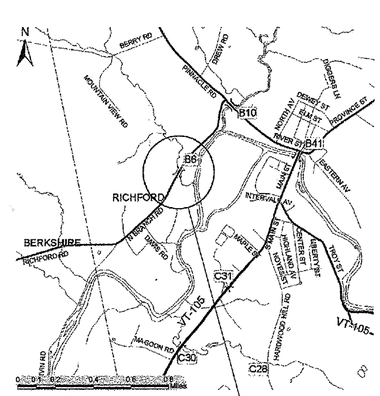
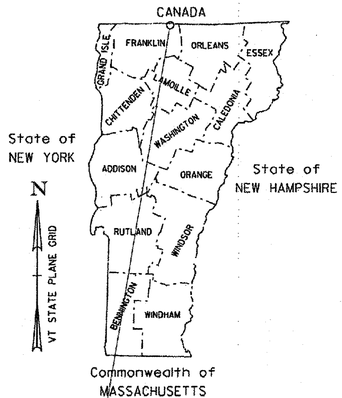
STATE OF VERMONT
AGENCY OF TRANSPORTATION





RICHFORD
BRF 0302(29)

PROPOSED IMPROVEMENT
BRIDGE PROJECT

TOWN OF RICHFORD

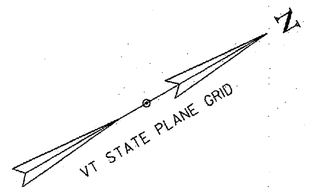
COUNTY OF FRANKLIN

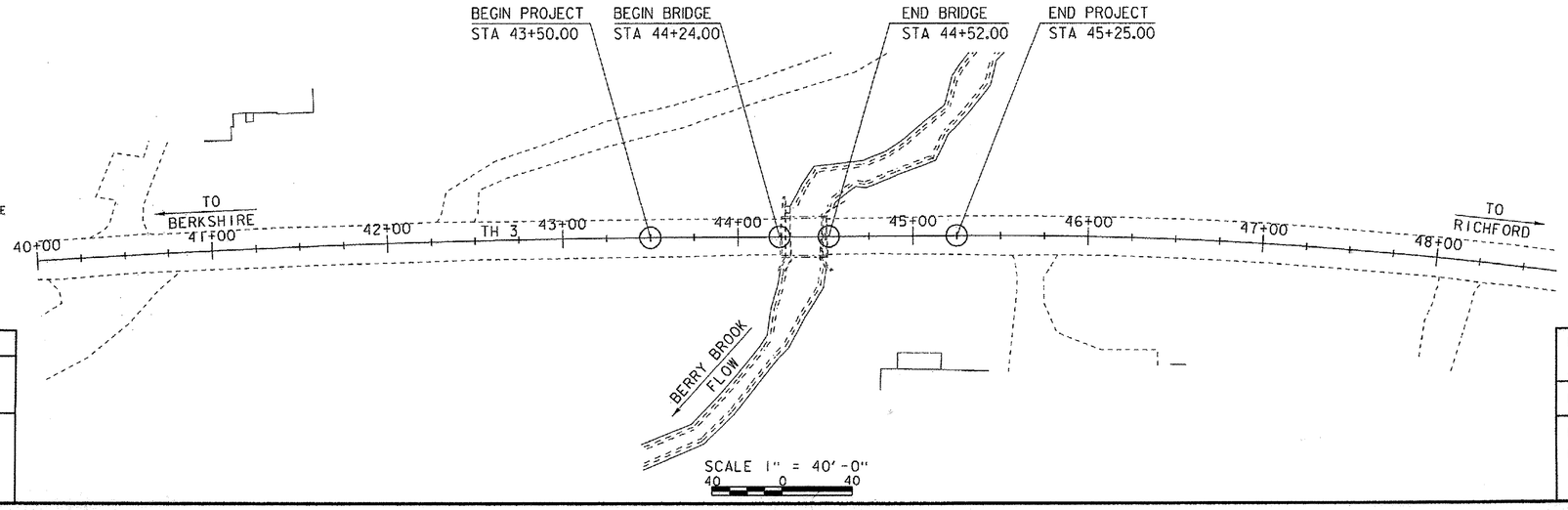
ROUTE NO : TH 3 (FAS 0302)(RURAL MAJOR COLLECTOR) BRIDGE NO : 6

PROJECT LOCATION : BEGINNING AT A POINT ON TH 3, APPROXIMATELY 1.2 MILES WEST OF THE JUNCTION WITH TH 1.

PROJECT DESCRIPTION : REPLACEMENT OF THE EXISTING BRIDGE WITH A CONCRETE ARCH AND RELATED ROADWAY AND CHANNEL WORK.

LENGTH OF STRUCTURE :	28.00 FEET.
LENGTH OF ROADWAY :	147.00 FEET.
LENGTH OF PROJECT :	175.00 FEET.





RECORD PLANS

CONTRACTOR: G. W. TATRO CONSTRUCTION – JEFFERSONVILLE, VT

RESIDENT ENGINEER: SCOTT WHEATLEY

CONSTRUCTION BEGAN: JULY 30, 2015

CONSTRUCTION COMPLETE: AUGUST 27, 2015

RECORD PLANS BY: SCOTT WHEATLEY & AARON JAMES

I HEREBY CERTIFY THAT ALL THE CONSTRUCTION REQUIRED BY THIS SET OF DRAWINGS HAS BEEN ACCOMPLISHED AS INDICATED HEREIN.

BY Scott J. Wheatley RESIDENT ENGINEER

DATE July 29, 2016

NOTE: Any further information concerning final quantities, amounts or other details relative to this project may be found at Central Files in the electronic archives.

CONSTRUCTION IS TO BE CARRIED ON IN ACCORDANCE WITH THESE PLANS AND THE STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011, AS APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION ON JULY 20, 2011 FOR USE ON THIS PROJECT, INCLUDING ALL SUBSEQUENT REVISIONS AND SUCH REVISED SPECIFICATIONS AND SPECIAL PROVISIONS AS ARE INCORPORATED IN THESE PLANS.

QUALITY ASSURANCE PROGRAM : LEVEL 2

SURVEYED BY : L. ORVIS

SURVEYED DATE : 4/9/2012

DATUM

VERTICAL NAVD88

HORIZONTAL NAD (83) 1996

DIRECTOR OF PROJECT DELIVERY

APPROVED [signature] DATE 12/12/2014

PROJECT MANAGER : CAROLYN CARLSON, P.E.

PROJECT NAME : RICHFORD

PROJECT NUMBER : BRF 0302 (29)

SHEET 1 OF 36 SHEETS

STATE OF VERMONT
AGENCY OF TRANSPORTATION

PRELIMINARY INFORMATION SHEET (BRIDGE)

Version
LRFD

INDEX OF SHEETS

PLAN SHEETS

STANDARDS LIST

E-193	PAVEMENT MARKING DETAILS	08-18-1995
G-1	STEEL BEAM GUARDRAIL DETAILS (POST, DELINEATOR, TYPICALS)	02-10-2014
G-1D	STEEL BEAM GUARDRAIL DETAILS (END TERMINAL, ANCHOR, MEDIAN)	02-10-2014
G-19	GENERIC GRADING PLANS FOR GUARDRAIL END TERMINALS	11-15-2002
S-360A	BRIDGE RAILING, GALVANIZED 2 RAIL BOX BEAM	04-23-2012
S-360B	GUARDRAIL APPROACH SECTION, GALVANIZED 2 RAIL BOX BEAM	04-23-2012
S-363	THRIE BEAM TO STANDARD STEEL BEAM TRANSITION SECTION	04-23-2012
T-1	TRAFFIC CONTROL GENERAL NOTES	08-06-2012
T-10	CONVENTIONAL ROADS CONSTRUCTION APPROACH SIGNING	08-06-2012
T-17	TRAFFIC CONTROL MISCELLANEOUS DETAILS	08-06-2012
T-28	CONSTRUCTION SIGN DETAILS	08-06-2012
T-30	CONSTRUCTION SIGN DETAILS	08-06-2012
T-31	CONSTRUCTION SIGN DETAILS	08-06-2012
T-42	BRIDGE NUMBER PLAQUE	04-09-2014
T-45	SQUARE TUBE SIGN POST AND ANCHOR	01-02-2013

STRUCTURES DETAIL SHEETS

SD-501.00	CONCRETE DETAILS AND NOTES	5/7/2010
SD-502.00	CONCRETE DETAILS AND NOTES	5/7/2010

FINAL HYDRAULIC REPORT

HYDROLOGIC DATA

Date: February 2014

DRAINAGE AREA : 4.7 sq. mi.
CHARACTER OF TERRAIN : Hilly, mixture of open and forested land cover
STREAM CHARACTERISTICS : Sinuous, aluvial with low banks to floodplain relief
NATURE OF STREAMBED : Mostly sand, gravel and silt with some cobbles

PEAK FLOW DATA

Q 2.33 =	250 cfs	Q 50 =	800 cfs
Q 10 =	500 cfs	Q 100 =	950 cfs
Q 25 =	650 cfs	Q 500 =	1330 cfs

DATE OF FLOOD OF RECORD: Unknown
ESTIMATED DISCHARGE: Unknown
WATER SURFACE ELEV.: Unknown
NATURAL STREAM VELOCITY : @ Q50 = 8.0 fps
ICE CONDITIONS : Light to moderate
DEBRIS: Light to moderate
DOES THE STREAM REACH MAXIMUM HIGHWATER ELEV. RAPIDLY? No
IS ORDINARY RISE RAPID? No
IS STAGE AFFECTED BY UPSTREAM OR DOWNSTREAM CONDITIONS? Yes
IF YES, DESCRIBE: Flood flows on the Missisquoi River may back up through this site.
That was not considered in this final hydraulics. Water elevations may be higher than shown.

WATERSHED STORAGE: < 1%
HEADWATERS:
UNIFORM: X
IMMEDIATELY ABOVE SITE:

EXISTING STRUCTURE INFORMATION

STRUCTURE TYPE: Single span concrete T-beam bridge
YEAR BUILT: 1900
CLEAR SPAN(NORMAL TO STREAM): 21'
VERTICAL CLEARANCE ABOVE STREAMBED: 5'
WATERWAY OF FULL OPENING: 125 sq. ft.
DISPOSITION OF STRUCTURE: Remove and replace with new structure
TYPE OF MATERIAL UNDER SUBSTRUCTURE: See boring logs

WATER SURFACE ELEVATIONS AT:

Q2.33 =	429.9'	VELOCITY =	5.9 fps
Q10 =	431.3'	"	7.5 fps
Q25 =	431.9'	"	7.6 fps
Q50 =	433.4'	"	8.0 fps
Q100 =	433.9'	"	9.1 fps

LONG TERM STREAMBED CHANGES: Scour through bridge area.

IS THE ROADWAY OVERTOPPED BELOW Q100: No
FREQUENCY: Above Q100
RELIEF ELEVATION: 436.2'
DISCHARGE OVER ROAD @Q100: 0 cfs

UPSTREAM STRUCTURE

TOWN: Richford — DISTANCE: 4,500'
HIGHWAY # : TH 8 — STRUCTURE #: 26
CLEAR SPAN: Not available — CLEAR HEIGHT: NA
YEAR BUILT: Not available — FULL WATERWAY: NA
STRUCTURE TYPE: Not available

DOWNSTREAM STRUCTURE

TOWN: Richford — DISTANCE: 800'
HIGHWAY # : Confluence Missisquoi River — STRUCTURE #:
CLEAR SPAN: — CLEAR HEIGHT:
YEAR BUILT: — FULL WATERWAY:
STRUCTURE TYPE:

LRFR LOAD RATING FACTORS

LOADING LEVELS	TRUCK						
	H-20	HL-93	3S2	6 AXLE	3A. STR.	4A. STR.	5A. SEMI
TONNAGE	20	36	36	66	30	34.5	38
INVENTORY							
POSTING							
OPERATING							
COMMENTS:							

PROPOSED STRUCTURE

STRUCTURE TYPE: Single span precast concrete structure

CLEAR SPAN(NORMAL TO STREAM): 26'
VERTICAL CLEARANCE ABOVE STREAMBED: 6'
WATERWAY OF FULL OPENING: 175 sq. ft.

WATER SURFACE ELEVATIONS AT:

Q2.33 =	429.8'	VELOCITY=	5.9 fps
Q10 =	431.0'	"	7.5 fps
Q25 =	431.4'	"	7.6 fps
Q50 =	431.7'	"	8.0 fps
Q100 =	431.9'	"	8.4 fps

IS THE ROADWAY OVERTOPPED BELOW Q100: No
FREQUENCY: Above Q100
RELIEF ELEVATION: 436.6'
DISCHARGE OVER ROAD @Q100: 0 cfs

AVERAGE LOW ELEVATION OF SUPERSTRUCTURE: 433.6'
VERTICAL CLEARANCE: @ Q50 = 1.9'

SCOUR: Contraction scour = 3' at Q100 and 4' at Q200.

REQUIRED CHANNEL PROTECTION: Stone Fill, Type II

PERMIT INFORMATION

AVERAGE DAILY FLOW:	10 cfs	DEPTH OR ELEVATION:
ORDINARY LOW WATER:	5 cfs	Depth = 0.5'
ORDINARY HIGH WATER:	110 cfs	Depth = 2.0'

TEMPORARY BRIDGE REQUIREMENTS

STRUCTURE TYPE: No temporary bridge required.
CLEAR SPAN (NORMAL TO STREAM):
VERTICAL CLEARANCE ABOVE STREAMBED:
WATERWAY AREA OF FULL OPENING:

ADDITIONAL INFORMATION

TRAFFIC MAINTENANCE NOTES

1. MAINTAIN TRAFFIC ON AN OFF SITE DETOUR.
2. TRAFFIC SIGNALS ARE NOT NECESSARY.
3. SIDEWALKS ARE NOT NECESSARY

DESIGN VALUES

1. DESIGN LIVE LOAD		HL-93
2. FUTURE PAVEMENT	d_p:	0.0 INCH
3. DESIGN SPAN	L:	26.00 FT
4. MIN. MID-SPAN POS. CAMBER @ RELEASE (PRESTRESSED UNITS)	Δ:	---
5. PRESTRESSING STRAND	f_y:	---
6. PRESTRESSED CONCRETE STRENGTH	f'_c:	---
7. PRESTRESSED CONCRETE RELEASE STRENGTH	f'_{ci}:	---
8. CONCRETE, HIGH PERFORMANCE CLASS AA	f'_c:	---
9. CONCRETE, HIGH PERFORMANCE CLASS A	f'_c:	---
10. CONCRETE, HIGH PERFORMANCE CLASS B	f'_c:	---
11. CONCRETE, CLASS C	f'_c:	3.0 KSI
12. REINFORCING STEEL	f_y:	60 KSI
13. STRUCTURAL STEEL AASHTO M270	f_y:	---
SEE PROJECT NOTES SHEET FOR INFORMATION -- 0.14 KCF		
14. NOMINAL BEARING RESISTANCE OF SOIL	q_n:	---
15. SOIL BEARING RESISTANCE FACTOR (REFER TO AASHTO LRFD)	ϕ:	0.45
16. NOMINAL BEARING RESISTANCE OF ROCK	q_n:	---
17. ROCK BEARING RESISTANCE FACTOR (REFER TO AASHTO LRFD)	ϕ:	---
18. PILE RESISTANCE FACTOR	ϕ:	---
19. LATERAL PILE DEFLECTION	Δ:	---
20. BASIC WIND SPEED	V_{3s}:	---
21. MINIMUM GROUND SNOW LOAD	p_g:	---
22. SEISMIC DATA PGA: 0	S_s:	---
	S_1:	---
23.		---
24.		---
25.		---
26.		---

AS BUILT "REBAR" DETAIL

LEVEL I	LEVEL II	LEVEL III
TYPE:	TYPE:	TYPE:
GRADE:	GRADE:	GRADE:

TRAFFIC DATA

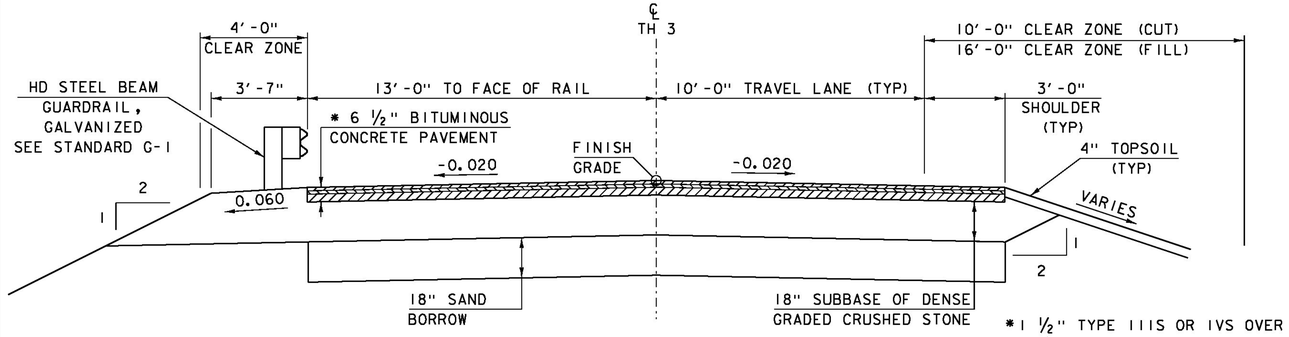
YEAR	ADT	DHV	% D	% T	ADTT
2015	830	120	56	13.9	120
2035	880	120	56	17.5	160

20 year ESAL for flexible pavement from 2015 to 2035 : 882.000
40 year ESAL for flexible pavement from 2015 to 2055 : 1,946.000
Design Speed : 50 mph

PROJECT NAME: **RICHFORD**
PROJECT NUMBER: **BRF 0302(29)**

FILE NAME: **s12j158pi.xls**
PROJECT LEADER: **C. CARLSON**
DESIGNED BY: **H. SALLS**
PRELIMINARY INFORMATION

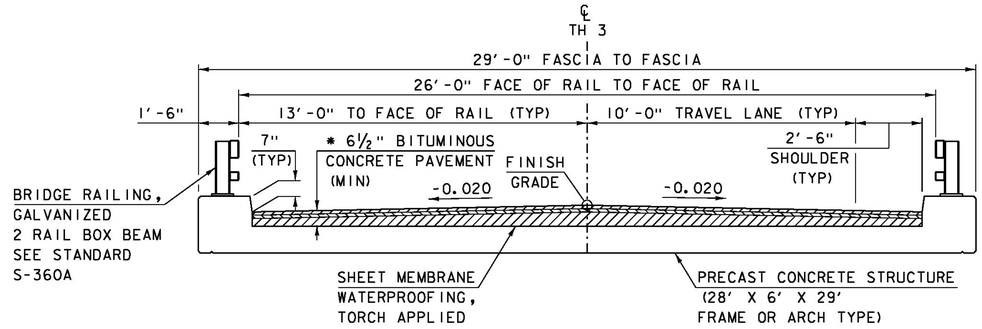
PLOT DATE: 1/6/2015
DRAWN BY: **R. PELLETT**
CHECKED BY: **H. SALLS**
SHEET 2 OF 36



ROADWAY TYPICAL SECTION

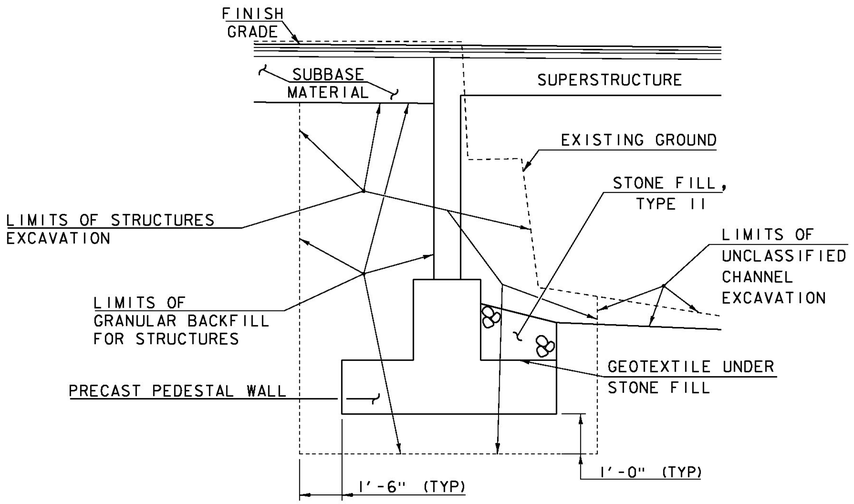
SCALE ⅜" = 1'-0"

*1 ½" TYPE 1115 OR 1V5 OVER
1 ½" TYPE 1115 OR 1V5 OVER
3 ½" TYPE 15 OR 115



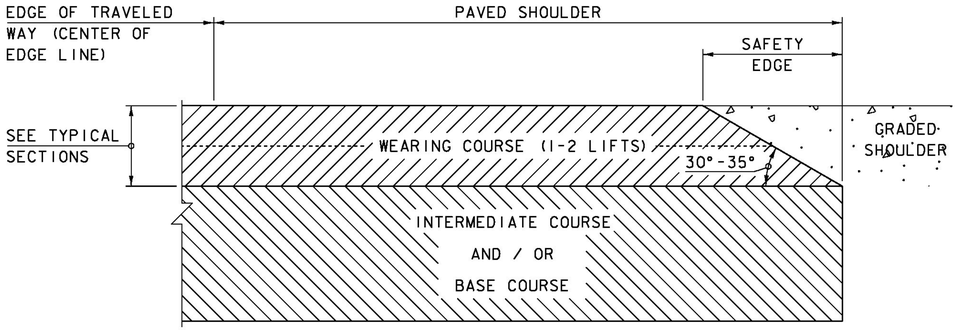
BRIDGE TYPICAL SECTION

SCALE: ⅜" = 1'-0"



ABUTMENT EARTHWORK SECTION

(NOT TO SCALE)

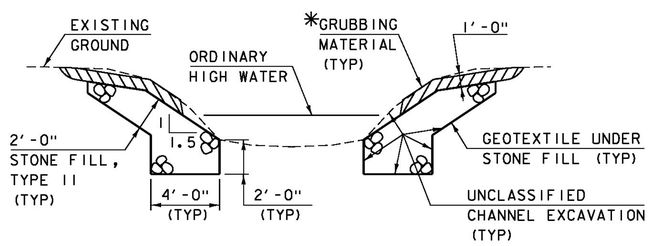


SAFETY EDGE DETAIL

NOT TO SCALE

1. THE EDGE OF PAVEMENT SHALL BE FORMED IN SUCH A WAY THAT THE BITUMINOUS CONCRETE PAVEMENT IS EXTRUDED OR COMPRESSED TO FORM THE 30 TO 35 DEGREE ANGLE. DEVICES THAT SIMPLY STRIKE-OFF THE MIX WITHOUT PROVIDING ANY COMPACTIVE EFFORT WILL NOT BE ALLOWED.

2. THE PAVED SHOULDER EXTENDS FROM THE EDGE OF TRAVELED WAY TO THE EDGE OF THE WEARING COURSE, INCLUDING THE "SAFETY EDGE".



TYPICAL CHANNEL SECTION

(NOT TO SCALE)

*WHENEVER CHANNEL SLOPE INTERSECTS ROADWAY SUBBASE, GRUBBING MATERIAL SHALL BEGIN AT THE BOTTOM OF SUBBASE.

MATERIAL TOLERANCES

(IF USED ON PROJECT)

SURFACE	
- PAVEMENT (TOTAL THICKNESS)	+/- ¼"
- AGGREGATE SURFACE COURSE	+/- ½"
SUBBASE	+/- 1"
SAND BORROW	+/- 1"

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158typ.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
TYPICAL SECTIONS

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 3 OF 36

GENERAL

1. THE CONTRACTOR WILL BE ALLOWED TO CLOSE THE ROAD TO TRAFFIC FOR INSTALLATION OF THE NEW STRUCTURE. SEE THE SPECIAL PROVISIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

2. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE STATE OF VERMONT AGENCY OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011, AND ITS LATEST REVISIONS, THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS 2012, AND ITS LATEST REVISIONS, AND THE VTRANS STRUCTURES DESIGN MANUAL.

3. ALL PRECAST CONCRETE COMPONENTS INCLUDING THE FOOTINGS, PEDESTAL WALLS, RIGID FRAME OR ARCH, HEADWALLS, WINGWALLS AND ALL CONNECTIONS BETWEEN THESE COMPONENTS SHALL BE DESIGNED BY THE PRECAST FABRICATOR. THE DESIGN CRITERIA USED FOR THIS PROJECT IS INDICATED BELOW.

4. DESIGN CRITERIA:

DESIGN LIVE LOAD:	HL - 93
FILL OVER THE STRUCTURE:	6 INCHES MINIMUM
FOUNDATION SOIL PARAMETERS	
UNIT WEIGHT:	125 PCF
FRICTION ANGLE:	36 DEGREES
COEFFICIENT OF FRICTION	
FORMED CONCRETE AGAINST SOIL:	0.35
RETAINED SOIL PARAMETERS	
UNIT WEIGHT:	140 PCF
FRICTION ANGLE:	35 DEGREES
COEFFICIENT OF FRICTION	
CONCRETE CAST AGAINST SOIL:	0.55
FORMED AGAINST SOIL:	0.45
NOMINAL BEARING RESISTANCE:	10 KSF FOR FOOTING WIDTHS > 6 FT

5. ALL DIMENSIONS SHOWN IN THE PLANS ARE HORIZONTAL OR VERTICAL AND ARE GIVEN AT 68 DEGREES FAHRENHEIT, UNLESS NOTED OTHERWISE.

6. ITEM 529.15 “REMOVAL OF STRUCTURE” SHALL INCLUDE THE REMOVAL OF THE EXISTING SUPERSTRUCTURE AND ANY PORTION OF THE EXISTING ABUTMENTS NOT REMOVED UNDER STRUCTURE EXCAVATION OR UNCLASSIFIED CHANNEL EXCAVATION.

7. THE DESIGN SHALL INCLUDE THE EFFECTS OF ALL LOADS, INCLUDING BUT NOT LIMITED TO LIVE LOAD, EARTH SURCHARGE AND HYDROSTATIC PRESSURE.

8. THE FABRICATOR SHALL BE RESPONSIBLE FOR SUPPLYING THE STATE WITH THE LRFR LOAD RATING FACTORS TO COMPLETE THE CHART SHOWN ON THE PRELIMINARY INFORMATION SHEET.

CONCRETE AND REINFORCING STEEL

9. THE RIGID FRAME OR ARCH, HEADWALLS AND WINGWALLS SHALL BE PRECAST CONCRETE CONFORMING TO SECTION 540 AND WILL BE PAID FOR UNDER THE APPROPRIATE 540 CONTRACT ITEM.

10. ALL ELEMENTS OF THE PRECAST STRUCTURE(S) SHALL BE DESIGNED BY THE PRECAST SUPPLIER, INCLUDING THE ANCHORAGE AND CONNECTIONS BETWEEN ELEMENTS. ALL ELEMENTS SHALL BE INSTALLED IN ACCORDANCE WITH THE FABRICATOR’S RECOMMENDATIONS. THE CONTRACTOR SHALL SUBMIT FABRICATION DRAWINGS FOR THE PRECAST RIGID FRAME OR ARCH IN ACCORDANCE WITH SECTION 105. IN ADDITION TO FABRICATION DRAWINGS, THE FABRICATOR SHALL PROVIDE A LOAD RATING AND SUPPORTING CALCULATIONS IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS REFERENCED IN GENERAL NOTE 1 AND THE VTRANS STRUCTURES DESIGN MANUAL, 2010. THE RATING AND SUPPORTING CALCULATIONS SHALL BE SIGNED, STAMPED AND DATED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE ENGINEERING IN THE STATE OF VERMONT. NOTE THAT THE FABRICATOR ASSUMES ALL LIABILITY FOR THE ADEQUACY AND ACCURACY OF THE RIGID FRAME OR ARCH DESIGN AND LOAD RATING.

11. WATER REPELLENT, SILANE SHALL BE FURNISHED IN ACCORDANCE WITH SECTION 514 AND SHALL BE SHOP APPLIED TO ALL EXPOSED CONCRETE SURFACES, EXCEPT THE UNDERSIDE OF THE STRUCTURE BETWEEN THE DRIP NOTCHES. ALL WORK IS INCIDENTAL TO THE APPROPRIATE 540 CONTRACT ITEM.

12. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 1” x 1”.

13. REINFORCING STEEL PLACEMENT TOLERANCES SHALL BE:
    SPACING: +/- 1 INCH
    CLEARANCE: +/- 1/4 INCH

14. PRECAST TOLERANCES:
    HEIGHT/WIDTH: +/- 1/4 INCH
    LENGTH: +/- 1/2 INCH

15. ALL REINFORCING STEEL IN THE PRECAST PEDESTAL WALLS AND FOOTINGS SHALL MEET THE REQUIREMENTS OF SECTION 507 FOR LEVEL I REINFORCING.

16. ALL REINFORCING STEEL IN THE PRECAST RIGID FRAME OR ARCH, WINGWALLS AND HEADWALLS SHALL MEET THE REQUIREMENTS OF SECTION 507 FOR LEVEL II REINFORCING.

17. PAYMENT FOR REINFORCING STEEL WILL BE INCLUDED IN THE UNIT BID PRICE FOR THE APPROPRIATE SECTION 540 CONTRACT ITEM.

18. THE PROPOSED STRUCTURE SHALL BE A THREE-SIDED RIGID FRAME OR ARCH WITH A MINIMUM CLEAR SPAN OF 26’. THE LUMP SUM COST FOR ITEM 540.10 “PRECAST CONCRETE STRUCTURE (28’-0” x 6’-0” x 29’-0” FRAME OR ARCH TYPE) SHALL INCLUDE THE PRECAST RIGID FRAME OR ARCH AND MECHANICAL CONNECTIONS.

19. THE PRECAST STRUCTURE DETAILS ARE SHOWN FOR REFERENCE ONLY. THE ACTUAL DIMENSIONS AND CONFIGURATION WILL BE DEPENDENT ON THE FABRICATOR. THE INSIDE CLEAR DIMENSION SHALL BE 26’ - 0” AND THE RISE SHALL BE 6’ - 0”.

20. NO HOLES SHALL BE DRILLED IN THE RIGID FRAME OR ARCH WITHOUT THE APPROVAL OF THE FABRICATOR AND VTRANS.

21. THE USE OF EQUIPMENT AND THE METHOD OF BACKFILLING AROUND THE BURIED STRUCTURE SHALL BE IN ACCORDANCE WITH THE MANUFACTURER’S RECOMMENDATION. CARE SHALL BE TAKEN WHEN BACKFILLING AGAINST JOINT SEALING MATERIALS.

22. JOINTS BETWEEN ALL ABUTTING PRECAST UNITS SHALL BE WATERTIGHT AND MECHANICALLY CONNECTED.

TRAFFIC CONTROL

23. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF A SITE SPECIFIC TRAFFIC CONTROL PLAN FOR ALL STAGES OF CONSTRUCTION. THE CONTRACTOR SHALL SUBMIT DETAILED TRAFFIC CONTROL PLANS TO THE RESIDENT ENGINEER FOR APPROVAL PER SUBSECTION 105.03. ALL COSTS SHALL BE INCLUDED IN ITEM 900.645 SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE).

24. THE TOWN SHALL BE RESPONSIBLE FOR SIGNING THE DETOUR; THE CONTRACTOR SHALL GIVE THE TOWN 21 DAYS NOTICE PRIOR TO ANY ROAD CLOSURE.

25. FOR MORE INFORMATION SEE THE SPECIAL PROVISIONS.

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)
FILE NAME: sl2jl58pnote.dgn	PLOT DATE: 12-JAN-2015
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
PROJECT NOTES	SHEET 4 OF 36

STATE OF VERMONT
AGENCY OF TRANSPORTATION

QUANTITY SHEET 1

SUMMARY OF ESTIMATED QUANTITIES				TOTALS		DESCRIPTIONS			
ROADWAY	EROSION CONTROL	BRIDGE	FULL C.E. ITEMS	GRAND TOTAL	FINAL	UNIT	ITEMS	ITEM NUMBER	ROUND
1				1		LS	CLEARING AND GRUBBING, INCLUDING INDIVIDUAL TREES AND STUMPS	201.10	
670				670		CY	COMMON EXCAVATION	203.15	
		50		50		CY	UNCLASSIFIED CHANNEL EXCAVATION	203.27	
160				160		CY	SAND BORROW	203.31	
80				80		CY	GRANULAR BORROW	203.32	
1				1		CY	TRENCH EXCAVATION OF EARTH, EXPLORATORY (N.A.B.I.)	204.22	
		760		760		CY	STRUCTURE EXCAVATION	204.25	
		280		280		CY	GRANULAR BACKFILL FOR STRUCTURES	204.30	
250				250		SY	COLD PLANING, BITUMINOUS PAVEMENT	210.10	
450				450		CY	SUBBASE OF DENSE GRADED CRUSHED STONE	301.35	
7				7		CWT	EMULSIFIED ASPHALT	404.65	
1				1		LU	PRICE ADJUSTMENT, ASPHALT CEMENT (N.A.B.I.)	406.50	
		78		78		SY	SHEET MEMBRANE WATERPROOFING, TORCH APPLIED	519.20	
56				56		LF	JOINT SEALER, HOT POURED	524.11	
		56		56		LF	BRIDGE RAILING, GALVANIZED 2 RAIL BOX BEAM	525.33	
		1		1		EACH	REMOVAL OF STRUCTURE (600 SF - EST.)	529.15	
		1		1		LS	PRECAST CONCRETE STRUCTURE (28' X 6' X 29' FRAME OR ARCH TYPE)	540.10	
		1		1		LS	PRECAST CONCRETE STRUCTURE (PEDESTAL WALL ABUTMENT #1)	540.10	
		1		1		LS	PRECAST CONCRETE STRUCTURE (PEDESTAL WALL ABUTMENT #2)	540.10	
		1		1		LS	PRECAST CONCRETE STRUCTURE (WINGWALL #1)	540.10	
		1		1		LS	PRECAST CONCRETE STRUCTURE (WINGWALL #2)	540.10	
		1		1		LS	PRECAST CONCRETE STRUCTURE (WINGWALL #3)	540.10	
		1		1		LS	PRECAST CONCRETE STRUCTURE (WINGWALL #4)	540.10	
		90		90		CY	STONE FILL, TYPE II	613.11	
160				160		LF	CAST-IN-PLACE CONCRETE CURB, TYPE B	616.28	
555				555		LF	REMOVING AND RESETTING FENCE	620.50	
208				208		LF	HD STEEL BEAM GUARDRAIL, GALVANIZED	621.21	
4				4		EACH	ANCHOR FOR STEEL BEAM RAIL	621.60	
4				4		EACH	GUARDRAIL APPROACH SECTION, GALVANIZED 2 RAIL BOX BEAM	621.72	
109				109		LF	REMOVAL AND DISPOSAL OF GUARDRAIL	621.80	
25				25		HR	UNIFORMED TRAFFIC OFFICERS	630.10	
400				400		HR	FLAGGERS	630.15	
			1	1		LS	FIELD OFFICE, ENGINEERS	631.10	
			1	1		LS	TESTING EQUIPMENT, CONCRETE	631.16	
			1	1		LS	TESTING EQUIPMENT, BITUMINOUS	631.17	
			3000	3000		DL	FIELD OFFICE TELEPHONE (N.A.B.I.)	631.26	
1				1		LS	MOBILIZATION/DEMOBILIZATION	635.11	
750				750		LF	4 INCH YELLOW LINE	646.21	
		170		170		SY	GEOTEXTILE UNDER STONE FILL	649.31	
	55			55		SY	GEOTEXTILE FOR SILT FENCE, WOVEN WIRE REINFORCED	649.515	

DETAILED SUMMARY OF QUANTITIES

QUANTITIES	UNIT	ITEMS
		EARTHWORKS SUMMARY
		FILL AVAILABLE
670	CY	COMMON EXCAVATION (670 x 1.0)
15	CY	UNCLASSIFIED CHANNEL EXCAVATION (50 x 0.3)
228	CY	STRUCTURE EXCAVATION (760 x 0.3)
2	CY	ROUNDING
915	**CY**	**TOTAL FILL AVAILABLE**
		FILL REQUIRED
92	CY	FACTORED FILL (80 x 1.15)
3	CY	ROUNDING
95	**CY**	**TOTAL FILL REQUIRED**
820	**CY**	**TOTAL WASTE**
		N.A.B.I. = NOT A BID ITEM

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: sl2jl58qs.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
QUANTITY I

PLOT DATE: 06-JAN-2015
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 5 OF 36

STATE OF VERMONT
AGENCY OF TRANSPORTATION

QUANTITY SHEET 2

SUMMARY OF ESTIMATED QUANTITIES									TOTALS		DESCRIPTIONS				DETAILED SUMMARY OF QUANTITIES		
						ROADWAY	EROSION CONTROL	BRIDGE	FULL C.E. ITEMS	GRAND TOTAL	FINAL	UNIT	ITEMS	ITEM NUMBER	ROUND	QUANTITIES	UNIT	ITEMS
							55			55		SY	GEOTEXTILE FOR FILTER CURTAIN	649.61				N.A.B.I. = NOT A BID ITEM
							10			10		LB	SEED	651.15				
							10			10		LB	SEED, WINTER RYE	651.17				
							100			100		LB	FERTILIZER	651.18				
							0.25			0.25		TON	AGRICULTURAL LIMESTONE	651.20				
							0.25			0.25		TON	HAY MULCH	651.25				
						30				30		CY	TOPSOIL	651.35				
						240		640		880		SY	GRUBBING MATERIAL	651.40				
							1			1		LS	EPSC PLAN	652.10				
							10			10		HR	MONITORING EPSC PLAN	652.20				
							1			1		LU	MAINTENANCE OF EPSC PLAN (N.A.B.I.)	652.30				
							470			470		SY	TEMPORARY EROSION MATTING	653.20				
							30			30		CY	VEHICLE TRACKING PAD	653.35				
							200			200		LF	BARRIER FENCE	653.50				
							160			160		LF	PROJECT DEMARCATION FENCE	653.55				
						6				6		EACH	REMOVING SIGNS	675.50				
						1				1		LS	SPECIAL PROVISION (CPM SCHEDULE)	900.645				
						1				1		LS	SPECIAL PROVISION (TEMPORARY RELOCATION OF STREAM)	900.645				
						1				1		LS	SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)	900.645				
						1				1		LU	SPECIAL PROVISION (INCENTIVE/DISINCENTIVE)(N.A.B.I.)	900.650				
						1				1		LU	SPECIAL PROVISION (MAT DENSITY PAY ADJUSTMENT, SMALL QUANTITY)(N.A.B.I.)	900.650				
						1				1		LU	SPECIAL PROVISION (MIXTURE PAY ADJUSTMENT)(N.A.B.I.)	900.650				
						270				270		TON	SPECIAL PROVISION (BITUMINOUS CONCRETE PAVEMENT, SMALL QUANTITY)	900.680				

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158qs.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
QUANTITY 2

PLOT DATE: 06-JAN-2015
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 6 OF 36

STATE OF VERMONT
AGENCY OF TRANSPORTATION

BRIDGE QUANTITY SHEET 1

SUMMARY OF BRIDGE QUANTITIES

DECK	APPROACH SLAB 1	APPROACH SLAB 2	ABUTMENT 1	ABUTMENT 2	CHANNEL	TOTALS BRIDGE TOTAL	UNIT	DESCRIPTIONS ITEMS	ITEM NUMBER
			15	35		50	CY	UNCLASSIFIED CHANNEL EXCAVATION	203.27
			373	387		760	CY	STRUCTURE EXCAVATION	204.25
			141	139		280	CY	GRANULAR BACKFILL FOR STRUCTURES	204.30
78						78	SY	SHEET MEMBRANE WATERPROOFING, TORCH APPLIED	519.20
56						56	LF	BRIDGE RAILING, GALVANIZED 2 RAIL BOX BEAM	525.33
1						1	EACH	REMOVAL OF STRUCTURE (600 SF - EST.)	529.15
1						1	LS	PRECAST CONCRETE STRUCTURE (28' X 6' X 29' FRAME OR ARCH TYPE)	540.10
			1			1	LS	PRECAST CONCRETE STRUCTURE (PEDESTAL WALL ABUTMENT #1)	540.10
				1		1	LS	PRECAST CONCRETE STRUCTURE (PEDESTAL WALL ABUTMENT #2)	540.10
			1			1	LS	PRECAST CONCRETE STRUCTURE (WINGWALL #1)	540.10
			1			1	LS	PRECAST CONCRETE STRUCTURE (WINGWALL #2)	540.10
				1		1	LS	PRECAST CONCRETE STRUCTURE (WINGWALL #3)	540.10
				1		1	LS	PRECAST CONCRETE STRUCTURE (WINGWALL #4)	540.10
			62	28		90	CY	STONE FILL, TYPE II	613.11
			72	98		170	SY	GEOTEXTILE UNDER STONE FILL	649.31
			320	320		640	SY	GRUBBING MATERIAL	651.40

DETAILED SUMMARY OF QUANTITIES

QUANTITIES	UNIT	ITEMS

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158qs.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
BRIDGE QUANTITY

PLOT DATE: 06-JAN-2015
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 7 OF 36

GENERAL INFORMATION

SYMBOLOGY LEGEND NOTE

THE SYMBOLOGY ON THIS SHEET IS INTENDED TO COVER STANDARD CONVENTIONAL SYMBOLOGY. THE SYMBOLOGY IS USED FOR EXISTING & PROPOSED FEATURES WITH HEAVIER LINEWEIGHT, IN COMBINATION WITH PROJECT ANNOTATION, AS NOTED ON PROJECT PLAN SHEETS. THIS LEGEND SHEET COVERS THE BASICS. SYMBOLOGY ON PLANS MAY VARY, PLAN ANNOTATIONS AND NOTES SHOULD BE USED TO CLARIFY AS NEEDED.

R.O.W. ABBREVIATIONS (CODES) & SYMBOLS

POINT	CODE	DESCRIPTION
	CH	CHANNEL EASEMENT
	CONST	CONSTRUCTION EASEMENT
	CUL	CULVERT EASEMENT
	D&C	DISCONNECT & CONNECT
	DIT	DITCH EASEMENT
	DR	DRAINAGE EASEMENT
	DRIVE	DRIVEWAY EASEMENT
	EC	EROSION CONTROL
	HWY	HIGHWAY EASEMENT
	I&M	INSTALL & MAINTAIN EASEMENT
	LAND	LANDSCAPE EASEMENT
	R&RES	REMOVE & RESET
	R&REP	REMOVE & REPLACE
	SR	SLOPE RIGHT
	UE	UTILITY EASEMENT
	(P)	PERMANENT EASEMENT
	(T)	TEMPORARY EASEMENT
■	BNDNS	BOUND SET
⧈	BNDNS	BOUND TO BE SET
●	IPNS	IRON PIN SET
◎	IPNS	IRON PIN TO BE SET
⊠	CALC	EXISTING ROW POINT
○	PROW	PROPOSED ROW POINT
[LENGTH]		LENGTH CARRIED ON NEXT SHEET

COMMON TOPOGRAPHIC POINT SYMBOLS

POINT	CODE	DESCRIPTION
	APL	BOUND APPARENT LOCATION
	BM	BENCHMARK
	BND	BOUND
	CB	CATCH BASIN
	COMB	COMBINATION POLE
	DITHR	DROP INLET THROATED DNC
	EL	ELECTRIC POWER POLE
	FPOLE	FLAGPOLE
	GASFIL	GAS FILLER
	GP	GUIDE POST
	GSO	GAS SHUT OFF
	GUY	GUY POLE
	GUYW	GUY WIRE
	GV	GATE VALUE
	H	TREE HARDWOOD
	HCTRL	CONTROL HORIZONTAL
	HVCTRL	CONTROL HORIZ. & VERTICAL
	HYD	HYDRANT
	IP	IRON PIN
	IPIPE	IRON PIPE
	LI	LIGHT - STREET OR YARD
	MB	MAILBOX
	MH	MANHOLE (MH)
	MM	MILE MARKER
	PM	PARKING METER
	PMK	PROJECT MARKER
	POST	POST STONE/WOOD
	RRSIG	RAILROAD SIGNAL
	RRSL	RAILROAD SWITCH LEVER
	S	TREE SOFTWOOD
	SAT	SATELLITE DISH
	SHRUB	SHRUB
	SIGN	SIGN
	STUMP	STUMP
	TEL	TELEPHONE POLE
	TIE	TIE
	TSIGN	SIGN W/DOUBLE POST
	VCTRL	CONTROL VERTICAL
	WELL	WELL
	WSO	WATER SHUT OFF

THESE ARE COMMON VAOT SURVEY POINT SYMBOLS FOR EXISTING FEATURES, ALSO USED FOR PROPOSED FEATURES WITH HEAVIER LINEWEIGHT, IN COMBINATION WITH PROPOSED ANNOTATION.

PROPOSED GEOMETRY CODES

CODE	DESCRIPTION
PC	POINT OF CURVATURE
PI	POINT OF INTERSECTION
CC	CENTER OF CURVE
PT	POINT OF TANGENCY
PCC	POINT OF COMPOUND CURVE
PRC	POINT OF REVERSE CURVE
POB	POINT OF BEGINNING
POE	POINT OF ENDING
STA	STATION PREFIX
AH	AHEAD STATION SUFFIX
BK	BACK STATION SUFFIX
D	CURVE DEGREE OF (100FT)
R	CURVE RADUIS OF
T	CURVE TANGENT LENGTH
L	CURVE LENGTH OF
E	CURVE EXTERNAL DISTANCE

UTILITY SYMBOLOGY

UNDERGROUND UTILITIES

- UGU — UTILITY (GENERIC-UNKNOWN)
- UT — TELEPHONE
- UE — ELECTRIC
- UC — CABLE (TV)
- UEC — ELECTRIC+CABLE
- UET — ELECTRIC+TELEPHONE
- UCT — CABLE+TELEPHONE
- UECT — ELECTRIC+CABLE+TELEP.
- G — GAS LINE
- W — WATER LINE
- S — SANITARY SEWER (SEPTIC)

ABOVE GROUND UTILITIES (AERIAL)

- AGU — UTILITY (GENERIC-UNKNOWN)
- T — TELEPHONE
- E — ELECTRIC
- C — CABLE (TV)
- EC — ELECTRIC+CABLE
- ET — ELECTRIC+TELEPHONE
- AER E&T — ELECTRIC+TELEPHONE
- CT — CABLE+TELEPHONE
- ECT — ELECTRIC+CABLE+TELEP.
- UTILITY POLE GUY WIRE

PROJECT CONSTRUCTION SYMBOLOGY

PROJECT DESIGN & LAYOUT SYMBOLOGY

- CZ — CLEAR ZONE
- PLAN LAYOUT MATCHLINE

PROJECT CONSTRUCTION FEATURES

- TOP OF CUT SLOPE
- TOE OF FILL SLOPE
- STONE FILL
- BOTTOM OF DITCH ℄
- CULVERT PROPOSED
- STRUCTURE SUBSURFACE
- PDF — PROJECT DEMARCATION FENCE
- BF — BARRIER FENCE
- TREE PROTECTION ZONE (TPZ)
- STRIPING LINE REMOVAL
- SHEET PILES

CONVENTIONAL BOUNDARY SYMBOLOGY

BOUNDARY LINES

- TOWN LINE — TOWN BOUNDARY LINE
- COUNTY LINE — COUNTY BOUNDARY LINE
- STATE LINE — STATE BOUNDARY LINE
- PROPOSED STATE R.O.W. (LIMITED ACCESS)
- PROPOSED STATE R.O.W.
- STATE ROW (LIMITED ACCESS)
- STATE ROW
- TOWN ROW
- PERMANENT EASEMENT LINE (P)
- TEMPORARY EASEMENT LINE (T)
- SURVEY LINE
- P/L — PROPERTY LINE (P/L)
- SR SR SR — SLOPE RIGHTS
- 6F — 6F PROPERTY BOUNDARY
- 4F — 4F PROPERTY BOUNDARY
- HAZ — HAZARDOUS WASTE

EPSC LAYOUT PLAN SYMBOLOGY

EPSC MEASURES

- FILTER CURTAIN
- SILT FENCE
- SILT FENCE WOVEN WIRE
- CHECK DAM
- DISTURBED AREAS REQUIRING RE-VEGETATION
- EROSION MATTING

SEE EPSC DETAIL SHEETS FOR ADDITIONAL SYMBOLOGY

ENVIRONMENTAL RESOURCES

- WETLAND BOUNDARY
- RIPARIAN BUFFER ZONE
- WETLAND BUFFER ZONE
- SOIL TYPE BOUNDARY
- T&E — THREATENED & ENDANGERED SPECIES
- HAZ — HAZ — HAZARDOUS WASTE AREA
- AG — AGRICULTURAL LAND
- HABITAT — FISH & WILDLIFE HABITAT
- FLOOD PLAIN — FLOOD PLAIN
- OHW — ORDINARY HIGH WATER (OHW)
- STORM WATER
- USDA FOREST SERVICE LANDS
- WILDLIFE HABITAT SUIT/CONN

ARCHEOLOGICAL & HISTORIC

- ARCH — ARCHEOLOGICAL BOUNDARY
- HISTORIC DIST — HISTORIC DISTRICT BOUNDARY
- HISTORIC — HISTORIC AREA
- Ⓗ HISTORIC STRUCTURE

CONVENTIONAL TOPOGRAPHIC SYMBOLOGY

EXISTING FEATURES

- ROAD EDGE PAVEMENT
- ROAD EDGE GRAVEL
- DRIVEWAY EDGE
- DITCH
- FOUNDATION
- FENCE (EXISTING)
- FENCE WOOD POST
- FENCE STEEL POST
- GARDEN
- ROAD GUARDRAIL
- RAILROAD TRACKS
- CULVERT (EXISTING)
- STONE WALL
- WALL
- WOOD LINE
- BRUSH LINE
- HEDGE
- BODY OF WATER EDGE
- LEDGE EXPOSED

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: sl2j158legend.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: AOT
CONVENTIONAL SYMBOLOGY LEGEND

PLOT DATE: 11-DEC-2014
DRAWN BY: M.LONGSTREET
CHECKED BY: H. SALLS
SHEET 8 OF 36

GPS CONTROL POINTS

HVCTRL #1

5600 VOLTS

NORTH = 905682.149
EAST = 1595379.726
ELEV. = 485.449

STATION MARK IS A VERTICAL CONTROL DISK WITH SETTING: STAINLESS STEEL ROD W/O SLEEVE (10 FT.+) DISK FROM: NGS THE MARK IS STAMPED: U 49 1978 SATELLITE: THE SITE IS SUITABLE FOR GPS OBSERVATIONS PG1387' RECOVERED IN GOOD CONDITION. IT IS 0.8 M (2.6 FT) NORTHWEST OF A PG1387' STEEL WITNESS POST.

