TRANSPORTATION IMPROVEMENT PROJECT

ATTACHMENT B

2834400TL.DWG Plotted on 24-Aug-2022 11:45 AM

PLAN OF

TRAPELO ROAD OVER BEAVER BROOK CULVERT REPLACEMENT AND FLOOD WALL

BRIDGE NO. B-07-015/W-04-039

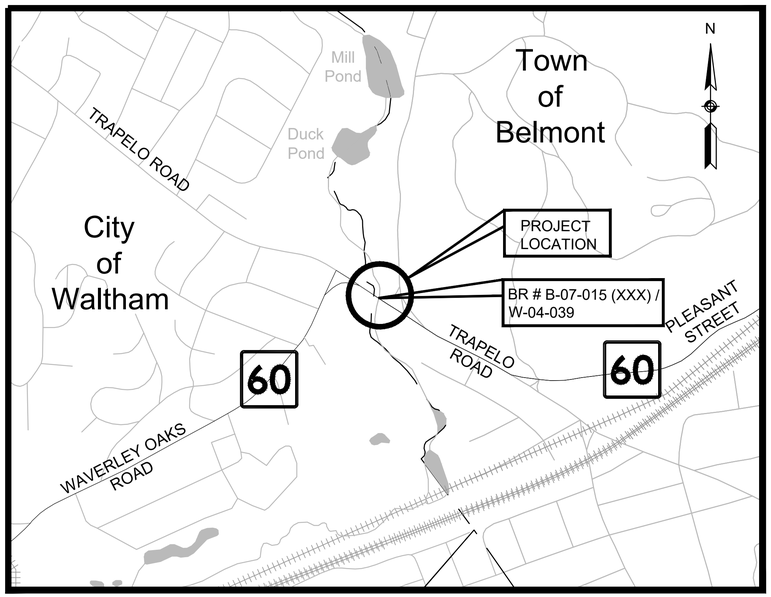
IN THE CITY OF WALTHAM

IN THE TOWN OF BELMONT

MIDDLESEX COUNTY

THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 2022, AS AMENDED, THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE LATEST MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS WITH MASSACHUSETTS AMENDMENTS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK, WILL GOVERN.

INDEX



0 500 1000 1500 2000

SCALE: 1" = 500'

DESIGN DESIGNATION - TRAPELO ROAD (ROUTE 60)

DESIGN SPEED	35 MPH
ADT (2012)	30,055
ADT (2032)	32,550
K	7.9%
D	55%
T (PEAK HOUR)	5.6%
T (AVERAGE DAY)	4.7%
DHV	2,571
DDHV	1,414
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL

IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CH 85 S35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS AND CALCULATIONS THAT SHALL BE USED TO FABRICATE AND CONSTRUCT THE STRUCTURE, DENOTED ON THESE PLANS FOR REVIEW AND APPROVAL. THIS APPROVAL SHALL CONSTITUTE THE FINAL APPROVAL AS STIPULATED BY CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS.

TRAPELO ROAD OVER BEAVER BROOK

CULVERT REPLACEMENT - BRIDGE NO. B-07-015 (EXISTING BIN: 7VB) / W-04-039 (EXISTING BIN: 8JN)

CITY OF WALTHAM / TOWN OF BELMONT

WALTHAM AND BELMONT, MA

COMMONWEALTH OF MASSACHUSETTS
SAMUEL OFFEI-ADDO
CIVIL
No. 41559
REGISTERED PROFESSIONAL ENGINEER

BSC GROUP
803 Summer Street
Boston, Massachusetts 02127

DRAWN BY: K. EAGAN, T. LANDRO	CHECKED BY: P. REED	
SCALE: 1" = 500'	BSC PROJECT NO.: 28344.00	REV. 0
DATE: 08/24/2022	DWG. NO.: 1 OF 18	

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
	A#	CURB CUT TYPE
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
BHL #	BHL #	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
		HYDRANT
		LIGHT POLE
CO.BD.		COUNTY BOUND
		GPS POINT
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
		WATER MANHOLE
MHB	MHB	MASSACHUSETTS HIGHWAY BOUND
MON		MONUMENT
SB		STONE BOUND
TB		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
TPL or GUY	TPL or GUY	TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB	UFB	UTILITY POLE W/ FIREBOX
UPDL	UPDL	UTILITY POLE WITH DOUBLE LIGHT
ULT	ULT	UTILITY POLE W / 1 LIGHT
UPL	UPL	UTILITY POLE
		BUSH
•SIZE & TYPE		TREE
		STUMP
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
100 99		CONTOURS (ON-THE-GROUND SURVEY DATA)
100 99		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		HAY BALES/SILT FENCE
		STRAW WATTLE
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

TRAFFIC SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
1	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR (6' x 6' TYP UNLESS OTHERWISE SPECIFIED)
		VIDEO DETECTION CAMERA
		MICROWAVE DETECTOR
		PEDESTRIAN PUSH BUTTON, SIGN (DIRECTIONAL ARROW AS SHOWN) AND SADDLE
		EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		VEHICULAR SIGNAL HEAD, OPTICALLY PROGRAMMED
		FLASHING BEACON
		PEDESTRIAN SIGNAL HEAD, (TYPE AS NOTED OR AS SPECIFIED)
RRSG	RRSG	RAILROAD SIGNAL
OR		SIGNAL POST AND BASE (ALPHA-NUMERIC DESIGNATION NOTED)
	20'	MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		HIGH MAST POLE OR TOWER
		SIGN AND POST
		SIGN AND POST (2 POSTS)
	20'	MAST ARM WITH LUMINAIRE
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		CONTROL CABINET, POLE MOUNTED
		FLASHING BEACON CONTROL AND METER PEDESTAL
		LOAD CENTER ASSEMBLY
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE
	CW	CROSSWALK
	SWL	SOLID WHITE LINE
	SYL	SOLID YELLOW LINE
	BWL	BROKEN WHITE LINE
	BYL	BROKEN YELLOW LINE
	DWL	DOTTED WHITE LINE
	DYL	DOTTED YELLOW LINE
	DWLEx	DOTTED WHITE LINE EXTENSION
	DYLEx	DOTTED YELLOW LINE EXTENSION
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE
		12" YELLOW TRANSVERSE LINES @ 10' O.C. @ 45°

1. ALL BASELINE TIES FOR CURB CORNERS AND RADII ARE TO THE P.C.'S OR P.T.'S, UNLESS OTHERWISE NOTED. WHERE PROPOSED CURB MEETS EXISTING CURB, BERM, ROADWAY, AND/OR DRIVEWAY PAVEMENT EDGES, MINOR FIELD ADJUSTMENTS TO EITHER THE DESIGNATED RADIUS OR THE DESIGNATED STATION OF THE P.C. OR P.T. FOR THE PROPOSED CURB OR BERM MAY BE REQUIRED. THESE ADJUSTMENTS SHALL BE MADE IN THE FIELD BY THE CONTRACTOR AS DIRECTED BY THE RESIDENT ENGINEER.
2. ALL EXISTING MUNICIPAL UTILITY CASTINGS THAT ARE TO REMAIN SHALL BE ADJUSTED TO LINE AND GRADE BY THE CONTRACTOR UNLESS OTHERWISE NOTED. ALL PRIVATE TELEPHONE, GAS, AND ELECTRICAL CASTINGS SHALL BE ADJUSTED BY OTHERS.
3. BASE MAPPING PREPARED BY BSC GROUP, INC. BETWEEN FEBRUARY AND JUNE OF 2006 AND SUPPLEMENTED WITH SPOT SURVEYS AFTER THAT DATE. HORIZONTAL DATUM: MASS. STATE PLANE COORD. SYSTEM MAINLAND ZONE. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988(NAVD88)
4. THE LOCATIONS OF EXISTING SUBSURFACE UTILITIES SHOWN ON THE PLANS WERE COMPILED FROM AVAILABLE RECORD DRAWINGS AND ARE NOT WARRANTED TO BE CORRECT. THE LOCATIONS ARE APPROXIMATE ONLY AND IN SOME CASES MAY BE INCOMPLETE. THE CONTRACTOR SHALL NOTIFY ALL AGENCIES REQUIRED AND VERIFY THE LOCATIONS OF ALL EXISTING SUBSURFACE UTILITIES PRIOR TO PERFORMING ANY WORK.
5. PRIOR TO THE INSTALLATION OF PROPOSED UTILITIES, THE CONTRACTOR SHALL EXCAVATE TEST PITS AT LOCATIONS OF UTILITY CROSSINGS TO VERIFY DEPTHS OF EXISTING PIPES, CONDUITS OR OTHER FACILITIES, AS DIRECTED BY ENGINEER.
6. THE CONTRACTOR SHALL ENSURE THAT ALL ROADWAY RUNOFF SHALL BE DIRECTED TO CATCH BASINS.
7. ALL WHEELCHAIR RAMPS SHALL BE CONSTRUCTED TO COMPLY WITH THE LATEST MASSDOT - HIGHWAY DIVISION STANDARDS.
8. ALL AREAS OUTSIDE OF THE LIMIT OF WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S OWN EXPENSE.
9. ALL EXISTING TREES TO REMAIN SHALL BE PROTECTED FROM DAMAGE CAUSED BY CONTRACTORS OPERATIONS.

ABBREVIATIONS

GENERAL

AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CIT	CHANGE IN TYPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
EXIST (or EX)	EXISTING
EXC	EXCAVATION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
FDN.	FOUNDATION
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HDW	HEADWALL
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HYD	HYDRANT
INV	INVERT
JCT	JUNCTION
L	LENGTH OF CURVE
LB	LEACH BASIN
LP	LIGHT POLE
LT	LEFT
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
P.G.L.	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE
PROJ	PROJECT
PROP	PROPOSED
PSB	PLANTABLE SOIL BORROW
PT	POINT OF TANGENCY
PVC	POINT OF VERTICAL CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
PVMT	PAVEMENT

ABBREVIATIONS (cont.)

GENERAL

R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TYP	TYPICAL
UP	UTILITY POLE
VAR	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
WCR	WHEEL CHAIR RAMP
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

TRAFFIC SIGNAL

CAB.	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY DON'T WALK
FDW	FLASHING DON'T WALK
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR AMBER
FYL	FLASHING AMBER LEFT ARROW
FYR	FLASHING AMBER RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILE, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALK
Y	STEADY CIRCULAR AMBER
YL	STEADY AMBER LEFT ARROW

Plotted on 23-Aug-2022 12:34 PM
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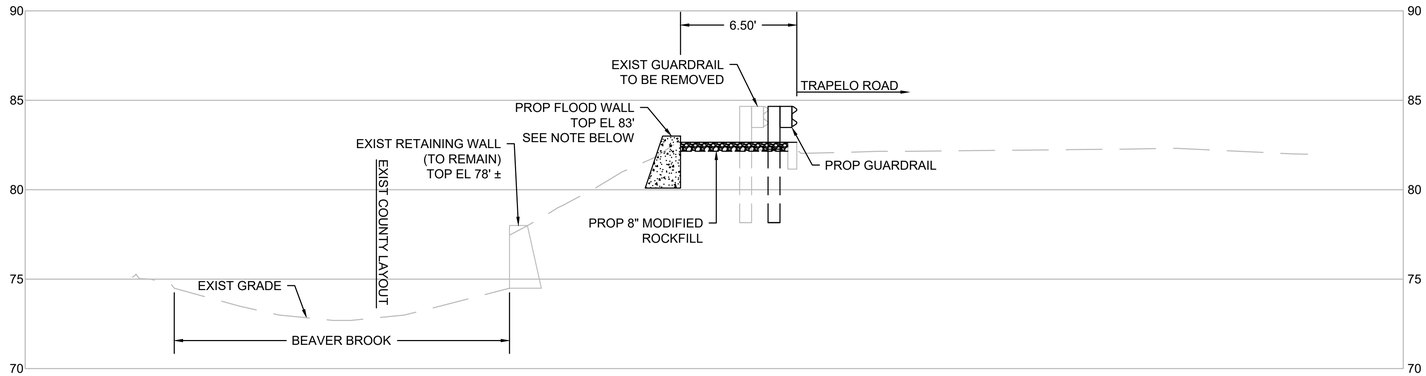
WALTHAM/BELMONT
TRAPELO ROAD (ROUTE 60)
CULVERT REPLACEMENT & FLOOD WALL
CONSTRUCTION PLAN

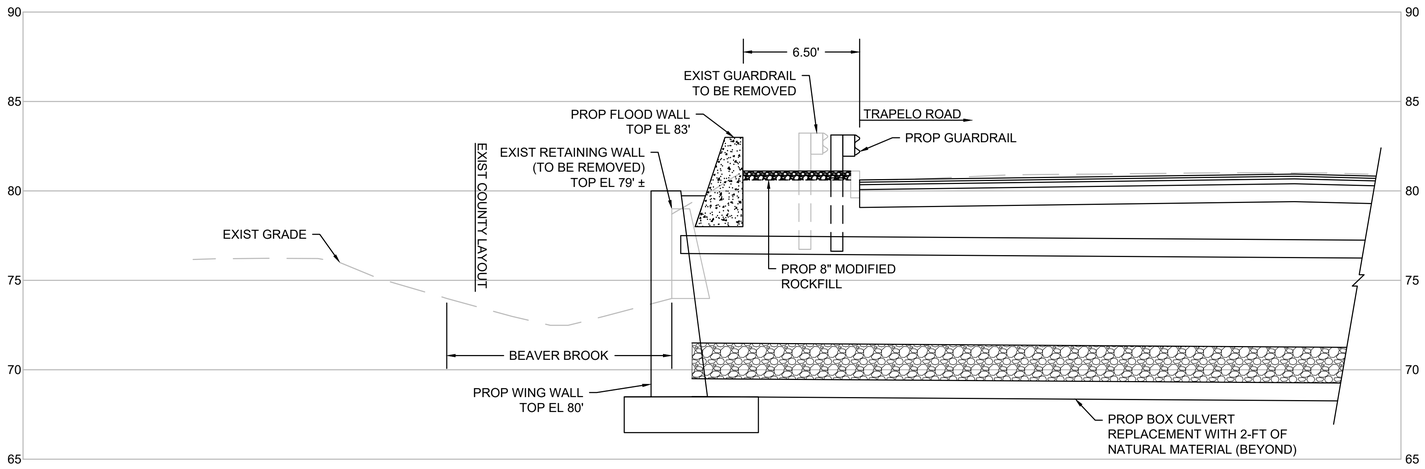
Plotted on 23-Aug-2022 12:36 PM
2834400CP.DWG

2834400SECT-WALL.DWG Plotted on 24-Aug-2022 11:44 AM



SECTION A-A

SEE SHEET 3 FOR PLAN VIEW
SCALE: 1" = 4'



SECTION B-B

SEE SHEET 3 FOR PLAN VIEW
SCALE: 1" = 4'

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

GENERAL CULVERT NOTES:

DESIGN:

IN ACCORDANCE WITH THE 2020 (9TH EDITION) AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS FOR HL-93 LOADING.

PRECAST CULVERT UNITS TO BE DESIGNED BY PRECASTER. DESIGN TO BE STAMPED BY MASSACHUSETTS REGISTERED STRUCTURAL ENGINEER AND SUBMITTED FOR REVIEW BY BSC GROUP.

DATE:

TO BE PLACED ON THE CULVERT HEADWALLS SHOWN ON SHEET 7 AND THE INSIDE FACE OF THE SOUTHWESTERLY PRECAST TRANSITION SHOWN ON SHEET 11. THE DATE USED SHALL BE THE LATEST YEAR OF THE CONTRACT COMPLETION AND SHALL BE THE SAME DATE IN ALL THREE LOCATIONS.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO GRADE M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS	#7 BARS	#8 BARS
NONE	16"	19"	23"	33"	38"
1. 12" OF CONCRETE BELOW BAR	20"	25"	30"	43"	49"
2. COATED BARS, COVER < $3d_b$, OR	23"	29"	34"	50"	57"
3. CLEAR SPACING < $6d_b$					
4. COATED BARS, ALL OTHER CASES	18"	23"	27"	40"	46"
5. CONDITION 2. AND 3.	26"	32"	39"	56"	64"
6. CONDITION 2. AND 4.	24"	30"	36"	52"	59"

ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.
ALL REINFORCEMENT SHALL BE EPOXY COATED.

MEMBRANE WATERPROOFING:

ALL MEMBRANE WATERPROOFING USED ON BRIDGE DECKS SHALL BE MEMBRANE WATERPROOFING FOR BRIDGE DECKS – SPRAY APPLIED.

EXISTING CONDITIONS:

ALL DIMENSIONS AND DETAILS SHOWN FOR THE EXISTING FEATURES ARE NOT GUARANTEED TO BE CORRECT. MASSDOT AND THE THE CITY OF WALTHAM/TOWN OF BELMONT HAVE NO EXISTING DRAWINGS FOR THE STRUCTURE. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR THE COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ADEQUACY AND ACCURACY THEREOF AND SHALL NOT COMMENCE ANY FABRICATION UNTIL THEY HAVE MADE THE REQUIRED MEASUREMENTS AND THE SUBMITTED SHOP DRAWINGS HAVE BEEN APPROVED BY THE ENGINEER. SHOP DRAWINGS SHALL STATE THAT THE EXISTING DIMENSIONS, ANGLES, ELEVATIONS AND FIELD CONDITIONS HAVE BEEN FIELD VERIFIED BY THE CONTRACTOR.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS REQUIRED FOR THE PROPER PERFORMANCE OF THE WORK. FIELD CONDITIONS MAY EXIST WHICH DEVIATE FROM THE TYPICAL AND THEORETICAL DIMENSIONS SHOWN ON THE PLANS. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR FABRICATION AND FIT OF THEIR WORK.

CONSTRUCTION:

ANY PERMIT MODIFICATIONS REQUIRED DUE TO THE CONTRACTOR'S MEAN AND METHODS WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL MODIFY ALL REQUIRED PERMITS AND LICENSES AND PAY ALL CHARGES AND FEES INCURRED. THE CONTRACTOR SHALL GIVE ALL NOTICES NECESSARY AND INCIDENT TO THE DUE AND LAWFUL PROSECUTION OF THE WORK, AND SHALL COMPLY WITH ALL LAWS, ORDINANCES, RULES, AND REGULATIONS OF THE FEDERAL GOVERNMENT, THE STATE, THE TOWN, AND OTHER BODIES HAVING JURISDICTION OVER THE WORK AND ENCOMPASSED BY THE CONTRACT. THE COMPLETION DATE WILL REMAIN AS STATED IN THE CONTRACT DOCUMENTS.

AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.

GENERAL NOTE:

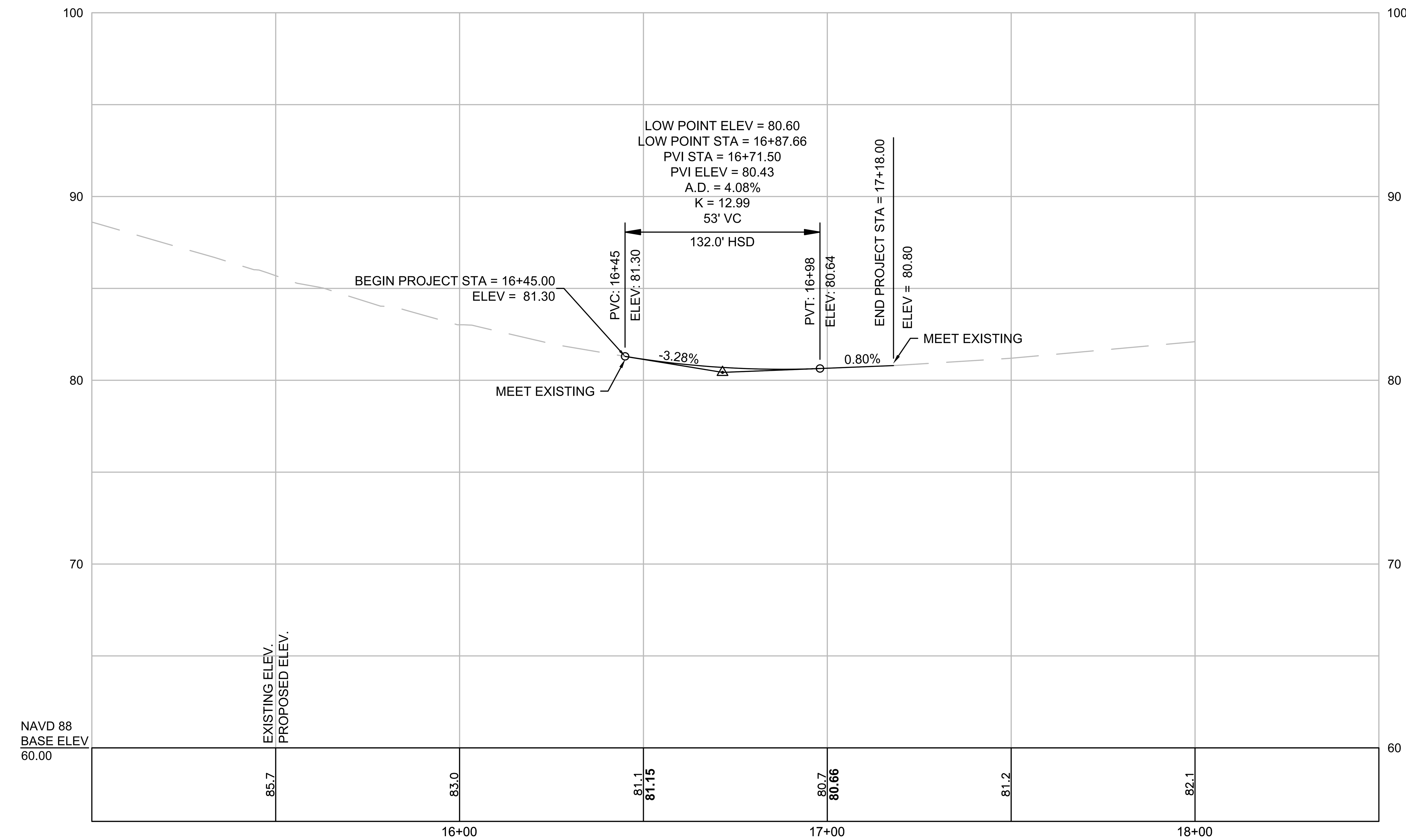
THE CONTRACTOR MUST COORDINATE ALL WORK WITH THE CITY OF WALTHAM/TOWN OF BELMONT. ALL UTILITY COMPANIES, THE ENGINEER AND ANY AFFECTED ABUTTERS. WORK SHALL NOT PROCEED WITHOUT WRITTEN APPROVAL FROM THE CITY OF WALTHAM/TOWN OF BELMONT.

