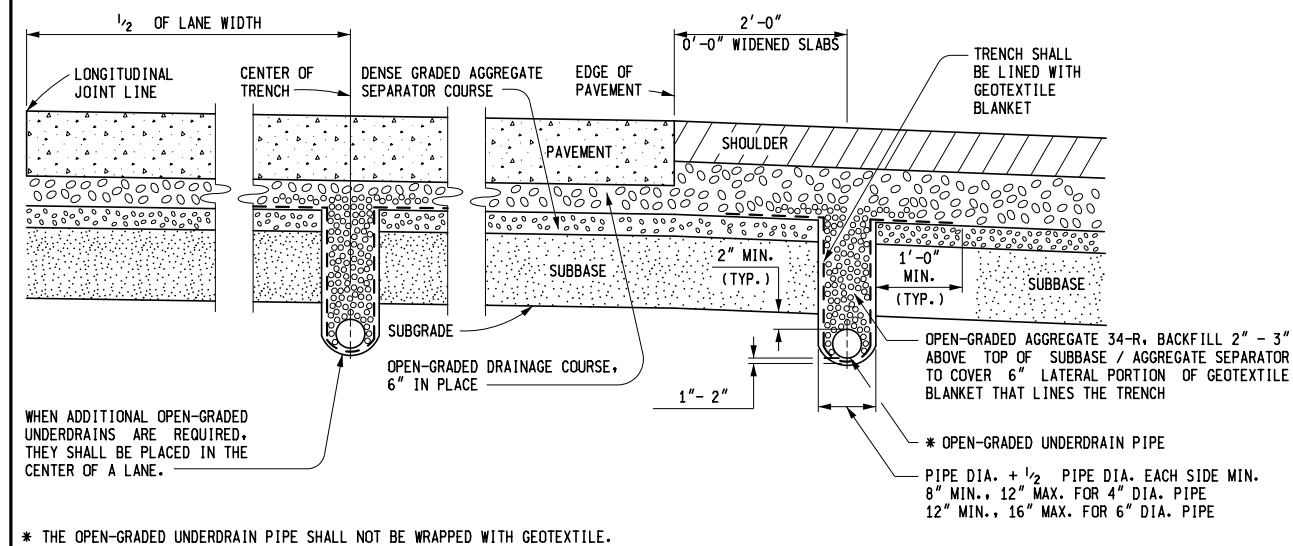
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SD13 of 17