HVCTRL #2

U 49

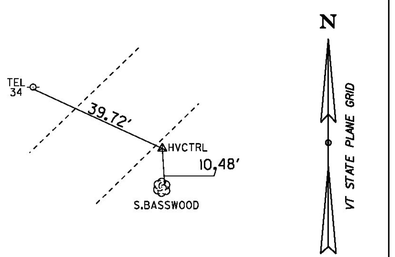
NORTH = 906242.748
EAST = 1593803.722
ELEV. = 446.210

GENERAL LOCATION, RICHFORD, VT. TO REACH FROM THE INTERSECTION OF VT ROUTE 105 AND VT ROUTE 139 IN RICHFORD VILLAGE GO SOUTHEAST ALONG VT ROUTE 105 FOR 0.2 MI (0.3 KM) TO THE INTERSECTION OF NOYES STREET LEFT. TURN LEFT AND GO SOUTH ALONG NOYES STREET FOR 0.4 MI (0.6 KM) TO THE INTERSECTION OF A PAVED DRIVE LEFT LEADING TO STAIRS UNLIMITED INC. CONTINUE STRAIGHT AHEAD AND GO SOUTHWEST ALONG NOYES STREET FOR ABOUT 20 M (65.6 FT) TO THE SITE OF THE MARK ON THE RIGHT. THE MARK IS SET FLUSH WITH GROUND SURFACE IN THE TOP OF A 30 CM DIAMETER CONCRETE MONUMENT POURED 1.3 M (4.3 FT) DEEP. THE MARK IS 6.9 M (22.6 FT) NORTHWEST OF AND ABOUT 1.0 M (3.3 FT) LOWER THAN THE CENTERLINE OF NOYES STREET, 15.2 M (49.9 FT) WEST NORTHWEST OF AN UNNUMBERED POLE, 18.1M (59.4 FT) WEST OF A CAST IRON GATE POST WITH AN ATTACHED MAILBOX, 46.3 M (151.9 FT) WEST SOUTHWEST OF THE WEST CORNER OF AN ELL ON THE STAIRS UNLIMITED INC. BUILDING, AND 1.2 M (3.9 FT) SOUTHEAST OF A 5600 VOLT ELECTRIC FENCE AND A FIBERGLASS WITNESS POST.

TRAVERSE TIES

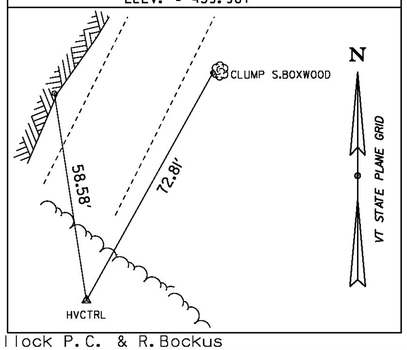
HVCTRL #6

NORTH = 908705.261
EAST = 1592012.674
ELEV. = 469.060



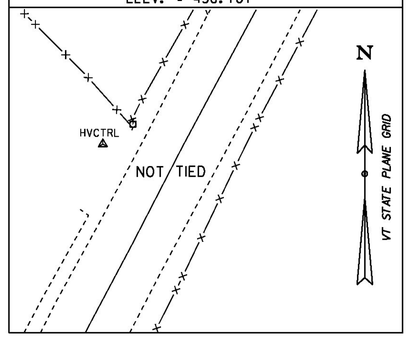
HVCTRL #7

NORTH = 909077.565
EAST = 1592302.792
ELEV. = 459.961



HVCTRL #8

NORTH = 909492.033
EAST = 1592470.855
ELEV. = 438.701



NORTH =
EAST =
ELEV. =

NORTH =
EAST =
ELEV. =

* Main Traverse Completed 4/17/09 by R. Bullock P.C. & R. Bockus

ALIGNMENT TIES

TOWN HIGHWAY 3

	STATION	NORTHING	EASTING
PC	40+00.00	909322.5958	1592404.8065
PI	41+86.52	909490.0381	1592486.9783

Radius:	6500.00
Delta:	3°17'14.35" Right
Degree of Curvature(Arc):	0°52'53.30"
Length:	372.93
Tangent:	186.52
Chord:	372.88
Middle Ordinate:	2.67
External:	2.68

PT	43+72.93
PC	45+24.77
PI	47+35.93

Radius:	2600.00
Delta:	9°17'10.58" Right
Degree of Curvature(Arc):	2°12'13.26"
Length:	421.40
Tangent:	211.16
Chord:	420.94
Middle Ordinate:	8.53
External:	8.56

PT	49+35.62
POE	49+46.16

DATUM

VERTICAL	NAVD 88
HORIZONTAL	NAD 83 (1996)
ADJUSTMENT	TRAVERSE

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: sl2j158tie.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
TIE

PLOT DATE: 11-DEC-2014
DRAWN BY: S. DONOVAN
CHECKED BY: H. SALLS
SHEET 9 OF 36

HD STEEL BEAM GUARDRAIL, GALVANIZED
STA 43+44.92 LT - STA 43+88.67 LT
STA 43+44.92 RT - STA 43+88.67 RT
STA 44+87.33 LT - STA 45+31.08 LT
STA 44+87.33 RT - STA 45+31.08 RT

GUARDRAIL APPROACH SECTION, GALVANIZED 2 RAIL BOX BEAM
STA 43+88.67 LT - STA 44+24.00 LT
STA 43+88.67 RT - STA 44+24.00 RT
STA 44+52.00 LT - STA 44+87.33 LT
STA 44+52.00 RT - STA 44+87.33 RT

BRIDGE RAILING, GALVANIZED 2 RAIL BOX BEAM
STA 44+24.00 LT - STA 44+52.00 LT
STA 44+24.00 RT - STA 44+52.00 RT

REMOVING AND RESETTING FENCE *
STA 42+50.00 LT - STA 44+17.00 LT
STA 42+50.00 RT - STA 44+23.00 RT
STA 44+51.00 RT - STA 44+75.00 RT
STA 44+52.00 LT - STA 46+25.00 LT

*FENCING WILL BE RESET AT A LOCATION AGREED UPON W/ THE PROPERTY OWNER AND ENGINEER IN THE FIELD

CONSTRUCT 5' PAVED APRON
STA 45+59.00 RT - STA 45+77.00 RT

REMOVAL AND DISPOSAL OF GUARDRAIL
STA 43+98.79 LT - STA 44+78.62 LT
STA 43+98.45 RT - STA 44+77.92 RT

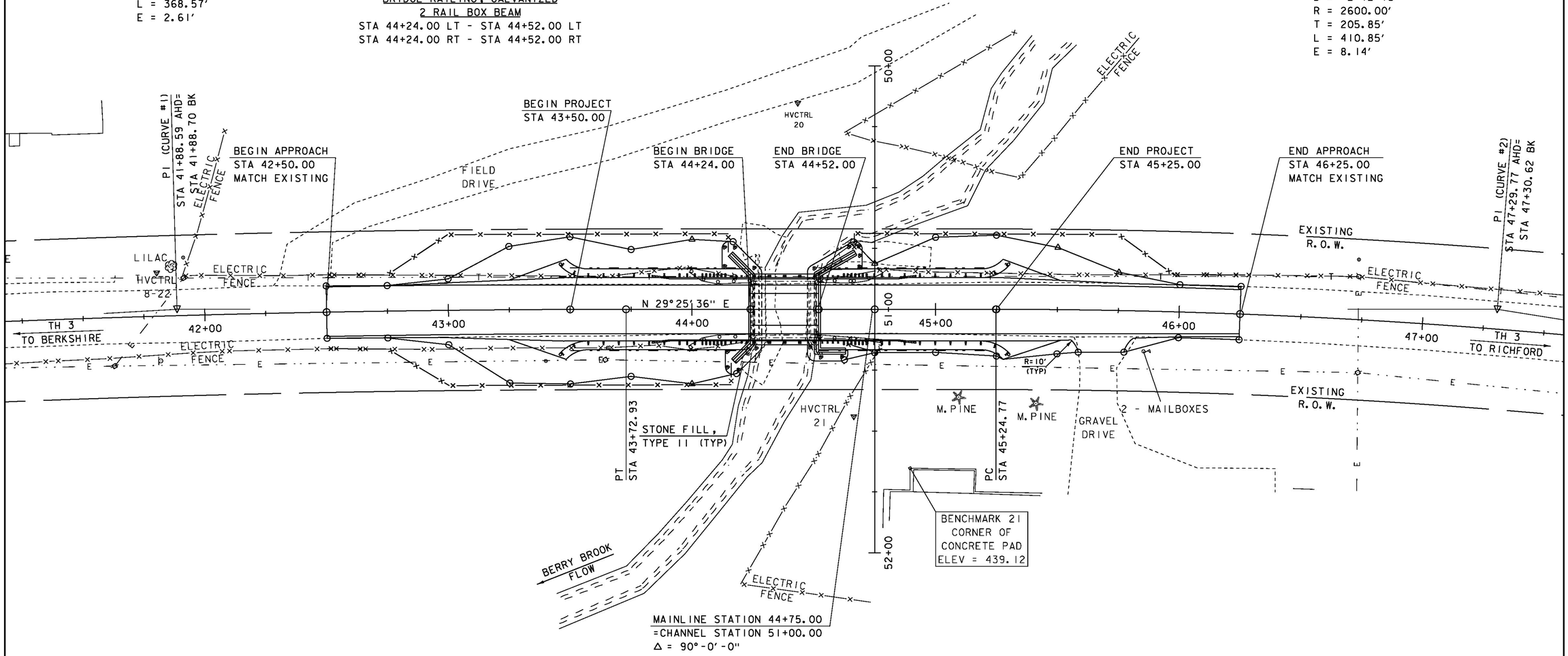
CAST-IN-PLACE CONCRETE CURB, TYPE B
STA 43+83.58 LT - STA 44+24.00 LT
STA 44+52.00 LT - STA 44+92.00 LT
STA 43+83.58 RT - STA 44+24.00 RT
STA 44+52.00 RT - STA 44+92.00 RT

ANCHOR FOR STEEL BEAM RAIL
STA 43+50.98 LT & RT
STA 45+23.80 LT & RT

CURVE (1)
DELTA = 3°14'56"
D = 0°52'53"
R = 6500.00'
T = 184.34'
L = 368.57'
E = 2.61'

CURVE (2)
DELTA = 9°03'14"
D = 2°12'13"
R = 2600.00'
T = 205.85'
L = 410.85'
E = 8.14'

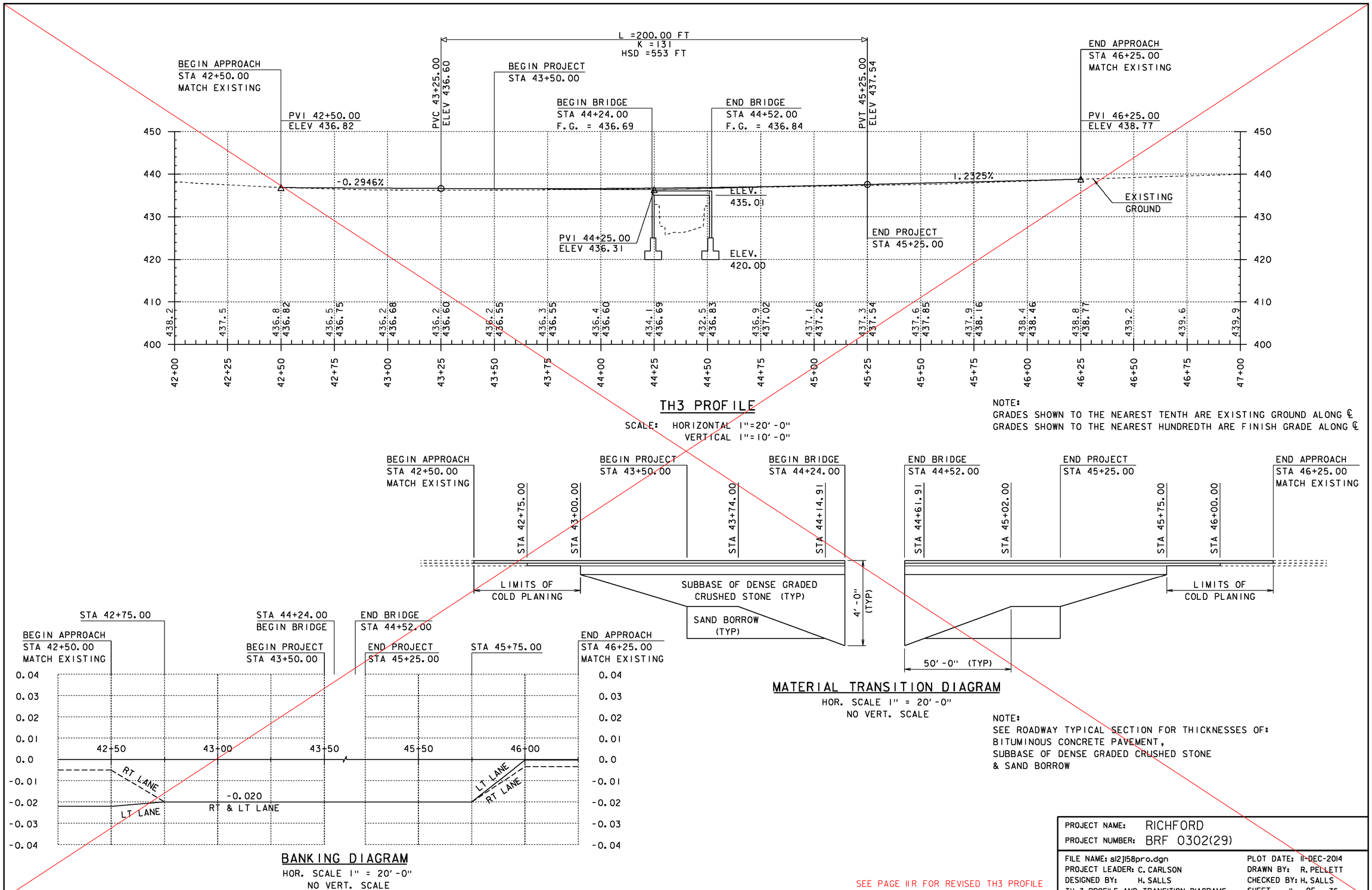
VT STATE PLANE GRID



EXISTING BRIDGE DATA
SINGLE SPAN CONCRETE T-BEAM
BRIDGE BUILT IN 1900
BRIDGE LENGTH = 24 FT.
WATERWAY AREA = 125 SF

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)
FILE NAME: s12j158bdr.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
LAYOUT	SHEET 10 OF 36



TH3 PROFILE

SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

MATERIAL TRANSITION DIAGRAM

HOR. SCALE 1" = 20'-0"
NO VERT. SCALE

NOTE:
SEE ROADWAY TYPICAL SECTION FOR THICKNESSES OF:
BITUMINOUS CONCRETE PAVEMENT,
SUBBASE OF DENSE GRADED CRUSHED STONE
& SAND BORROW

BANKING DIAGRAM

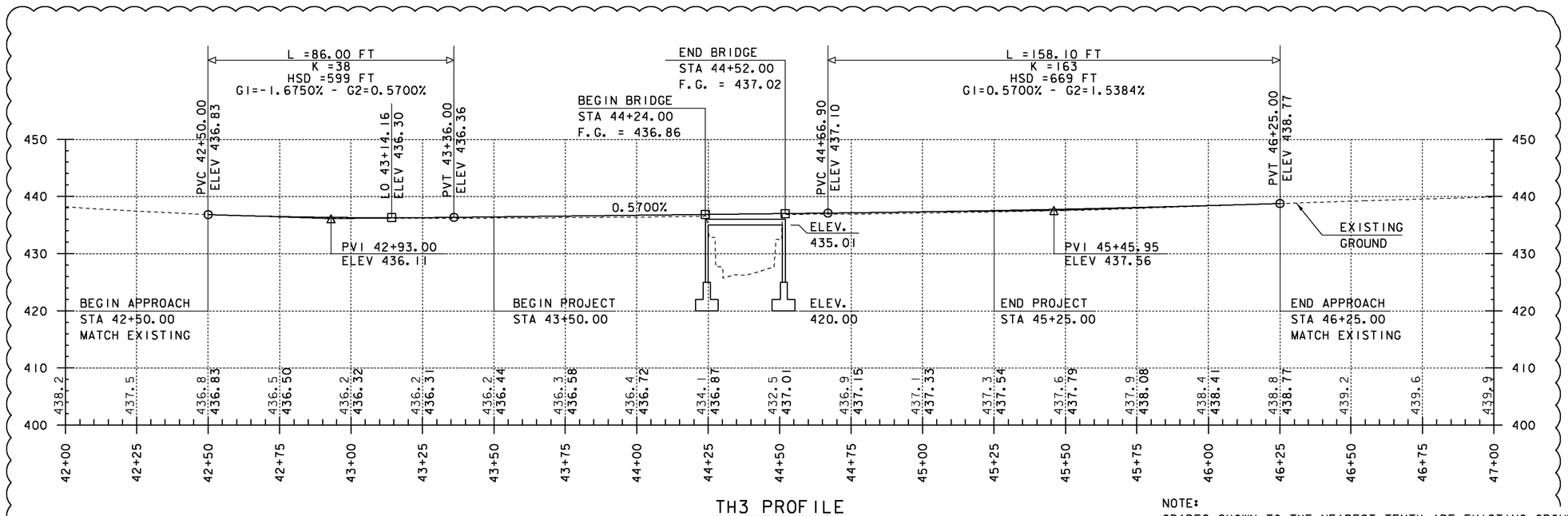
HOR. SCALE 1" = 20'-0"
NO VERT. SCALE

SEE PAGE IIR FOR REVISED TH3 PROFILE

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: sl2j158pro.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
TH 3 PROFILE AND TRANSITION DIAGRAMS

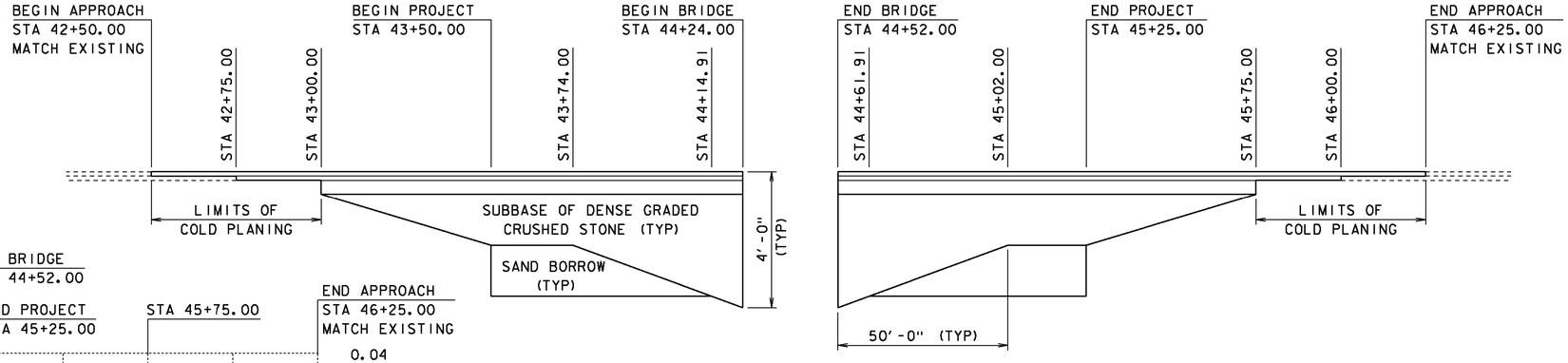
PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET II OF 36



TH3 PROFILE

SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

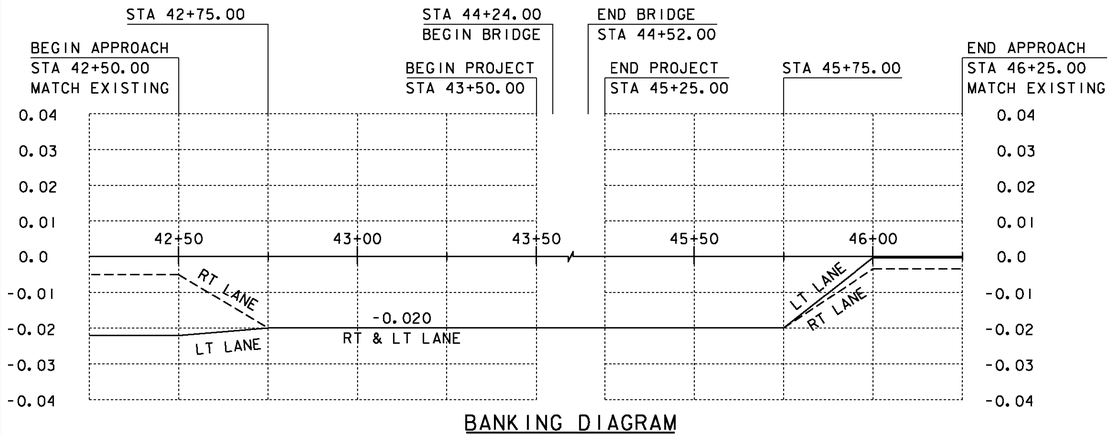
NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG L
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG L



MATERIAL TRANSITION DIAGRAM

HOR. SCALE 1" = 20'-0"
NO VERT. SCALE

NOTE:
SEE ROADWAY TYPICAL SECTION FOR THICKNESSES OF:
BITUMINOUS CONCRETE PAVEMENT,
SUBBASE OF DENSE GRADED CRUSHED STONE
& SAND BORROW



BANKING DIAGRAM

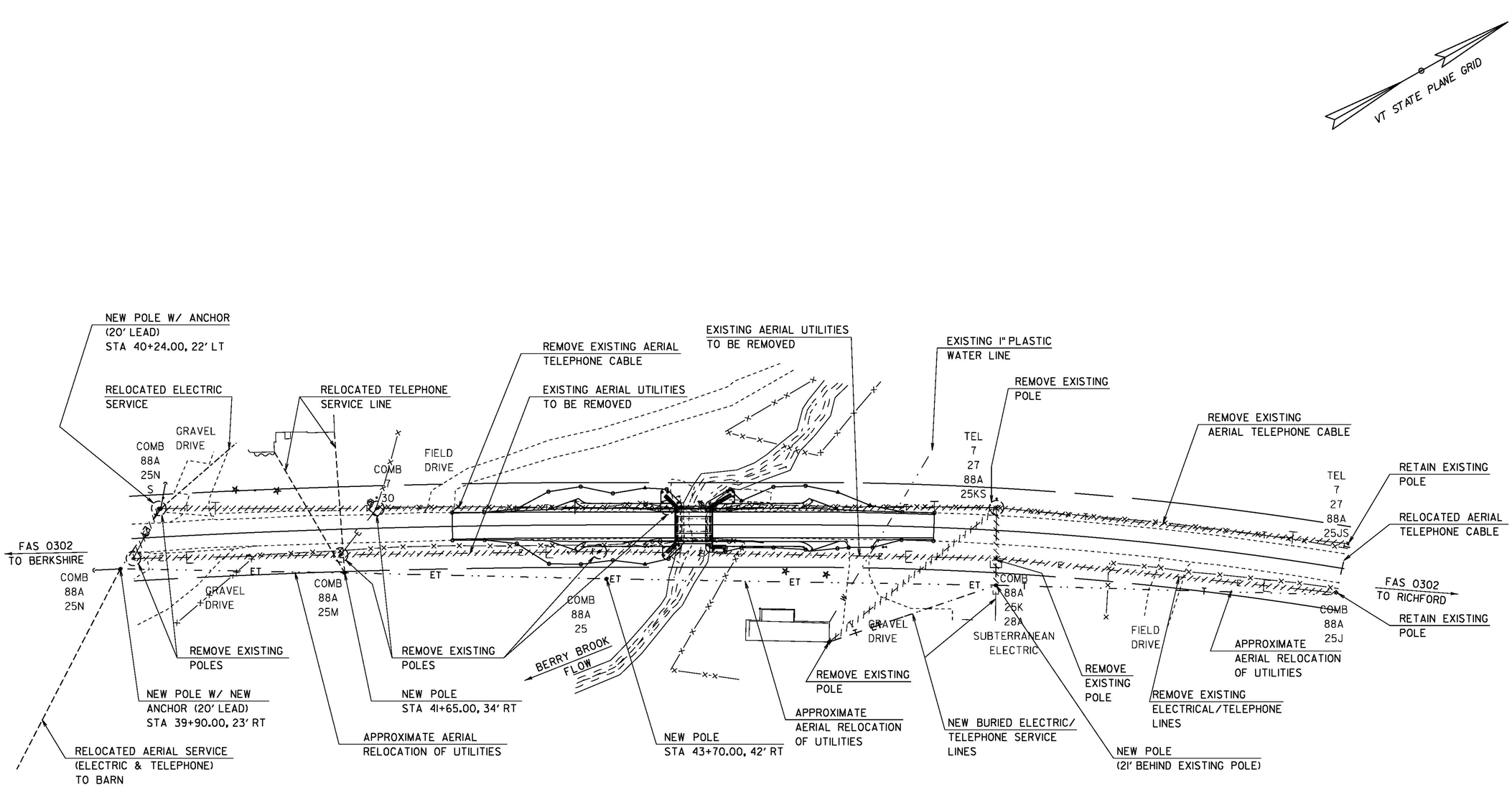
HOR. SCALE 1" = 20'-0"
NO VERT. SCALE

REVISION	DATE	DESCIPTION	BY
1	06-03-2015	RAISED THE GRADE 2" OVER BRIDGE SAG CURVE REMOVED TANGENT ADDED	MCL

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158pro.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
TH 3 PROFILE AND TRANSITION DIAGRAMS

PLOT DATE: 03-JUN-2015
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 11R OF 36



SCALE 1" = 40'-0"
40 0 40

NOTE:

1. ALL UTILITY RELOCATION, REMOVAL AND NEW LINES AND POLES SHALL BE PERFORMED/INSTALLED BY THE UTILITY COMPANY OR A CONTRACTOR CONTRACTED BY THE UTILITY COMPANY TO PERFORM THE REQUIRED WORK. SEE THE UTILITY SPECIAL PROVISIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

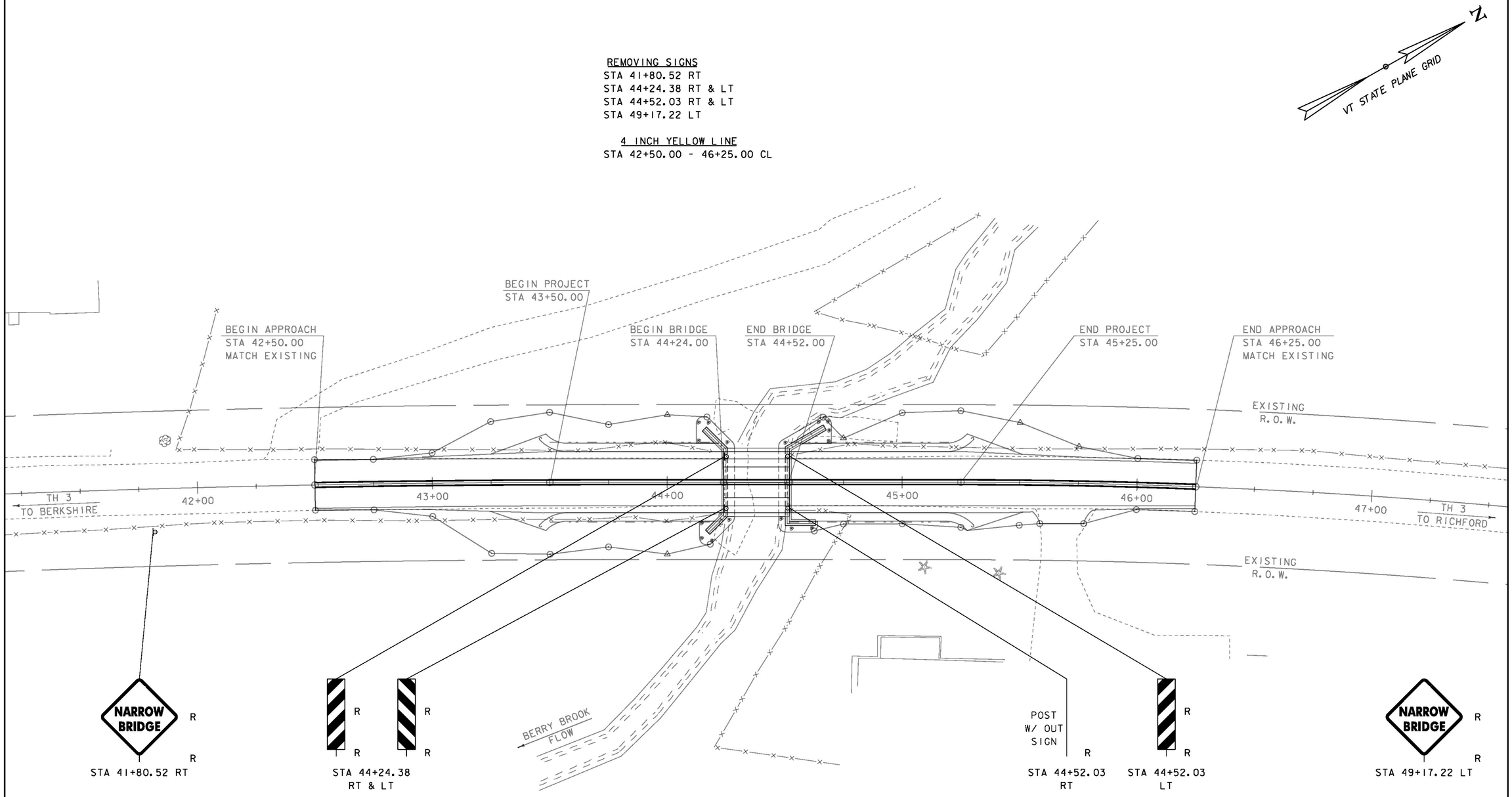
PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: sl2j158bdru+11.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
UTILITY LAYOUT

PLOT DATE: 11-DEC-2014
DRAWN BY: M. LONGSTREET
CHECKED BY: L. WHEELER
SHEET 12 OF 36

REMOVING SIGNS
STA 41+80.52 RT
STA 44+24.38 RT & LT
STA 44+52.03 RT & LT
STA 49+17.22 LT

4 INCH YELLOW LINE
STA 42+50.00 - 46+25.00 CL



LEGEND
R - REMOVE

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)
FILE NAME: s12j158bdrsign.dgn	PLOT DATE: 06-JAN-2015
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
SIGNS & PAVEMENT MARKING LAYOUT	SHEET 13 OF 36

SOIL CLASSIFICATION

AASHTO	
A1	Gravel and Sand
A3	Fine Sand
A2	Silty or Clayey Gravel and Sand
A4	Silty Soil - Low Compressibility
A5	Silty Soil - Highly Compressible
A6	Clayey Soil - Low Compressibility
A7	Clayey Soil - Highly Compressible

ROCK QUALITY DESIGNATION

R.Q.D. (%)	ROCK DESCRIPTION
<25	Very Poor
25 to 50	Poor
51 to 75	Fair
76 to 90	Good
>90	Excellent

SHEAR STRENGTH

UNDRAINED SHEAR STRENGTH IN P.S.F.	CONSISTENCY
<250	Very Soft
250-500	Soft
500-1000	Med. Stiff
1000-2000	Stiff
2000-4000	Very Stiff
>4000	Hard

CORRELATION GUIDE OF "N" TO DENSITY/CONSISTENCY

DENSITY (GRANULAR SOILS)		CONSISTENCY (COHESIVE SOILS)	
N	DESCRIPTIVE TERM	N	DESCRIPTIVE TERM
<5	Very Loose	<2	Very Soft
5-10	Loose	2-4	Soft
11-24	Med. Dense	5-8	Med. Stiff
25-50	Dense	9-15	Stiff
>50	Very Dense	16-30	Very Stiff
		31-60	Hard
		>60	Very Hard

COMMONLY USED SYMBOLS

▼	Water Elevation
⊕	Standard Penetration Boring
⊕	Auger Boring
⊙	Rod Sounding
S	Sample
N	Standard Penetration Test Blow Count Per Foot For: 2" O.D. Sampler 1 3/8" I.D. Sampler Hammer Weight Of 140 Lbs. Hammer Fall Of 30"
VS	Field Vane Shear Test
US	Undisturbed Soil Sample
B	Blast
DC	Diamond Core
MD	Mud Drill
WA	Wash Ahead
HSA	Hollow Stem Auger
AX	Core Size 1 1/8"
BX	Core Size 1 5/8"
NX	Core Size 2 1/8"
M	Double Tube Core Barrel Used
LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
NP	Non Plastic
w	Moisture Content (Dry Wgt. Basis)
D	Dry
M	Moist
MTW	Moist To Wet
W	Wet
Sat	Saturated
Bo	Boulder
Gr	Gravel
Sa	Sand
Si	Silt
Cl	Clay
HP	Hardpan
Le	Ledge
NLTD	No Ledge To Depth
CNPF	Can Not Penetrate Further
TLOB	Top of Ledge Or Boulder
NR	No Recovery
Rec.	Recovery
%Rec.	Percent Recovery
RQD	Rock Quality Designation
CBR	California Bearing Ratio
<	Less Than
>	Greater Than
R	Refusal (N > 100)
VTSPG	NAD83 - See Note 7

COLOR

blk	Black	pnk	Pink
bl	Blue	pu	Purple
brn	Brown	rd	Red
dk	Dark	tn	Tan
gry	Gray	wh	White
gn	Green	yel	Yellow
lt	Light	mltc	Multicolored
or	Orange		

DEFINITIONS (AASHTO)

BEDROCK (LEDGE) - Rock in its native location of indefinite thickness.

BOULDER - A rock fragment with an average dimension > 12 inches.

COBBLE - Rock fragments with an average dimension between 3 and 12 inches.

GRAVEL - Rounded particles of rock < 3" and > 0.0787" (#10 sieve).

SAND - Particles of rock < 0.0787" (#10 sieve) and > 0.0029" (#200 sieve).

SILT - Soil < 0.0029" (#200 sieve), non or slightly plastic and exhibits no strength when air-dried.

CLAY - Fine grained soil, exhibits plasticity when moist and considerable strength when air-dried.

VARVED - Alternate layers of silt and clay.

HARDPAN - Extremely dense soil, cemented layer, not softened when wet.

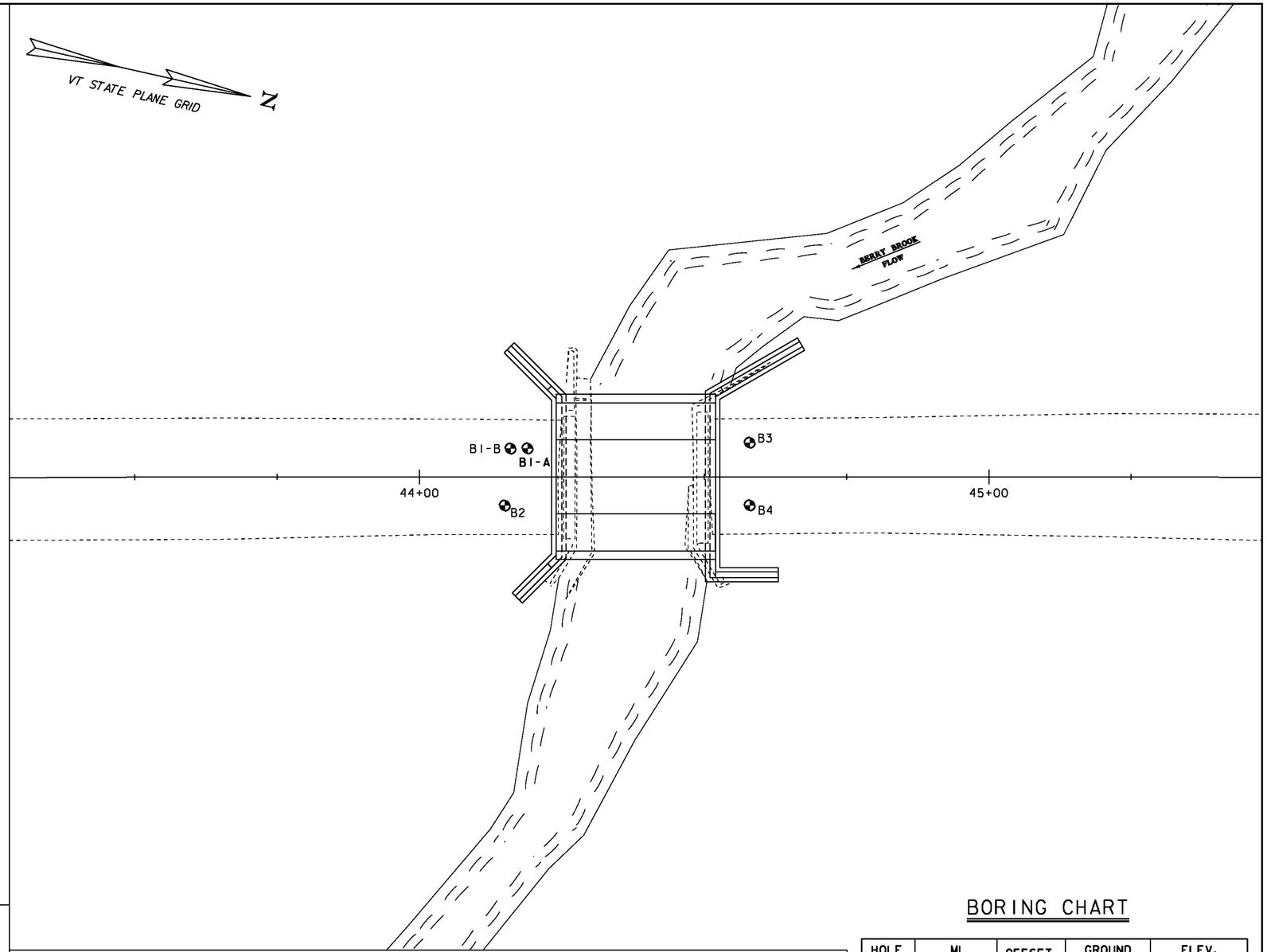
MUCK - Soft organic soil (containing > 10% organic material.

MOISTURE CONTENT - Weight of water divided by dry weight of soil.

FLOWING SAND - Granular soil so saturated (loose) that it flows into drill casing during extraction of wash rod.

STRIKE - Angle from magnetic north to line of intersection of bed with a horizontal plane.

DIP - Inclination of bed with a horizontal plane.



GENERAL NOTES

1. The subsurface explorations shown herein were made between 09/04/2013 and 09/09/2013 by the Agency.
2. Soil and rock classifications, properties and descriptions are based on engineering interpretation from available subsurface information by the Agency and may not necessarily reflect actual variations in subsurface conditions that may be encountered between individual boring or sample locations.
3. Observed water levels and/or conditions indicated are as recorded at the time of exploration and may vary according to the prevailing rainfall, methods of exploration and other factors.
4. Engineering judgment was exercised in preparing the subsurface information presented herein. Analysis and interpretation of subsurface data was performed and interpreted for Agency 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 Agency. The subsurface information is presented in good faith and is not intended as a substitute for personal investigation, independent interpretation, independent analysis or judgment by the Contractor.
5. Pictorial structure details shown on the boring plan layout or soils profile are for illustrative purposes only and may not accurately portray final contract details.
6. Terminology used on boring logs to describe the hardness, degree of weathering, and spacing of fractures, joints and other discontinuities in the bedrock is defined in the AASHTO Manual on Subsurface Investigations, 1988.
7. Northing and Easting coordinates are shown in Vermont State Plane Grid North American Datum 1983 in meters and survey feet.

BORING CHART

HOLE NO.	ML STATION	OFFSET	GROUND ELEV.	ELEV. TLOB
B1-A	44+19.00	5' LT	436.50	395.50
B1-B	44+16.00	5' LT	436.50	395.50
B2	44+15.00	5' RT	436.50	396.50
B3	44+58.00	6' LT	437.00	392.00
B4	44+58.00	5' RT	437.00	388.00

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: si2j158bor.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
BORING INFORMATION

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 14 OF 36

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-1A/B**
Page No.: 1 of 3
Pin No.: 12j158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/04/13 Date Finished: 9/05/13
VTSPG NAD83: N 909695.07 ft E 1592596.89 ft
Station: 44+19 Offset: 5' L
Ground Elevation: 436.5 ft

	Casing	Sampler
Type:	FJ	SS
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	140 lb.
Hammer Fall:	30 in.	30 in.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations [3]

Date	Depth (ft)	Notes
09/04/13		See Note 3.

Depth (ft)	Strata [1]	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value) [2]	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
		6" Asphalt										
		S1 (0.5' to 2'): Medium dense, brown-gray fine to coarse SAND, little fine Gravel, little Silt, slightly moist. (Fill) Rec. = 1.0 ft (AASHTO M145 Classification: A-1-b.)				16-9-8 (17)	4.2	35.4	49.5	15.1	NP	NP
		S2 (2' to 4'): Medium dense, brown-gray fine to coarse SAND, some fine to coarse Gravel, little Silt, slightly moist. (Fill) Rec. = 1.42 ft (AASHTO M145 Classification: A-1-b.)				4-6-11-11 (17)	7.1	41.4	43.3	15.3	NP	NP
5		S3 (4' to 6'): Medium dense, brown fine to coarse SAND and fine to coarse GRAVEL, little Silt, very moist to wet. (Fill) Rec. = 1.17 ft (AASHTO M145 Classification: A-1-b.)				10-9-6-5 (15)	10.2	49.5	35.6	14.9	NP	NP
		S4 (6' to 8'): Loose, brown fine to coarse SAND, some Silt, little fine Gravel, very moist. (Possible Fill) Rec. = 0.83 ft (AASHTO M145 Classification: A-2-4.)				4-5-4-5 (9)	15.7	21.6	49.9	28.5	NP	NP
		S5 (9' to 11'): Loose, no recovery. Rec. = 0.0 ft				7-4-5-7 (9)						
10		S6 (11' to 13'): Medium dense; S6A (Upper 5"): Brown fine to coarse SAND and SILT, trace fine Gravel (concentrated at top of sample), wet. S6B (Lower 3"): Gray SILT, trace fine Sand, wet. (Sand/Silt) Rec. = 0.67 ft (AASHTO M145 Classification: A-4.)				7-6-6-6 (12)	28.7		2.3	97.7	NP	NP
			C1									
		C1 (13' to 13.7'): Hard, slightly weathered, gray with white QUARTZITE BOULDER.				16-18-20-24 (38)	10.5	48.1	17.5	34.4	NP	NP
15		S7 (14' to 16'): Dense, greenish-gray fine to coarse GRAVEL and SILT, some fine to coarse Sand, moist. (Glacial Till) Rec. = 0.5 ft (AASHTO M145 Classification: A-2-4.)				9-19-19-16 (38)	10.4	39.0	31.5	29.5	NP	NP
BOTTOM OF FOOTING ELEV 420.00		S8 (16' to 18'): Dense, gray fine to coarse SAND, some Silt, some fine Gravel, moist to wet. (Glacial Till) Rec. = 1.17 ft (AASHTO M145 Classification: A-2-4.)										
		S9 (19' to 19.3'): Refusal, gray SILT, some fine to coarse Sand, some fine to coarse Gravel (fractured), wet. (Glacial Till) Rec. = 0.25 ft (AASHTO M145 Classification: A-4.)				80/3" (R)	8.5	38.4	23.4	38.2	NP	NP
20		S10 (21' to 21.2'): Refusal, gray fine to coarse GRAVEL, some fine to coarse Sand, little Silt, wet. (Glacial Till) Rec. = 0.17 ft (AASHTO M145 Classification: A-1-b.)				80/2" (R)	7.5	63.1	20.0	16.9	NP	NP
		S11 (24' to 24.5'): Refusal, gray SILT and fine to coarse SAND, trace fine Gravel, moist. (Glacial Till) Rec. = 0.5 ft (AASHTO M145 Classification: A-4.)				100/6" (R)	8.5	14.9	31.7	53.4	NP	NP
25		S12 (29' to 29.5'): Refusal, gray SILT and fine to coarse SAND, little fine Gravel, moist. (Glacial Till) Rec. = 0.5 ft				100/6" (R)	9.0	18.1	29.9	52.0	NP	NP

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GEODESIGN BORING LOG 750-09.13 RICHFORD.VTRANS.GPJ VERMONT AOT.GDT 10/9/13

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-1A/B**
Page No.: 2 of 3
Pin No.: 12j158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/04/13 Date Finished: 9/05/13
VTSPG NAD83: N 909695.07 ft E 1592596.89 ft
Station: 44+19 Offset: 5' L
Ground Elevation: 436.5 ft

	Casing	Sampler
Type:	FJ	SS
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	140 lb.
Hammer Fall:	30 in.	30 in.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations [3]

Date	Depth (ft)	Notes
09/04/13		See Note 3.

Depth (ft)	Strata [1]	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value) [2]	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
		(AASHTO M145 Classification: A-4.)										
35		S13 (34' to 35'): Refusal, gray fine to coarse SAND and SILT, little fine Gravel, wet. (Glacial Till) Rec. = 0.83 ft (AASHTO M145 Classification: A-4.)				58-100/5.5" (R)	12.2	18.0	46.3	35.7	NP	NP
40		S14 (39' to 39.4'): Refusal, gray and greenish gray fine to coarse SAND and SILT, some fine Gravel, wet. Approximately 2" in spoon shoe of possible weathered bedrock. (Glacial Till) Rec. = 0.42 ft (AASHTO M145 Classification: A-2-4.)				100/5" (R)	11.8	35.2	30.4	34.4	NP	NP
		Inferred Weathered Bedrock	C2	93 (48)	3.5							
		C2 (41' to 46'): Poor quality, gray-greenish gray, moderately hard, fine grained, moderately weathered PHYLLITE interbedded with Quartz, fracture angle approximately 45 to 90 degrees.			5 4 5.5 6.5							
45												
		C3 (46' to 51'): Poor quality, greenish gray, moderately hard, fine grained, moderately weathered PHYLLITE, fracture angle approximately 60 to 80 degrees.	C3	87 (47)	4 5 6 6 8							
50												
		Hole stopped @ 51.0 ft B-1A abandoned; B-1B end of Core										
55												

Top of Bedrock @ 41.0 ft

Remarks:
1) Hammer efficiency correction factor is assumed. Elevation, station and offset are estimated by GeoDesign from site plans provided by VTrans and taped measurements from existing features made in the field by GeoDesign personnel. They should be considered accurate only to the degree implied by the method of location used.
2) Sample S2 not performed in accordance with ASTM D1586, (sampled immediately after sample S1 without clearing the borehole with the roller bit).
3) Soil moisture descriptions may not accurately depict actual conditions due to wash and drive drilling methods. Wash water observed to be brown in color to approximately 11' deep, then turning gray by 13' deep.
4) Cored through a boulder from 13' to 13.7' deep. Lost water upon breaking through. Casing became out of alignment while attempting to drive through boulder. Abandoned location and moved to B-1B, offset 3.5' south/west, (approximate STA 44+16, 5' L)

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GEODESIGN BORING LOG 750-09.13 RICHFORD.VTRANS.GPJ VERMONT AOT.GDT 10/9/13

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158bor.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
BORING LOGS 1

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 15 OF 36

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-1A/B**
Page No.: 3 of 3
Pin No.: 12j158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/04/13 Date Finished: 9/05/13
VTSPG NAD83: N 909695.07 ft E 1592596.89 ft
Station: 44+19 Offset: 5' L
Ground Elevation: 436.5 ft

	Casing	Sampler
Type:	FJ	SS
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	140 lb.
Hammer Fall:	30 in.	30 in.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations [3]

Date	Depth (ft)	Notes
09/04/13		See Note 3.

Depth (ft)	Strata [1]	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value) [2]	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
65		5) Advanced casing in B-1B to 14' deep prior to continuing with soil sampling. 6) Noted occasional roller bit grinding/chatter below 18' deep, on inferred gravel. 7) Encountered inferred weathered bedrock at approximately 39.2' deep based on split spoon resistance. Roller bit penetration slowed to approximately 1 inch in 5 minutes at approximately 41' deep on inferred top of competent rock. Began rock core at 41' deep. 8) Used reduced drilling RPM and pressure for entire rock core. Encountered oscillations of drill string below 48' deep, most pronounced from 50' to 51' deep, where driller had to pause every 10 to 30 seconds to correct. 9) Grouted borehole with 1 bag portland cement, 1/2 bag bentonite powder, and 40 gallons water. Topped off borehole with approximately 3 inches of cold patch asphalt at the ground surface. 10) All visual descriptions are per the Burmister classification system. All lab gradations are per the AASHTO M 145 classification system.										
70												
75												
80												
85												

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GEODESIGN BORING LOG 750-09.13 RICHFORD VTRANS.GPJ VERMONT AOT.GDT 10/9/13

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158bor.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
BORING LOGS 2

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 16 OF 36

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-2**
Page No.: 1 of 2
Pin No.: 12J158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/09/13 Date Finished: 9/09/13
VTSPG NAD83: N 909686.67 ft E 1592603.64 ft
Station: 44+15 Offset: 5' R
Ground Elevation: 436.5 ft

	Casing	Sampler
Type:	FJ	SS
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	140 lb.
Hammer Fall:	30 in.	30 in.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations [3]

Date	Depth (ft)	Notes
09/09/13		Not recorded.

Depth (ft)	Strata [1]	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value) [2]	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
		6" Asphalt										
		Inferred Fill										
5												
		Inferred Boulder / Cobble										
		Inferred Fill										
10		S1 (9' to 11'): Medium dense, brown fine to coarse SAND and fine to coarse GRAVEL, little Silt, wet. Rec. = 0.83 ft (AASHTO M145 Classification: A-1-b.)				4-9-16-14	11.3	50.1	32.3	17.6	NP	NP
		Inferred Possible Fill										
		Inferred Silt / Sand										
15												
BOTTOM OF FOOTING ELEV 420.00		Inferred Glacial Till										
20												
25												

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GEODESIGN BORING LOG 750-09.13 RICHFORD VTRANS.GPJ VERMONT AOT.GDT 10/9/13

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-2**
Page No.: 2 of 2
Pin No.: 12J158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/09/13 Date Finished: 9/09/13
VTSPG NAD83: N 909686.67 ft E 1592603.64 ft
Station: 44+15 Offset: 5' R
Ground Elevation: 436.5 ft

	Casing	Sampler
Type:	FJ	SS
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	140 lb.
Hammer Fall:	30 in.	30 in.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations [3]

Date	Depth (ft)	Notes
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Depth (ft)	Strata [1]	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value) [2]	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
35												
40		C1 (40' to 43.5'): Poor quality, moderately hard, sliver-gray-green PHYLLITE. Fractures at approximately 60 to 90 degrees.	C1	67 (33)	2.3 1.5 1.5 2.8							
		Top of Bedrock @ 40.0 ft										
		Hole stopped @ 43.5 ft										
45												
50												
55												

Remarks:
1) Hammer efficiency correction factor is assumed. Strata breaks and composition are inferred from roller bit and casing resistance observed during borehole advance and soil samples collected in nearby Borings B-1 and B-4. Elevation, station and offset are estimated by GeoDesign from site plans provided by VTrans and taped measurements from existing features made in the field by GeoDesign personnel. They should be considered accurate only to the degree implied by the method of location used.
2) Drove casing to near refusal at approximately 7' deep and cleaned out with roller bit. Return water brown, except gray/greenish-gray from 7' to 7.5' deep. Casing drove at approximately 100 to 200 blows per inch from 7' to 7.3' deep.
3) Inferred gravel fill to 5' deep. Infer elevated gravel content from 5' to 9' deep based on roller bit grinding. Inferred cobble/boulder at 7' to 7.5' deep.
4) Infer strata change between 13' and 15' deep due to decrease in resistance and grinding during casing and roller bit advance from 13' to 14' deep and a change in wash water color to gray between 14' and 15' deep.
5) Infer strata change to glacial till at 17' deep based on increased roller bit resistance. Note quartz gravel in the return water.
6) Encountered inferred gravel within the soil matrix based on roller bit resistance at 26', 27.5', 28.5', 30', 33', 34', 35', and 37.5' deep. Encountered roller bit refusal at 40' deep on inferred competent bedrock.
7) Lowered drilling RPM while coring at 42.5' deep due to rig oscillations. Water hose burst while advancing core barrel at 43.5' deep. Terminated boring at 43.5' deep.
8) Borehole backfilled with winter sand mix and topped with approximately 3 inches of cold patch asphalt at the ground surface.
9) All visual descriptions are per the Burmister classification system. All lab gradations are per the AASHTO M 145 classification system.