PRECAST COMPONENTS:

THE CULVERT STRUCTURE WILL BE PRECAST CONCRETE. IT IS IMPERATIVE THAT FABRICATION TOLERANCES CONTAINED IN THE SPECIAL PROVISIONS WILL BE FOLLOWED TO ENSURE PROPOSED FIELD FIT-UP. PRE-FITTING EACH UNIT AT THE PRECAST YARD TO AVOID ANY CONFLICTS AND/OR DELAYS IS HIGHLY ENCOURAGED.

Drawing name: \\Jacksonville\Projects\2022\28344001\Transportation_Drawings\Proposed Wall Options\28344002SECT-WALL.dwg
Plotted on: Wednesday, August 24, 2022 - 11:44am by KSHOOMO

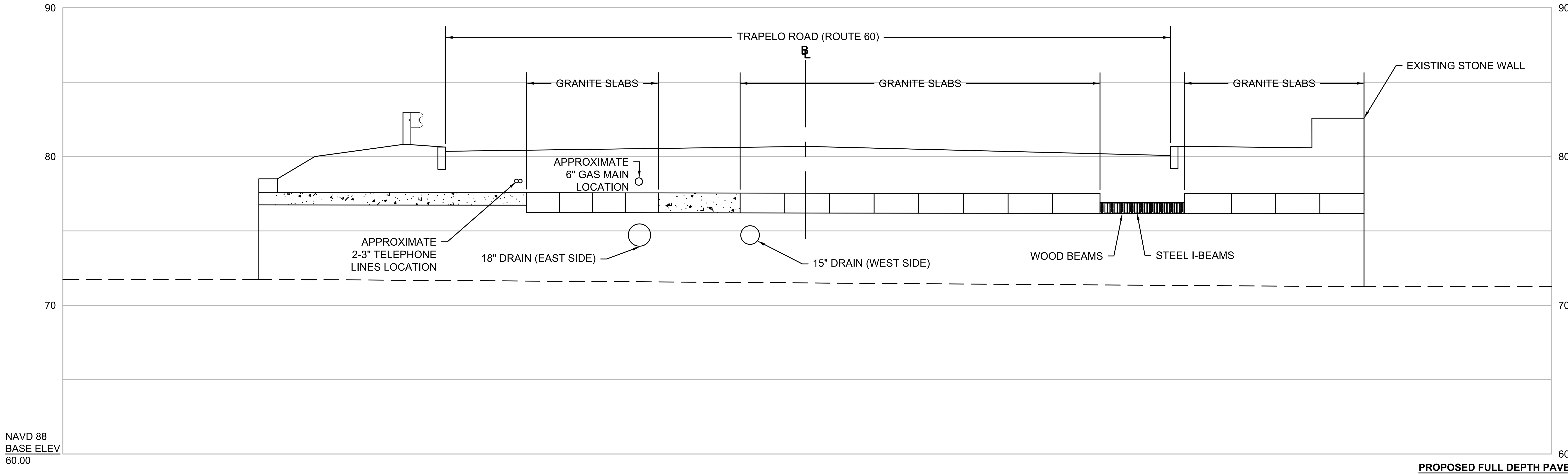
WALTHAM/BELMONT
TRAPELO ROAD (ROUTE 60)
CULVERT REPLACEMENT & FLOOD WALL
ROADWAY PROFILE



TRAPELO ROAD PROFILE
SCALE: 1" = 20' H
1" = 4' V

HOR. SCALE IN FEET
20 0 20 40
4 0 4 8
VER. SCALE IN FEET

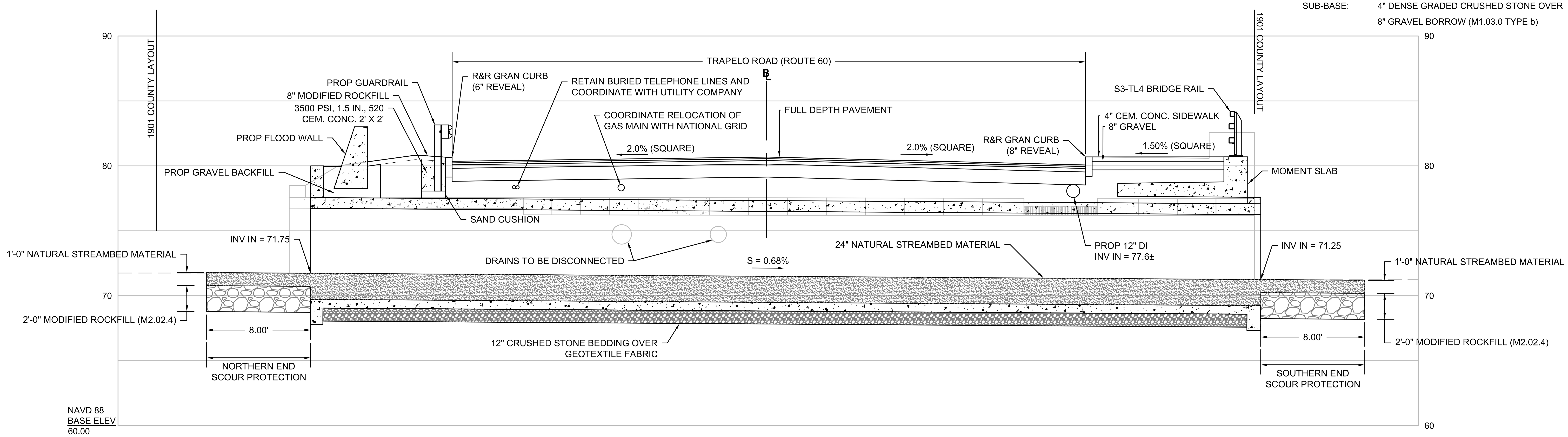
Plotted on 23-Aug-2022 12:38 PM
2834400PR.DWG



EXISTING CULVERT PROFILE

PROPOSED FULL DEPTH PAVEMENT

SURFACE:	1½" SUPERPAVE SURFACE COURSE - 12.5 (SSC - 12.5) OVER 0.07 GAL/SY TACK COAT OVER
INTERMEDIATE:	1¾" SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC - 12.5) OVER 0.07 GAL/SY TACK COAT OVER
BASE:	4½" SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5) OVER
SUB-BASE:	4" DENSE GRADED CRUSHED STONE OVER 8" GRAVEL BORROW (M1.03.0 TYPE b)



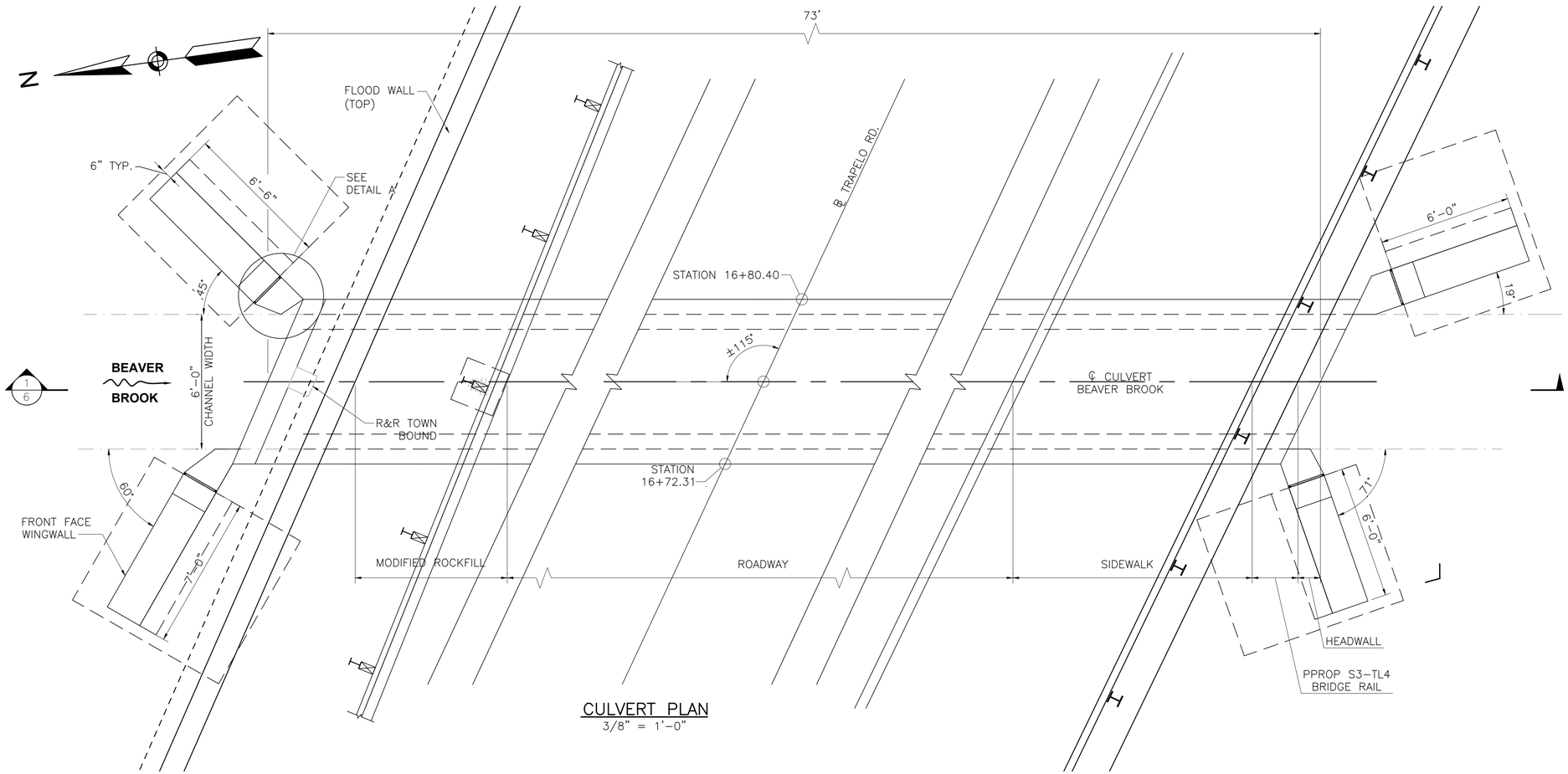
PROPOSED CULVERT PROFILE

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

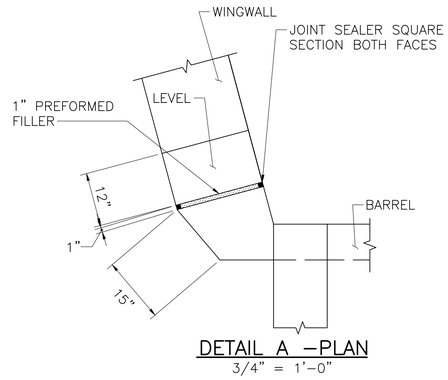
WALTHAM/BELMONT
TRAPELO ROAD (ROUTE 60)
CULVERT REPLACEMENT & FLOOD WALL
GRADING PLAN
SHEET 7 OF 18
Plotted on 23-Aug-2022 12:40 PM
2834400GR.DWG
NOTE: ALL GRADED SLOPES TO HAVE WETLAND BASIN SEED MIX RIPARIAN.
BEAVER BROOK RESERVATION MAP 60, LOT 1
BEAVER BROOK
TEMPORARY ACCESS AREA
PLANT 3 EACH GRAY DOGWOOD, WINTERBERRY, NORTHERN ARROWWOOD. 2' CONTAINERS. PLANT WINTERBERRY CLOSEST TO STREAM BOUNDARY.
1901 COUNTY LAYOUT
+86.69
OFFSET: 94.82
R = 75'
L = 86'
PROP. FLOOD WALL
R = 310'
L = 41'
+31.20
OFFSET: 34.94
+90.57
OFFSET: 28.95
+06.33
OFFSET: 27.50
PROP CB
RIM = 80.10
INV = 76.10
28'-12" RCP
PROP DMH
RIM = 80.50
INV(12" RCP) = 75.82
INV (EX 18" VC) = 74.25
INV(OUT) = 74.15
PROPOSED 6' W x 5' D
(PLUS 2' EMBEDMENT)
BOX CULVERT
TRAPELO ROAD (RTE 60)
100' WETLAND BUFFER
TRAPELO ROAD ℄
LIMIT OF WORK (TYP.)
PROP DMH
RIM = 80.47
INV(IN-15" RCP) = 75.16
INV(IN-12" RCP) = 76.41
INV(IN-12" DI) = 77.44
INV(OUT) = 75.06
PROP CB
RIM = 80.51
INV = 76.51
10'-12" RCP
24'-15" RCP
12'-15" RCP
32'-12" DI
46'-18" RCP
PROP CB
RIM = 80.10
INV = 77.60
CENTERLINE OF SWALE (TYP.)
PLANT 3 EACH GRAY DOGWOOD, WINTERBERRY, NORTHERN ARROWWOOD. 2' CONTAINERS. PLANT WINTERBERRY CLOSEST TO STREAM BOUNDARY. AVOID PLANTING DIRECTLY IN SWALE.
STRAW WATTLES (TYP.)
TEMPORARY ACCESS AREA
100' WETLAND BUFFER
BELMONT
WALTHAM
0 10 20 30 40
SCALE: 1" = 10'

WALTHAM/BELMONT
TRAPELO ROAD (ROUTE 60)
CULVERT REPLACEMENT & FLOOD WALL
CULVERT PLAN AND ELEVATION
SHEET 8 OF 18

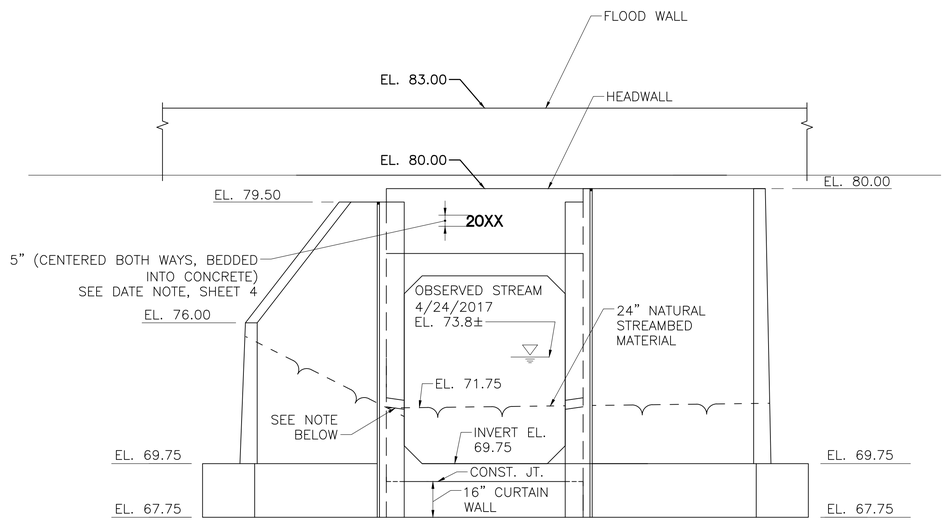
2834400DET(CULVERT).DWG Plotted on 23-Aug-2022 12:40 PM



CULVERT PLAN
3/8" = 1'-0"

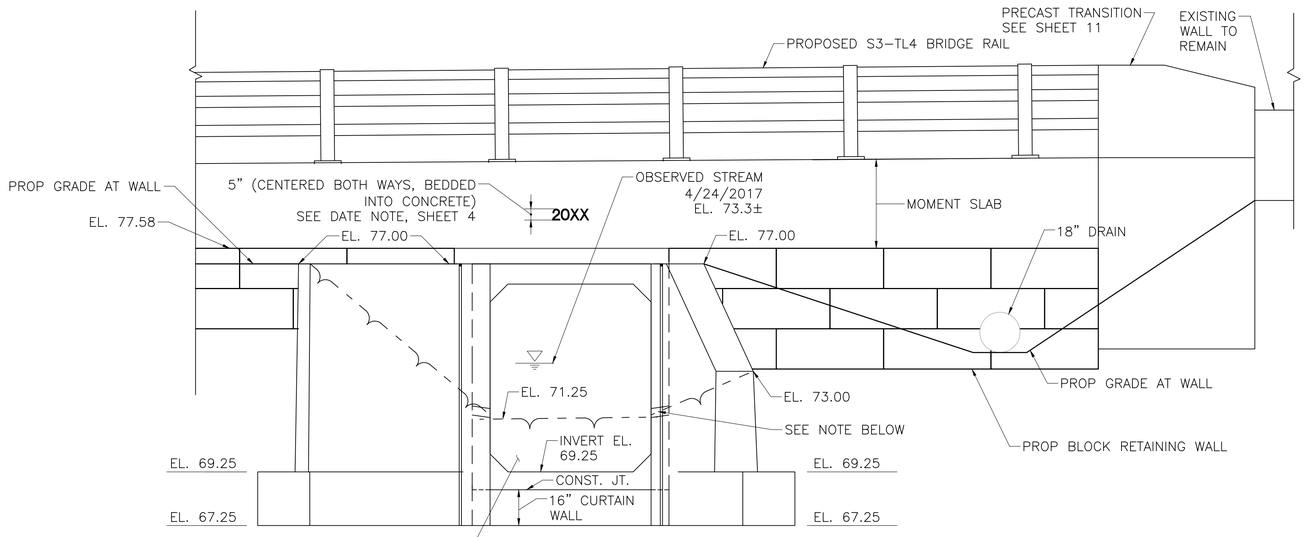


DETAIL A –PLAN
3/4" = 1'-0"



NORTH ELEVATION
3/8" = 1'-0"

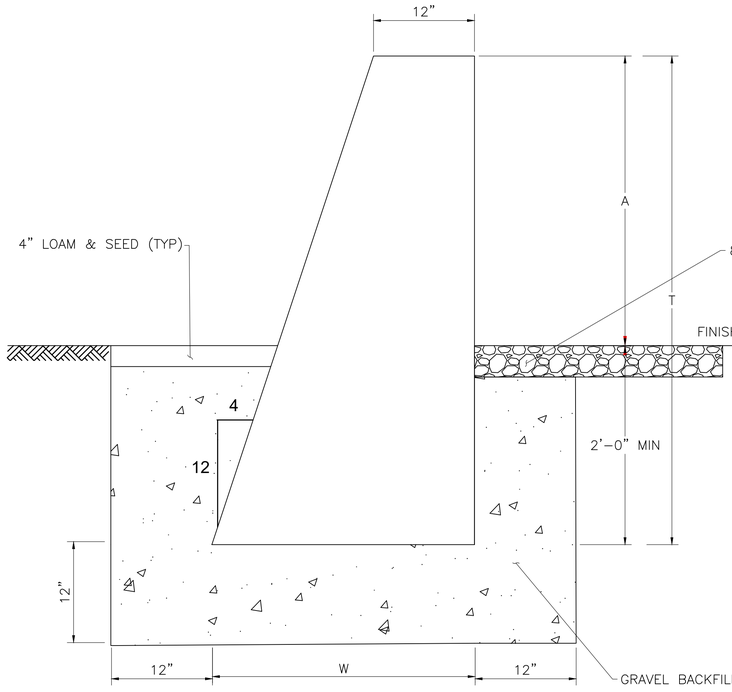
NOTE: 4" DIAMETER WEEP HOLES TO BE PROVIDED AT 15' SPACING ALONG CULVERT WALLS



SOUTH ELEVATION
3/8" = 1'-0"

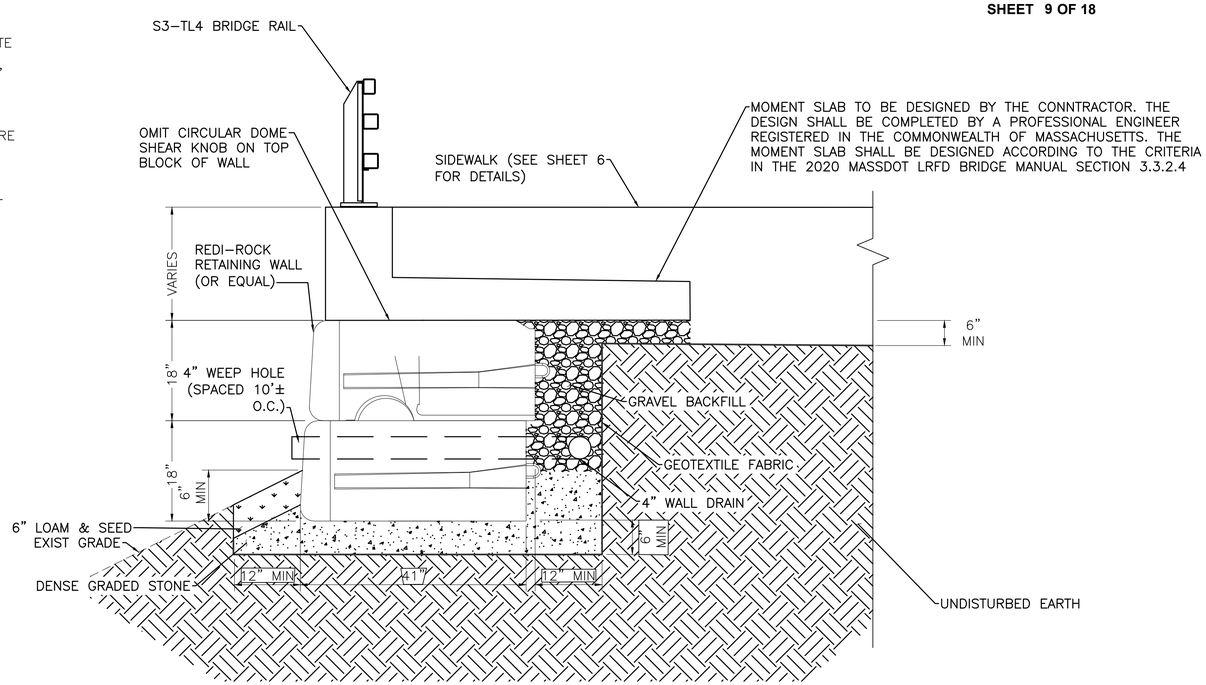
NOTE: 4" DIAMETER WEEP HOLES TO BE PROVIDED AT 15' SPACING ALONG CULVERT WALLS

Drawing name: \\Vanasse\jobs\Projects–BOS\3834400\Transportation_Drawings\Proposed\3834400DET(CULVERT).dwg
Plotted on: Tuesday, August 23, 2022 - 12:40pm by HEPHPOND

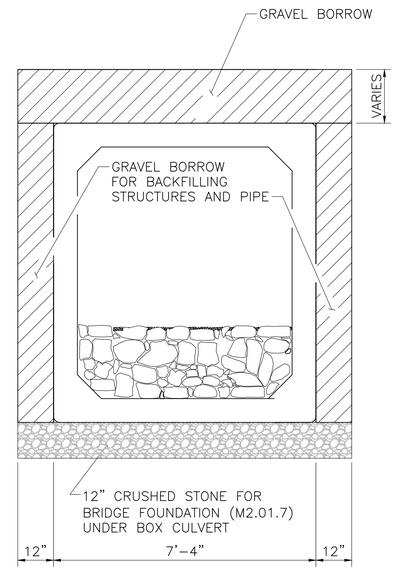


NOTES:
1. 4000 PSI, 1.5, 565 CEMENT CONCRETE TO BE USED.
2. EXPANSION JOINTS TO BE PLACED 60' O.C. MAXIMUM WITH INTERMEDIATE CONSTRUCTION JOINTS PLACED AT 30' O.C. MAXIMUM.
3. ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM.
4. PAYMENTS WILL BE BASED ON TABLE BELOW.
5. WATERSTOPS TO BE INSTALLED AT ALL EXPANSION JOINTS.

