TOWN OF BOLTON, MASSACHUSETTS

FORBUSH MILL ROAD OVER STILL RIVER

PROPOSED BRIDGE

MASSDOT BRIDGE NO. B-15-010 (CER)

FINAL DESIGN
JUNE 2023

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23	GUARDRAIL APPROACH GEOMETRY
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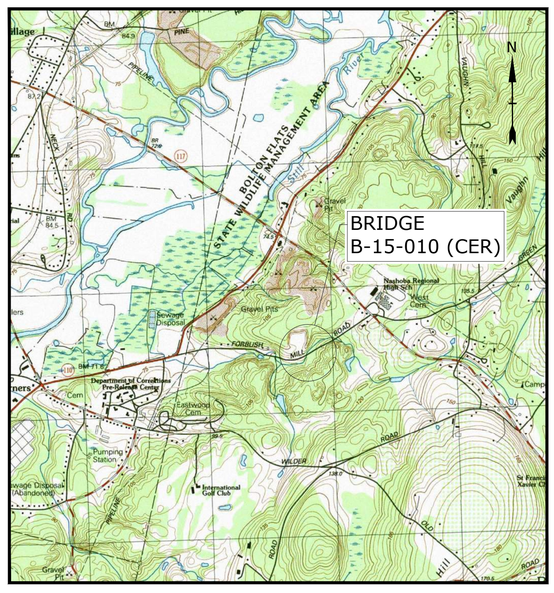


LOCATION MAP
SCALE: 1" = 1000'

PREPARED BY:
Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
ERIC OHANIAN
CIVIL
No. 53235
REGISTERED PROFESSIONAL ENGINEER
06/26/2023

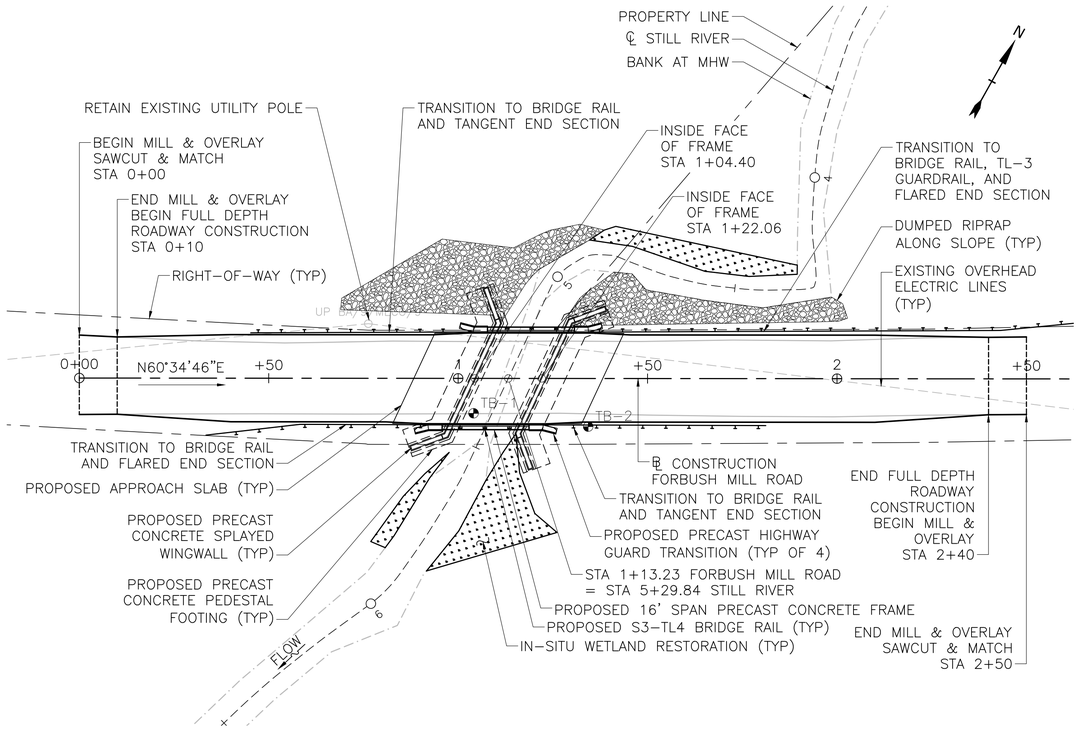
COMMONWEALTH OF MASSACHUSETTS
DANIEL L. MURPHY, JR.
CIVIL
No. 41049
REGISTERED PROFESSIONAL ENGINEER
06/27/2023

PREPARED FOR:
TOWN OF BOLTON
DEPARTMENT OF PUBLIC WORKS
RANDALL HEGLIN, DIRECTOR OF PUBLIC WORKS

TOWN OF BOLTON
SELECT BOARD
STANLEY WYSOCKI, CHAIRMAN
ROBERT CZEKANSKI, MEMBER

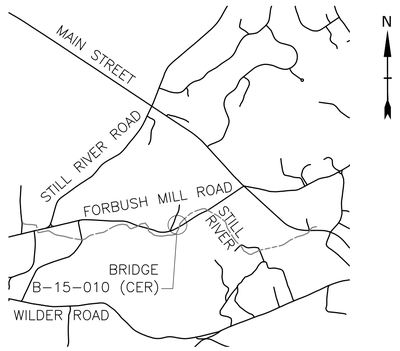
COMPLETE SET 24 SHEETS

Last Saved: 6/5/2023
Plotted: Tue, Jun 27, 2023 - 3:19pm By: SSak
Tighe & Bond: J:\B\B5108 town of bolton\004 - forbush mill road culverts\drawings, figures\AutoCAD\Sheet\B5108-004_01_COVER.dwg



KEY PLAN

SCALE: 1" = 20'

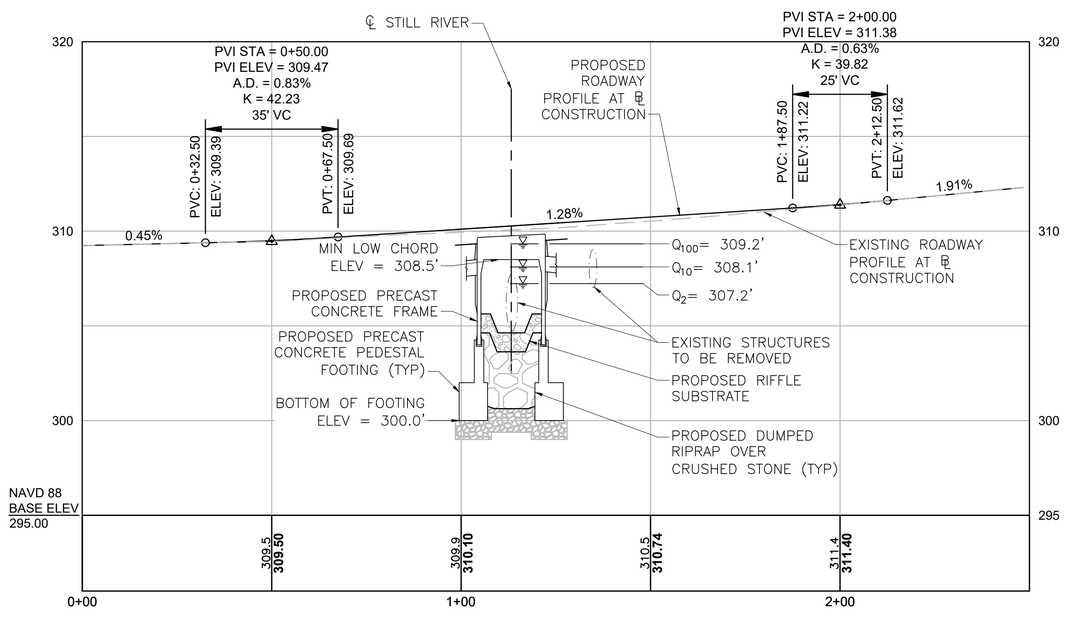


LOCUS

SCALE: 1" = 2000'

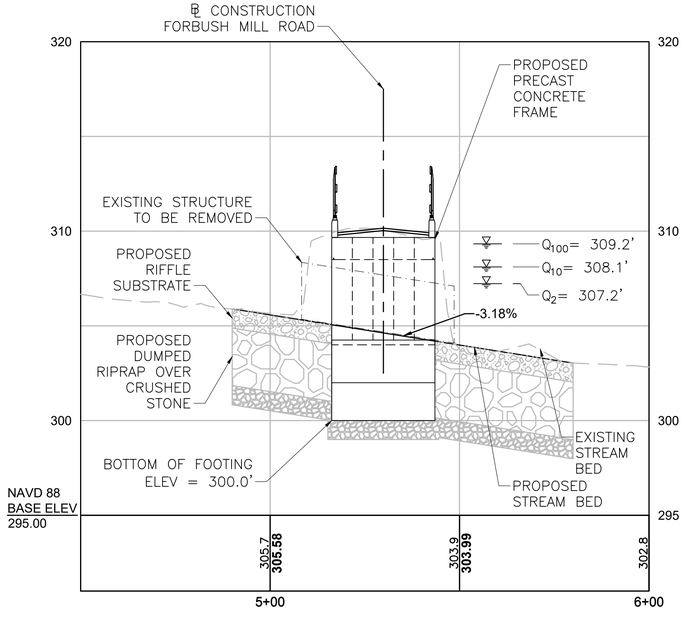
SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000
DESIGN SPECTRA	
As	0.110
SDs	0.232
SD1	0.094
SITE CLASS	D
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.48
DESIGN FLOOD DISCHARGE (C.F.S.)	123.8
DESIGN FLOOD FREQUENCY (YEARS)	10
DESIGN FLOOD VELOCITY (F.P.S.)	10.3
DESIGN FLOOD ELEVATION (FEET, NAVD)	308.1
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	379.3
BASE FLOOD ELEVATION (FEET, NAVD)	309.2
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	25
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	3.0
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	2.7
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	N/A
MAXIMUM ELEVATION (FEET, NAVD)	N/A
DATE (MM/YYYY)	N/A
HISTORY OF ICE FLOES	UNKNOWN
EVIDENCE OF SCOUR AND EROSION	N/A



FORBUSH MILL ROAD PROFILE – ℄ PROPOSED ROADWAY

HORIZ: 1" = 20' VERT: 1" = 4'



PROFILE ALONG ℄ STILL RIVER

HORIZ.: 1" = 20' VERT.: 1" = 4'

0 20' 40'

SCALE: 1" = 20'

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER DATE

SHEET 1 OF 13 SHEETS BRIDGE NO. B-15-010 (CER)

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L MURPHY, JR.
CIVIL
No. 41049
REGISTERED PROFESSIONAL ENGINEER
06/27/2023

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06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_02_BRIDGE_COVER.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

BRIDGE KEY PLAN, PROFILES, LOCUS, & INDEX

SCALE: AS SHOWN

SHEET 2 OF 24

Last Saved: 6/22/2023
Plotted On: Jun 22, 2023-3:20pm By: SSak
Tighe & Bond: J:\B\b5108 town of bolton\004 - forbush mill road culverts\drawings, figures\AutoCAD\Sheet\B5108-004_02_BRIDGE_COVER.dwg

DESIGN LOADS AND SPECIFICATIONS:

1. DESIGN LOADING: HL–93
2. DESIGN METHOD: LOAD AND RESISTANCE FACTOR DESIGN (LRFD)
3. SPECIFICATIONS: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH ED., 2020 AS AMENDED
   MASSDOT LRFD BRIDGE MANUAL, 2013, AS AMENDED BY SUPPLEMENTS
   THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 2023
4. FOUNDATION DATA: ABUTMENTS AND WINGWALLS:
   PEDESTAL FOOTINGS SUPPORTED ON CRUSHED STONE ON UNDISTURBED SOIL WITH A FACTORED BEARING CAPACITY OF 6.35 KSF.
   PRECAST GUARD TRANSITION:
   TRANSITION BASE ON CONTROLLED DENSITY FILL (NON EXCAVATABLE) ON COMPACTED GRAVEL BORROW OR UNDISTURBED SOIL.
5. REINFORCING STEEL: AASHTO M31 (ASTM A 615) GRADE 60
   EPOXY COATED BARS: ALL BARS.
6. CONCRETE: PRECAST RIGID FRAME, SAFETY CURBS, CORBELS, WINGWALLS, GUARD TRANSITIONS, AND CIP FACE OF PRECAST FRAME:
   5000 PSI, ¾", 685 HP CEMENT CONCRETE
   PRECAST PEDESTAL FOOTINGS:
   4000 PSI, ¾", 585 HP CEMENT CONCRETE
   CIP APPROACH SLABS, AND CIP APPROACH SLAB SHELVES:
   4000 PSI, 1½", 565 CEMENT CONCRETE

BASE PLAN NOTES:

1. THE EXISTING CONDITIONS INFORMATION SHOWN ON THE DRAWINGS IS BASED ON SURVEY DRAWINGS PROVIDED BY WSP USA INC. TITLED "EXISTING CONDITIONS SURVEY, FORBUSH MILL ROAD, BOLTON, MASSACHUSETTS" AND DATED APRIL 12, 2022.
2. UTILITY LOCATIONS SHOWN WERE PLOTTED FROM INFORMATION SUPPLIED BY RESPECTIVE UTILITY COMPANIES AND DATA OBTAINED FROM FIELD SURVEYS AND AS BUILT DRAWINGS. THE ACCURACY AND COMPLETENESS OF SUBSURFACE INFORMATION SHOWN ON THESE DRAWINGS IS NOT GUARANTEED.
3. THE HORIZONTAL COORDINATE SYSTEM IS THE NORTH AMERICAN DATUM OF 1983 (NAD 83), MASSACHUSETTS STATE PLANE, MAINLAND ZONE, US FEET. VERTICAL DATUM IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. THE EXISTING CONDITIONS SHOWN ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS.
5. WETLAND RESOURCE AREAS WERE DELINEATED BY TIGHE & BOND, INC. ON APRIL 4, 2022

GENERAL NOTES:

1. NOTIFY DIGSAFE AT 1–888–344–7233 AND OTHER UTILITY OWNERS IN THE AREA NOT ON THE DIGSAFE LIST AT LEAST 72 HOURS PRIOR TO ANY DIGGING, TRENCHING, ROCK REMOVAL, DEMOLITION, BORING, BACKFILLING, GRADING, LANDSCAPING, OR ANY OTHER EARTH MOVING OPERATIONS.
2. LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE. IN ADDITION, SOME UTILITIES MAY NOT BE SHOWN. DETERMINE THE EXACT LOCATION OF UTILITIES BY TEST PIT OR OTHER METHODS, AS NECESSARY TO PREVENT DAMAGE TO UTILITIES AND/OR INTERRUPTIONS IN UTILITY SERVICE OR CONSTRUCTION OPERATIONS. PERFORM TEST PIT EXCAVATIONS AND OTHER INVESTIGATIONS TO LOCATE UTILITIES, AND PROVIDE THIS INFORMATION TO THE ENGINEER, PRIOR TO CONSTRUCTING THE PROPOSED IMPROVEMENTS. LOCATE ALL EXISTING UTILITIES TO BE CROSSED BY HAND EXCAVATION.
3. NOT ALL OF THE UTILITY SERVICES TO BUILDINGS ARE SHOWN. THE CONTRACTOR SHALL ANTICIPATE THAT EACH PROPERTY HAS SERVICE CONNECTIONS FOR THE VARIOUS UTILITIES.
4. NOTIFY THE ENGINEER OF ANY UTILITIES IDENTIFIED DURING CONSTRUCTION THAT ARE NOT SHOWN ON THE DRAWINGS OR THAT DIFFER IN SIZE OR MATERIAL.
5. IT IS ANTICIPATED FOR OVERHEAD WIRES AND UTILITY POLES TO REMAIN IN PLACE. PENDING CONTRACTOR'S MEANS AND METHODS FOR BRIDGE CONSTRUCTION, CONTRACTOR MAY COORDINATE TEMPORARY WORK WITH NATIONAL GRID (1–800–375–7405) AND OTHERS AS REQUIRED, AT THE SOLE COST OF THE CONTRACTOR.
6. TIGHE & BOND ASSUMES NO RESPONSIBILITY FOR ANY ISSUES, LEGAL OR OTHERWISE, RESULTING FROM CHANGES MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM TIGHE & BOND.
7. THE CONTRACTOR IS RESPONSIBLE FOR SITE SAFETY; COORDINATION WITH THE OWNER, ALL SUBCONTRACTORS, WITH OTHER CONTRACTORS WORKING WITHIN THE LIMITS OF WORK, AND THE MEANS AND METHODS OF CONSTRUCTING THE PROPOSED WORK.
8. OBTAIN, PAY FOR AND COMPLY WITH PERMITS, NOTICES AND FEES NECESSARY TO COMPLETE THE WORK. ARRANGE AND PAY FOR NECESSARY INSPECTIONS AND APPROVALS FROM THE JURISDICTIONAL AUTHORITIES.
9. SHORE UTILITY TRENCHES WHERE FIELD CONDITIONS DICTATE AND/OR WHERE REQUIRED BY LOCAL, STATE AND FEDERAL HEALTH AND SAFETY CODES.
10. FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO CONSTRUCTION. IF FIELD CONDITIONS ARE OBSERVED THAT VARY SIGNIFICANTLY FROM THOSE SHOWN ON THE DRAWINGS, IMMEDIATELY NOTIFY THE ENGINEER IN WRITING FOR RESOLUTION OF THE CONFLICTING INFORMATION.
11. PROTECT AND MAINTAIN ALL UTILITIES IN THE AREAS UNDER CONSTRUCTION DURING THE WORK. LEAVE ALL PIPES AND STRUCTURES WITHIN THE LIMITS OF THE CONTRACT IN A CLEAN AND OPERABLE CONDITION AT THE COMPLETION OF THE WORK. TAKE ALL NECESSARY PRECAUTIONS TO PREVENT SAND AND SILT FROM DISTURBED AREAS FROM ENTERING THE DRAINAGE SYSTEM.
12. NOTIFY THE ENGINEER IN WRITING OF ANY CONFLICT, ERROR, AMBIGUITY, OR DISCREPANCY WITH THE PLANS OR BETWEEN THE PLANS AND ANY APPLICABLE LAW, REGULATION, CODE, STANDARD SPECIFICATION, OR MANUFACTURER'S INSTRUCTIONS.
13. THE CONTRACTOR IS RESPONSIBLE FOR SUPPORT OF EXISTING UTILITIES AND REPAIR OR REPLACEMENT COSTS OF UTILITIES DAMAGED DURING CONSTRUCTION, WHETHER ABOVE OR BELOW GRADE. REPLACE DAMAGED UTILITIES IMMEDIATELY AT NO ADDITIONAL COST TO THE OWNER AND AT NO COST TO THE PROPERTY OWNER.
14. TAKE NECESSARY MEASURES AND PROVIDE CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE, AND STRENGTH TO PREVENT ACCESS TO ALL WORK AND STAGING AREAS AT THE COMPLETION OF EACH DAYS WORK.
15. NO OPEN TRENCHES WILL BE ALLOWED OVER NIGHT. THE USE OF ROAD PLATES TO PROTECT THE EXCAVATION WILL BE CONSIDERED UPON REQUEST, BUT BACKFILLING IS PREFERRED.
16. THE CONTRACTOR IS RESPONSIBLE FOR ALL NECESSARY TRAFFIC CONTROL/SAFETY DEVICES TO ENSURE SAFE VEHICULAR AND PEDESTRIAN ACCESS THROUGH THE WORK AREA, OR FOR SAFELY IMPLEMENTING DETOURS AROUND THE WORK AREA. PERFORM TRAFFIC CONTROL IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED TRAFFIC CONTROL PLAN.
17. MAINTAIN EMERGENCY ACCESS TO ALL PROPERTIES WITHIN THE PROJECT AREA AT ALL TIMES DURING CONSTRUCTION.
18. WHEN WORKING IN THE ROAD, PROVIDE THE OWNER AND LOCAL FIRE/POLICE/SCHOOL AUTHORITIES A DETAILED PLAN OF APPROACH INDICATING METHODS OF PROPOSED TRAFFIC ROUTING ON A DAILY BASIS. PROVIDE COORDINATION TO ENSURE COMMUNICATION AND COORDINATION BETWEEN THE OWNER, CONTRACTOR AND LOCAL FIRE/POLICE/SCHOOL AUTHORITIES THROUGHOUT THE CONSTRUCTION PERIOD.
19. REMOVE AND DISPOSE OF ALL CONSTRUCTION–RELATED WASTE MATERIALS AND DEBRIS IN STRICT ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL LAWS.
20. THE TERM "DEMOLISH" USED ON THE DRAWINGS MEANS TO REMOVE AND DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS.
21. THE TERM "ABANDON" USED ON THE DRAWINGS MEANS TO LEAVE IN PLACE AND TAKE APPROPRIATE MEASURES TO DECOMMISSION AS SPECIFIED OR NOTED ON THE DRAWINGS.
22. ALL PROPOSED WORK MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER TO MEET EXISTING CONDITIONS.

FOUNDATION NOTES:

1. FOUNDATION MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.
2. CONCRETE SHALL NOT BE PLACED IN WATER OR ON FROZEN GROUND.
3. BOTTOM OF FOUNDATION ELEVATIONS PROVIDED ON DRAWINGS SHALL BE CONSIDERED MINIMUM DEPTHS. CONTRACTOR SHALL REMOVE UNSUITABLE MATERIAL AS REQUIRED.
4. ALL FINISHED EXCAVATIONS SHALL BE VERIFIED AND APPROVED BY THE ENGINEER PRIOR TO PRECAST SECTION DELIVERY OR TO ANY CONCRETE PLACEMENT.
5. ALL EXCAVATIONS FOR FOOTINGS FOUNDED ON SOIL SHALL BE FINISHED BY HAND FOR THE LAST 6".
6. ALL BACKFILL UNDER OR ADJACENT TO ANY PORTION OF THE STRUCTURE SHALL BE PLACED IN ACCORDANCE WITH MASSDOT STANDARD SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, AND SPECIAL PROVISIONS.
7. REVIEW SOIL STRATA CONDITIONS BELOW BRIDGE FOOTINGS WITH ENGINEER PRIOR TO INSTALLATION.
8. ANY UNSUITABLE MATERIALS SUCH AS BOULDERS, ROOTS, ORGANIC SOILS, OR SILT/CLAY ENCOUNTERED WITHIN THE FOUNDATION BEARING ZONE, DEFINED BY A 1H:1V PLAN EXTENDING DOWNWARD AND OUTWARD FROM 1 FOOT BEYOND THE EDGE OF FOOTING, SHALL BE REMOVED AND REPLACED WITH CRUSHED STONE, AS DIRECTED BY THE ENGINEER.