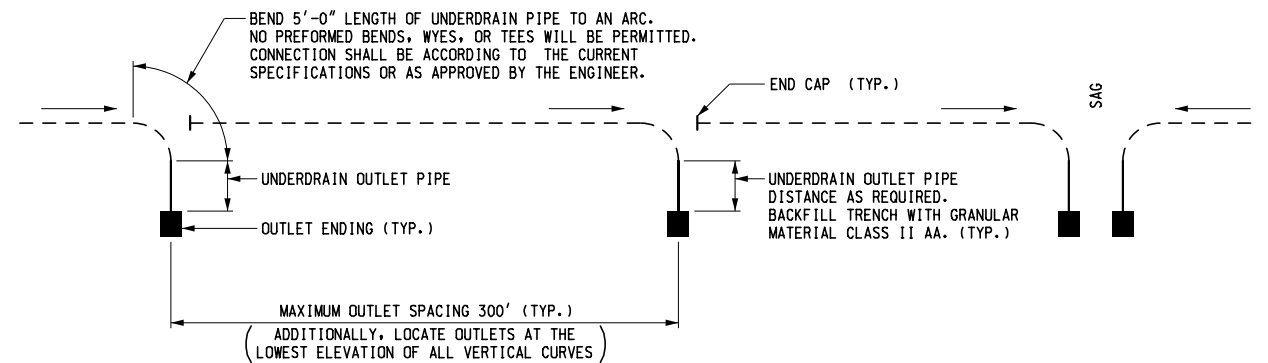


OPEN-GRADED UNDERDRAIN PIPE
WITH GEOTEXTILE SEPARATOR

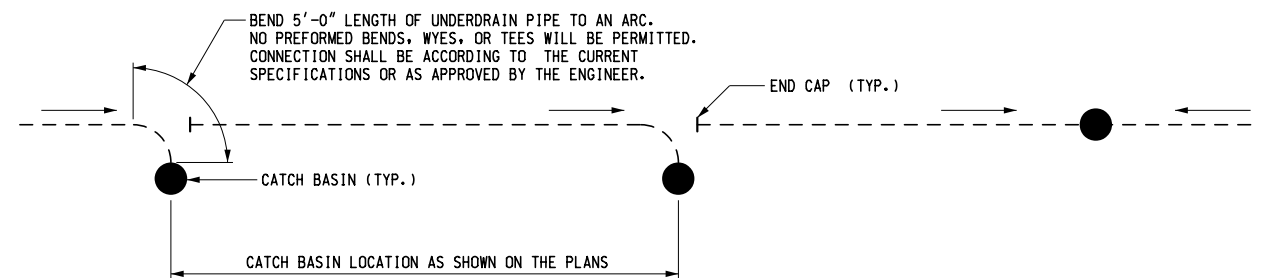


OPEN-GRADED UNDERDRAIN PIPE
WITH DENSE GRADED AGGREGATE SEPARATOR COURSE

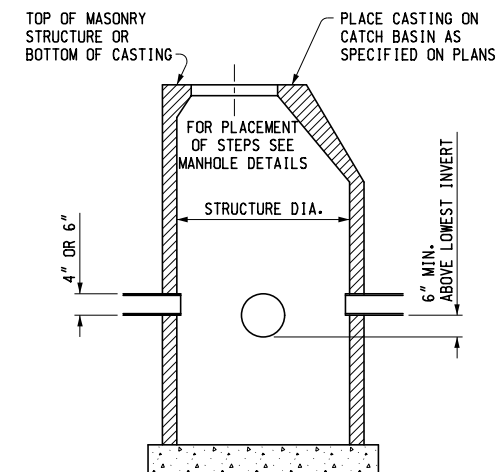
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR			
GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS FOR UNDERDRAINS, AND SEWER BULKHEADS			
F.H.W.A. APPROVAL	6-28-2021 PLAN DATE	R-80-F	SHEET 5 OF 8