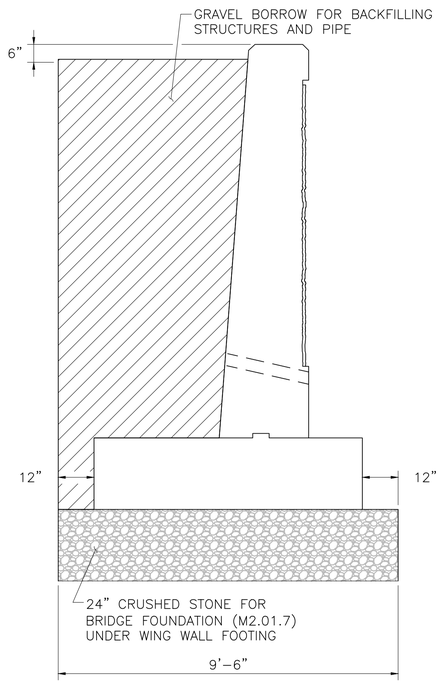
HEIGHTS		WIDTH	AREA SQ. FT.	CU. YDS. PER LIN. FT.
A	T	W		
2'-0"	4'-0"	2'-4"	6.667	0.247
2'-6"	4'-6"	2'-6"	7.875	0.292
3'-0"	5'-0"	2'-8"	9.165	0.339
3'-6"	5'-6"	2'-10"	10.541	0.390
4'-0"	6'-0"	3'-0"	12.000	0.444
4'-6"	6'-6"	3'-2"	13.541	0.502
5'-0"	7'-0"	3'-4"	15.162	0.562



BLOCK WALL DETAIL
NOT TO SCALE

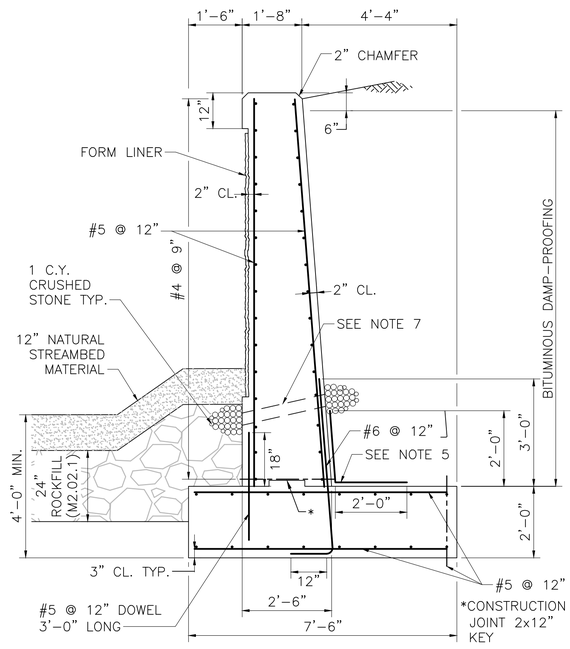


FLOOD WALL
NOT TO SCALE



LIMITS BACKFILL & FOUNDATION MATERIAL
1/2" = 1'-0"

LIMITS GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES
1/2" = 1'-0"

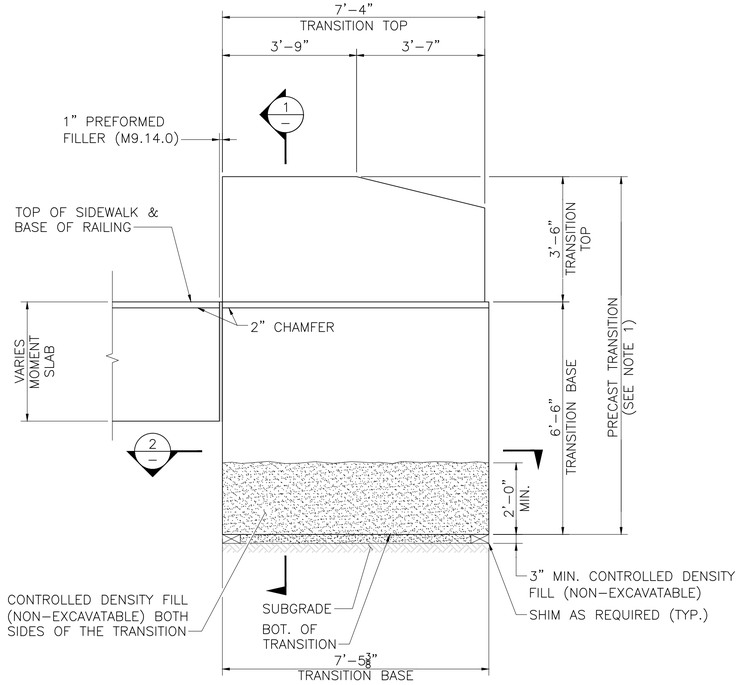


TYPICAL WINGWALL SECTION
1/2" = 1'-0"

NOTES:

1. CONTRACTOR MAY CAST-IN-PLACE OR ELECT TO PRECAST THE WINGWALL STEM AND FOOTING. DUE TO THE REQUIRED LIFTING AND HANDLING OF PRECAST UNITS, THE PRECAST DESIGN SHALL BE STAMPED BY A PROFESSIONAL STRUCTURAL ENGINEER REGISTERED IN MASSACHUSETTS.
2. FABRICATION OF PRECAST UNITS SHALL NOT OCCUR UNTIL SHOP DRAWINGS HAVE BEEN REVIEWED BY BSC.
3. ALL CONCRETE TO BE 4000 PSI, 1½ IN., 565 CEMENT CONCRETE.
4. ADEQUATELY SPACED PVC SLEEVES TO BE INCLUDED IN PRECAST FOOTINGS TO FACILITATE PLACEMENT OF CONTROLLED DENSITY FILL (NON-EXCAVATABLE).
5. MEMBRANE WATERPROOFING AND 4" X 8" X 2", 4000 PSI (SEE MASSDOT SPECIFICATIONS FOR DESIGN REQUIREMENTS) CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN THE STANDARD SPECIFICATIONS.
6. 4"ø WEEP HOLES (JUST ABOVE PROTECTIVE COURSE).

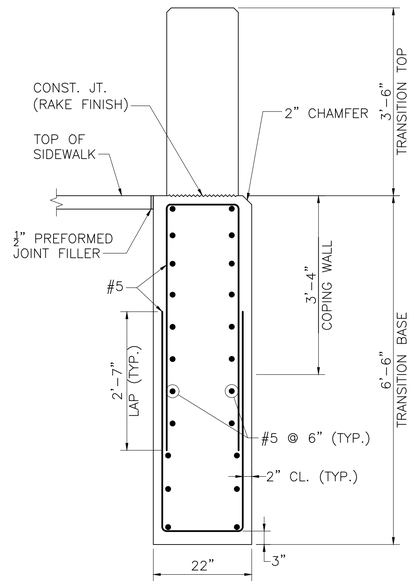
2834401_BR10-12.DWG Plotted on 23-Aug-2022 12:40 PM



SIDEWALK

PRECAST TRANSITION ELEVATION AT MOMENT SLAB

SCALE: 1/2" = 1'-0"

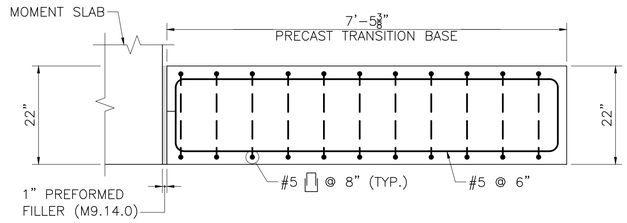


NOTES:

1. REINFORCEMENT OF THE TRANSITION TOP IS NOT SHOWN FOR CLARITY.

SECTION 1

SCALE: 3/4" = 1'-0"



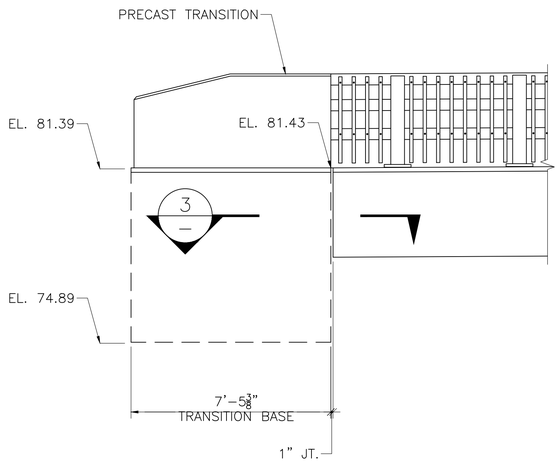
NOTE:
WINGWALL REINFORCEMENT AND STRIATIONS NOT SHOWN FOR CLARITY.

SECTION 2

SCALE: 3/4" = 1'-0"

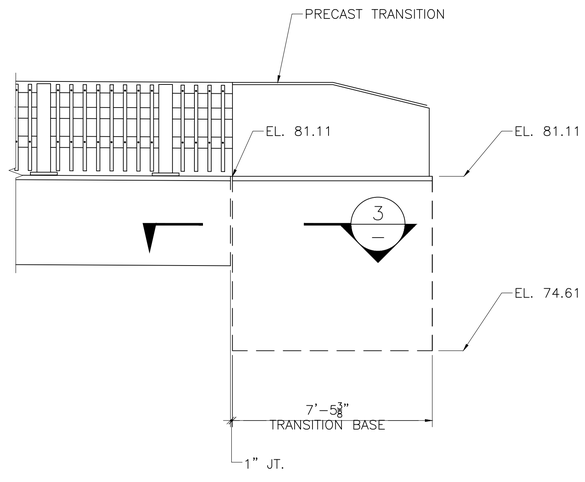
NOTES:

1. THREADED INSERTS SHALL BE PREQUALIFIED BY THE MANUFACTURER AS BEING CAPABLE OF DEVELOPING A NOMINAL SHEAR RESISTANCE OF 20 KIPS PER 7/8" ø S.S. BOLT. S.S. BOLTS SHALL BE 7/8" ø X 1 1/2" LONG FULLY THREADED AISI TYPE 304N STAINLESS STEEL. INSERTS FOR 7/8" S.S. BOLTS SHALL BE GALVANIZED AND CAST INTO THE TRANSITION.
2. USE LATEST CONTRACT COMPLETION YEAR IN EFFECT WHEN THE FIRST TRANSITION IS CAST. USE THIS YEAR FOR ALL PRECAST TRANSITIONS.
3. ALL CONCRETE FOR THE PRECAST TRANSITION SHALL BE 5000 PSI, 3/4", 685 HP CEMENT CONCRETE.
4. LIFTING DEVICES (NOT SHOWN), INCLUDING THEIR NUMBER AND LOCATION, SHALL BE DESIGNED AND DETAILED BY THE PRECASTER. THEY SHALL BE GALVANIZED AND SHALL BE PLACED AND RECESSED IN POCKETS TO PROVIDE 1 1/2" CLEAR COVER TO THE FACE OF THE TRANSITION CONCRETE. THESE DEVICES SHALL BE CLEARLY SHOWN ON THE SHOP DRAWINGS ALONG WITH ALL SUPPORTING CALCULATIONS AND/OR CATALOG CUTS. ONCE THE PRECAST TRANSITION IS SET IN PLACE, THE LIFTING DEVICE POCKETS SHALL BE FILLED WITH A NON-SHRINK GROUT THAT MATCHES THE COLOR OF THE TRANSITION CONCRETE WHEN CURED AND THE FILLED POCKETS SHALL BE RUBBED WITH A CORUNDUM STONE TO BLEND OUT THE JOINTS.



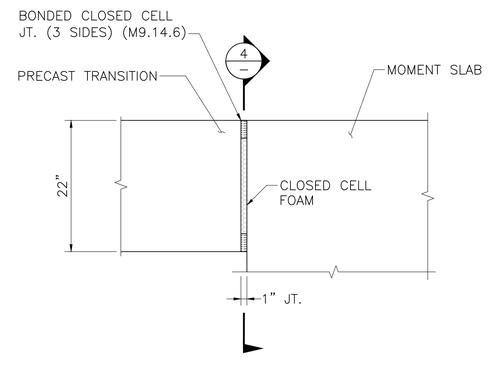
SOUTHWEST PRECAST TRANSITION ELEVATION

SCALE: 3/8" = 1'-0"



SOUTHEAST PRECAST TRANSITION ELEVATION

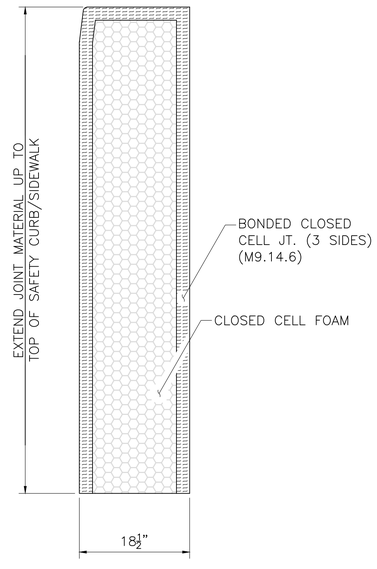
SCALE: 3/8" = 1'-0"



NOTE:
REINFORCEMENT NOT SHOWN FOR CLARITY.

SECTION 3

SCALE: 1" = 1'-0"



SECTION 4

SCALE: 1" = 1'-0"

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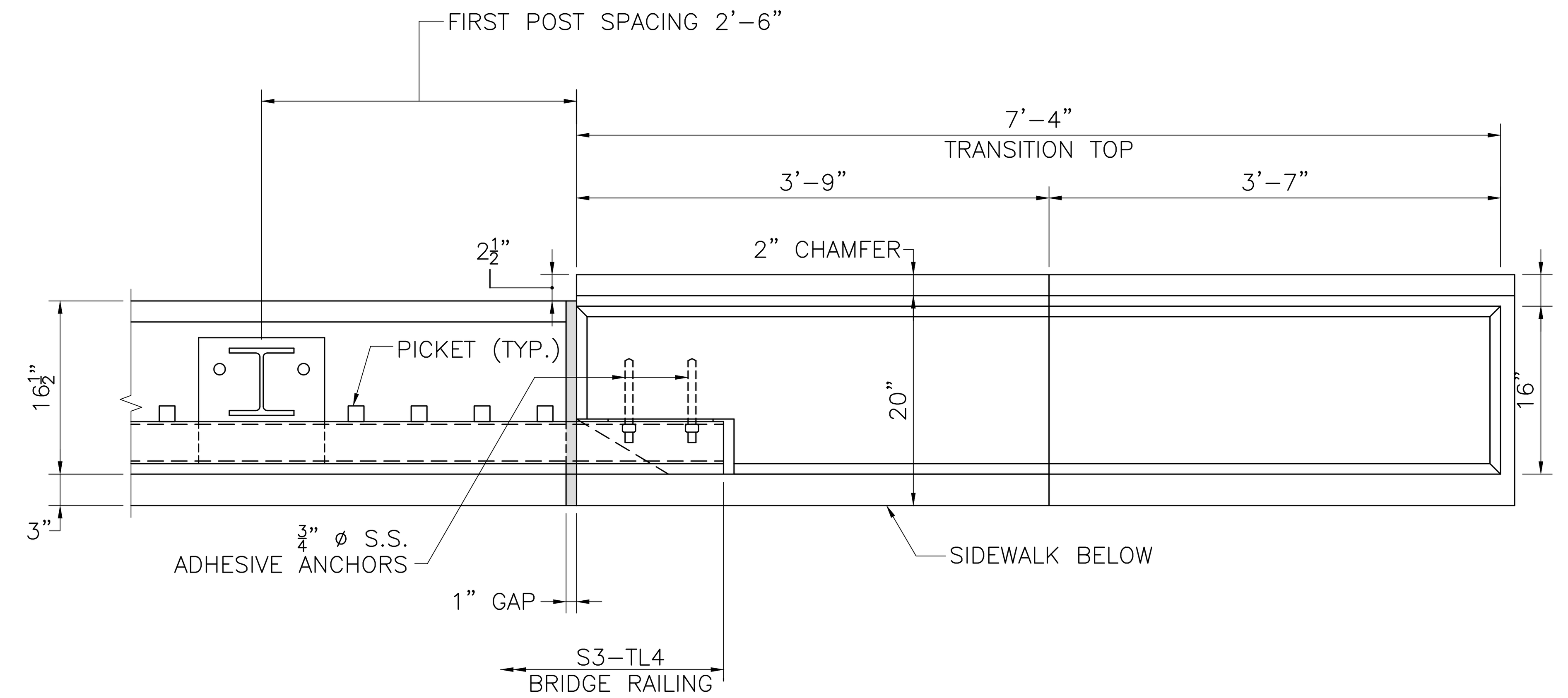
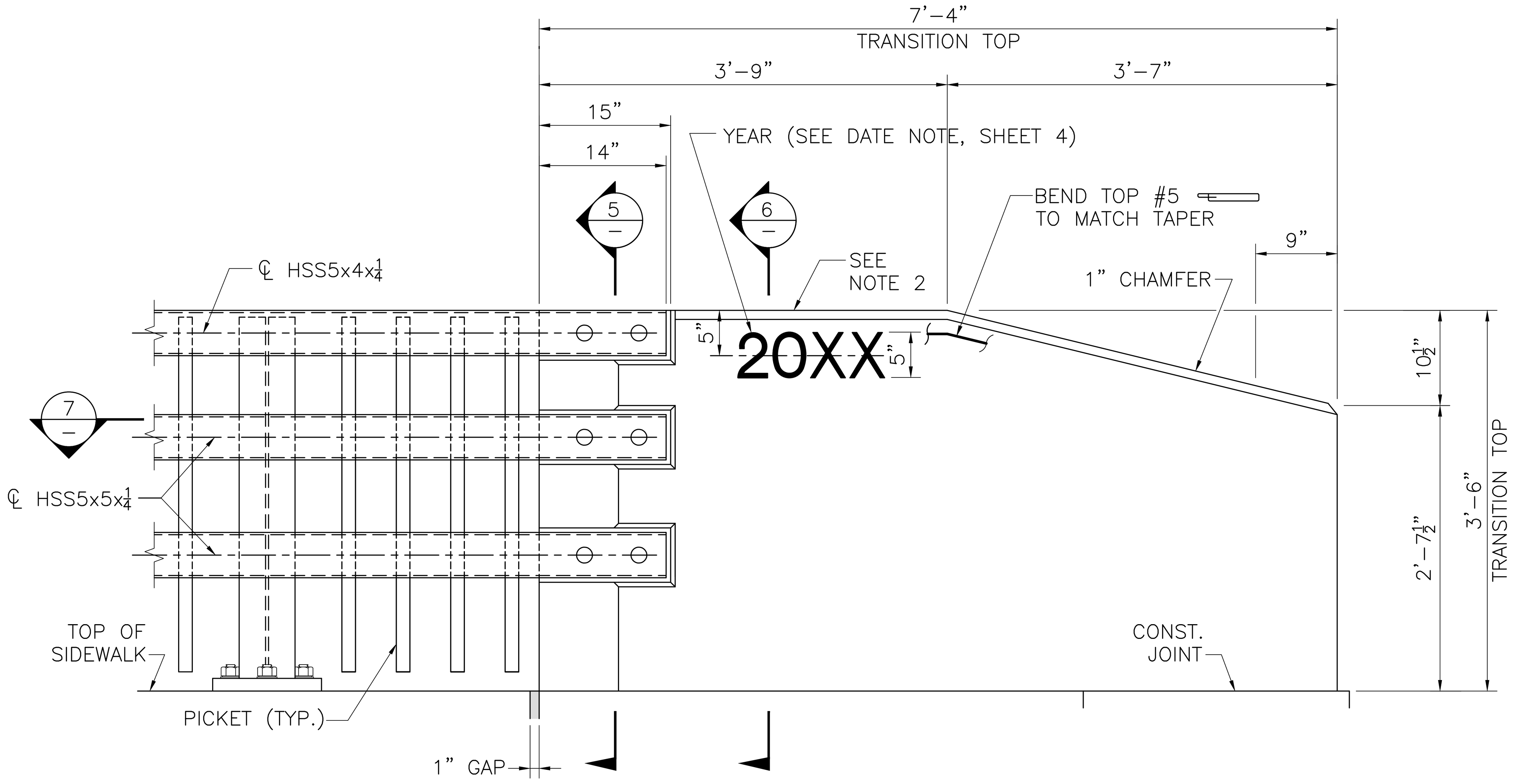
Plotted on: Tuesday, August 23, 2022 - 12:40pm by SPOPOVIC