GEOTECHNICAL DESIGN PARAMETERS:

1. MINIMUM EMBEDMENT FOR FROST PROTECTION FOR FOOTINGS FOUNDED ON SOIL = 4 FEET BELOW ADJACENT GROUND SURFACE.
2. MAXIMUM ALLOWABLE SETTLEMENT = 1.00 INCHES TOTAL, 0.5 INCH DIFFERENTIAL
3. PRECAST RIGID FRAME:
   a. FACTORED BEARING RESISTANCE = 6.35 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.
4. LATERAL EARTH PRESSURES FOR RESTRAINED RIGID FRAME WALLS (AT–REST):
   a. STATIC =
      - 48 POUNDS PER CUBIC FOOT PER FOOT (PCF/FT) AS AN EQUIVALENT FLUID PRESSURE (ABOVE GROUNDWATER).
      - 85 POUNDS PER CUBIC FOOT PER FOOT (PCF/FT) AS AN EQUIVALENT FLUID PRESSURE (BELOW GROUNDWATER).
   b. SURCHARGE =
      - HORIZONTAL FORCE FROM THE PRESSURE DISTRIBUTION PRODUCED BY THE AASHTO HL–93 VEHICULAR LIVE LOAD, UNIFORMLY DISTRIBUTED OVER THE HEIGHT OF THE WALL.
   c. SEISMIC =
      - 35 POUNDS PER CUBIC FOOT PER FOOT (PCF/FT) AS AN EQUIVALENT FLUID PRESSURE.
5. LATERAL EARTH PRESSURES FOR UNRESTRAINED WINGWALLS (ACTIVE):
   a. STATIC =
      - 27 PCF/FT AS AN EQUIVALENT FLUID PRESSURE, 200 PSF MINIMUM (ABOVE GROUNDWATER).
      - 75 PCF/FT AS AN EQUIVALENT FLUID PRESSURE, 200 PSF MINIMUM (BELOW GROUNDWATER).
   b. SURCHARGE =
      - HORIZONTAL FORCE FROM THE PRESSURE DISTRIBUTION PRODUCED BY THE AASHTO HL–93 VEHICULAR LIVE LOAD, UNIFORMLY DISTRIBUTED OVER THE HEIGHT OF THE WALL.
   c. SEISMIC =
      - 31 POUNDS PER SQUARE FOOT PER FOOT (PSF/FT) AS AN EQUIVALENT FLUID PRESSURE.
6. BACKFILL UNIT WEIGHT = 120 POUNDS PER CUBIC FOOT (PCF)
7. BACKFILL ANGLE OF INTERNAL FRICTION = 37 DEGREES
8. COEFFICIENT OF FRICTION FOR PRECAST CONCRETE ON CRUSHED STONE = 0.45 (DELTA = 24 DEGREES)

REINFORCEMENT NOTES:

1. REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO 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
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. EPOXY COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

2. THE MINIMUM REBAR SPLICE LENGTH SCHEDULE IS BASED ON F'c= 4,000 PSI AND Fy= 60,000 PSI.
3. IF THE CLEAR SPACING BETWEEN THE REBARS IS LESS THAN FIVE BAR DIAMETERS, OR IF THE COVER IS LESS THAN TWO BAR DIAMETERS, INCREASE THE SPLICE LENGTH BY AN ADDITIONAL 50%.
4. IF LIGHTWEIGHT CONCRETE IS USED, INCREASE THE SPLICE LENGTH BY AN ADDITIONAL 30%.
5. WHEN BARS OF DIFFERENT SIZE ARE LAP SPLICED, THE SPLICE LENGTH SHALL BE THE LARGER OF EITHER THE DEVELOPMENT LENGTH OF THE LARGER BAR OR THE SPLICE LENGTH OF THE SMALLER BAR.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER _____ DATE _____

Tighe&Bond

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06/27/2023

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06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_03_GENERAL.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

GENERAL NOTES (SHEET 1 OF 2)

SCALE: NO SCALE

Last Saved 6/22/2023
Plotted: Jun 22, 2023-3:21pm By: SSak
Tighe & Bond: j:\b\b5108 town of bolton\004 - forbush mill road culverts\drawings_figures\AutoCAD\Sheet\B5108-004_03_GENERAL.dwg

CULVERT REMOVAL NOTES:

1. THE CONTRACTOR'S METHOD FOR REMOVAL OF THE EXISTING CULVERT SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND ACCEPTANCE PRIOR TO THE COMMENCEMENT OF ANY REMOVAL OPERATIONS.
2. REMOVAL OF EXISTING CULVERT STRUCTURE SHALL INCLUDE THE COMPLETE REMOVAL OF THE PIPES AND HEADWALLS. REFER TO SHEET 7 FOR DEMOLITION PLAN.
3. PRIOR TO REMOVAL OF EXISTING CULVERT, THE CONTRACTOR SHALL VERIFY THAT EXISTING UTILITIES HAVE BEEN RELOCATED OR A TEMPORARY BYPASS HAS BEEN INSTALLED.

PRECAST CONCRETE BRIDGE STRUCTURE NOTES:

1. ITEM 995.01, BRIDGE STRUCTURE, SHALL INCLUDE THE PRECAST CONCRETE RIGID FRAME, CORBELS, CURBS/HEADWALLS, WINGWALLS, PEDESTAL FOOTINGS USED TO SUPPORT THE RIGID FRAME AND WINGWALLS, APPROACH SLABS, APPROACH SLAB SHELVES, AND PRECAST GUARDRAIL TRANSITIONS. JOINT MATERIALS, MEMBRANE, AND ANY OTHER MATERIALS OR ITEMS REQUIRED FOR INSTALLATION OF THE PRECAST CONCRETE BRIDGE STRUCTURE SHALL BE SUBSIDIARY.
2. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, AND DESIGN CALCULATIONS SEALED AND SIGNED BY A CURRENTLY REGISTERED MASSACHUSETTS PROFESSIONAL ENGINEER(S) TO THE ENGINEER FOR REVIEW AND ACCEPTANCE TO ENSURE CONFORMANCE WITH THE CONTRACT DOCUMENTS AND THEN TO MASSDOT FOR REVIEW AND APPROVAL. DESIGN SHALL ENCOMPASS THE RIGID FRAME AND FOUNDATIONS, WINGWALLS AND FOUNDATIONS, CONNECTION OF HEADWALLS TO RIGID FRAME, AND CORBELS. SHOP DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED PRIOR TO FABRICATION FOR ALL PRECAST CONCRETE ELEMENTS. SHOP DRAWINGS SHALL SHOW JOINT DETAILS AND REINFORCEMENT SIZE AND LOCATION.
3. CHANGES OR MODIFICATIONS DURING THE FABRICATION PROCESS MUST BE SUBMITTED TO THE ENGINEER FOR ACCEPTANCE AND THEN TO MASSDOT FOR APPROVAL AND INCORPORATED INTO THE FINAL AS-BUILT DRAWINGS.
4. DIMENSIONS SHOWN FOR THE PRECAST CONCRETE ELEMENTS ARE APPROXIMATE AND BASED ON CONCEPTUAL DESIGN. NO ADJUSTMENTS TO QUANTITIES OR PAYMENTS WILL BE MADE AS A RESULT OF PROVIDING PRECAST UNITS SIZED DIFFERENTLY THAN SHOWN ON THE PLANS. CONTRACTOR TO ADJUST OVERALL BRIDGE GEOMETRY AS NEEDED IF PRECAST ELEMENT SIZES SELECTED BY CONTRACTOR DIFFER. SEE ALSO SPECIAL PROVISIONS SECTION 995.
5. THE QUALITY OF MATERIALS, THE PROCESS OF MANUFACTURE, AND THE FINISHED PRECAST UNITS SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE ENGINEER.
6. JOINTS BETWEEN ABUTTING PRECAST UNITS SHALL BE MECHANICALLY CONNECTED, WATERTIGHT, GROUTED, AND MEMBRANED. SEE JOINT DETAILS ON SHEET 15.
7. WATERPROOF MEMBRANE SHALL BE PROVIDED OVER THE STRUCTURE ACROSS THE ENTIRE ROADWAY WIDTH.
8. SHEET MEMBRANE SHALL BE 2' WIDE WITH PROTECTION BOARD (SUBSIDIARY) AND PLACED CENTERED OVER JOINTS.
9. EXPOSED CONCRETE SURFACES SHALL BE TREATED WITH WATER REPELLENT (SILANE/SILOXANE).
10. PRECAST CONCRETE HEADWALL ANCHORAGES, CURBS/HEADWALLS, AND RIGID FRAME SECTIONS SHALL BE DESIGNED TO ACCOUNT FOR ALL EARTH PRESSURE, LIVE LOAD SURCHARGES, AND BRIDGE RAILING LIVE LOAD AS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR NCHRP 350 TL-4 TEST LEVEL.
11. WEEP HOLES SHALL BE PLACED 1'-0" (TYP) ABOVE THE TOP OF THE PEDESTAL FOOTING AND ONE (1) WEEP SHALL BE PROVIDED ON BOTH SIDES OF EACH RIGID FRAME OR WINGWALL UNIT OR 10'-0" (MAX) SPACING ALONG FOOTING.
12. FOOTINGS SHALL HAVE A KEYWAY WITH THE SPECIFIED DIMENSIONS. GROUT SHALL BE PLACED AROUND THE BOTTOM OF THE RIGID FRAME OR WINGWALL AND TO THE TOP OF THE KEYWAY.
13. TOP SURFACES OF FOOTING UNITS SHALL BE SET UNIFORMLY TRUE & LEVEL TO A TOLERANCE OF ±1/8".
14. DEWATERING IS REQUIRED AT EACH FOUNDATION LOCATION TO CONTROL THE WATER INFLOW AND ADEQUATELY DEWATER THE FOOTING EXCAVATION. SUMP PUMPING AREAS AROUND THE ENTIRE PERIMETER SHALL BE REQUIRED, AT A MINIMUM, TO ADEQUATELY CONTROL THE GROUNDWATER WITHIN THE EXCAVATION AREAS. DEWATERING SHALL BE CONTINUOUS UNTIL THE PRECAST CONCRETE RIGID FRAME AND WINGWALLS ARE BACKFILLED EVENLY ON BOTH SIDES TO THE ELEVATIONS OF THE SURROUNDING WATER TABLE, UNLESS OTHERWISE DIRECTED.
15. PROPOSED DEWATERING SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND ACCEPTANCE.
16. THE CONTRACTOR SHALL SUBMIT DRAWINGS AND DESIGN CALCULATIONS, SEALED AND SIGNED BY A CURRENTLY REGISTERED MASSACHUSETTS PROFESSIONAL ENGINEER TO THE ENGINEER FOR REVIEW AND ACCEPTANCE OF PROPOSED SHORING AND SUPPORT OF EXCAVATION. SHOP DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED PRIOR TO FABRICATION AND INSTALLATION FOR ALL SHORING AND SUPPORT OF EXCAVATION ELEMENTS.
17. WATER PUMPED FROM DEWATERING LOCATIONS SHALL BE FILTERED ADEQUATELY TO REMOVE FINE MATERIALS PRIOR TO RETURNING THE WATER TO THE RIVER/BROOK. ACTUAL LOCATION OF SEDIMENTATION BASIN TO BE DETERMINED BY CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.
18. ANY FOUNDATION MATERIALS WEAKENED AS A RESULT OF INSUFFICIENT CARE WHILE MAINTAINING A DEWATERED CONDITION SHALL BE REMOVED AND REPLACED WITH GRAVEL BORROW (M1.03.0 TYPE A) OR CRUSHED STONE AT NO EXPENSE TO THE OWNER.
19. REINFORCEMENT OF THE PRECAST UNITS SHALL HAVE A 2" MINIMUM CLEAR COVER IN THE TOP FACE OF TOP SLAB, INSIDE FACE OF SIDEWALLS, AND HEADWALLS. ALL OTHER REINFORCEMENT IN THE PRECAST UNITS SHALL HAVE A 1½" MINIMUM CLEAR COVER. ANY CAST-IN-PLACE CONCRETE SHALL MEET AASHTO COVER REQUIREMENTS.
20. A CORROSION INHIBITOR CONCRETE ADDITIVE SHALL BE INCLUDED AS PART OF THE CONCRETE MIX FOR CONCRETE CURBS/HEADWALLS.
21. DATE TO BE PLACED ON THE INSIDE NORTHEAST FACE AND INSIDE SOUTHWEST FACE HIGHWAY GUARDRAIL TRANSITIONS. CONTRACTOR SHALL FURNISH A SHEET SHOWING SIZE AND CHARACTER OF NUMERALS. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST HIGHWAY GUARDRAIL TRANSITION IS CONSTRUCTED. BOTH HIGHWAY GUARDRAIL TRANSITIONS SHALL FEATURE THE SAME DATE.
22. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS OTHERWISE NOTED.
23. SHEAR KEYS SHALL BE 4" HIGH BY ONE-THIRD THE WIDTH OF THE CONCRETE ELEMENT, CENTERED, WITH 3" MINIMUM CLEAR ON EACH SIDE.
24. APPLY PAVEMENT JOINT ADHESIVE ALONG ALL LONGITUDINAL JOINTS BETWEEN PAVEMENT PASSES AND ALONG BRIDGE CURB LINES AND EXPANSION JOINT ARMORING PRIOR TO PLACING ALL PAVEMENT COURSES.
25. FACES OF PRECAST CONCRETE TO BE BACKFILLED AGAINST SHALL BE COATED WITH DAMP-PROOFING IN ACCORDANCE WITH THE SPECIFICATIONS.

CHAPTER 85 SECTION 35 REVIEW AND APPROVAL NOTES:

1. IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS AND DESIGN 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.
2. PROVIDE CHAPTER 85 FINAL APPROVAL STAMP TO ALL DRAWING SHEETS PRIOR TO SUBMISSION TO MASSACHUSETTS DEPARTMENT OF TRANSPORTATION AS SHOWN BELOW:

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 S 35

DISTRICT 3 BRIDGE ENGINEER _____ DATE _____

3. FINAL CHAPTER 85 APPROVAL MUST BE OBTAINED PRIOR TO FABRICATION OF BRIDGE ELEMENTS. CONTRACTOR SHALL BE RESPONSIBLE FOR EDITS AND/OR REVISIONS REQUIRED FOR FINAL CHAPTER 85 APPROVAL AT SOLE COST TO THE CONTRACTOR.

LEGEND:

EXISTING	PROPOSED	DESCRIPTION
		BENCHMARK
		UTILITY POLE
		TREE
WF		WETLAND FLAG
		TREELINE
		OVERHEAD UTILITY
		MINOR CONTOURS
		MAJOR CONTOURS
		EDGE OF ROW
		EDGE OF PAVEMENT
		CENTERLINE
		GUARDRAIL
		100-FOOT BUFFER ZONE (MAWPA) / 75-FOOT ADJACENT UPLAND RESOURCE AREA (BYLAW)
		200-FOOT RIVERFRONT AREA
		BORDERING LAND SUBJECT TO FLOODING
		BORDER OF VEGETATED WETLAND
		MEAN HIGH WATER/BANK
		LIMITS OF WORK
		EROSION CONTROL BARRIER
		COFFERDAM
		DEMOLISH
		DUMPED RIPRAP
		IN-SITU WETLAND RESTORATION

ABBREVIATIONS:

ADJ	ADJUST
APPROX	APPROXIMATE
BIT	BITUMINOUS
℄	BASELINE
BLSF	BORDERING LAND SUBJECT TO FLOODING
BO	BY OTHERS
BOT	BOTTOM
CIP	CAST-IN-PLACE
CFS	CUBIC FEET PER SECOND
CJ	CONSTRUCTION JOINT
℄	CENTERLINE
CL	CLEAR COVER
CMP	CORROGATED METAL PIPE
CONC	CONCRETE
CY	CUBIC YARD
DIA	DIAMETER
EL/ELEV	ELEVATION
EOP	EDGE OF PAVEMENT
EW	EACH WAY
FT	FEET
GALV	GALVANIZED
HMA	HOT MIX ASPHALT
HORIZ	HORIZONTAL
LT	LEFT
MAX	MAXIMUM
MIN	MINIMUM
NO	NUMBER
NTS	NOT TO SCALE
N/A	NOT APPLICABLE
OC	ON CENTER
OH	OVERHEAD
PC	POINT OF CURVATURE
PCMS	PORTABLE CHANGEABLE MESSAGE SIGN
PGL	PROPOSED GRADE LINE
PI	POINT OF INTERSECTION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
REM	REMOVE
RET UP	RETAIN UTILITY POLE
ROW	RIGHT OF WAY
RT	RIGHT
R&D	REMOVE AND DISPOSE
R&R	REMOVE AND RESET
SF	SQUARE FOOT
SOE	SUPPORT OF EXCAVATION
SS	STAINLESS STEEL
TYP	TYPICAL
UP	UTILITY POLE
VERT	VERTICAL

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER _____ DATE _____

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L. MURPHY, JR.
CIVIL
No. 41049
REGISTERED PROFESSIONAL ENGINEER
06/27/2023

COMMONWEALTH OF MASSACHUSETTS
ERIC OHANIAN
CIVIL
No. 53235
REGISTERED PROFESSIONAL ENGINEER
06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

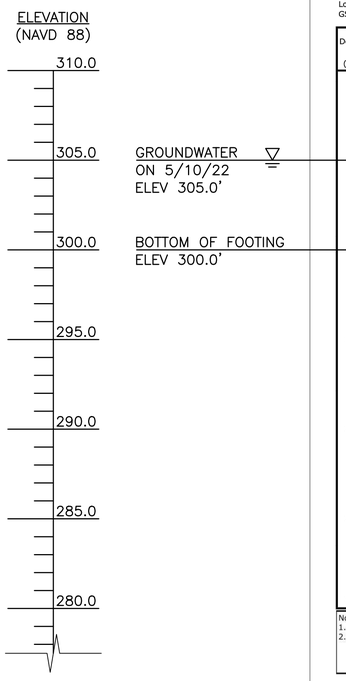
PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_03_GENERAL.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

GENERAL NOTES
(SHEET 2 OF 2)

SCALE: AS SHOWN

SHEET 4 OF 24

Last Saved: 6/22/2023
Plotted On: Jun 22, 2023 3:21pm By: SSak
Tighe & Bond: j:\b\b5108 town of bolton\004 - forbush mill road culverts\drawings_figures\AutoCAD\Sheet\B5108-004_03_GENERAL.dwg



Tighe&Bond
Engineers | Environmental Specialists

Boring No. **TB-1**
Page 1 of 2
File No. B-5108-004
Checked by: D. Gnatek

Project: Forbush Mill Rd Culvert Replacement
Location: Forbush Mill Rd over Still River, Bolton, MA
Client: Town of Bolton, MA

Drilling Co. Technical Drilling Services, Inc.
Foreman: A. Natsis
T&B Rep.: M. Begag
Date Start: 05/10/22 End: 05/10/22
Location See Exploration Location Plan
GS. Elev. 310± (NAVD88)

	Casing	Sampler
Type	HSA & FJ	Split Spoon
I.D./O.D.	See Note 2	1-3/8"/2"
Hammer Wt.	140#	140#
Hammer Fall	30"	30"
Rig Make/Model	Diedrich D120 (autohammer)	

Groundwater Readings

Date	Time	Depth	Casing	Sta. Time
Refer to Note 1				

Depth (ft.)	Casing Blows Per Ft.	Sample No. / Rec.(in)	Sample Depth (ft.)	Blows Per 6"	PID Reading (ppm)	Sample Description	General Stratigraphy	Notes	Well Construction
		S-1 / 20	0-2	15-11	-	Medium dense, brown, fine to coarse SAND, some Gravel, little Silt, dry	0.3' **ASPHALT**		
				11-10			**SAND (EXISTING FILL)**		
		S-2 / 15	2-4	8-7	-	Medium dense, brown, fine to coarse SAND, some Silt, little Gravel, dry	4'		
				7-3					
5		S-3 / 16	4-6	6-8	-	Medium dense, brown, fine to coarse SAND, some Gravel, little Silt, wet at 5'	**SAND and GRAVEL**	1	
				11-14					
		S-4 / 12	6-8	7-6	-	Medium dense, brown, fine to coarse SAND and GRAVEL, little Silt, wet	8'		
				5-13					
		S-5 / 12	8-10	10-7	-	Medium dense, grey, fine SAND and SILT, wet		2	
10				7-8					
15		S-6 / 16	14-16	7-5	-	Medium dense, grey, SILT and fine SAND, wet			No Well Installed
				5-8					
20		S-7 / 20	19-21	5-6	-	Medium dense, grey, SILT and fine SAND, wet	**SILT and SAND**		
				7-8					
25		S-8 / 19	24-26	8-11	-	Medium dense, grey, fine SAND and SILT, wet			
				11-13					
		S-9 / 24	29-31	9-10	-	Medium dense, grey/brown, SILT and fine SAND, wet			
30				11-14					

Notes:
1. Groundwater estimated at 5' based on sample wetness.
2. Switched from 4-1/4"/7-5/8" HSA to 4"/4-1/2" FJ casing at 8'.

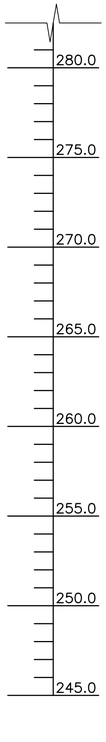
Proportions Used

TRACE (TR.)	0 - <10%
LITTLE (LI.)	10 - <20%
SOME (SO.)	20 - <35%
AND	35 - <50%

Density/Consistency

VERY LOOSE	0-4	VERY SOFT	<2
LOOSE	4-10	SOFT	2-4
MEDIUM DENSE	10-30	MEDIUM	4-8
DENSE	30-50	STIFF	8-15
VERY DENSE	>50	VERY STIFF	15-30
		HARD	>30

BORING TB–1 (1 OF 2)



Tighe&Bond
Engineers | Environmental Specialists

Boring No. **TB-1**
Page 2 of 2
File No. B-5108-004
Checked by: D. Gnatek

Project: Forbush Mill Rd Culvert Replacement
Location: Forbush Mill Rd over Still River, Bolton, MA
Client: Town of Bolton, MA

Depth (ft.)	Casing Blows Per Ft.	Sample No. / Rec.(in)	Sample Depth (ft.)	Blows Per 6"	PID Reading (ppm)	Sample Description	General Stratigraphy	Notes	Well Construction
							SILT and SAND		
							32.5'		
35		S-10 / 17	34-36	6-9	-	Very stiff, grey, Clayey SILT, little fine Sand, wet			No Well Installed
				11-16					
							Clayey SILT		
40		S-11 / 17	39-41	8-8	-	Very stiff, grey, Clayey SILT, little fine Sand, wet		3	
				8-12					
						End of Boring at 41'			
45									
50									
55									
60									
65									

Notes:
3. Borehole backfilled with cuttings, bentonite, and sand.