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GEODESIGN BORING LOG 750-09.13 RICHFORD VTRANS.GPJ VERMONT AOT.GDT 10/9/13

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158bor.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
BORING LOGS 3

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 17 OF 36

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-3**
Page No.: 1 of 3
Pin No.: 12j158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/05/13 Date Finished: 9/06/13
VTSPG NAD83: N 909729.53 ft E 1592615.18 ft
Station: 44+58 Offset: 6' L
Ground Elevation: 437 ft

	Casing	Sampler
Type:	FJ	N.A.
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	N.A.
Hammer Fall:	30 in.	N.A.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations [3]

Date	Depth (ft)	Notes
09/06/13	9.7	In casing (15 hrs.)

Depth (ft)	Strata [1]	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value) [2]	Moisture Content %	Gravel %	Sand %	Fines %
		6" Asphalt								
		Inferred Fill								
5										
		Inferred Silt/Sand								
10										
15										
BOTTOM OF FOOTING ELEV 420.00										
		Inferred Glacial Till								
20										
25										

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GEODESIGN BORING LOG 750-09.13 RICHFORD VTRANS.GPJ VERMONT AOT.GDT 10/9/13

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-3**
Page No.: 2 of 3
Pin No.: 12j158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/05/13 Date Finished: 9/06/13
VTSPG NAD83: N 909729.53 ft E 1592615.18 ft
Station: 44+58 Offset: 6' L
Ground Elevation: 437 ft

	Casing	Sampler
Type:	FJ	N.A.
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	N.A.
Hammer Fall:	30 in.	N.A.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations [3]

Date	Depth (ft)	Notes
09/06/13	9.7	In casing (15 hrs.)

Depth (ft)	Strata [1]	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value) [2]	Moisture Content %	Gravel %	Sand %	Fines %
35										
40										
45		C1 (45' to 50'): Poor quality, moderately hard, fine grained, silvery gray-green with white GNEISS. With occasional Quartz bedding. Fractures between 30 and 70 degrees from horizontal.	C1	72 (38)	2.25 3 2 2.5 2					
		Top of Bedrock @ 45.0 ft								
50		Hole stopped @ 50.0 ft								
55										

Remarks:
1) Hammer efficiency correction factor is assumed. Strata breaks and composition are inferred from roller bit and casing resistance observed during borehole advance and soil samples collected in nearby Borings B-1 and B-4. Elevation, station and offset are estimated by GeoDesign from site plans provided by VTrans and taped measurements from existing features made in the field by GeoDesign personnel. They should be considered accurate only to the degree implied by the method of location used.
2) Casing driven to 8' deep. Note advancement rate slowed considerably at approximately 7.7' deep.
3) Wash water observed to be grayish-brown in color from surface to 12' deep before turning gray below 12' deep.
4) Noted grinding of roller bit from approximately 7.5' to 8.5' deep on inferred gravel.
5) Infer strata change to Silt / Sand at 8.5' deep due to significant increase in bit advancement rate.
6) Infer strata change to glacial till due to decrease in bit advancement rate at 17' deep.
7) Note decrease in advancement rate at 22' deep through inferred dense glacial till soils. Consistent, slow rate from 22' to 41.5' deep, with an increase from 41.5' to 43.5' deep

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GEODESIGN BORING LOG 750-09.13 RICHFORD VTRANS.GPJ VERMONT AOT.GDT 10/9/13

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158bor.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
BORING LOGS 4

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 18 OF 36

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-3**
Page No.: 3 of 3
Pin No.: 12j158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/05/13 Date Finished: 9/06/13
VTSPG NAD83: N 909729.53 ft E 1592615.18 ft
Station: 44+58 Offset: 6' L
Ground Elevation: 437 ft

	Casing	Sampler
Type:	FJ	N.A.
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	N.A.
Hammer Fall:	30 in.	N.A.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations [3]

Date	Depth (ft)	Notes
09/06/13	9.7	In casing (15 hrs.)

Depth (ft)	Strata [1]	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value) [2]	Moisture Content %	Gravel %	Sand %	Fines %
65		8) Inferred gravelly zones within the glacial till matrix based on drilling resistance / behavior from 31' to 31.5' deep, 38' to 38.5' deep, and 43.5' to 44' deep. 9) Borehole backfilled with winter sand mix and topped with approximately 3 inches of cold patch asphalt at the ground surface. 10) All visual descriptions are per the Burmister classification system.								
70										
75										
80										
85										

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GEODESIGN BORING LOG 750-09.13 RICHFORD VTRANS.GPJ VERMONT AOT.GDT 10/9/13

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158bor.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
BORING LOGS 5

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 19 OF 36

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-4**
Page No.: 1 of 3
Pin No.: 12J158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/03/13 Date Finished: 9/04/13
VTSPG NAD83: N 909724.13 ft E 1592624.76 ft
Station: 44+58 Offset: 5' R
Ground Elevation: 437 ft

	Casing	Sampler
Type:	FJ	SS
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	140 lb.
Hammer Fall:	30 in.	30 in.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations [3]

Date	Depth (ft)	Notes
09/03/13	10.0	Wet sample
09/04/13	9.5	In Casing

Depth (ft)	Strata [1]	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value) [2]	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
		6" Asphalt										
		S1 (0.5' to 2'): Medium dense, tan fine to coarse SAND, little fine Gravel, little Silt, slightly moist. (Roadbase Fill) Rec. = 1.08 ft (AASHTO M145 Classification: A-1-b.)				8-15-14 (29)	4.7	29.3	51.9	18.8	NP	NP
		S2 (2' to 4'): Medium dense, brown fine to coarse SAND, some fine to coarse Gravel, some Silt, moist. (Subbase Fill) Rec. = 1.0 ft (AASHTO M145 Classification: A-1-b.)				11-9-7-6 (16)	8.0	42.5	35.7	21.8	NP	NP
5		S3 (4' to 6'): Loose, brown fine to coarse SAND, some Silt, little fine Gravel, moist. (Possible Fill) Rec. = 0.67 ft (AASHTO M145 Classification: A-2-4.)				3-2-3-2 (5)	16.0	26.1	52.5	21.4	NP	NP
		S4 (6' to 8'): Loose, brown and gray fine to coarse SAND, some Silt, trace fine Gravel, very moist. (Possible Fill) Rec. = 1.08 ft (AASHTO M145 Classification: A-2-4.)				4-3-1-3 (4)	23.2	8.5	59.4	32.1	NP	NP
10		S5 (9' to 11'): Loose, gray SILT, little fine to coarse Sand, trace fine Gravel (concentrated in top of sample), wet. (Silt / Sand) Rec. = 1.17 ft (AASHTO M145 Classification: A-4.)				3-3-2-4 (5)	25.1	9.6	4.2	86.2	22	1
		S6 (11' to 13'): Medium dense, gray SILT, some Clayey Silt, trace fine Sand, wet. (Silt / Sand) Rec. = 1.67 ft (AASHTO M145 Classification: A-4.)				4-6-5-6 (11)	27.9		1.3	98.7	25	6
15		S7 (14' to 16'): Loose, gray SILT and Clayey SILT (laminated), trace fine Sand, wet. (Silt / Sand) Rec. = 1.67 ft (AASHTO M145 Classification: A-4.)				3-4-3-3 (7)	28.9		1.0	99.0	24	5
BOTTOM OF FOOTING ELEV 420.00		S8A (16' to 17') - Upper 8" of S8: Medium dense, gray SILT, trace Clayey Silt, trace fine Sand, wet. (Silt / Sand) Rec. = 1.0 ft (AASHTO M145 Classification: A-4.)				3-2-8-10 (10)	27.4		2.7	97.3	22	2
		S8B (17' to 18') - Lower 4" of S8: Medium dense, gray fine to coarse SAND, some Silt, some fine Gravel, wet. (Glacial Till) (AASHTO M145 Classification: A-2-4.)					9.9	41.0	30.6	28.4	NP	NP
20		S9 (19' to 21'): Dense, gray fine to coarse SAND, some fine to coarse Gravel, some Silt, moist to wet. (Glacial Till) Rec. = 1.33 ft (AASHTO M145 Classification: A-2-4.)				9-16-20-26 (36)	9.3	35.3	34.2	30.5	NP	NP
		S10 (21' to 23'): Very dense, gray/green fine to coarse SAND and SILT, some fine Gravel, moist to wet. (Glacial Till) Rec. = 1.25 ft (AASHTO M145 Classification: A-2-4.)				24-29-27-28 (56)	10.0	32.7	32.0	35.3	NP	NP
25		S11 (24' to 24.4'): Refusal, gray SILT and fine to coarse SAND, some fine to coarse Gravel, moist to wet. (Glacial Till) Rec. = 0.42 ft (AASHTO M145 Classification: A-4.)				80/5.5" (R)	9.1	29.7	32.5	37.8	NP	NP
		S12 (29' to 29.4'): Refusal, gray SILT and fine to coarse Sand, trace fine Gravel, moist. (Glacial Till) Rec. = 0.42 ft				80/5.5" (R)	9.7	14.4	33.8	51.8	NP	NP

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GEODESIGN BORING LOG 750-09.13 RICHFORD VTRANS.GPJ VERMONT AOT.GDT 10/9/13

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-4**
Page No.: 2 of 3
Pin No.: 12J158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/03/13 Date Finished: 9/04/13
VTSPG NAD83: N 909724.13 ft E 1592624.76 ft
Station: 44+58 Offset: 5' R
Ground Elevation: 437.0 ft

	Casing	Sampler
Type:	FJ	SS
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	140 lb.
Hammer Fall:	30 in.	30 in.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations

Date	Depth (ft)	Notes
09/03/13	10.0	Wet sample
09/04/13	9.5	In Casing

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
		(AASHTO M145 Classification: A-4.)										
35		S13 (34' to 34.3'): Refusal, gray SILT, some fine to coarse Sand, some fine to coarse Gravel (fractured, platelike), moist. (Glacial Till) Rec. = 0.33 ft (AASHTO M145 Classification: A-4.)				80/4" (R)	9.3	29.0	26.9	44.1	NP	NP
40		S14 (39' to 39.2'): Refusal, gray and white SILT, some fine to coarse Gravel, some fine to coarse Sand, moist. (Glacial Till) Rec. = 0.25 ft (AASHTO M145 Classification: A-4.)				100/3" (R)	8.9	36.5	24.0	39.5	NP	NP
45		S15 (44' to 44.2'): Refusal, gray WEATHERED PHYLLITE. C1 (44' to 49'): Very poor quality, gray to greenish-gray, fine-grained weathered to extremely weathered (majority of core washed away) PHYLLITE, fracture angle estimated at 70 to 90 degrees.	C1	25 (0)	2.5 4.3 3 3 2	100/2" (R)						
50		S16 (49' to 49.1'): Refusal, gray WEATHERED PHYLLITE with highly weathered zones. C2 (49' to 54'): Fair quality, greenish-gray fine grained, slightly to moderately weathered PHYLLITE, fracture angle approximately 45 to 70 degrees.	C2	78 (50)	3.5 2 3.8 3.5 4	100/1" (R)	Top of Bedrock @ 49.0 ft					
55		C3 (54' to 59'): Poor quality, greenish-gray fine grained, moderately weathered PHYLLITE, fracturing approximately 70 to 90 degrees.	C3	80 (25)	3 3.5 5 7 6							
		Hole stopped @ 59.0 ft										

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG 750-09.13 RICHFORD VTRANS.GPJ VERMONT AOT.GDT 11/15/13

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158bor.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
BORING LOGS 6

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 20 OF 36

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Richford BRF 0302(29)
Richford, VT
GeoDesign # 750-09.13

Boring No.: **B-4**
Page No.: 3 of 3
Pin No.: 12j158
Checked By: JFW

Boring Crew: J. Leonhardt (TransTech), A. Baribault (GeoDesign)
Date Started: 9/03/13 Date Finished: 9/04/13
VTSPG NAD83: N 909724.13 ft E 1592624.76 ft
Station: 44+58 Offset: 5' R
Ground Elevation: 437 ft

	Casing	Sampler
Type:	FJ	SS
I.D.:	4 in	2 in
Hammer Wt:	140 lb.	140 lb.
Hammer Fall:	30 in.	30 in.
Hammer/Rod Type:	Auto/NWJ	
Rig:	CME 550X ATV	C_E = ~1.5

Groundwater Observations [3]

Date	Depth (ft)	Notes
09/03/13	10.0	Wet sample
09/04/13	9.5	In Casing

Depth (ft)	Strata [1]	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value) [2]	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
65		Remarks: 1) Hammer efficiency correction factor is assumed. Elevation, station and offset are estimated by GeoDesign from site plans provided by VTrans and taped measurements from existing features made in the field by GeoDesign personnel. They should be considered accurate only to the degree implied by the method of location used. 2) Samples S2 and S4 were not performed in accordance with ASTM D1586, (samples taken immediately after preceding split spoon sample without first clearing the borehole with the roller bit). 3) Soil moisture descriptions may not accurately depict actual conditions due to wash and drive drilling methods. Observe brown return water to approximately 10' deep, then turning gray. 4) Drove casing to 10' deep prior to advancing borehole open hole with the roller bit to 17' deep. At 17' deep encountered gravelly soils resulting in loss of water. Drive casing to 21 feet deep (prior to sampling S10) and advance the remainder of the borehole open hole with the roller bit until beginning coring at 44' deep. 5) Encountered weathered rock in sample S15 at 44' deep. Attempted core from 44' to 49' deep with low recovery / RQD sample obtained. Cleaned hole with roller bit to 49 feet and attempted split spoon. 6) Return water light gray during rock core. Coring times inflated due to drill string oscillation leading to driller using a lower RPM drilling speed and having stop approximately 1 to 4 times per minute to correct, particularly for C2 and C3. 7) Borehole grouted with 1 bag portland cement, 1/2 bag bentonite powder, and 40 gallons water. Topped off borehole with approximately 3 inches of cold patch asphalt at the ground surface. 8) All visual descriptions are per the Burmister classification system. All lab gradations are per the AASHTO M 145 classification system.										
70												
75												
80												
85												

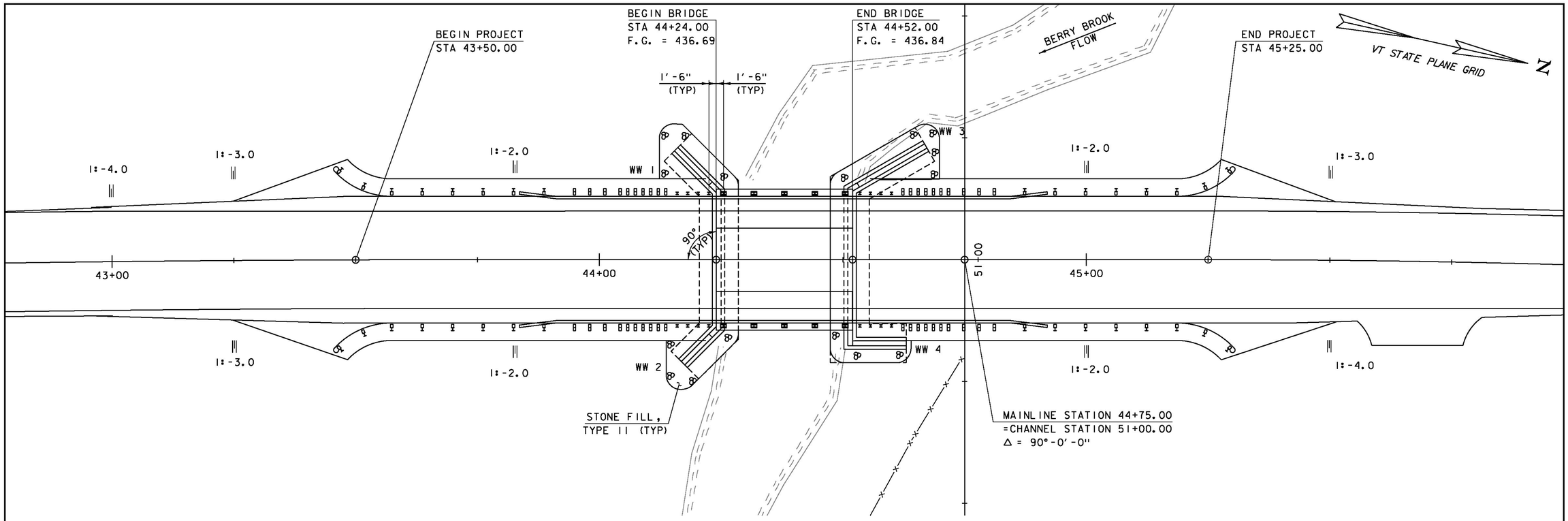
Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GEODESIGN BORING LOG 750-09.13 RICHFORD VTRANS.GPJ VERMONT AOT.GDT 10/9/13

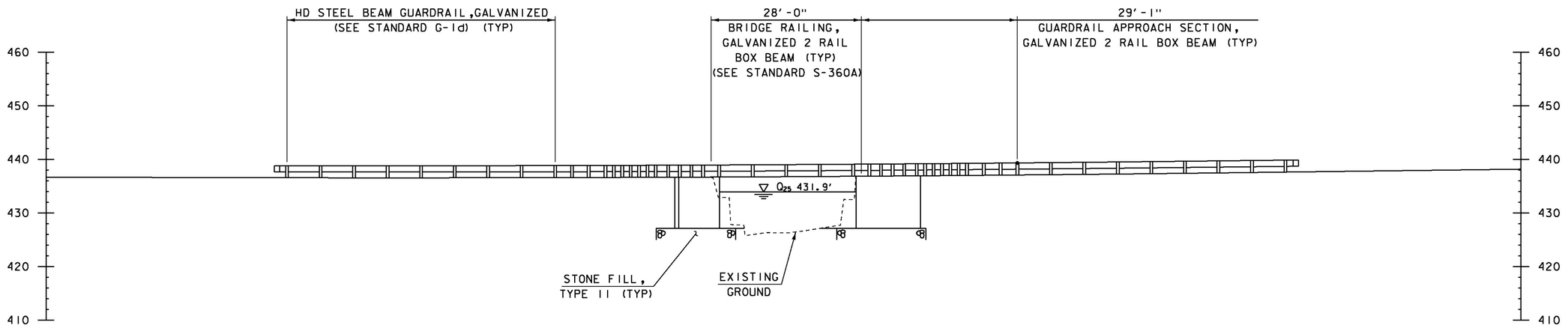
PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158bor.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
BORING LOGS 7

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 21 OF 36



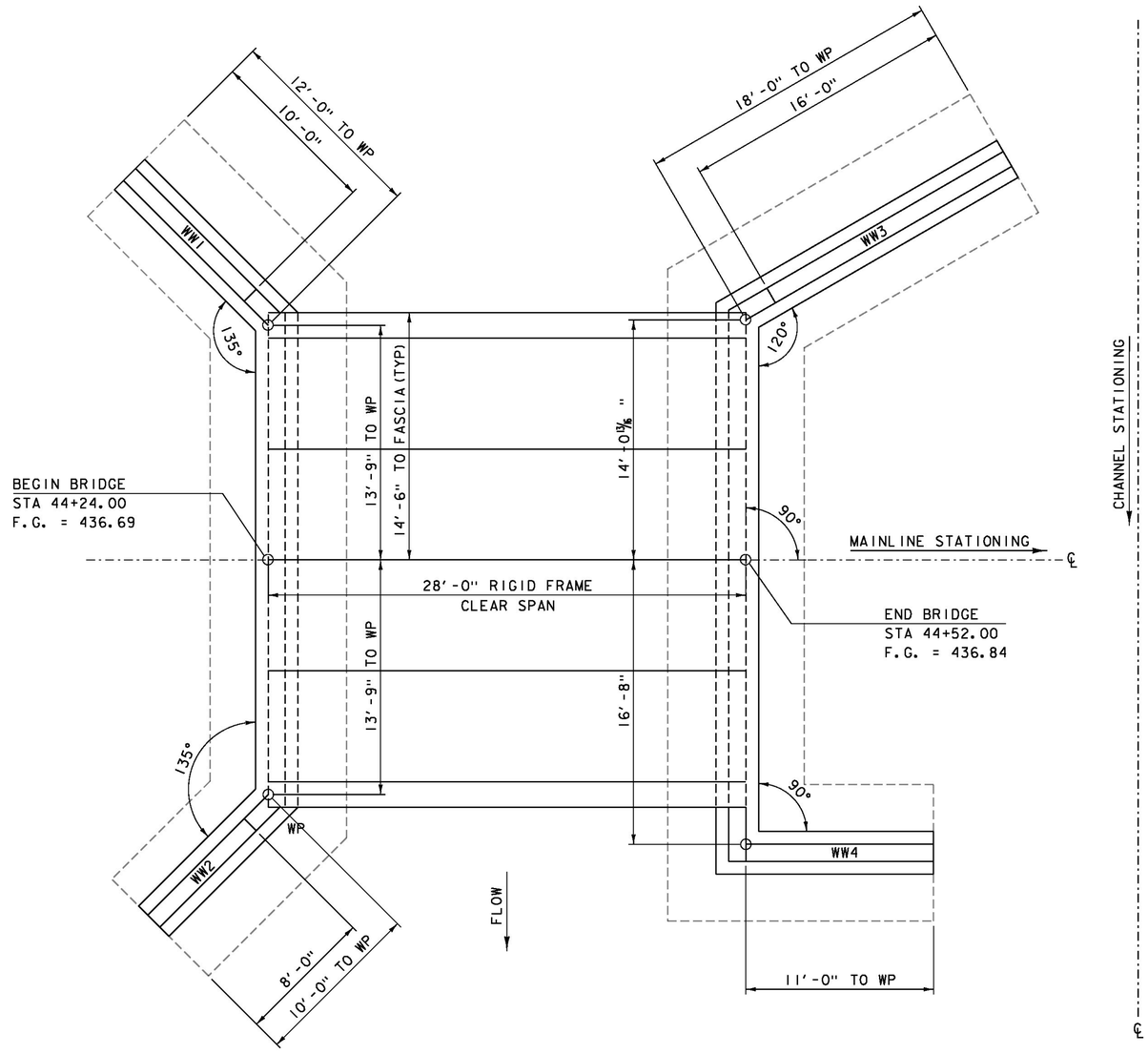
PLAN



ELEVATION

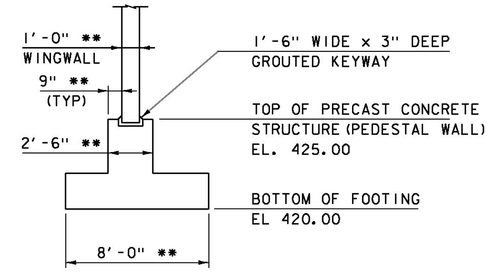
SCALE 1" = 10'-0"
10 0 10

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)
FILE NAME: s12j158pe.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
PLAN AND ELEVATION	SHEET 22 OF 36



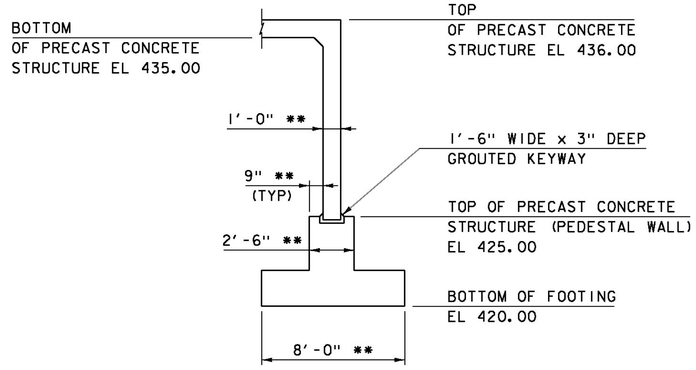
BRIDGE LAYOUT

SCALE 1/4" = 1'-0"



WINGWALL SECTION

SCALE 1/4" = 1'-0"

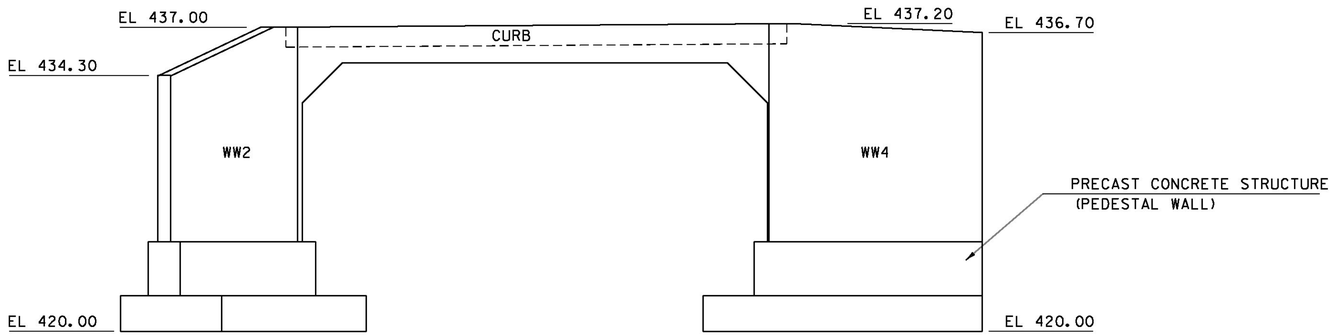


PEDESTAL WALL SECTION

SCALE 1/4" = 1'-0"

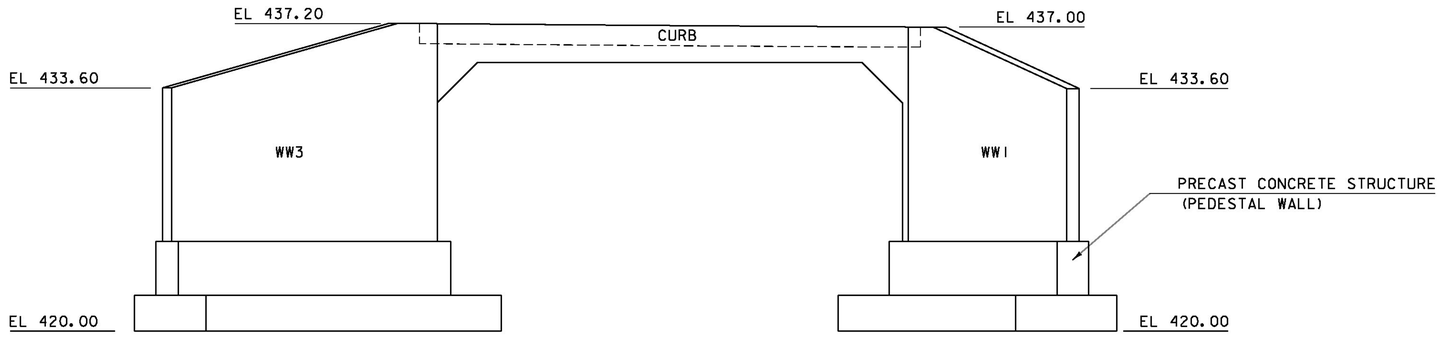
** DIMENSION SHOWN FOR ESTIMATING PURPOSES ONLY. ACTUAL DIMENSIONS TO BE DETERMINED BY THE FABRICATOR.

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)
FILE NAME: sl2jl58sub.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
BRIDGE LAYOUT AND WALL SECTIONS	SHEET 23 OF 36



DOWNSTREAM ELEVATION LOOKING UPSTREAM

SCALE 1/4" = 1'-0"

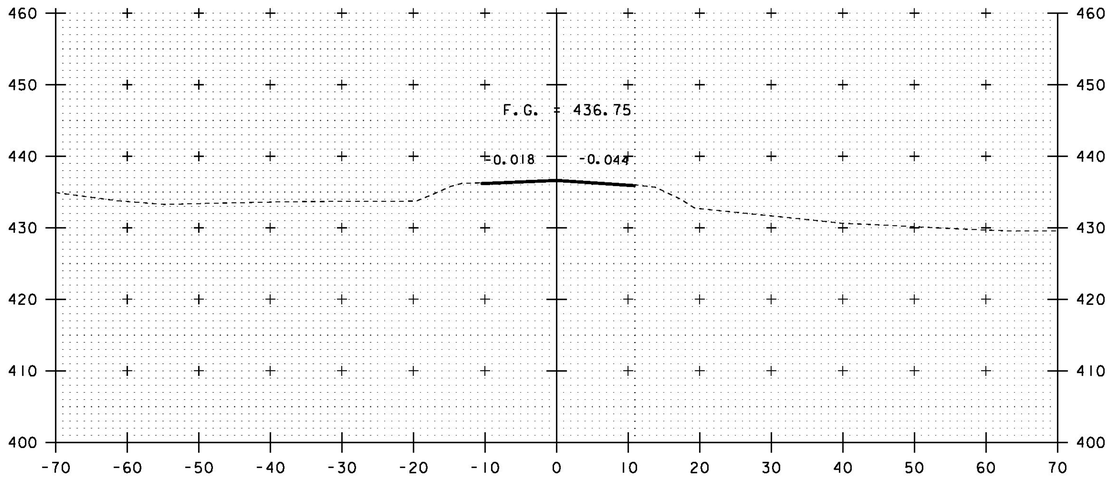


UPSTREAM ELEVATION LOOKING DOWNSTREAM

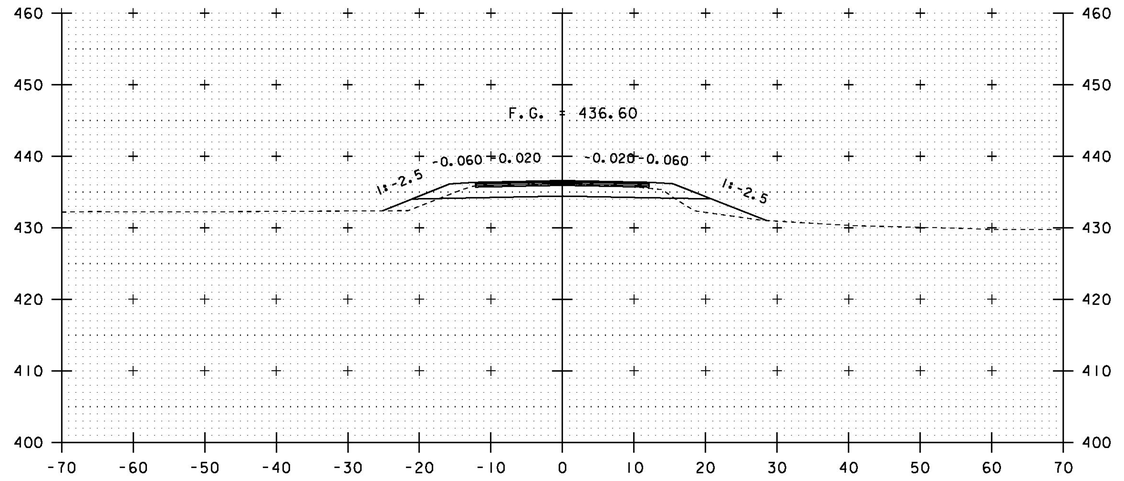
SCALE 1/4" = 1'-0"

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)

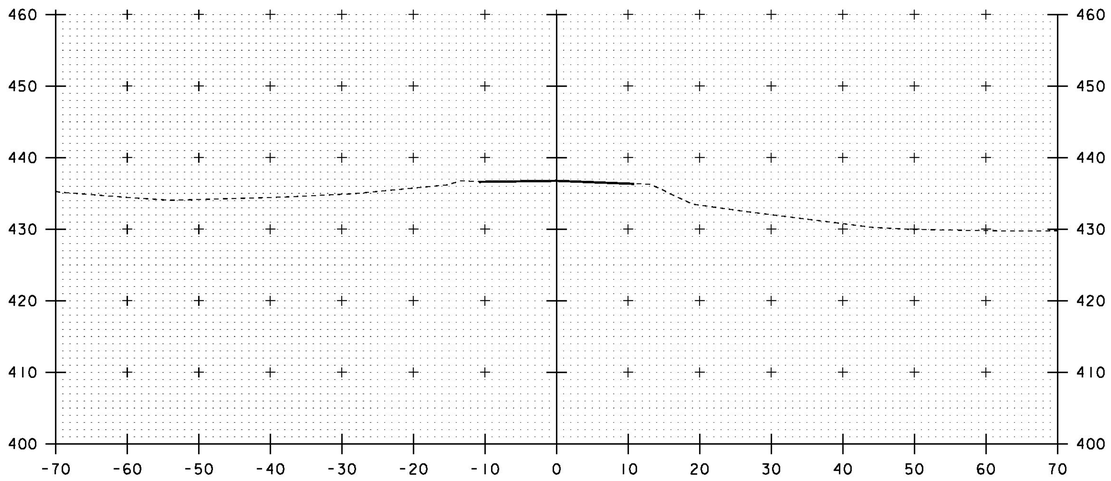
FILE NAME: s12j158sub.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
BRIDGE ELEVATIONS	SHEET 24 OF 36



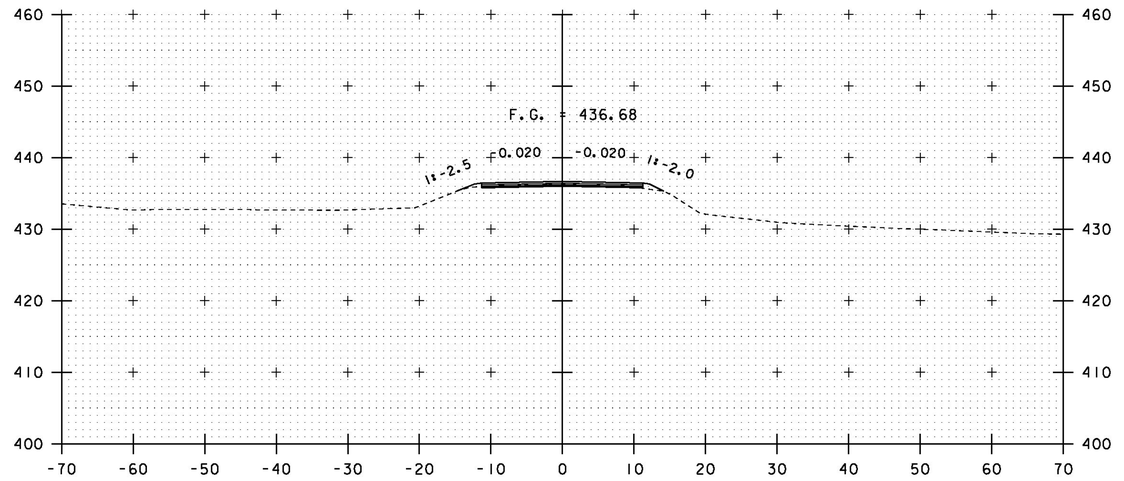
42+75



43+25



42+50
BEGIN APPROACH
MATCH EXISTING

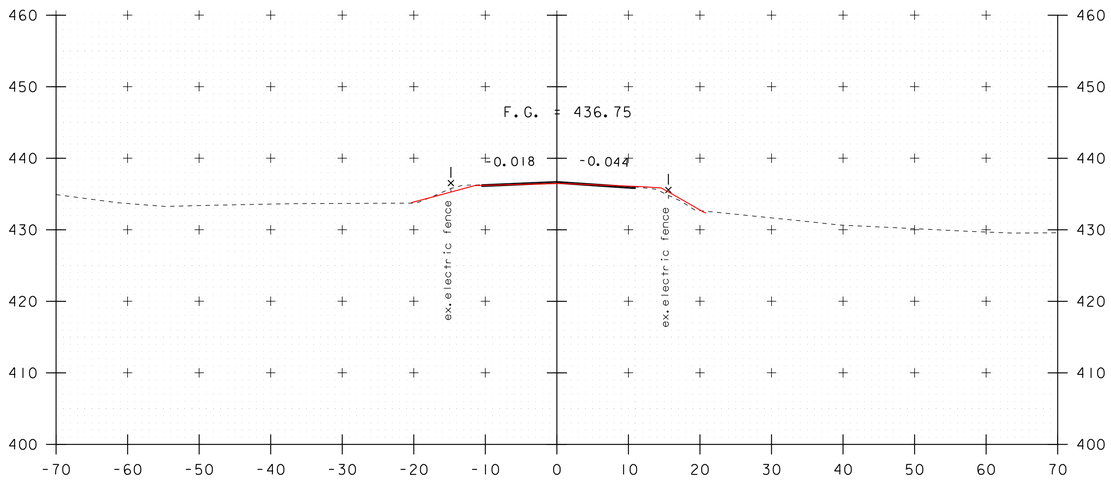


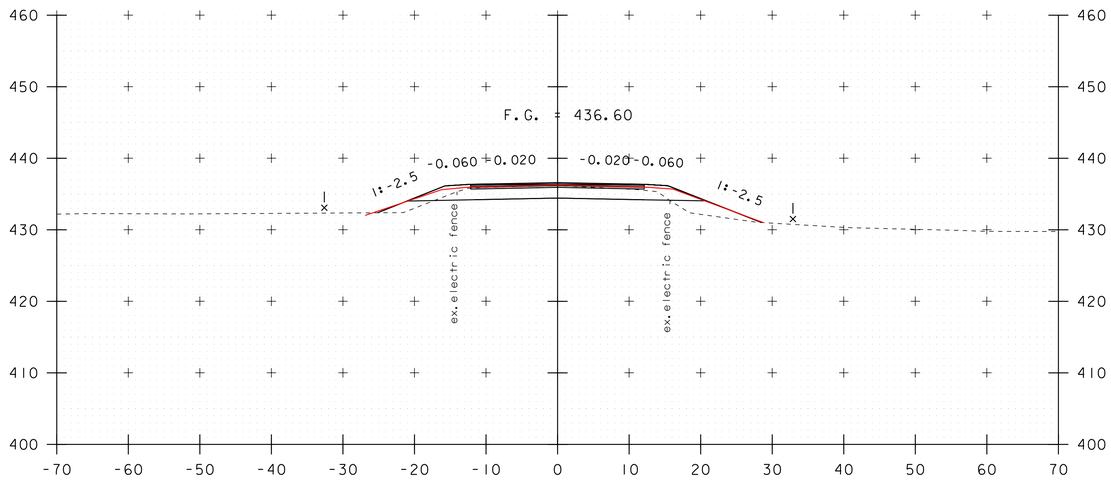
43+00

STA. 42+50 TO STA. 43+25

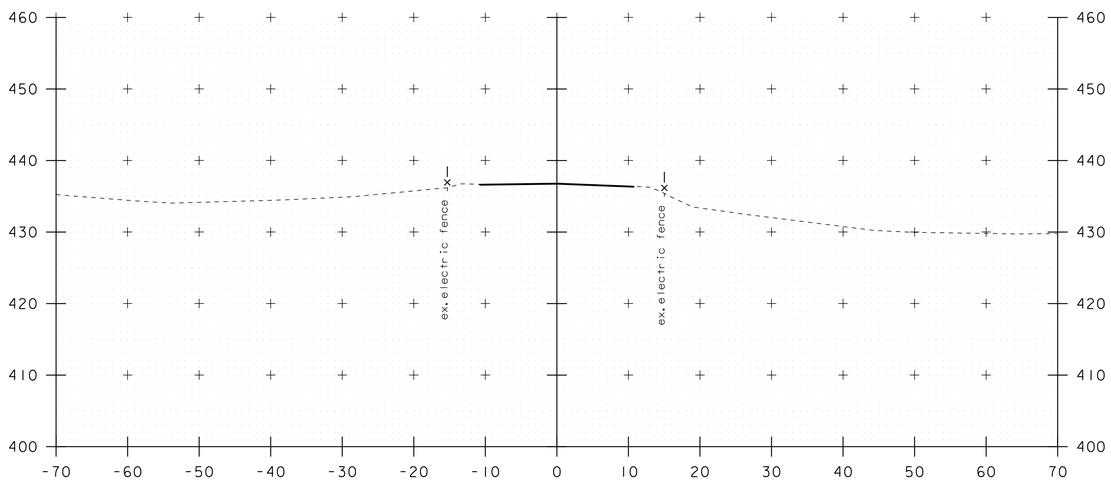
PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)

FILE NAME: s12j158xs.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
MAINLINE CROSS SECTIONS 1	SHEET 25 OF 36



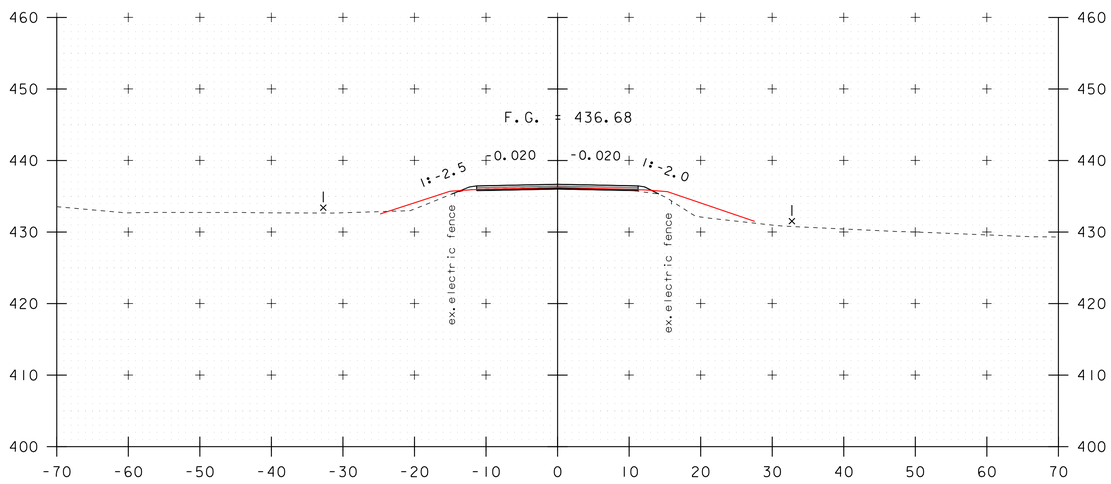


42+75



42+50
BEGIN APPROACH
MATCH EXISTING

43+25



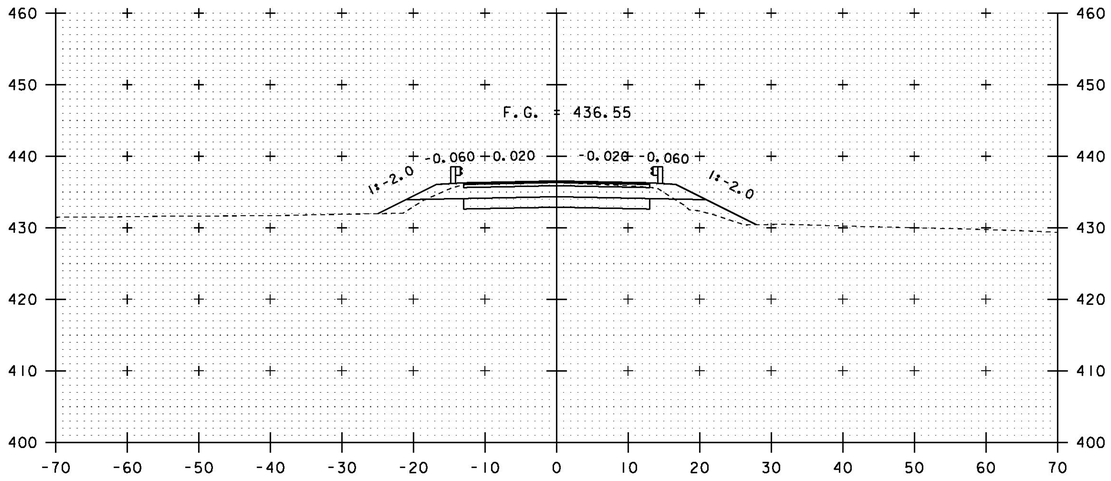
43+00

STA. 42+50 TO STA. 43+25

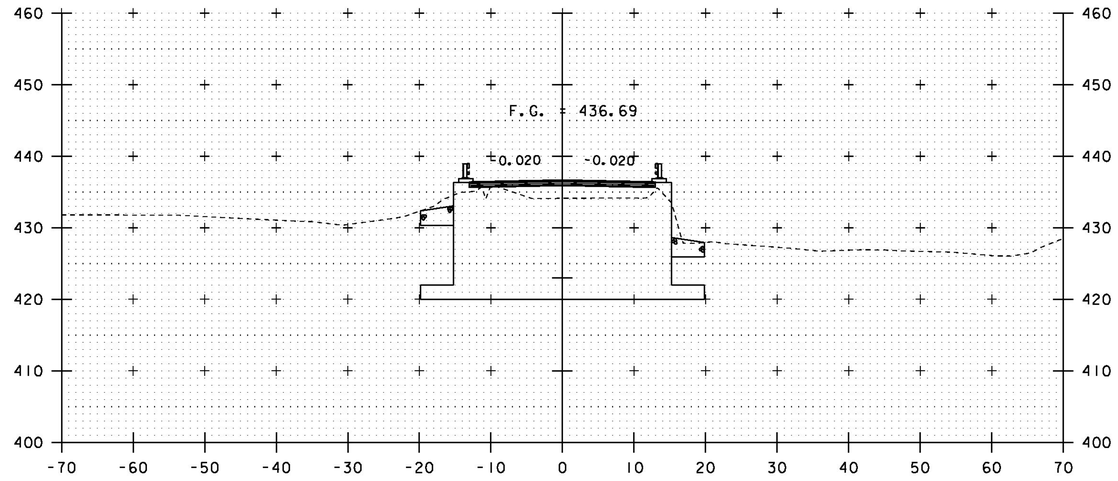
PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: sl2j158xs.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
MAINLINE CROSS SECTIONS 1

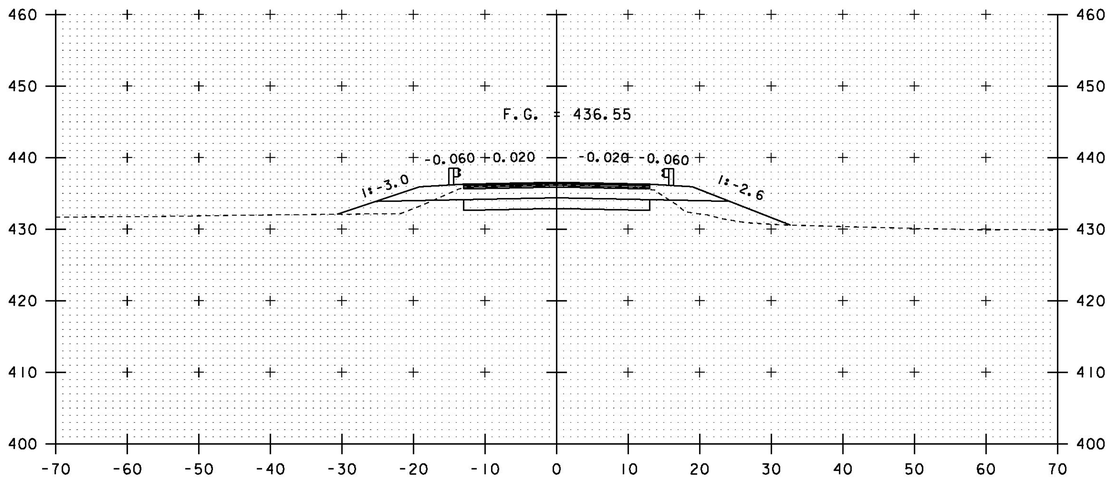
PLOT DATE: 09-AUG-2016 09:57
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET ~~258~~ 27 OF ~~316~~ 64



43+75



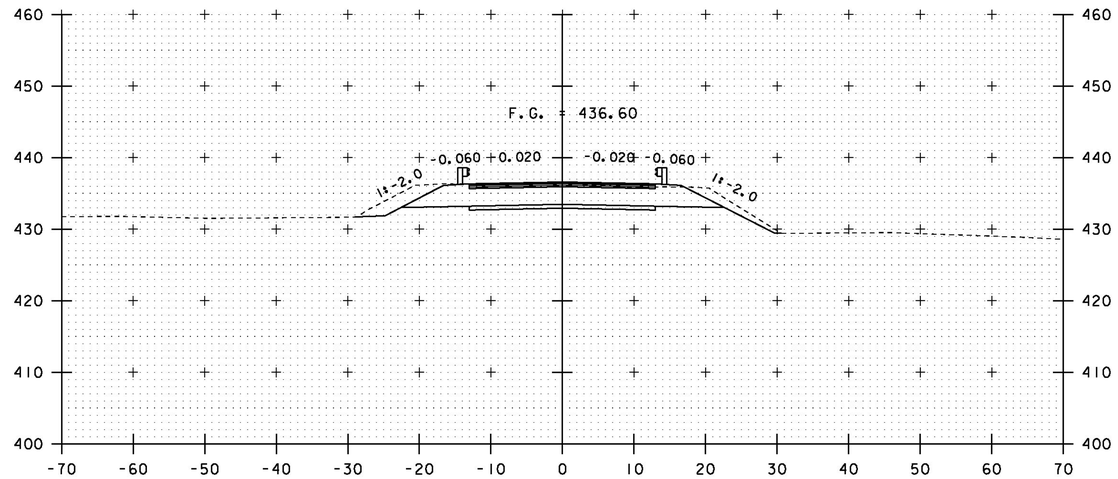
44+25



43+75

43+50

BEGIN PROJECT



44+25

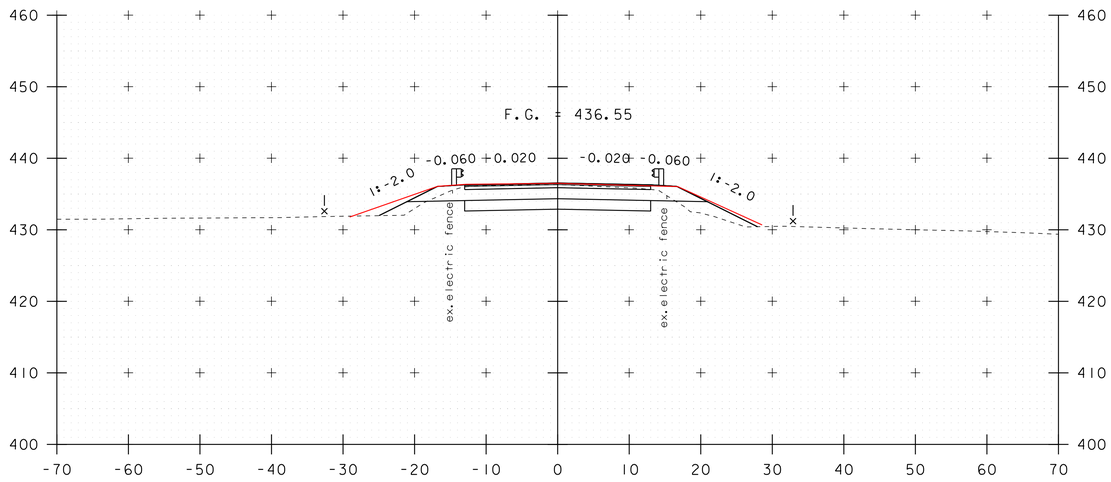
STA 44+24 BEGIN BRIDGE

44+00

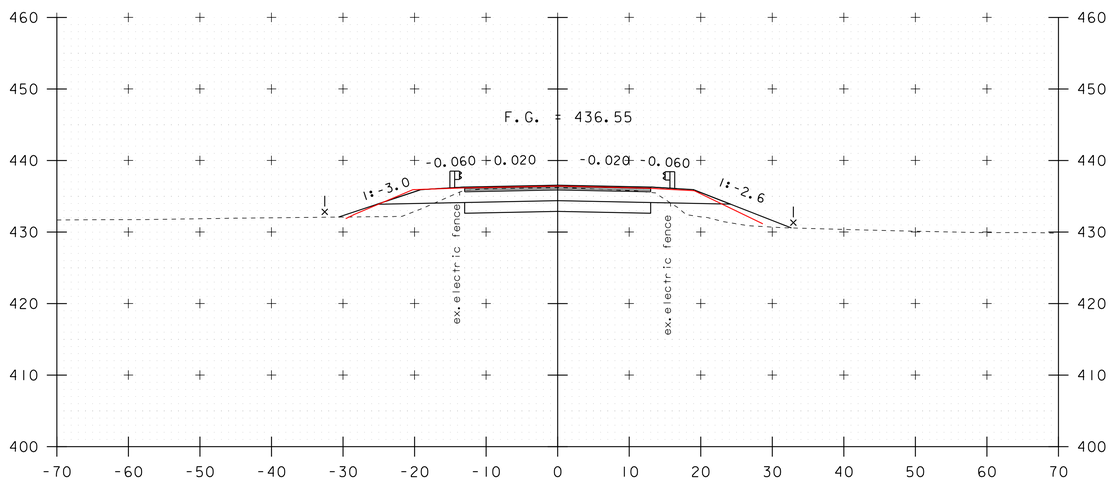
STA. 43+50 TO STA. 44+25

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)