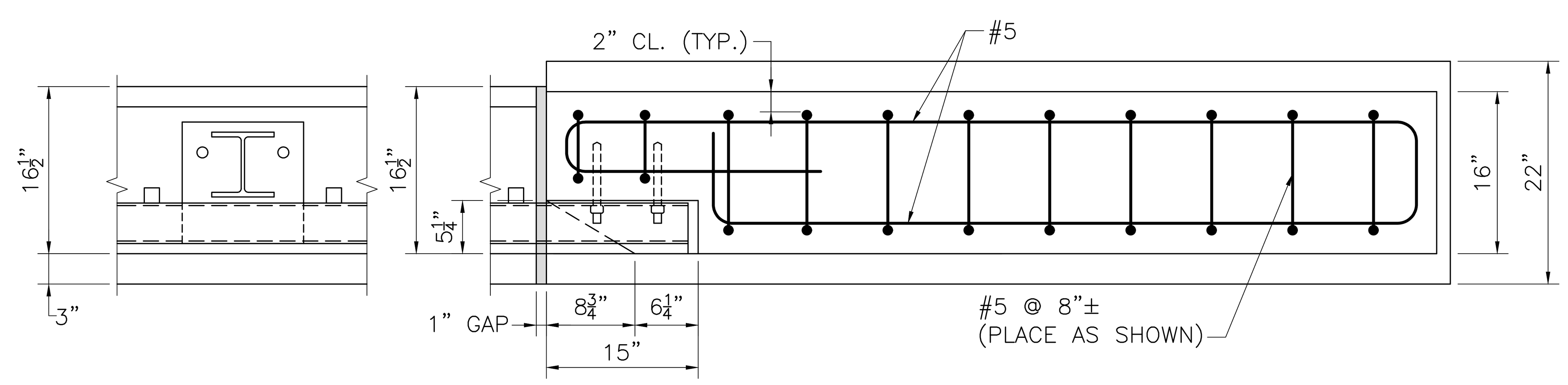
Plotted on 23-Aug-2022 12:40 PM
2834401_BR10-12.DWG



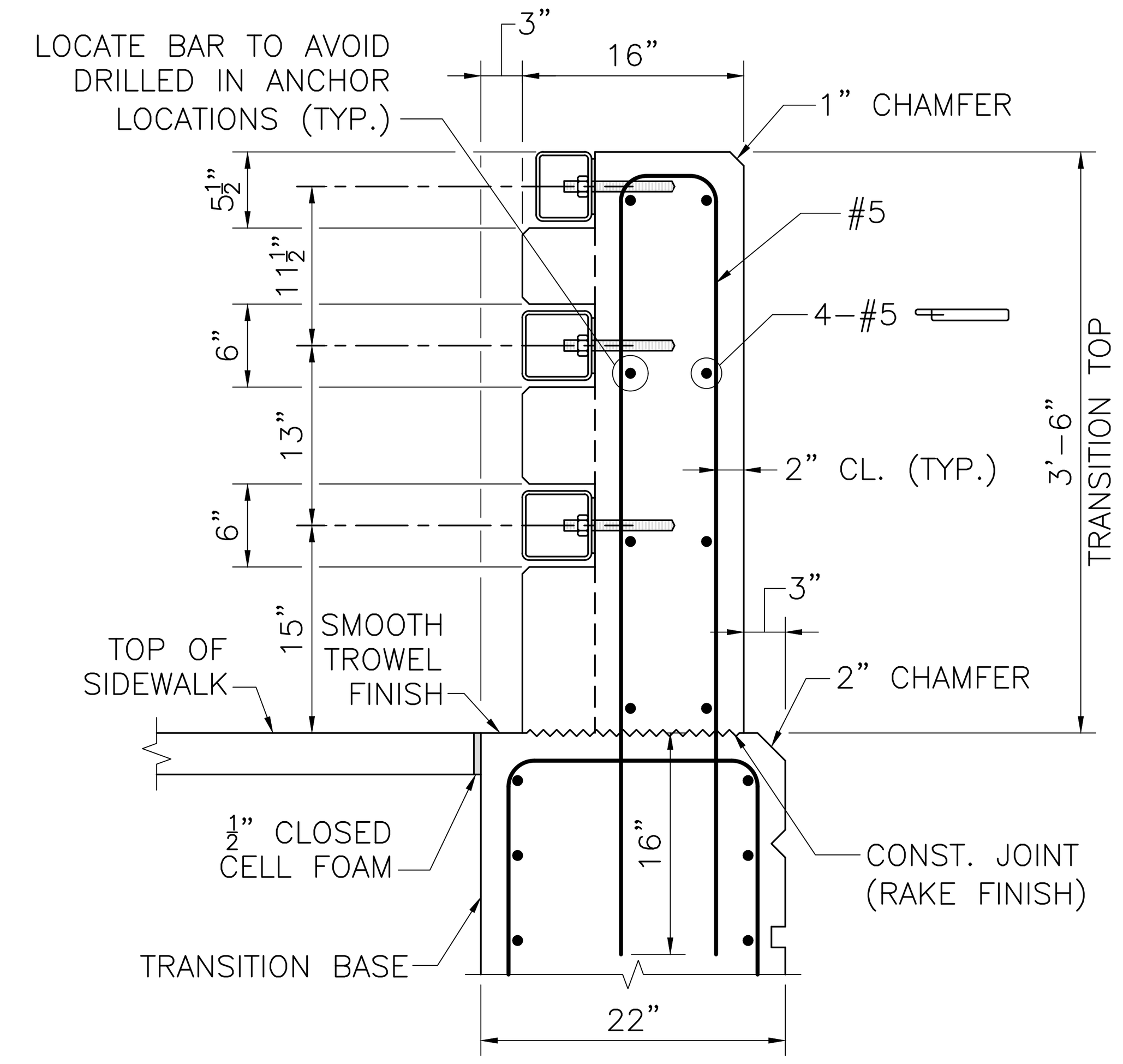
PLAN AT SIDEWALK
SCALE: 1" = 1'-0"



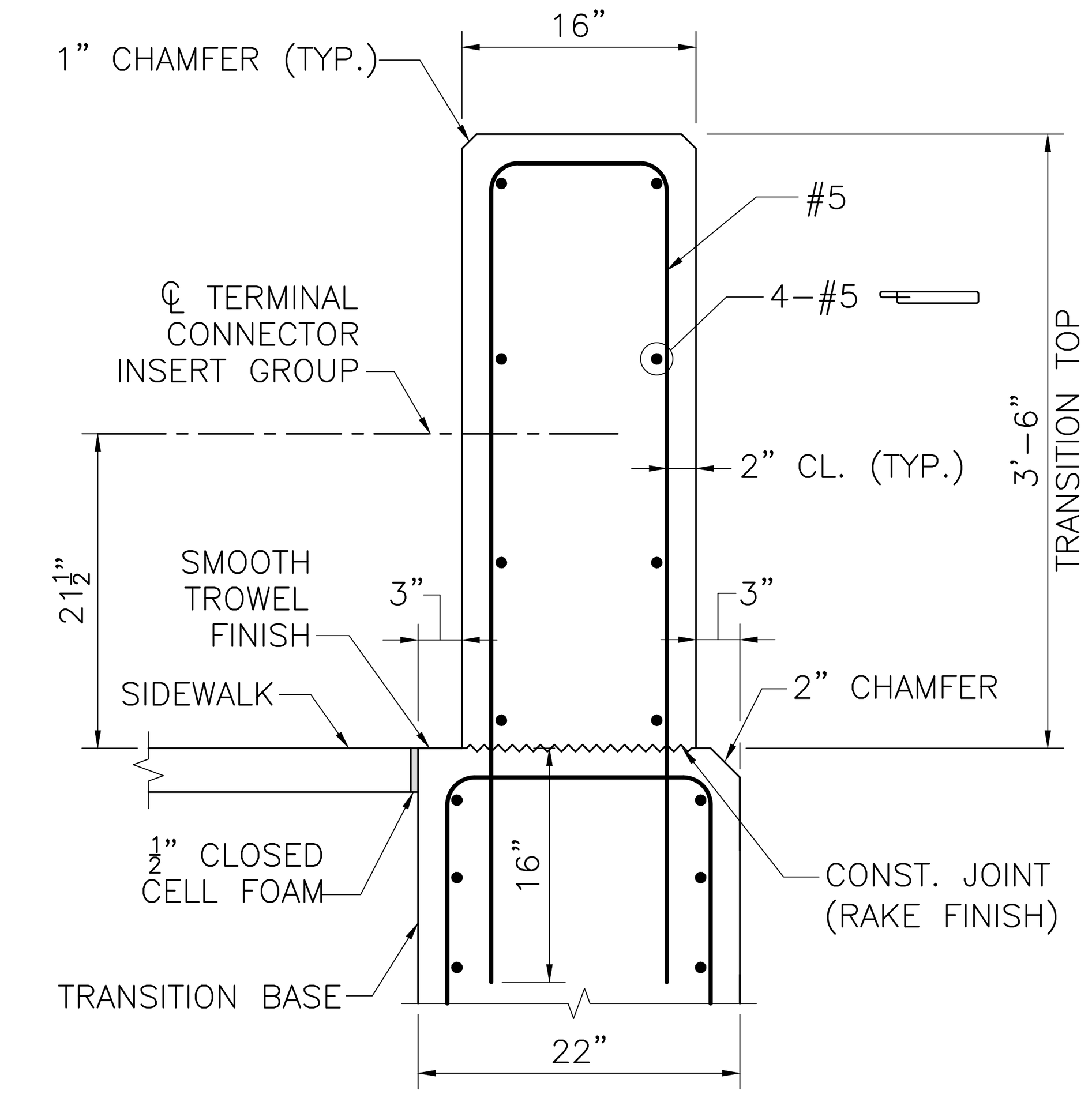
ELEVATION AT SIDEWALK
SCALE: 1" = 1'-0"



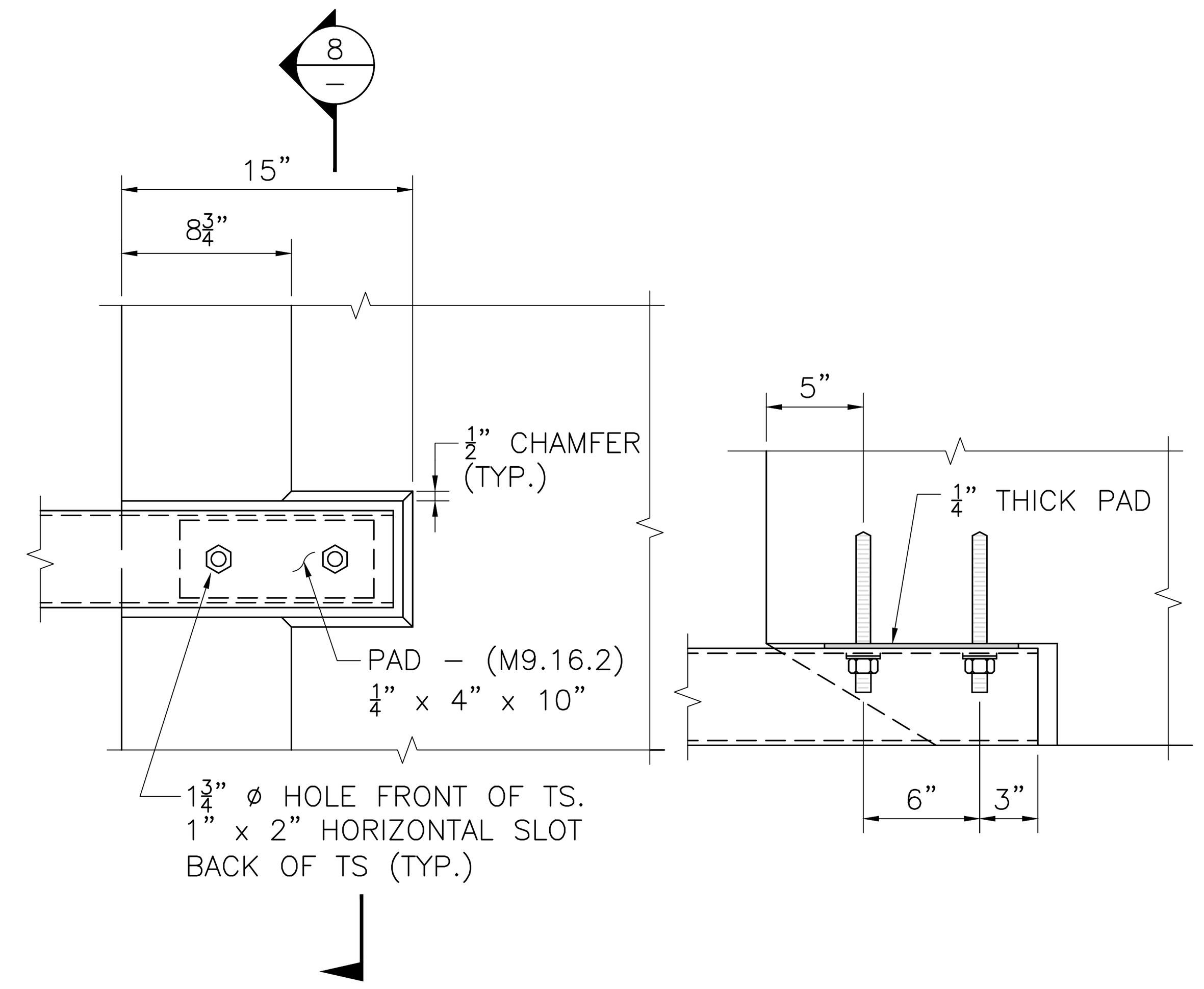
SECTION 7
SCALE: 1" = 1'-0"



SECTION 5 AT SIDEWALK
SCALE: 1" = 1'-0"

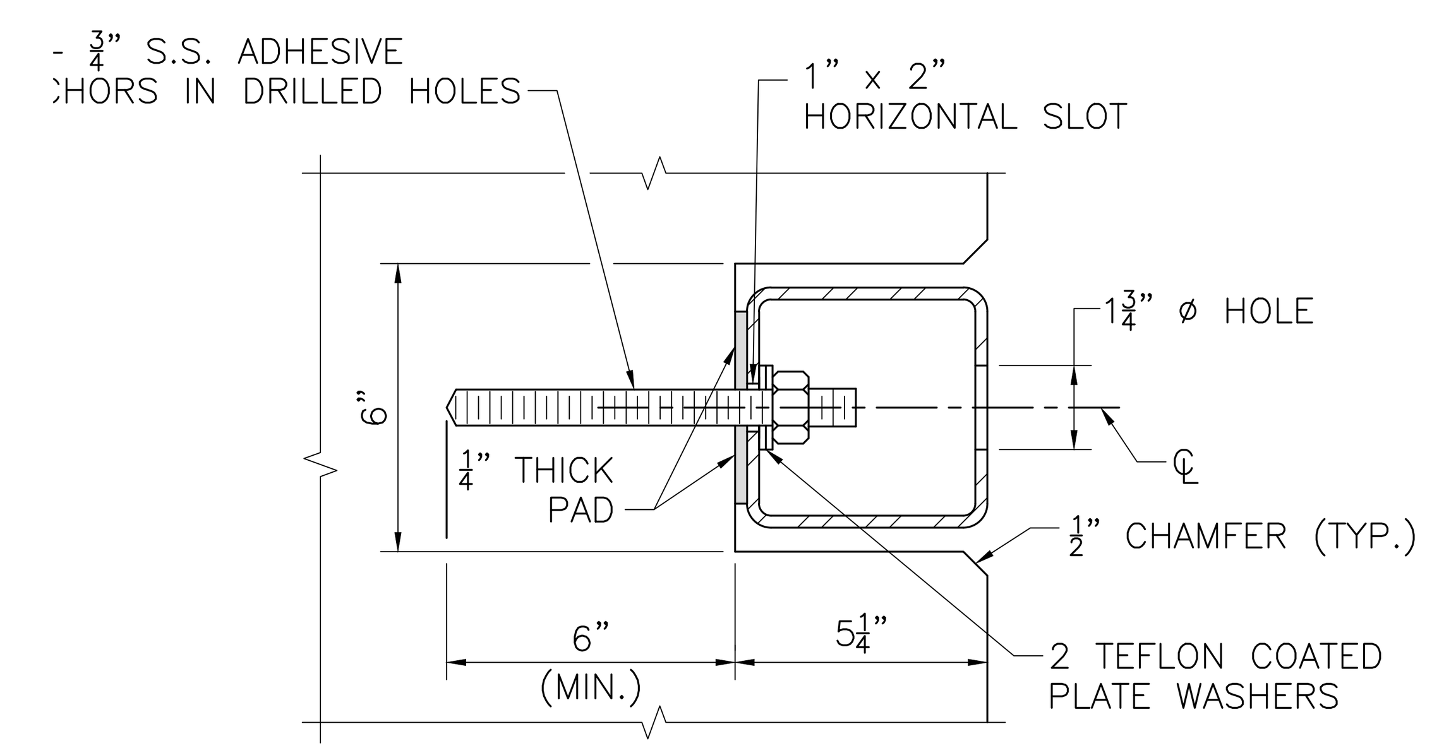


SECTION 6 AT SIDEWALK
SCALE: 1" = 1'-0"



ELEVATION   PLAN

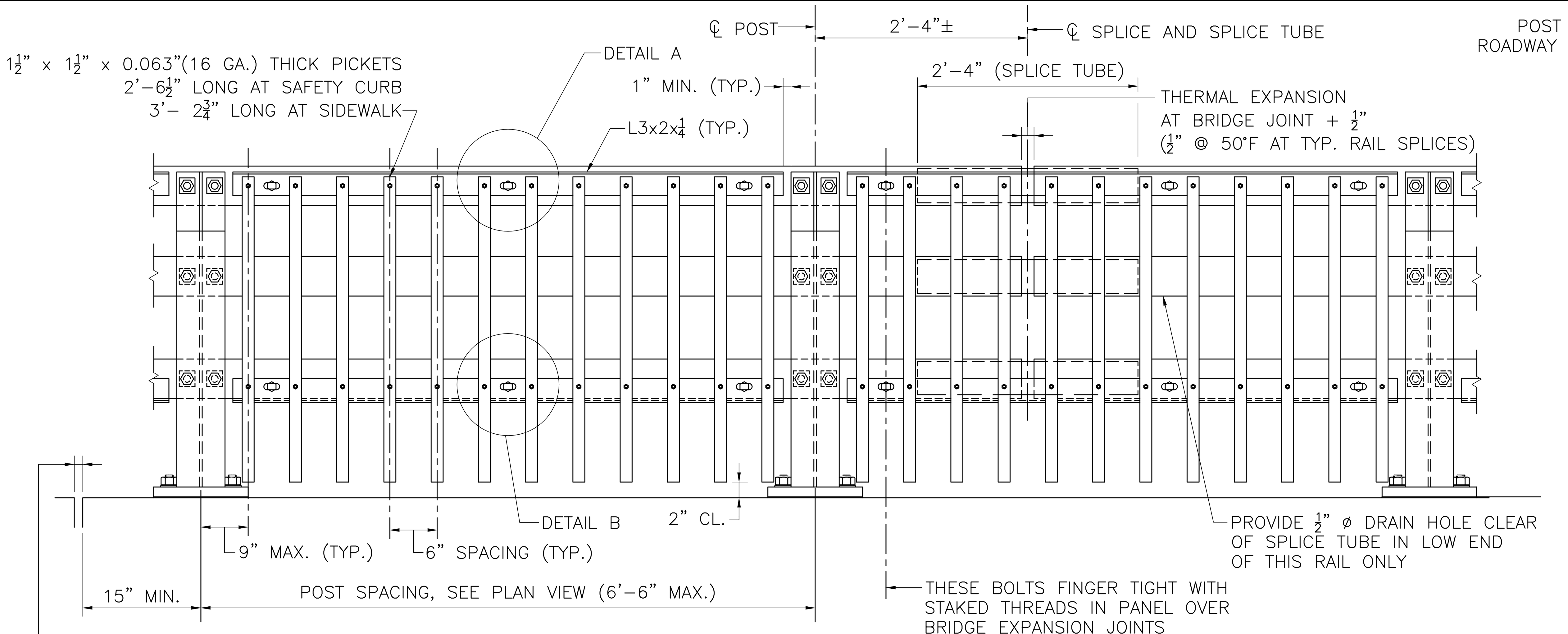
RAIL ATTACHMENT
SCALE: 1 1/2" = 1'-0"