PLAN SHOWING OUTLETS FOR UNDERDRAINS



PLAN SHOWING UNDERDRAINS TAPPED INTO CATCH BASINS



PROFILE VIEW

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR			
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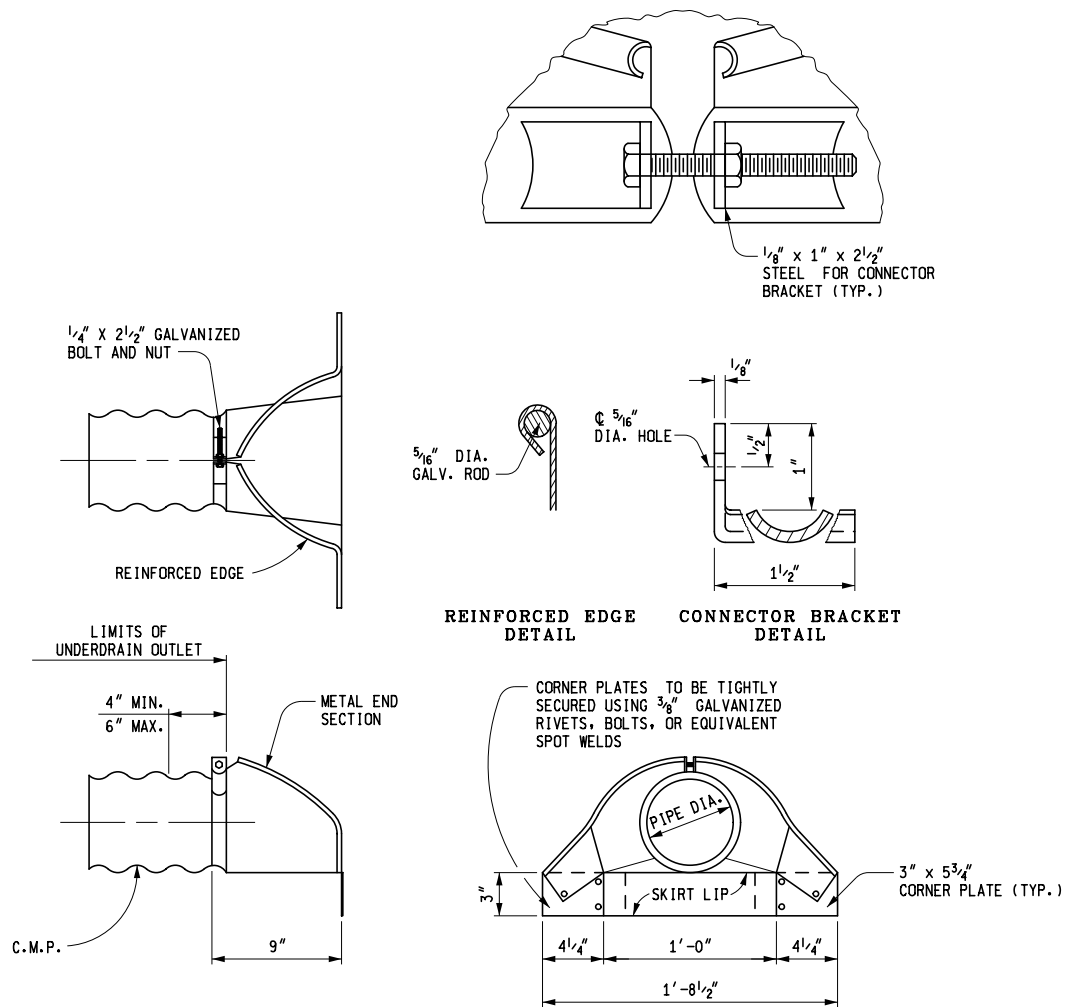