BORING TB–1 (2 OF 2)

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON SHEET 2 THUS: TB–1
2. BORINGS WERE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1⅜" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT TIGHE & BOND'S OFFICE, 53 SOUTHAMPTON ROAD, WESTFIELD, MA 01085. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE DESIGN ENGINEER.
6. ALL BORINGS WERE DRILLED IN MAY 2022.
7. BORINGS WERE DRILLED BY TECHNICAL DRILLING SERVICE, INC. OF STERLING, MA.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
9. THE SURFACE ELEVATION ON EACH BORING LOG IS THE ELEVATION OF THE EXISTING GROUND AT THE TIME THE BORING WAS TAKEN.
10. ENGINEERING JUDGEMENT WAS EXERCISED IN PREPARING THE SUBSURFACE INFORMATION PRESENTED HEREIN. ANALYSIS AND INTERPRETATION OF SUBSURFACE DATA WAS PERFORMED FOR DESIGN AND ESTIMATING PURPOSES. PRESENTATION OF THE INFORMATION IN THE CONTRACT IS INTENDED TO PROVIDE THE CONTRACTOR ACCESS TO THE SAME DATA AVAILABLE TO THE OWNER. THE SUBSURFACE INFORMATION IS PRESENTED IN GOOD FAITH AND IS NOT INTENDED AS A SUBSTITUTE FOR PERSONAL INVESTIGATION, INDEPENDENT INTERPRETATION, INDEPENDENT ANALYSIS OR JUDGEMENT BY THE CONTRACTOR.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER _____ DATE _____

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L MURPHY, JR.
CIVIL
No. 41049
REGISTERED PROFESSIONAL ENGINEER
06/27/2023

COMMONWEALTH OF MASSACHUSETTS
ERIC OHANIAN
CIVIL
No. 53235
REGISTERED PROFESSIONAL ENGINEER
06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

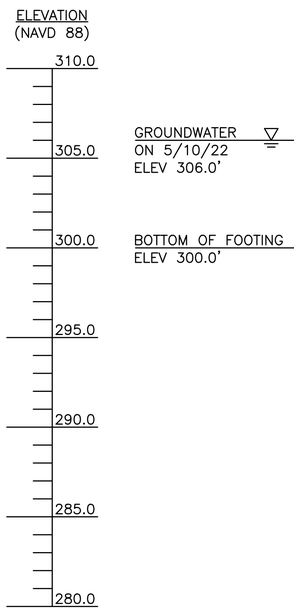
PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_03_GENERAL.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

BORING LOGS & BORING NOTES (SHEET 1 OF 2)

SCALE: NO SCALE

SHEET 5 OF 24

Last Saved: 6/27/2023
Plotted On: Jun 27, 2023 - 3:21pm By: SSak
Tighe & Bond: J:\B\05108 town of bolton\004 - forbush mill road culverts\drawings_figures\AutoCAD\Sheet\B5108-004_03_GENERAL.dwg



Tighe&Bond
Engineers | Environmental Specialists

Project: Forbush Mill Rd Culvert Replacement
Location: Forbush Mill Rd over Still River, Bolton, MA
Client: Town of Bolton, MA

Boring No. **TB-2**
Page 1 of 1
File No. B-5108-004
Checked by: D. Gnatek

Drilling Co. Technical Drilling Services, Inc.
Foreman: A. Natsis
T&B Rep.: M. Begag
Date Start: 05/10/22 End: 05/10/22
Location See Exploration Location Plan
GS. Elev. 310± (NAVD88)

	Casing	Sampler
Type	HSA & FJ	Split Spoon
I.D./O.D.	See Note 2	1-3/8"/2"
Hammer Wt.	140#	140#
Hammer Fall	30"	30"
Rig Make/Model	Diedrich D120 (autohammer)	

Groundwater Readings

Date	Time	Depth	Casing	Sta. Time
Refer to Note 1				

Depth (ft.)	Casing Blows Per Ft.	Sample No. / Rec.(in)	Sample Depth (ft.)	Blows Per 6"	PID Reading (ppm)	Sample Description	General Stratigraphy	Notes	Well Construction
		S-1 / 18	0-2	13-7	-	Medium dense, brown, fine to coarse SAND, some Gravel, little Silt, dry	**SAND (EXISTING FILL)**		
				4-4					
		S-2 / 15	2-4	3-5	-	Medium dense, brown, fine to coarse SAND and SILT, little Gravel, dry			
				8-6			4'		
		S-3 / 5	4-6	3-1	-	Loose, brown, fine to coarse SAND, some Gravel, little Silt, wet		1	
5				6-12					
		S-4 / 14	6-8	10-9	-	Medium dense, brown, fine to coarse SAND and GRAVEL, little Silt, wet	**SAND and GRAVEL**		
				10-7					
		S-5 / 14	8-10	4-6	-	Medium dense, brown, fine to coarse SAND, some Silt, little Gravel, wet			
10				5-5			10'		
		S-6 / 24	10-12	4-5	-	Medium dense, grey, SILT and fine SAND, wet			
				5-6					
		S-7 / 8	14-16	6-6	-	Medium dense, grey, SILT and fine SAND, wet			No Well Installed
15				7-10					
		S-8 / 17	19-21	8-8	-	Medium dense, grey, fine SAND and SILT, wet	**SILT and SAND**		
20				9-10					
		S-9 / 16	24-26	9-10	-	Medium dense, grey, SILT and fine SAND, wet			
25				14-14					
		S-10 / 18	29-31	8-9	-	Medium dense, grey, fine SAND and SILT, wet			
30				10-13				3	

Notes:
1. Groundwater estimated at 4' based on sample wetness
2. Switched from 4-1/4"/7-5/8" HSA to 4"/4-1/2" FJ casing at 14'.
3. End of Boring at 31'. Borehole backfilled with cuttings, Portland cement, and sand.

Proportions Used

TRACE (TR.)	0 - <10%
LITTLE (LI.)	10 - <20%
SOME (SO.)	20 - <35%
AND	35 - <50%

Density/Consistency

VERY LOOSE	0-4	VERY SOFT	<2
LOOSE	4-10	SOFT	2-4
MEDIUM DENSE	10-30	MEDIUM	4-8
DENSE	30-50	STIFF	8-15
VERY DENSE	>50	VERY STIFF	15-30
		HARD	>30

BORING TB–2 (1 OF 1)

BORING NOTES:

1. FOR BORING NOTES, SEE SHEET 05

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER _____ DATE _____

SHEET 5 OF 13 SHEETS BRIDGE NO. B–15–010 (CER)

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L MURPHY, JR.
CIVIL
No. 41049
REGISTERED PROFESSIONAL ENGINEER
06/27/2023

COMMONWEALTH OF MASSACHUSETTS
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06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

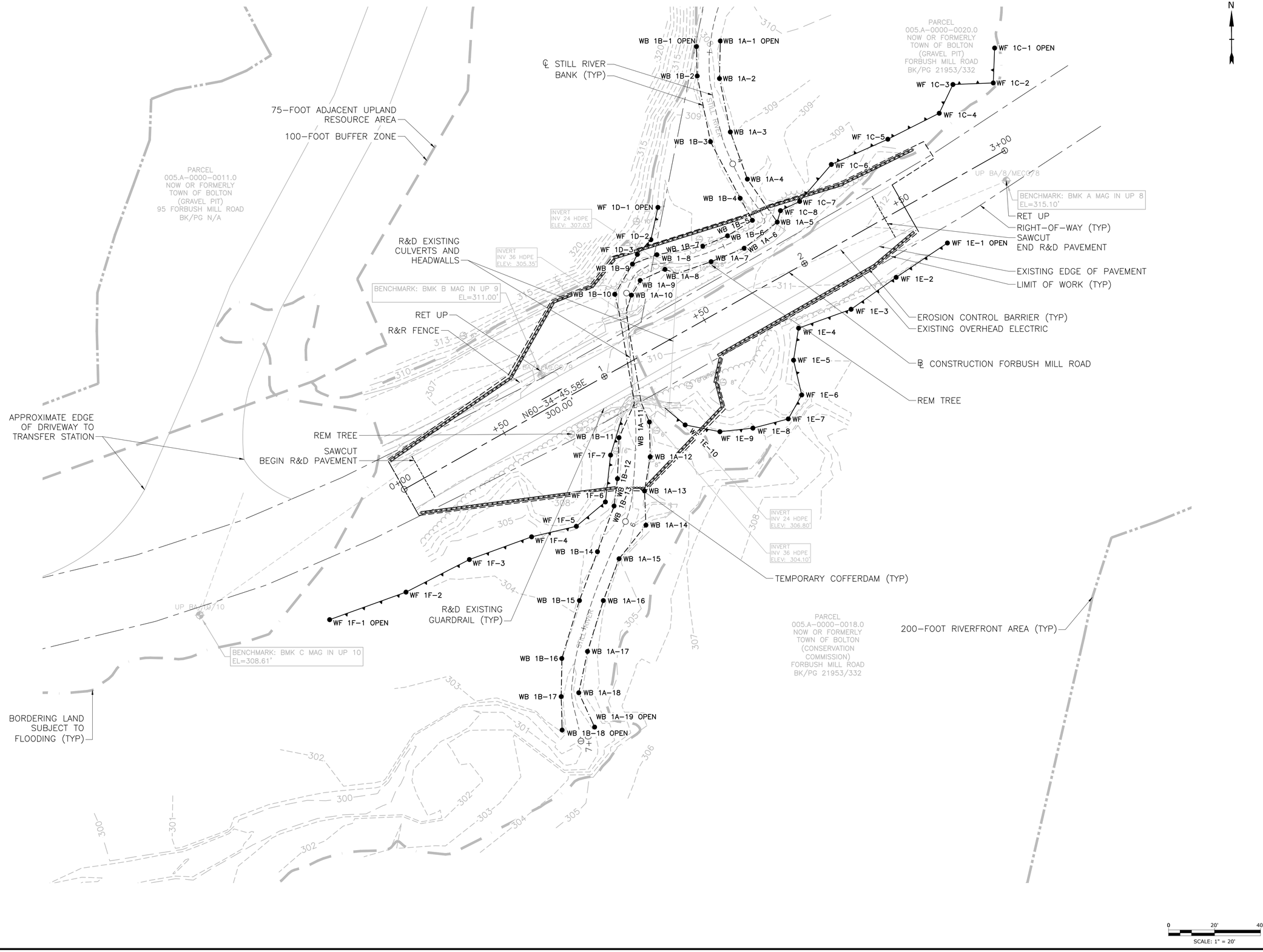
PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_03_GENERAL.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

BORING LOGS & BORING NOTES (SHEET 2 OF 2)

SCALE: NO SCALE

SHEET 6 OF 24

Last Saved: 6/22/2023
Plotted On: Jun 22, 2023-3:21pm By: SSak
Tighe & Bond: J:\B\B5108 town of bolton\004 - forbush mill road culverts\drawings_figures\AutoCAD\Sheet\B5108-004_03_GENERAL.dwg



Tighe&Bond

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06/27/2023

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06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton,
Massachusetts

MassDOT Bridge No.
B-15-010 (CER)

MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_04_CIVIL.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

EXISTING CONDITIONS &
DEMOLITION PLAN

SCALE: 1" = 20'

SHEET 7 OF 24

Last Saved: 4/17/2023
Plotted: Jun 22, 2023–3:21pm By: SSak
Tighe & Bond: j:\b\b5108 town of bolton\004 - forbush mill road culverts\drawings, figures\AutoCAD\Sheet\B5108-004_04_CIVIL.dwg

END FLARED END SECTION
STA 1+68, 16.0' LT
END W-BEAM RAIL
BEGIN FLARED END SECTION
STA 2+43, 12.0' LT
℄ STILL RIVER
BANK (TYP)
PROPOSED GUARDRAIL, TL-3
END TRANSITION TO BRIDGE RAIL
BEGIN W-BEAM RAIL
STA 1+68, 12.0' LT
END BRIDGE RAIL
BEGIN TRANSITION TO BRIDGE RAIL
STA 1+34, 12.0' LT
END TRANSITION TO BRIDGE RAIL
BEGIN BRIDGE RAIL
STA 1+04, 12.0' LT
20:1 TAPER EDGE OF PAVEMENT
RESTORE RIPRAP SWALE
BENCHMARK: BMK B MAG IN UP 9
EL=311.00'
END TANGENT END SECTION
BEGIN TRANSITION TO BRIDGE RAIL
STA 0+70, 12.0' LT
BEGIN TANGENT END SECTION
STA 0+45, 12.0' LT
20:1 TAPER EDGE OF PAVEMENT
APPROXIMATE EDGE
OF DRIVEWAY TO
TRANSFER STATION
STA 0+10
END MILL AND OVERLAY
BEGIN FULL DEPTH
ROADWAY RESTORATION
SAWCUT AND MATCH
STA 0+00
BEGIN MILL AND OVERLAY
SAWCUT AND MATCH
75-FOOT ADJACENT UPLAND
RESOURCE AREA
100-FOOT BUFFER ZONE
200-FOOT RIVERFRONT AREA
PARCEL
005.A-0000-0011.0
NOW OR FORMERLY
TOWN OF BOLTON
(GRAVEL PIT)
95 FORBUSH MILL ROAD
BK/PG N/A
BENCHMARK: BMK C MAG IN UP 10
EL=308.61'
BEGIN FLARED END SECTION
STA 0+33, 16.0' RT
END FLARED END SECTION
BEGIN TRANSITION TO BRIDGE RAIL
STA 0+58, 12.0' RT
END TRANSITION TO BRIDGE RAIL
BEGIN BRIDGE RAIL
STA 0+92, 12.0' RT
BORDERING LANDS
SUBJECT TO
FLOODING (TYP)
PARCEL
005.A-0000-0020.0
NOW OR FORMERLY
TOWN OF BOLTON
(GRAVEL PIT)
FORBUSH MILL ROAD
BK/PG 21953/332
LIMIT OF WORK (TYP)
STA 2+50
END MILL AND OVERLAY
SAWCUT AND MATCH
RIGHT-OF-WAY (TYP)
BENCHMARK: BMK A MAG IN UP 8
EL=315.10'
STA 2+40
END FULL DEPTH ROADWAY RESTORATION
BEGIN MILL AND OVERLAY
SAWCUT AND MATCH
20:1 TAPER EDGE OF PAVEMENT
EROSION CONTROL BARRIER (TYP)
EXISTING OVERHEAD ELECTRIC
SLOPE PROTECTION (TYP)
EXISTING EDGE OF PAVEMENT
℄ CONSTRUCTION FORBUSH MILL ROAD
END TANGENT END SECTION
STA 1+81, 12.0' RT
PROPOSED EDGE OF PAVEMENT (TYP)
END TRANSITION TO BRIDGE RAIL
BEGIN TANGENT END SECTION
STA 01+56, 12.0' RT
20:1 TAPER EDGE OF PAVEMENT
END BRIDGE RAIL
BEGIN TRANSITION TO BRIDGE RAIL
STA 1+22, 12.0' RT
IN-SITU WETLAND RESTORATION (TYP)
SEE DETAIL, SHEET 9
PROPOSED TREELINE (TYP)
TEMPORARY COFFERDAM (TYP)
PARCEL
005.A-0000-0018.0
NOW OR FORMERLY
TOWN OF BOLTON
(CONSERVATION
COMMISSION)
FORBUSH MILL ROAD
BK/PG 21953/332
200-FOOT RIVERFRONT AREA
N
0 20' 40'
SCALE: 1" = 20'

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L MURPHY, JR.
CIVIL
No. 41049
REGISTERED PROFESSIONAL ENGINEER
06/27/2023

COMMONWEALTH OF MASSACHUSETTS
ERIC OHANIAN
CIVIL
No. 53235
REGISTERED PROFESSIONAL ENGINEER
06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton,
Massachusetts

MassDOT Bridge No.
B-15-010 (CER)

MARK	DATE	DESCRIPTION

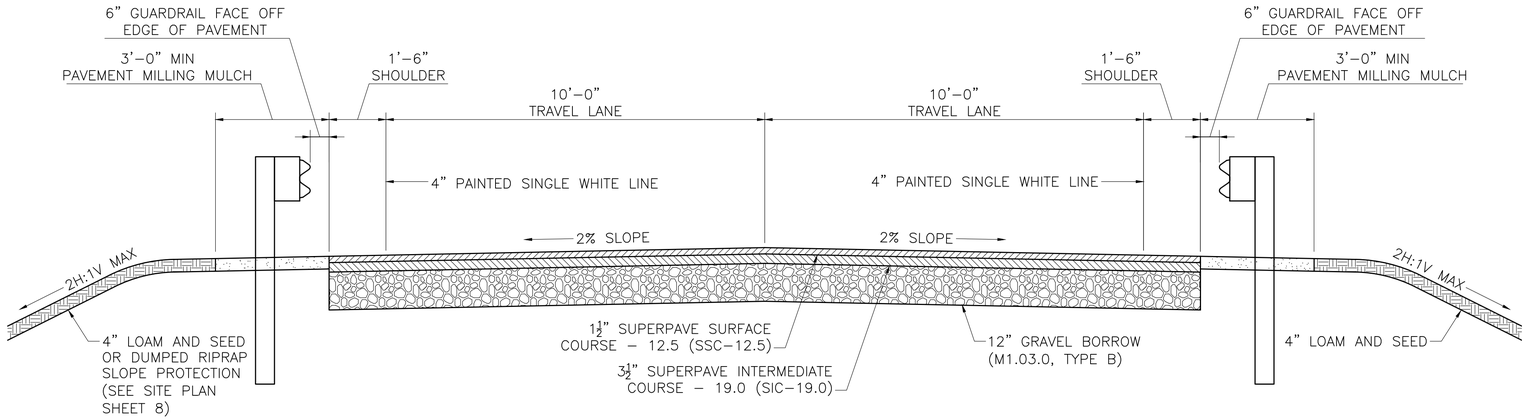
PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_04_CIVIL.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

SITE PLAN

SCALE: 1" = 20'

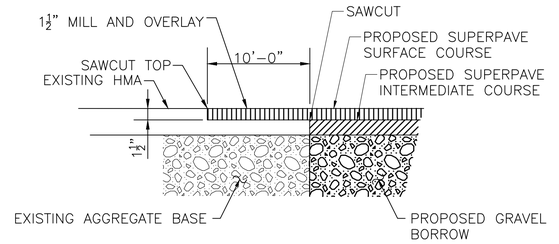
SHEET 8 OF 24

Last Saved: 4/17/2023
Plotted On: Jun 22, 2023 3:22pm By: SSak
Tighe & Bond: J:\B\b5108 town of bolton\004 - forbush mill road culverts\drawings_figures\AutoCAD\Sheet\B5108-004_04_CIVIL.dwg



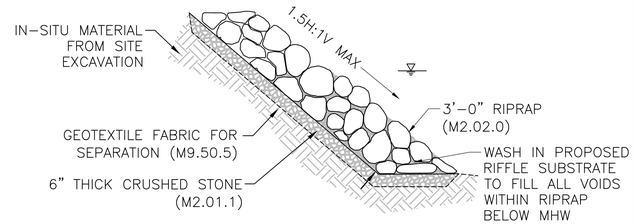
FORBUSH MILL ROAD TYPICAL SECTION

SCALE: ½" = 1'–0"



TYPICAL BUTT JOINT TO EXISTING PAVEMENT

NOT TO SCALE



SLOPE PROTECTION

NOT TO SCALE

IN–SITU WETLAND RESTORATION NOTES:

1. STABILIZATION OF DISTURBED AREAS OR NEW SOIL SHALL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. APPROPRIATE VEGETATIVE SOIL STABILIZATION IS TO BE USED TO MINIMIZE EROSION. TEMPORARY OR PERMANENT VEGETATIVE COVER IS TO BE ESTABLISHED IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, USING HYDRO–SEEDING, BROADCASTING, OR OTHER APPROVED TECHNIQUES.
2. TREES AND SHRUBS SHOULD BE PLANTED FIRST AND THEN SEEDING WITH THE SPECIFIED SEED MIX (TABLE 1).
3. TREES AND SHRUB SPECIES PLANTING SUBSTITUTIONS MAY BE REQUIRED BASED ON THE AVAILABILITY OF NATIVE MATERIAL. SUBSTITUTIONS SHALL BE APPROVED BY A WETLAND SCIENTIST OR ENGINEER OVERSEEING THE RESTORATION.
4. MAINTAIN VEGETATED SURFACES, INCLUDING WATER, AND RE–SEEDING UNTIL ESTABLISHED CONDITIONS ARE MET AND UNTIL THE END OF THE CONTRACTUAL MAINTENANCE PERIOD.
5. SEED MIX SPECIFIED IN TABLE 1 SHALL BE APPLIED BASED ON THE APPLICATION RATE SPECIFIED BY THE SUPPLIER.
6. THE IN–SITU WETLAND RESTORATION AREAS SHALL BE MULCHED WITH WEED FREE STRAW FOLLOWING SEEDING.
7. AREAS WHERE WETLAND TOPSOIL IS SIGNIFICANTLY DISTURBED OR REMOVED ENTIRELY, WETLAND TOPSOIL FOR WETLAND REPLACEMENT AREAS SHALL CONSIST OF A MIXTURE OF EQUAL VOLUMES OF CLEAN, WEED AND SEED FREE ORGANIC AND MINERAL MATERIALS. WELL–DECOMPOSED CLEAN LEAF COMPOST SHALL BE USED AS A SOIL AMENDMENT TO ACHIEVE THE ORGANIC STANDARD. WOOD CHIPS, PEAT MOSS, AND PEAT MOSS BY–PRODUCTS SHALL NOT BE USED AS ORGANIC AMENDMENTS. SUPPLEMENTAL TOPSOIL IN WETLAND REPLACEMENT AREAS SHALL HAVE A MINIMUM ORGANIC CARBON CONTENT OF 4–12% (7 TO 21% ORGANIC MATTER) ON A DRY WEIGHT BASIS. MATCH EXISTING GRADE.
8. APPROXIMATELY 800 SQUARE FEET OF WETLAND RESTORATION IS REQUIRED. APPROXIMATELY 20 SHRUBS ARE ANTICIPATED.

TABLE 1
Seed Mix[1] for Application to Bank and Wetland Restoration Areas and for Wetland Replacement

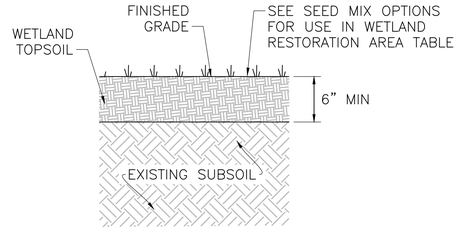
Common Name	Botanical Name	Indicator Status[2]
Fox Sedge	*Carex vulpinoidea*	OBL
Blunt Broom Sedge	*Carex scoparia*	FACW
Lurid Sedge	*Carex lurida*	OBL
Hop Sedge	*Carex lupulina*	OBL
Fowl Bluegrass	*Poa palustris*	FACW
Beggar Ticks	*Bidens frondosa*	FACW
Green Bulrush	*Scirpus atrovirens*	OBL
Swamp Milkweed	*Asclepias incarnata*	OBL
Fringed Sedge	*Carex crinita*	OBL
New York Ironweed	*Vernonia noveboracensis*	FACW
Soft Rush	*Juncus effusus*	OBL
Starved/Calico Aster	*Aster lateriflorus (Symphyotrichum lateriflorum)*	FAC
Blue Flag	*Iris versicolor*	OBL
American Mannagrass	*Glyceria grandis*	OBL
Square Stemmed Monkey Flower	*Mimulus ringens*	OBL
Spotted Joe Pye Weed	*Eupatorium maculatum (Eutrochium maculatum)*	OBL

[1] New England Wetmix (Wetland Seed Mix) Species Composition (New England Wetland Plants, Inc.) as of March 2023.
[2] Indicator status is based on the USDA NRCS Plants Database.

TABLE 2
Native Shrubs (tubelings or live stakes) for Bank Restoration[1]

Common Name	Botanical Name	Indicator Status[2]	On center Spacing
Silky Dogwood	*Cornus amomum*	FACW	6'-8'
Winterberry	*Ilex verticillata*	FACW	6'-8'
Pussy Willow	*Salix discolor*	FACW	6'-8'
Bebb Willow	*Salix bebbiana*	FACW	6'-8'
Black Willow	*Salix nigra*	OBL	6'-8'

[1] Shrubs to be selected from the species listed in this table based on the availability of native nursery stock at the time of installation.
[2] Indicator status is based on the USDA NRCS Plants Database.