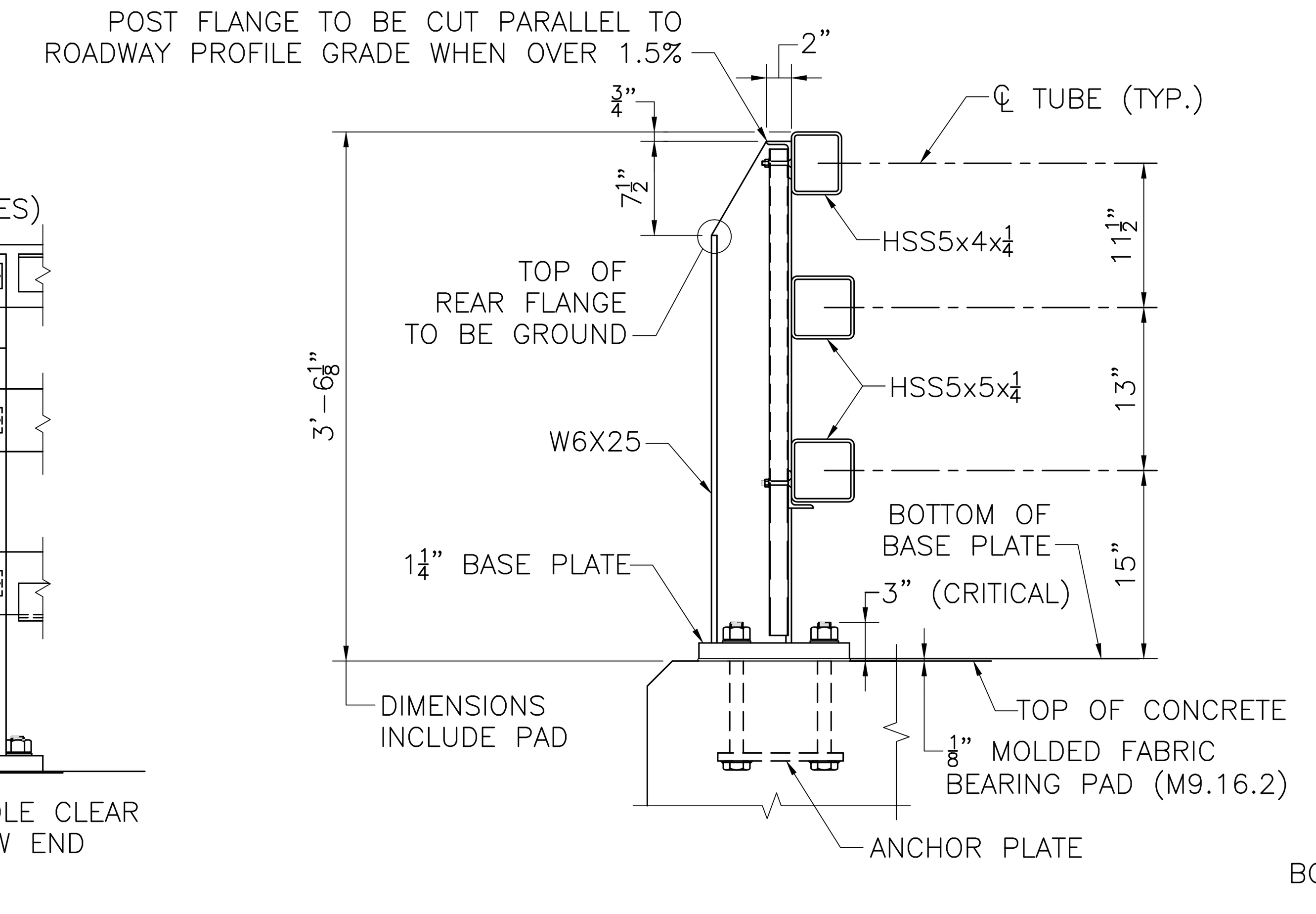
SECTION 8
SCALE: 3" = 1'-0"

TOP OF PRECAST TRANSITION FOR S3–TL4 RAILING

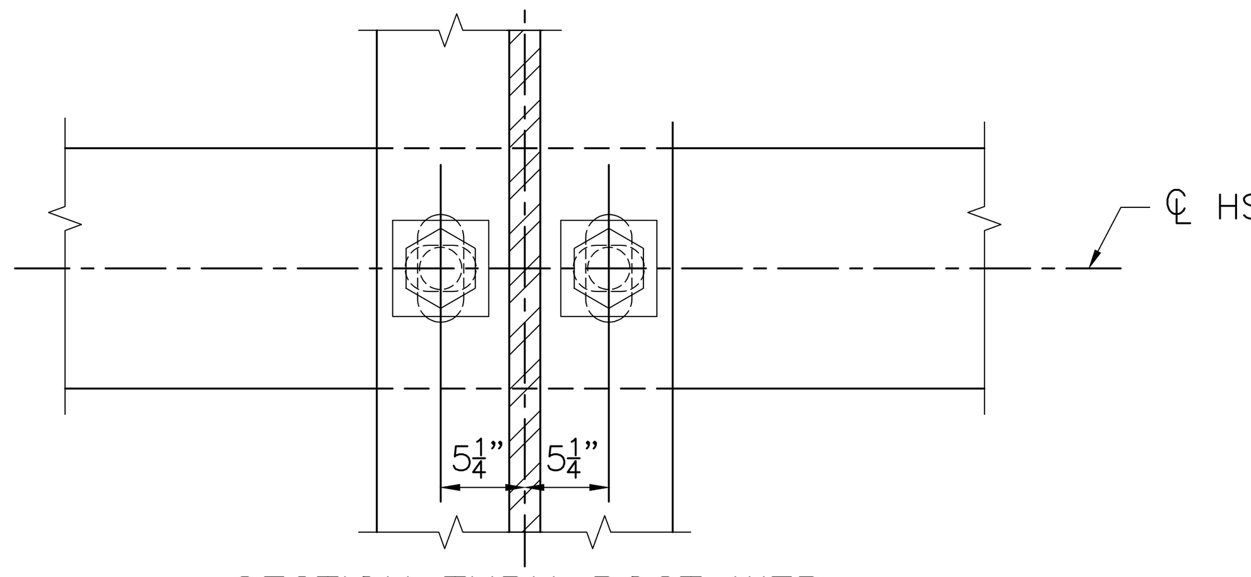
WALTHAM/BELMONT
TRAPELO ROAD (ROUTE 60)
CULVERT REPLACEMENT & FLOOD WALL
S3-TL4 RAILING DETAILS



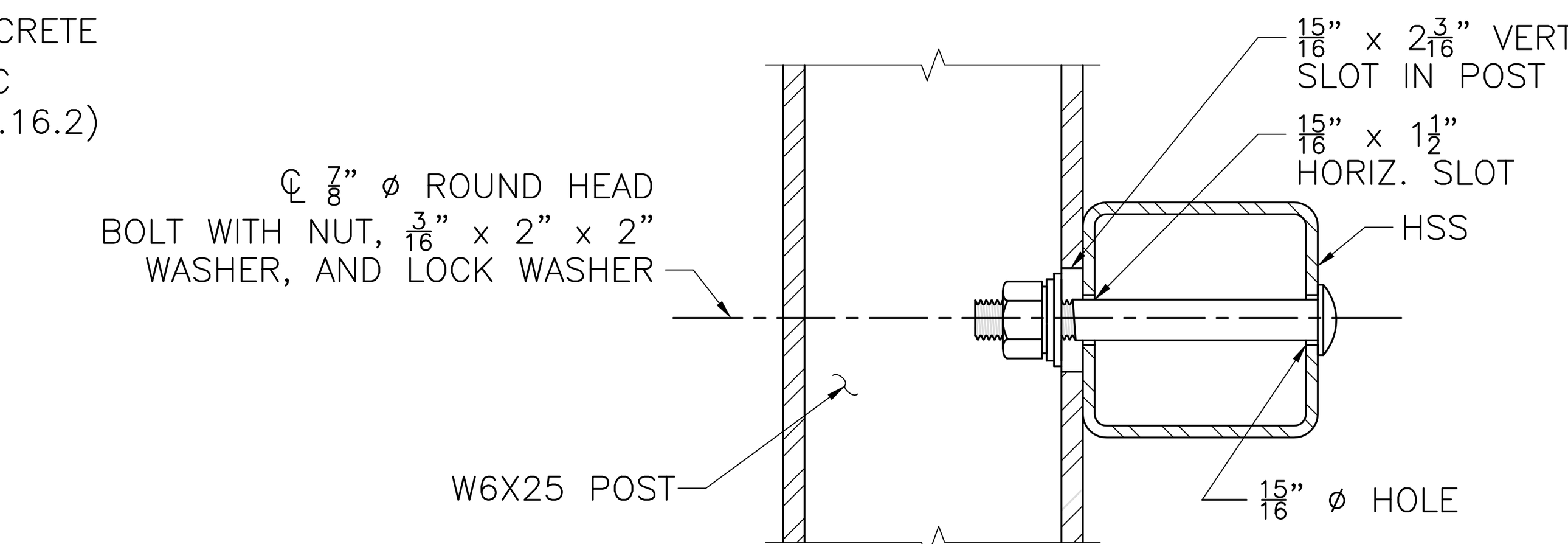
BRIDGE RAILING ELEVATION AT SIDEWALK
SCALE: 1" = 1'-0"



SECTION 24
SCALE: 1" = 1'-0"



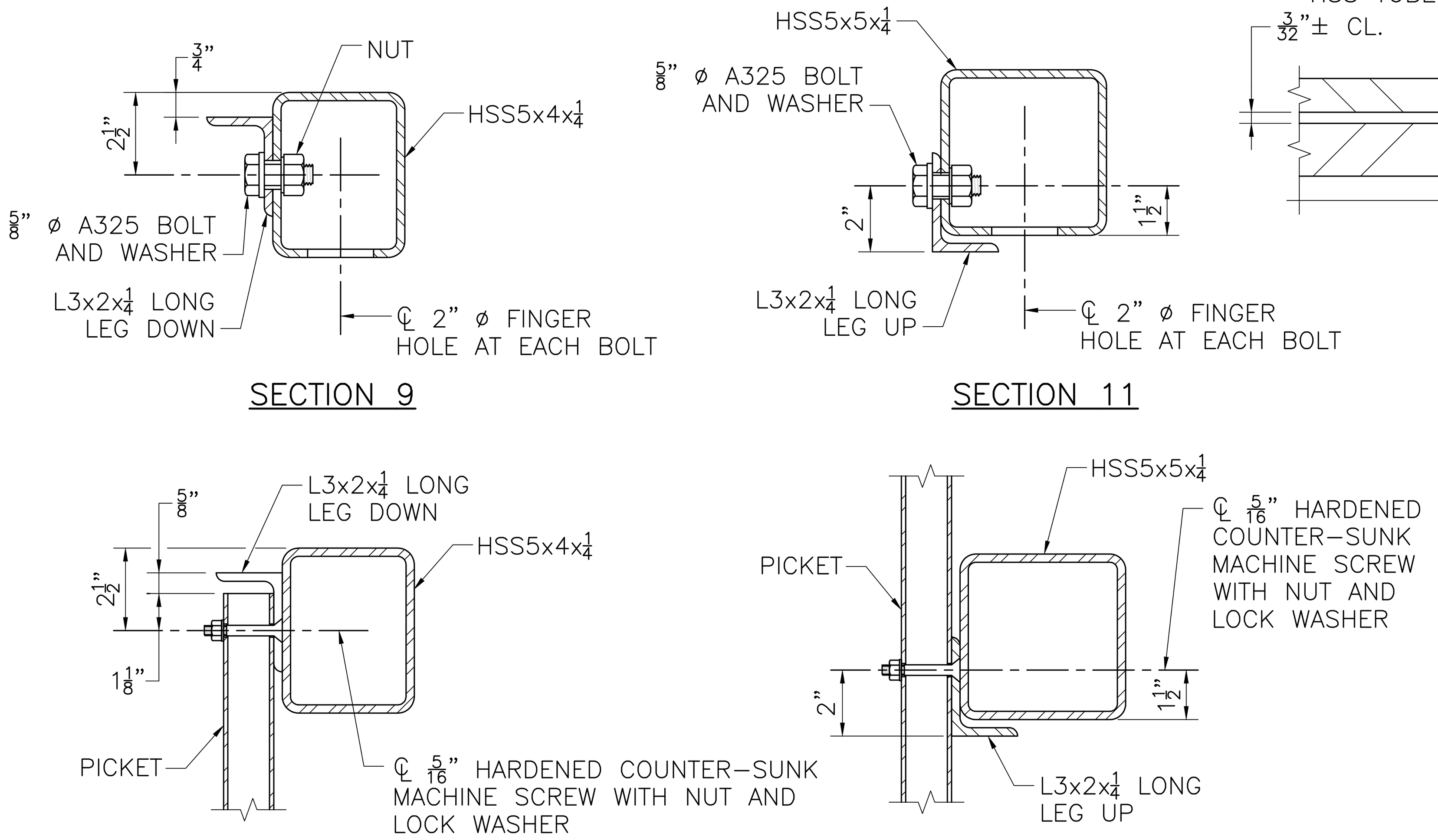
SECTION THRU POST WEB



SECTION THRU RAIL

NOTE:
CONNECTIONS AT LOWER RAILS SHOWN.
CONNECTIONS AT TOP RAIL SIMILAR.

TYPICAL RAIL TO POST CONNECTIONS
SCALE: 1" = 1'-0"

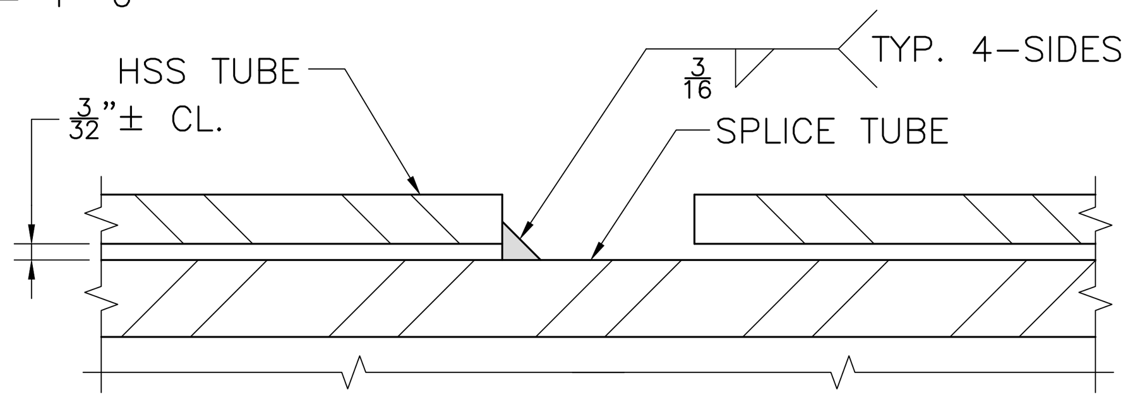


SECTION 9

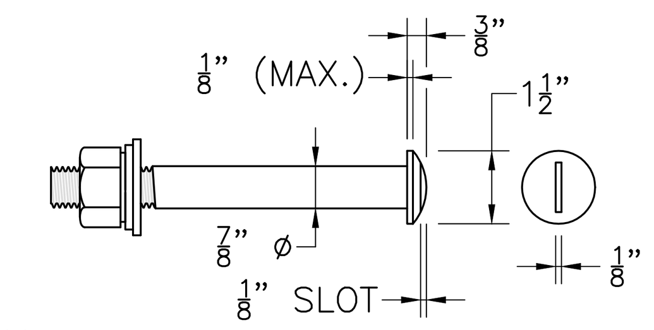
SECTION 11

SECTION 10

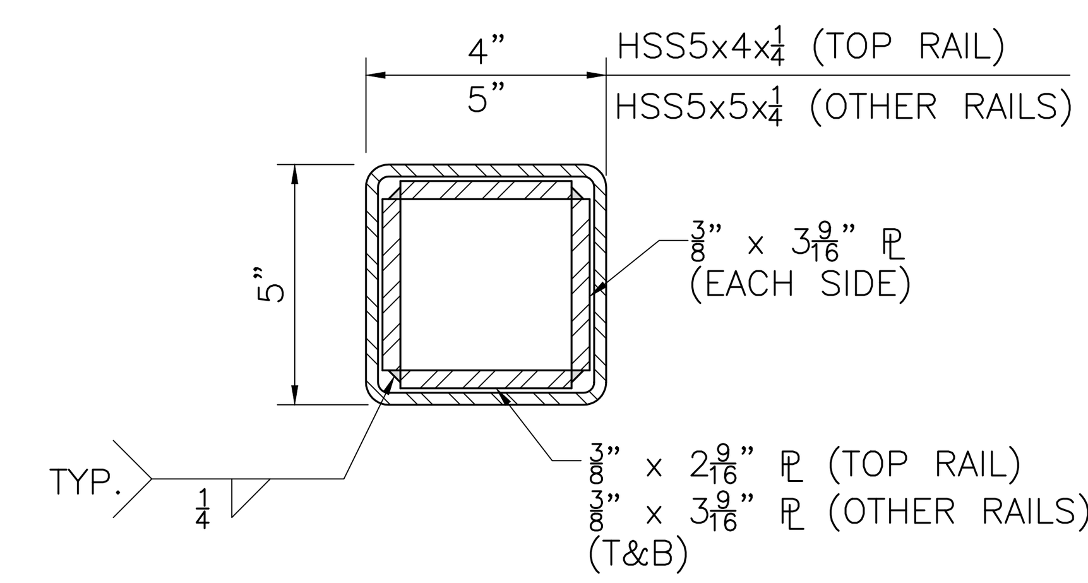
SECTION 12



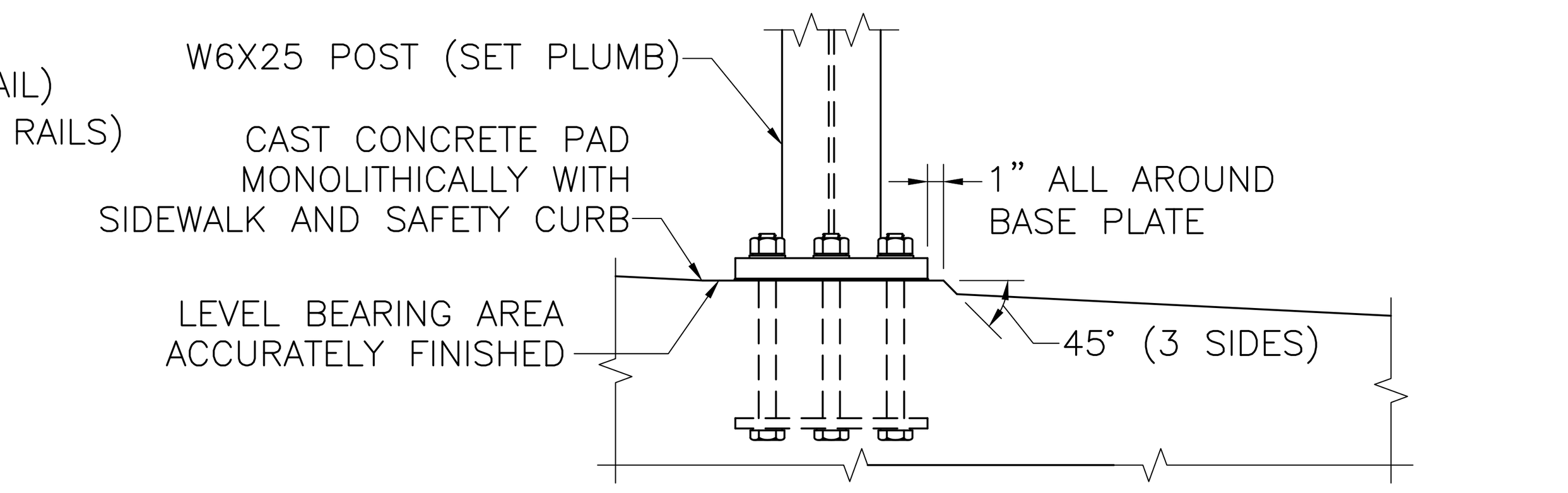
SPLICE DETAIL
FULL SIZE



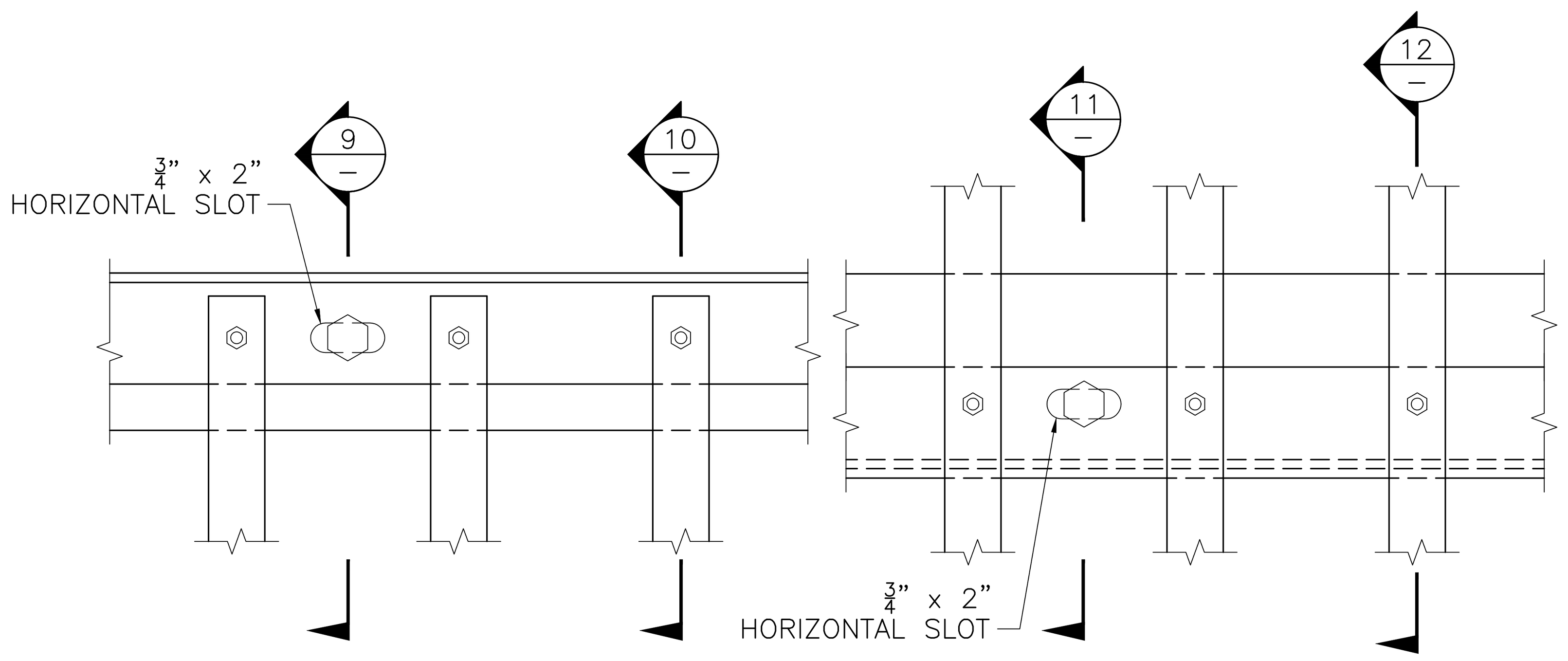
⅞" ø ROUND HEAD BOLT
SCALE: 3" = 1'-0"