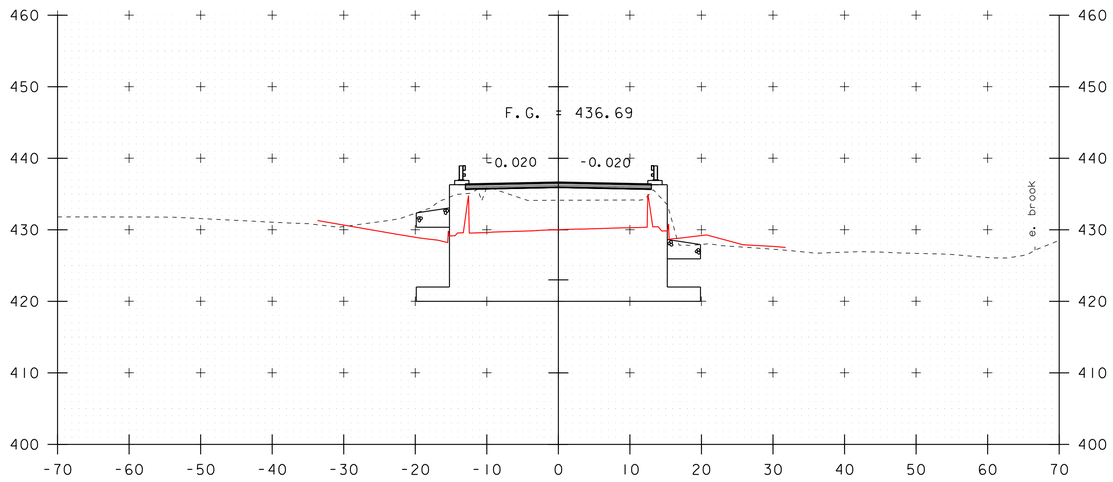
FILE NAME: s12j158xs.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
MAINLINE CROSS SECTIONS 2	SHEET 26 OF 36



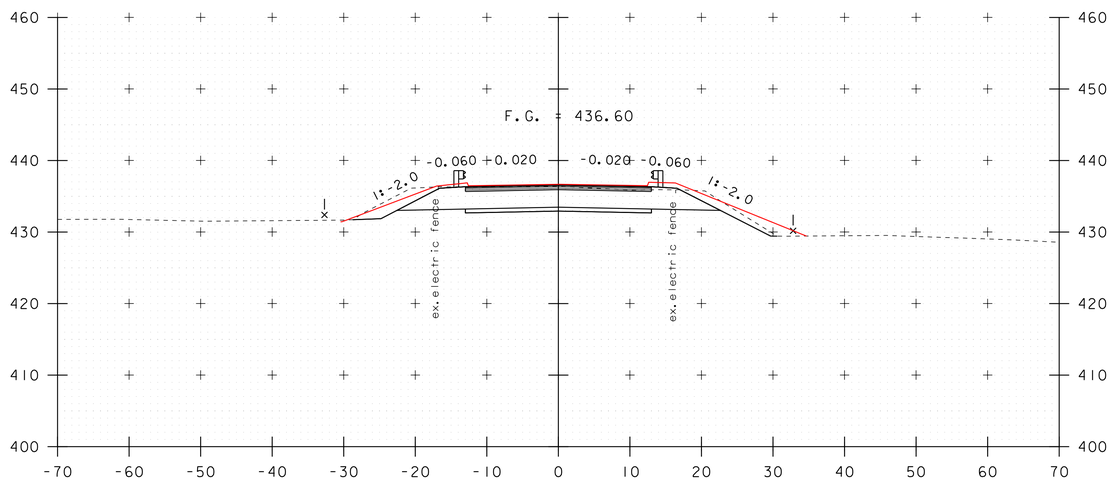
43+75



43+50
BEGIN PROJECT



44+25
STA 44+24 BEGIN BRIDGE



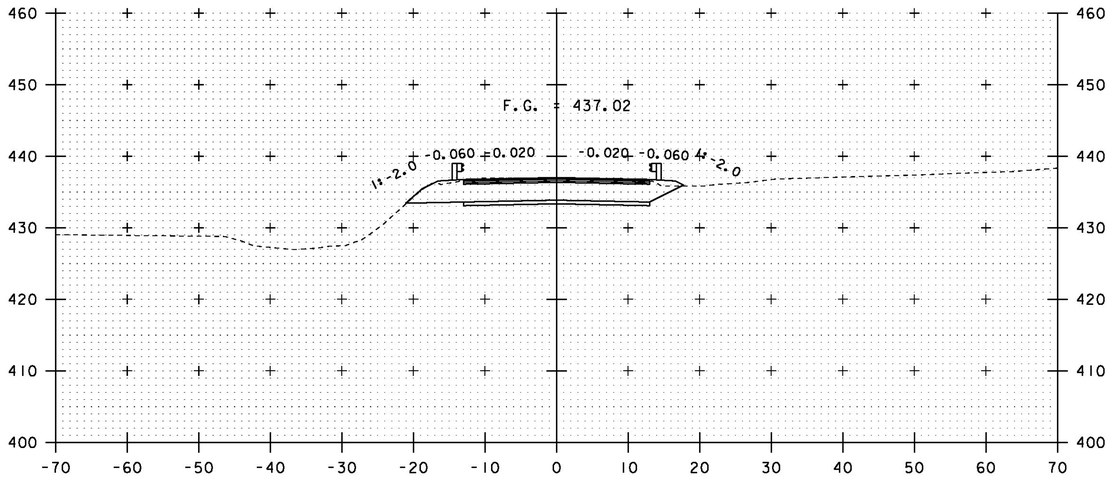
44+00

STA. 43+50 TO STA. 44+25

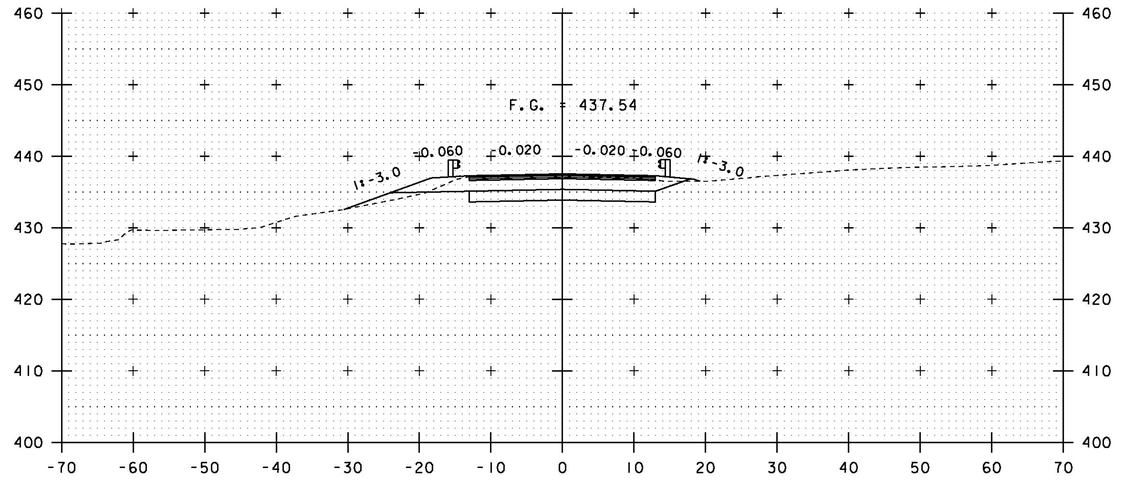
PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: sl2j158xs.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
MAINLINE CROSS SECTIONS 2

PLOT DATE: 09-AUG-2016 09:57
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 25 OF 64

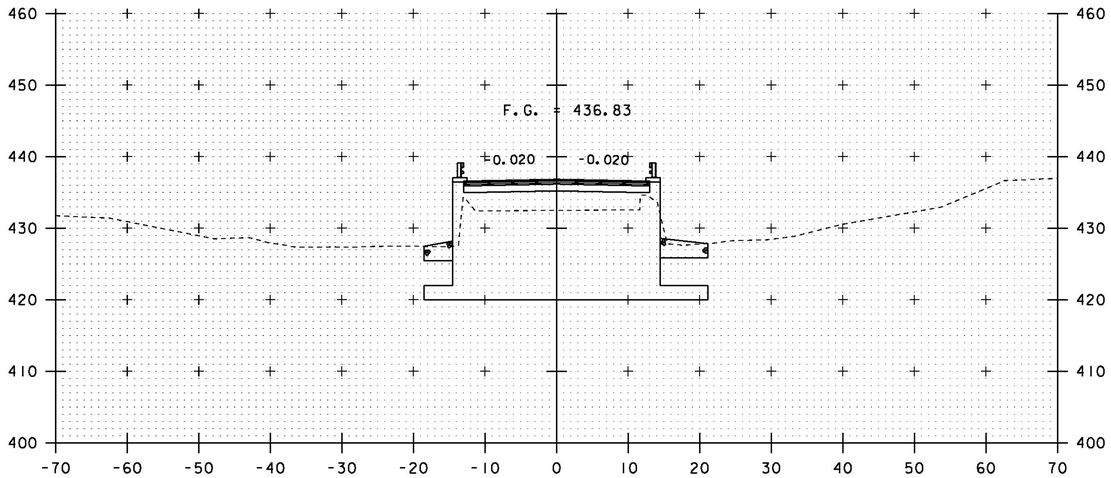


44+75



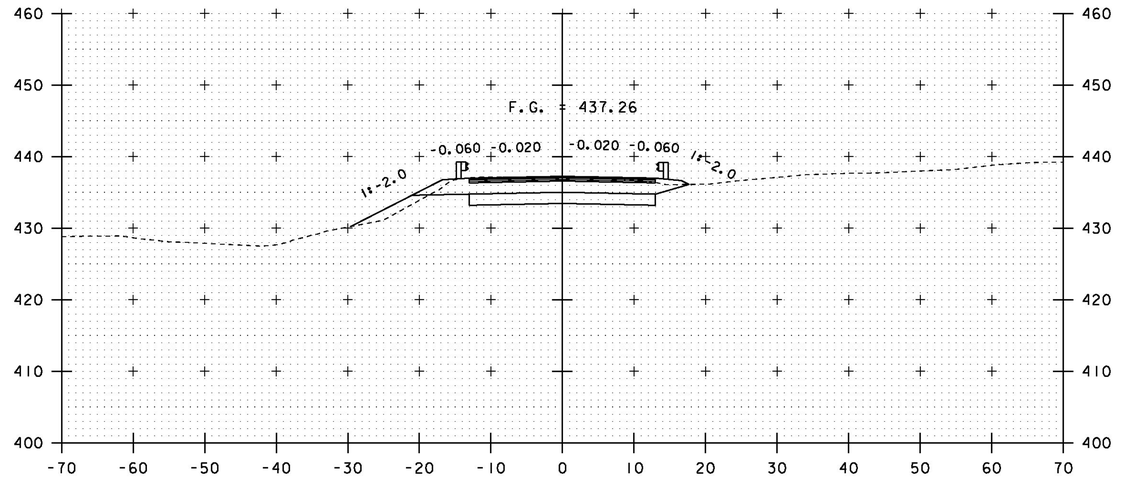
45+25

STA 44+52 END BRIDGE



44+50

END PROJECT

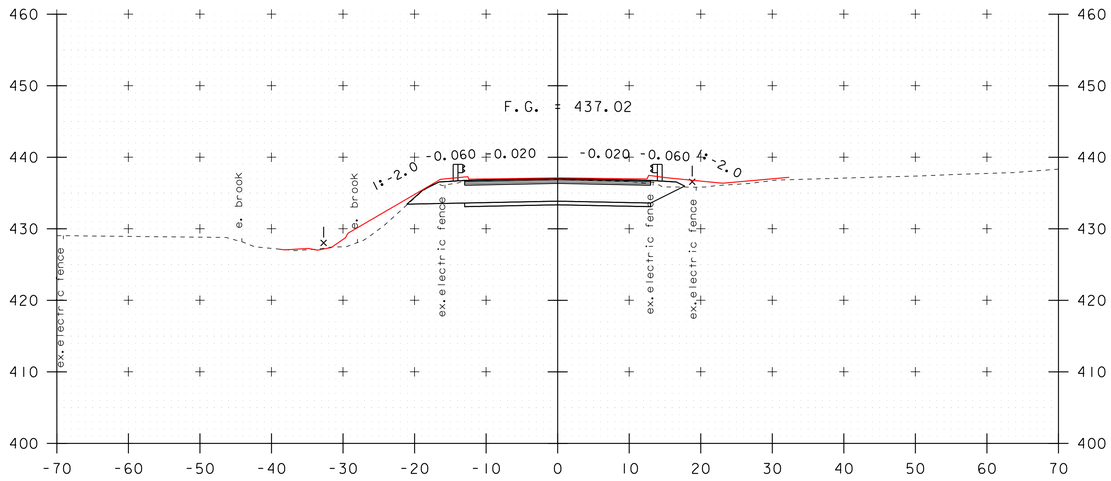


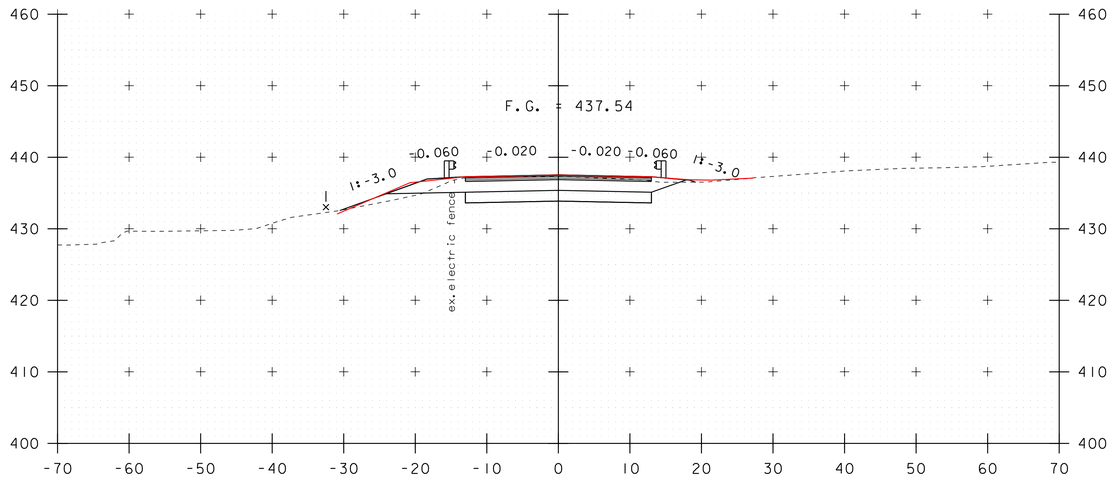
45+00

STA. 44+50 TO STA. 45+25

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)

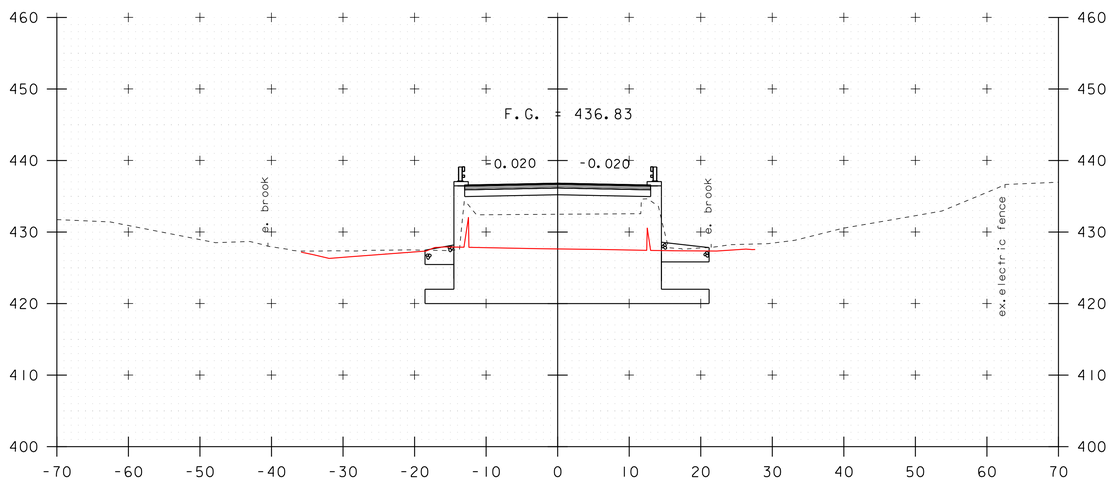
FILE NAME: s12j158xs.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
MAINLINE CROSS SECTIONS 3	SHEET 27 OF 36





44+75

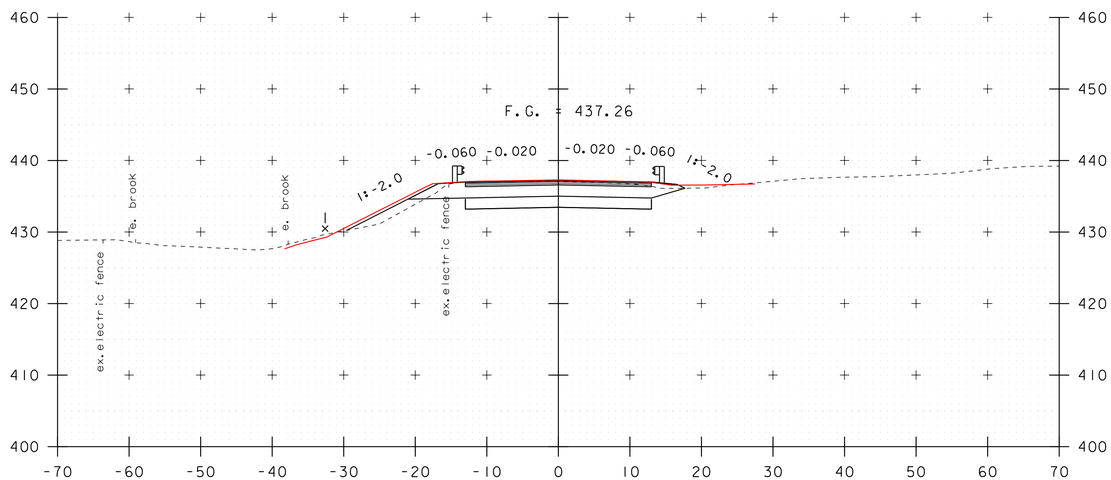
STA 44+52 END BRIDGE



44+50

45+25

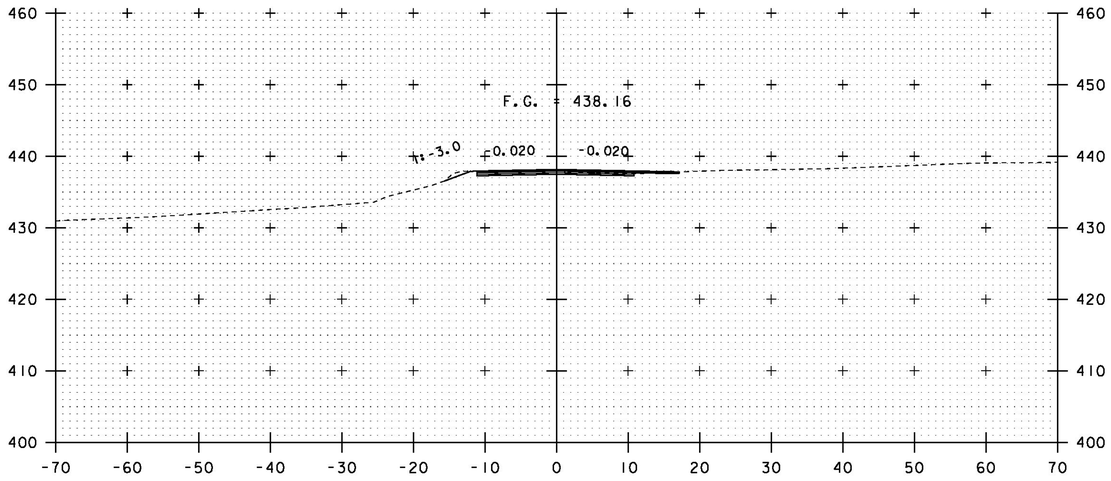
END PROJECT



45+00

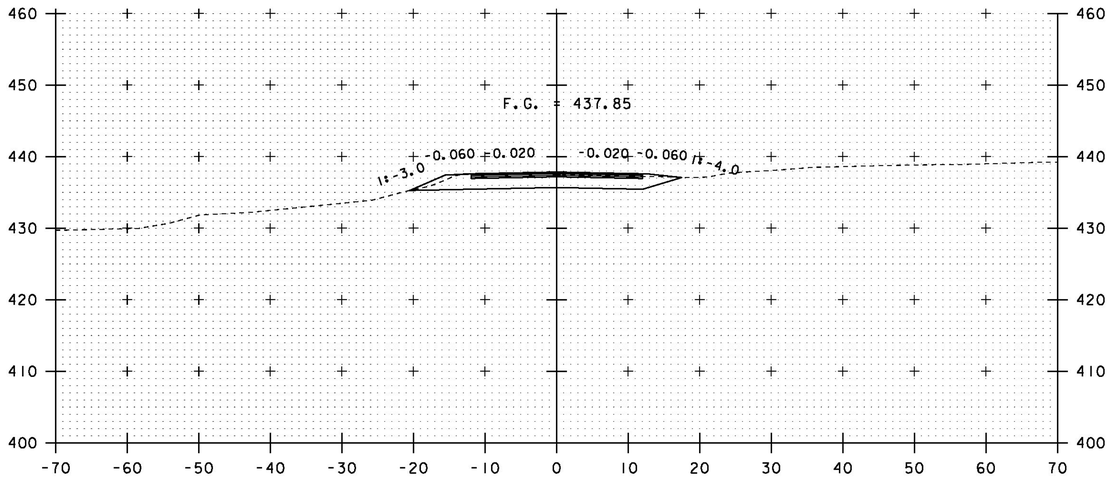
STA. 44+50 TO STA. 45+25

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)
FILE NAME: sl2j158xs.dgn	PLOT DATE: 09-AUG-2016 09:57
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
MAINLINE CROSS SECTIONS 3	SHEET 23R 31 OF 26 64

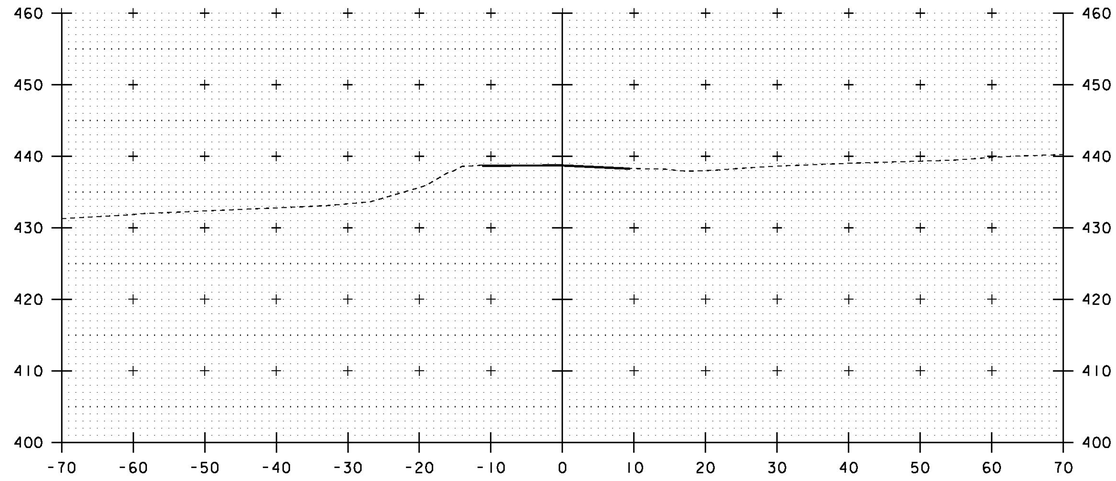


45+75

CONSTRUCT PAVED APRON



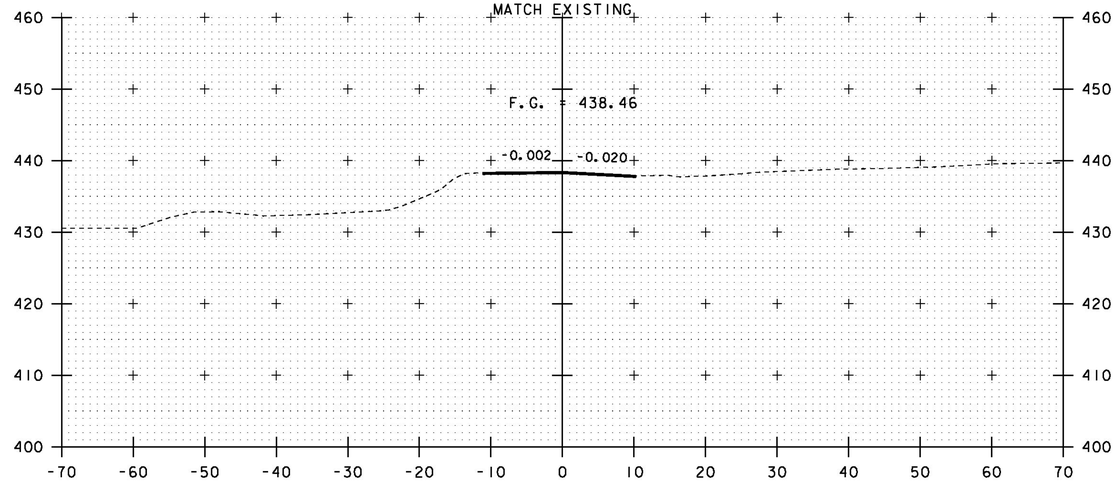
45+50



46+25

END APPROACH

MATCH EXISTING



46+00

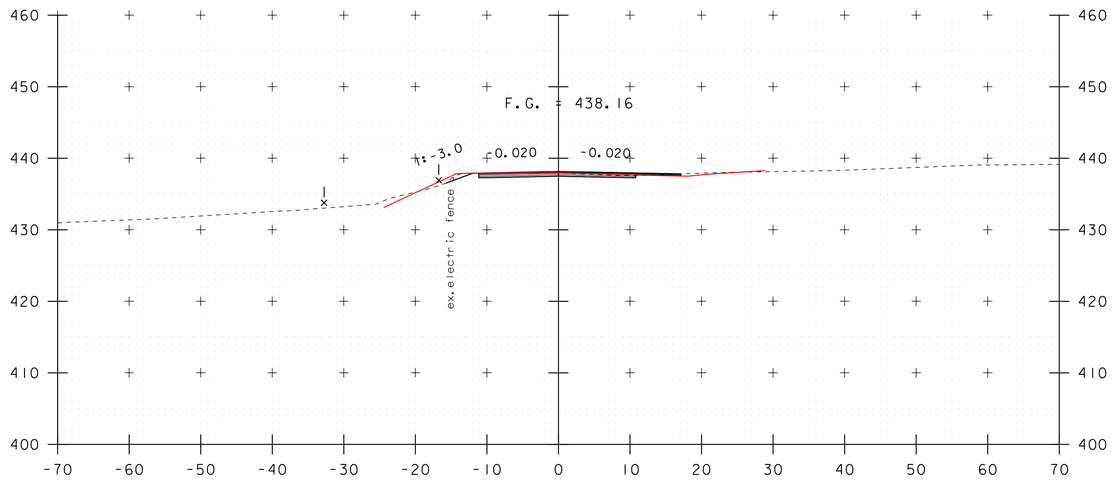
STA. 45+50 TO STA. 46+25

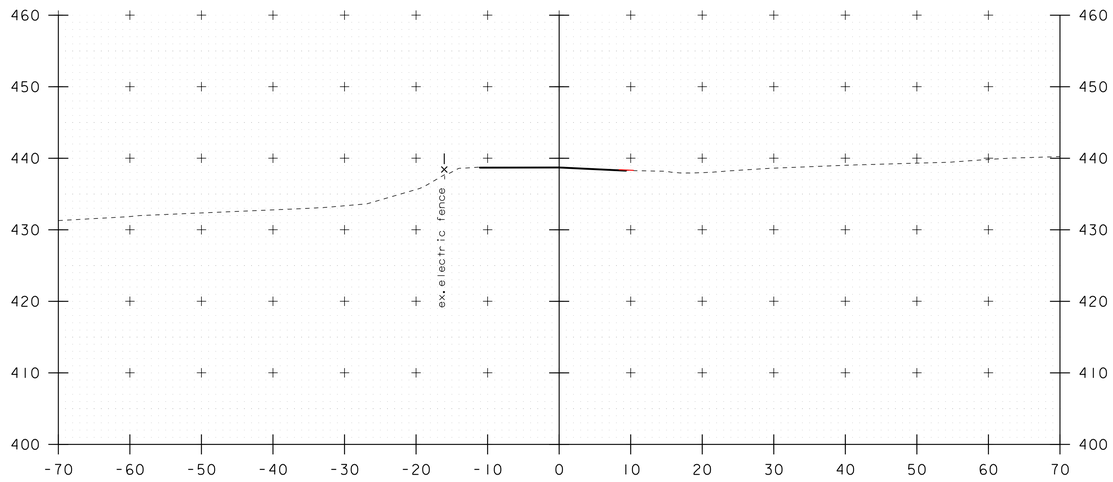
PROJECT NAME: RICHFORD

PROJECT NUMBER: BRF 0302(29)

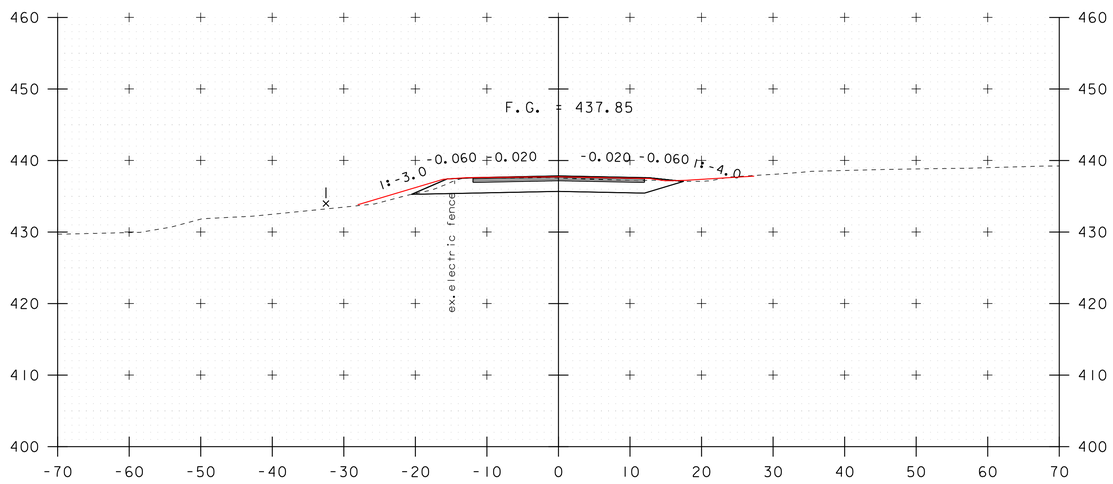
FILE NAME: s12j158xs.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
MAINLINE CROSS SECTIONS 4

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 28 OF 36



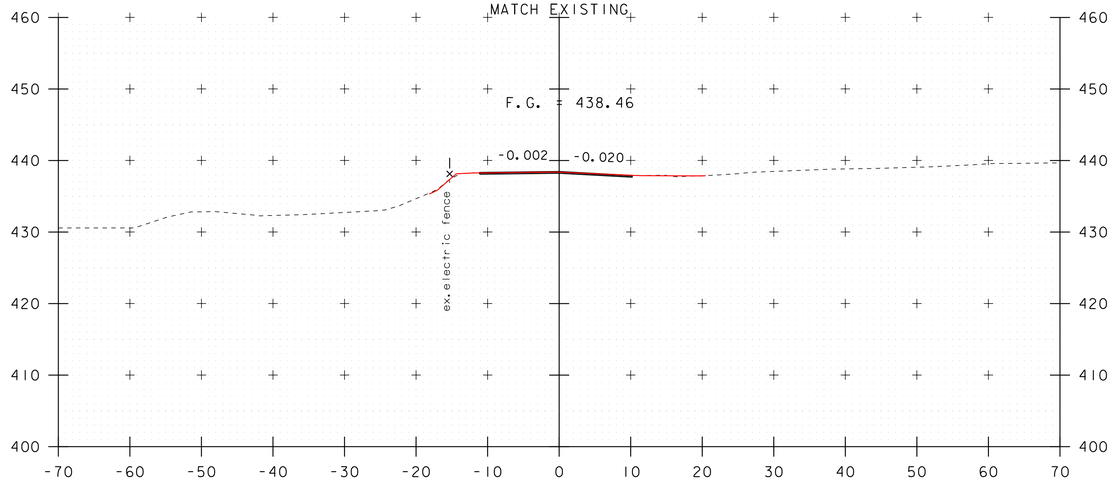


45+75
CONSTRUCT PAVED APRON



45+50

46+25
END APPROACH
MATCH EXISTING



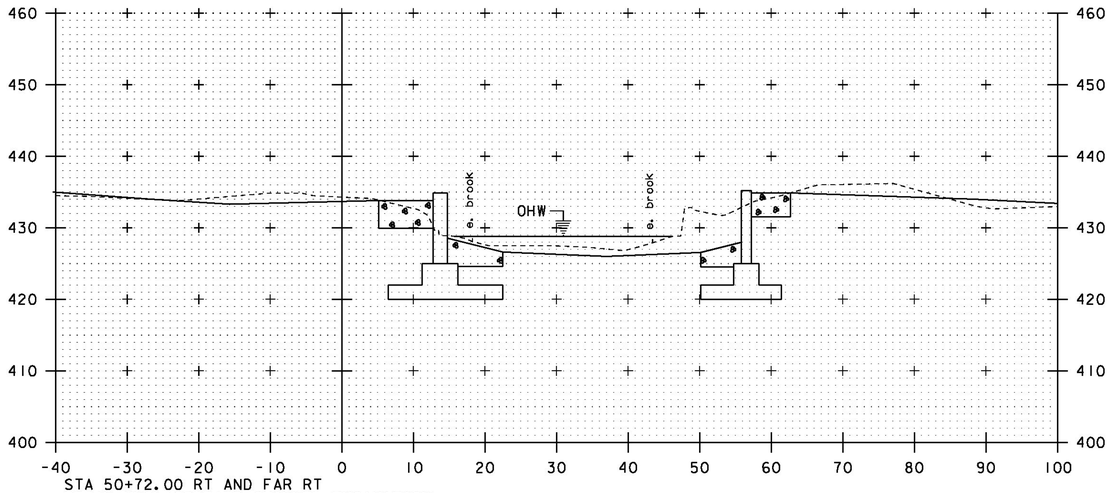
46+00

STA. 45+50 TO STA. 46+25

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

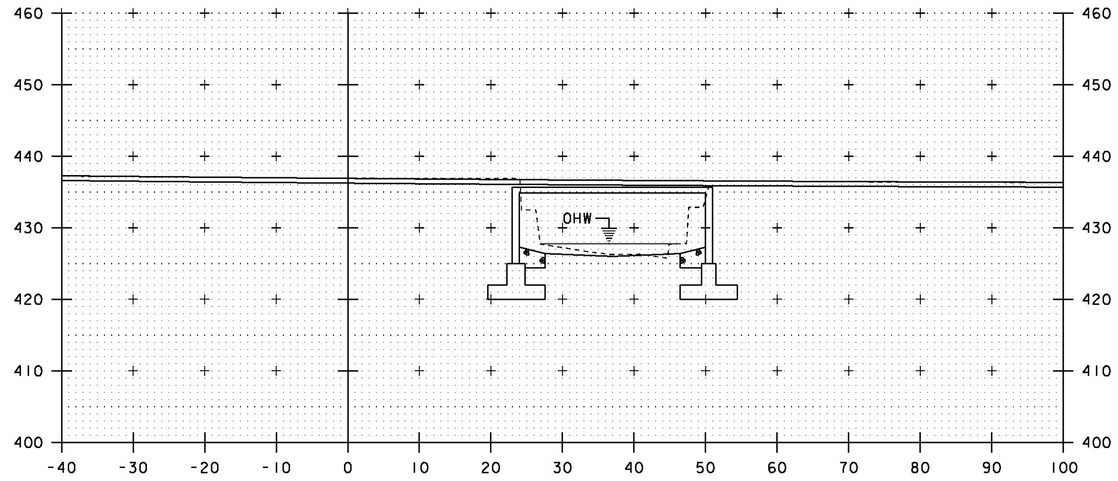
FILE NAME: sl2j158xs.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
MAINLINE CROSS SECTIONS 4

PLOT DATE: 09-AUG-2016 09:57
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 33 OF 64

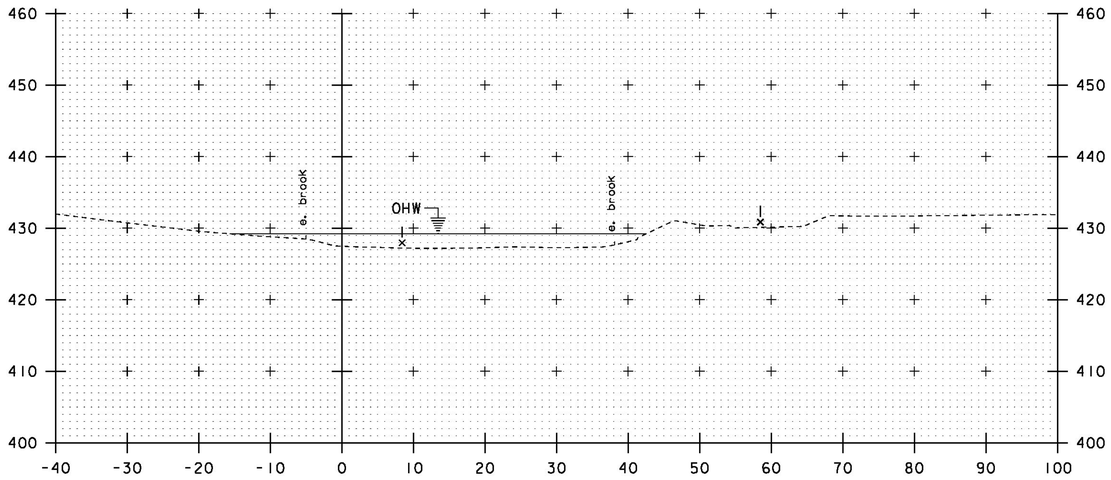


STA 50+72.00 RT AND FAR RT
BEGIN UNCLASSIFIED CHANNEL EXCAVATION
GEOTEXTILE UNDER STONE FILL
STONE FILL, TYPE II
GRUBBING MATERIAL

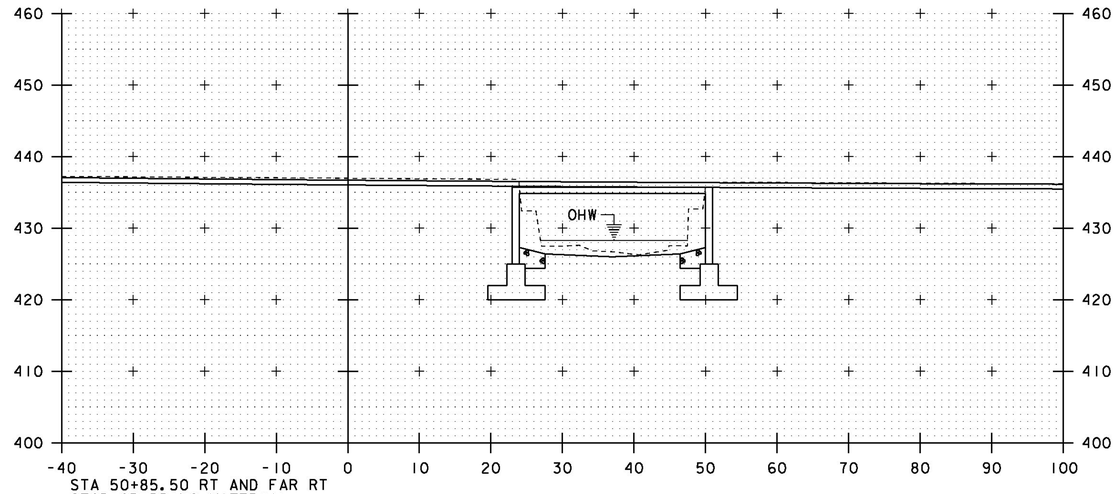
50+80



51+00



50+70



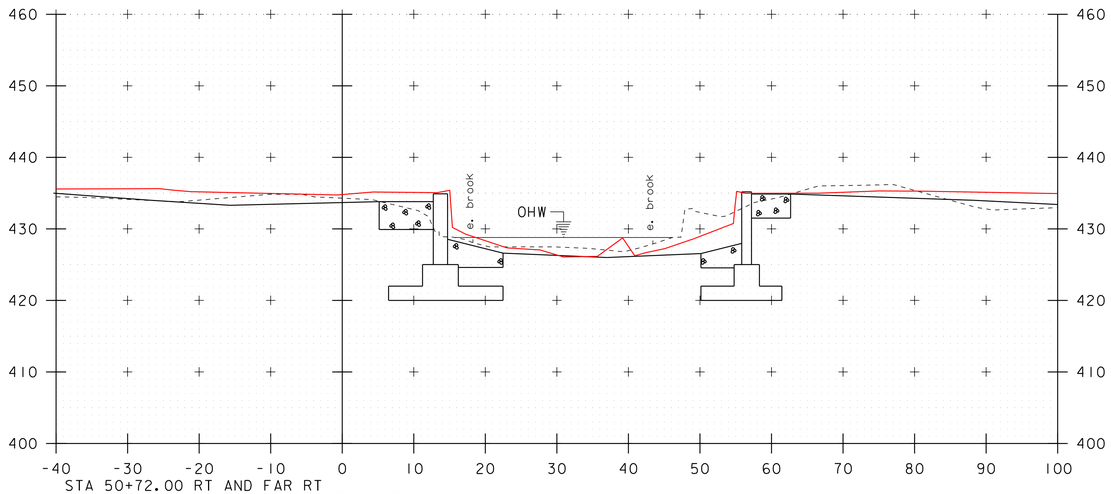
STA 50+85.50 RT AND FAR RT
STOP GRUBBING MATERIAL

50+90

STA. 50+70 TO STA. 51+00

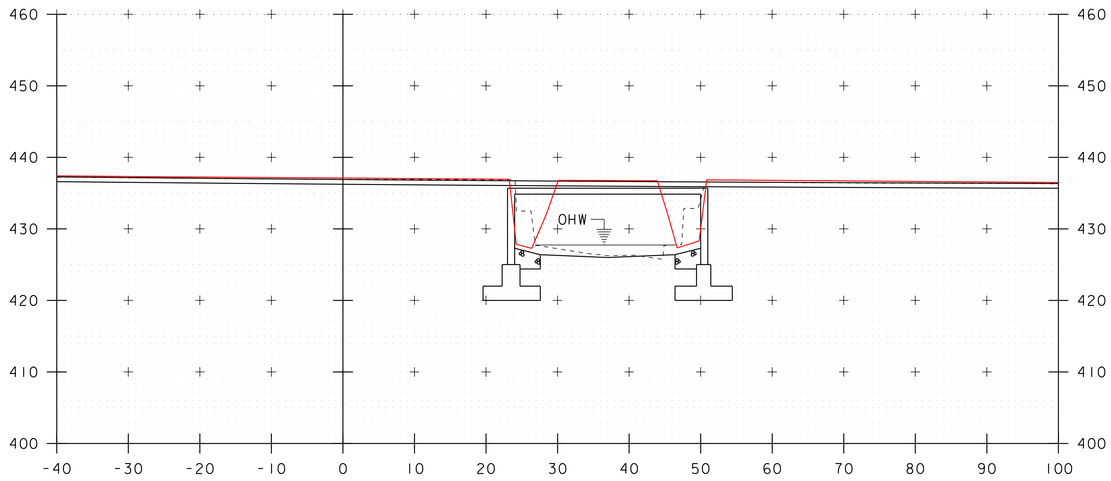
PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)

FILE NAME: s12j158xs.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
CHANNEL CROSS SECTIONS I	SHEET 29 OF 36

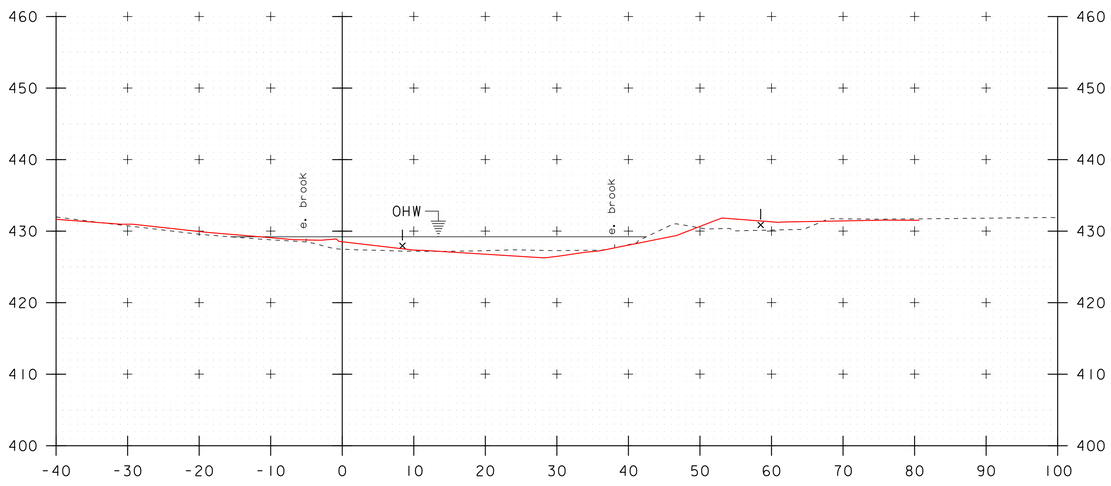


STA 50+72.00 RT AND FAR RT
BEGIN UNCLASSIFIED CHANNEL EXCAVATION
GEOTEXTILE UNDER STONE FILL
STONE FILL, TYPE II
GRUBBING MATERIAL

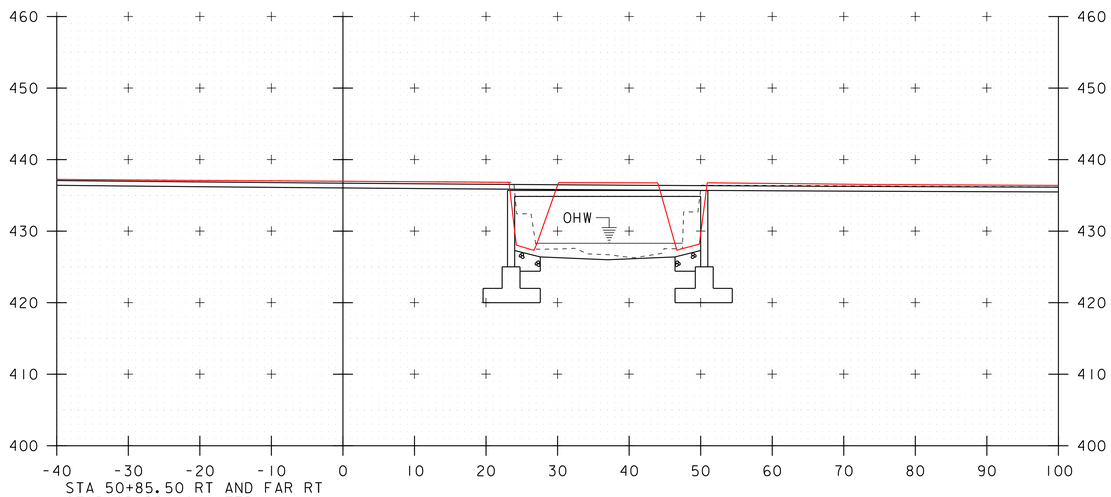
50+80



51+00



50+70

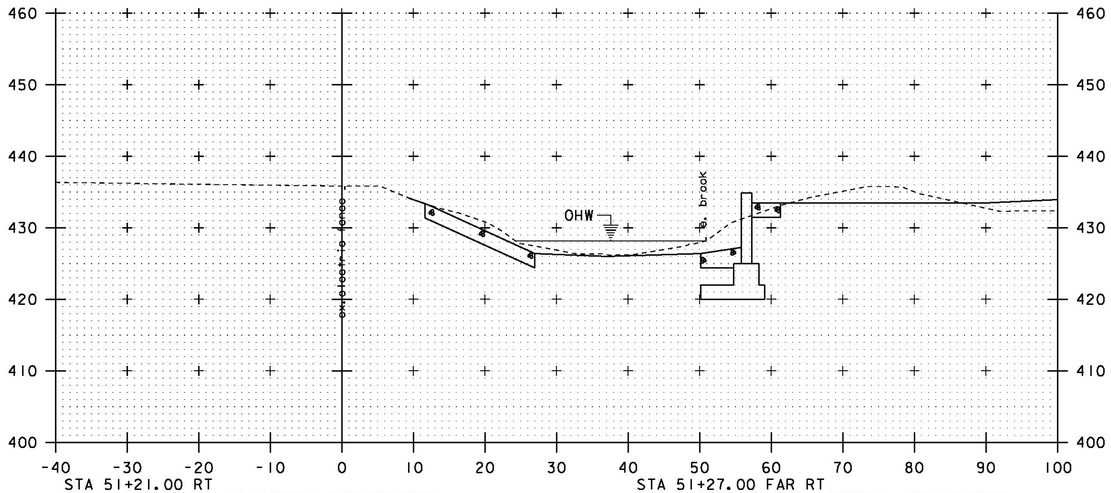


STA 50+85.50 RT AND FAR RT
STOP GRUBBING MATERIAL

50+90

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)
FILE NAME: sl2j158xs.dgn	PLOT DATE: 09-AUG-2016 09:57
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
CHANNEL CROSS SECTIONS 1	SHEET 35 OF 64