IN–SITU WETLAND RESTORATION

NOT TO SCALE

0 2' 4'
SCALE: 1/2" = 1'-0"

Tighe&Bond

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DANIEL L MURPHY, JR.
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06/27/2023

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ERIC OHANIAN
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FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
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DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

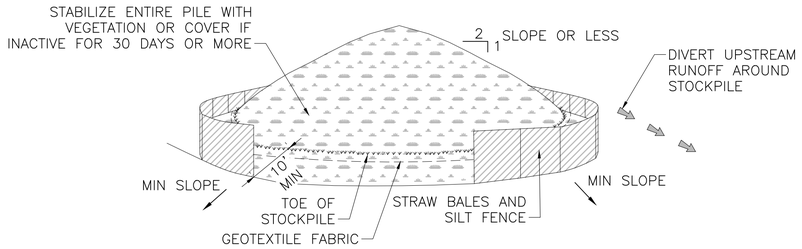
CONSTRUCTION DETAILS (SHEET 1 OF 3)

SCALE: AS SHOWN

SHEET 9 OF 24

EROSION CONTROL NOTES:

1. ALL EROSION CONTROL MEASURES SHOWN, SPECIFIED AND REQUIRED BY THE ENGINEER SHALL BE INSTALLED PRIOR TO ANY CONSTRUCTION OR IMMEDIATELY UPON REQUEST. MAINTAIN ALL SUCH CONTROL MEASURES UNTIL FINAL SURFACE TREATMENTS ARE IN PLACE AND/OR UNTIL PERMANENT VEGETATION IS ESTABLISHED.
2. MAINTAIN AN ADDITIONAL SUPPLY OF EROSION CONTROL MEASURES THROUGHOUT THE CONSTRUCTION PERIOD.
3. PRIOR TO STARTING WORK, CLEARLY STAKE WORK LIMIT LINE(S). DO NOT DISTURB VEGETATION AND TOPSOIL BEYOND THE NEW LIMIT LINE. COORDINATE WITH THE ENGINEER THE LOCATIONS FOR THE TEMPORARY STOCKPILING OF TOPSOIL DURING CONSTRUCTION.
4. SIDE SLOPES, AND DISTURBED VEGETATED AREAS, SHALL BE A MAXIMUM GRADE OF 2:1 COMPACTED, STABILIZED, LOAMED AND SEEDED AS SHOWN ON DRAWINGS. SIDE SLOPES SHALL BE IMMEDIATELY FINE GRADED AND SEEDED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
5. SILT TRAPPED AT BARRIERS SHALL BE REMOVED AND DISPOSED OF IN UPLAND AREAS OUTSIDE BUFFER ZONES. MATERIALS DEPOSITED IN ANY TEMPORARY SETTLING BASIN SHALL BE REMOVED AT THE COMPLETION OF THE PROJECT. ALL DISTURBED AREAS SHALL BE RESTORED.
6. INSTALL EROSION CONTROLS AT THE EDGE OF NEW WORK. EROSION CONTROLS SHALL ACT AS LIMIT OF WORK LINE TO HELP ENSURE THAT EQUIPMENT DOES NOT DISTURB ADJACENT PROPERTIES.
7. ADDITIONAL EROSION CONTROLS MAY BE REQUIRED TO LIMIT SEDIMENTS FROM DISCHARGING TO ADJACENT PROPERTIES OR WATERWAYS.
8. PROPERLY STABILIZE AND PROTECT TEMPORARY STOCKPILES OF MATERIALS RELATED TO THE CONSTRUCTION ACTIVITIES TO LIMIT MOVEMENT OF MATERIAL ONTO ADJACENT PARCELS, OR INTO THE STREAM.
9. STABILIZE THE AREAS OF CONSTRUCTION ACTIVITIES AT THE CLOSE OF EACH CONSTRUCTION DAY. CHECK EROSION CONTROLS AT THIS TIME AND MAINTAIN OR REINFORCE IF NECESSARY
10. PROTECT NEW WORK FROM FLOODING. PROPERLY SLOPE GRADING IN THE AREAS SURROUNDING ALL EXCAVATIONS TO LIMIT WATER FROM RUNNING INTO THE EXCAVATED AREA OR TO ADJACENT PROPERTIES. UPON COMPLETION OF THE WORK, RESTORE ALL AREAS IN A SATISFACTORY MANNER.
11. ALL SILT–LADEN WATER MUST BE SETTLED OR FILTERED TO REMOVE ALL SEDIMENTS PRIOR TO RELEASE TO AN UPLAND AREA, IN A SEDIMENTATION OR FILTER BAG LOCATED DOWN GRADIENT.
12. DEWATER AS NECESSARY TO KEEP CONSTRUCTION AREAS FREE OF WATER, DISCHARGE WATER FROM DEWATERING TO APPROPRIATE UPLAND LOCATION AND WITHOUT SEDIMENT (SEE DEWATERING REQUIREMENTS).
13. AT THE END OF EACH WORK DAY, ANY SEDIMENTS TRACKED ONTO PUBLIC RIGHTS–OF–WAY BEYOND THE PROJECT LIMITS SHALL BE SWEPT.

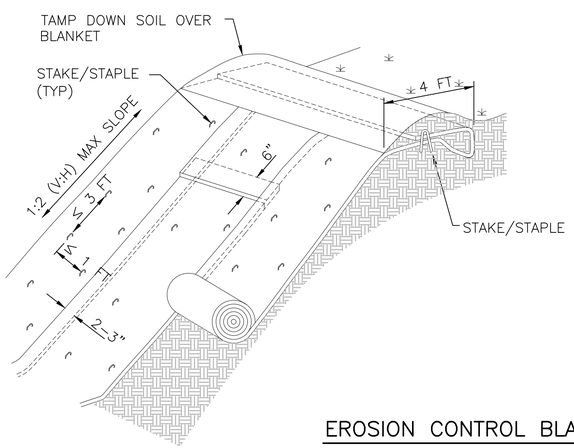


INSTALLATION NOTES:

1. AREA CHOSEN FOR STOCKPILING OPERATIONS SHALL BE DRY AND STABLE.
2. MAXIMUM SLOPE OF STOCKPILE SHALL BE 2H:1V.
3. UPON COMPLETION OF SOIL STOCKPILING, EACH PILE SHALL BE SURROUNDED WITH EITHER SILT FENCING AND STRAW BALES, THEN STABILIZED WITH VEGETATION OR COVERED.

SOIL STOCKPILING

NOT TO SCALE

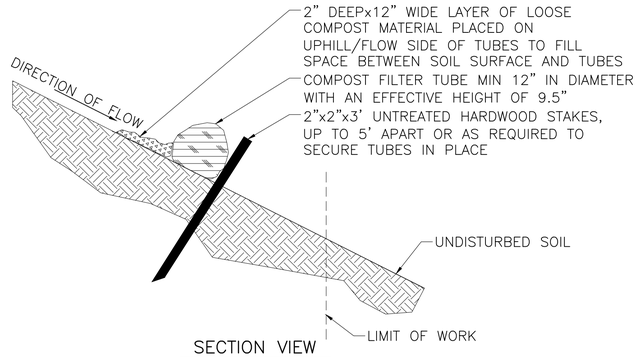


INSTALLATION NOTES:

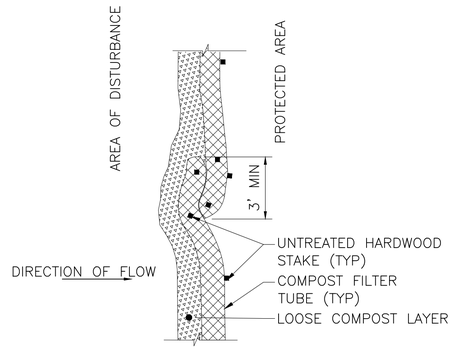
1. 100% BIODEGRADABLE WEAVE JUTE NET EROSION CONTROL BLANKET OVER 6" LOAM & SEED. DO NOT USE NYLON OR PLASTIC NETTING. IN ALL LOCATIONS WITH A 3:1 SLOPE OR STEEPER. SEED MIX AS SHOWN IN TABLE BELOW.
2. EROSION CONTROL BLANKET SHOULD BE INSTALLED VERTICALLY DOWNSLOPE.
3. STAKES/STAPLES SHOULD BE PLACED NO MORE THAN 3 FT APART VERTICALLY, AND 1 FT APART HORIZONTALLY.
4. SLOPE SURFACE SHOULD BE FREE OF STICKS, ROCKS, AND OTHER OBSTRUCTIONS.
5. BLANKETS SHOULD BE ROLLED OUT LOOSELY AND STAKED/STAPLED TO MAINTAIN DIRECT SOIL CONTACT. DO NOT STRETCH THE BLANKETS.

EROSION CONTROL BLANKET

NOT TO SCALE



SECTION VIEW



PLAN VIEW – JOINT DETAIL

COMPOST FILTER TUBE NOTES:

1. PROVIDE A MINIMUM TUBE DIAMETER OF 12" FOR SLOPES UP TO 50' IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPES OF 3H:1V MAY REQUIRE LARGER TUBE DIAMETER OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATION WITH LONGER SLOPES OR STEEPER SLOPES.
2. INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
3. DO NOT INSTALL IN PERENNIAL, EPHEMERAL OR INTERMITTENT STREAMS.
4. CONFIGURE TUBES AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN–OFF.
5. TUBES FOR COMPOST FILTERS SHALL BE JUTE MESH OR APPROVED BIODEGRADABLE MATERIAL. ADDITIONAL TUBES SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
6. TAMP TUBES IN PLACE TO ENSURE GOOD CONTACT WITH SOIL SURFACE. IT IS NOT NECESSARY TO TRENCH TUBES INTO EXISTING GRADE.
7. WHEN STAKING IS NOT POSSIBLE, SUCH AS WHEN TUBES MUST BE PLACED ON PAVEMENT, HEAVY CONCRETE OR CINDER BLOCKS CAN BE USED BEHIND TUBES UP TO 5' APART OR AS REQUIRED TO SECURE TUBES IN PLACE.
8. PROVIDE 3' MINIMUM OVERLAP AT ENDS OF TUBES TO JOIN IN A CONTINUOUS BARRIER AND MINIMIZE UNIMPEDED FLOW.
9. STAKE JOINING TUBES SNUGLY AGAINST EACH OTHER TO PREVENT UNFILTERED FLOW BETWEEN THEM.
10. SECURE ENDS OF TUBES WITH STAKES SPACED 18" APART THROUGH TOPS OF TUBES.

COMPOST FILTER TUBES

NOT TO SCALE

Tighe&Bond

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DANIEL L MURPHY, JR.
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FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

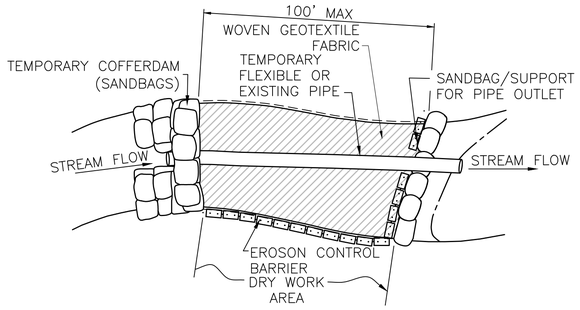
PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_04_CIVIL.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

CONSTRUCTION DETAILS (SHEET 2 OF 3)

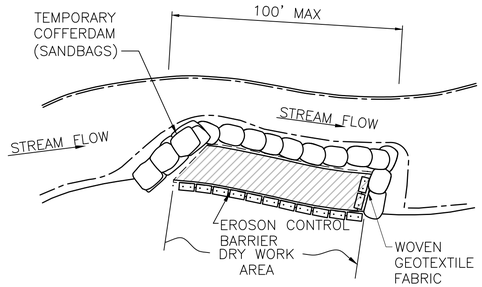
SCALE: NO SCALE

SHEET 10 OF 24

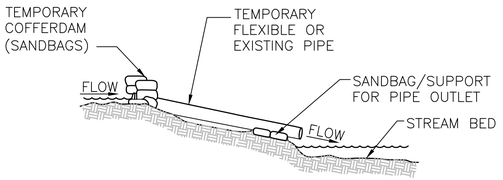
Last Saved: 4/17/2023
Printed On: Jun 22, 2023-3:22pm By: SSak
Tighe & Bond: J:\B\B5108 town of bolton\004 - forbush mill road culverts\drawings_figures\AutoCAD\Sheet\B5108-004_04_CIVIL.dwg



PLAN VIEW – COFFERDAM



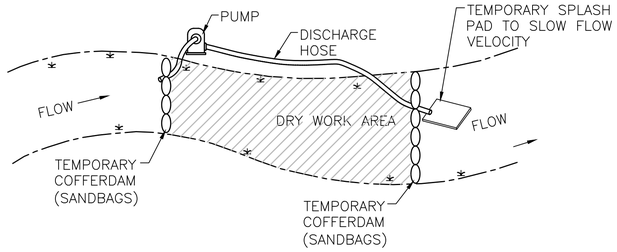
PLAN VIEW – DIVERSION



ELEVATION VIEW

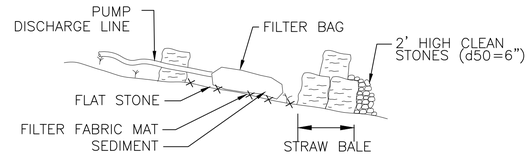
STREAM BYPASS DETAIL (PIPE)

NOT TO SCALE

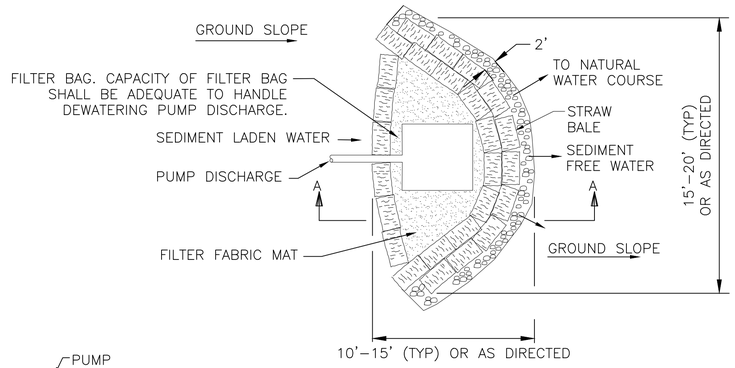


STREAM BYPASS DETAIL (PUMPED)

NOT TO SCALE

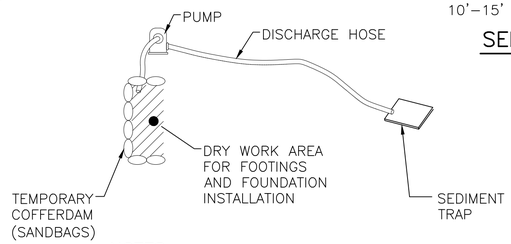


SECTION A–A



SEDIMENT TRAP

NOT TO SCALE



NOTES:

1. DEWATERING EQUIPMENT SHALL REMAIN WITHIN THE PERMANENTLY IMPACTED AREAS.
2. DISCHARGE HOSE SHALL NOT CROSS THE STREAM AT ANY LOCATION

COFFERDAM AND DEWATERING

NOT TO SCALE

WATER CONTROL SEQUENCING:

1. INSTALL A TEMPORARY COFFERDAM UPSTREAM OF THE EXISTING CULVERT PRIOR TO REMOVAL OF THE EXISTING CULVERT. PROVIDE BYPASS FLUME PIPE OR PUMP. SIZE AND PROVIDE A FLUME PIPE OR PUMP WITH ADEQUATE CAPACITY TO ACCOMMODATE STREAM FLOWS AS INDICATED IN THE WATER CONTROL NOTES. SUBMIT AN EMERGENCY CONTINGENCY PLAN FOR A STORM EVENT GREATER THAN THE 2–YEAR STORM.
2. REMOVE AND DISPOSE EXISTING CULVERTS, EXCAVATE AND DEWATER FOR BRIDGE INSTALLATION, PLACE CRUSHED STONE TO GRADE, INSTALL BRIDGE AND PLACE STREAM BED MATERIAL THROUGH BRIDGE, FOLLOWED BY SITE RESTORATION. AT NO POINT SHOULD THE STREAM FLOW OVER NEWLY EXCAVATED EARTH OR OVER AREAS THAT DO NOT HAVE THE FINISHED SURFACE TREATMENT.
3. ABUTMENTS AND THE SUPERSTRUCTURE SHALL THEN BE INSTALLED AND STREAM DIVERSION MAY BE REMOVED AFTER ALL SURFACES HAVE BEEN PROTECTED AGAINST EROSION.
4. STREAM DIVERSION MAY BE USED TO WORK AT INDIVIDUAL ABUTMENTS AND THE FLUME PIPE MAY BE REMOVED, IF THE STREAMBED AREA EXPOSED TO FLOWS HAS BEEN STABILIZED.

WATER CONTROL NOTES:

1. THE ISOLATED WORK AREA WITHIN THE COFFERDAMS MAY BE DEWATERED AS NEEDED TO PERFORM WORK IN THE DRY. ALL WORK MUST BE PERFORMED IN THE DRY. ANY DEWATERING ACTIVITIES SHALL BE PERFORMED USING A DISCHARGE HOSE, FILTER BAG, AND SEDIMENT TRAP (SHOWN ON THIS SHEET).
2. PRIOR TO BEGINNING ANY CONSTRUCTION IN THE STREAM, SUBMIT TO THE OWNER A WORK SEQUENCE INDICATING ANTICIPATED COFFERDAM LOCATIONS, OR ALTERNATE SYSTEM. WORK SHALL ONLY BE PERFORMED DURING LOW FLOW CONDITIONS.
3. THE COFFERDAM WORK MAY BE MODIFIED TO ADDRESS THE CONTRACTOR'S SEQUENCE OF CONSTRUCTION, WITH THE APPROVAL OF THE OWNER.
4. TEMPORARY COFFERDAMS (SAND BAG, JERSEY BARRIER, WATER FILLED BARRIER OR EQUIVALENT; USE OF UNCONSOLIDATED MATERIALS STRICTLY PROHIBITED) WILL BE INSTALLED TO MAINTAIN A DRY WORK AREA DURING CONSTRUCTION ACTIVITIES AND TO LIMIT SEDIMENTATION AS A RESULT OF THE PROPOSED WORK. THE WORK AREA LOCATED WITHIN THE COFFERDAMS SHALL BE DEWATERED. THE COFFERDAMS WILL BE LOCATED WITHIN THE STREAM TO ALLOW INSTALLATION OF BRIDGE FOOTINGS AND FOUNDATIONS AND IN OTHER LOCATIONS WHERE DEWATERING NEAR THE STREAM IS REQUIRED.
5. WATER CONTROLS SHOULD BE DESIGNED FOR A 2–YEAR STORM (PEAK FLOW 76.8 CFS). PRIOR TO COMMENCING WORK SUBMIT TO THE ENGINEER DRAWINGS AND CALCULATIONS, STAMPED BY A PROFESSIONAL ENGINEER IN THE STATE OF MASSACHUSETTS, INDICATING THE CONTRACTOR'S METHOD FOR CONTROL OF WATER. THE SUBMITTAL SHALL INCLUDE PROPOSED IMPACT AREAS, RESTORATION METHODS, FLOW RATES, DEWATERING METHODS AND A DETAILED SCHEDULE FOR THE CONTROL OF WATER.
6. AN EXCAVATION SUPPORT SYSTEM MAY BE USED FOR THE CONSTRUCTION OF THE BRIDGE ABUTMENT AND WINGWALL FOOTINGS TO PREVENT IMPACTING EXISTING UTILITIES. THE EXCAVATION SUPPORT SYSTEM SHALL CONFORM TO THE PROVISIONS OF SECTION 950. THE DESIGN OF THE PROPOSED SUPPORT OF EXCAVATION SYSTEM SHALL BE PERFORMED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF MASSACHUSETTS. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND CALCULATIONS FOR THE PROPOSED SUPPORT OF EXCAVATION SYSTEM FOR REVIEW AND APPROVAL BY THE OWNER. COORDINATE DESIGN OF THE PROPOSED SUPPORT OF EXCAVATION WITH SELECTED WATER CONTROL METHODS.

DEWATERING REQUIREMENTS:

PREPARE A DEWATERING PLAN TO ADDRESS THE FOLLOWING CONCERNS AND ADHERE TO THE FOLLOWING REQUIREMENTS:

1. IF THE WATER TABLE IS INTERCEPTED DURING EXCAVATION, WATER COLLECTED IN THE TRENCH SHALL BE PUMPED OUT SO THAT THE WORK CAN BE PERFORMED "IN THE DRY." PROVIDE ADEQUATELY SIZED DEWATERING EQUIPMENT WITH 100% BACKUP AND SEDIMENTATION/EROSION CONTROL STRUCTURES AS DETAILED ON THE CONTRACT DRAWINGS TO ENSURE CONSTRUCTION "IN THE DRY" AND ADEQUATELY PROTECT ADJACENT WETLAND AREAS AND WATERWAYS.
2. ALL GROUNDWATER REMOVED (PUMPED) FROM THE TRENCH EXCAVATION AND DISCHARGED SHALL BE A "CLEAN DISCHARGE." PROVIDE WHATEVER DEVICES ARE REQUIRED TO ACHIEVE THE "CLEAN DISCHARGE." IF THE OWNER'S REPRESENTATIVE DETERMINES THE PUMPED DISCHARGE IS CLEAN (LESS THAN 50 NTU), THE FLOW CAN BE DIRECTED TO AN UPLAND AREA. IF THE OWNER'S REPRESENTATIVE DETERMINES THAT THE FLOW IS NOT CLEAN, DIRECT THAT FLOW TO ONE OR MORE FILTRATION DEVICES FOR THE PURPOSE OF SUBSTANTIALLY REMOVING SUSPENDED SOLIDS FROM THE WATER. THE FILTRATION DEVICES SHALL BE AS SHOWN ON THE DRAWINGS OR APPROVED ALTERNATES SUGGESTED BY THE CONTRACTOR, OR AS REQUIRED BY THE LOCAL PERMITS.
3. OBTAIN ALL NECESSARY STATE AND LOCAL PERMITS RELATING TO DEWATERING ACTIVITIES.
4. DEWATERING DISCHARGE LOCATIONS ARE TO BE REVIEWED AND APPROVED BY THE OWNER'S REPRESENTATIVE.
5. ANY PROPOSED DEWATERING AND SHORING PROCEDURES SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR REVIEW AND ACCEPTANCE. THE DEWATERING/WATER CONTROL AND SHORING/TEMPORARY EARTH SUPPORT SHALL BE DESIGNED AND STAMPED BY A REGISTERED PROFESSIONAL ENGINEER IN THE COMMONWEALTH OF MASSACHUSETTS.