SPLICE TUBE DETAILS
SCALE: 3" = 1'-0"



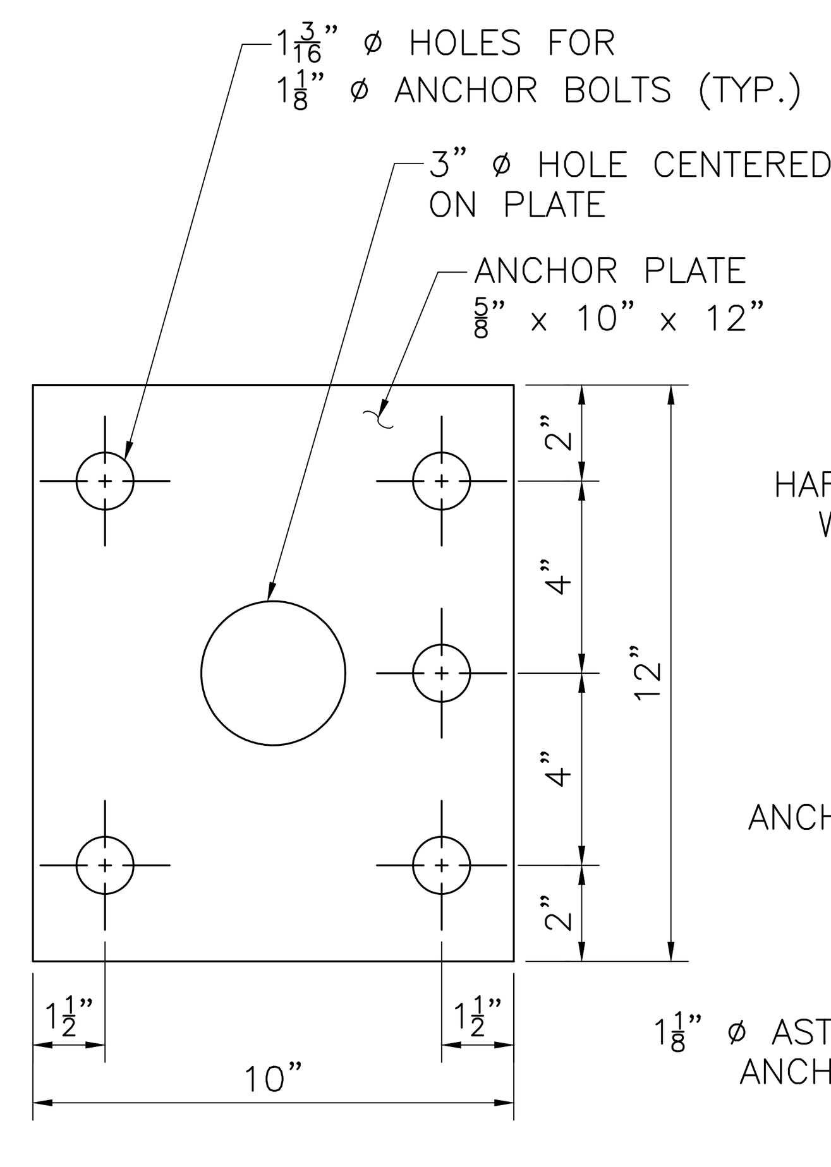
SETTING OF POSTS (PROFILE GRADE OVER 1.5%)
SCALE: 1" = 1'-0"



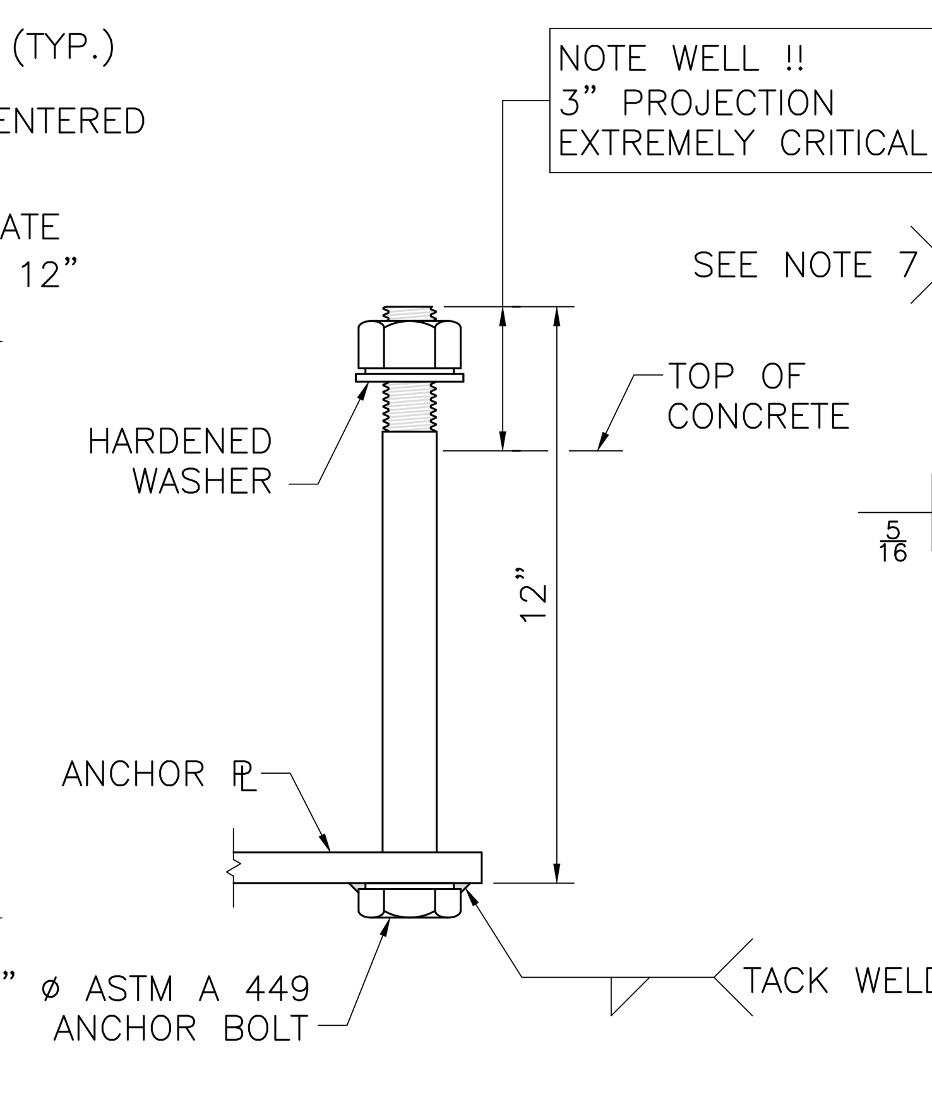
DETAIL A

DETAIL B

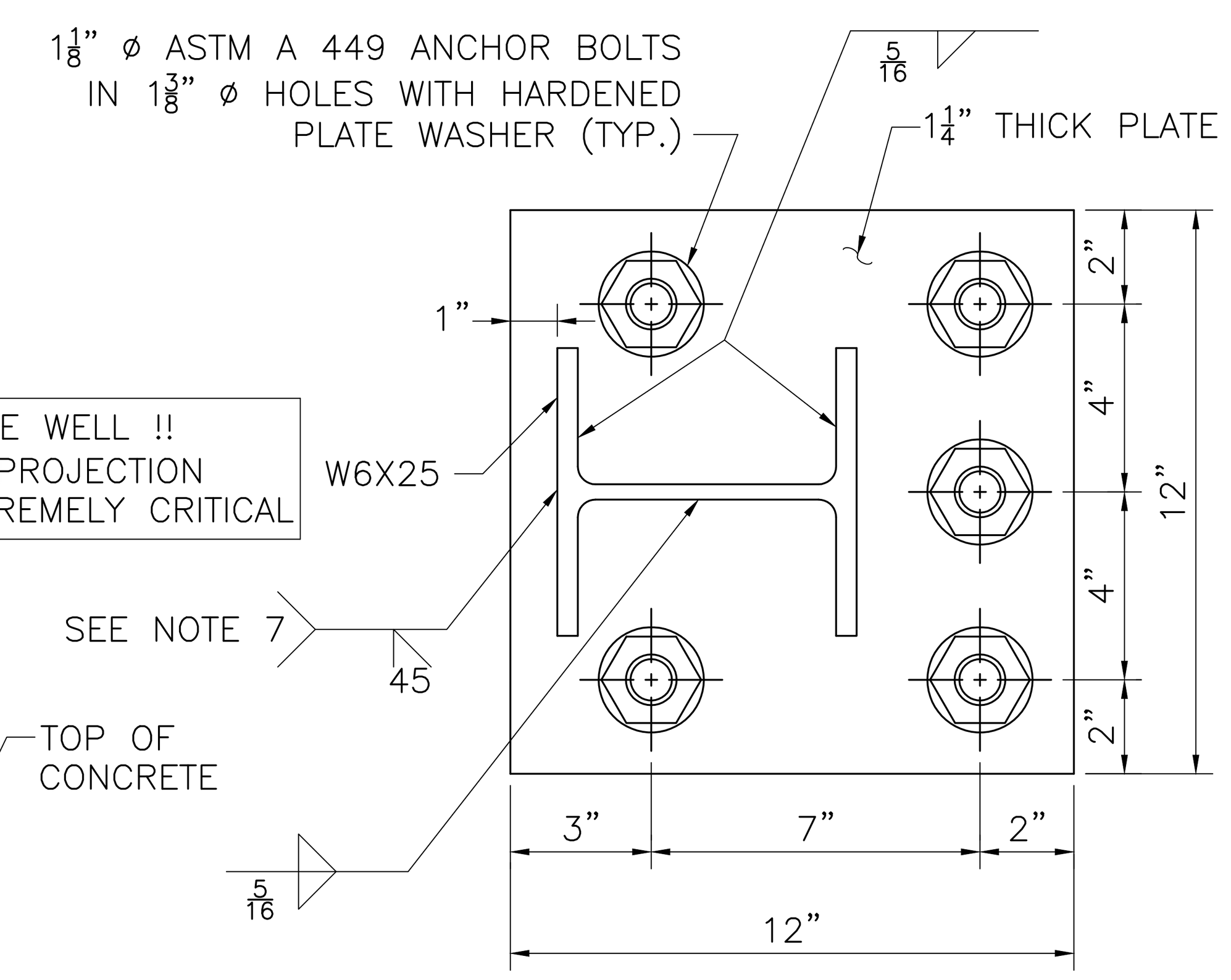
TYPICAL PICKET TO RAIL DETAILS
SCALE: 3" = 1'-0"



ANCHOR PLATE
SCALE: 3" = 1'-0"



ANCHOR BOLT
SCALE: 3" = 1'-0"



BASE PLATE
SCALE: 3" = 1'-0"

RAILING NOTES:

1. RAIL POST AND BASE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 270 GRADE 50. HOLLOW RAILING STRUCTURAL TUBING (HSS) SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 500 WITH A CERTIFIED Fy = 50 KSI MINIMUM. THE MINIMUM HORIZONTAL BENDING RADII OF THE HSS TUBING SHALL BE 8 FEET. PICKET CARRIER ANGLES, ANCHOR PLATES, AND SPLICE TUBE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 270 GRADE 36. PICKET TUBING SHALL CONFORM TO ASTM A 513 WITH Fy = 36 KSI MIN. OR A 500 GRADE B.

2. ALL STEEL (EXCEPT THE ⅝" ANCHOR PLATE AND FASTENERS) SHALL BE GALVANIZED AND PAINTED DARK BRONZE (FEDERAL STD. 595B COLOR NO. 10045). ANCHOR PLATE SHALL BE GALVANIZED ONLY. HEADS OF ⅞" ø ROUND HEAD BOLTS SHALL BE PAINTED TO MATCH RAIL.

3. ANCHOR BOLTS SHALL BE SET WITH TEMPLATES. THE NUT SECURING THE POST BASE PLATE TO THE CONCRETE SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AN ADDITIONAL 1/8 TURN AFTER STEEL IS IN PLACE.

4. RAILS SHALL BE CONTINUOUS OVER A MINIMUM OF FOUR (4) POSTS WITHOUT SPLICES WHERE POSSIBLE. RAILS SHALL BE SPLICED IN THE PANELS OVER EXPANSION JOINT.

5. ENDS OF TUBE SECTIONS SHALL BE SAWED. GRIND SMOOTH EXPOSED EDGES. ALL CUT ENDS SHALL BE TRUE AND SMOOTH.

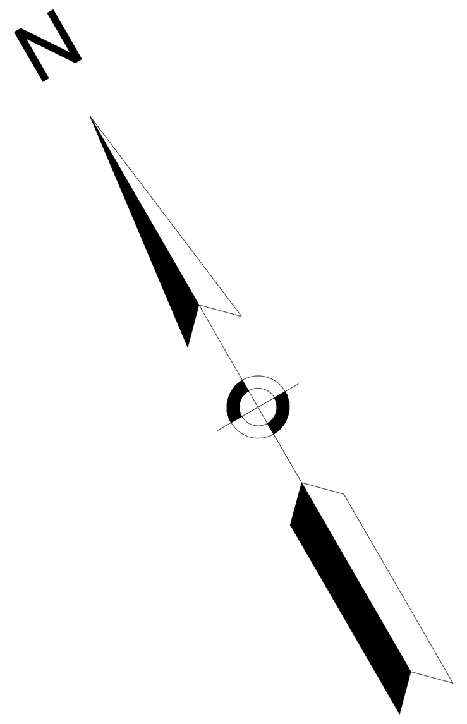
6. ALL POSTS TO BE PLUMB WHEN PROFILE GRADE EXCEEDS 1.5%. FOR PROFILE GRADES LESS THAN 1.5%, POSTS SHALL BE SET PERPENDICULAR TO GRADE.

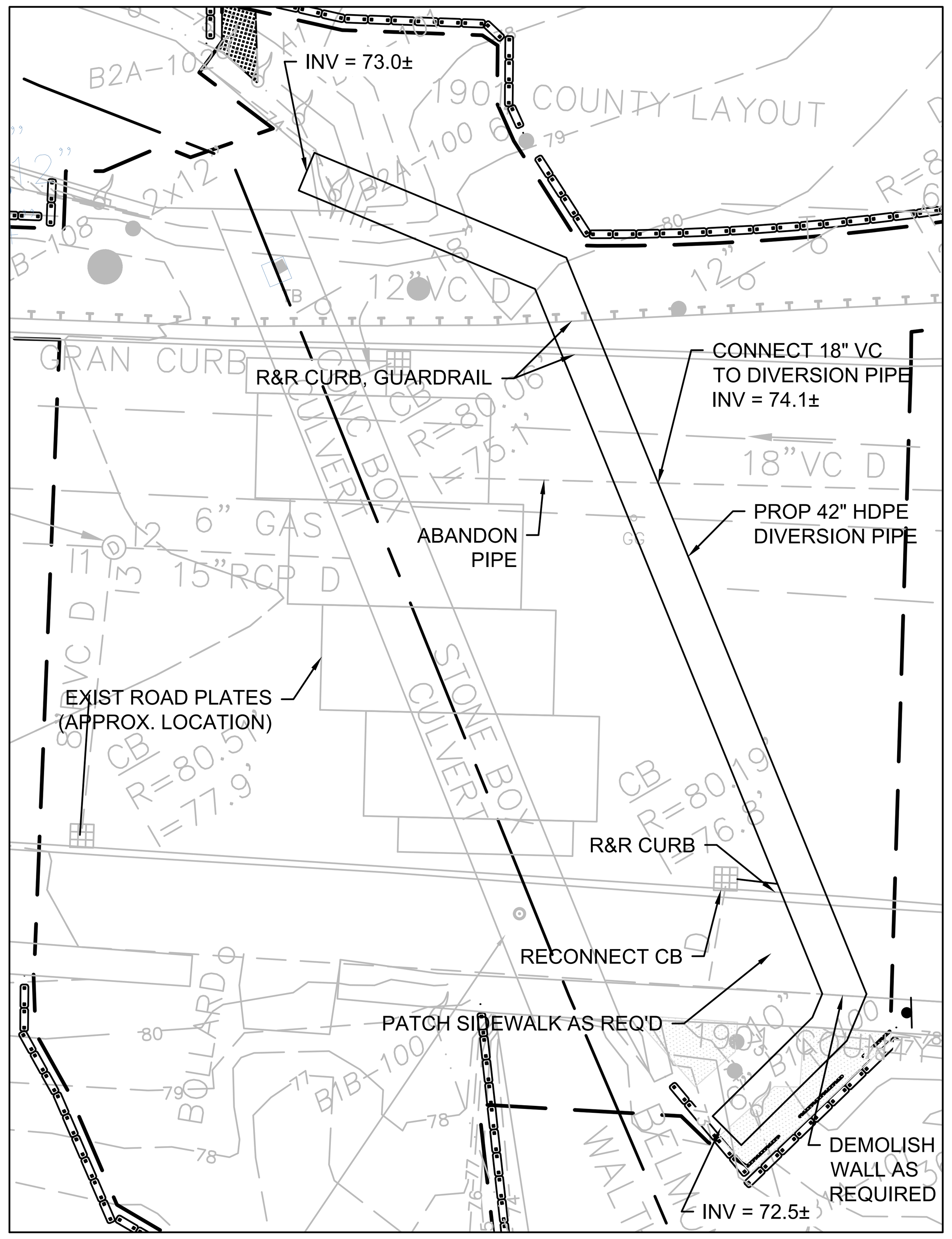
7. POST FLANGE WELD DOES NOT REQUIRE MAGNETIC PARTICLE TESTING. WELD SHALL BE BACK-GOUGED ON BACK SIDE EXCEPT AT WEB. WELD IS THE SAME ON BOTH FLANGES.

8. ⅞" ø ROUND HEAD BOLTS SHALL CONFORM TO THE CHEMICAL AND PHYSICAL REQUIREMENTS OF AASHTO M 164.