STA. 50+70 TO STA. 51+00



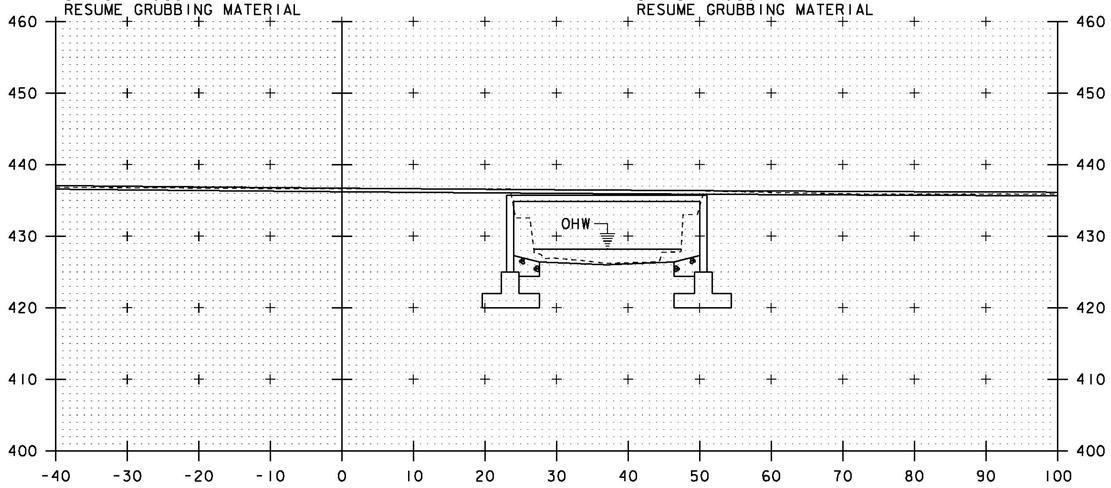
STA 51+21.00 RT
END UNCLASSIFIED CHANNEL EXCAVATION
GEOTEXTILE UNDER STONE FILL
STONE FILL, TYPE II
GRUBBING MATERIAL

STA 51+14.50 RT
RESUME GRUBBING MATERIAL

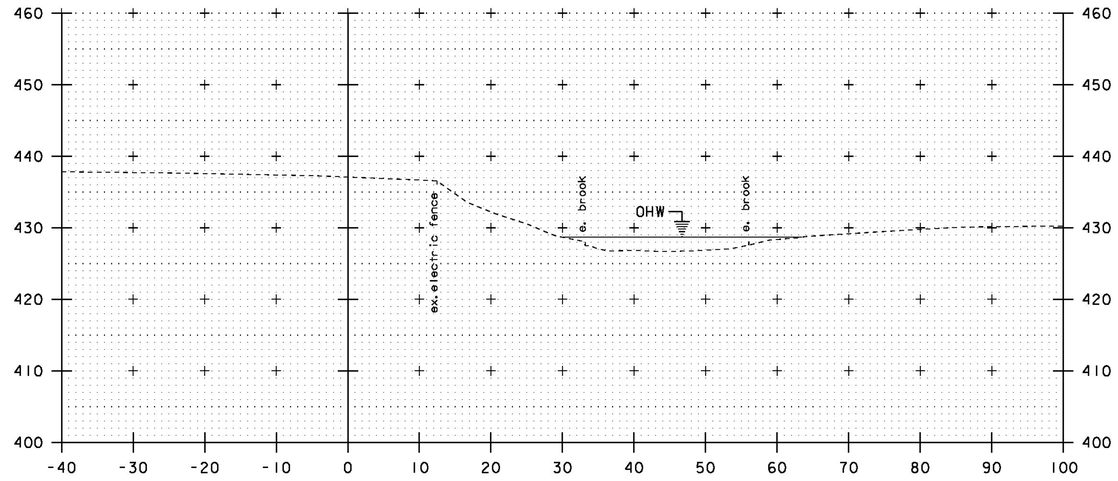
51+20

STA 51+27.00 FAR RT
END UNCLASSIFIED CHANNEL EXCAVATION
GEOTEXTILE UNDER STONE FILL
STONE FILL, TYPE II
GRUBBING MATERIAL

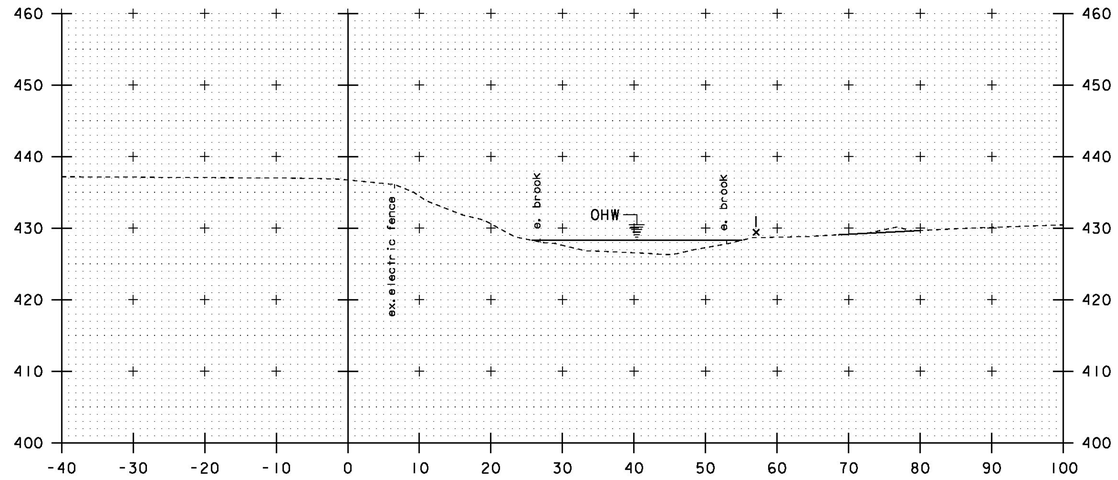
STA 51+14.50 FAR RT
RESUME GRUBBING MATERIAL



51+10



51+40



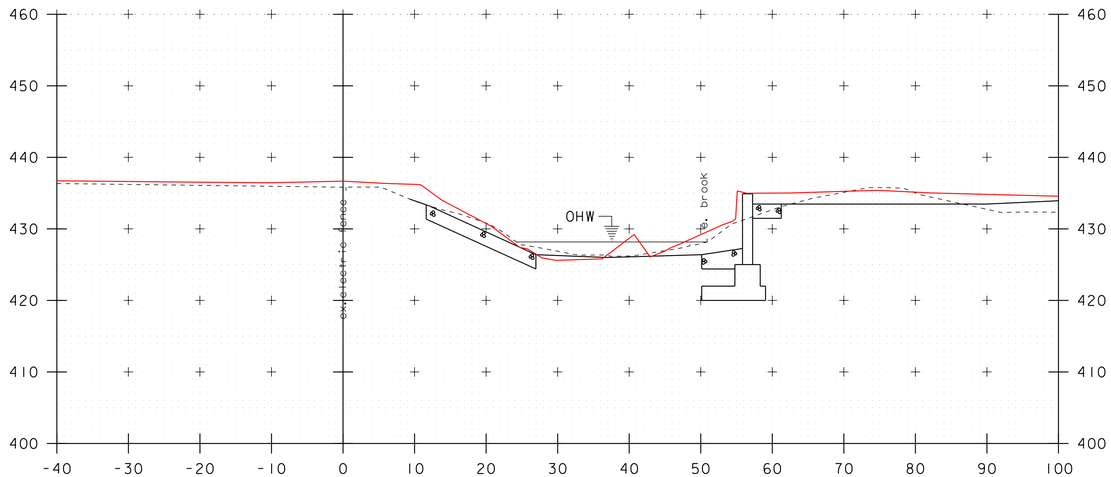
51+30

STA. 51+10 TO STA. 51+40

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: s12j158xs.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
CHANNEL CROSS SECTIONS 2

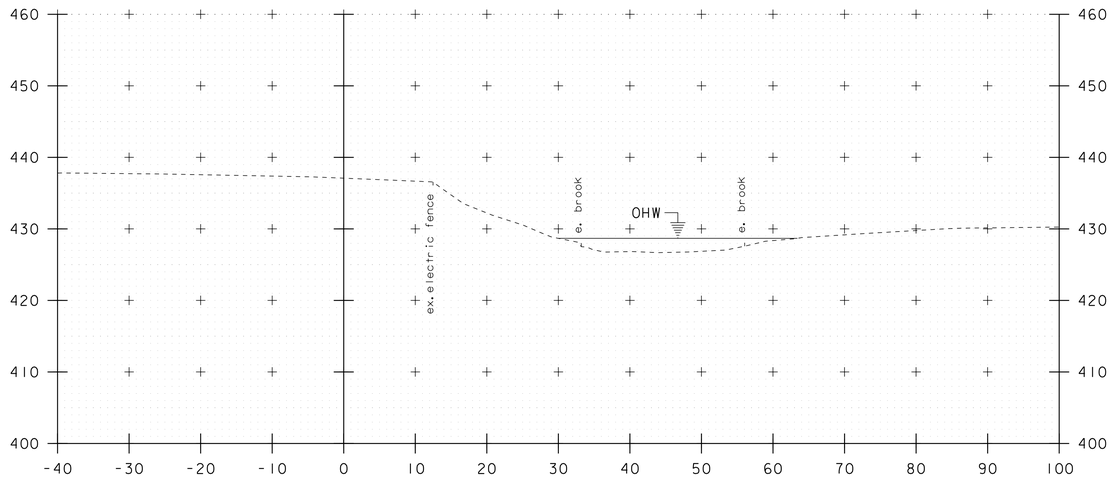
PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 30 OF 36



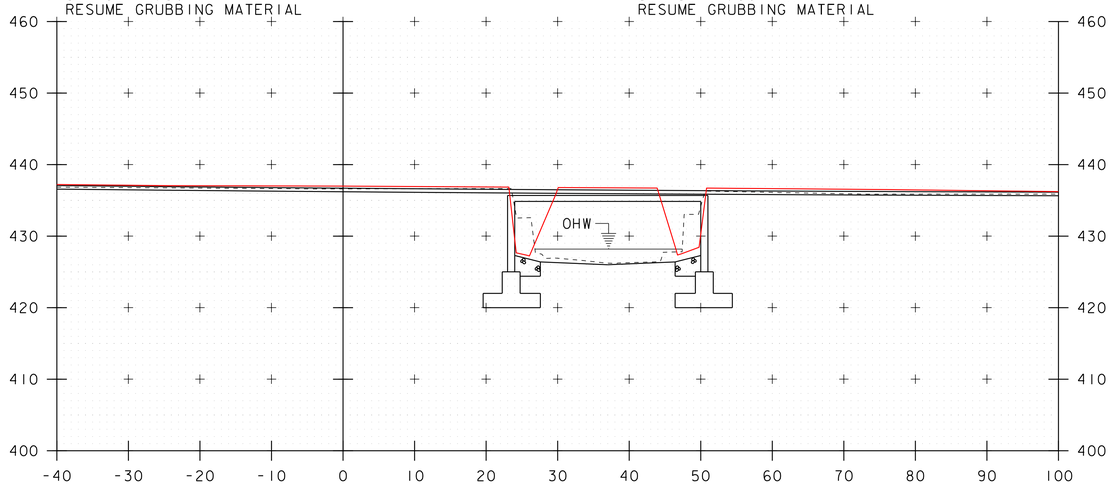
STA 51+21.00 RT
END UNCLASSIFIED CHANNEL EXCAVATION
GEOTEXTILE UNDER STONE FILL
STONE FILL, TYPE II
GRUBBING MATERIAL
STA 51+14.50 RT
RESUME GRUBBING MATERIAL

STA 51+27.00 FAR RT
END UNCLASSIFIED CHANNEL EXCAVATION
GEOTEXTILE UNDER STONE FILL
STONE FILL, TYPE II
GRUBBING MATERIAL
STA 51+14.50 FAR RT
RESUME GRUBBING MATERIAL

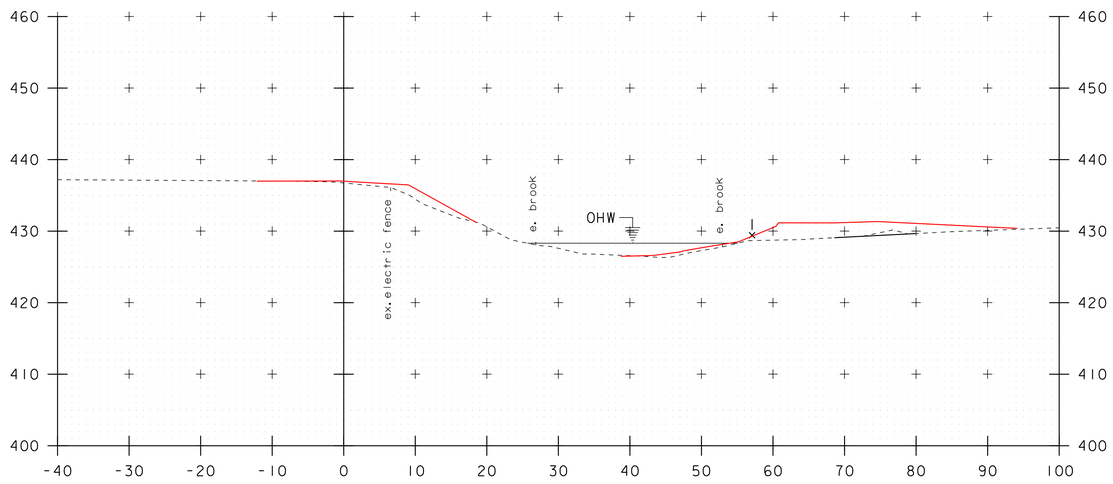
51+20



51+40



51+10



51+30

STA. 51+10 TO STA. 51+40

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: sl2j158xs.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
CHANNEL CROSS SECTIONS 2

PLOT DATE: 09-AUG-2016 09:57
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 37 OF 64

EPSC PLAN NARRATIVE

1.1 PROJECT DESCRIPTION

THIS PROJECT INVOLVES THE REPLACEMENT OF BRIDGE 6 AND APPROACH ROADWAY AND CHANNEL WORK. EXISTING CONCRETE T-BEAM WILL BE REPLACED WITH A PRECAST CONCRETE 3-SIDED FRAME OR ARCH, SPANNING 28 FEET OVER BERRY BROOK. BRIDGE 6 IS LOCATED IN THE TOWN OF RICHFORD, ON TH 3 1.2 MILES WEST OF JUNCTION WITH TH 1.

NOTE: AREA OF DISTURBANCE INCLUDES LIMITS OF EARTH DISTURBANCE WITHIN THE PROJECT AREA, AS WELL AS WASTE, BORROW AND STAGING AREAS, AND OTHER EARTH DISTURBING ACTIVITIES WITHIN OR DIRECTLY ADJACENT TO THE PROJECT LIMITS AS SHOWN ON THE ATTACHED EPSC PLAN.

TOTAL AREA OF DISTURBANCE AS SHOWN ON THE ATTACHED EPSC PLAN IS APPROXIMATELY 0.35 ACRE.

IT IS ANTICIPATED THAT THIS PROJECT WILL LAST ONE CONSTRUCTION SEASON.

1.2 SITE INVENTORY

1.2.1 TOPOGRAPHY

THE TOPOGRAPHY OF THE AREA IS HILLY, WITH A MIXTURE OF OPEN AND FORESTED LAND COVER. TOWN HIGHWAY 3, FIELD DRIVE AND GRAVEL DRIVEWAY ARE WITHIN THE PROJECT LIMITS. THERE IS A RESIDENCE ON THE EAST SIDE OF THE PROJECT.

1.2.2 DRAINAGE, WATERWAYS, BODIES OF WATER, AND PROXIMITY TO NATURAL OR MAN-MADE WATER FEATURES

THE BERRY BROOK IS THE ONLY WATER SOURCE WITHIN THE PROJECT LIMITS. THE BROOK IS CLASSIFIED AS STEEP, SINUOUS, ALUVIAL WITH LOW BANKS TO FLOODPLAIN RELIEF. STREAM BED CONSISTS OF MOSTLY SAND, GRAVEL AND SILT WITH SOME COBBLES. DUE TO THE NATURE OF THE SURROUNDING TERRAIN THE PROJECT SITE COULD RECEIVE FLOOD WATER FROM THE MISSISQUOI RIVER AS IT MAY BACK UP THROUGH THE SITE.

1.2.3 VEGETATION

THE VEGETATION IN THE PROJECT AREA CONSISTS OF PASTURE LAND. THE IMPACT TO VEGETATION WILL BE LIMITED TO THAT WHICH IS DIRECTLY AFFECTED BY REPLACEMENT OF THE EXISTING BRIDGE. UPON PROJECT COMPLETION, THE CHANNEL WILL BE ARMORED WITH STONE FILL TYPE II AS SPECIFIED ON THE PLANS. DISTURBED VEGETATION WILL BE REESTABLISHED WITH STANDARD SEED AND MULCH PRACTICES.

1.2.4 SOILS

ALL SOIL DATA CAME FROM THE U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE FOR THE COUNTY OF FRANKLIN, VERMONT. SOIL ON THE PROJECT SITE IS PEACHAM STONY SOILS, <1%, "K FACTOR" = 0.28. THE SOIL IS CONSIDERED MODERATELY ERODIBLE DUE TO SLOPES.

NOTE: K-VALUES GENERALLY INDICATE THE FOLLOWING:
0.0-0.23 = LOW EROSION POTENTIAL
0.24-0.36 = MODERATE EROSION POTENTIAL
0.37 AND HIGHER = HIGH EROSION POTENTIAL

1.2.5 SENSITIVE RESOURCE AREAS

CRITICAL HABITATS: NO
HISTORICAL OR ARCHEOLOGICAL AREAS: NO
PRIME AGRICULTURAL LAND: NO
THREATENED AND ENDANGERED SPECIES: NO
WATER RESOURCE: BERRY BROOK
WETLANDS: YES

1.3 RISK EVALUATION

THIS PROJECT DOES NOT FALL UNDER THE JURISDICTION OF GENERAL PERMIT 3-9020 FOR STORMWATER RUNOFF FROM CONSTRUCTION SITES. SHOULD CHANGES PRIOR TO OR DURING CONSTRUCTION RESULT IN ONE OR MORE ACRES OF EARTH DISTURBANCE OR SHOULD THE PROJECT BECOME PART OF A LARGER PLAN OF DEVELOPMENT, THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY ADDITIONAL PERMITTING.

1.4 EROSION PREVENTION AND SEDIMENT CONTROL

THE EROSION CONTROL PLANS ARE MEANT AS A GUIDELINE FOR PREVENTING EROSION AND CONTROLLING SEDIMENT TRANSPORT. THE PRINCIPLES OUTLINED IN THIS NARRATIVE CONSIST OF APPLYING MEASURES THROUGHOUT CONSTRUCTION OF THE PROJECT IN ORDER TO MINIMIZE SEDIMENT TRANSPORT TO THE RECEIVING WATERS. THE MEASURES INCLUDE STABILIZATION AND STRUCTURAL PRACTICES, STORM WATER CONTROLS AND OTHER POLLUTION PREVENTION PRACTICES. THEY HAVE BEEN PROPOSED BY THE DESIGNER AS A BASIS FOR PROTECTING RESOURCES AND WILL NEED TO BE BUILT UPON BASED ON THE SPECIFIC MEANS AND METHODS OF THE CONTRACTOR. REFER TO THE LOW RISK SITE HANDBOOK AND APPROPRIATE DETAIL SHEETS FOR SPECIFIC GUIDANCE AND CONSTRUCTION DETAILING.

ALL MEASURES SHALL BE REGULARLY MAINTAINED AND SHALL BE CHECKED FOR SEDIMENT BUILD-UP. SEDIMENT SHALL BE DISPOSED OF AT AN APPROVED SITE WHERE IT WILL NOT BE SUBJECT TO EROSION.

1.4.1 MARK SITE BOUNDARIES

SITE BOUNDARIES AND AREAS CONSTRUCTION EQUIPMENT CAN ACCESS SHALL BE DELINEATED.

PROJECT DEMARCATION FENCING (PDF) AND BARRIER FENCE SHALL BE USED TO PHYSICALLY MARK SITE BOUNDARIES.

1.4.2 LIMIT DISTURBANCE AREA

PREVENTING INITIAL SOIL EROSION BY MINIMIZING THE EXPOSED AREA IS MUCH MORE EFFECTIVE THAN TREATING ERODED SEDIMENT. EARTH DISTURBANCE CAN BE MINIMIZED THROUGH CONSTRUCTION PHASING BY ONLY OPENING UP EARTH AS NECESSARY. THIS CAN LIMIT THE AREA THAT WILL BE DISTURBED AND EXPOSED TO EROSION. EMPLOY TEMPORARY CONSTRUCTION STABILIZATION PRACTICES IN INCREMENTAL STAGES AS PHASES CHANGE. FOR PROJECTS WHICH FALL UNDER THE CONSTRUCTION GENERAL PERMIT, ONLY THE ACREAGE LISTED ON THE PERMIT AUTHORIZATION MAY BE EXPOSED AT ANY GIVEN TIME.

MAINTAINING VEGETATED BUFFERS ALONG STREAM BANKS, WETLANDS OR OTHER SENSITIVE AREAS IS A CRUCIAL EROSION AND SEDIMENT CONTROL MEASURE THAT SHOULD BE ESTABLISHED WHEREVER POSSIBLE.

1.4.3 SITE ENTRANCE/EXIT STABILIZATION

TRACKING OF SEDIMENT ONTO PUBLIC HIGHWAYS SHALL BE MINIMIZED TO REDUCE THE POTENTIAL FOR RUNOFF ENTERING RECEIVING WATERS. INSTALLATION SHALL COINCIDE WITH THE CONTRACTOR'S PROGRESS SCHEDULE.

STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AS PROPOSED ON THE EPSC PLAN AND ANYWHERE EQUIPMENT WILL BE GOING FROM AREAS OF EXPOSED SOILS TO PAVED SURFACES.

1.4.4 INSTALL SEDIMENT BARRIERS

SEDIMENT BARRIERS SHALL BE UTILIZED TO INTERCEPT RUNOFF AND ALLOW SUSPENDED SEDIMENT TO SETTLE OUT. THEY SHALL BE INSTALLED PRIOR TO ANY UP SLOPE WORK.

SILT FENCE AND TURBIDITY CURTAIN WILL BE INSTALLED AS PROPOSED ON THE EPSC PLAN.

1.4.5 DIVERT UPLAND RUNOFF

DIVERSIONARY MEASURES SHALL BE USED TO INTERCEPT RUNOFF FROM ABOVE THE CONSTRUCTION AND DIRECT IT AROUND THE DISTURBED AREA SO THAT CLEAN WATER DOES NOT BECOME MUDDIED WHILE TRAVELING OVER EXPOSED SOILS ON THE CONSTRUCTION SITE.

THE PROJECT AREA IS RELATIVELY FLAT. THEREFORE IT IS NOT ANTICIPATED THAT DIVERSION MEASURES WILL BE NECESSARY.

1.4.6 SLOW DOWN CHANNELIZED RUNOFF

NONE ANTICIPATED

1.4.7 CONSTRUCT PERMANENT CONTROLS

NONE ANTICIPATED

1.4.8 STABILIZE EXPOSED SOILS DURING CONSTRUCTION

ALL AREAS OF DISTURBANCE MUST HAVE TEMPORARY STABILIZATION IN PLACE WITHIN 48 HOURS OF DISTURBANCE OR IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT 3-9020 AUTHORIZATION.

THE FORECAST OF RAINFALL EVENTS SHALL TRIGGER IMMEDIATE PROTECTION OF EXPOSED SOILS.

1.4.9 WINTER STABILIZATION

VARIOUS MEASURES SPECIFIC TO WINTER MAY BE NECESSARY SHOULD THE PROJECT EXTEND INTO WINTER (OCTOBER 15 THROUGH APRIL 15). REFER TO THE LOW RISK SITE HANDBOOK FOR GUIDANCE.

1.4.10 STABILIZE SOIL AT FINAL GRADE

EXPOSED SOIL MUST BE STABILIZED WITHIN 48 HOURS OF REACHING FINAL GRADE.

1.4.11 DE-WATERING ACTIVITIES

DISCHARGE FROM DEWATERING ACTIVITIES THAT FLOWS OFF OF THE CONSTRUCTION SITE MUST NOT CAUSE OR CONTRIBUTE TO A VIOLATION OF THE VERMONT WATER QUALITY STANDARDS.

1.4.12 INSPECT YOUR SITE

INSPECT THE PROJECT SITE BASED ON SPECIAL PROVISION REQUIREMENTS OR CONSTRUCTION GENERAL PERMIT AUTHORIZATION STIPULATIONS.

1.5 SEQUENCE AND STAGING

THIS SECTION WILL BE DEVELOPED BY THE CONTRACTOR USING THE GUIDANCE OUTLINED IN THE VTRANS EPSC PLAN CONTRACTOR CHECKLIST.

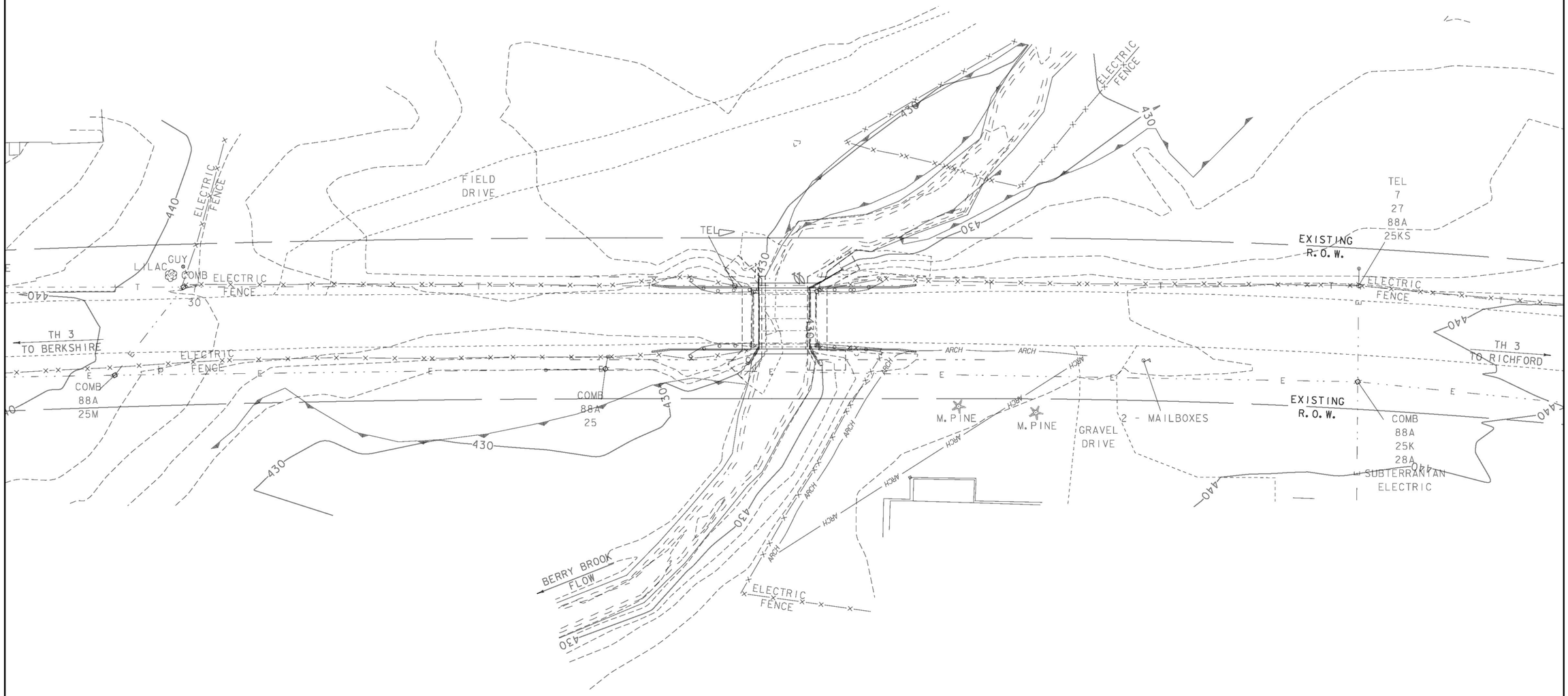
1.5.2 OFF-SITE ACTIVITIES

IN ADDITION TO THE CONTRACTOR CHECKLIST ANY ACTIVITIES OUTSIDE THE CONSTRUCTION LIMITS SHALL FOLLOW SUBSECTIONS 105.25- 105.29 OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION.

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)
FILE NAME: si2j158epsc_narrative.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
EPSC NARRATIVE	SHEET 31 OF 36

SOIL INFORMATION
PEACHAM STONY SOILS
<1% SLOPES
MODERATE EROSION POTENTIAL
K=0.28

VT STATE PLANE GRID

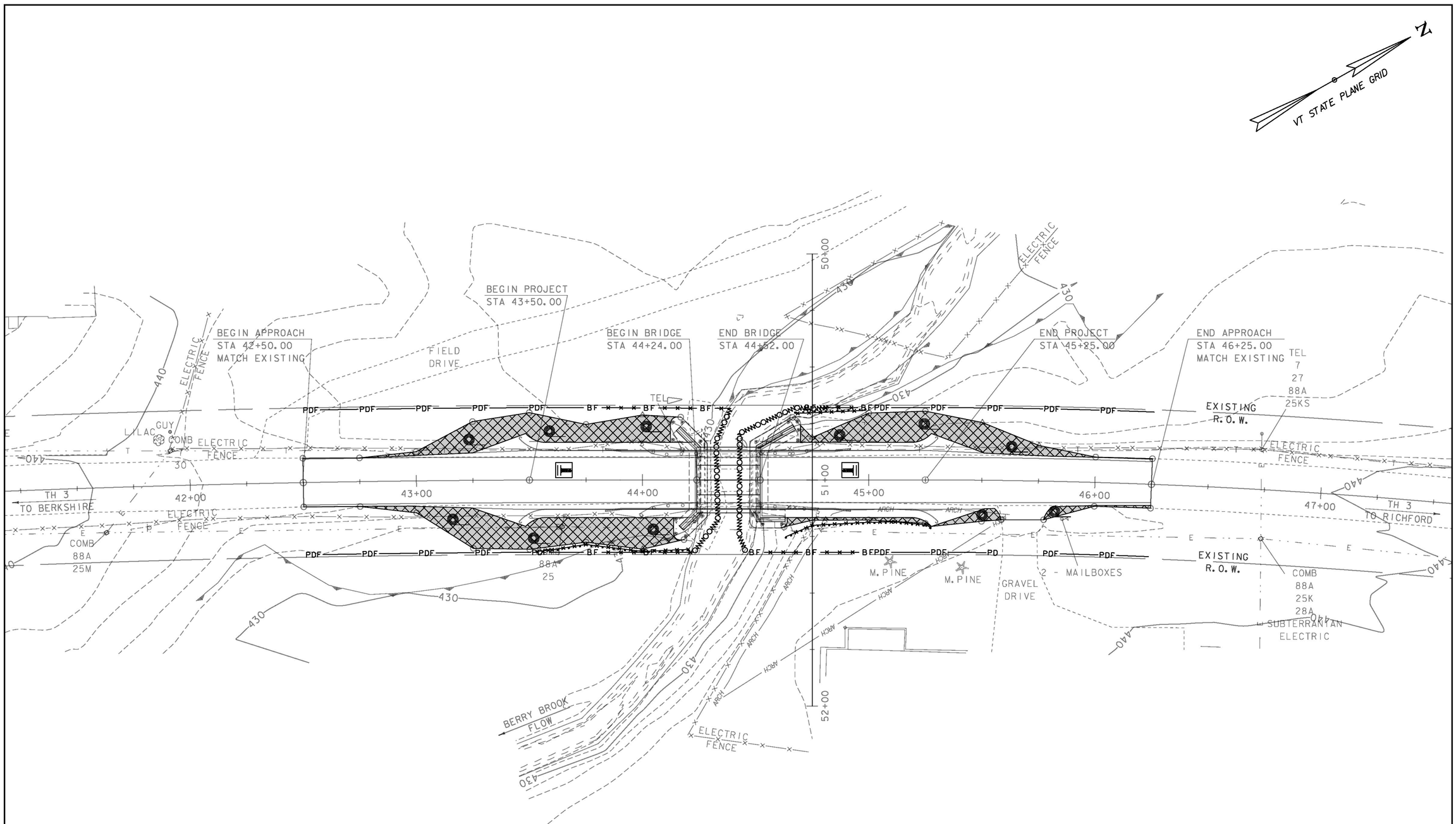


NOTE: SEE SHEET 8 FOR SYMBOLOGY LEGEND

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)

FILE NAME: s12j158bdrero.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
EPSC EXISTING CONDITIONS	SHEET 32 OF 36

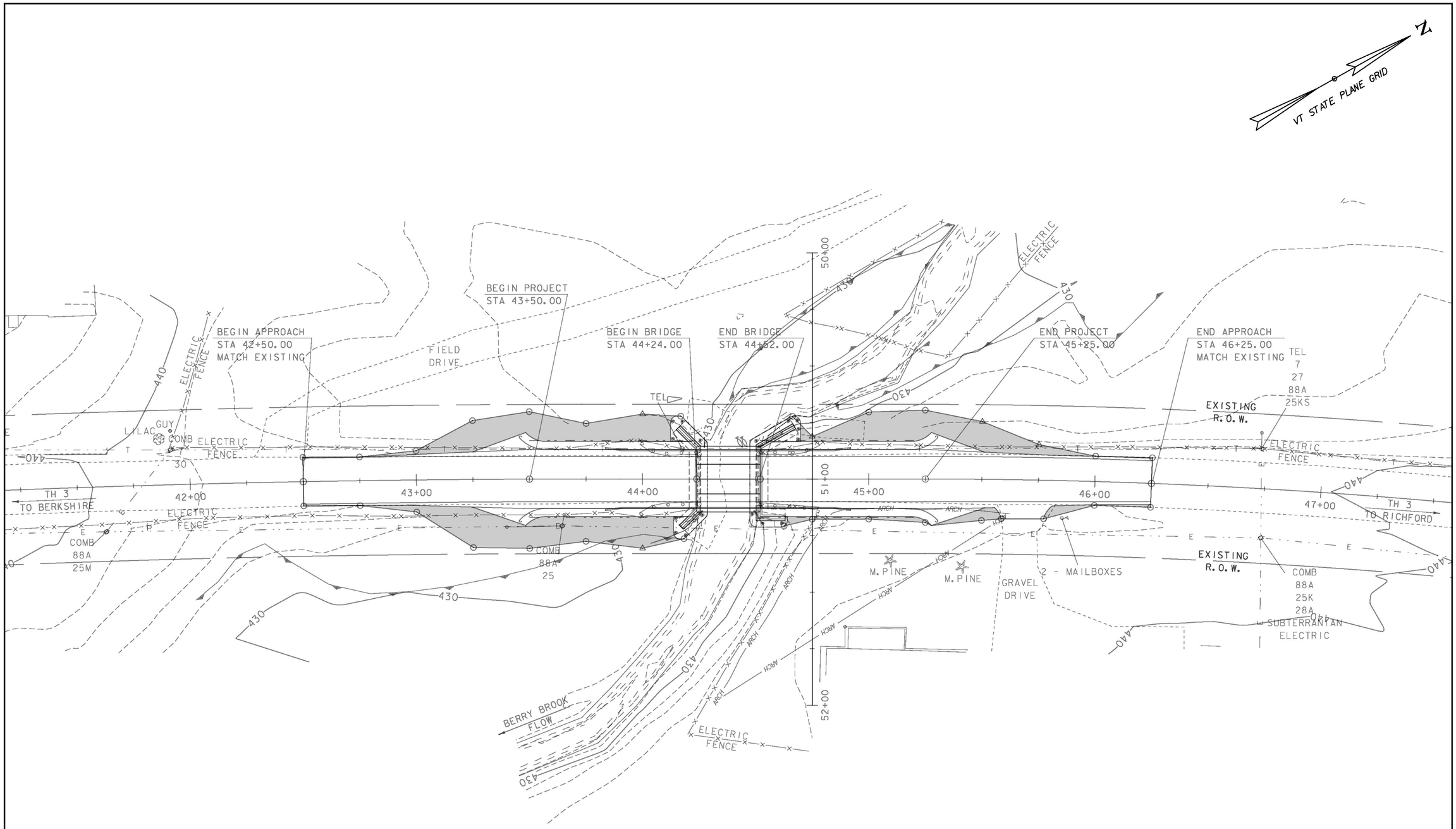


= STABILIZED CONSTRUCTION ENTRANCE

NOTE: SEE SHEET 8 FOR SYMBOLOGY LEGEND

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: RICHFORD	
PROJECT NUMBER: BRF 0302(29)	
FILE NAME: sl2jl58bdrero.dgn	PLOT DATE: 06-JAN-2015
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
EPSC DURING CONSTRUCTION	SHEET 33 OF 36

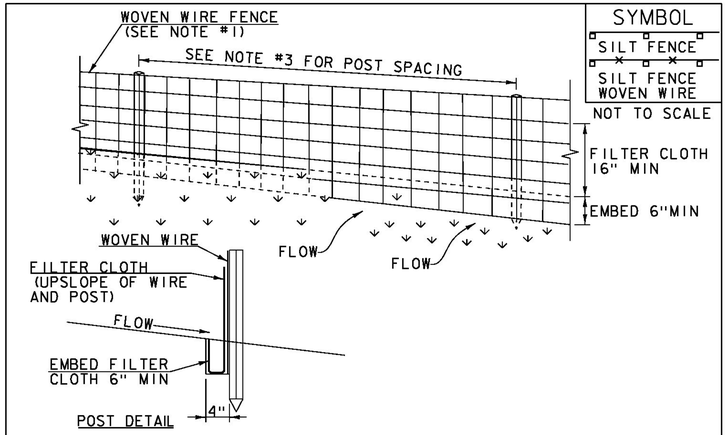


NOTE: SEE SHEET 8 FOR SYMBOLOGY LEGEND

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	RICHFORD
PROJECT NUMBER:	BRF 0302(29)

FILE NAME: s12j158bdrero.dgn	PLOT DATE: 11-DEC-2014
PROJECT LEADER: C. CARLSON	DRAWN BY: R. PELLETT
DESIGNED BY: H. SALLS	CHECKED BY: H. SALLS
EPSC FINAL CONDITIONS	SHEET 34 OF 36



SYMBOL

SILT FENCE

SILT FENCE WOVEN WIRE

NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE REINFORCED FENCE IS REQUIRED WITHIN 100' UPSLOPE OF RECEIVING WATERS WHEN THE PROJECT FALLS UNDER A CONSTRUCTION STORMWATER PERMIT. WOVEN WIRE SHALL BE A MIN. 14 GAUGE WITH A 6" MAX. MESH OPENING.
2. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI100X, STABILINKA T140N OR APPROVED EQUIVALENT.
3. POST SPACING FOR WIRE-BACKED FENCE SHALL BE 10' MAXIMUM. FOR FILTER-CLOTH FENCE, WHEN ELONGATION IS >50%, POST SPACING SHALL NOT EXCEED 4' AND WHEN ELONGATION IS <50%, POST SPACING SHALL NOT EXCEED 6'.
4. WOVEN WIRE FENCE IS TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES. FILTER CLOTH IS TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY 6" AND FOLDED.
6. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN SEDIMENT REACHES HALF OF FABRIC HEIGHT.

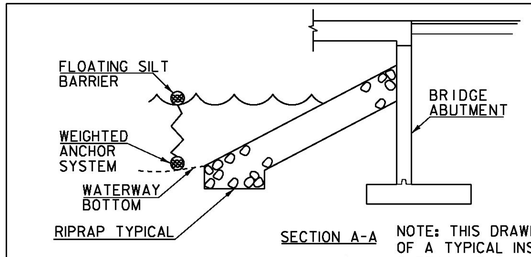
ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC
ORIGINALLY DEVELOPED BY USDA-NRCS
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SILT FENCE

NOTES:
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- " FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 649 AND AS SHOWN IN THE PLANS FOR ~~GEOTEXTILE FOR SILT FENCE (PAY ITEM 649.51) OR~~ GEOTEXTILE FOR SILT FENCE, WOVEN WIRE REINFORCED (PAY ITEM 649.515).

REVISIONS	
MARCH 21, 2008	WHF
DECEMBER 11, 2008	WHF
JANUARY 13, 2009	WHF

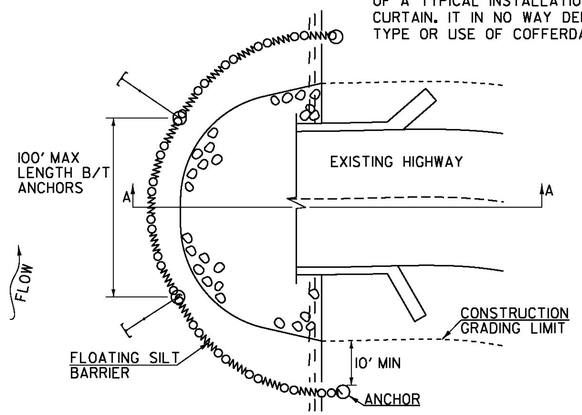


SYMBOL

NOT TO SCALE

SECTION A-A

NOTE: THIS DRAWING IS A DEPICTION OF A TYPICAL INSTALLATION OF FILTER CURTAIN. IT IN NO WAY DEFINES THE TYPE OR USE OF COFFERDAM IF USED.



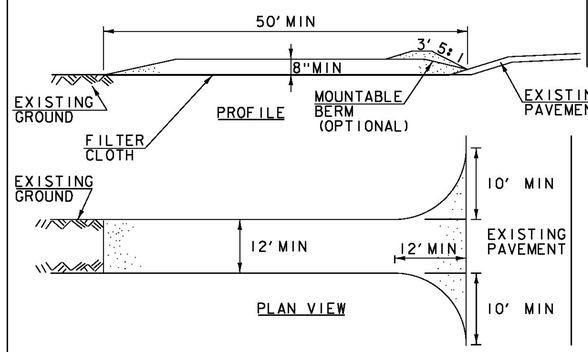
CONSTRUCTION SPECIFICATIONS

1. FILTER CURTAIN SHALL NOT BE PLACED ACROSS A FLOWING WATERWAY, OR IN A WATERWAY WITH STREAM VELOCITIES GREATER THAN 1.5 FEET/SECOND.
2. MAXIMUM 100' LENGTH BETWEEN ANCHORS.
3. LAST SECTION SHALL TERMINATE A MINIMUM OF 10' BEYOND LIMIT OF DISTURBANCE.
4. THE WEIGHTED ANCHOR SYSTEM SHALL BE A TYPE WHICH ALLOWS THE CURTAIN TO CONFORM TO THE BOTTOM OF THE WATERWAY.
5. THE CURTAIN SHALL BE REMOVED BY SLOWLY PULLING TOWARD THE SHORE MINIMIZING THE ESCAPE OF SEDIMENTS INTO WATERWAY.

FILTER CURTAIN

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 649 FOR GEOTEXTILE FOR FILTER CURTAIN (PAY ITEM 649.61).

REVISIONS	
APRIL 1, 2008	WHF
JANUARY 13, 2009	WHF
SEPTEMBER 4, 2009	WHF



SYMBOL

NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

1. STONE SIZE- USE 1-4" STONE, RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH- NOT LESS THAN 50' (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30' MINIMUM LENGTH APPLIES).
3. THICKNESS- NOT LESS THAN 8".
4. WIDTH- 12' MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. 24' IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE MUST BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
6. SURFACE WATER- ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE- THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED ACCORDING TO PERMIT REQUIREMENTS.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC
ORIGINALLY DEVELOPED BY USDA-NRCS
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

STABILIZED CONSTRUCTION ENTRANCE

NOTES:
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- " FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

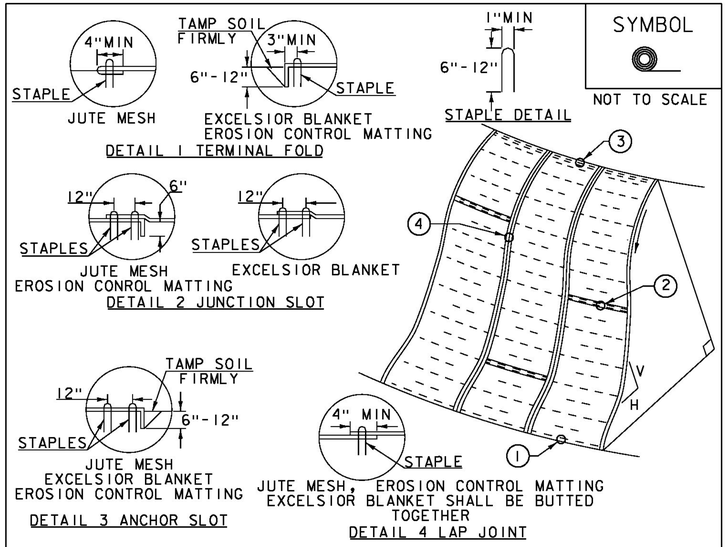
THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 653 FOR VEHICLE TRACKING PAD (PAY ITEM 653.35) OR AS SPECIFIED IN THE CONTRACT.

REVISIONS	
MARCH 24, 2008	WHF
JANUARY 13, 2009	WHF

PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: sl2j158erodet.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
EPSC DETAILS I

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 35 OF 36



SYMBOL

NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

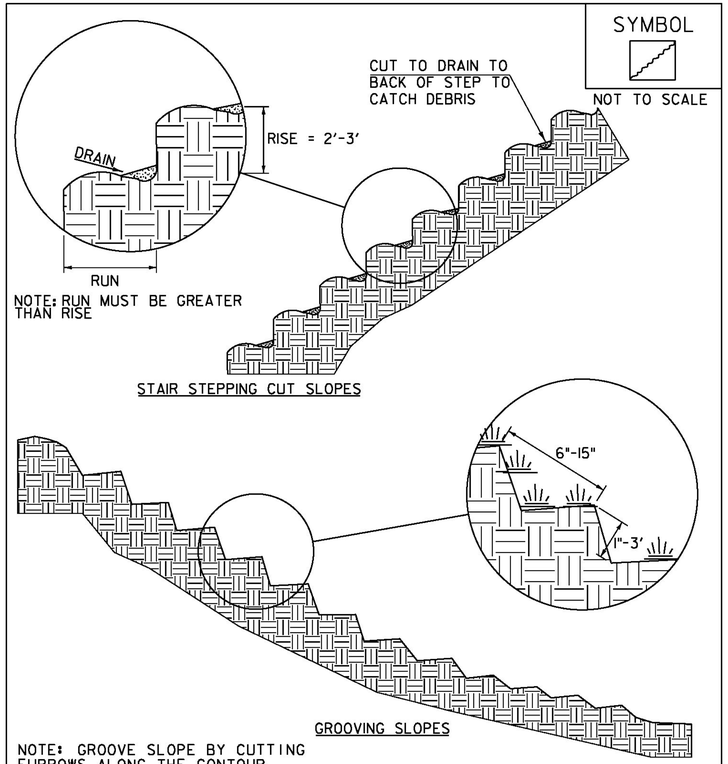
1. APPLY TO SLOPES GREATER THAN 3H:1V OR WHERE NECESSARY TO AID IN ESTABLISHING VEGETATION.
2. APPLY FERTILIZER, LIME SEED PRIOR TO PLACING MATTING.
3. STAPLES ARE TO BE PLACED ALTERNATELY, IN COLUMNS APPROXIMATELY 2' APART AND IN ROWS APPROXIMATELY 3' APART. APPROXIMATELY 175 STAPLES ARE REQUIRED PER 4'X225' ROLL OF MATERIAL AND 125 STAPLES ARE REQUIRED PER 4'X150' ROLL OF MATERIAL.
4. DISTURBED AREAS SHALL BE SMOOTHLY GRADED. EROSION CONTROL MATERIAL SHALL BE PLACED LOOSELY OVER GROUND SURFACE. DO NOT STRETCH.
5. ALL TERMINAL ENDS AND TRANSVERSE LAPS SHALL BE STAPLED AT APPROXIMATELY 12" INTERVALS.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC
ORIGINALLY DEVELOPED BY USDA-NRCS
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

ROLLED EROSION CONTROL PRODUCT (RECP) SIDE SLOPE

NOTES:
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.
THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 653 AND AS SHOWN IN THE PLANS FOR TEMPORARY EROSION MATTING (PAY ITEM 653.20) ~~OR PERMANENT EROSION MATTING (PAY ITEM 653.21).~~

REVISIONS	
APRIL 16, 2007	JMF
JANUARY 13, 2009	WHF



SYMBOL

NOT TO SCALE

NOTE: RUN MUST BE GREATER THAN RISE

STAIR STEPPING CUT SLOPES

GROOVING SLOPES

NOTE: GROOVE SLOPE BY CUTTING FURROWS ALONG THE CONTOUR. IRREGULARITIES IN THE SOIL SURFACE CATCH RAINWATER AND RETAIN LIME, FERTILIZER AND SEED.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC
ORIGINALLY DEVELOPED BY USDA-NRCS
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SURFACE ROUGHENING

NOTES:
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

THIS WORK SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT

REVISIONS	
APRIL 1, 2008	WHF
JANUARY 13, 2009	WHF

VAOT RURAL AREA MIX

	LBS/AC				
% WEIGHT	BROADCAST	HYDROSEED	NAME	GERM %	PURITY %
37.5%	22.5	45	CREEPING RED FESCUE	85%	98%
37.5%	22.5	45	TALL FESCUE	90%	95%
5.0%	3	6	RED TOP	90%	95%
15.0%	9	18	BIRDSFOOT TREFOIL	85%	98%
5.0%	3	6	ANNUAL RYE GRASS	85%	95%
100%	60	120			

VAOT URBAN AREA MIX

	LBS/AC				
% WEIGHT	BROADCAST	HYDROSEED	NAME	GERM %	PURITY %
42.5%	34	68	CREEPING RED FESCUE	85%	98%
10.0%	8	16	PERENNIAL RYE GRASS	90%	95%
42.5%	34	68	KENTUCKY BLUE GRASS	85%	85%
5.0%	4	8	ANNUAL RYE GRASS	85%	95%
100%	80	160			

SOIL AMENDMENT GUIDANCE

FERTILIZER		LIME	
BROADCAST	HYDROSEED	BROADCAST	HYDROSEED
10-20-10	*FOLLOW*	PELLETIZED	*FOLLOW*
500 LBS/AC	*MANUFACTURER*	2 TONS/AC	*MANUFACTURER*

CONSTRUCTION GUIDANCE

1. RURAL SEED MIX: USE AS INDICATED IN THE PLANS AND/OR FOR ALL ESTABLISHED UPLAND (NON WETLAND) AREAS DISTURBED BY THE CONTRACTOR.
2. URBAN SEED MIX: USE AS INDICATED IN THE PLANS AND/OR FOR ALL ESTABLISHED LAWN AREAS DISTURBED BY THE CONTRACTOR.
3. ALL SEED MIXTURES: SHALL NOT HAVE A WEED CONTENT EXCEEDING 0.40% BY WEIGHT AND SHALL BE FREE OF ALL NOXIOUS SEED.
4. FERTILIZER AND LIMESTONE: SHALL FOLLOW RATES SHOWN ON PLAN OR AS DIRECTED BY THE ENGINEER
5. HAY MULCH: TO BE PLACED ON EARTH SLOPES AT THE RATE OF 2 TONS/ACRE, ACHIEVE 90% GROUND COVER OR AS DIRECTED BY THE ENGINEER.
6. TOPSOIL: TO BE USED WITH SEED AS INDICATED ON THE PLANS, OR AS DIRECTED BY THE ENGINEER.
7. HYDROSEEDING: ALTHOUGH GUIDANCE IS GIVEN ABOVE THE SITE CONDITIONS AND THE TYPE OF HYDROSEED WILL ULTIMATELY DICTATE THE AMOUNTS AND TYPES OF SOIL AMENDMENTS TO BE APPLIED
8. TURF ESTABLISHMENT: PLACING SEED, FERTILIZER, LIME AND MULCH PRIOR TO SEPTEMBER 15 AND AFTER APRIL 15 CAN BETTER ENSURE A VIGOROUS GROWTH OF GRASS.