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L MURPHY, JR.
CIVIL
No. 41049
REGISTERED PROFESSIONAL ENGINEER
06/27/2023

COMMONWEALTH OF MASSACHUSETTS
ERIC OHANIAN
CIVIL
No. 53235
REGISTERED PROFESSIONAL ENGINEER
06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_04_CIVIL.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

CONSTRUCTION DETAILS (SHEET 3 OF 3)

SCALE: NO SCALE

SHEET 11 OF 24

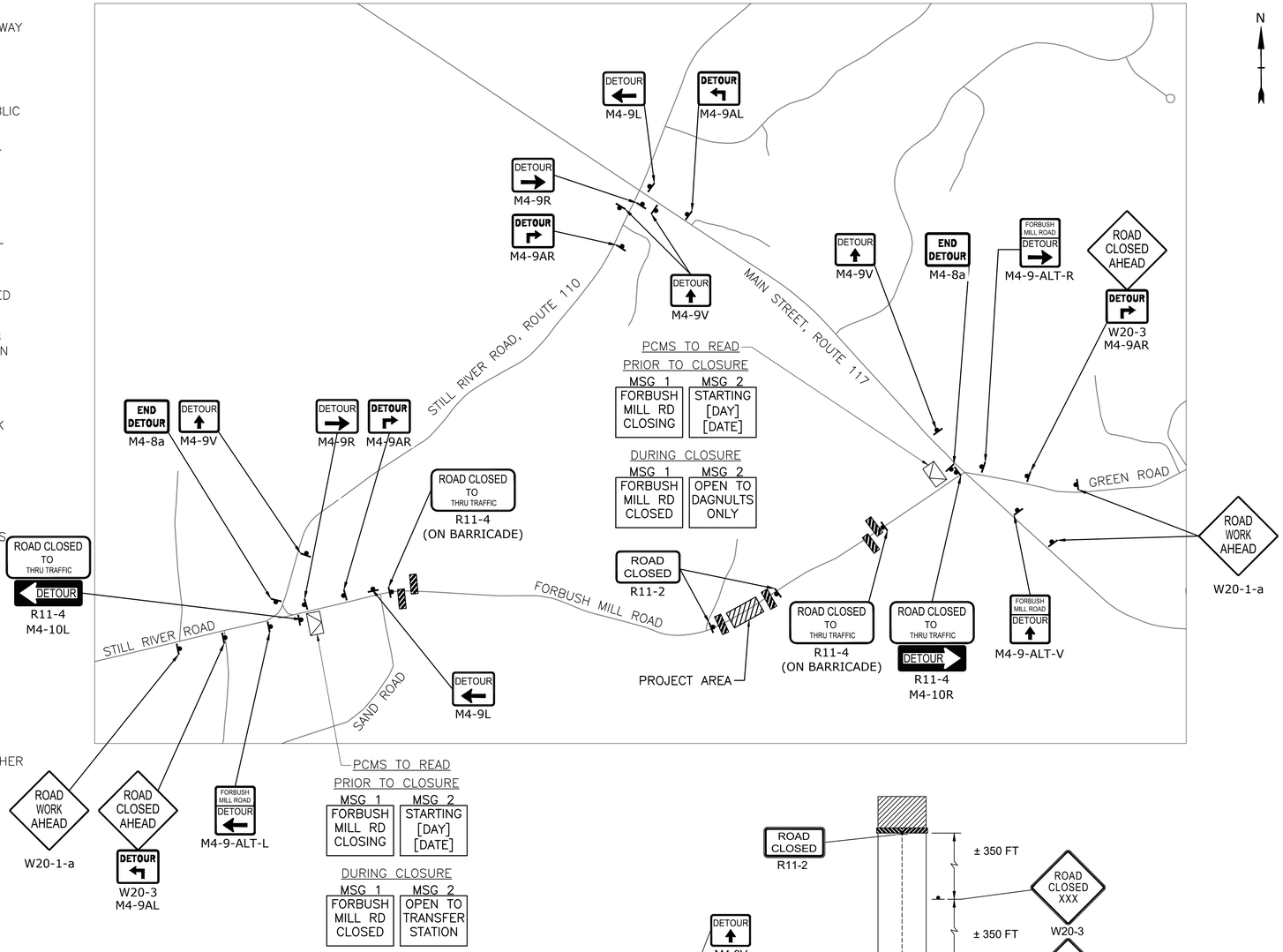
Last Saved: 4/17/2023
Plotted On: Jun 22, 2023-3:22pm By: SSak
Tighe & Bond: J:\B\B5108 town of bolton\004 - forbush mill road culverts\drawings_figures\AutoCAD\Sheet\B5108-004_04_CIVIL.dwg

NOTES:

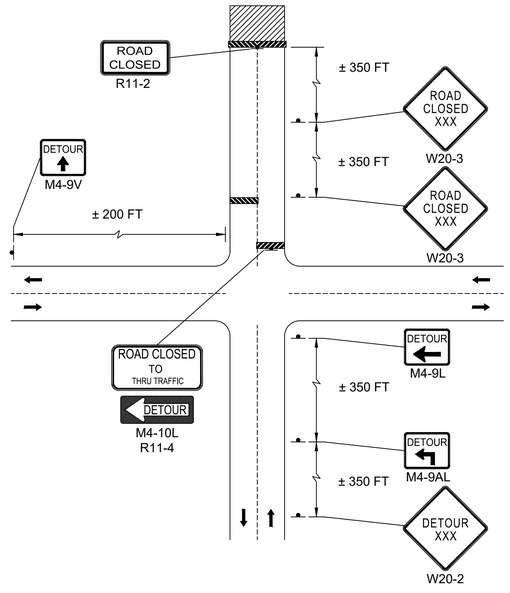
1. TEMPORARY FENCING AND BARRIERS SHALL BE DEPLOYED ON SITE DURING THE ROADWAY CLOSURE TO PREVENT ACCESS TO THE CROSSING.
2. NO THRU TRAFFIC SHALL BE PERMITTED UNTIL THE BRIDGE STRUCTURE, GUARDRAILS, AND PAVEMENT HAVE BEEN INSTALLED.
3. PLACEMENT OF SIGNS TO BE COORDINATED WITH THE ENGINEER, DEPARTMENT OF PUBLIC WORKS, POLICE DEPARTMENT, AND FIRE DEPARTMENT (BOLTON, MASSACHUSETTS).
4. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS.
5. ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
6. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
7. 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.
8. 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 "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
9. 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.
10. PORTABLE CHANGEABLE MESSAGE SIGNS SHALL BE IN PLACE 14 DAYS PRIOR TO THE START OF ANY WORK TO PROVIDE ADVANCE NOTICE OF ROAD CLOSURE.
11. THE FIRST FIVE PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A LIGHTS.
12. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
13. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
14. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
15. MINIMUM LANE WIDTH IS TO BE 11 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
16. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
17. TWO-WAY TRAFFIC SHALL BE RESTORED AT THE END OF THE PROJECT.
18. THE CONTRACTOR SHALL PROVIDE ALL SIGNAGE, BARRICADES, POLICE DETAILS AND OTHER CONTROLS AS REQUIRED FOR TRAFFIC CONTROL.

LEGEND:

- TYPE III BARRICADE
- WORK ZONE
- SIGN
- PCMS



SIGN LEGEND					
CODE	DESCRIPTION	SIZE	AREA	NO.	TOTAL AREA
W20-1-a	ROAD WORK AHEAD	36"x36"	9 SF	3	27 SF
W20-3	ROAD CLOSED AHEAD	36"x36"	9 SF	2	18 SF
R11-2	ROAD CLOSED	48"x30"	10 SF	2	20 SF
R11-4	ROAD CLOSED TO THRU TRAFFIC	60"x30"	12.5 SF	4	50 SF
M4-9-ALT-V	DETOUR WITH STREET NAME	30"X36"	7.5 SF	1	7.5 SF
M4-9-ALT-L	DETOUR WITH STREET NAME	30"X36"	7.5 SF	1	7.5 SF
M4-9-ALT-R	DETOUR WITH STREET NAME	30"X36"	7.5 SF	1	7.5 SF
M4-10L	DETOUR	48"x18"	6 SF	1	6 SF
M4-10R	DETOUR	48"x18"	6 SF	1	6 SF
M4-9L	DETOUR	30"x24"	5 SF	2	10 SF
M4-9R	DETOUR	30"x24"	5 SF	2	10 SF
M4-9V	DETOUR	30"x24"	5 SF	4	20 SF
M4-9AL	DETOUR	30"x24"	5 SF	2	10 SF
M4-9AR	DETOUR	30"x24"	5 SF	3	15 SF
M4-8a	END DETOUR	30"x24"	5 SF	2	10 SF
				TOTAL =	224.5 SF



Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L. MURPHY, JR.
CIVIL
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06/27/2023

COMMONWEALTH OF MASSACHUSETTS
ERIC OHANIAN
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REGISTERED PROFESSIONAL ENGINEER
06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_04_CIVIL.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

TEMPORARY TRAFFIC CONTROL PLAN

SCALE: NO SCALE

SHEET 12 OF 24

Last Saved: 4/17/2023
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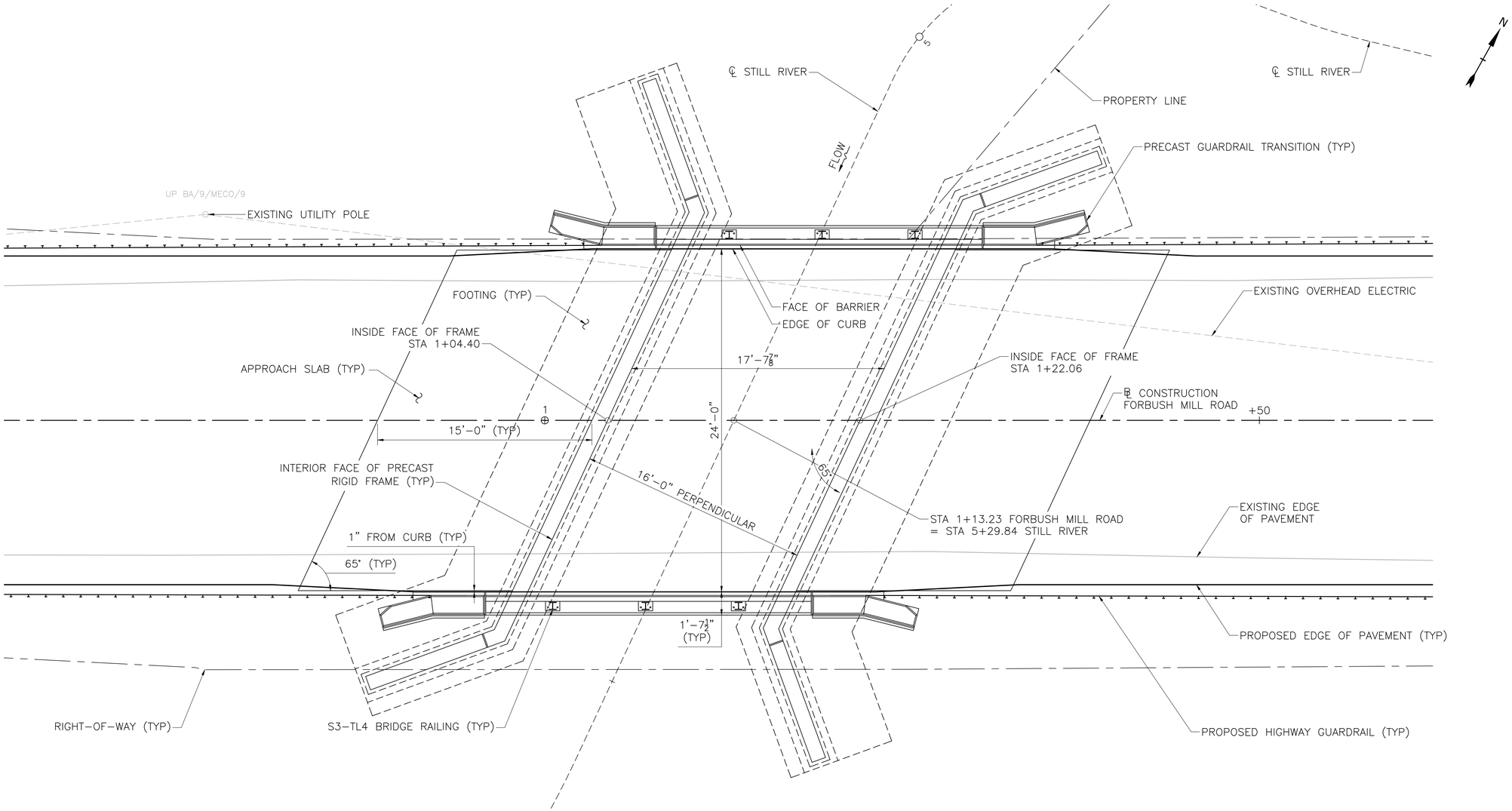
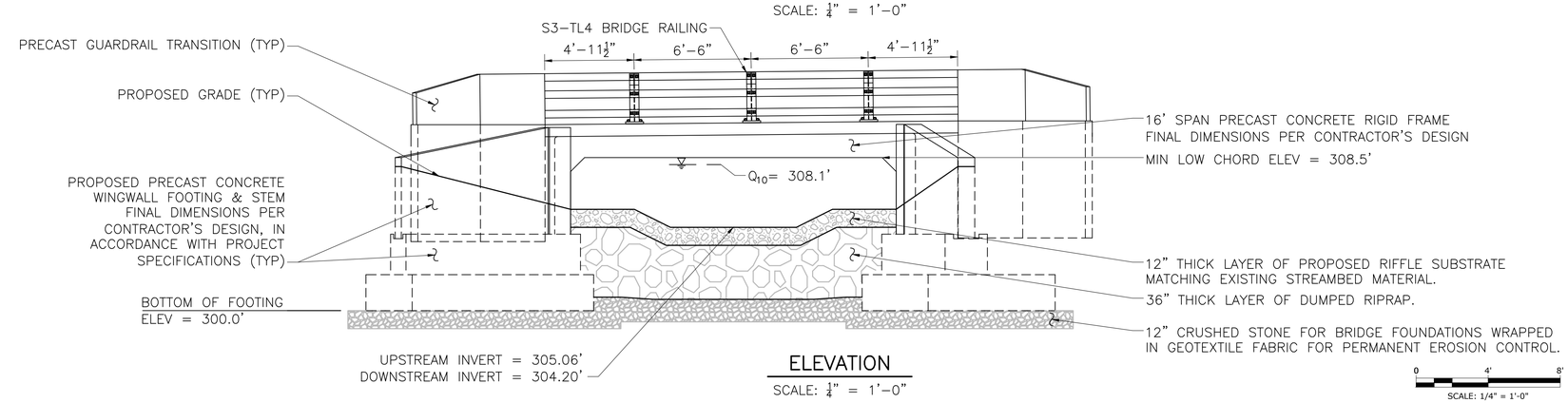
Tighe & Bond: j:\b\b5108 town of bolton\004 - forbush mill road culverts\drawings_figures\AutoCAD\Sheet\B5108-004_04_CIVIL.dwg



GENERAL BRIDGE PLAN

SCALE: ¼" = 1'-0"



ELEVATION

SCALE: ¼" = 1'-0"

0 4' 8'

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

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER — DATE

Tighe&Bond

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GENERAL BRIDGE PLAN & ELEVATION

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

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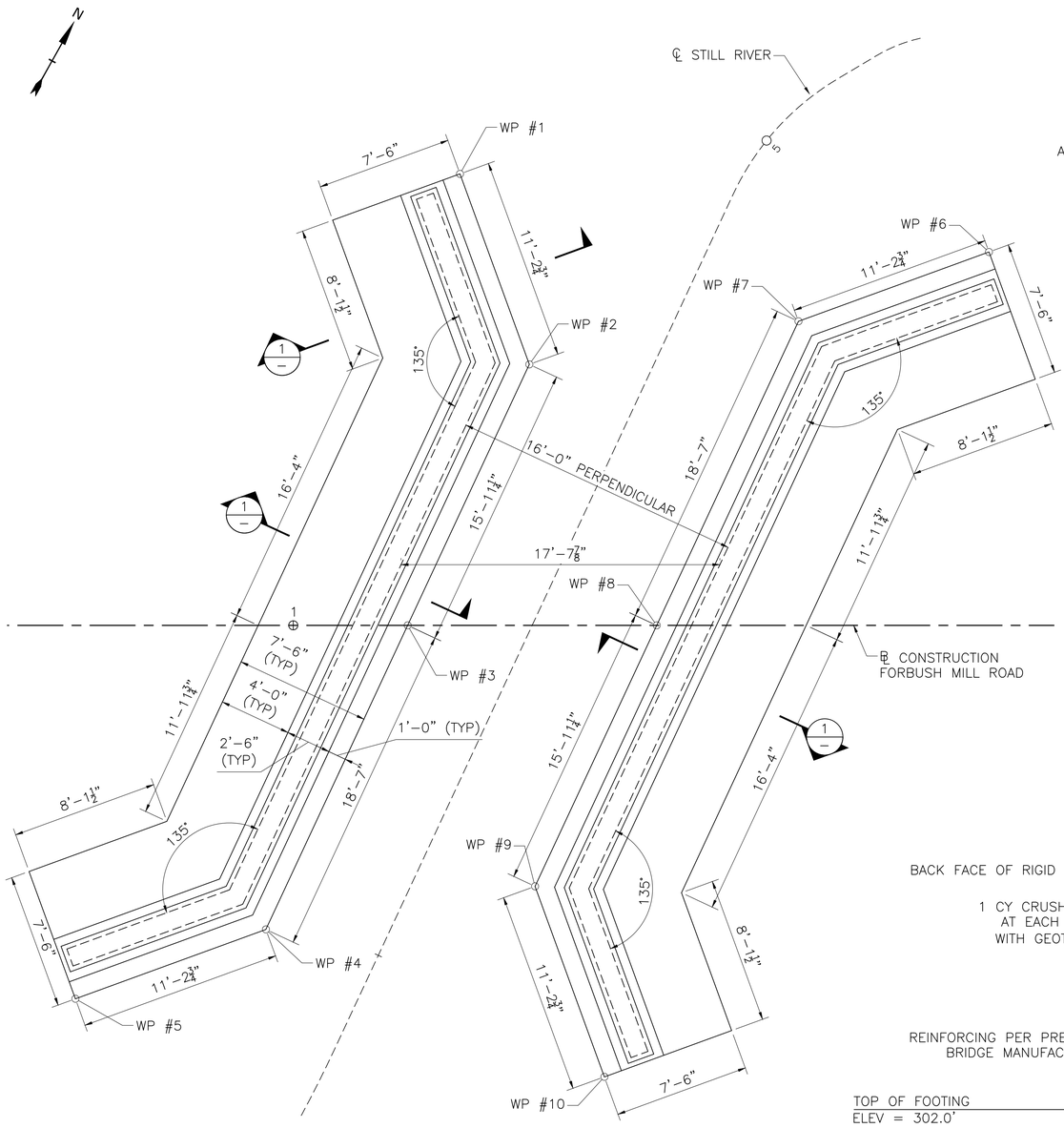
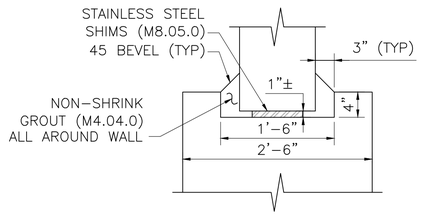


FOUNDATION PLAN

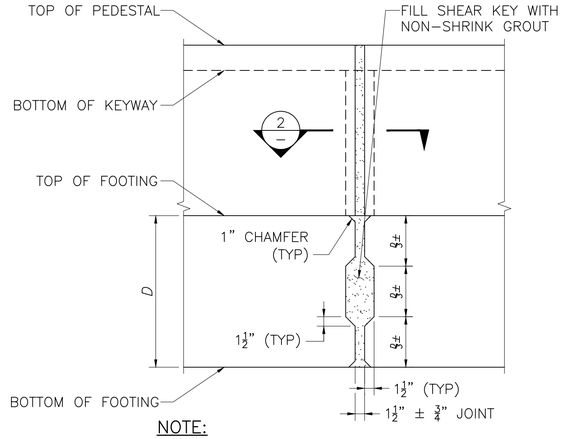
SCALE: ¼" = 1'-0"



KEYWAY DETAIL

SCALE: 1" = 1'-0"

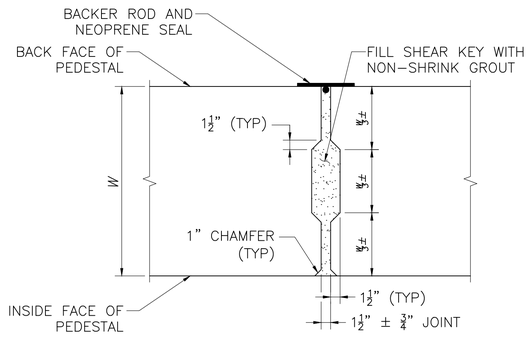
WORKING POINTS				
WORKING POINT	STATION	OFFSET	NORTHING	EASTING
WP #1	1+09.23	LT 25.00'	2,987,613.24	618,161.31
WP #2	1+13.07	LT 14.45'	2,987,605.94	618,169.83
WP #3	1+06.33	0.00'	2,987,590.04	618,171.06
WP #4	0+98.48	RT 16.83'	2,987,571.52	618,172.49
WP #5	0+87.94	RT 20.67'	2,987,563.00	618,165.19
WP #6	1+38.52	LT 20.67'	2,987,623.86	618,188.95
WP #7	1+27.98	LT 16.83'	2,987,615.34	618,181.64
WP #8	1+20.13	0.00'	2,987,596.82	618,183.08
WP #9	1+13.39	RT 14.45'	2,987,580.92	618,184.30
WP #10	1+17.23	RT 25.00'	2,987,573.62	618,192.83



NOTE:
REINFORCEMENT IS NOT SHOWN FOR CLARITY.

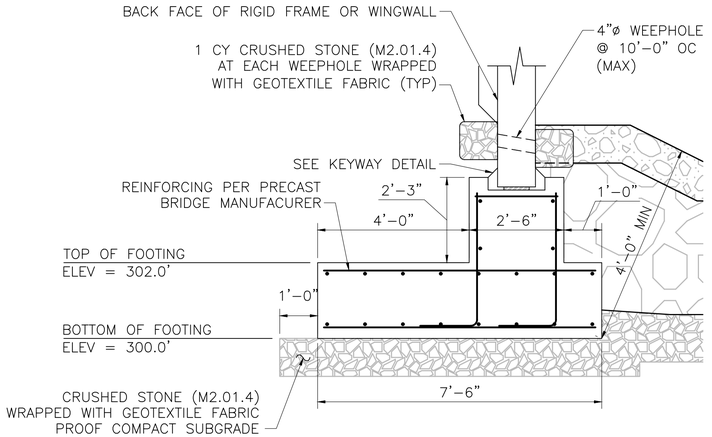
FOOTING JOINT DETAIL

SCALE: 1" = 1'-0"



NOTE:
REINFORCEMENT IS NOT SHOWN FOR CLARITY.

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



SECTION 1
SCALE: ½" = 1'-0"

TYPICAL PRECAST FOOTING SECTION

FOUNDATION NOTES:

1. DIMENSIONS AND REINFORCEMENT SHOWN ARE BASED ON CONCEPTUAL DESIGN. FINAL DESIGN AND REINFORCEMENT OF PRECAST STRUCTURES TO BE DETERMINED BY THE CONTRACTOR.
2. MINIMUM FOOTING THICKNESS SHALL BE 2'-0".
3. STRIP FOOTING JOINTS SHALL BE AT A MINIMUM OF 18" FROM RIGID FRAME JOINTS. FOOTING JOINTS SHALL PROVIDE A SHEAR KEY PER THE FOOTING JOINT DETAIL.
4. CONCEPTUAL LAYOUT SHOWN IS BASED ON A RIGID FRAME STEM WIDTH OF 1'-0", TOP SLAB THICKNESS OF 1'-2", AND A WINGWALL STEM WIDTH OF 1'-0". FINAL DIMENSIONS TO BE VERIFIED PER CONTRACTOR'S FINAL DESIGN. ANY CHANGE IN THICKNESS SHALL CHANGE ASSOCIATED DIMENSIONS ACCORDINGLY.