S3-TL4 BRIDGE RAILING

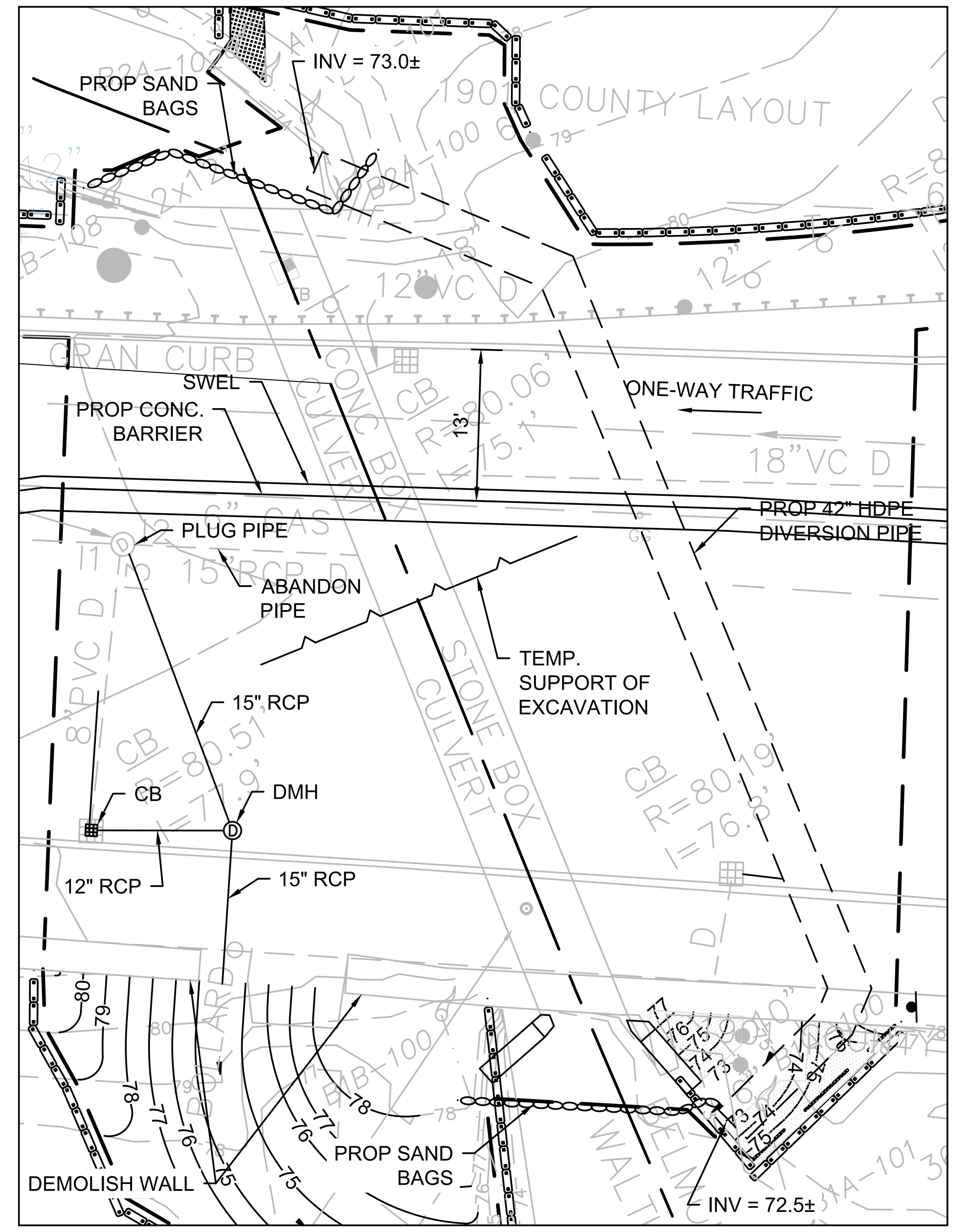
2834401_BR10-12.DWG Plotted on 23-Aug-2022 12:40 PM





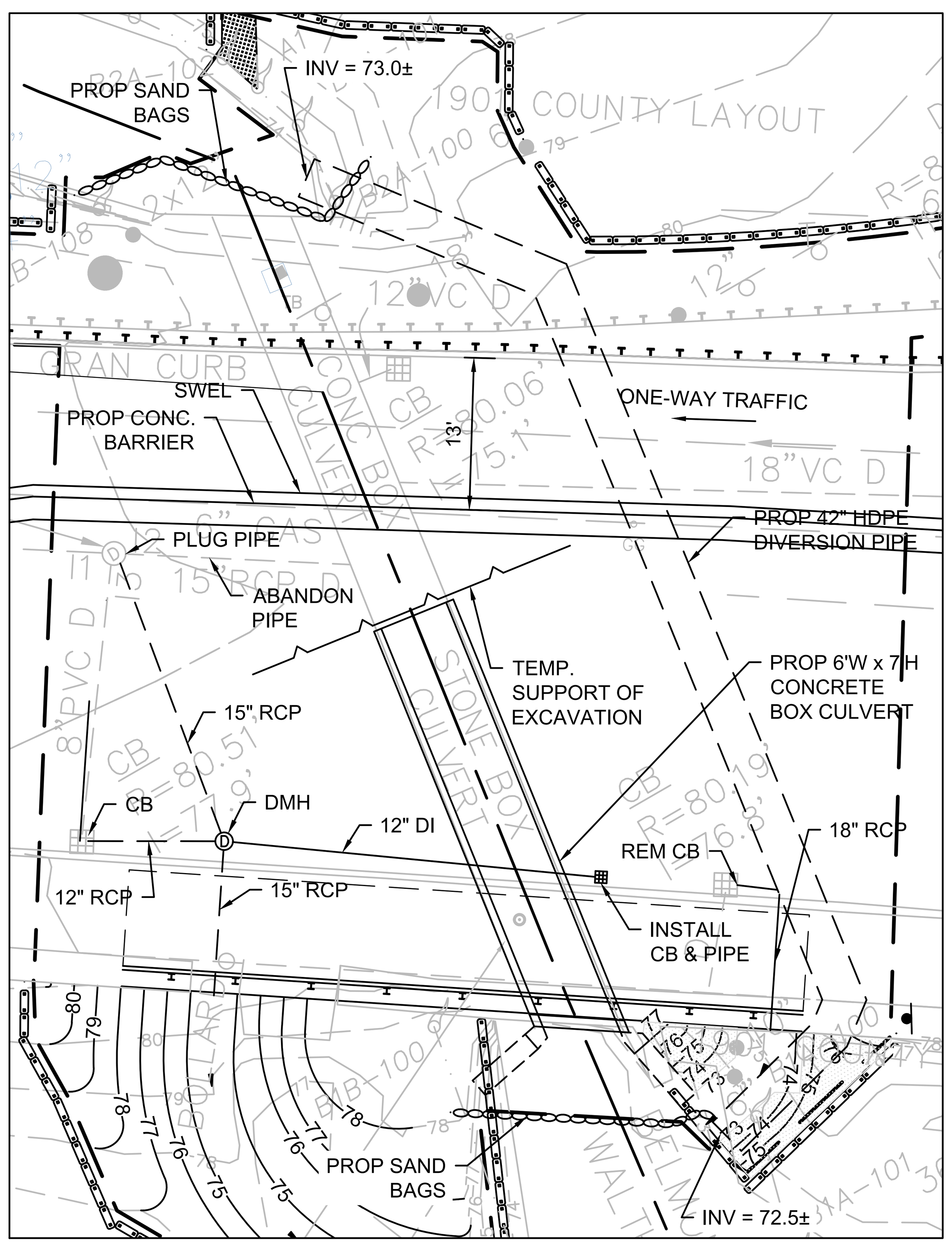
PRELIMINARY STAGE

1. INSTALL EROSION CONTROLS
2. USING LANE CLOSURES, INSTALL TRENCH BOX, EXCAVATE AND INSTALL TEMPORARY 42" HDPE DIVERSION PIPE.
3. RECONNECT CATCH BASIN TO 42' DIVERSION PIPE.
4. CONNECT EXIST 18" VC PIPE TO DIVERSION PIPE.
5. BACKFILL AND PAVE OVER DIVERSION PIPE EXCAVATION.



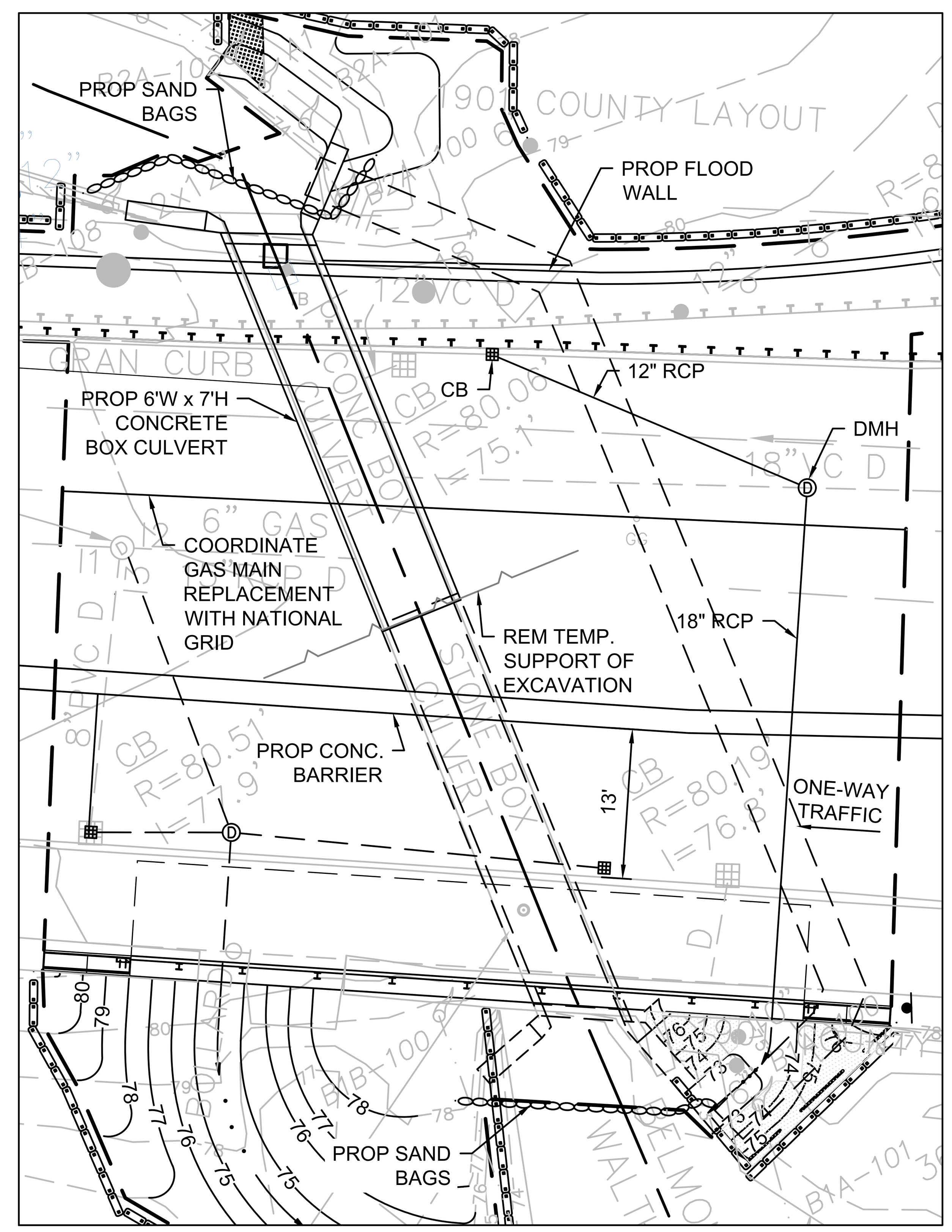
STAGE 1A

1. IMPLEMENT EASTBOUND TRAFFIC DETOUR, PEDESTRIAN DETOUR, AND INSTALL BARRIERS AS SHOWN ON TRAFFIC STAGING PLAN - STAGE 1. WORK WITH CITY AND TOWN OFFICIALS TO REMOVE STEEL PLATES IN ROAD AS NEEDED TO PERFORM WORK.
2. INSTALL SAND BAGS (OR OTHER APPROVED WATER CONTROL SYSTEM) AND REDIRECT STREAM FLOW THROUGH DIVERSION PIPE.
3. DEMOLISH DOWNSTREAM WALL.
4. CONSTRUCT WINGWALLS AND PROPOSED DRAINAGE SYSTEM AS SHOWN, AND PLUG 15" PIPE.
5. INSTALL TEMPORARY SUPPORT OF EXCAVATION.
6. DEMOLISH SOUTH HALF OF CULVERT.



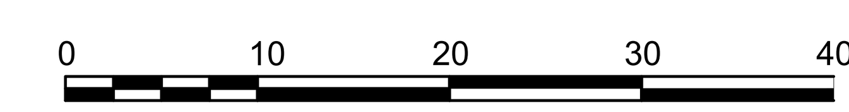
STAGE 1B

1. CONSTRUCT SOUTH HALF OF CULVERT.
2. CONSTRUCT BLOCK WALL, PORTION OF 18" DRAIN, MOMENT SLAB, AND BRIDGE RAILING (EXCLUDING EAST PRECAST HIGHWAY GUARDRAIL TRANSITION).
3. CONSTRUCT CB AND 12" DI PIPE AND REMOVE EX CB AS SHOWN.
4. CONSTRUCT SIDEWALK AND CURBING.
5. PAVE SOUTH HALF OF ROAD EXCLUDING TOP COURSE.



STAGE 2

1. INSTALL BARRIERS AS SHOWN ON TRAFFIC STAGING PLAN - STAGE 2 AND SHIFT TRAFFIC TO SOUTHBOUND SIDE.
2. DEMOLISH NORTH HALF OF CULVERT AND UPSTREAM HEADWALL.
3. CONSTRUCT NORTH HALF OF CULVERT AND WEST WINGWALL.
4. REMOVE TEMPORARY SUPPORT OF EXCAVATION.
5. SHIFT STREAM FLOW THROUGH NEW CULVERT.
6. REMOVE PROJECTING ENDS OF 42" DIVERSION PIPE AND FLOWFILL REMAINDER.
7. INSTALL REMAINING CATCH BASIN, MANHOLE, PIPE, EAST PRECAST HIGHWAY GUARDRAIL TRANSITION, AND EAST WINGWALL.
8. INSTALL FLOOD WALL.
9. COORDINATE GAS MAIN REPLACEMENT WORK AS REQUIRED.
10. PAVE NORTH HALF OF ROAD, FULL WIDTH TOP COURSE AND OPEN TO TRAFFIC.



SCALE: 1" = 10'

2834400CP(STAGE).DWG
Plotted on 23-Aug-2022 12:44 PM

WALTHAM/BELMONT
TRAPELO ROAD (ROUTE 60)
CULVERT REPLACEMENT & FLOOD WALL
TRAFFIC STAGING PLAN - STAGE 1

Plotted on 23-Aug-2022 12:46 PM
2834400TMP(STAGE).DWG

WALTHAM/BELMONT
TRAPELO ROAD (ROUTE 60)
CULVERT REPLACEMENT & FLOOD WALL
TRAFFIC STAGING PLAN - STAGE 2
SHEET 15 OF 18

WALTHAM/BELMONT
TRAPELO ROAD (ROUTE 60)
CULVERT REPLACEMENT & FLOOD WALL
DETOUR PLAN
SHEET 16 OF 18

Plotted on 23-Aug-2022 12:47 PM

2834400TMP(DETOUR).DWG

N

TRAPELO RD CLOSED AHEAD
SEEK ALTERNATE ROUTE

TRAPELO RD CLOSED
FOLLOW DETOUR

TRAPELO RD EB CLOSED BELMONT LINE
FOLLOW DETOUR

TRAPELO RD EB CLOSED BELMONT LINE
FOLLOW DETOUR

City of Waltham

Town of Belmont

Town of Watertown

FOREST STREET

Beaver Brook

Mill Pond

Duck Pond

MILL STREET

PLEASANT STREET

CONCORD AVENUE

COMMON STREET

THOMAS STREET

W20-1

TRAPELO ROAD

MA-R2-10e

W20-2

M4-9AR

M4-9R

R11-2
M4-10R

M4-9V

MA-R2-10a

M4-8a

PROJECT LOCATION

60

WAVERLEY OAKS ROAD

D3-1
W20-1 (AHD)

Clematis Brook

M4-9L

D3-1
M4-9AL

BEAVER STREET

Beaver Brook

D3-1
M4-9R

D3-1
M4-9V

D3-1
M4-9AR

D3-1
M4-9AL

WARREN STREET

BELMONT STREET

HAGAR LANE

SYCAMORE STREET

LEXINGTON STREET

WHITE STREET

BEECH STREET

WAVERLEY STREET

ORCHARD STREET

WAVERLEY AVENUE

Lyman Pond

LINDEN STREET

MAIN STREET

20

LEGEND

PROPOSED DETOUR ROUTE

PROPOSED WORK ZONE

SIGN ASSEMBLY

PROPOSED ONE WAY(WESTBOUND) TRAFFIC EASTBOUND DETOUR OF TRAPELO ROAD

0 500 1000 1500 2000

SCALE: 1" = 500'

TRAFFIC SIGN SUMMARY

IDENTIFICATION NUMBER	SIZE OF SIGN WIDTH (in)	SIZE OF SIGN HEIGHT (in)	TEXT	TEXT DIMENSIONS (in) LETTER HEIGHT	TEXT DIMENSIONS (in) VERTICAL SPACING	TEXT DIMENSIONS (in) ARROW RTE. MKR.	COLOR BACKGROUND	COLOR LEGEND	COLOR BORDER	UNIT AREA (S.F.)
D3-1	46	12	Trapelo Rd	6D/4D	3" 3"	N/A	FLUORESCENT ORANGE	BLACK	BLACK	3.83
MA-R2-10a	48	36	WORK ZONE SPEEDING FINES DOUBLED	SEE MASSDOT STANDARDS			FLUORESCENT ORANGE	BLACK	BLACK	12.00
MA-R2-10e	36	48	END ROAD WORK DOUBLE FINES END	SEE MASSDOT STANDARDS			FLUORESCENT ORANGE	BLACK	BLACK	12.00
M4-8a	24	12	END DETOUR	SEE 2009 M.U.T.C.D.			FLUORESCENT ORANGE	BLACK	BLACK	2.00
M4-9A L/R	30	24	DETOUR / DETOUR				FLUORESCENT ORANGE	BLACK	BLACK	5.00
M4-9A SL/R	30	24	DETOUR / DETOUR				FLUORESCENT ORANGE	BLACK	BLACK	5.00
M4-9 L/R	30	24	DETOUR / DETOUR				FLUORESCENT ORANGE	BLACK	BLACK	5.00
M4-9b L/R	30	24	DETOUR / DETOUR				FLUORESCENT ORANGE	BLACK	BLACK	5.00
M4-9 SL/R	30	24	DETOUR / DETOUR				FLUORESCENT ORANGE	BLACK	BLACK	5.00
M4-9V	30	24	DETOUR				FLUORESCENT ORANGE	BLACK	BLACK	5.00
M4-10 L/R	48	18	DETOUR / DETOUR				FLUORESCENT ORANGE	BLACK	BLACK	6.00
M6-1 L/R	21	15					FLUORESCENT ORANGE	BLACK	BLACK	2.19
R3-7R	30	30	RIGHT LANE MUST TURN RIGHT				FLUORESCENT ORANGE	BLACK	BLACK	6.25
R4-7AL	24	30	KEEP LEFT				FLUORESCENT ORANGE	BLACK	BLACK	5.00
R9-9	24	12	SIDEWALK CLOSED				FLUORESCENT ORANGE	BLACK	BLACK	2.00
R11-2	48	30	ROAD CLOSED				FLUORESCENT ORANGE	BLACK	BLACK	10.00
W1-4R	36	36					FLUORESCENT ORANGE	BLACK	BLACK	9.00
W4-2L/R	36	36					FLUORESCENT ORANGE	BLACK	BLACK	9.00
W4-7L	36	36	THRU TRAFFIC MERGE LEFT				FLUORESCENT ORANGE	BLACK	BLACK	9.00
W20-1(AHD)	36	36	ROAD WORK AHEAD				FLUORESCENT ORANGE	BLACK	BLACK	9.00

IDENTIFICATION NUMBER	SIZE OF SIGN WIDTH (in)	SIZE OF SIGN HEIGHT (in)	TEXT	TEXT DIMENSIONS (in) LETTER HEIGHT	TEXT DIMENSIONS (in) VERTICAL SPACING	TEXT DIMENSIONS (in) ARROW RTE. MKR.	COLOR BACKGROUND	COLOR LEGEND	COLOR BORDER	UNIT AREA (S.F.)
W20-2	36	36	DETOUR AHEAD	SEE 2009 M.U.T.C.D.			FLUORESCENT ORANGE	BLACK	BLACK	9.00
W20-3	36	36	ROAD CLOSED AHEAD				FLUORESCENT ORANGE	BLACK	BLACK	9.00
W20-5R	36	36	RIGHT LANE CLOSED				FLUORESCENT ORANGE	BLACK	BLACK	9.00
W20-5L/R (AHD)	36	36	LEFT LANE CLOSED AHEAD / RIGHT LANE CLOSED AHEAD				FLUORESCENT ORANGE	BLACK	BLACK	9.00

NOTES:

1. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS. UNLESS SUPERCEDED BY THESE PLANS.
2. ALL SIGN LEGENDS, BORDERS AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
3. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
4. TEMPORARY CONSTRUCTION SIGNING, BARRICADES AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES." AND/OR MASH "MANUAL FOR ASSESSING SAFETY HARDWARE."
6. CONTRACTORS SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT AND SIMILAR OPERATIONS.
7. THE FIRST TEN PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A SEQUENTIAL FLASHING LIGHTS.
8. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
9. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
10. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
11. MINIMUM LANE WIDTH IS TO BE 11 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF CHANNELIZING DEVICE OR BARRIER.
12. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.

LEGEND:

- REFLECTORIZED PLASTIC DRUM OR 36" CONE
- P/F POLICE/FLAGGER DETAIL
- TYPE III BARRICADE
- CHANGEABLE MESSAGE SIGN
- ARROW BOARD
- WORK ZONE
- DIRECTION OF TRAFFIC
- IMPACT ATTENUATOR
- MEDIAN BARRIER
- MEDIAN BARRIER WITH WARNING LIGHTS
- WORK VEHICLE
- TRUCK MOUNTED ATTENUATOR
- TRAFFIC OR PEDESTRIAN SIGNAL
- SIGN

THE IDEAL CAPACITY OF A MAJOR HIGHWAY IS GENERALLY CONSIDERED TO BE 1900 PASSENGER CARS PER HOUR PER LANE (PCPHPL). IN WORK ZONES ON A MULTI-LANE DIVIDED HIGHWAY, THE FOLLOWING VOLUME GUIDELINES HAVE BEEN SUGGESTED:

MEASURED AVERAGE WORK ZONE CAPACITIES

Number of Lanes		Number of Studies	Average Capacity	
NORMAL (existing)	OPEN (to traffic)		VPH	VPHPL
3	1	7	1,170	1,170
2	1	8	1,340	1,340
5	2	8	2,740	1,370
4	2	4	2,960	1,480
3	2	9	2,980	1,490
4	3	4	4,560	1,520

Source: Dudek, C., Notes on Work Zone Capacity and Level of Service. Texas Transportation Institute, Texas A&M University, College Station, Texas (1984)

BY OBTAINING HOURLY TRAFFIC COUNTS FOR A PARTICULAR ROADWAY (WITH A MINIMUM OF A 48-HOUR AUTOMATIC TRAFFIC RECORDER (ATR) COUNT), THIS WILL HELP TO DETERMINE AT WHAT TIMES OF THE DAY OR NIGHT A CERTAIN NUMBER OF LANES MAY BE CLOSED.

massDOT Massachusetts Department of Transportation Highway Division | Notes for Traffic Management | FIGURE Gen-1 GENERAL GUIDELINES

CONVENTIONAL ROADWAY– A STREET OR HIGHWAY OTHER THAN A LOW-VOLUME ROAD, EXPRESSWAY, OR FREEWAY.