ADAPTED FROM VTRANS TECHNICAL LANDSCAPE MANUAL FOR ROADWAYS AND TRANSPORTATION FACILITIES

TURF ESTABLISHMENT

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 651 ~~FOR SEED (PAY ITEM 651.15)~~

REVISIONS	
JUNE 23, 2009	WHF
JANUARY 15, 2010	WHF
FEBRUARY 16, 2011	WHF

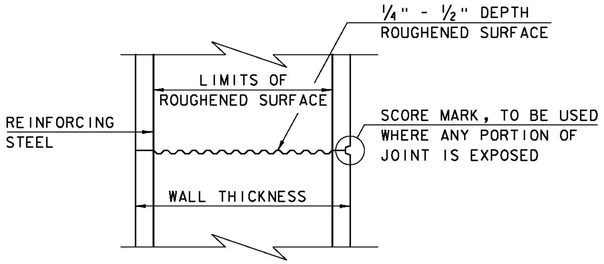
PROJECT NAME: RICHFORD
PROJECT NUMBER: BRF 0302(29)

FILE NAME: si2j158erodet.dgn
PROJECT LEADER: C. CARLSON
DESIGNED BY: H. SALLS
EPSC DETAILS 2

PLOT DATE: 11-DEC-2014
DRAWN BY: R. PELLETT
CHECKED BY: H. SALLS
SHEET 36 OF 36

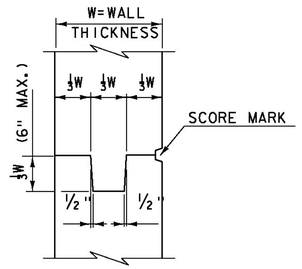
CONCRETE GENERAL NOTES

1. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 1" x 1"
2. REINFORCING STEEL SIZE AND SPACING SHOWN IN THE PLANS IS BASED ON 60 KSI STEEL, UNLESS NOTED OTHERWISE. WITH THE ENGINEER'S PERMISSION, BAR SIZE AND SPACING MAY BE MODIFIED ACCORDING TO THE LATEST AASHTO LRFD BRIDGE DESIGN SPECIFICATION AND STRUCTURES DESIGN MANUAL WHEN USING HIGHER STRENGTH STEEL.

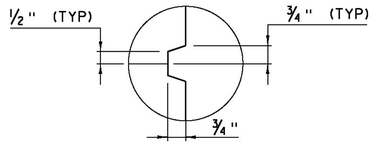


TYPICAL HORIZONTAL CONSTRUCTION JOINT
(NOT TO SCALE)

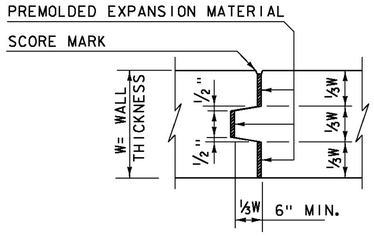
1. THE SURFACE OF THE CONCRETE CONSTRUCTION JOINTS SHALL BE CLEANED AND FREE OF LAITANCE.
2. IMMEDIATELY BEFORE NEW CONCRETE IS PLACED, ALL CONSTRUCTION JOINTS SHALL BE WETTED AND STANDING WATER REMOVED.



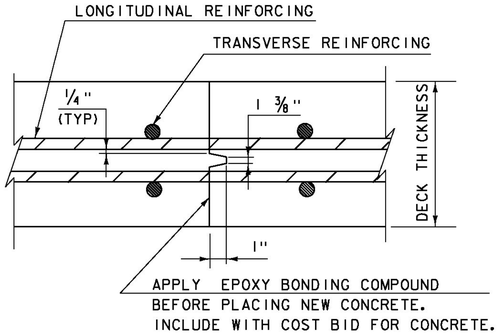
TYPICAL CONCRETE CONSTRUCTION JOINT
(NOT TO SCALE)



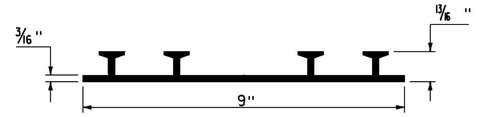
SCORE MARK DETAIL
(NOT TO SCALE)



TYPICAL CONCRETE EXPANSION JOINT
(NOT TO SCALE)



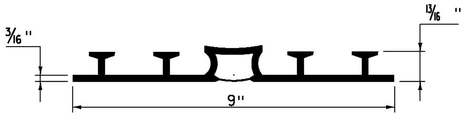
TRANSVERSE BRIDGE SLAB CONSTRUCTION JOINT DETAILS
(NOT TO SCALE)



P.V.C. WATERSTOP FOR CONSTRUCTION JOINTS
(NOT TO SCALE)

PAYMENT FOR THE P.V.C. WATERSTOP SHALL BE INCIDENTAL TO THE UNIT BID PRICE FOR THE ADJACENT CONCRETE.

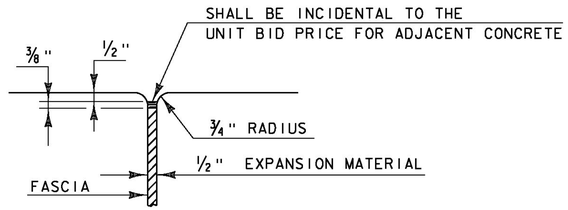
OTHER CONFIGURATIONS OF WATERSTOP MAY BE USED UPON APPROVAL OF THE ENGINEER.



P.V.C. WATERSTOP FOR EXPANSION JOINTS
(NOT TO SCALE)

PAYMENT FOR THE P.V.C. WATERSTOP SHALL BE INCIDENTAL TO THE UNIT BID PRICE FOR THE ADJACENT CONCRETE.

OTHER CONFIGURATIONS OF WATERSTOP MAY BE USED UPON APPROVAL OF THE ENGINEER.



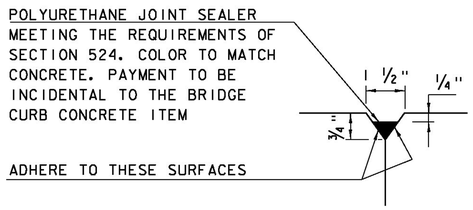
JOINT BETWEEN FASCIA AND WINGWALL
(NOT TO SCALE)

REVISIONS	
MAY 7, 2010	APPROVED FOR USE BY VAOT STRUCTURES SECTION
FEBRUARY 9, 2012	REBAR SUBSTITUTION ALLOWANCE ADDED TO CONCRETE GENERAL NOTES.

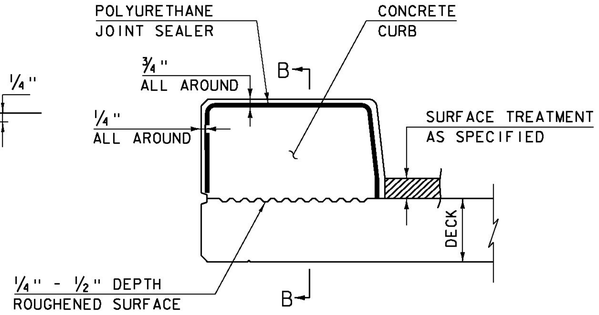
CONCRETE DETAILS AND NOTES

VERMONT AGENCY OF TRANSPORTATION
STRUCTURES - SECTION

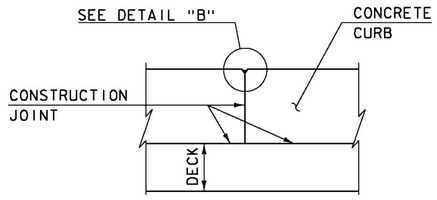
STRUCTURES DETAIL
SD-501.00



DETAIL "B"
(NOT TO SCALE)

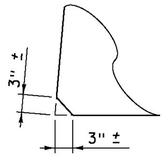


CONCRETE CURB JOINT SECTION
(NOT TO SCALE)

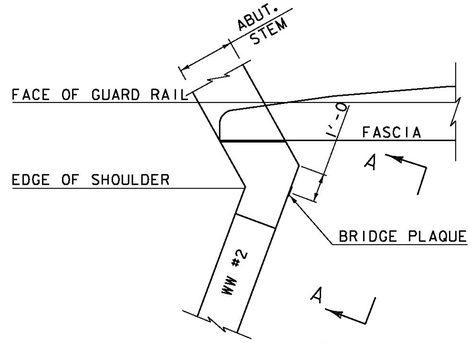


SECTION B - B
(NOT TO SCALE)

1. SEE TYPICAL HORIZONTAL CONSTRUCTION JOINT DETAIL FOR ADDITIONAL INFORMATION



ACUTE ANGLE CLIP DETAIL
(NOT TO SCALE)



PLAN

CONCRETE CURB JOINT NOTES

1. CONCRETE CURBS MAY BE PLACED IN ONE CONTINUOUS OPERATION IF AN APPROVED SHRINKAGE REDUCING ADMIXTURE LISTED IN THE SPECIAL PROVISIONS IS USED WITH THE CONCRETE MIX DESIGN. PAYMENT FOR THE SHRINKAGE REDUCING ADMIXTURE WILL BE INCIDENTAL TO THE BRIDGE CURB CONCRETE ITEM.

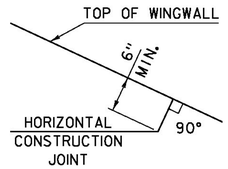
2. IF THE CONTRACTOR CHOOSES NOT TO USE AN APPROVED SHRINKAGE REDUCING ADMIXTURE, THE CURBS SHALL BE CONSTRUCTED WITH CONSTRUCTION JOINTS SPACED AT A MAXIMUM OF 15'-0" CENTER TO CENTER AND 2'-0" MINIMUM FROM THE CENTER OF NEAREST BRIDGE RAILING POST.

3. ON MULTI-SPAN CONTINUOUS SUPERSTRUCTURES, REGARDLESS OF WHETHER APPROVED SHRINKAGE REDUCING ADMIXTURE IS USED, CURB JOINTS SHALL BE LOCATED OVER THE CENTERLINE OF PIERS AND 7'-0" EACH SIDE OF THE CENTERLINE OF EACH PIER.

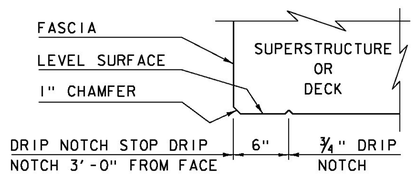
4. WHEN CURB JOINTS ARE USED THE CURBS SHALL BE PLACED IN ALTERNATE SECTIONS WITH A MINIMUM OF 48 HOUR DELAY BETWEEN ADJACENT PLACEMENTS.

5. LONGITUDINAL REINFORCING SHALL BE CONTINUOUS THROUGH CURB CONSTRUCTION JOINTS. CURB STIRRUP BARS SHALL BE TURNED AS NECESSARY TO MAINTAIN COVER IN THE FLARED CURB ENDS.

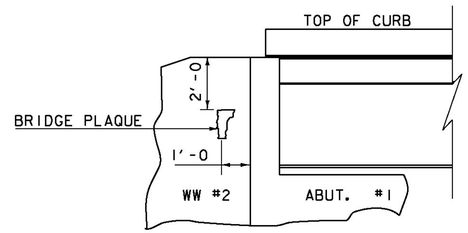
6. THE JOINT SPACING AND DETAILS SHOWN SHALL APPLY TO SIDEWALKS WHEN SHOWN IN THE PLANS.



HORIZONTAL WINGWALL CONSTRUCTION JOINT
(NOT TO SCALE)



DRIP NOTCH DETAIL
(NOT TO SCALE)



VIEW "A - A"

BRIDGE PLAQUE
(NOT TO SCALE)

THE BRIDGE PLAQUE WILL BE SUPPLIED BY THE AGENCY OF TRANSPORTATION AND SHALL BE INSTALLED BY THE CONTRACTOR AT ABUTMENT #1 ON THE RIGHT SIDE AS SHOWN OR AS DIRECTED BY THE ENGINEER.

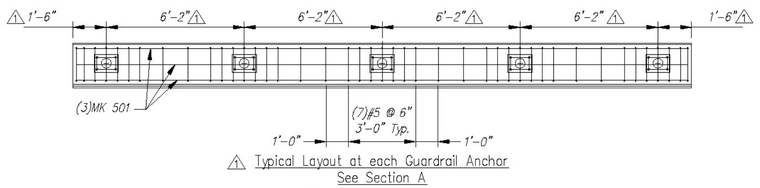
PAYMENT FOR INSTALLATION OF THE BRIDGE PLAQUE SHALL BE INCIDENTAL TO THE ADJACENT CONCRETE.

REVISIONS	
MAY 7, 2010	APPROVED FOR USE BY VAOT STRUCTURES SECTION
JUNE 4, 2010	MODIFIED AND ADDED TWO DETAILS
OCTOBER 10, 2012	MODIFIED HORZ. JOINT WINGWALL ADD 6" MIN. DIMENSION

CONCRETE DETAILS AND NOTES

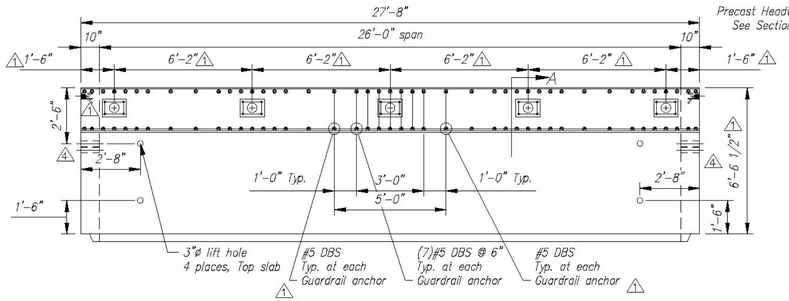
VERMONT AGENCY OF TRANSPORTATION
STRUCTURES - SECTION

STRUCTURES DETAIL
SD-502.00

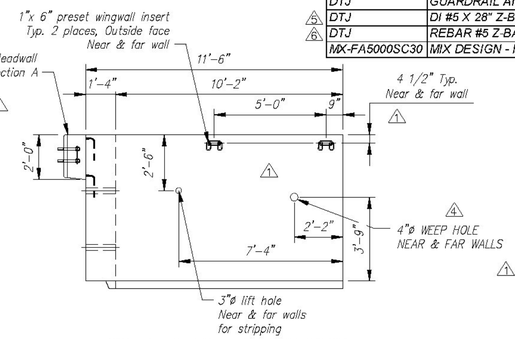


⚠1 Typical Layout at each Guardrail Anchor
See Section A

PLAN VIEW
HEADWALL REINFORCING DETAIL
Scale: 1/4" = 1'-0"



PLAN VIEW
Scale: 1/4" = 1'-0"



R. SIDE ELEVATION
Scale: 1/4" = 1'-0"

QUANTITY = 1
WEIGHT = 31.19 TONS

	C1 - BILL OF MATERIALS / EMBEDS				
	CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
⚠4	DTJ	CERTI-VEX PENSEAL 244-40%	1.30	GA	
	EM-0005A	1" X 6 " PRESET WING INSERTS	4	EA	
	EM-00033	3" FOAM CORE PVC	7	FT	
⚠5	DTJ	DBSAE #5 Z-BAR GR 60 VTAOT LEVEL II	86	EA	DOWEL BAR SPLICER
	DTJ	REBAR #4 Z-BAR GR 60 VTAOT LEVEL II	696	LB	
	DTJ	REBAR #5 Z-BAR GR 60 VTAOT LEVEL II	57	LB	
	DTJ	REBAR #7 Z-BAR GR 60 VTAOT LEVEL II	2281	LB	
	MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	13.62	CY	
	C1 HEADWALL - BILL OF MATERIALS / EMBEDS				
	DTJ	GUARDRAIL ANCHOR	5	EA	SUPPLIED BY OTHERS
⚠5	DTJ	DI #5 X 28" Z-BAR GR 60 VTAOT LEVEL II	86	EA	DOWEL IN
⚠6	DTJ	REBAR #5 Z-BAR GR 60 VTAOT LEVEL II	228	LB	
	MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	1.78	CY	

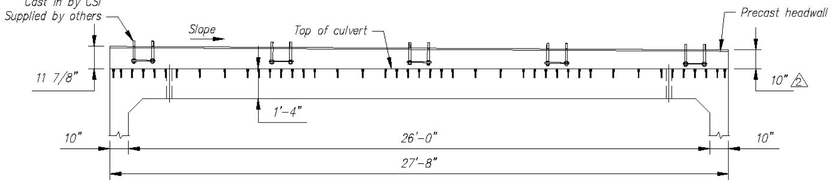
C1 Culvert Rebar Schedule			
MK		QTY	LENGTH
401	#4	16	10 '- 6 "
402	#4	8	27 '- 0 "
403	#4	104	6 '- 4 "
501	#5	2	27 '- 4 "
701	#7	32	18 '- 0 "
702	#7	20	27 '- 0 "

C1 HW Rebar Schedule			
MK		QTY	LENGTH
501	#5	3	27 '- 4 "
⚠6 502	#5	43	3 '- 2 "

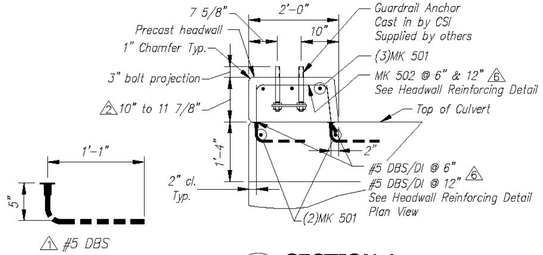
⚠1 Culvert piece length is ½" shorter on shop drawing than on layout drawing. Layout dimension includes joint gap.

ALL REINFORCING TO BE Z-BAR
GR 60(VTAOT LEVEL 2)

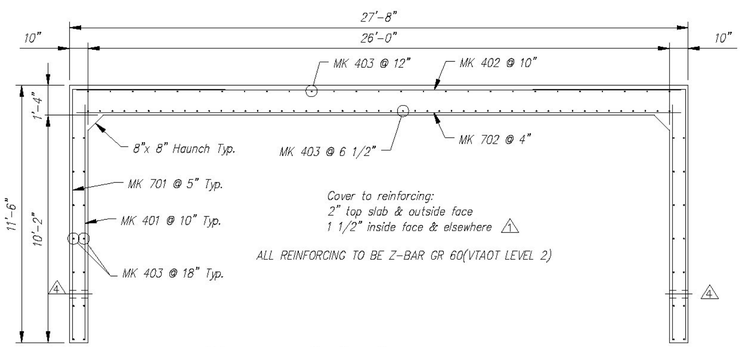
ALL DOWEL BAR SPLICER & DOWEL-IN
TO BE EPOXY COATED ⚠5
(VTAOT LEVEL 1)



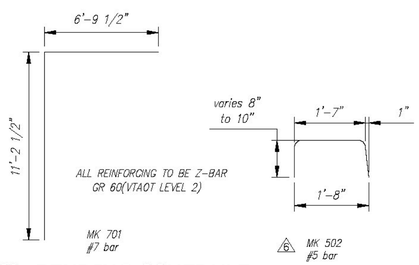
PARTIAL ELEVATION
Scale: 1/4" = 1'-0"



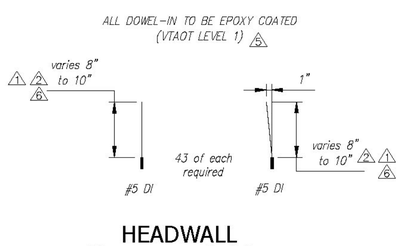
SECTION A
Scale: N.T.S.



REINFORCING DETAIL
Scale: N.T.S.



BENDING SCHEDULE
Scale: N.T.S.



HEADWALL BENDING SCHEDULE
Scale: N.T.S.

Rev.	Date	By
10		
9		
8		
7		
6	21JUL2015	RY
5	08JUL2015	RY
4	17JUN2015	BSS
3	10JUN2015	RY
2	28MAY2015	RY
1	14MAY2015	RY

REVISIONS
DESCRIPTION

1 SHORTENED DI & ADDED REBAR TO HW TO EASE MFG
2 ALL DBS/DI WERE Z-BAR, NOW EPOXY COATED
3 REVISED PER CUSTOMER REVIEW
4 ADJUSTED WATER REPELLENT
5 10" WAS 9 1/2", HDWALL BEND SCHED – 8" WAS 7 1/2"
6 REVISED PER CUSTOMER REVIEW, REVISED GUARDRAIL ANCHOR SPACING, MOVED WINGWALL ANCHOR, ADDED NOTE

llowing documents and/or sources:

GE PROJECT, TOWN OF RICHFORD

ATED 2011

Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

STATE AGENCY
VTrans

Drawn By R. YEAGER	Date 16APR2015	
Reviewed By	Date	
Approved By C. VICK	Date 7/21/15	

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

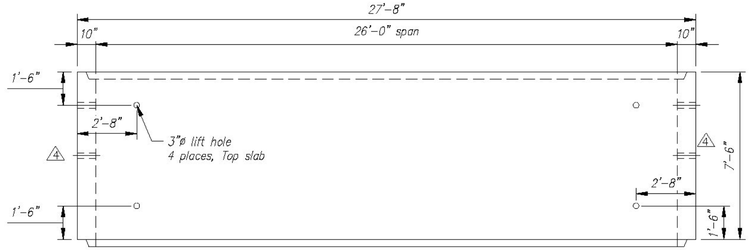
C | SHOP DRAWING C1 | REV 6
Drawing No. C22312-C1
Quantity: 1 | Project No: BRF030229 | SHEET 1 OF 14

QUANTITY = 2
WEIGHT = 30.78 TONS

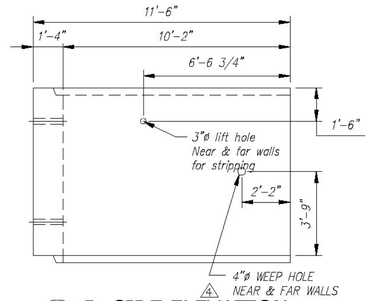
C2 - BILL OF MATERIALS / EMBEDS				
CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
EM-00033	3" FOAM CORE PVC	7	FT	
JS-00002	1"X1"CLOSED NEOP GASKET	49	FT	AROUND BELL
DTJ	REBAR #4 Z-BAR GR 60 VTAOT LEVEL II	824	LB	
DTJ	REBAR #7 Z-BAR GR 60 VTAOT LEVEL II	2667	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	15.2	CY	

C2 Culvert Rebar Schedule			
MK	QTY	LENGTH	
401 #4	20	10 ' - 6 "	
402 #4	10	27 ' - 0 "	
403 #4	104	7 ' - 3 "	
701 #7	38	18 ' - 0 "	
702 #7	23	27 ' - 0 "	

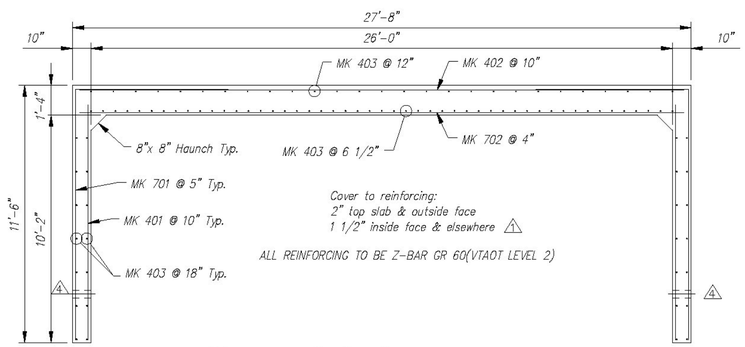
⚠1 Culvert piece length is ½" shorter on shop drawing than on layout drawing. Layout dimension includes joint gap.



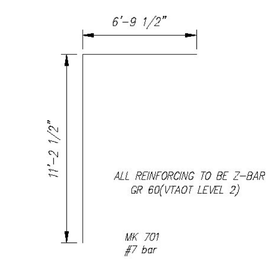
PLAN VIEW
Scale: 1/4" = 1'-0"



R. SIDE ELEVATION
Scale: 1/4" = 1'-0"



REINFORCING DETAIL
Scale: N.T.S.



BENDING SCHEDULE
Scale: N.T.S.

Vermont Agency of Transportation
RECEIVED
Richford Precast Frame Complete Updated Submittal_Approved 7.23.15.pdf

CK'D BY CLB OK'D BY HIS

July 22, 2015

RESUBMIT NO Approved

BY C. CARLSON DATE 07/23/15

Rev.	Date	By
3	17JUN2015	BSS
2	14MAY2015	RY
1	DESCRIPTION	
	REVISIONS	
1	REVISED PER CUSTOMER REVIEW	
2	REVISED PER CUSTOMER REVIEW, ADDED NOTE	

Contractor is to verify that all information shown on drawings has been thoroughly checked and coordinated with the contract documents and is adequate to meet the field conditions. Some dimensions and details may differ slightly from contract drawings to accommodate the manufacturing or design process. Approval of this drawing indicates that any deviation from the contract documents has been reviewed and found to be acceptable. Production will not commence until receipt of signed, approved shop drawings.

This drawing is based upon information provided from the following documents and/or sources:

Engineer: STATE OF VT/AOT PROGRAM DEVELOPMENT
Project No: ----
Drawings: STATE OF VT/AOT PROPOSED IMPROVEMENT BRIDGE PROJECT, TOWN OF RICHFORD SHEETS 1,2,4,22,23,24 OF 36
Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011
Other: ----

Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

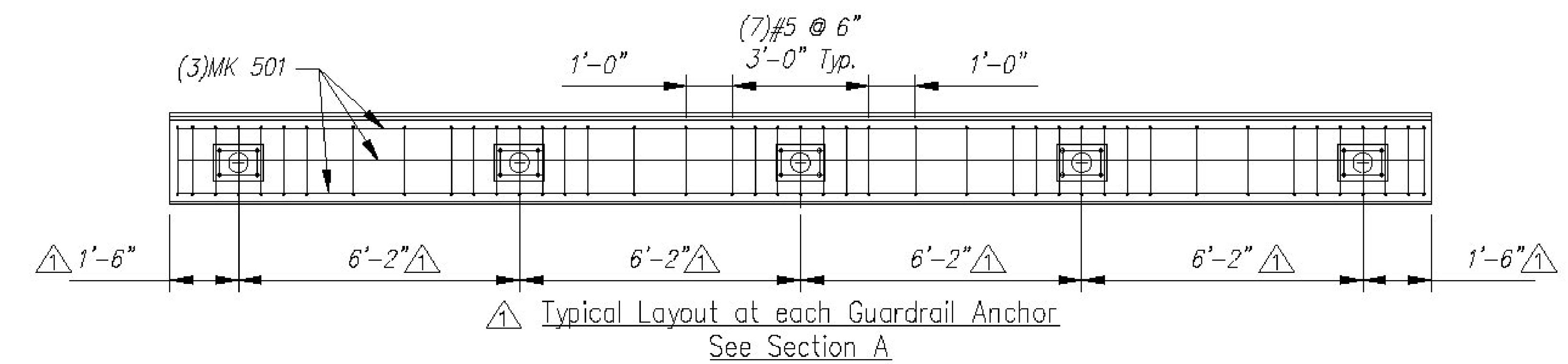
STATE AGENCY
VTrans

Drawn By R. YEAGER	Date 16APR2015	
Reviewed By B. KOLAWOLE	Date	
Approved By C. VICK	Date 17JUN2015	

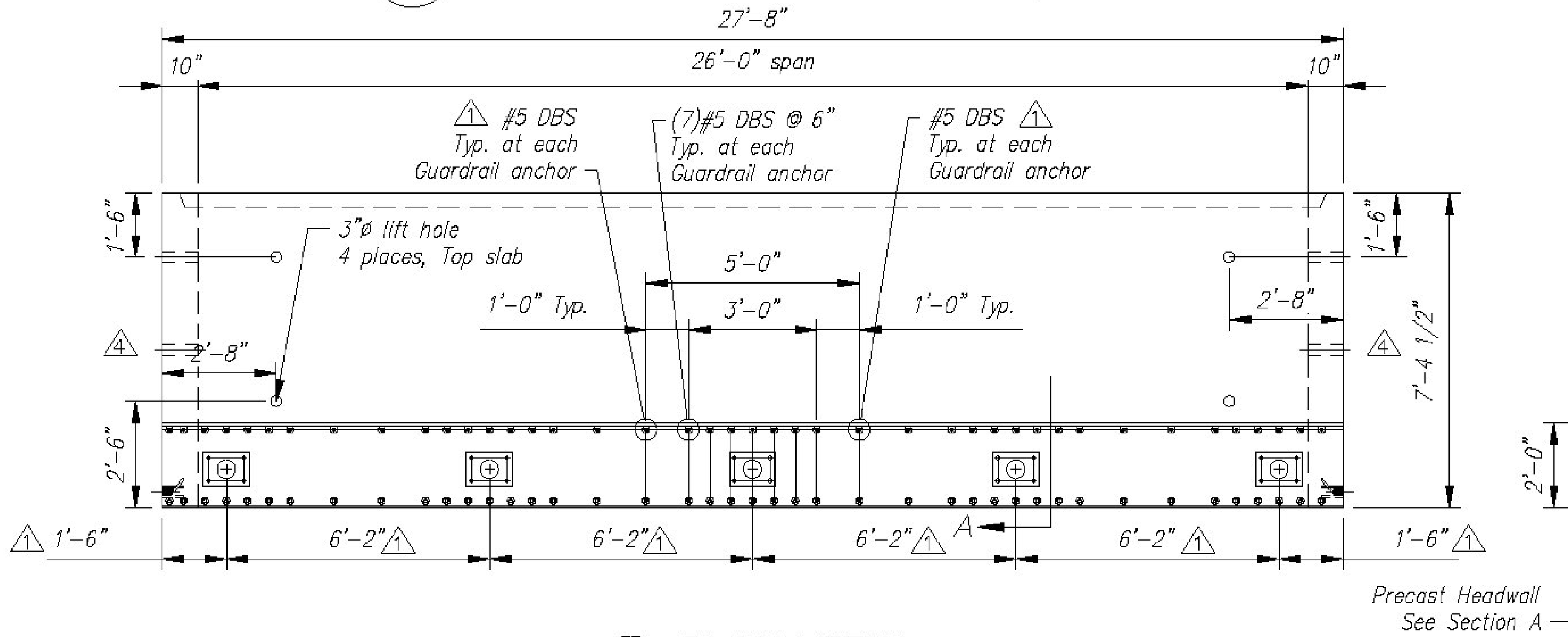
G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

C | SHOP DRAWING C2 | REV 2
Drawing No. C22312-C2
Quantity: 2 | Project No: BRF030229 | SHEET 2 OF 14

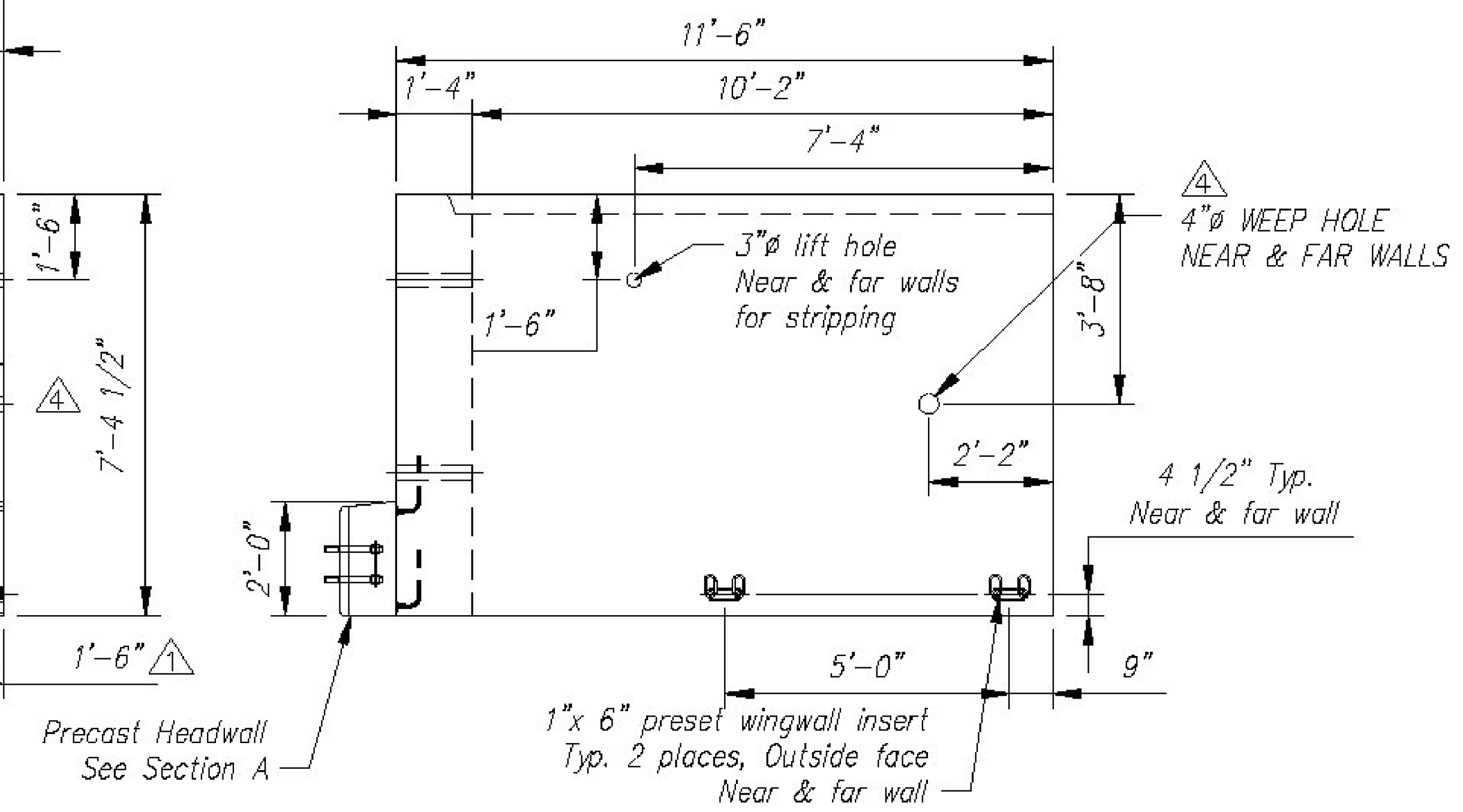
C3 - BILL OF MATERIALS / EMBEDS				
CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
DTJ	CERTI-VEX PENSEAL 244-40%	1.30	GA	
EM-0005A	1" X 6" PRESET WING INSERTS	4	EA	
EM-00033	3" FOAM CORE PVC	7	FT	
JS-00002	1"X1"CLOSED NEOP GASKET	49	FT	AROUND BELL
DTJ	DBSAE #5 Z-BAR GR 60 VTAOT LEVEL II	86	EA	DOWEL BAR SPLICER
DTJ	REBAR #4 Z-BAR GR 60 VTAOT LEVEL II	784	LB	
DTJ	REBAR #5 Z-BAR GR 60 VTAOT LEVEL II	57	LB	
DTJ	REBAR #7 Z-BAR GR 60 VTAOT LEVEL II	2539	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	14.72	CY	
C3 HEADWALL - BILL OF MATERIALS / EMBEDS				
DTJ	GUARDRAIL ANCHOR	5	EA	SUPPLIED BY OTHERS
DTJ	DI #5 X 28" Z-BAR GR 60 VTAOT LEVEL II	86	EA	DOWEL IN
DTJ	REBAR #5 Z-BAR GR 60 VTAOT LEVEL II	228	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	1.78	CY	



PLAN VIEW
HEADWALL REINFORCING DETAIL
Scale: 1/4" = 1'-0"



PLAN VIEW
Scale: 1/4" = 1'-0"

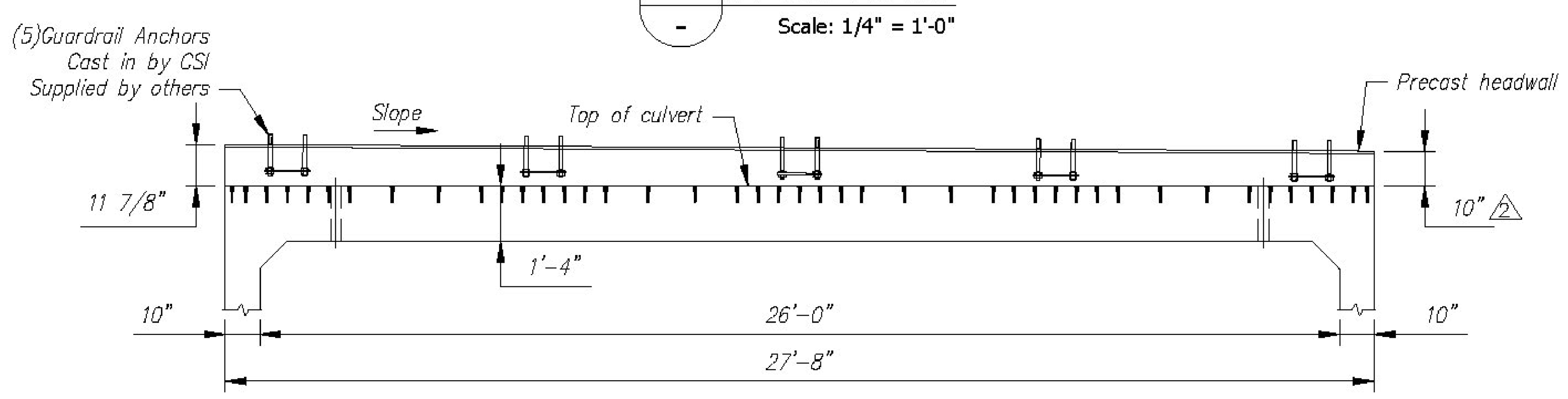


R. SIDE ELEVATION
Scale: 1/4" = 1'-0"

C3 Culvert Rebar Schedule			
MK		QTY	LENGTH
401	#4	18	10 '- 6 "
402	#4	9	27 '- 0 "
403	#4	104	7 '- 1.5 "
501	#5	2	27 '- 4 "
701	#7	36	18 '- 0 "
702	#7	22	27 '- 0 "

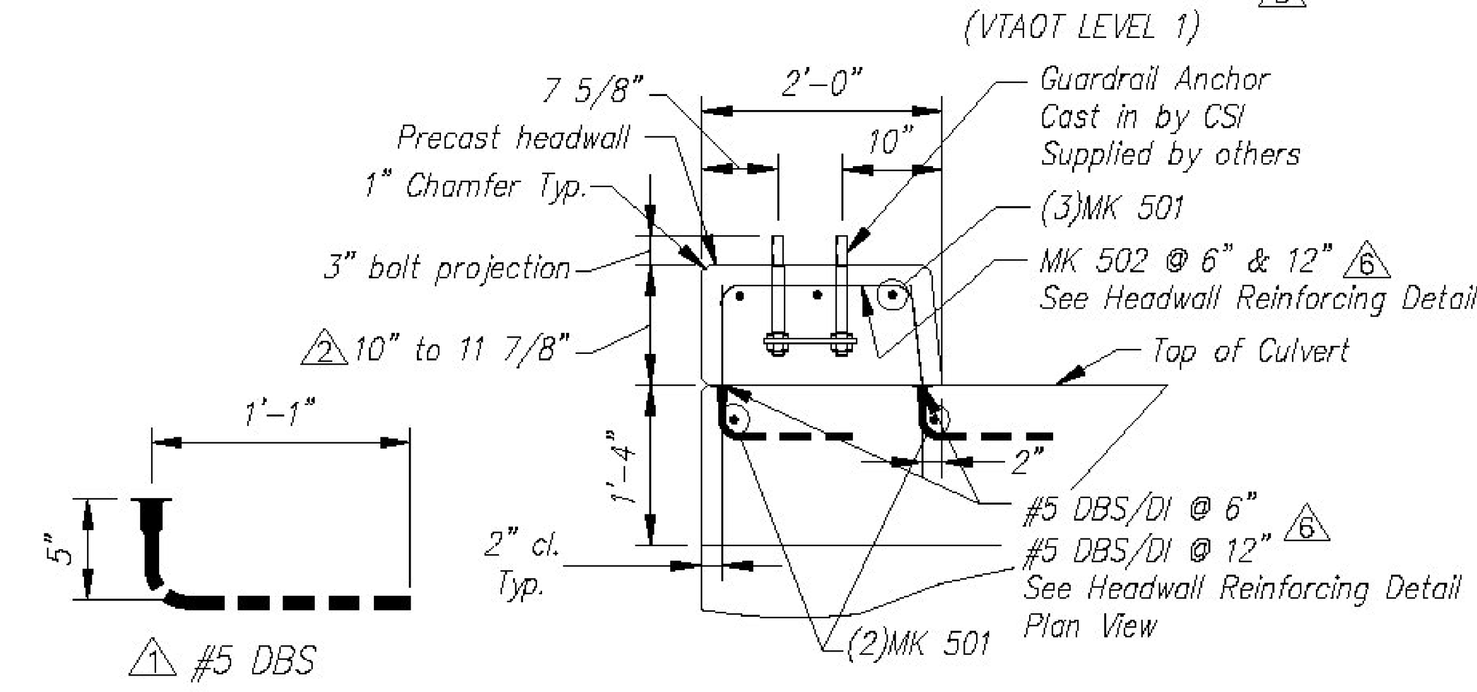
C3 HW Rebar Schedule			
MK		QTY	LENGTH
501	#5	3	27 '- 4 "
502	#5	43	3 '- 2 "

QUANTITY = 1
WEIGHT = 33.41 TONS

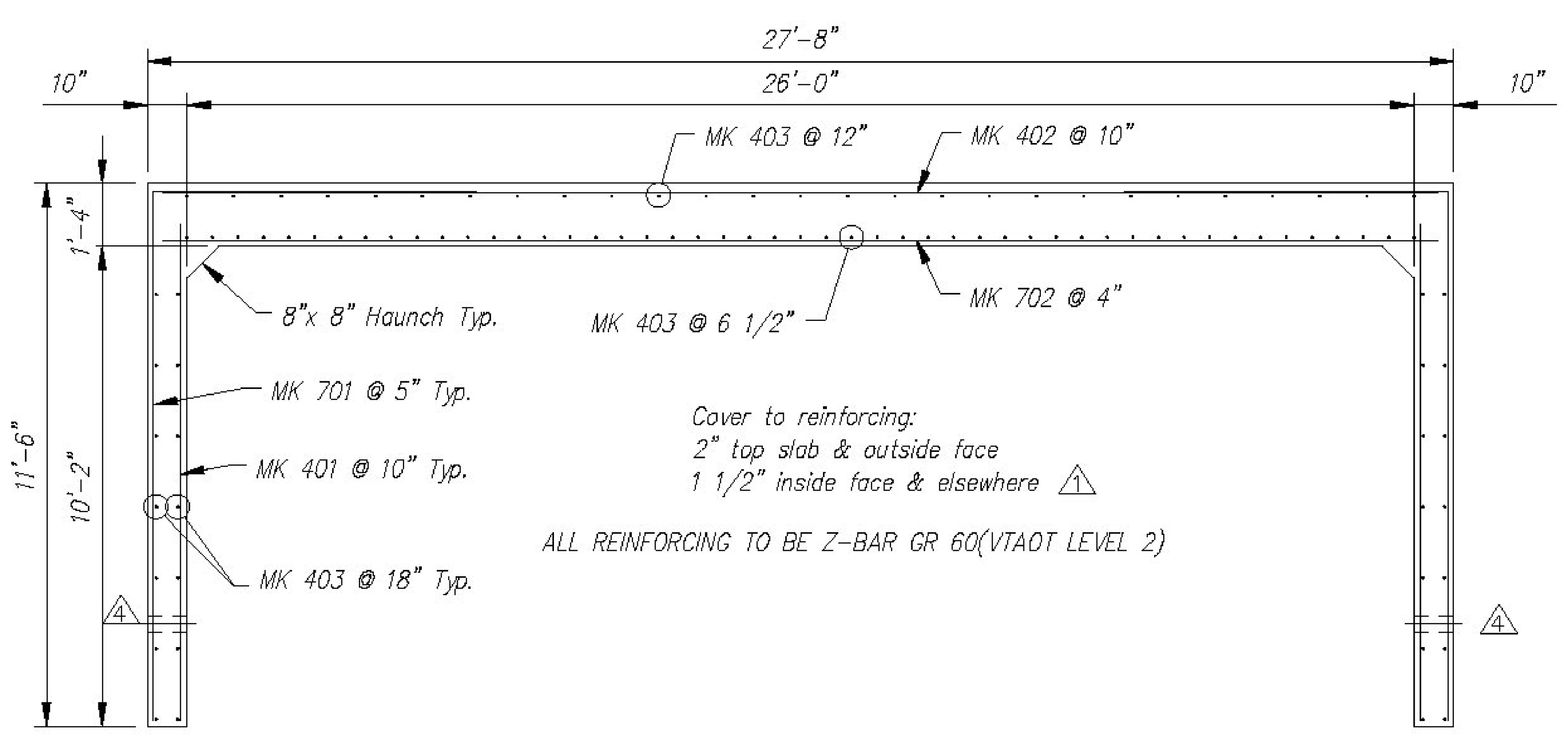


PARTIAL ELEVATION
Scale: 1/4" = 1'-0"

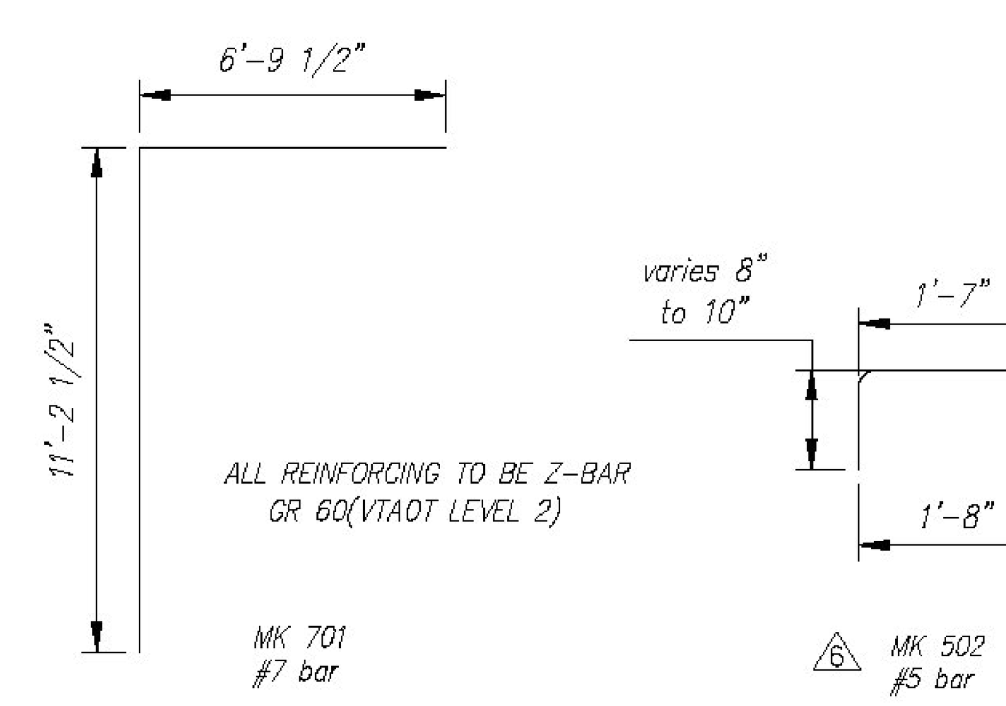
ALL REINFORCING TO BE Z-BAR GR 60(VTAOT LEVEL 2)
ALL DOWEL BAR SPLICER & DOWEL-IN TO BE EPOXY COATED (VTAOT LEVEL 1)



SECTION A
Scale: N.T.S.

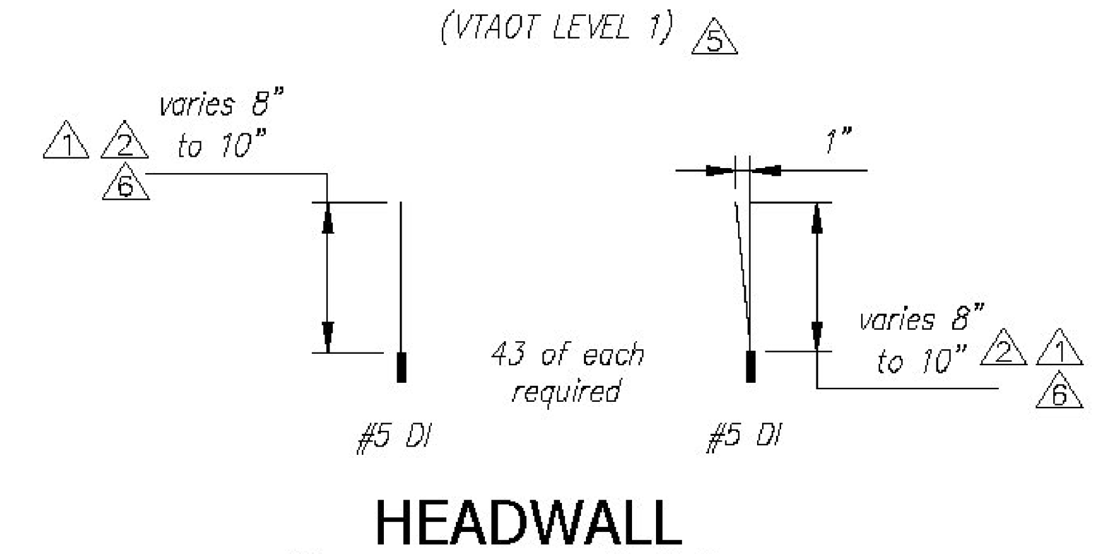


REINFORCING DETAIL
Scale: N.T.S.