0 4' 8'
SCALE: 1/4" = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING
DISTRICT 3 BRIDGE ENGINEER — DATE

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L MURPHY, JR.
CIVIL
No. 41049
REGISTERED PROFESSIONAL ENGINEER
06/27/2023

COMMONWEALTH OF MASSACHUSETTS
ERIC OHANIAN
CIVIL
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REGISTERED PROFESSIONAL ENGINEER
06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

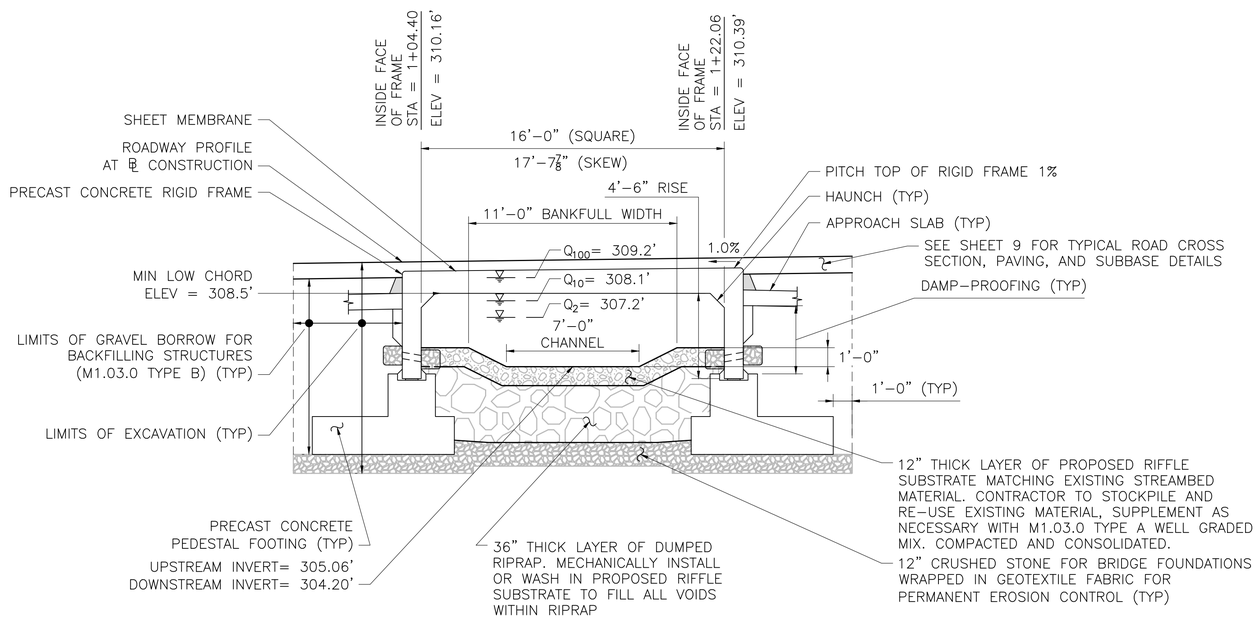
MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_05_STRC.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

FOUNDATION PLAN & DETAILS

SCALE: AS SHOWN

Last Saved: 6/22/2023
Plotted On: Jun 22, 2023-3:23pm By: SSak
Tighe & Bond: j:\b\b5108 town of bolton\004 - forbush mill road culverts\drawings_figures\AutoCAD\Sheet\B5108-004_05_STRC.dwg

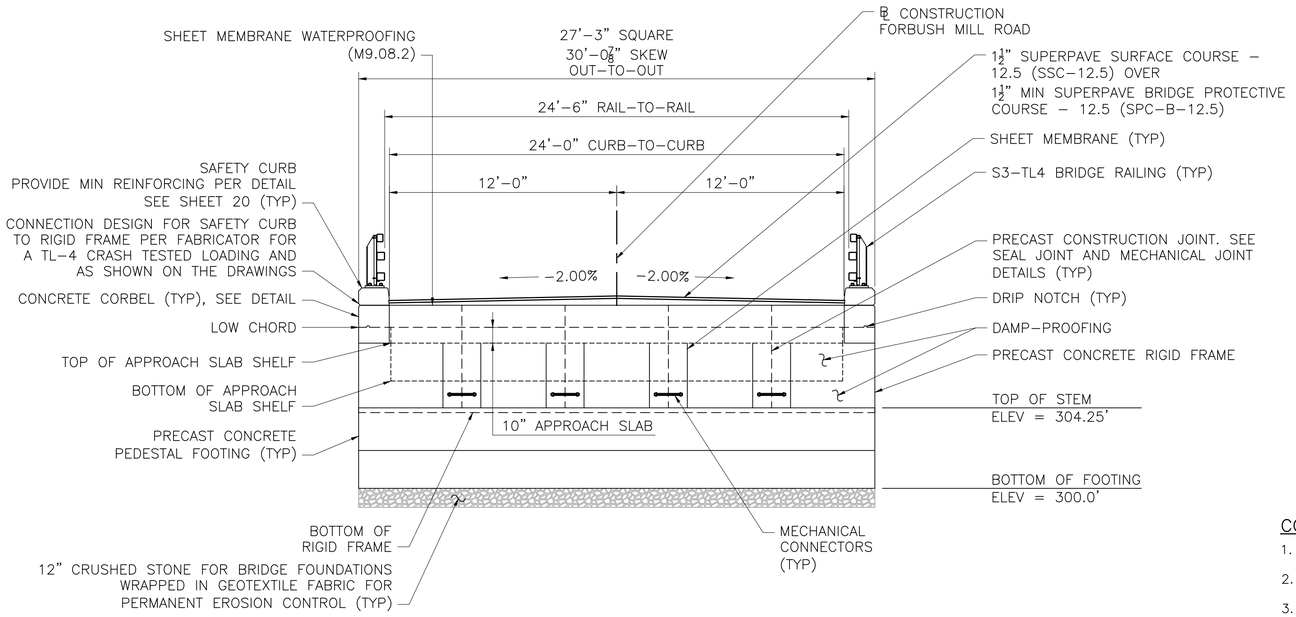


SQUARE BRIDGE SECTION AT ℄ CONSTRUCTION (LOOKING NORTH)

SCALE: ¼" = 1'-0"

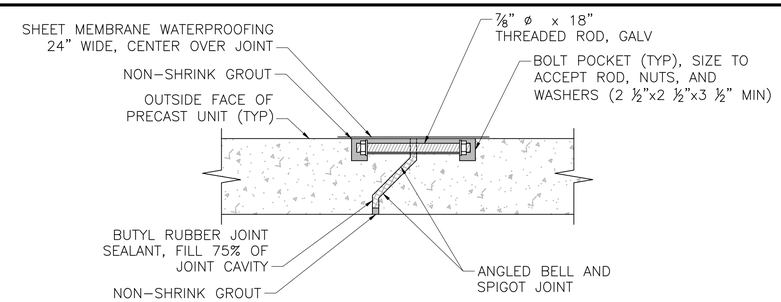
NOTES:

1. FOOTING REINFORCEMENT NOT SHOWN FOR CLARITY. SEE SHEET 15 FOR DETAILS.
2. THE VERTICAL AND HORIZONTAL HAUNCH DIMENSIONS SHALL BE EQUAL TO THE SIDEWALL THICKNESS.



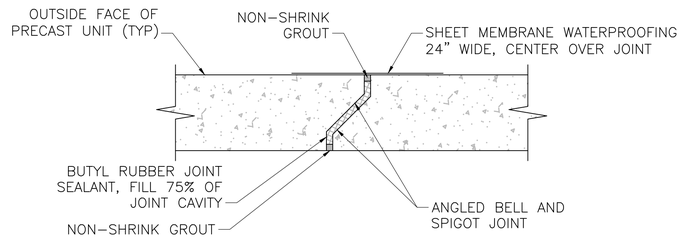
TRANSVERSE SQUARE BRIDGE SECTION

SCALE: ¼" = 1'-0"



MECHANICAL JOINT

NOT TO SCALE

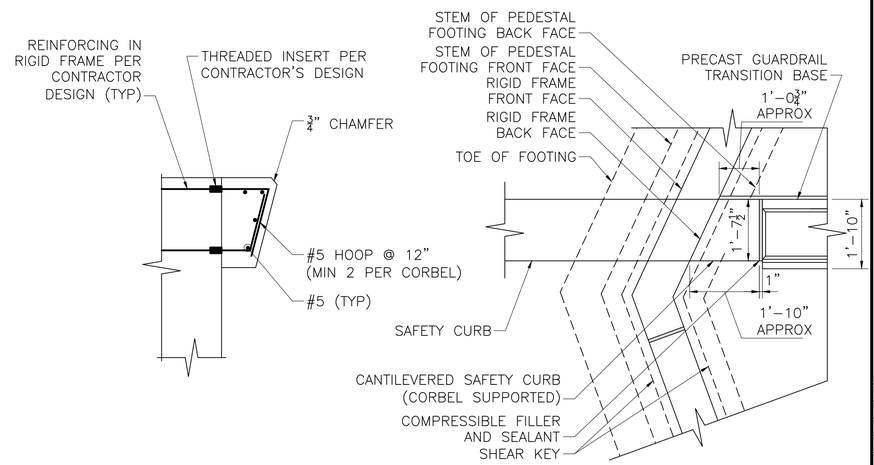


SEAL JOINT

NOT TO SCALE

JOINT NOTES:

1. PROVIDE BUTYL RUBBER JOINT SEALANT (AASHTO M-198) BETWEEN PRECAST CONCRETE UNITS.
2. PROVIDE A MINIMUM OF 5 MECHANICAL CONNECTORS BETWEEN RIGID FRAME UNITS (3 ON TOP AND 1 ON EACH SIDE) AND 2 MECHANICAL CONNECTORS BETWEEN WINGWALL UNITS.
3. ALL BOLT POCKETS SHALL BE FILLED WITH NON-SHRINK GROUT.
4. SHEET MEMBRANE SHALL BE PLACED IN 2-FOOT WIDE STRIPS, CENTERED OVER THE TOP AND/OR SIDES OF EACH JOINT.



PRECAST CONCRETE CORBEL

NOT TO SCALE

HORIZONTAL SECTION AT CONCRETE CORBEL

SCALE: ½" = 1'-0"

CONCRETE CORBEL NOTES:

1. REINFORCEMENT IS SHOWN FOR SCHEMATIC PURPOSES ONLY.
2. CONTRACTOR IS RESPONSIBLE FOR CORBEL DIMENSIONS, REINFORCING, AND DESIGN.
3. CONTRACTOR TO VERIFY GEOMETRY OF PEDESTAL FOOTING, RIGID FRAME, CORBEL, AND HIGHWAY GUARD TRANSITION BASE TO AVOID CONFLICTS. APPROXIMATE DIMENSIONS SHOWN ARE FOR SCHEMATIC PURPOSES ONLY.

0 4' 8'
SCALE: 1/4" = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING
DISTRICT 3 BRIDGE ENGINEER — DATE

Tighe&Bond

DANIEL L MURPHY, JR. CIVIL No. 41049 REGISTERED PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS
06/27/2023

ERIC OHANIAN CIVIL No. 53235 REGISTERED PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS
06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
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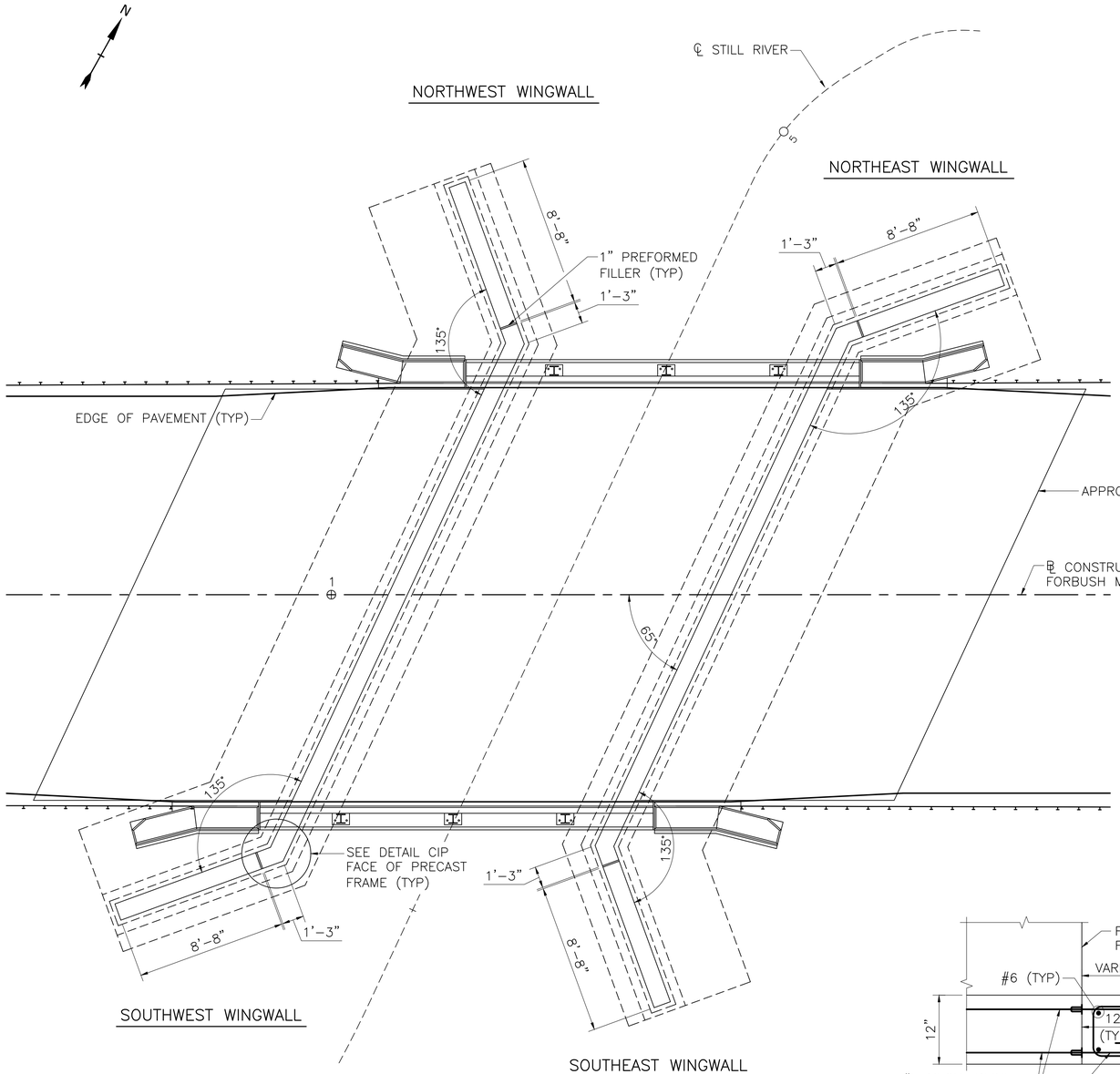
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

BRIDGE SECTION & DETAILS

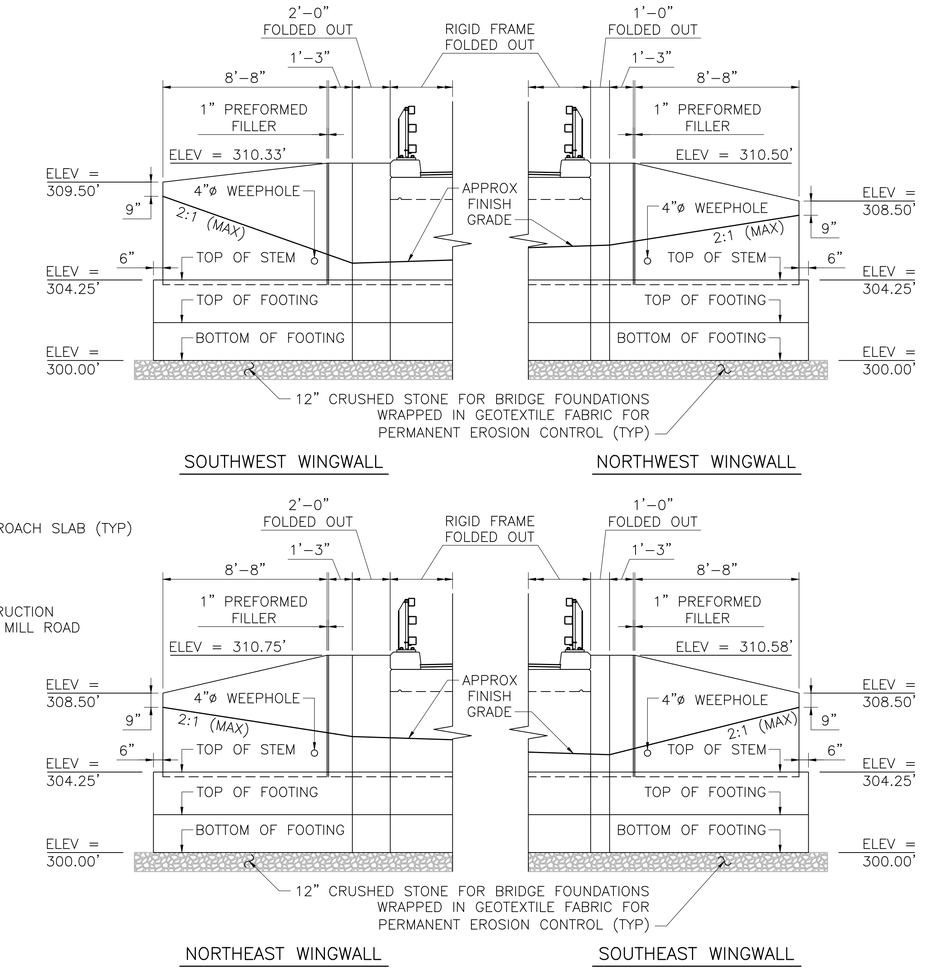
SCALE: AS SHOWN

Last Saved: 6/22/2023
Plotted On: Jun 22, 2023-3:23pm By: SSak
Tighe & Bond: J:\B\B5108 town of bolton\004 - forbush mill road culverts\drawings, figures\AutoCAD\Sheet\B5108-004_05_STRC.dwg



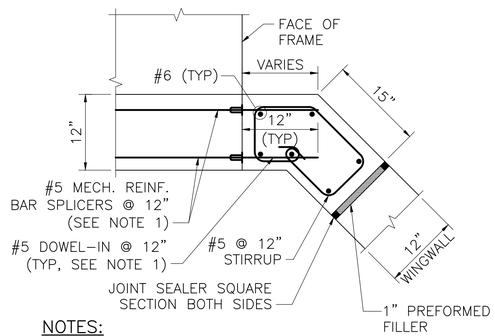
WINGWALL PLAN

SCALE: $\frac{1}{4}$" = 1'–0"



WINGWALL ELEVATIONS

SCALE: $\frac{1}{4}$" = 1'–0"



NOTES:

1. THE CONTRACTOR MAY SUBSTITUTE #5 DOWELS, 3'–0" LONG, FOR MECHANICAL REINFORCING BAR SPLICERS AND THREADED REBARS.
2. RIGID FRAME REINFORCEMENT IS NOT SHOWN FOR CLARITY.
3. CONCRETE TEXTURE, COLOR, AND APPEARANCE SHALL MATCH THE PRECAST RIGID FRAME AND WINGWALLS.

CIP FACE OF PRECAST FRAME DETAIL

SCALE: 1" = 1'–0"

0 4' 8'

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

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER — DATE

Tighe&Bond

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FINAL DESIGN

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Town of Bolton

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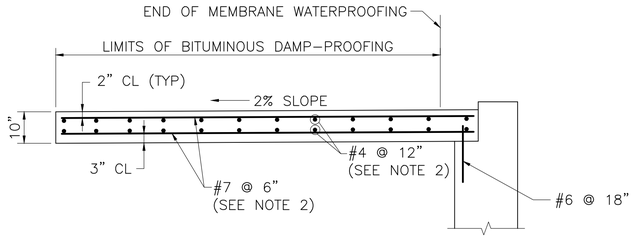
WINGWALL PLAN & ELEVATION

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

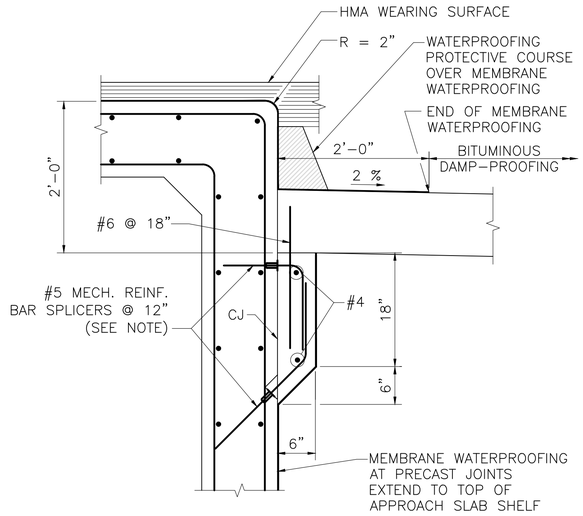


NOTES:

1. APPROACH SLAB TO BE 4000 PSI, 1½ IN, 565 CEMENT CONCRETE.
2. PLACE LONGITUDINAL REINFORCEMENT PARALLEL TO ℄ CONSTRUCTION. PLACE TRANSVERSE REINFORCEMENT PARALLEL TO ABUTMENT.

APPROACH SLAB DETAILS

SCALE: ½" = 1'–0"



NOTE:

THE CONTRACTOR MAY SUBSTITUTE #5 ⊃ DOWELS, FOR MECHANICAL REINFORCING BAR SPLICERS AND THREADED REBARS.

CIP APPROACH SLAB SHELF – DETAILS

SCALE: 1" = 1'–0"

0 2' 4'

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

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER _____ DATE _____

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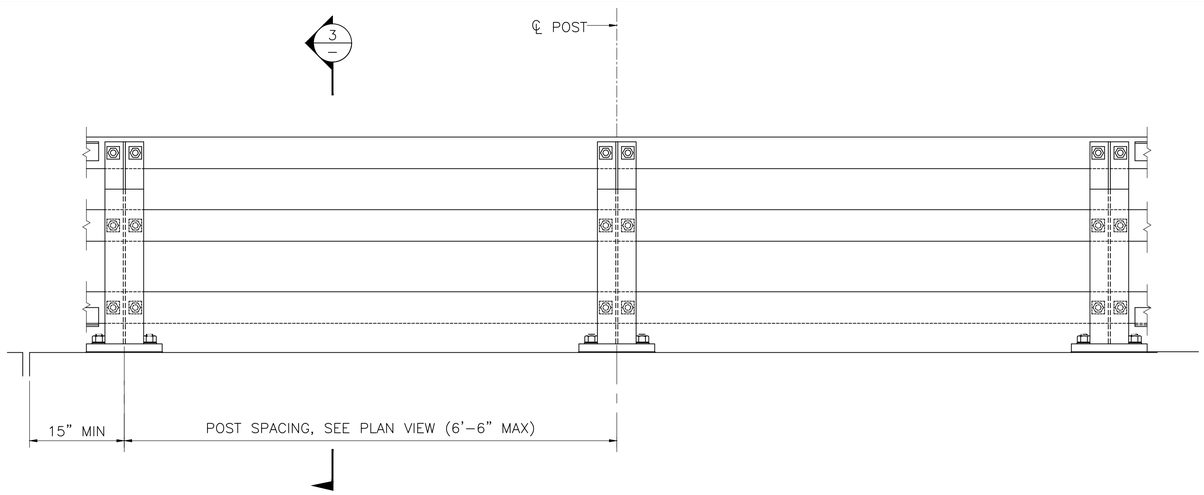
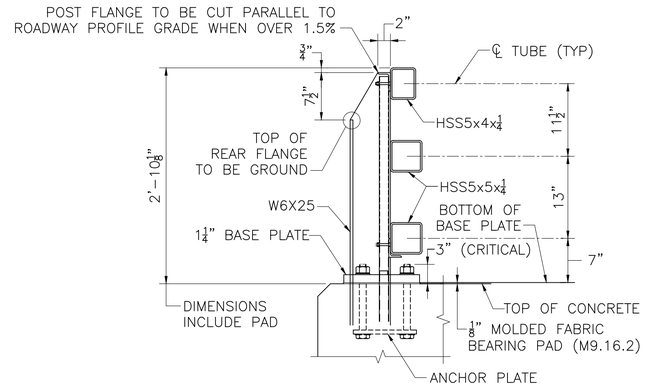
APPROACH SLAB DETAILS

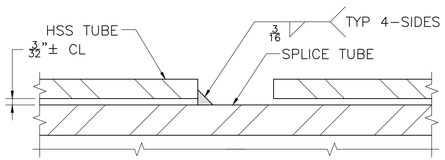
SCALE: AS SHOWN



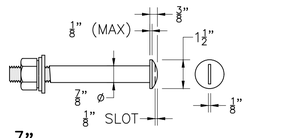
BRIDGE RAILING ELEVATION
SCALE: 1" = 1'–0"



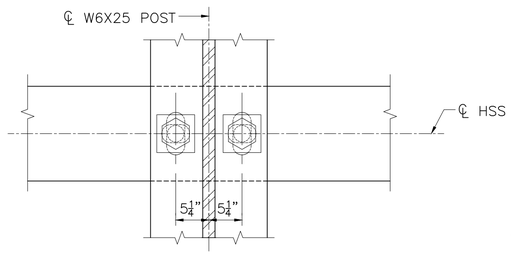
SECTION 3
SCALE: 1" = 1'–0"



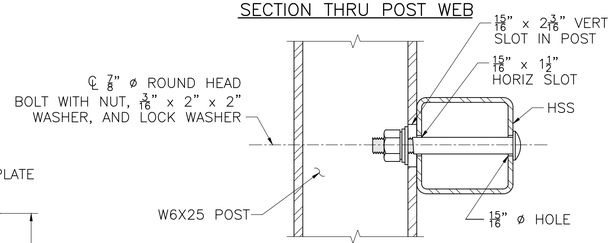
SPLICE DETAIL
FULL SIZE



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



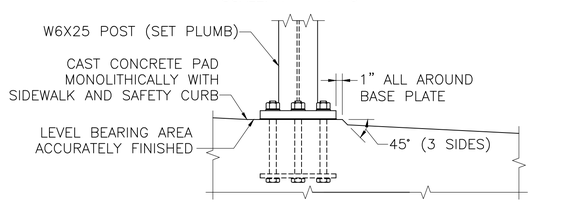
SECTION THRU POST WEB



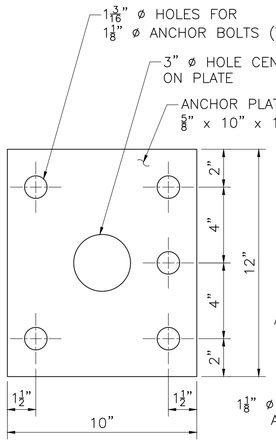
SECTION THRU RAIL

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

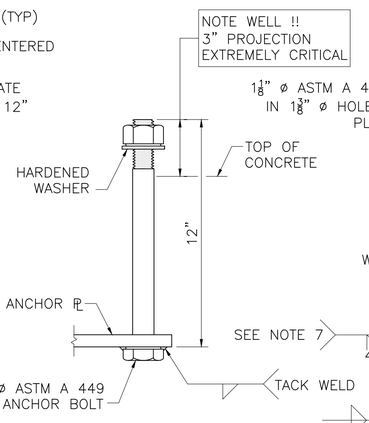
TYPICAL RAIL TO POST CONNECTIONS
SCALE: 1" = 1'–0"



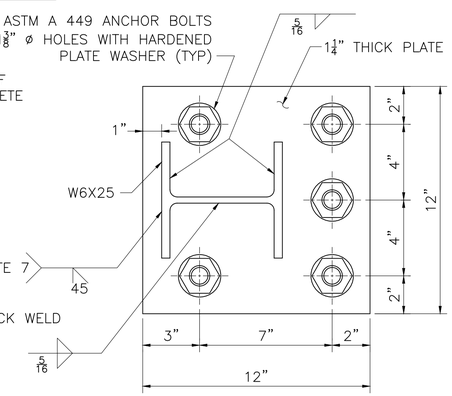
SETTING OF POSTS (PROFILE GRADE OVER 1.5%)
SCALE: 1" = 1'–0"



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 MINIMUM OR A 500 GRADE B.
2. ALL STEEL (EXCEPT THE ⅝" ANCHOR PLATE AND FASTENERS) SHALL BE GALVANIZED AND PAINTED FEDERAL BLACK (FEDERAL STD. 595 COLOR NO. 27038). 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.

MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL PART II CONVENTIONAL CONSTRUCTION S3–TL4 BRIDGE RAILING

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER _____ DATE _____

S3–TL4 BRIDGE RAILING

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

Last Saved: 6/27/2023
Plotted On: Jun 22, 2023-3:24pm By: SSak
Tighe & Bond: j:\b\b5108 town of bolton\004 - forbush mill road culverts\drawings, figures\AutoCAD\Sheet\B5108-004_06_DETAILS.dwg

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L MURPHY, JR.
CIVIL
No. 41049
REGISTERED PROFESSIONAL ENGINEER
06/27/2023

COMMONWEALTH OF MASSACHUSETTS
ERIC OHANIAN
CIVIL
No. 53235
REGISTERED PROFESSIONAL ENGINEER
06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

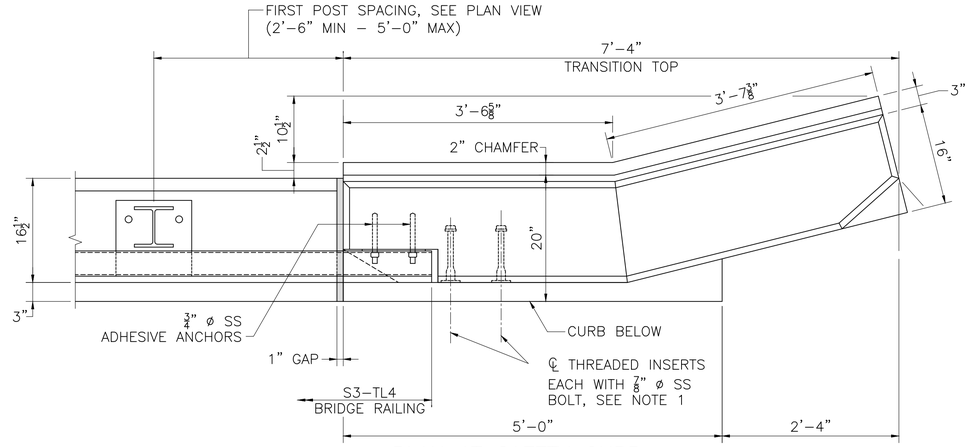
MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_06_DETAILS.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

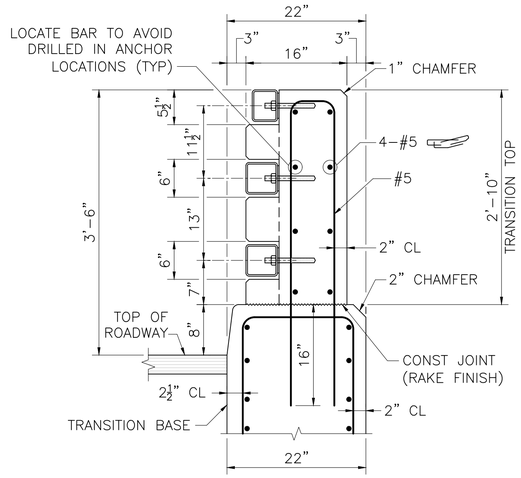
S3-TL4 BRIDGE RAILING

SCALE: AS SHOWN



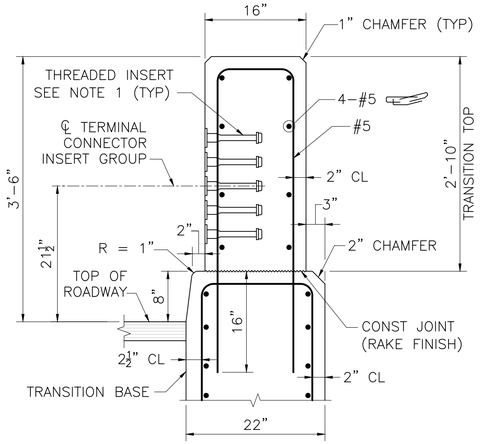
PLAN AT SAFETY CURB

SCALE: 1" = 1'-0"



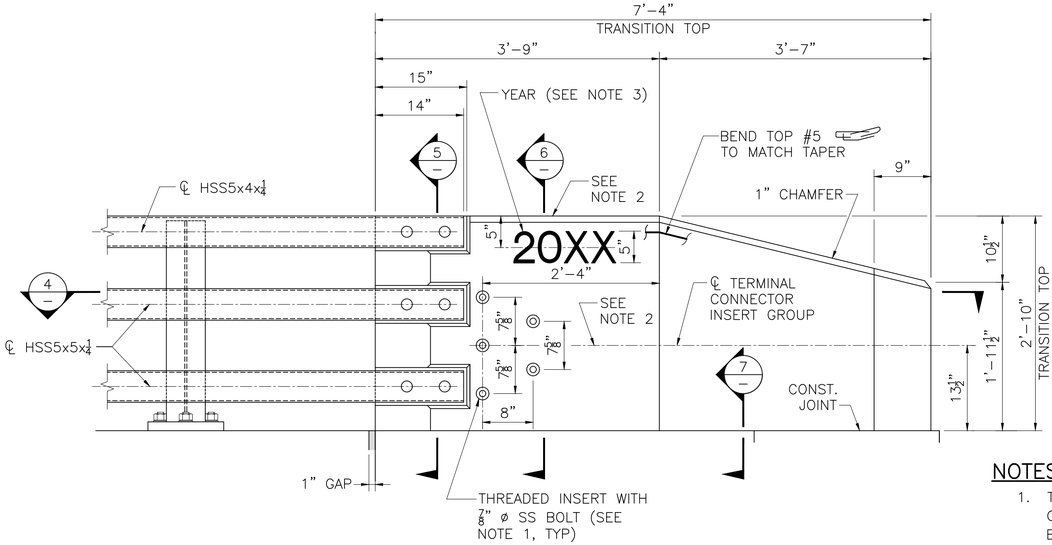
SECTION 5 AT SAFETY CURB

SCALE: 1" = 1'-0"



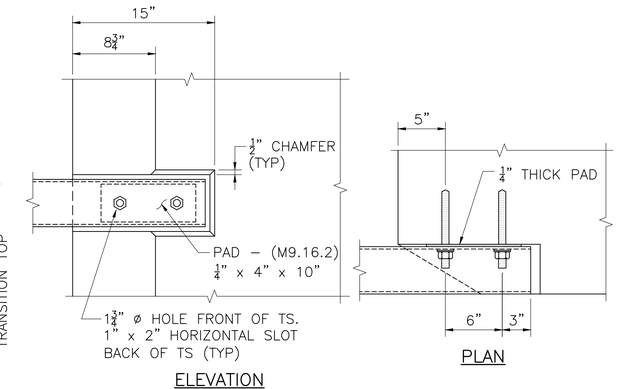
SECTION 6 AT SAFETY CURB

SCALE: 1" = 1'-0"



ELEVATION AT SIDEWALK

SCALE: 1" = 1'-0"

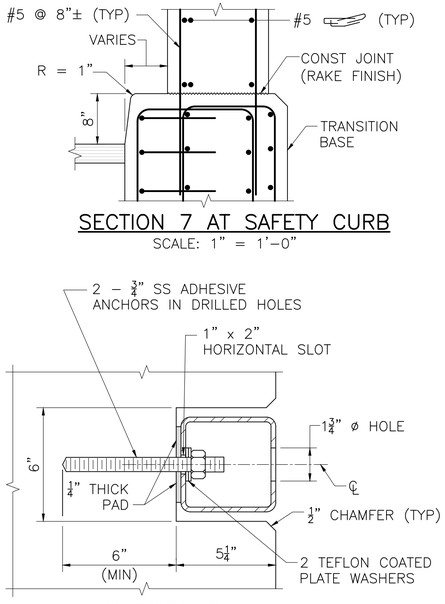


ELEVATION

PLAN

RAIL ATTACHMENT

SCALE: 1½" = 1'-0"

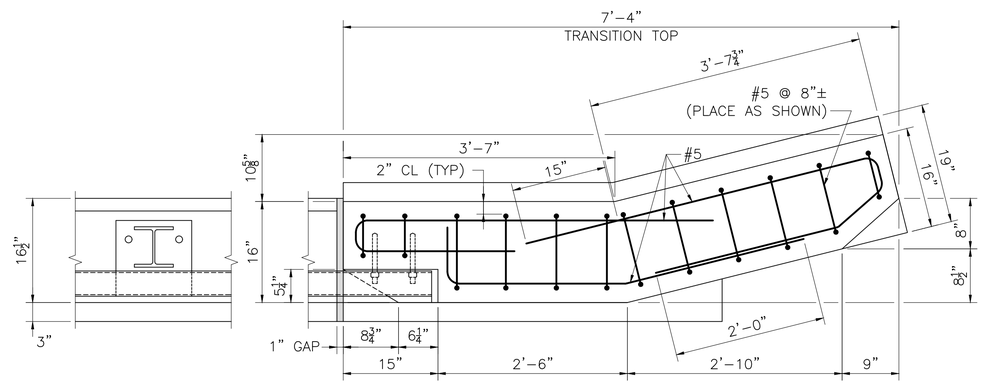


SECTION 7 AT SAFETY CURB

SCALE: 1" = 1'-0"

SECTION 8

SCALE: 3" = 1'-0"



SECTION 4

SCALE: 1" = 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 ⅞" ø SS BOLT. SS BOLTS SHALL BE ⅞" ø x 1½" LONG FULLY THREADED AISI TYPE 304N STAINLESS STEEL. INSERTS FOR ⅞" SS BOLTS SHALL BE GALVANIZED AND CAST INTO THE TRANSITION.

2. FOR AN APPROACH GRADE UP TO 3%, THE TRANSITION MAY BE CAST SQUARE AND SET PLUMB WITH THE MINIMUM EMBEDMENT DEPTH SHOWN. THE TERMINAL CONNECTOR INSERT GROUP SHALL BE SQUARE TO THE POST.

   FOR AN APPROACH GRADE IN EXCESS OF 3%, THE TRANSITION TOP AND THE TOP OF CURB SHALL FOLLOW THE APPROACH GRADE. THE HEIGHT OF THE TRANSITION TOP SHALL VARY PROVIDED THAT THE MINIMUM DIMENSIONS SHOWN ON THE CONSTRUCTION DRAWINGS ARE MET. THE BOTTOM OF THE TRANSITION BASE SHALL BE SET LEVEL WITH THE MINIMUM EMBEDMENT DEPTH SHOWN. THE TERMINAL CONNECTOR INSERT GROUP SHALL BE SLOPED TO FOLLOW THE APPROACH GRADE.

3. USE LATEST CONTRACT COMPLETION YEAR IN EFFECT WHEN THE FIRST GUARDRAIL TRANSITION IS CAST. USE THIS YEAR FOR ALL GUARDRAIL TRANSITIONS.

4. ALL CONCRETE FOR THE PRECAST HIGHWAY GUARDRAIL TRANSITION SHALL BE 5000 PSI, ¾", 685 HP CEMENT CONCRETE.

5. 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 1½" 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.

MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL PART II CONVENTIONAL CONSTRUCTION S3-TL4 BRIDGE RAILING AND PRECAST GUARDRAIL TRANSITION DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER — DATE

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

TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR S3-TL4 RAILING

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L MURPHY, JR.
CIVIL
No. 41049
REGISTERED PROFESSIONAL ENGINEER
06/27/2023

COMMONWEALTH OF MASSACHUSETTS
ERIC OHANIAN
CIVIL
No. 53235
REGISTERED PROFESSIONAL ENGINEER
06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

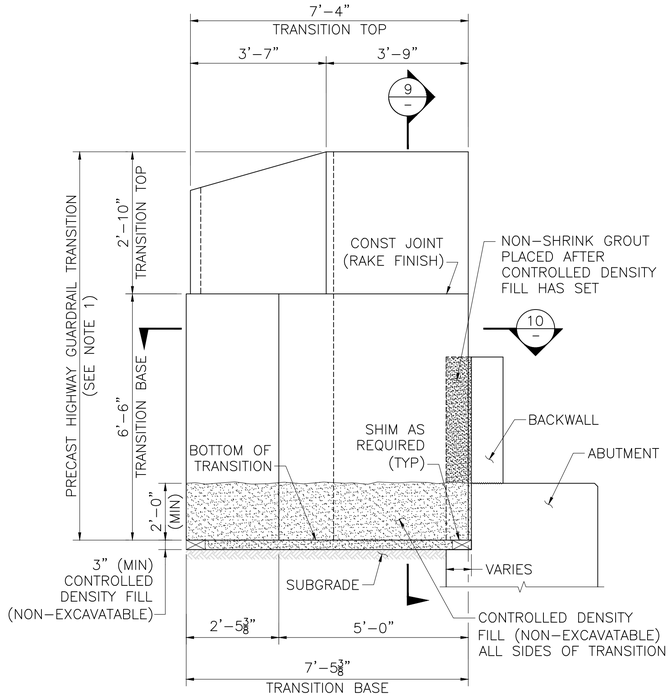
MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_06_DETAILS.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

TOP OF PRECAST GUARDRAIL TRANSITION S3-TL4 BRIDGE RAILING

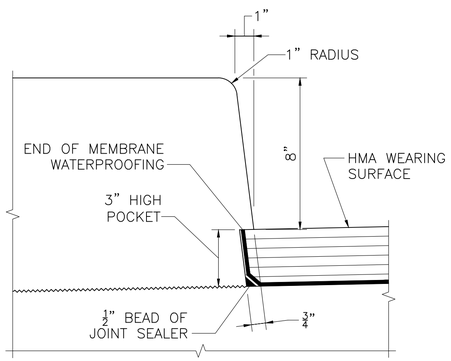
SCALE: AS SHOWN

Last Saved: 6/22/2023
Plotted On: Jun 22, 2023-3:24pm By: SSak
Tighe & Bond: J:\B\B5108 town of bolton\004 - forbush mill road culverts\drawings, figures\AutoCAD\Sheet\B5108-004_06_DETAILS.dwg



PRECAST HIGHWAY GUARDRAIL TRANSITIONS ELEVATION AT SPLAYED WINGWALL (MASSDOT 3.8.9)

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

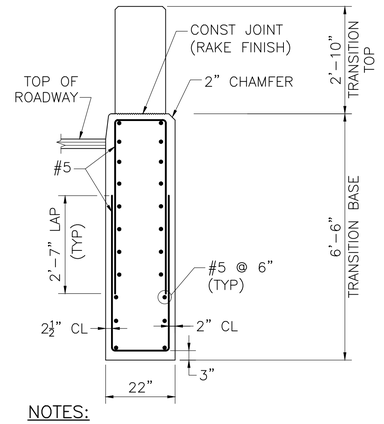


NOTES:

1. TURN MEMBRANE UP INTO 3" HIGH POCKET.

FACE OF SAFETY CURB DETAILS (MASSDOT 9.8.1)

SCALE: 3" = 1'-0"



NOTES:

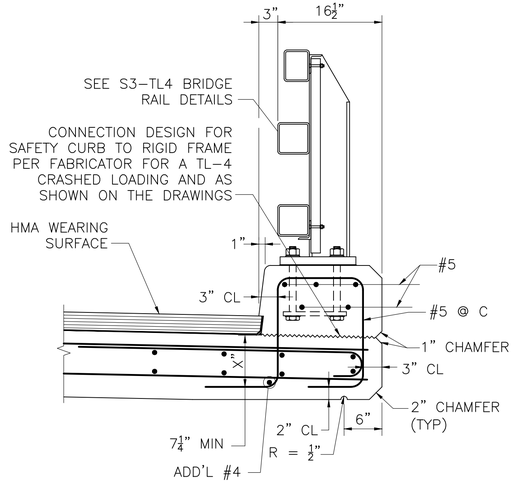
1. REINFORCEMENT OF THE TRANSITION TOP IS NOT SHOWN FOR CLARITY.

PRECAST HIGHWAY GUARDRAIL TRANSITIONS VERTICAL SECTION FOR S3-TL4 (MASSDOT 3.8.4)

SECTION 9 / –

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

FOR S3-TL4 RAILING AT SAFETY CURB

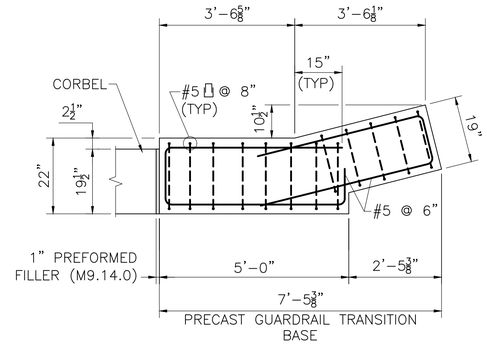


S3-TL4 RAIL SECTION THRU SAFETY CURB (MASSDOT 9.3.1)

SCALE: 1" = 1'-0"

NOTES:

1. SIZE AND SPACING OF THE TRANSVERSE RIGID FRAME REINFORCEMENT AS PER THE CONTRACTOR'S DESIGN. #4 MIN BAR SIZE AND 6" MAX SPACING SHALL BE PROVIDED TO MATCH SAFETY CURB REINFORCING.
2. SIZE AND SPACING OF THE ADDITIONAL REINFORCEMENT AS PER THE CONTRACTOR'S DESIGN.
3. C = 6" MAX SPACING SHALL BE PROVIDED. USE THE SAME SPACING FOR THE PRIMARY SAFETY CURB REINFORCEMENT AS THE TRANSVERSE RIGID FRAME REINFORCEMENT.
4. CONTRACTOR IS RESPONSIBLE FOR DESIGN OF SAFETY CURB CONNECTION TO RIGID FRAME INCLUDING FORCES FROM S3-TL4 BARRIER.



NOTE:

WINGWALL REINFORCEMENT NOT SHOWN FOR CLARITY.

PRECAST HIGHWAY GUARDRAIL TRANSITIONS HORIZONTAL SECTION (MASSDOT 3.8.5)

SECTION 10 / –

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

PRECAST HIGHWAY GUARDRAIL TRANSITION NOTES (MASSDOT 3.8.3):

1. PRECAST GUARDRAIL TRANSITION SHALL BE 5000 PSI, 3/4 IN, 685 HP CEMENT CONCRETE.
2. GRAVEL BORROW SHALL BE PLACED AND THOROUGHLY COMPACTED TO THE GRADE OF 3" (MIN) BELOW THE INTENDED BOTTOM OF THE PRECAST GUARDRAIL TRANSITION BASE AND TO A HEIGHT OF 2'-0" (MIN) ON ALL SIDES OF THE TRANSITION BASE TO FORM A TRENCH IN WHICH TO SET THE TRANSITION. WHERE NO GRAVEL BORROW IS REQUIRED BELOW THE BASE, IT SHALL BE PLACED ON UNDISTURBED SOIL.
3. CONTRACTOR SHALL SET THE PRECAST GUARDRAIL TRANSITION TO THE REQUIRED ELEVATION AND ALIGNMENT, AND BACKILL PRECAST GUARDRAIL TRANSITION WITH CONTROLLED DENSITY FILL (NON-EXCAVATABLE) TO THE ELEVATION SHOWN.
4. AFTER CONTROLLED DENSITY FILL (NON-EXCAVATABLE) HAS SET FILL THE GAPS BETWEEN GUARDRAIL TRANSITION AND BACKWALL AND ABUTMENT WITH NON-SHRINK GROUT UP TO THE TOP OF BACKWALL.
5. THE REST OF REINFORCEMENT IS NOT SHOWN FOR CLARITY.