EXPRESSWAY– A DIVIDED HIGHWAY WITH PARTIAL CONTROL OF ACCESS.

FREEWAY– A DIVIDED HIGHWAY WITH FULL CONTROL OF ACCESS.

LOW-VOLUME ROAD– A FACILITY LYING OUTSIDE OF BUILT-UP AREAS OF CITIES, TOWNS, AND COMMUNITIES, AND IT SHALL HAVE A TRAFFIC VOLUME OF LESS THAN 400 AADT. IT SHALL NOT BE A FREEWAY, EXPRESSWAY, INTERCHANGE RAMP, FREEWAY SERVICE ROAD, OR A ROAD ON A DESIGNATED STATE HIGHWAY SYSTEM.

Source: MUTCD LATEST EDITION

TAPER LENGTH CRITERIA FOR TEMPORARY TRAFFIC CONTROL ZONES

Type of Taper	Taper Length (L)*
MERGING TAPER	AT LEAST L
SHIFTING TAPER	AT LEAST 0.5L
SHOULDER TAPER	AT LEAST 0.33L
ONE-LANE, TWO-WAY TRAFFIC TAPER	50 FT MINIMUM 100 FT MAXIMUM
DOWNSTREAM TAPER	50 FT MINIMUM 100 FT PER LANE

Source: Table 6C-3 MUTCD LATEST EDITION

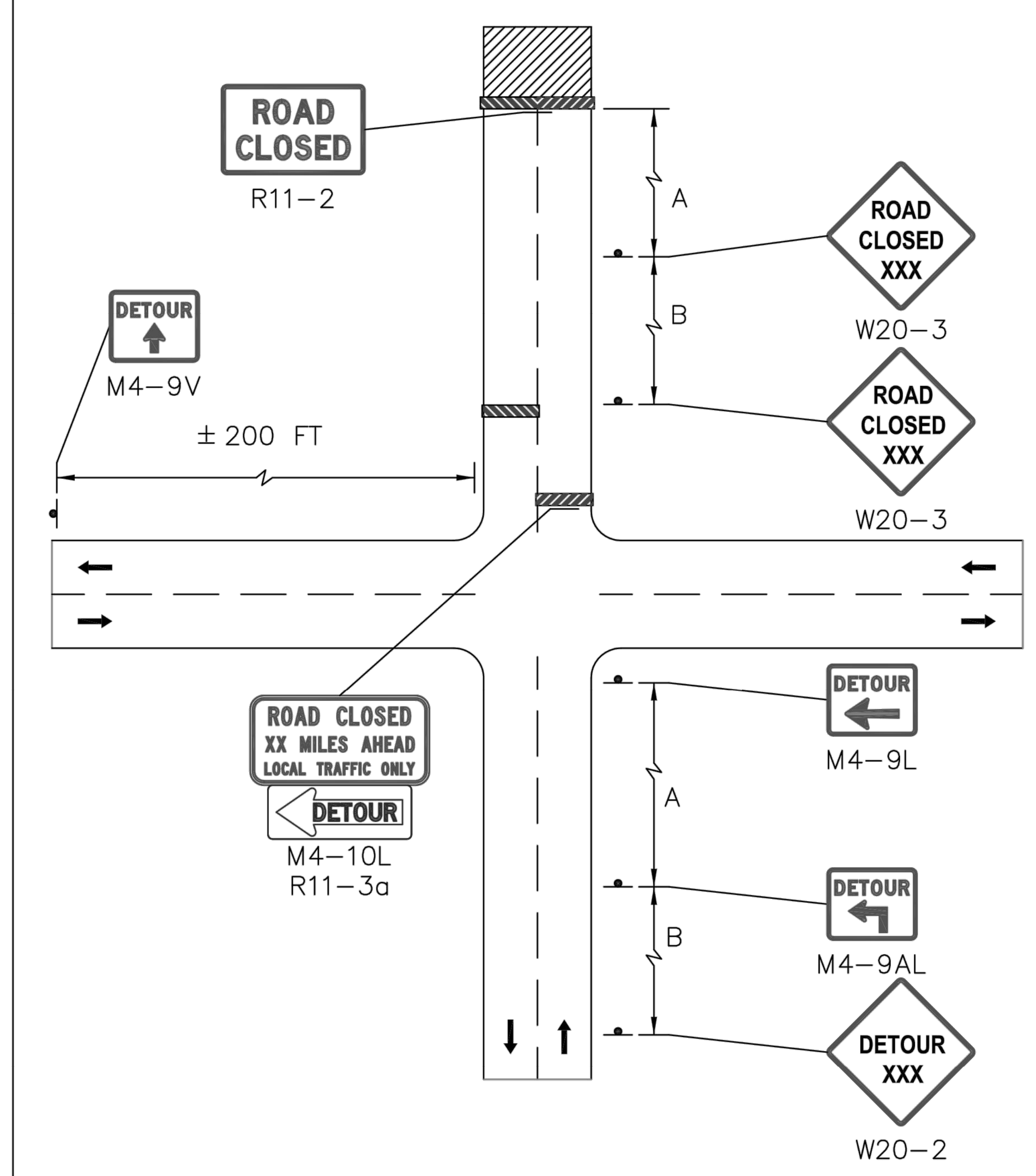
FORMULAS FOR DETERMINING TAPER LENGTHS

Speed Limit (S)	Taper Length (L) Feet
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR MORE	$L = WS$

WHERE: L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = POSTED SPEED LIMIT, OR OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICAPATED OPERATING SPEED IN MPH

Source: Table 6C-4 MUTCD LATEST EDITION

massDOT Massachusetts Department of Transportation Highway Division | Notes for Traffic Management | FIGURE Gen-3 NOTES ON WORK ZONE DISTANCES



massDOT Massachusetts Department of Transportation Highway Division | Standard Details and Drawings for the Development of TemporaryTraffic Control Plans | FIGURE D-1 DETOUR ADVANCE SIGNING NOT TO SCALE

SUGGESTED WORK ZONE WARNING SIGN SPACING

Road Type	Distance Between Signs**		
	A	B	C
LOCAL OR LOW VOLUME ROADWAYS*	350	350	350
MOST OTHER ROADWAYS*	500	500	500
FREEWAYS AND EXPRESSWAYS*	1,000	1,500	2,640

* ROAD TYPE TO BE DETERMINED BY MASSDOT OFFICE OF TRANSPORTATION PLANNING.

** DISTANCES ARE SHOWN IN FEET. THE COLUMN HEADINGS A, B, AND C ARE THE DIMENSIONS SHOWN IN THE DETAIL/ TYPICAL SETUP FIGURES. THE A DIMENSION IS THE DISTANCE FROM THE TRANSITION OR POINT OF RESTRICTION TO THE FIRST SIGN. THE B DIMENSION IS THE DISTANCE BETWEEN THE FIRST AND SECOND SIGNS. THE C DIMENSION IS THE DISTANCE BETWEEN THE SECOND AND THIRD SIGNS. (THE "THIRD" SIGN IS THE FIRST ONE TYPICALLY ENCOUNTERED BY A DRIVER APPROACHING A TEMPORARY TRAFFIC CONTROL (TTC) ZONE.)

THE "THIRD" SIGN ABOVE IS TYPICALLY REFERRED TO AS AN "ADVANCE WARNING" SIGN ON THE TTCP SETUPS. THESE ADVANCE WARNING SIGNS ARE LOCATED PRIOR TO THE PROJECT LIMITS ON ALL APPROACHES (i.e. THE W20-1 SERIES (ROAD WORK XX FT) SIGNS), AND USUALLY REMAIN FOR THE DURATION OF THE PROJECT. ADDITIONAL SIGNS (i.e. "RIGHT LANE CLOSED 1 MILE" AND "LEFT LANE CLOSED 1 MILE") HAVE BEEN SHOWN IN SOME FIGURES AS EXAMPLES OF REINFORCEMENT SIGN PLACEMENT BUT ARE USED IN RARE OCCASIONS.

THE FIRST AND SECOND WARNING SIGNS ABOVE ARE REFERRED TO AS THE OPERATIONAL (DAY-TO-DAY) WORK ZONE SIGNS AND MAY BE MOVED DEPENDING ON WHERE THE SPECIFIC ROADWAY WORK FOR THAT DAY IS LOCATED.

MA-R2-10a SIGNS SHALL BE PLACED BETWEEN THE SECOND AND THIRD SIGNS AS DESCRIBED ABOVE.

MA-R2-10a, MA-R2-10e AND W20-1 SERIES SIGNS ARE TO BE INCLUDED ON ALL DETAILS/TYPICAL SETUPS.

Based on: Table 6C-1 MUTCD LATEST EDITION

STOPPING SIGHT DISTANCE AS A FUNCTION OF SPEED

SPEED* (mph)	DISTANCE (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

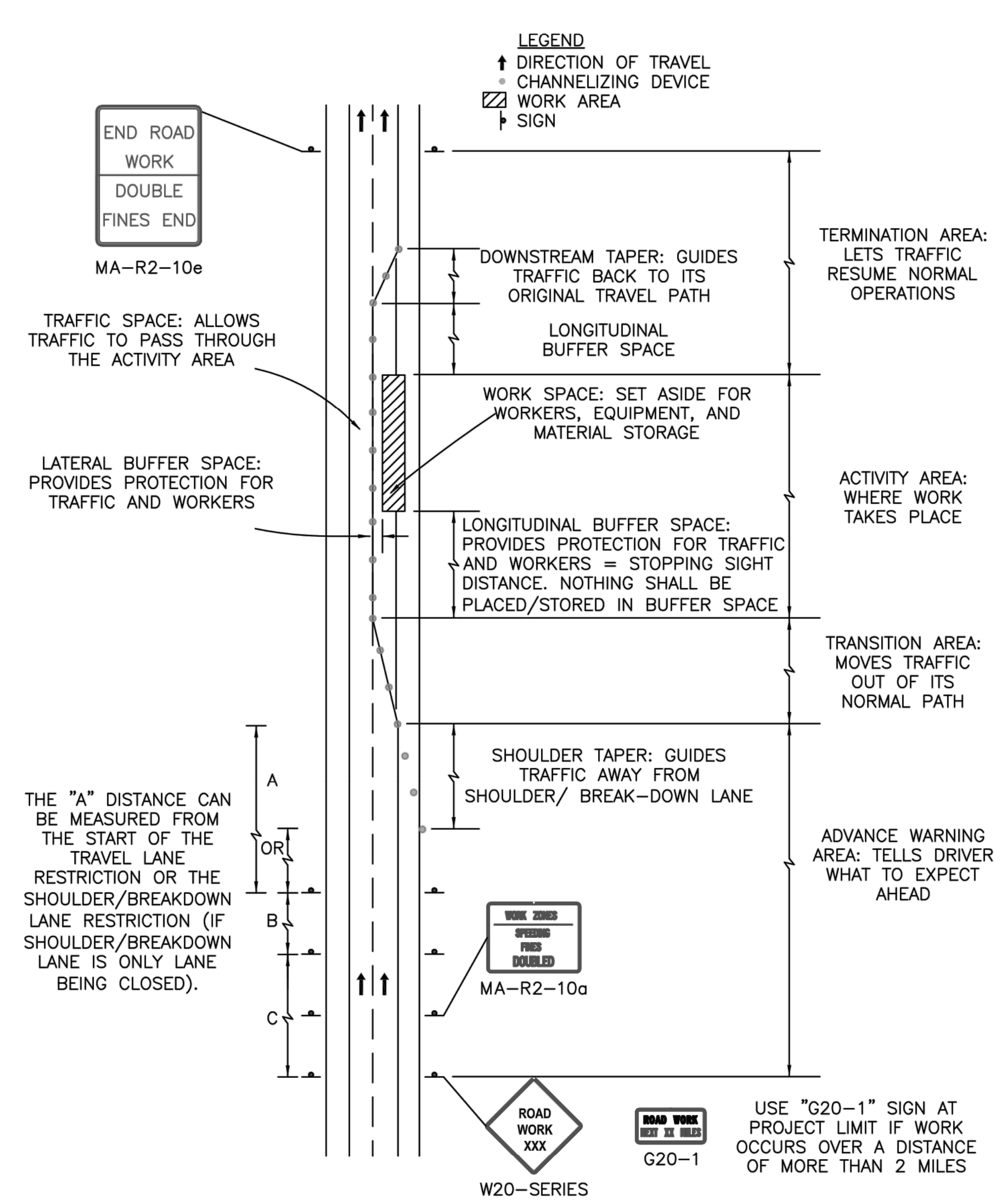
*POSTED SPEED, OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED

THESE VALUES MAY BE USED TO DETERMINE THE LENGTH OF LONGITUDINAL BUFFER SPACES.

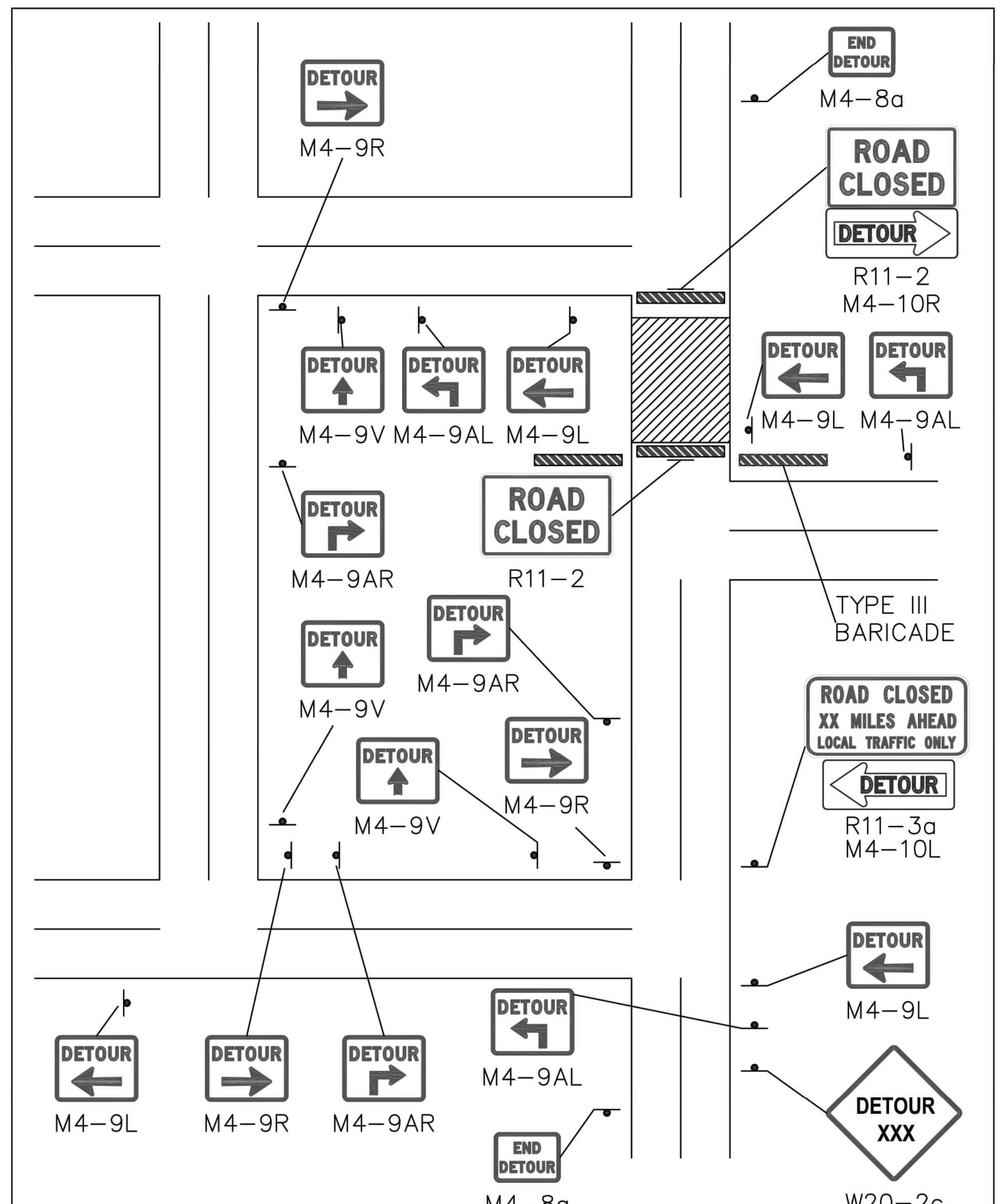
THE DISTANCES IN THE ABOVE CHART REPRESENT THE MINIMAL VALUES FOR BUFFER SPACING.

Source: Table 6C-2 MUTCD LATEST EDITION

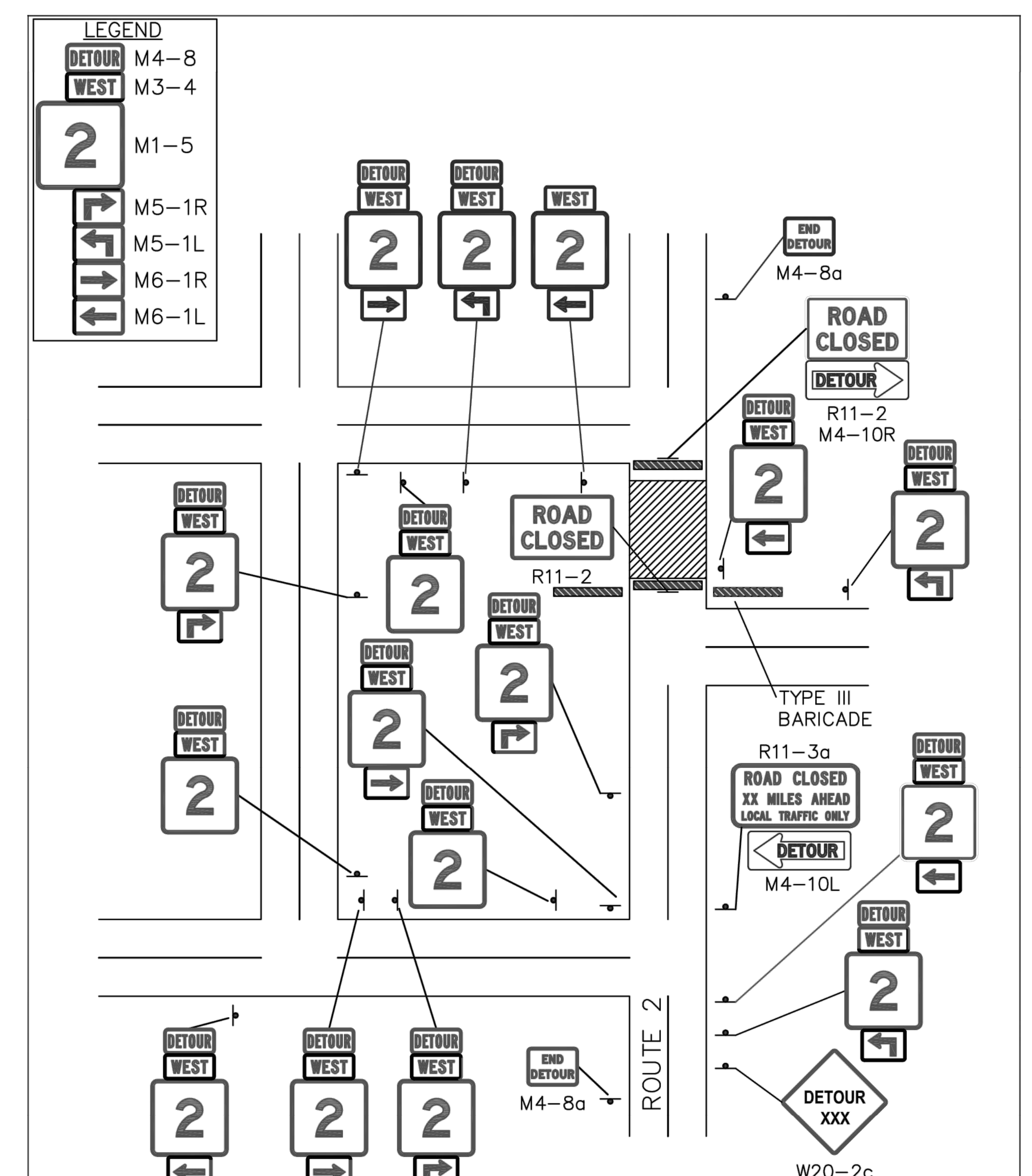
massDOT Massachusetts Department of Transportation Highway Division | Notes for Traffic Management | FIGURE Gen-2 NOTES ON WORK ZONE DISTANCES



massDOT Massachusetts Department of Transportation Highway Division | Standard Details and Drawings for the Development of TemporaryTraffic Control Plans | FIGURE Gen-4 COMPONENT PARTS OF A TEMPORARY TRAFFIC CONTROL (TTC) ZONE NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division | Standard Details and Drawings for the Development of TemporaryTraffic Control Plans | FIGURE D-2 DETOUR NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division | Standard Details and Drawings for the Development of TemporaryTraffic Control Plans | FIGURE D-3 ROUTE WITH DETOUR NOT TO SCALE

Plotted on 23-Aug-2022 12:47 PM
28344000TMP(DETAILS AND SIGN SUMMARY).DWG