BENDING SCHEDULE
Scale: N.T.S.

ALL DOWEL-IN TO BE EPOXY COATED (VTAOT LEVEL 1)



HEADWALL
BENDING SCHEDULE
Scale: N.T.S.

Rev.	Date	DESCRIPTION	By
10			
9			
8			
7			
6	21JUL2015	SHORTENED DI & ADDED REBAR TO HW TO EASE MFG	RY
5	08JUL2015	ALL DBS/DI WERE Z-BAR, NOW EPOXY COATED	RY
4	17JUN2015	REVISED PER CUSTOMER REVIEW	BSS
3	10JUN2015	ADJUSTED WATER REPELLENT	RY
2	28MAY2015	10" DIM WAS 9 1/2", HDWALL BEND SCHED – 8" WAS 7 1/2"	RY
1	14MAY2015	REVISED PER CUSTOMER REVIEW, REVISED GUARDRAIL ANCHOR SPACING, MOVED WINGWALL ANCHOR, ADDED NOTE	RY

REVISIONS

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owing documents and/or sources:
E PROJECT, TOWN OF RICHFORD
TED 2011

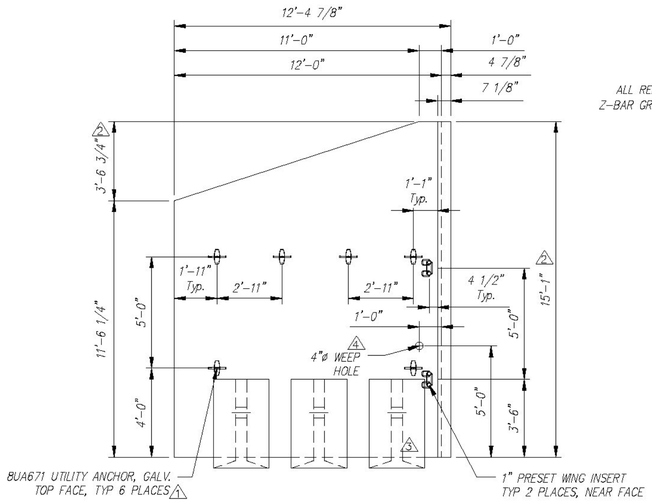
CSI
Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

STATE AGENCY
VTrans

Drawn By: R. YEAGER | Date: 16APR2015
Reviewed By: | Date:
Approved By: C VICK | Date: 7/21/15

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

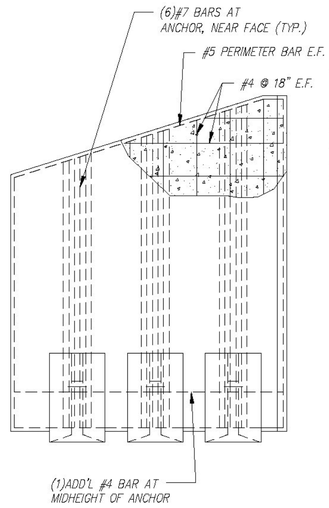
C | SHOP DRAWING C3 | REV 6
Drawing No. C22312-C3
Quantity: 1 | Project No: BRF030229 | SHEET 3 OF 14



ALL REINFORCING TO BE Z-BAR GR 60(VTAOT LEVEL 2)

PLAN VIEW
Scale: 1/4" = 1'-0"

ALL EXPOSED EDGES OF CONCRETE TO RECEIVE 1" CHAMFER

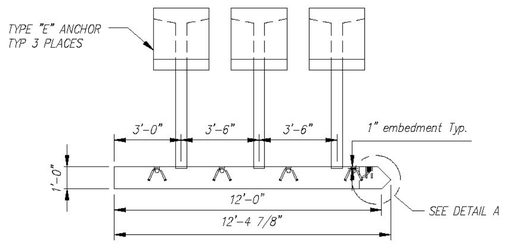


REINFORCING DETAIL
Scale: 1/4" = 1'-0"

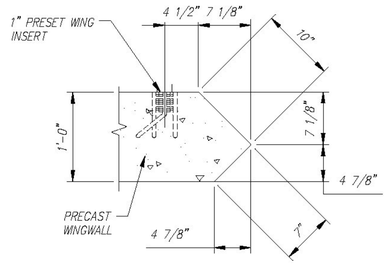
QUANTITY = 1
WEIGHT = 15.73 TONS 2

WW1 - BILL OF MATERIALS / EMBEDS

	CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
	CSANC-E	CONSPAN WINGWALL ANCHOR (E)	3	EA	
4	DTJ	CERTI-VEX PENSEAL 244-40%	1.20	GA	
	EM-00034	4" FOAM CORE PVC	1	FT	
	EM-0005A	1" X 6 " PRESET WING INSERT	2	EA	
1	EM-00115	UTILITY ANCHOR #8UA671-GALVANIZED	6	EA	
2	DTJ	REBAR #4 Z-BAR GR 60 VTAOT LEVEL II	335	LB	
2	DTJ	REBAR #5 Z-BAR GR 60 VTAOT LEVEL II	106	LB	
2	DTJ	REBAR #7 Z-BAR GR 60 VTAOT LEVEL II	533	LB	
2	MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	6.06	CY	



FRONT ELEVATION
Scale: 1/4" = 1'-0"



DETAIL A
Scale: N.T.S.

Vermont Agency of Transportation

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Richford Precast Frame Complete Updated Submittal_Approved 7.22.15.pdf

CK'D BY CLB OK'D BY HIS

July 22, 2015

RESUBMIT NO Approved

BY C. CARLSON DATE 07/23/15

Rev.	Date	By
10		
9		
8		
7		
6		
5		
4	17JUN2015	BSS
3	10JUN2015	RY
2	28MAY2015	RY
1	14MAY2015	RY

REVISIONS

DESCRIPTION

1 REVISED PER CUSTOMER REVIEW
2 MOVED WEEP HOLE TO 1"
3 15'-1 WAS 14'-8", VARIOUS CHANGES
4 REVISED PER CUSTOMER REVIEW

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Project No: ----
Drawings: STATE OF VT/AOT PROPOSED IMPROVEMENT BRIDGE PROJECT, TOWN OF RICHFORD SHEETS 1,2,4,22,23,24 OF 36
Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011
Other: ----

Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

STATE AGENCY VTrans

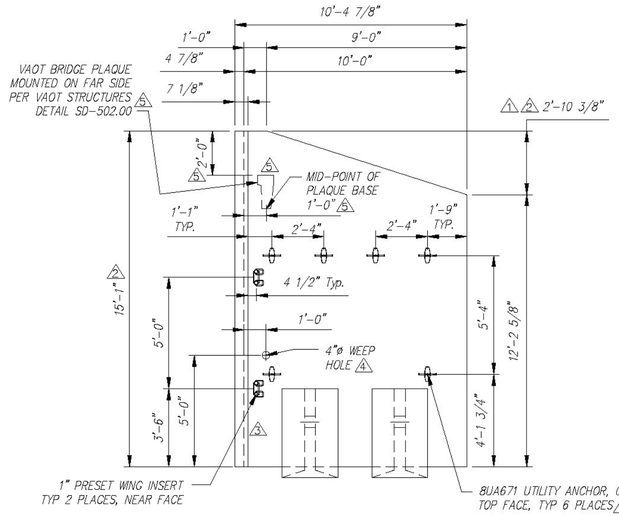
Drawn By B. SKELTON/RY Date 17APR2015
Reviewed By B. KOLAWOLE Date
Approved By C. VICK Date 17JUN2015

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

C | SHOP DRAWING WW1 | REV 4
Drawing No. C22312-WW1
Quantity: 1 | Project No: BRF030229 | SHEET 4 OF 14

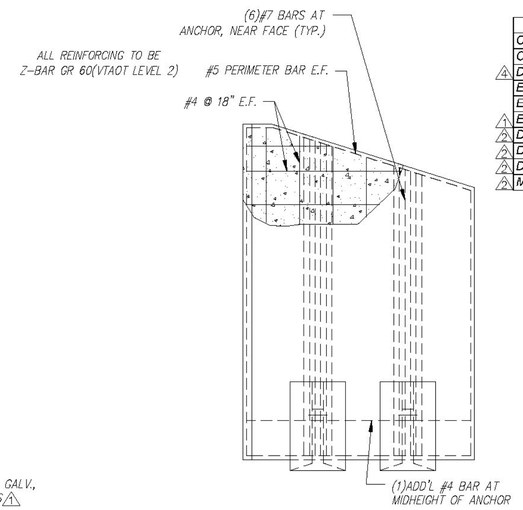
QUANTITY = 1
WEIGHT = 12.86 TONS 2

WW2 - BILL OF MATERIALS / EMBEDS				
CS! ID#	DESCRIPTION	QTY	UM	COMMENTS
CSANC-E	CON/SPAN WINGWALL ANCHOR (E)	2	EA	
4 DTJ	CERTI-VEX PENSEAL 244-40%	1.10	GA	
EM-00034	4" FOAM CORE PVC	1	FT	
EM-0005A	1" X 6 " PRESET WING INSERT	2	EA	
1 EM-00115	UTILITY ANCHOR #8UA671-GALVANIZED	6	EA	
2 DTJ	REBAR #4 Z-BAR GR 60 VTAOT LEVEL II	286	LB	
2 DTJ	REBAR #5 Z-BAR GR 60 VTAOT LEVEL II	99	LB	
2 DTJ	REBAR #7 Z-BAR GR 60 VTAOT LEVEL II	350	LB	
2 MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	5.21	CY	

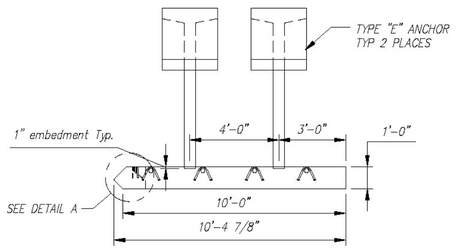


PLAN VIEW
Scale: 1/4" = 1'-0"

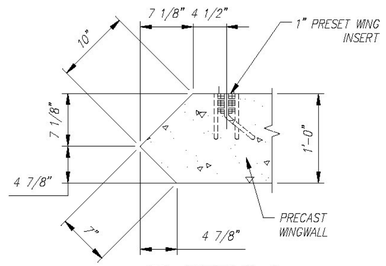
ALL EXPOSED EDGES OF CONCRETE TO RECEIVE 1" CHAMFER 1



REINFORCING DETAIL
Scale: 1/4" = 1'-0"



FRONT ELEVATION
Scale: 1/4" = 1'-0"



DETAIL A
Scale: N.T.S.

Vermont Agency of Transportation
RECEIVED
Richford Precast Frame Complete Updated Submittal_Approved 7.23.15.pdf
CK'D BY CLB OK'D BY HIS
July 22, 2015
RESUBMIT NO Approved
BY C. CARLSON DATE 07/23/15

Rev.	Date	By	DESCRIPTION
			REVISIONS
10			
9			
8			
7			
6	10JUL2015	RY	ADDED VAOT BRIDGE PLAQUE
5	17JUN2015	BSS	REVISED PER CUSTOMER REVIEW
4	10JUN2015	RY	MOVED WEEP HOLE TO 1"
3	28MAY2015	RY	15'-1" WAS 14'-8", VARIOUS CHANGES
2	14MAY2015	RY	REVISED PER CUSTOMER REVIEW
1			

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Project No: ----
Drawings: STATE OF VT/AOT PROPOSED IMPROVEMENT BRIDGE PROJECT, TOWN OF RICHFORD SHEETS 1,2,4,22,23,24 OF 36
Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011

Other: ----

Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

STATE AGENCY
VTrans

Drawn By B. SKELTON/RY Date 17APR2015
Reviewed By B. KOLAWOLE Date
Approved By C. VICK Date 7/10/15

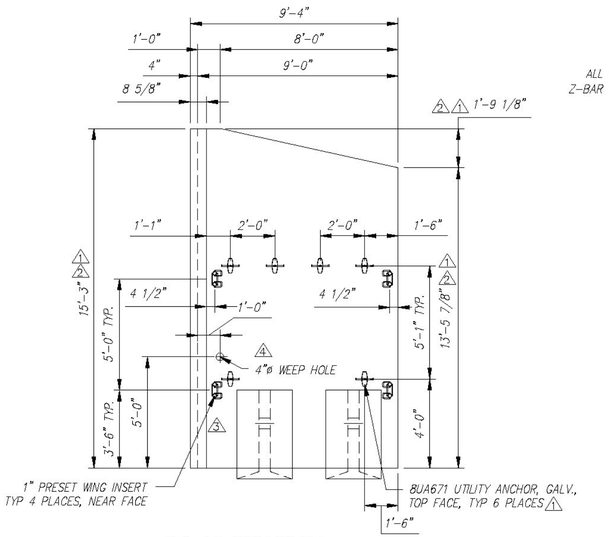
G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

C | Drawing No. SHOP DRAWING WW2 C22312-WW2 | REV 5

Quantity: 1 | Project No: BRF030229 | SHEET 5 OF 14

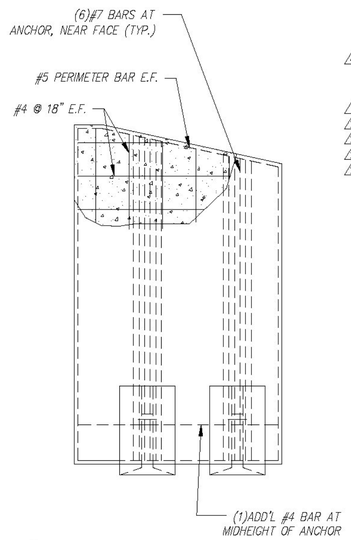
QUANTITY = 1
WEIGHT = 12.21 TONS 2

	WW3A - BILL OF MATERIALS / EMBEDS				
	CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
	CSANC-E	CON/SPAN WINGWALL ANCHOR (E)	2	EA	
4	DTJ	CERTI-VEX PENSEAL 244-40%	1.00	GA	
	EM-00034	4" FOAM CORE PVC	1	FT	
	EM-0005A	1" X 6 " PRESET WING INSERT	4	EA	
1	EM-G0115	UTILITY ANCHOR #8UA671-GALVANIZED	6	EA	
2	DTJ	REBAR #4 Z-BAR GR 60 VTAOT LEVEL II	252	LB	
2	DTJ	REBAR #5 Z-BAR GR 60 VTAOT LEVEL II	96	LB	
2	DTJ	REBAR #7 Z-BAR GR 60 VTAOT LEVEL II	358	LB	
2	MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	4.89	CY	



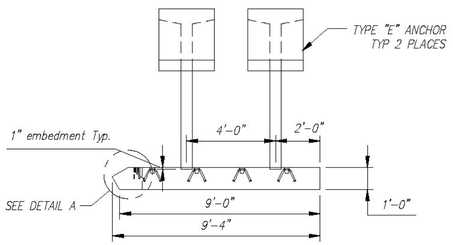
ALL REINFORCING TO BE Z-BAR GR 60(VTAOT LEVEL 2)

PLAN VIEW
Scale: 1/4" = 1'-0"

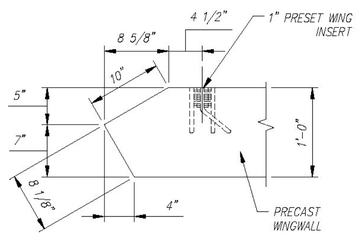


REINFORCING DETAIL
Scale: 1/4" = 1'-0"

1 ALL EXPOSED EDGES OF CONCRETE TO RECEIVE 1" CHAMFER



FRONT ELEVATION
Scale: 1/4" = 1'-0"



DETAIL A
Scale: N.T.S.

Vermont Agency of Transportation
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CK'D BY CLB OK'D BY HIS
July 22, 2015
RESUBMIT NO Approved
BY C. CARLSON DATE 07/23/15

Rev.	Date	By	DESCRIPTION
4	17JUN2015	BSS	REVISED PER CUSTOMER REVIEW
3	10JUN2015	RY	MOVED WEEP HOLE TO 1'
2	28MAY2015	RY	15'-3" WAS 14'-10 3/8", 13'-5 7/8" WAS 13'-3 3/8", VARIOUS CHANGES
1	14MAY2015	RY	REVISED PER CUSTOMER REVIEW

REVISIONS

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Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011
Other: ----

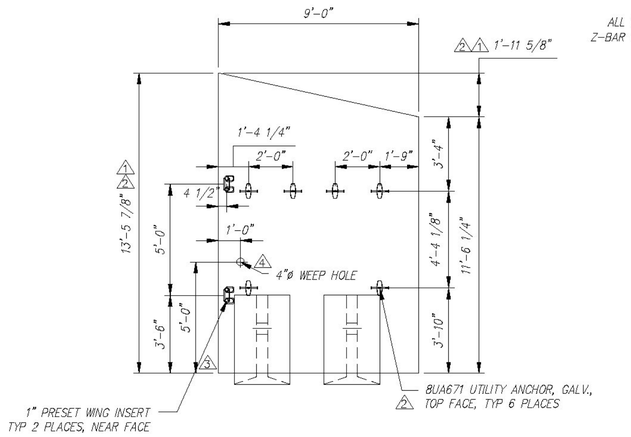
Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

STATE AGENCY
VTrans

Drawn By B. SKELTON/RY Date 17APR2015
Reviewed By B. KOLAWOLE Date
Approved By C. VICK Date 17JUN2015

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

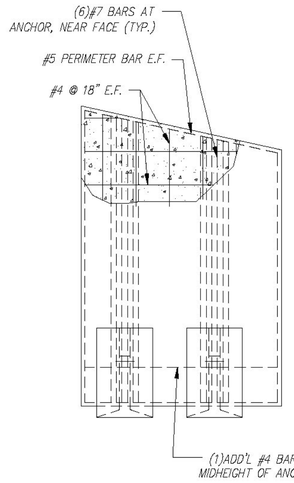
C | SHOP DRAWING WW3A | REV 4
Drawing No. C22312-WW3A
Quantity: 1 | Project No: BRF030229 | SHEET 6 OF 14



ALL REINFORCING TO BE Z-BAR GR 60(VTAOT LEVEL 2)

PLAN VIEW
Scale: 1/4" = 1'-0"

ALL EXPOSED EDGES OF CONCRETE TO RECEIVE 1" CHAMFER

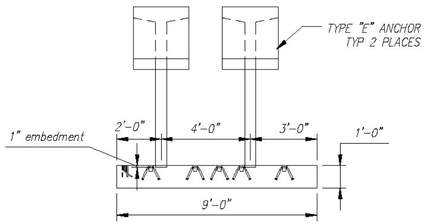


REINFORCING DETAIL
Scale: 1/4" = 1'-0"

QUANTITY = 1
WEIGHT = 10.75 TONS 2

WW3B - BILL OF MATERIALS / EMBEDS

	CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
	CSANC-E	CON/SPAN WINGWALL ANCHOR (E)	2	EA	
4	DTJ	CERTI-VEX PENSEAL 244-40%	1.00	GA	
	EM-00034	4" FOAM CORE PVC	1	FT	
	EM-0005A	1" X 6 " PRESET WING INSERT	2	EA	
2	EM-00115	UTILITY ANCHOR #8UA671-GALVANIZED	6	EA	
	DTJ	REBAR #4 Z-BAR GR 60 VTAOT LEVEL II	208	LB	
	DTJ	REBAR #5 Z-BAR GR 60 VTAOT LEVEL II	87	LB	
	DTJ	REBAR #7 Z-BAR GR 60 VTAOT LEVEL II	315	LB	
	MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	4.17	CY	



FRONT ELEVATION
Scale: 1/4" = 1'-0"

Vermont Agency of Transportation

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Richford Precast Frame Complete Updated Submittal_Approved 7.23.15.pdf

CK'D BY CLB OK'D BY HIS

July 22, 2015

RESUBMIT NO Approved

BY C. CARLSON DATE 07/23/15

Rev.	Date	By
10		
9		
8		
7		
6		
5		
4	17JUN2915	BSS
3	10JUN2015	RY
2	04JUN2015	RY
1	14MAY2015	RY

REVISIONS
1 REVISED PER CUSTOMER REVIEW
2 ADDED WEEP HOLE
3 REVISED PER CUTOMER REVIEW
4 REVISED PER CUSTOMER REVIEW

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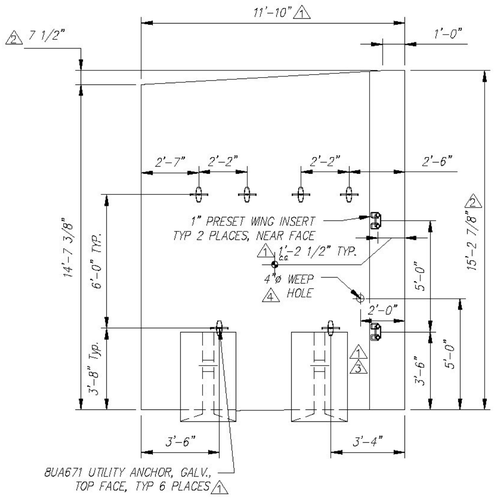
Approved By C. VICK Date 17JUN2015

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

C | SHOP DRAWING WW3B | REV 4
Drawing No. C22312-WW3B
Quantity: 1 | Project No: BRF030229 | SHEET 7 OF 14

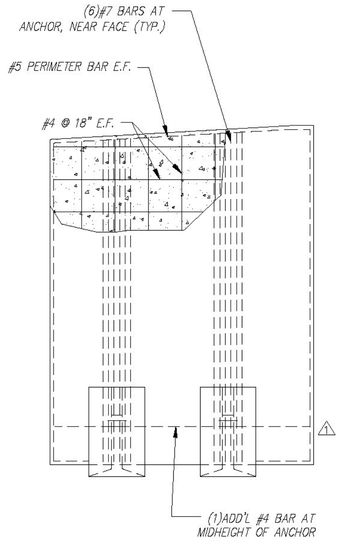


PLAN VIEW

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

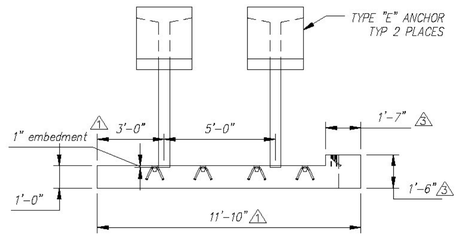
ALL REINFORCING TO BE
Z-BAR GR 60(VTAOT LEVEL 2)

ALL EXPOSED EDGES OF
CONCRETE TO RECEIVE
1 1" CHAMFER



REINFORCING DETAIL

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



FRONT ELEVATION

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

QUANTITY = 1
WEIGHT = 16.47 TONS 2 3

WW4 - BILL OF MATERIALS / EMBEDS

	CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
	CSANC-E	CON/SPAN WINGWALL ANCHOR (E)	2	EA	
4	DTJ	CERTI-VEX PENSEAL 244-40%	1.20	GA	
	EM-00034	4" FOAM CORE PVC	1	FT	
	EM-0005A	1" X 6 " PRESET WING INSERT	2	EA	
1	EM-00115	UTILITY ANCHOR #8UA671-GALVANIZED	6	EA	
	DTJ	REBAR #4 Z-BAR GR 60 VTAOT LEVEL II	305	LB	
	DTJ	REBAR #5 Z-BAR GR 60 VTAOT LEVEL II	108	LB	
	DTJ	REBAR #7 Z-BAR GR 60 VTAOT LEVEL II	356	LB	
3 1	MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	6.99	CY	

Vermont Agency of Transportation

RECEIVED

Richford Precast Frame Complete Updated Submittal_Approved 7.23.15.pdf

CK'D BY CLB OK'D BY HIS

July 22, 2015

RESUBMIT NO Approved

BY C. CARLSON DATE 07/23/15

Rev.	Date	By	DESCRIPTION
10			
9			
8			
7			
6			
5			
4	17JUN2015	BSS	REVISED PER CUSTOMER REVIEW
3	10JUN2015	RY	ADDED 6" STANDOFF
2	04JUN2015	RY	REVISED PER CUSTOMER REVIEW
1	14MAY2015	RY	REVISED PER CUSTOMER REVIEW

REVISIONS

Contractor is to verify that all information shown on drawings has been transcribed correctly and that the contract documents are adequate to meet the field conditions. Some dimensions and details may differ slightly from contract drawings to accommodate the manufacturing or design process. Approval of this drawing indicates that any deviation from the contract documents has been reviewed and found to be acceptable. Production will not commence until receipt of signed, approved shop drawings.

This drawing is based upon information provided from the following documents and/or sources:

Engineer: STATE OF VT/AOT PROGRAM DEVELOPMENT
Project No: ----
Drawings: STATE OF VT/AOT PROPOSED IMPROVEMENT BRIDGE PROJECT, TOWN OF RICHFORD SHEETS 1,2,4,22,23,24 OF 36
Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011

Other: ----

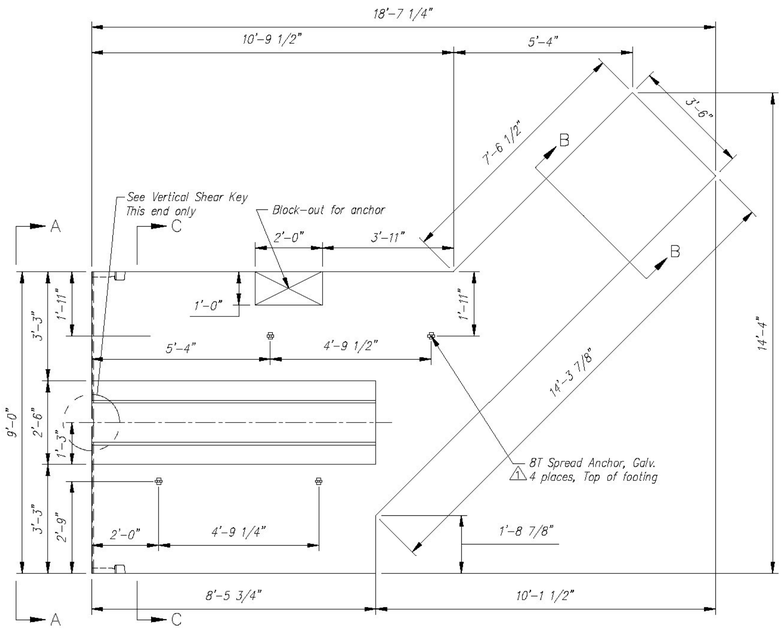
Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

STATE AGENCY
VTrans

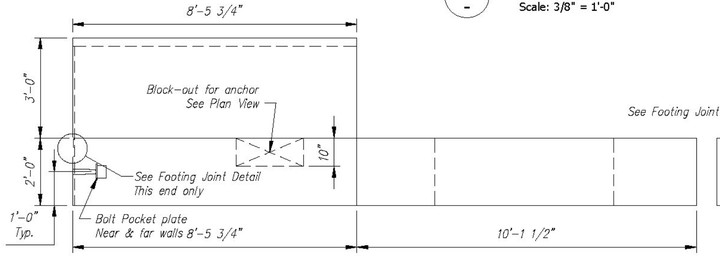
Drawn By B. SKELTON/RY	Date 17APR2015
Reviewed By B. KOLAWOLE	Date
Approved By C. VICK	Date 17JUN2015

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

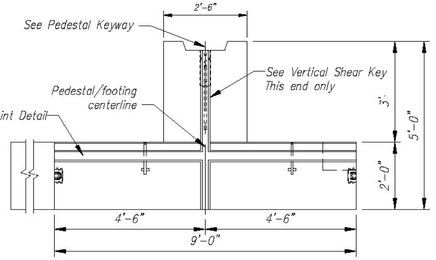
C | SHOP DRAWING WW4 | REV 4
Drawing No. C22312-WW4
Quantity: 1 | Project No: BRF030229 | SHEET 8 OF 14



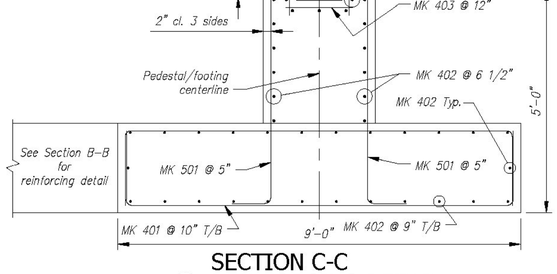
PLAN VIEW
Scale: 3/8" = 1'-0"



ELEVATION
Scale: 3/8" = 1'-0"



ELEVATION A-A
Scale: 3/8" = 1'-0"



SECTION C-C
REINFORCING DETAIL
Scale: N.T.S.

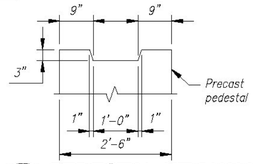
QUANTITY = 1
WEIGHT = 23.02 TONS

FOOTING SLAB - F1 - BILL OF MATERIALS / EMBEDS				
CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
EM-00078	8T SPREAD ANCHOR #FL119/P94	4	EA	
EM-00125	BOLT POCKET PLATE (GALVANIZED)	2	EA	
RM-00013	REBAR #4 BLACK- GR 60	424	LB	
RM-00015	REBAR #5 BLACK-GR 60 40'	264	LB	
RM-00017	REBAR #6 BLACK-GR 60 40'	128	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	9.11	CY	
FOOTING PEDESTAL - F1 - BILL OF MATERIALS / EMBEDS				
RM-00013	REBAR #4 BLACK- GR 60	104	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	2.25	CY	

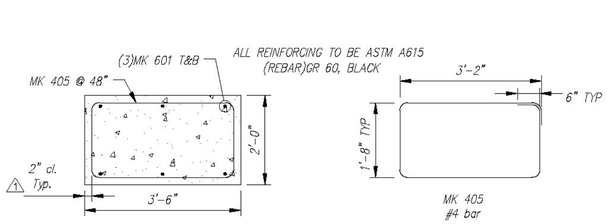
Ftg. Slab - F1 Rebar Schedule				
MK		QTY	LENGTH	
401	#4	26	12 '- 0 "	
402	#4	26	10 '- 9 "	MAX
405	#4	4	10 '- 8 "	
501	#5	40	6 '- 4 "	
601	#6	6	14 '- 3 "	MAX

Ftg. Pedestal-F1 Rebar Schedule			
MK		QTY	LENGTH
402	#4	17	8 '- 3 "
403	#4	9	1 '- 8 "

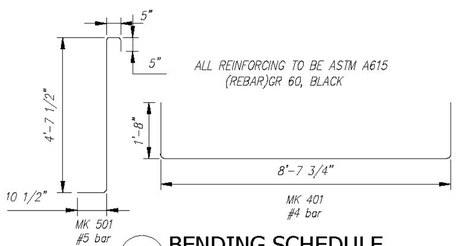
Vermont Agency of Transportation
RECEIVED
Richford Precast Frame Complete Updated Submittal_Approved 7.23.15.pdf
CK'D BY CLB OK'D BY HIS
July 22, 2015
RESUBMIT NO Approved
BY C. CARLSON DATE 07/23/15



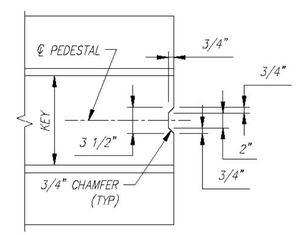
PEDESTAL KEYWAY
Scale: N.T.S.



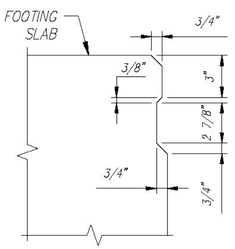
SECTION B-B
REINFORCING DETAIL
Scale: N.T.S.



BENDING SCHEDULE
Scale: N.T.S.



VERTICAL SHEAR KEY
Scale: N.T.S.



JOINT DETAIL
Scale: N.T.S.

Rev.	Date	By	DESCRIPTION
1	14MAY2015	RY	REVISED PER CUSTOMER REVIEW, REVISED ANCHOR LOCATIONS

REVISIONS

Contractor is to verify that all information shown on drawings has been thoroughly detailed correctly with respect to contract documents and adequate to meet the field conditions. Some dimensions and details may differ slightly from contract drawings to accommodate the manufacturing or design process. Approval of this drawing indicates that any deviation from the contract documents has been reviewed and found to be acceptable. Production will not commence until receipt of signed, approved shop drawings.

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Project No: ----
Drawings: STATE OF VT/AOT PROPOSED IMPROVEMENT BRIDGE PROJECT, TOWN OF RICHFORD SHEETS 1,2,4,22,23,24 OF 36
Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011
Other: ----

Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

STATE AGENCY
VTrans

Drawn By R. YEAGER	Date 16APR2015		
Reviewed By B. KOLAWOLE	Date	C	SHOP DRAWING F1 — Drawing No. C22312-F1 — REV 1
Approved By C. VICK	Date 17JUN2015	Quantity: 1	Project No: BRF030229 — SHEET 9 OF 14

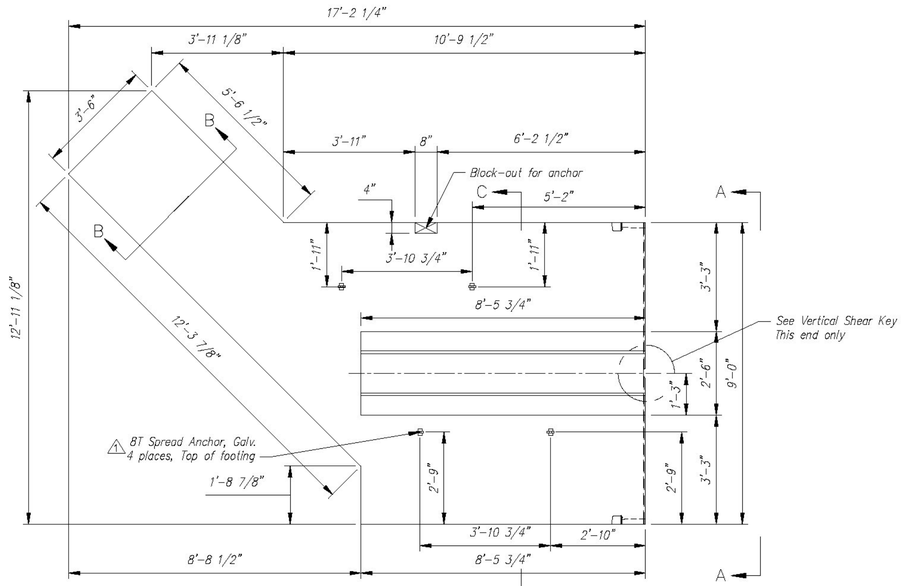
G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT- ROAD IMPROVEMENT
RICHFORD, VT.

QUANTITY = 1
WEIGHT = 21.97 TONS

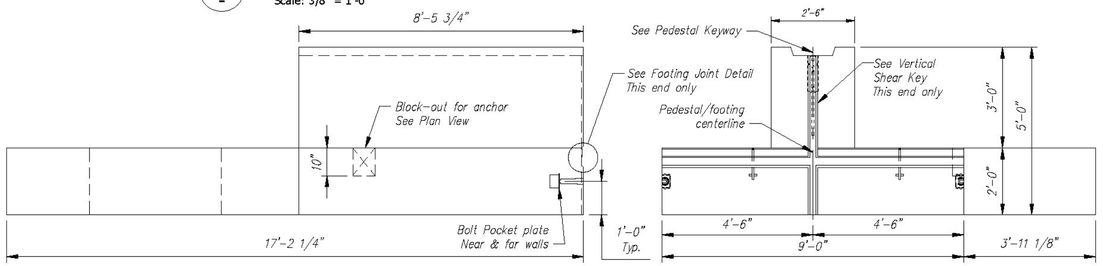
Ftg. Slab - F2 Rebar Schedule				
MK		QTY	LENGTH	
401	#4	26	12 '- 0 "	
402	#4	26	10 '- 9 "	MAX
405	#4	4	10 '- 8 "	
501	#5	40	6 '- 4 "	
601	#6	6	12 '- 3 "	MAX

Ftg. Pedestal-F2 Rebar Schedule			
MK		QTY	LENGTH
402	#4	17	8 '- 3 "
403	#4	9	1 '- 8 "

FOOTING SLAB - F2 - BILL OF MATERIALS / EMBEDS				
CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
EM-00078	8T SPREAD ANCHOR #FL119/P94	4	EA	
EM-00125	BOLT POCKET PLATE (GALVANIZED)	2	EA	
RM-00013	REBAR #4 BLACK- GR 60	424	LB	
RM-00015	REBAR #5 BLACK-GR 60 40'	264	LB	
RM-00017	REBAR #6 BLACK-GR 60 40'	110	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	8.59	CY	
FOOTING PEDESTAL - F2 - BILL OF MATERIALS / EMBEDS				
RM-00013	REBAR #4 BLACK- GR 60	104	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	2.26	CY	

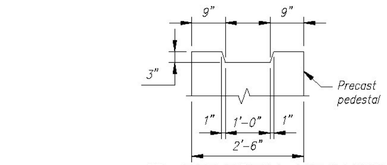


PLAN VIEW
Scale: 3/8" = 1'-0"

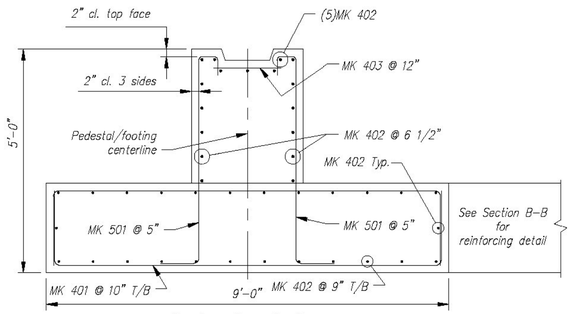


ELEVATION
Scale: 3/8" = 1'-0"

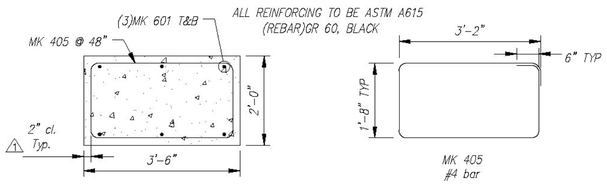
ELEVATION A-A
Scale: 3/8" = 1'-0"



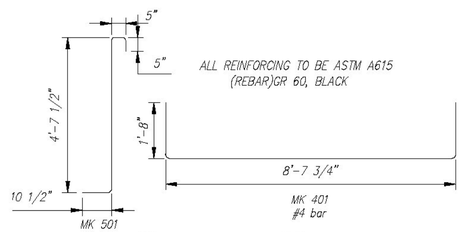
PEDESTAL KEYWAY
Scale: N.T.S.



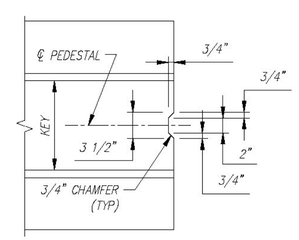
SECTION C-C
REINFORCING DETAIL
Scale: N.T.S.



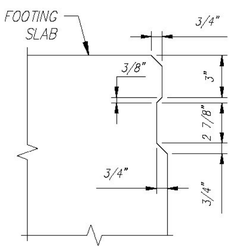
SECTION B-B
REINFORCING DETAIL
Scale: N.T.S.



BENDING SCHEDULE
Scale: N.T.S.



VERTICAL SHEAR KEY
Scale: N.T.S.



JOINT DETAIL
Scale: N.T.S.

Rev.	Date	By
1	14MAY2015	RY

REVISIONS
1 REVISED PER CUSTOMER REVIEW, REVISED ANCHOR LOCATIONS

following documents and/or sources:

GE PROJECT, TOWN OF RICHFORD

ATED 2011

Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

STATE AGENCY
VTrans

Drawn By R. YEAGER	Date 16APR2015	
Reviewed By B. KOLAWOLE	Date	
Approved By C. VICK	Date 17JUN2015	

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

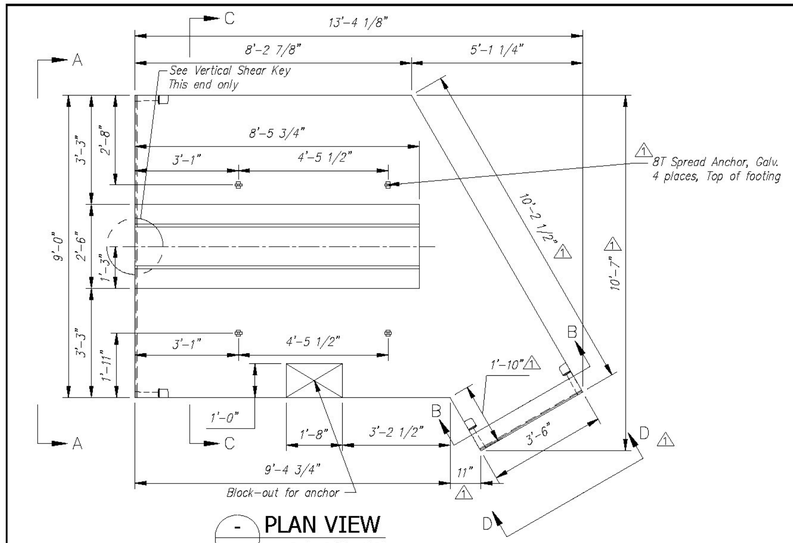
C | Drawing No. SHOP DRAWING F2 | REV 1
Quantity: 1 | Project No: BRF030229 | SHEET 10 OF 14

QUANTITY = 1
WEIGHT = 19.85 TONS ⚠1

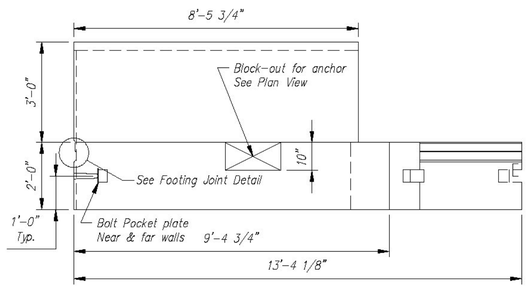
Ftg. Slab - F3A Rebar Schedule				
MK		QTY	LENGTH	
401	#4	22	12 '- 0 "	
402	#4	26	9 '- 4 "	MAX
405	#4	2	10 '- 8 "	
501	#5	40	6 '- 4 "	
601	#6	6	9 '- 10 "	MAX

Ftg. Pedestal-F3A Rebar Schedule			
MK		QTY	LENGTH
402	#4	17	8 '- 3 "
403	#4	9	1 '- 8 "

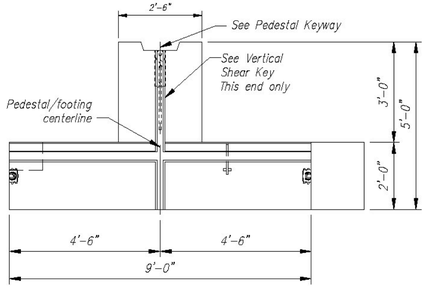
FOOTING SLAB - F3A - BILL OF MATERIALS / EMBEDS				
CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
⚠1 EM-00078	8T SPREAD ANCHOR #FL119/P94	4	EA	
⚠1 EM-00125	BOLT POCKET PLATE (GALVANIZED)	4	EA	
⚠1 RM-00013	REBAR #4 BLACK- GR 60	353	LB	
RM-00015	REBAR #5 BLACK-GR 60 40'	264	LB	
⚠1 RM-00017	REBAR #6 BLACK-GR 60 40'	89	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	7.44	CY	
FOOTING PEDESTAL - F3A - BILL OF MATERIALS / EMBEDS				
RM-00013	REBAR #4 BLACK- GR 60	104	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	2.26	CY	



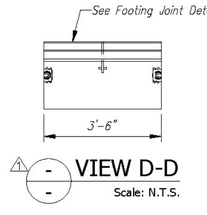
PLAN VIEW
Scale: 3/8" = 1'-0"



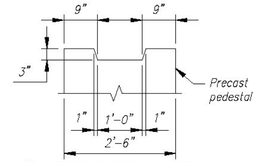
ELEVATION
Scale: 3/8" = 1'-0"



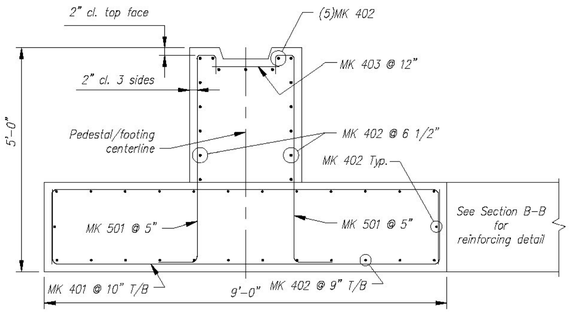
ELEVATION A-A
Scale: 3/8" = 1'-0"



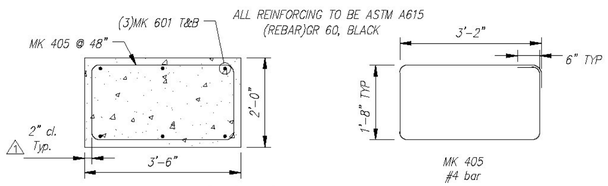
VIEW D-D
Scale: N.T.S.



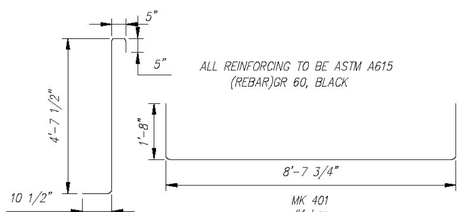
PEDESTAL KEYWAY
Scale: N.T.S.



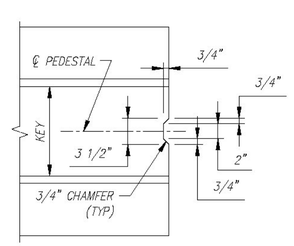
SECTION C-C
REINFORCING DETAIL
Scale: N.T.S.



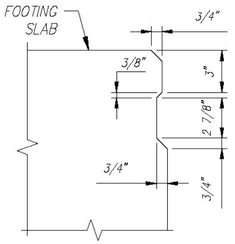
SECTION B-B
REINFORCING DETAIL
Scale: N.T.S.



BENDING SCHEDULE
Scale: N.T.S.



VERTICAL SHEAR KEY
Scale: N.T.S.



JOINT DETAIL
Scale: N.T.S.

REV.	Date	DESCRIPTION
1	14MAY2015	REVISED PER CUSTOMER REVIEW, REVISED FOOTING, ADDED BOLT POCKETS,REVISED ANCHOR LOCATIONS
2		
3		
4		
5		
6		
7		
8		
9		
10		

REVISIONS
By
RY

llowing documents and/or sources:

GE PROJECT, TOWN OF RICHFORD

ATED 2011

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Phone 603-889-4163
Fax 603-889-2417

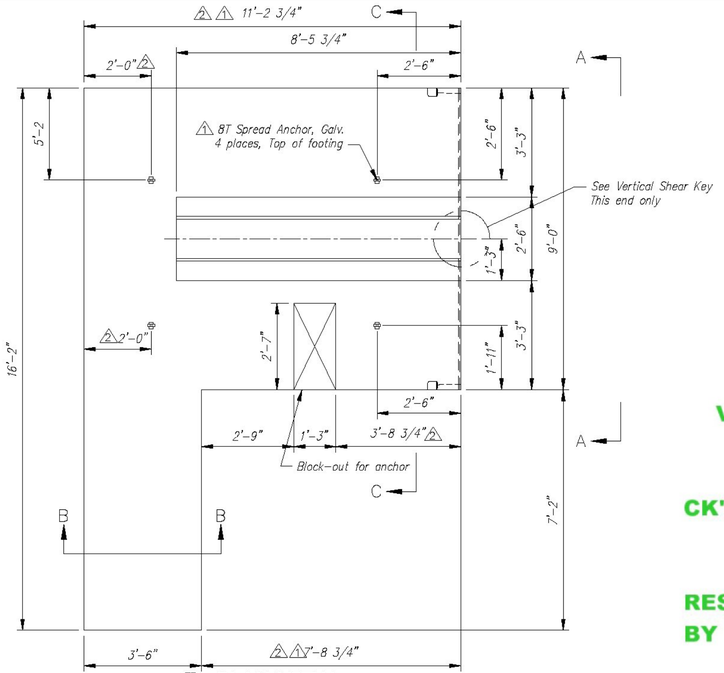
STATE AGENCY
VTrans

Drawn By R. YEAGER	Date 16APR2015	
Reviewed By B. KOLAWOLE	Date	
Approved By C. VICK	Date 17JUN2015	

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

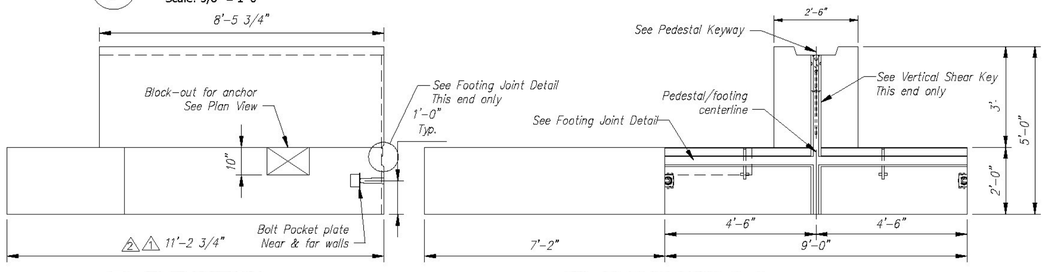
C — Drawing No. SHOP DRAWING F3A / C22312–F3A — REV 1

Quantity: 1 | Project No: BRF030229 | SHEET 11 OF 14



PLAN VIEW

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

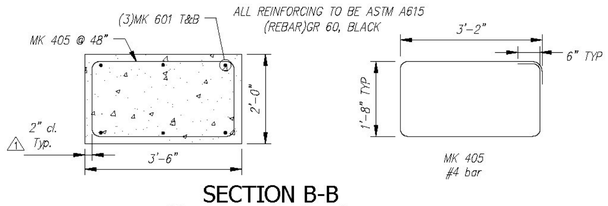


ELEVATION

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

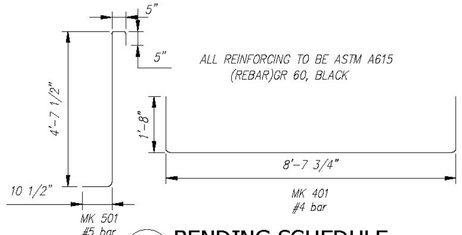
ELEVATION A-A

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



SECTION B-B REINFORCING DETAIL

Scale: N.T.S.



BENDING SCHEDULE

Scale: N.T.S.