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SD14	of 17

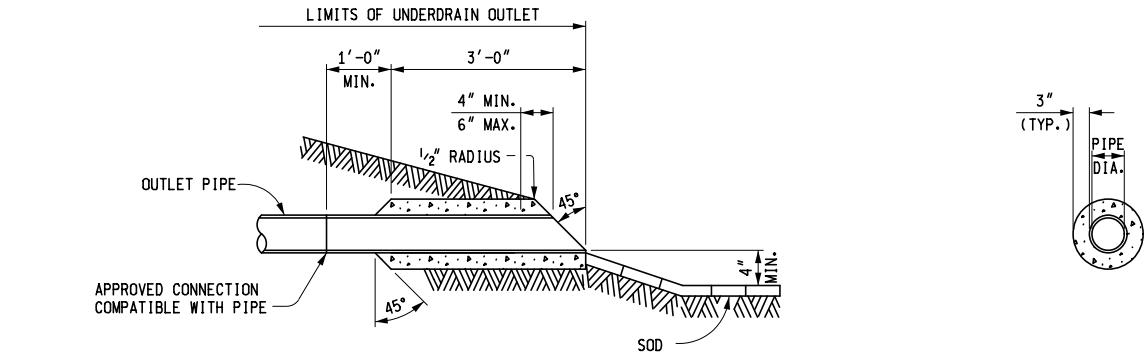


STEEL END SECTION FOR 4" OR 6" PIPE

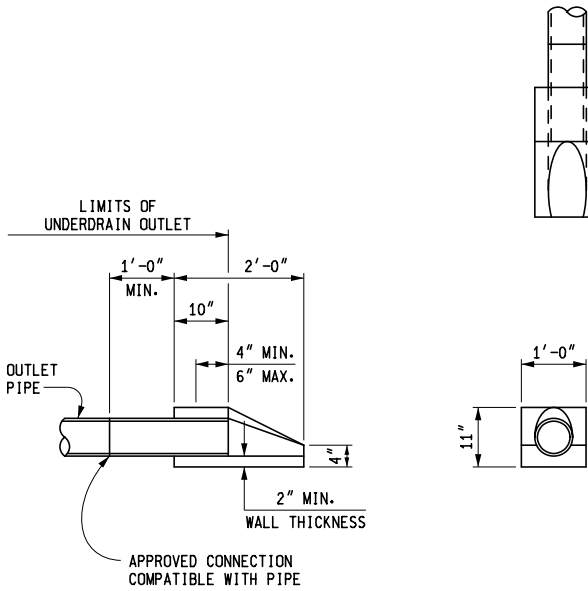
MICHIGAN DEPARTMENT OF TRANSPORTATION
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F.H.W.A. APPROVAL	6-28-2021 PLAN DATE	R-80-F	SHEET 7 OF 8
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CONCRETE RING FOR 4" OR 6" PIPE



CONCRETE END SECTION
FOR 4" OR 6" PIPE

- NOTES:
- POSITIVE DRAINAGE SHALL BE PROVIDED FOR UNDERDRAINS AND UNDERDRAIN OUTLETS.
- UNDERDRAIN PIPE SIZES SHALL BE AS SPECIFIED ON THE PLANS.
- CONNECTIONS BETWEEN UNDERDRAIN PIPE AND UNDERDRAIN OUTLET PIPE SHALL BE CONSTRUCTED ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS AND AS APPROVED BY THE ENGINEER.
- CONNECTIONS, IF REQUIRED WITHIN THE OUTLET PIPE, SHALL BE ACCORDING TO APPLICABLE ASTM SPECIFICATIONS REFERENCED IN THE CURRENT STANDARD SPECIFICATIONS. THEY SHALL BE WATER TIGHT, AND OF THE SAME MATERIAL AS THE OUTLET PIPE.
- OUTLET CONNECTIONS TO DRAINAGE STRUCTURES SHALL BE ACCORDING TO CURRENT STANDARD SPECIFICATIONS FOR DRAINAGE STRUCTURES.
- UNDERDRAIN OUTLET PIPE SHALL BE RIGID PVC OR CORRUGATED METAL ONLY.
- THE CONCRETE RING OR CONCRETE END SECTION SHALL BE CAST AROUND THE SAME TYPE OF PIPE AS THAT USED FOR UNDERDRAIN OUTLET PIPE.
- STEEL END SECTIONS SHALL BE ATTACHED TO THE ENDS OF CORRUGATED METAL PIPE AS SPECIFIED ON THIS STANDARD PLAN, BY STANDARD METAL BANDS, OR BY OTHER CONNECTING DEVICES AS APPROVED BY THE ENGINEER.
- STEEL END SECTIONS ARE NOT ALLOWED ON PVC OUTLET PIPE. CONCRETE END SECTIONS ARE REQUIRED.
- HELICALLY CORRUGATED PIPE (EXCEPT PERFORATED PIPE) SHALL HAVE THE ENDS OF THE PIPE REROLLED TO FORM ANNULAR CORRUGATIONS FOR CONNECTING THE END SECTION.
- GRANULAR MATERIAL PRODUCED FROM CRUSHED PORTLAND CEMENT CONCRETE IS NOT PERMITTED FOR ANY BACKFILL MATERIAL.