MASSDOT STANDARD DETAILS:

MASSDOT 2013 LRFD BRIDGE MANUAL PART II CONVENTIONAL CONSTRUCTION S3-TL4 BRIDGE RAILING AND PRECAST GUARDRAIL TRANSITION DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 3 BRIDGE ENGINEER — DATE

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

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS — DANIEL L MURPHY, JR. CIVIL No. 41049 REGISTERED PROFESSIONAL ENGINEER — 06/27/2023

COMMONWEALTH OF MASSACHUSETTS — ERIC OHANIAN CIVIL No. 53235 REGISTERED PROFESSIONAL ENGINEER — 06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton, Massachusetts

MassDOT Bridge No. B-15-010 (CER)

MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_06_DETAILS.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

PRECAST GUARDRAIL TRANSITION & S3-TL4 BRIDGE RAILING DETAILS

SCALE: AS SHOWN

Last Saved: 6/22/2023
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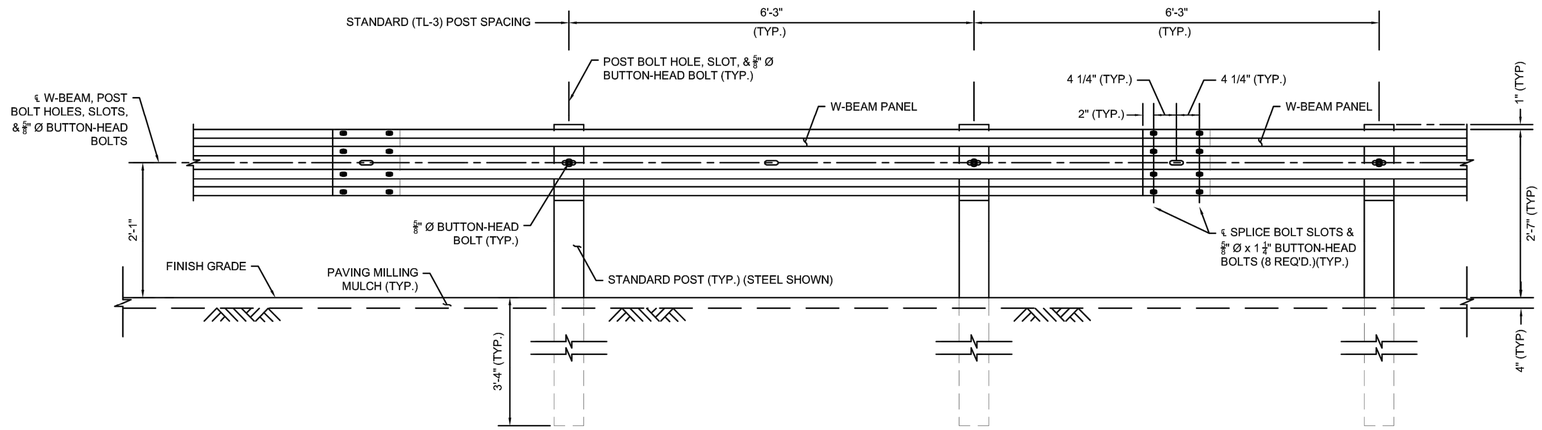
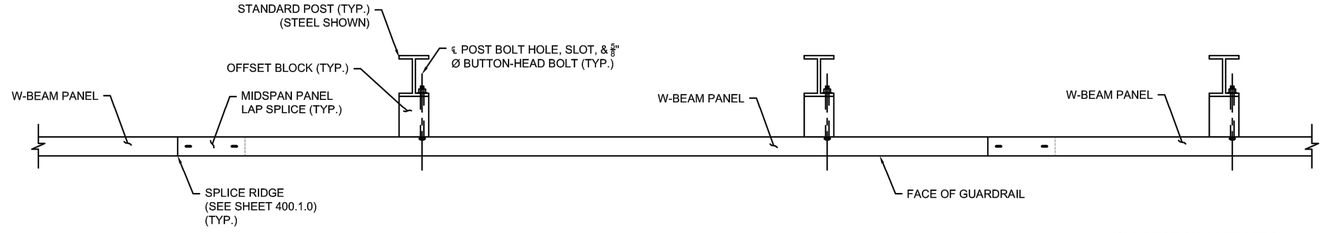
Tighe & Bond: J:\B\b5108 town of bolton\004 - forbush mill road culverts\drawings, figures\AutoCAD\Sheet\B5108-004_06_DETAILS.dwg

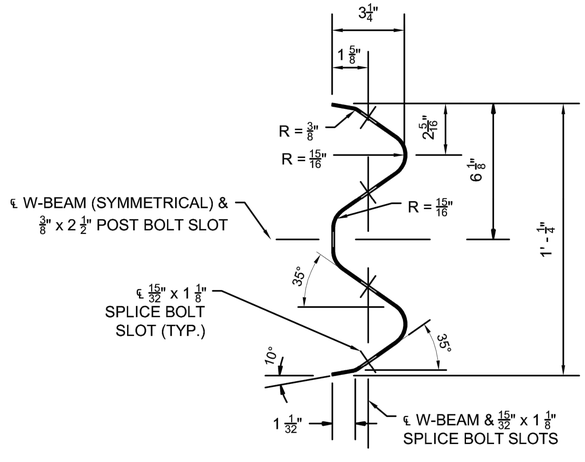


ELEVATION

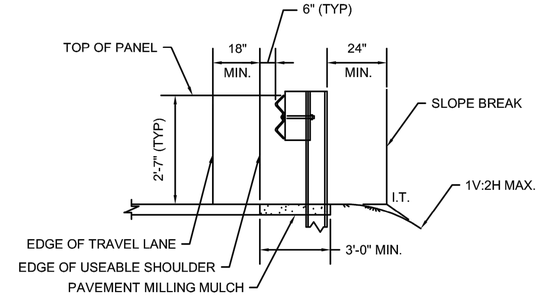


PLAN

GUARDRAIL, TL–3



W-BEAM PANEL SECTION



FLUSH WITH ROADWAY

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division

MASSDOT STANDARD DETAILS:

MASSDOT HIGHWAY DIVISION, CONSTRUCTION STANDARD DETAILS, GUARDRAIL, TL–3 & W–BEAM PANEL DETAILS

Tighe&Bond

COMMONWEALTH OF MASSACHUSETTS
DANIEL L MURPHY, JR.
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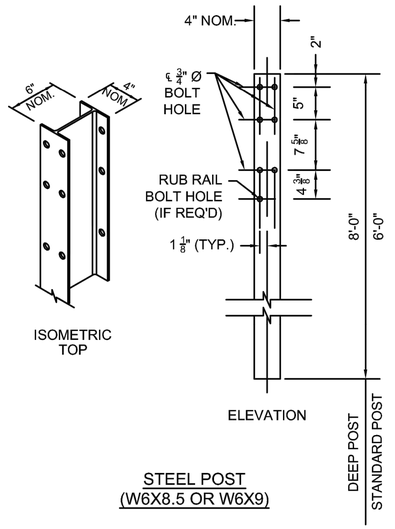
APPROVED BY:	DLM

HIGHWAY GUARDRAIL TL-3 & W-BEAM PANEL DETAILS

SCALE: NO SCALE

SHEET 21 OF 24

Last Saved: 6/22/2023
Plotted On: Jun 22, 2023 3:24pm By: SSak
Tighe & Bond: J:\B\B5108 town of bolton\004 - forbush mill road culverts\drawings_figures\AutoCAD\Sheet\B5108-004_06_DETAILS.dwg



STEEL POST
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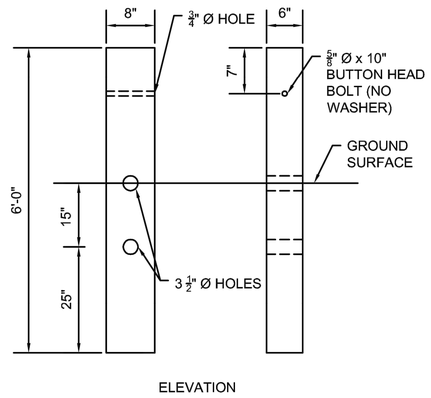
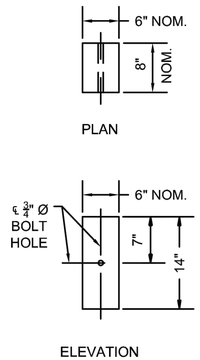
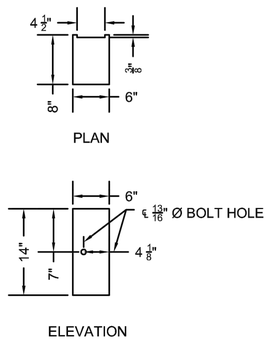


CRT POST (TIMBER ONLY)
(6" X 8" NOMINAL)
USE ONLY WHERE SPECIFIED



W-BEAM TIMBER OFFSET BLOCK
FOR USE WITH TIMBER POSTS
(6"X 8" NOMINAL)

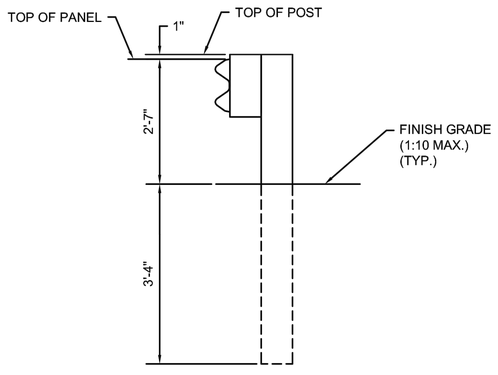


W-BEAM TIMBER OFFSET BLOCK
FOR USE WITH STEEL POSTS
(6"X8" NOMINAL)

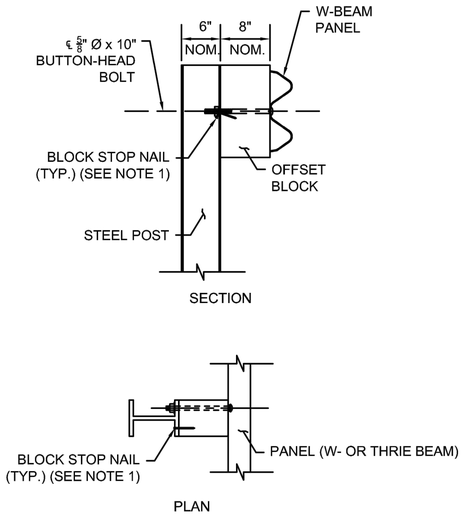
NOTES:

1. DRIVE ONE NAIL PER W BEAM TIMBER OFFSET BLOCK TO PREVENT BLOCK ROTATION. USE ASTM A153 HOT DIP GALVANIZED STEEL 3 ½" TYPE 16D NAILS. FOR STEEL POSTS, DRIVE THE NAIL THROUGH THE UNUSED FLANGE BOLT HOLE AND BEND THE NAIL SO ITS HEAD CONTACTS THE FLANGE.
2. DEEP STEEL POSTS SHALL ONLY BE USED WHERE INDICATED IN THESE STANDARDS OR THE PLANS.
3. WHERE BACK OF POSTS ARE EXPOSED AND PLACED WITHIN 2'-0" OF A SIDEWALK, SEPARATED BIKE FACILITY OR SHARED-USE PATH, TIMBER POSTS SHALL BE USED. ALTERNATIVELY, STEEL POSTS WITH A TIMBER BACKING, PER 400.5.1, MAY BE SUBSTITUTED AT NO ADDITIONAL COST. WHEN TIMBER POSTS ARE USED, ONE OF THE FOLLOWING SAFETY TREATMENTS IS REQUIRED FOR ALL BOLTS PROTRUDING FROM THE BACK FACE OF THE POST:
   - A. AFTER TIGHTENING THE NUT, TRIM THE PROTRUDING POST BOLT FLUSH WITH THE NUT AND GALVANIZE PER M7.04.11;
   - B. USE 15" POST BOLTS AND COUNTERSINK THE WASHER AND NUT BETWEEN 1" AND 1 ½" DEEP INTO THE BACK FACE OF THE POST; OR
   - C. USE 15" POST BOLT SLEEVE NUTS AND WASHERS.

END TREATMENTS AND TRANSITIONS, WHERE SPECIFIC MATERIAL TYPES ARE SPECIFIED, ARE EXEMPT FROM THESE REQUIREMENTS.



GUARDRAIL MOUNTING
HEIGHT & POST DEPTH



W-BEAM
STEEL POST

Tighe&Bond

DANIEL L MURPHY, JR. CIVIL No. 41049 REGISTERED PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS
06/27/2023

ERIC OHANIAN CIVIL No. 53235 REGISTERED PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS
06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton,
Massachusetts

MassDOT Bridge No.
B-15-010 (CER)

MARK	DATE	DESCRIPTION

PROJECT NO:	B5108-004
DATE:	JUNE 2023
FILE:	B5108-004_06_DETAILS.dwg
DRAWN BY:	SDS
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

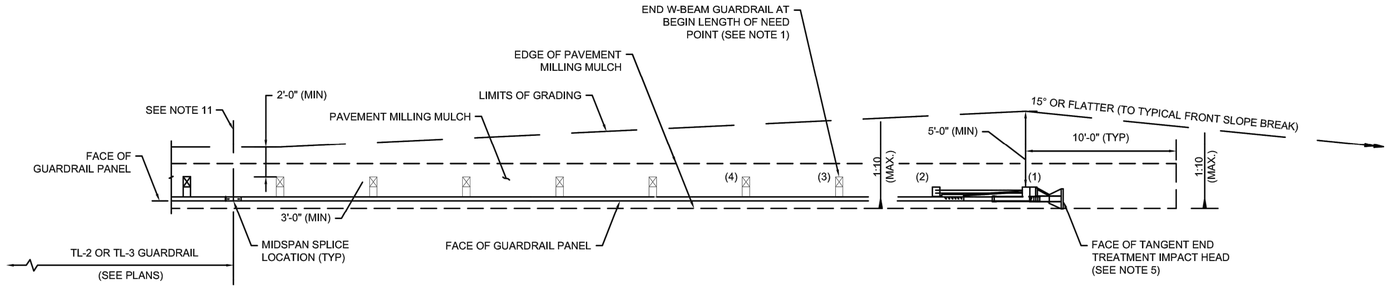
HIGHWAY GUARDRAIL
POST & OFFSET BLOCK
DETAILS

SCALE: NO SCALE

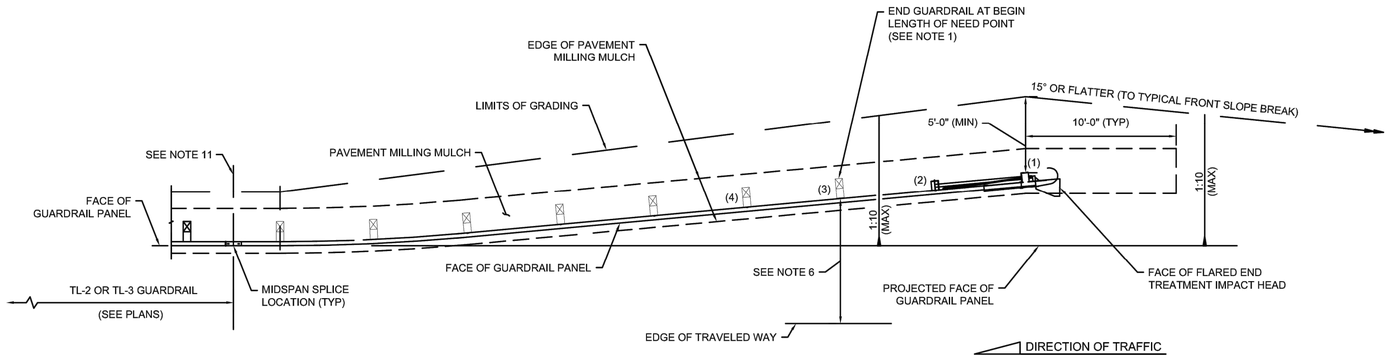
SHEET 22 OF 24

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division

MASSDOT STANDARD DETAILS:
MASSDOT HIGHWAY DIVISION,
CONSTRUCTION STANDARD DETAILS,
GUARDRAIL POST &
OFFSET BLOCK DETAILS



TANGENT END TREATMENT SEGMENT - PLAN



FLARED END TREATMENT SEGMENT - PLAN

1. INSTALL GUARDRAIL AT STATION AND OFFSET SHOWN IN THE PLANS. THE END OF THE GUARDRAIL SHOWN IN THE PLANS CORRESPONDS WITH THE BEGIN LENGTH OF NEED POINT FOR THE END TREATMENT (SHOWN AT POST 3 IN THESE STANDARDS, BUT MAY VARY BY MANUFACTURER).
2. PROPRIETARY END TREATMENTS MAY VARY IN SIZE AND SHAPE FROM WHAT IS DEPICTED IN THESE STANDARDS. HOWEVER, THE MAXIMUM SLOPES AND MINIMUM OFFSETS DIMENSIONED FROM THE POSTS SHOWN HEREIN SHALL STILL APPLY.
3. END TREATMENT TEST LEVEL AND TYPE (TANGENT OR FLARED) SHALL BE SPECIFIED IN THE PLANS.
4. CONSTRUCT TANGENT AND FLARED END TREATMENTS IN ACCORDANCE WITH THE MANUFACTURER'S UNIQUE DRAWING DETAILS, PROCEDURES, AND SPECIFICATIONS.
5. AT THE DISCRETION OF THE ENGINEER, THE FACE OF THE TANGENT END TREATMENT IMPACT HEAD MAY BE OFFSET UP TO 2'-0" FROM THE PROJECTED FACE OF GUARDRAIL TO MINIMIZE NUISANCE HITS. THE OFFSET SHALL OCCUR OVER THE ENTIRE LENGTH OF THE END TREATMENT UNLESS OTHERWISE SPECIFIED BY THE MANUFACTURER.
6. LATERAL OFFSET OF FLARED END TREATMENT SHALL BE DETERMINED BY THE DESIGN ENGINEER FOLLOWING THE METHODOLOGY FOUND IN THE *ROADSIDE DESIGN GUIDE* AND SHOULD FALL WITHIN THE ALLOWABLE TOLERANCES SPECIFIED BY THE MANUFACTURER. LATERAL OFFSET SHALL BE MEASURED FROM THE EDGE OF TRAVELED WAY TO THE FACE OF THE GUARDRAIL AT POST #3.
7. END TREATMENTS SHALL NOT TERMINATE CURVED W-BEAM SEGMENTS.
8. END TREATMENT IMPACT HEAD DELINEATION SHALL CONFORM TO 601.63.
9. INSTALL GRADING AS SHOWN HEREIN UNDER SEPARATE PAY ITEMS.
10. SEE 400.2.2 FOR APPROACH TERMINAL GEOMETRY FOR GUARDRAIL INSTALLED ADJACENT TO CURB AND DOUBLE FACED GUARDRAIL.
11. MAINTAIN 2'-0" (MIN) OFFSET TO FRONT SLOPE BREAK DOWNSTREAM OF MIDSPAN SPLICE LOCATION AT ALL TIMES. IF, DOWNSTREAM OF THE SPLICE, GRADING CONSTRAINTS INHIBIT THIS MINIMUM OFFSET THEN USE DEEP STEEL POSTS AND TRANSITION TO A SLOPE BREAK CONDITION DESIGN PER THE DETAIL IN 400.1.5 UNTIL THE 2'-0" OFFSET CAN BE MET.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division

MASSDOT STANDARD DETAILS:
MASSDOT HIGHWAY DIVISION, CONSTRUCTION STANDARD DETAILS, GUARDRAIL, APPROACH GEOMETRY

Tighe&Bond

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06/27/2023

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ERIC OHANIAN
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06/26/2023

FINAL DESIGN

Forbush Mill Road over Still River Proposed Bridge

Town of Bolton

Bolton,
Massachusetts

MassDOT Bridge No.
B-15-010 (CER)

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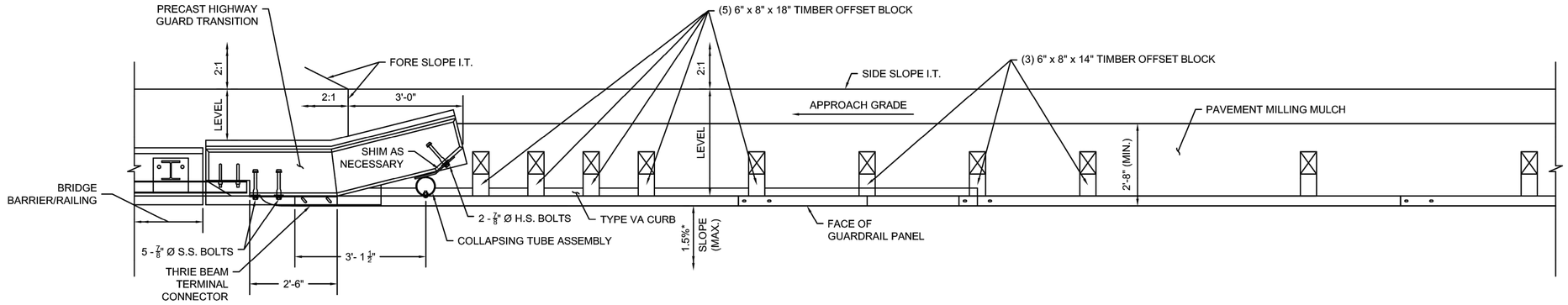
DESIGNED/CHECKED BY:	EAO
APPROVED BY:	DLM

GUARDRAIL APPROACH GEOMETRY

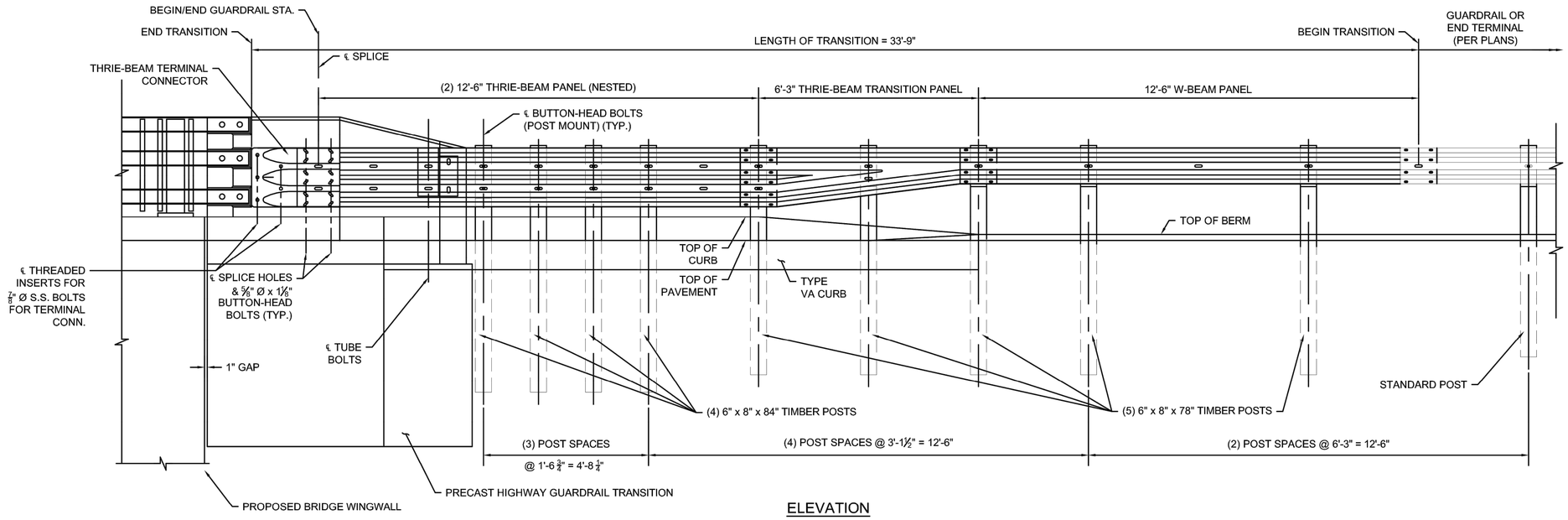
SCALE: NO SCALE

SHEET 23 OF 24

Last Saved: 6/22/2023
Plotted On: Jun 22, 2023 3:24pm By: SSak
Tighe & Bond: J:\B\B5108 town of bolton\004 - forbush mill road culverts\drawings, figures\AutoCAD\Sheet\B5108-004_06_DETAILS.dwg



PLAN



ELEVATION

GUARDRAIL TRANSITION TO BRIDGE RAIL

Tighe&Bond

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GUARDRAIL TRANSITION TO BRIDGE RAIL (FACE OF CURB)

SCALE: NO SCALE

SHEET 24 OF 24

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division

MASSDOT STANDARD DETAILS:
MASSDOT HIGHWAY DIVISION, CONSTRUCTION STANDARD DETAILS, GUARDRAIL TRANSITION TO BRIDGE RAIL (FACE OF CURB)

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Plotted On: Jun 22, 2023 - 3:24pm By: SSak
Tighe & Bond: J:\B\b5108 town of bolton\004 - forbush mill road culverts\drawings, figures\AutoCAD\Sheet\B5108-004_06_DETAILS.dwg