MICHIGAN DEPARTMENT OF TRANSPORTATION
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OUTLET ENDINGS FOR UNDERDRAINS,
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F.H.W.A. APPROVAL	6-28-2021 PLAN DATE	R-80-F	SHEET 8 OF 8
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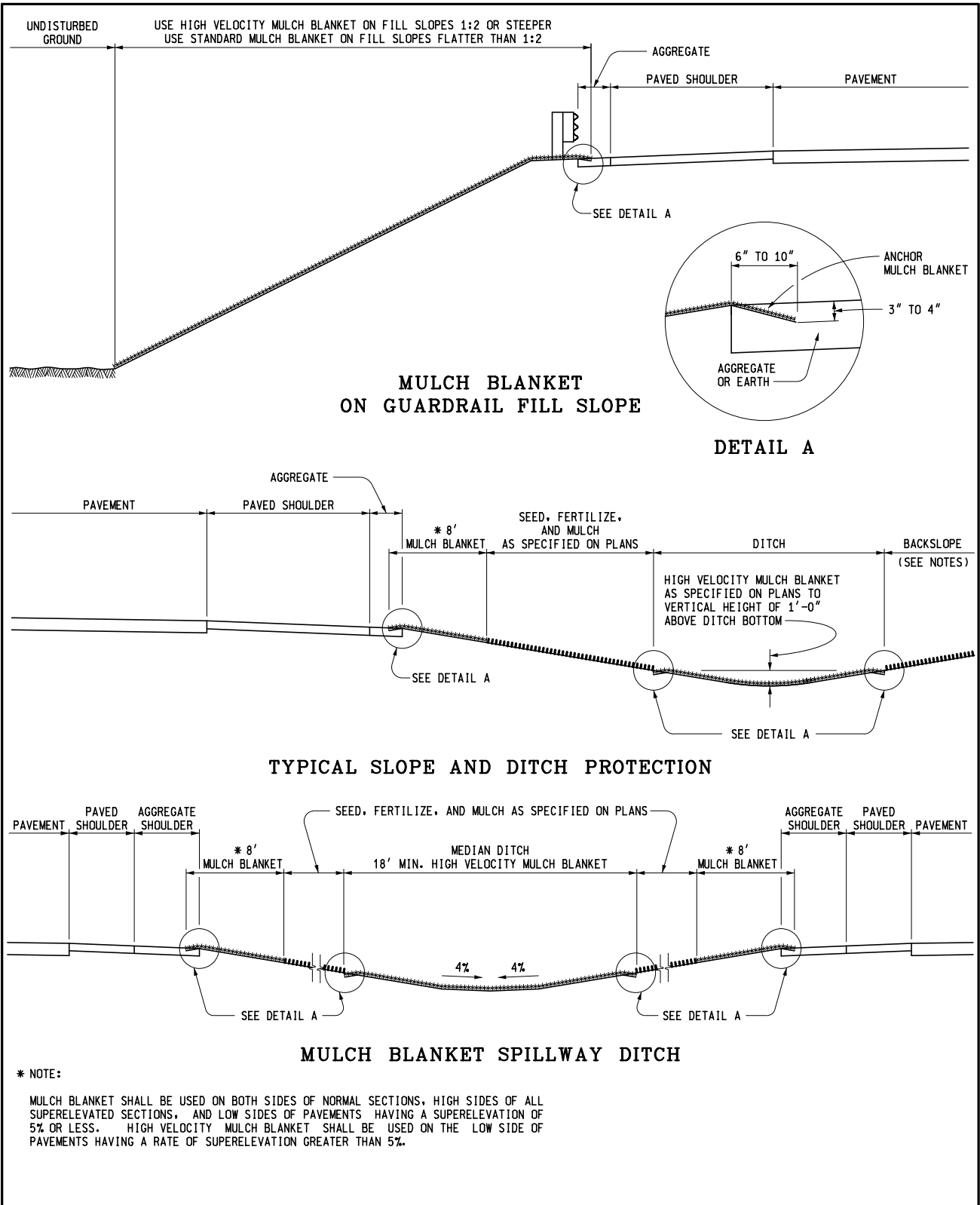
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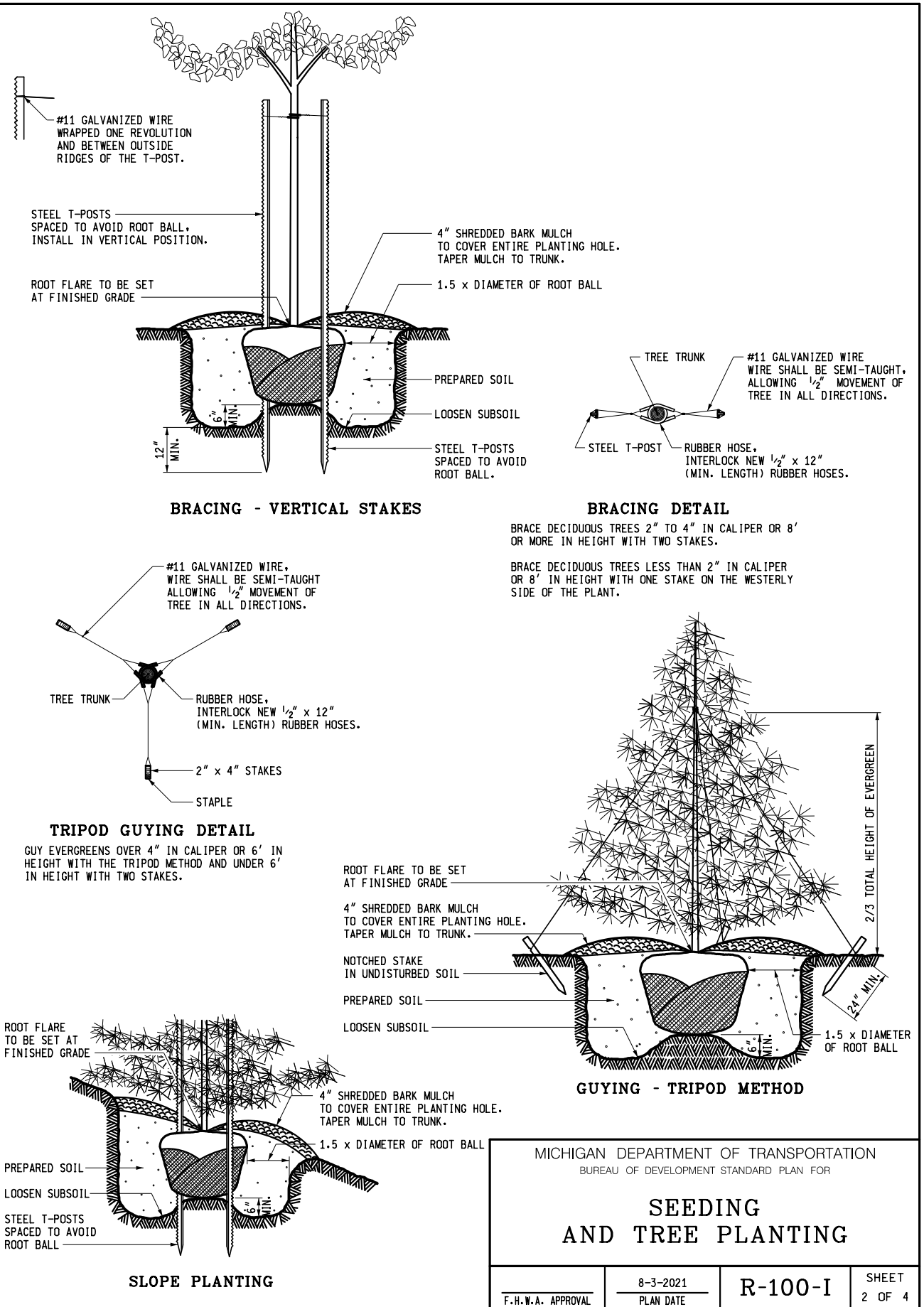
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SD15 of 17



 Michigan Department of Transportation	DEPARTMENT DIRECTOR Paul C. Ajegba	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR			
	APPROVED BY: _____ DIRECTOR, BUREAU OF FIELD SERVICES	SEEDING AND TREE PLANTING			
	DRAWN BY: <u>B.L.T.</u>	APPROVED BY: _____ DIRECTOR, BUREAU OF DEVELOPMENT	F.H.W.A. APPROVAL	8-3-2021 PLAN DATE	R-100-I
	CHECKED BY: <u>W.K.P.</u>				SHEET 1 OF 4



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SD16 of 17