Ftg. Slab - F4 Rebar Schedule			
MK		QTY	LENGTH
401	#4	28	12 '- 0 "
402	#4	26	11 '- 0 " MAX
405	#4	3	10 '- 8 "
501	#5	40	6 '- 4 "
601	#6	6	8 '- 0 " MAX

Ftg. Pedestal-F4 Rebar Schedule			
MK		QTY	LENGTH
402	#4	17	8 '- 3 "
403	#4	9	1 '- 8 "

QUANTITY = 1
WEIGHT = 23.69 TONS

FOOTING SLAB - F4 - BILL OF MATERIALS / EMBEDS				
CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
EM-00078	8T SPREAD ANCHOR #FL119/P94	4	EA	
EM-00125	BOLT POCKET PLATE (GALVANIZED)	2	EA	
RM-00013	REBAR #4 BLACK- GR 60	437	LB	
RM-00015	REBAR #5 BLACK-GR 60 40'	264	LB	
RM-00017	REBAR #6 BLACK-GR 60 40'	72	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	9.34	CY	
FOOTING PEDESTAL - F4 - BILL OF MATERIALS / EMBEDS				
RM-00013	REBAR #4 BLACK- GR 60	104	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	2.26	CY	

Vermont Agency of Transportation

RECEIVED

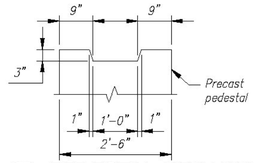
Richford Precast Frame Complete Updated Submittal_Approved 7.23.15.pdf

CK'D BY CLB OK'D BY HIS

July 22, 2015

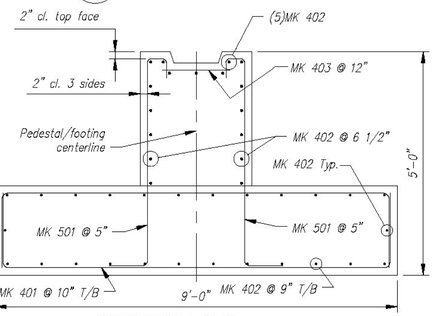
RESUBMIT NO **Approved**

BY C. CARLSON DATE 07/23/15



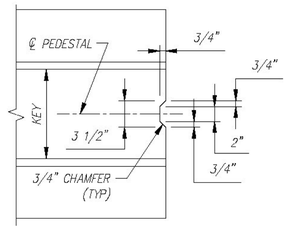
PEDESTAL KEYWAY

Scale: N.T.S.



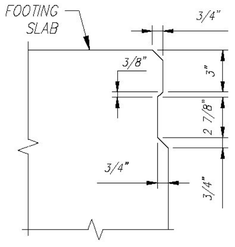
SECTION C-C REINFORCING DETAIL

Scale: N.T.S.



VERTICAL SHEAR KEY

Scale: N.T.S.



JOINT DETAIL

Scale: N.T.S.

Rev.	Date	By
10		
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8		
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2	10JUN2015	RY
1	14MAY2015	RY

DESCRIPTION
REVISIONS

1 14MAY2015 REVISED PER CUSTOMER REVIEW, REVISED FOOTING DUE TO WINGWALL RELOCATION

2 10JUN2015 ADDED 6" TO WIDTH, 11'-2.75 DIM WAS 10'-8.75

Contractor is to verify that all information shown on drawings has been transferred to shop drawings with the contract documents and is adequate to meet the field conditions. Some dimensions and details may differ slightly from contract drawings to accommodate the manufacturing or design process. Approval of this drawing indicates that any deviation from the contract documents has been reviewed and found to be acceptable. Fabrication will not commence until receipt of signed, approved shop drawings.

This drawing is based upon information provided from the following documents and/or sources:

Engineer: STATE OF VT/AOT PROGRAM DEVELOPMENT
Project No: ----
Drawings: STATE OF VT/AOT PROPOSED IMPROVEMENT BRIDGE PROJECT, TOWN OF RICHFORD SHEETS 1,2,4,22,23,24 OF 36
Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011
Other: ----

Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

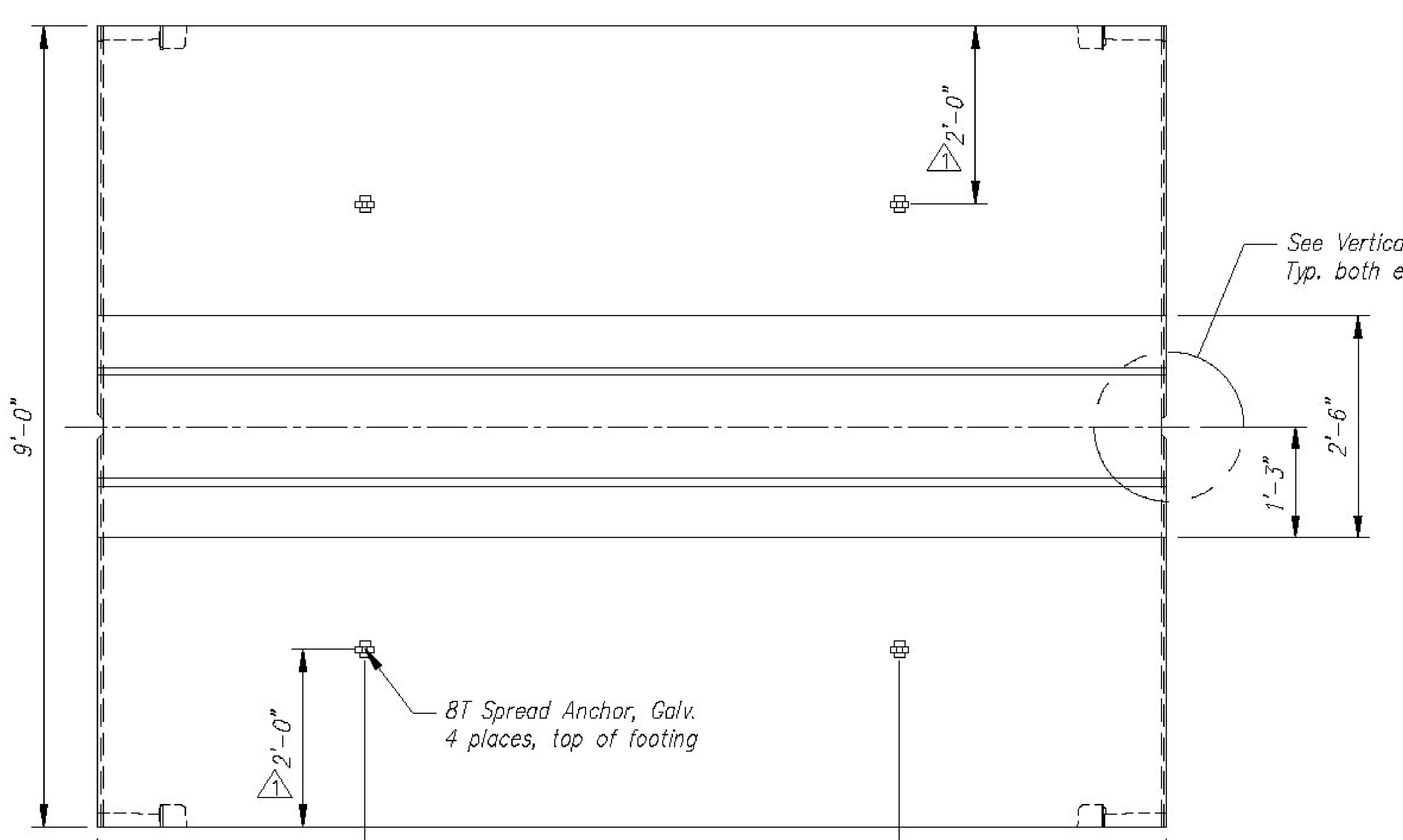
STATE AGENCY
VTrans

Drawn By R. YEAGER	Date 16APR2015	
Reviewed By B. KOLAWOLE	Date	
Approved By C. VICK	Date 17JUN2015	

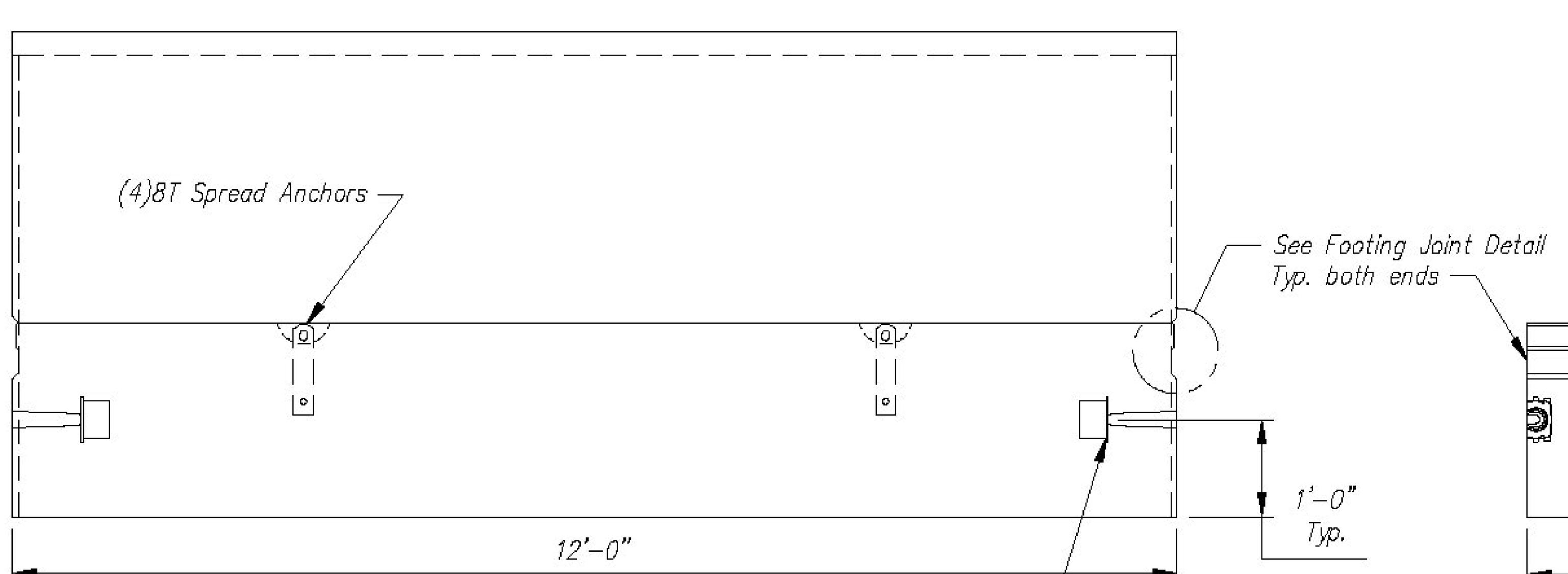
G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

C | SHOP DRAWING F4 | REV 2
Drawing No. C22312-F4

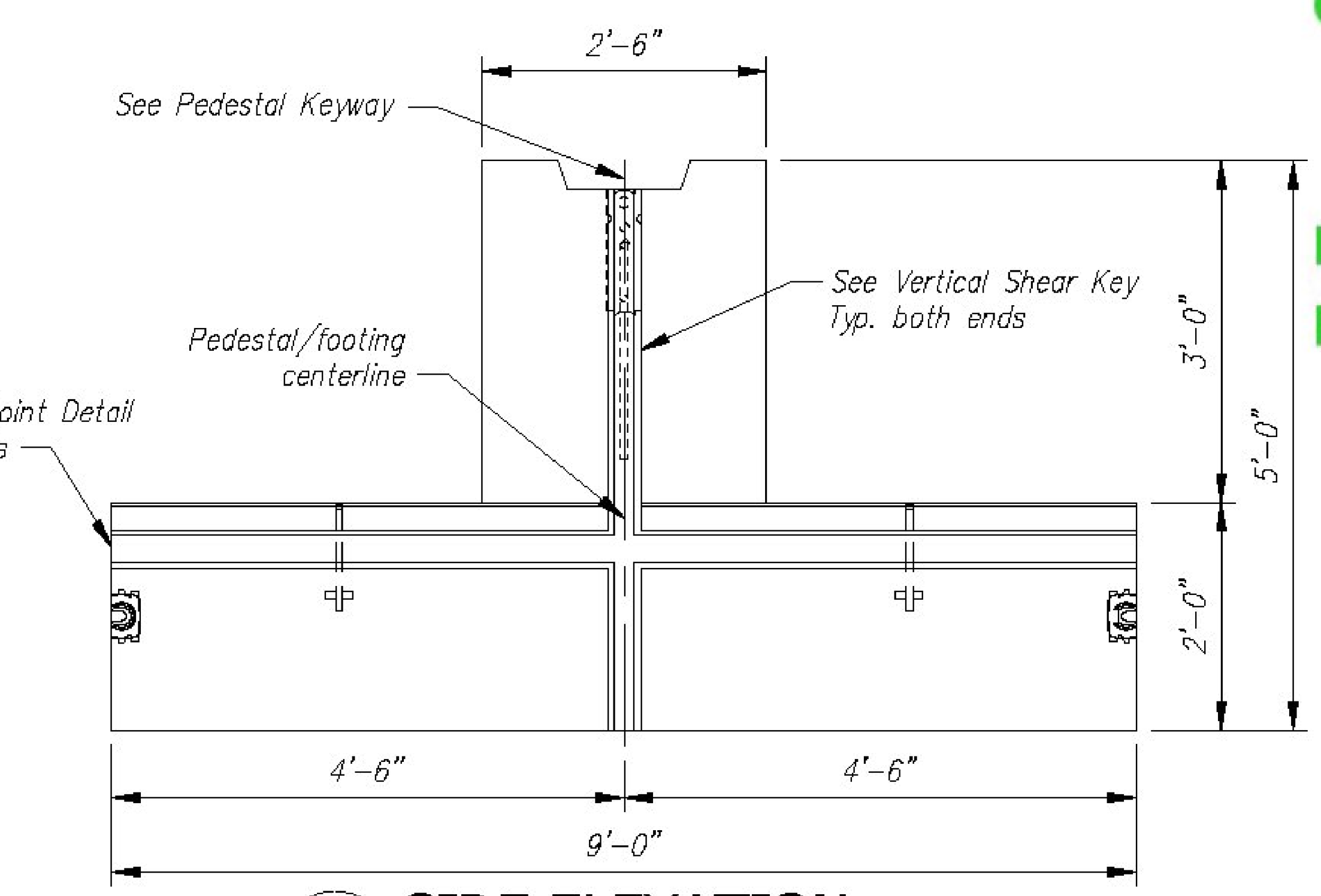
Quantity: 1 | Project No: BRF030229 | SHEET 12 OF 14



PLAN VIEW
Scale: 1/2" = 1'-0"



ELEVATION
Scale: 1/2" = 1'-0"



SIDE ELEVATION
Scale: 1/2" = 1'-0"

QUANTITY = 1
WEIGHT = 22.66 TONS

FOOTING SLAB - F5 - BILL OF MATERIALS / EMBEDS				
CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
EM-00078	8T SPREAD ANCHOR #FL119/P94	4	EA	
EM-00125	BOLT POCKET PLATE (GALVANIZED)	4	EA	
RM-00013	REBAR #4 BLACK- GR 60	445	LB	
RM-00015	REBAR #5 BLACK-GR 60 40'	383	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	7.86	CY	
FOOTING PEDESTAL - F5 - BILL OF MATERIALS / EMBEDS				
RM-00013	REBAR #4 BLACK- GR 60	147	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	3.33	CY	

Ftg. Slab - F5 Rebar Schedule			
MK		QTY	LENGTH
401	#4	30	12 '- 0 "
402	#4	26	11 '- 9 "
501	#5	58	6 '- 4 "

Ftg. Pedestal-F5 Rebar Schedule			
MK		QTY	LENGTH
402	#4	17	11 '- 9 "
403	#4	12	1 '- 8 "

Vermont Agency of Transportation

RECEIVED

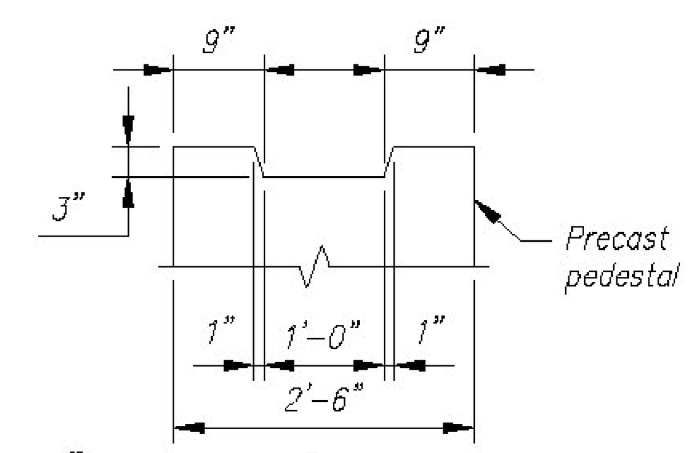
Richford Precast Frame Complete Updated Submittal_Approved 7.23.15.pdf

CK'D BY CLB OK'D BY HIS

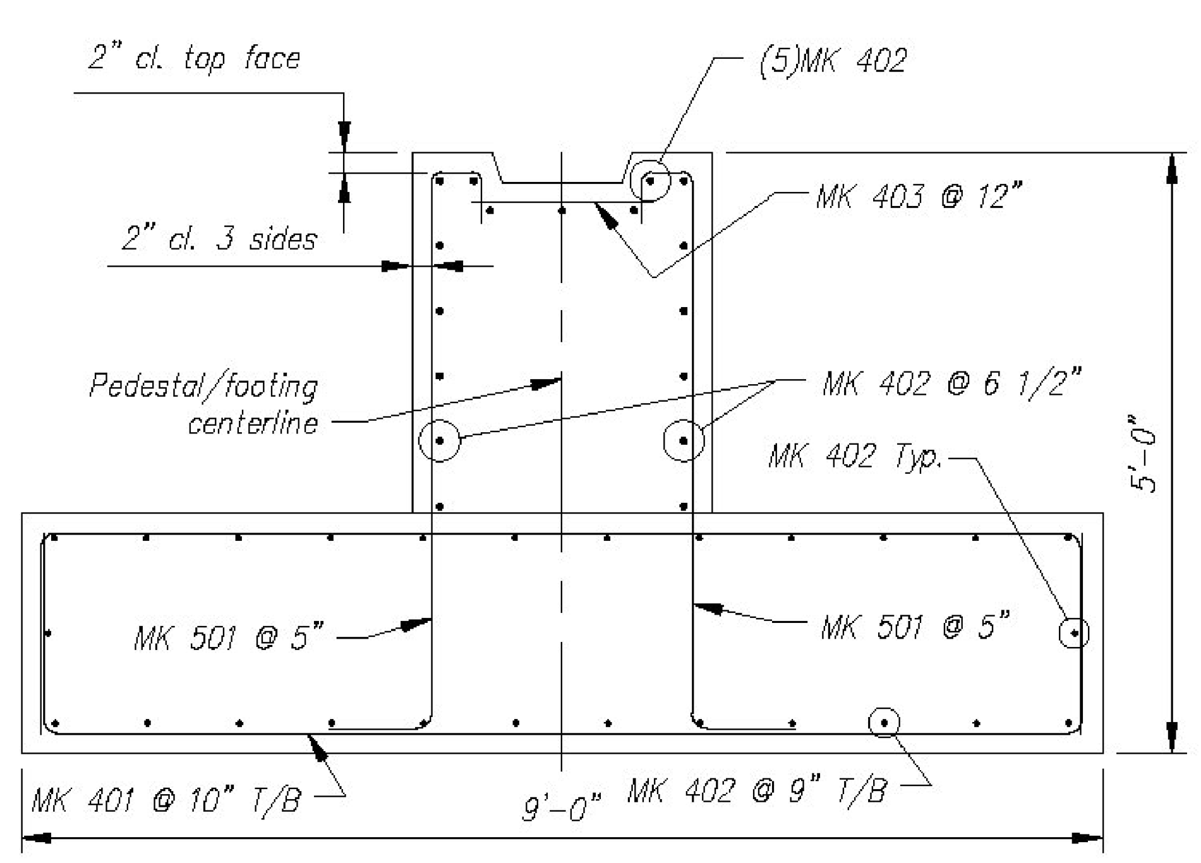
July 22, 2015

RESUBMIT NO Approved

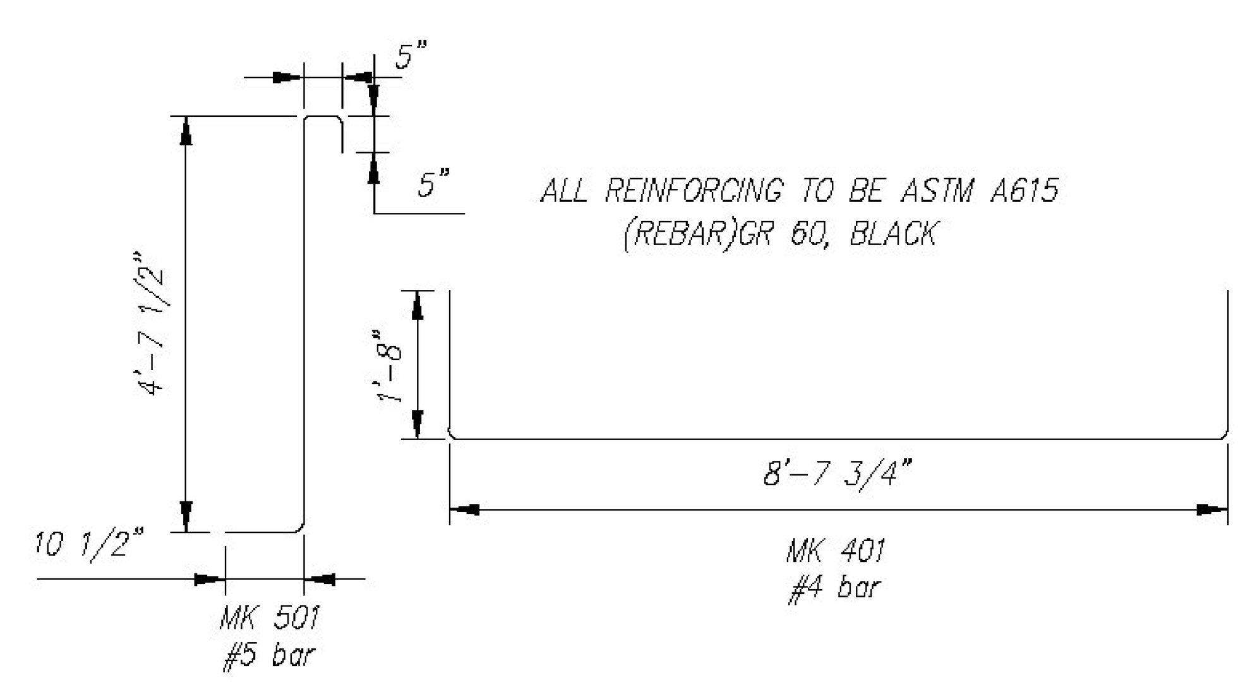
BY C. CARLSON DATE 07/23/15



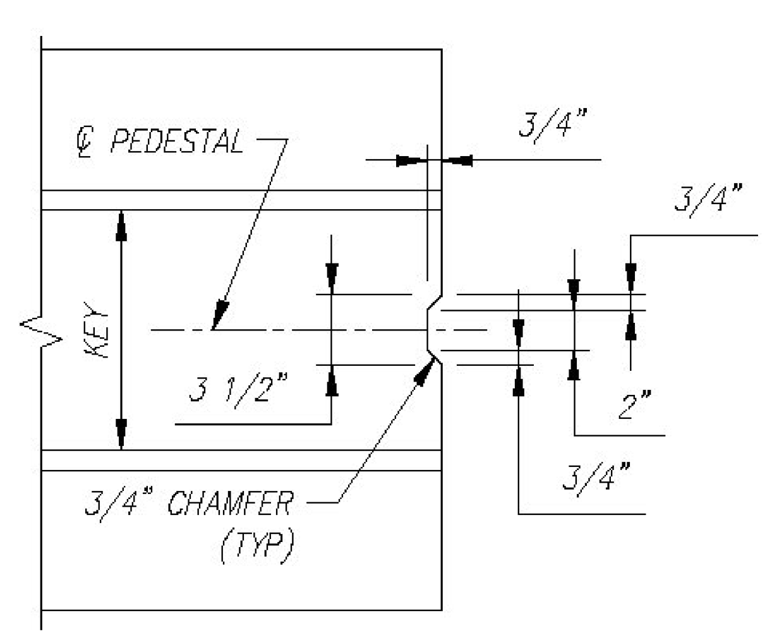
PEDESTAL KEYWAY
Scale: N.T.S.



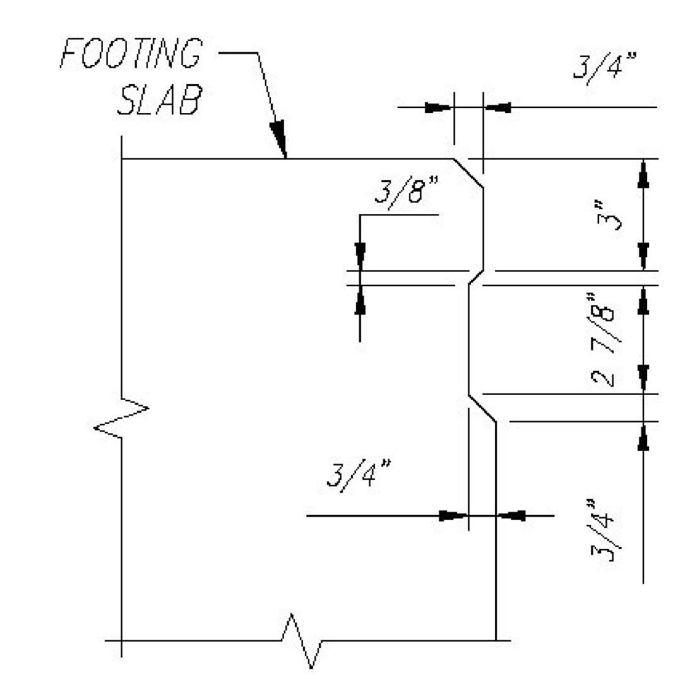
REINFORCING DETAIL
Scale: N.T.S.



BENDING SCHEDULE
Scale: N.T.S.



VERTICAL SHEAR KEY
Scale: N.T.S.



JOINT DETAIL
Scale: N.T.S.

Rev.	Date	DESCRIPTION	By
10			
9			
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1	14MAY2015	REVISED PER CUSTOMER REVIEW, REVISED ANCHOR LOCATIONS	RY

REVISIONS

Contractor is to verify that all information shown on drawings has been thoroughly checked, complies with the contract documents and is adequate to meet the field conditions. Some dimensions and details may differ slightly from contract drawings to accommodate the manufacturing or design process. Approval of this drawing indicates that any deviation from the contract documents has been reviewed and found to be acceptable. Production will not commence until receipt of signed, approved shop drawings.

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Project No: ----
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Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011

Other: ----

CSI
Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

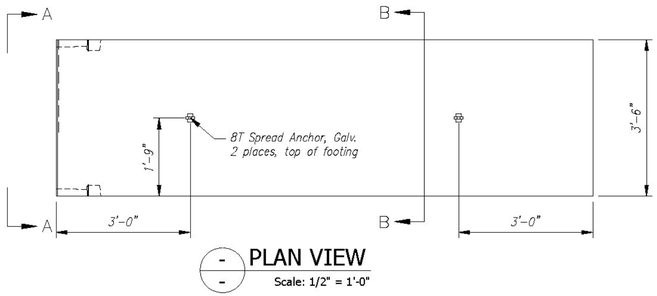
STATE AGENCY
VTrans

Drawn By	Date
R. YEAGER	16APR2015
Reviewed By	Date
B. KOLAWOLE	
Approved By	Date
C. VICK	17JUN2015

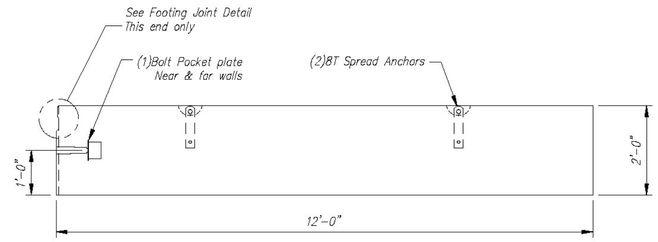
G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT- ROAD IMPROVEMENT
RICHFORD, VT.

C SHOP DRAWING F5 REV 1
Drawing No. C22312-F5

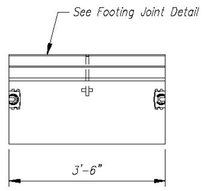
Quantity: 2 Project No: BRF030229 SHEET 13 OF 14



PLAN VIEW
Scale: 1/2" = 1'-0"



ELEVATION
Scale: 1/2" = 1'-0"

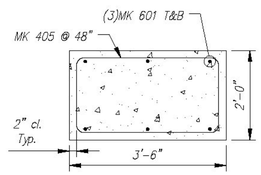


VIEW A-A
Scale: 1/2" = 1'-0"

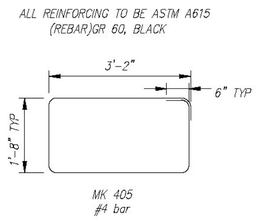
QUANTITY = 1
WEIGHT = 6.30 TONS

FOOTING SLAB - F3B - BILL OF MATERIALS / EMBEDS				
CSI ID#	DESCRIPTION	QTY	UM	COMMENTS
EM-00078	8T SPREAD ANCHOR #FL119/P94	2	EA	
EM-00125	BOLT POCKET PLATE (GALVANIZED)	2	EA	
RM-00013	REBAR #4 BLACK- GR 60	29	LB	
RM-00017	REBAR #6 BLACK-GR 60 40'	105	LB	
MX-FA5000SC30	MIX DESIGN - FLY ASH 5000 SELF CONSOLIDATING	3.11	CY	

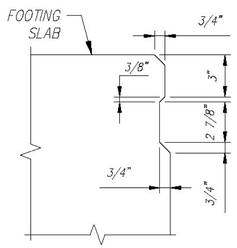
Ftg. Slab - F3B Rebar Schedule			
MK		QTY	LENGTH
405	#4	4	10 ' - 8 "
601	#6	6	11 ' - 8 "



SECTION B-B
REINFORCING DETAIL
Scale: N.T.S.



BENDING SCHEDULE
Scale: N.T.S.



JOINT DETAIL
Scale: N.T.S.

Vermont Agency of Transportation
RECEIVED
Richford Precast Frame Complete Updated Submittal_Approved 7.23.15.pdf

CK'D BY CLB OK'D BY HIS

July 22, 2015

RESUBMIT NO Approved

BY C. CARLSON DATE 07/23/15

RY	By
	REVISED PER CUSTOMER REVIEW, NEW FOOTING SECTION
	DESCRIPTION
	REVISIONS
10	
9	
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2	
1	14MAY2015
Rev.	Date

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Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011
Other: ----

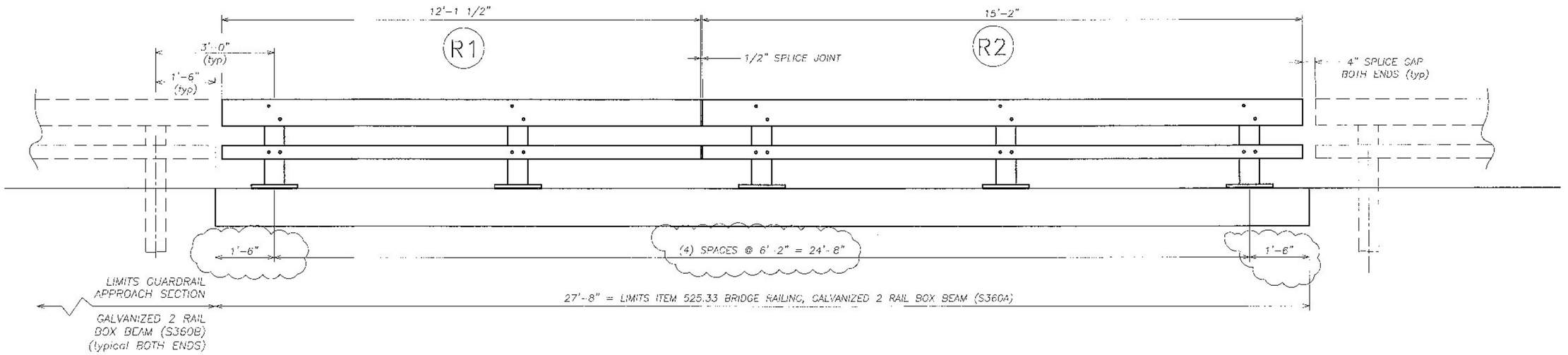
Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

STATE AGENCY
VTrans

Drawn By R. YEAGER	Date 14MAY2015		
Reviewed By	Date		
Approved By C. VICK	Date 17JUN2015		

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

C	SHOP DRAWING F3B	REV 1
	Drawing No. C22312-F3B	
Quantity: 1	Project No: BRF030229	SHEET 14 OF 14



TYPICAL RAILING ELEVATION

LOOKING AT FACE OF RAILING FROM CENTERLINE OF ROAD
BOTH SIDES TYPICAL

BILL OF MATERIAL

ITEM 525.33 BRIDGE RAILING, GALVANIZED 2 RAIL BOX BEAM = 56 LF

Qty	mk	Description	Spec.
10		BRIDGE RAILING POST W6 x 25 x 2'-2.375" OAH WITH 1 x 10 x 14 BASE PLATE (GLV)	A709 gr 50
2		SPLICE TUBE (FOR 8X4 RAIL) HSS 7 x 3 x 3/8 x 1'-8.000" OAL w/ TAPPED HOLES & 2 WELDED NUTS (GLV)	A500 gr B
2		SPLICE TUBE (FOR 4X4 RAIL) HSS 3 x 3 x 5/16 x 1'-8.000" OAL w/ TAPPED HOLES & 2 WELDED NUTS (GLV)	A500 gr B
2	R1	UPPER RAIL TUBE HSS 8 x 4 x 5/16 x 12'-1.500" LG (GLV) one end holes, one end slots	A500 gr B
2	R2	UPPER RAIL TUBE HSS 8 x 4 x 5/16 x 15'-2.000" LG (GLV) one end holes, one end slots	A500 gr B
2	R1	LOWER RAIL TUBE HSS 4 x 4 x 1/4 x 12'-1.500" LG (GLV) one end holes, one end slots	A500 gr B
2	R2	LOWER RAIL TUBE HSS 4 x 4 x 1/4 x 15'-2.000" LG (GLV) one end holes, one end slots	A500 gr B
10		ANCHOR SPACER PLATE PL 0.375 x 13.000 x 9.375	A709 gr 36
40		ANCHOR STUD DBL END PART THREAD - 1" DIA x 12.000 w/ 2.250" THD EACH END (GLV)	A449
80		HEAVY HEX NUT 1" (GLV)	A563 DH
40		ROUND WASHER (SAE) - 1" DIA SMALL (GLV)	F436
40		JAM NUT 1" (GALV)	A563 DH
40		ROUND HEAD POST BOLT slot or wrench head - no shoulder 3/4" DIA x 6" LG. FULL BODY (GLV)	A449 / A325
40		LOCK NUT 3/4" (GLV)	A563 DH
40		ROUND WASHER (SAE) 3/4" (GLV)	F436
16		HEX HEAD BOLT 5/8" DIA x 1.75" LG. (GLV)	A325
16		ROUND WASHER (SAE) 5/8" (GLV)	F436
10		BEARING PAD 0.125" THICK x 10.000 x 14.000 (NEOPRENE 80 duro +/-10)	aashto M251

No.	Remarks	Date
B	changes to match precast drawings	06-19-15
A	changes to match precast drawings	05-14-15
0	initial submittal	04-28-15

REVISIONS

Vermont Agency of Transportation
RECEIVED
CK'D BY FDB OK'D BY HIS
June 23, 2015
RESUBMIT No Approved
BY Carolyn Carlson DATE 06/23/15

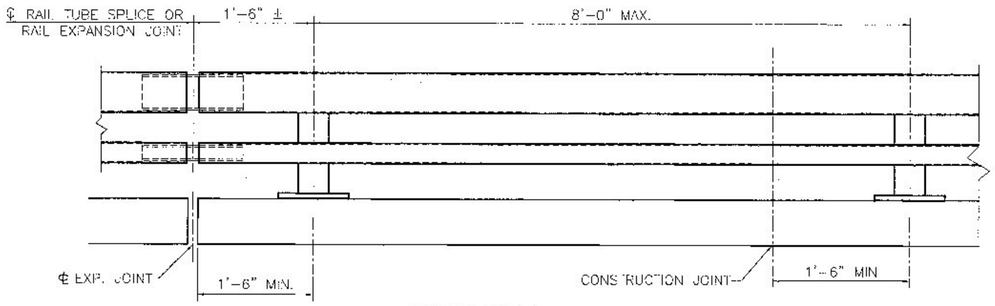
HIGHWAY SAFETY CORP
GLASTONBURY, CT
860-633-9445

ITEM 525.33 BRIDGE RAILING, GALVANIZED 2 RAIL BOX BEAM (S-360A)
BRF 0302 (29)
TH 3 - BRIDGE NO. 6
TOWN OF RICHFORD, FRANKLIN COUNTY VT
GENERAL CONTRACTOR
SUB CONTRACTOR LAFAYETTE

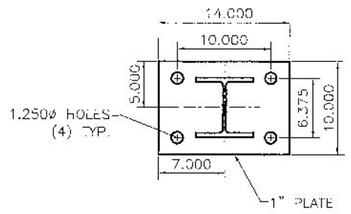
CERTIFIED FABRICATOR

HSC JOB NO. 2039
SHEET NO. 1 of 3

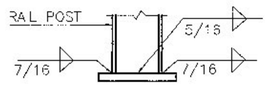
DRAWN PAR CHECKED DATE 04-27-15 SCALE NONE SIZE D



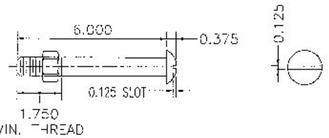
BRIDGE RAILING ELEVATION



POST AND BASE PLATE

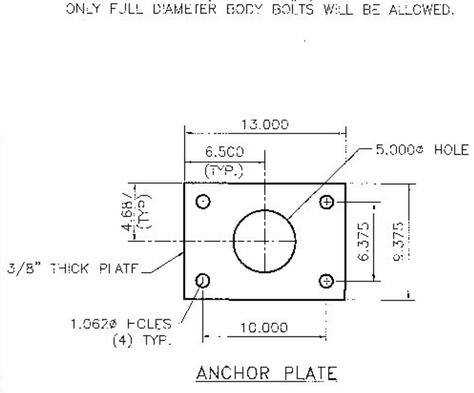


BASE WELD DETAIL

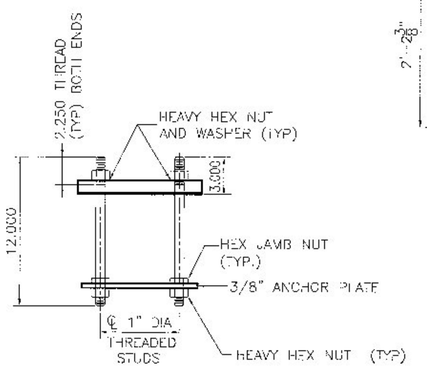


3/4" DIA. A449
ROUND HEAD BOLT

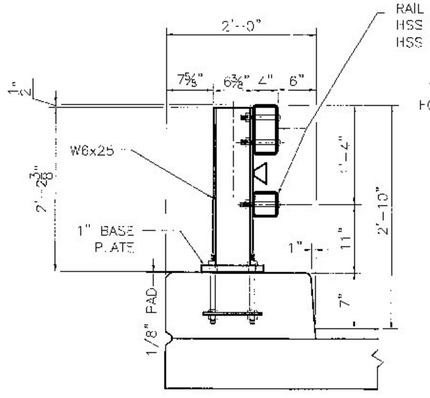
(WITH WASHER AND PREVAILING TORQUE TYPE LOCK NUT)
(SEE NOTE #8)
ONLY FULL DIAMETER BODY BOLTS WILL BE ALLOWED.



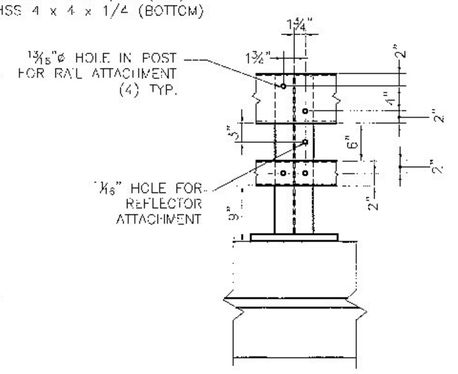
ANCHOR PLATE



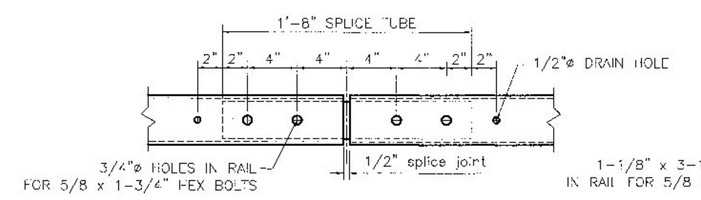
RAIL POST ANCHORAGE



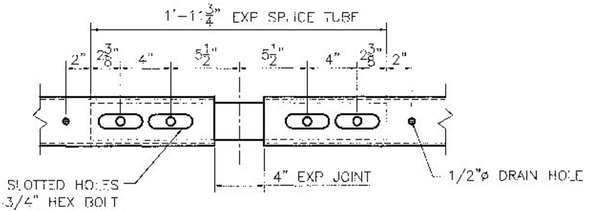
TYPICAL SECTION



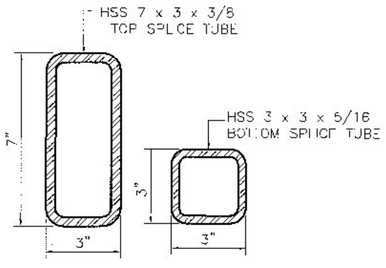
ELEVATION



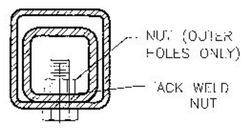
FIXED SPLICE JOINT DETAIL
BOTTOM VIEW



EXPANSION SPLICE DETAIL
BOTTOM VIEW

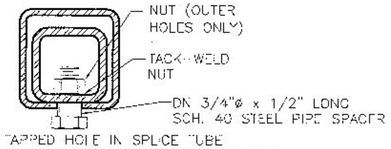


RAIL TUBE SPLICE SECTION



TAPPED HOLE IN SPLICE TUBE &
3/4"ø HOLE IN RAIL TUBE FOR 5/8ø BOLT
& PLAIN HARDENED WASHER

FIXED SPLICE JOINT SECTION



TAPPED HOLE IN SPLICE TUBE
AND 1.125 x 3.500 SLOT IN RAIL TUBE FOR
5/8ø BOLT AND PLAIN HARDENED WASHER

EXPANSION JOINT SECTION

NOTES:

1. ALL WORK AND MATERIALS SHALL CONFORM TO SECTION 525.

2. PRIOR TO GALVANIZING, ALL EXPOSED CUT OR SHEARED EDGES SHALL BE ROUNDED TO A 1/16" RADIUS AND BE FREE OF BURRS.

3. ALL POSTS SHALL BE SET NORMAL TO GRADE.

4. SECTIONS OF RAIL TUBE SHALL BE ATTACHED TO A MINIMUM OF TWO (2) RAIL POSTS AND PREFERABLY TO AT LEAST FOUR (4) POSTS.

5. RAIL TUBE EXPANSION JOINT SHALL BE PROVIDED IN ANY RAIL BAY SPANNING THE END OF AN INTEGRAL ABUTMENT BRIDGE AND AT ALL SUPERSTRUCTURE EXPANSION JOINTS. EXPANSION JOINT WIDTH SHALL BE 4" AT 45°F AND WILL BE ADJUSTED IN THE FIELD BY THE ENGINEER FOR OTHER TEMPERATURES.

6. HOLES IN RAILS FOR RAIL TUBE ATTACHMENT SHALL BE FIELD-DRILLED. HOLES SHALL BE COATED WITH AN APPROVED ZINC-RICH PAINT PRIOR TO INSTALLATION.

7. RAIL POST ANCHORING NUTS SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AN ADDITIONAL ONE-EIGHTH TURN.

8. RAIL TUBES SHALL BE ATTACHED USING 3/4" FULL DIAMETER BODY ASTM A449 ROUND HEAD BOLTS INSERTED THROUGH THE FACE OF THE TUBE. HOLES IN POSTS SHALL BE 1/16" LARGER THAN THE BOLT SIZE.

9. ANY BENDING OR CURVING OF RAIL SHALL BE DONE IN A FABRICATION PLANT IN ACCORDANCE WITH SUBMITTED PROCEDURES.

10. THE MINIMUM DISTANCE FROM A POST TO AN EXPANSION JOINT SHALL BE SUCH TO MAINTAIN MINIMUM EDGE DISTANCE OF 5" FROM ANY ANCHOR STUD TO THE END OF THE SLAB, OR TO THE EXPANSION JOINT RECESS POUR, IF ONE IS USED.

11. A DELINEATOR (SEE VAOT STANDARD DRAWING C-1 FOR DETAILS) SHALL BE INSTALLED AT NEAREST POST TO 30 FT SPACING. WHITE IS TO BE INSTALLED ON THE DRIVER'S RIGHT. FOR ONE WAY BRIDGES, YELLOW IS TO BE INSTALLED ON THE DRIVER'S LEFT. PAYMENT SHALL BE INCIDENTAL TO OTHER ITEMS.

12. THIS RAILING MEETS THE REQUIREMENTS FOR A TL-4 SERVICE LEVEL.

MATERIALS
RAIL TUBES.....ASTM A500 GRADE B OR ASTM A501
RAIL POSTS AND BASE PLATES.....ASTM A709/A709M, GRADE 50
ALL OTHER SHAPES AND PLATES.....ASTM A709/A709M, GRADE 36
ANCHOR STUDS.....ASTM A449
ALL OTHER BOLTS (UNLESS NOTED).....AASHTO M164, TYPE 1

NUTS FOR AASHTO M164 BOLTS AND FOR ANCHOR STUDS SHALL COMPLY WITH AASHTO M291 (ASTM A563).

WASHERS SHALL COMPLY WITH AASHTO M293 (ASTM F436) SPECIFICATIONS.

1/8" PAD SHALL COMPLY WITH STANDARD SPECIFICATION SUBSECTION 731.01 OR 731.02.

RAIL POSTS AND BASE PLATES SHALL BE TESTED FOR IMPACT PROPERTIES IN ACCORDANCE WITH ASTM A370 CHARPY IMPACT TESTING USING TYPE A SPECIMEN.

Vermont Agency of Transportation
RECEIVED
CK'D BY FDB OK'D BY HIS
June 23, 2015
RESUBMIT No Approved
BY Carolyn Carlson DATE 06/23/15

HIGHWAY SAFETY CORP
GLASTONBURY, CT
860-633-9445

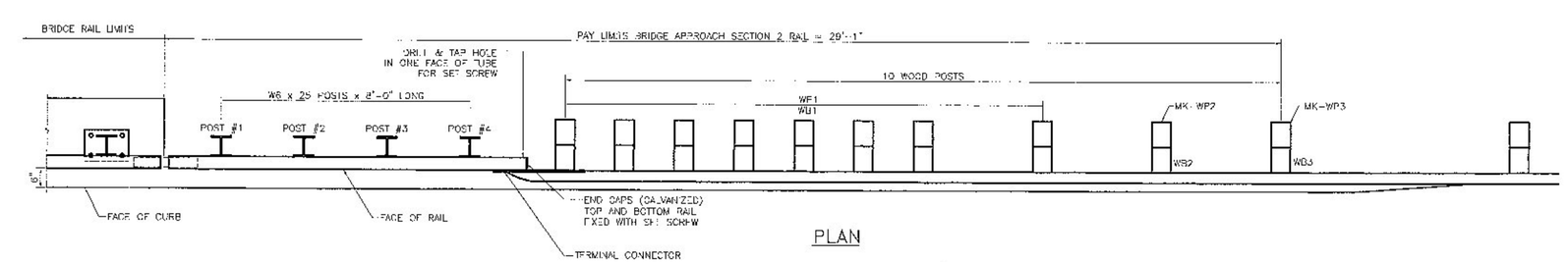
ITEM 525.33 BRIDGE RAILING, GALVANIZED 2 RAIL BOX BEAM (S-3004)

BRF 0302 (29)
TH 3 - BRIDGE NO. 6
TOWN OF RICHFORD, FRANKLIN COUNTY VT

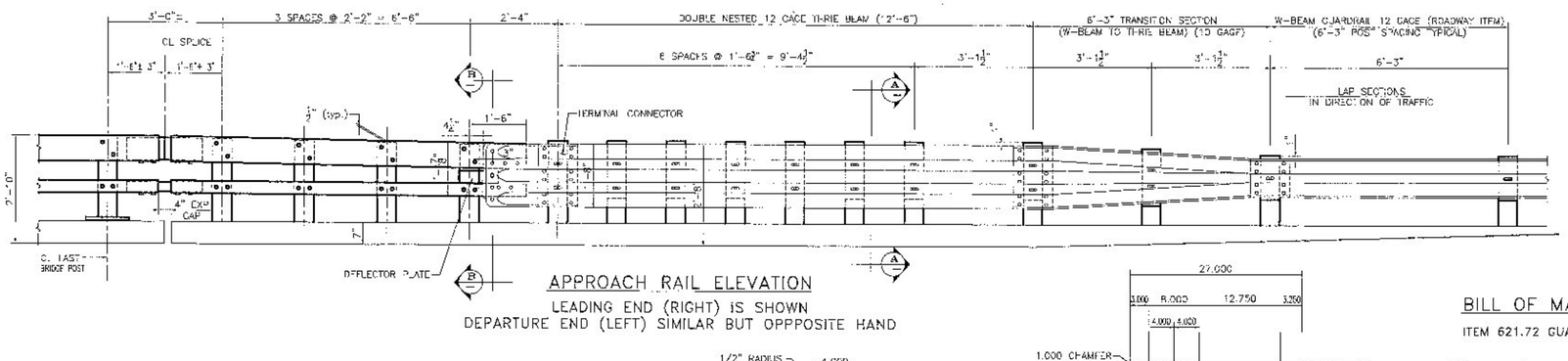
GENERAL CONTRACTOR
SUB CONTRACTOR LAFAYETTE

NSC CERTIFIED FABRICATOR
NSC JOB NO. 2039
SHEET NO. 2 of 3

DRAWN PAR | CHECKED | DATE 04-27-15 | SCALE NONE | SIZE D

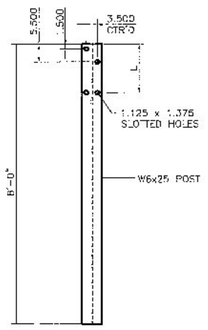


PLAN



APPROACH RAIL ELEVATION

LEADING END (RIGHT) IS SHOWN
DEPARTURE END (LEFT) SIMILAR BUT OPPPOSITE HAND



STEEL POST

STEEL POST CHART

No.	L
#1	1'-3.250"
#2	1'-3.000"
#3	1'-2.667"
#4	1'-2.375"

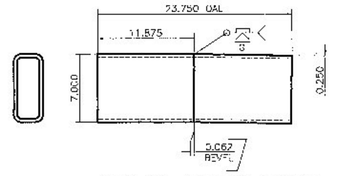
NOTES:
1. PAYMENT FOR GUARDRAIL APPROACH SECTION – GALVANIZED 2 RAIL, SHALL INCLUDE ALL TERMINAL CONNECTOR, THE CONNECTION PLATE, THE DEFLECTOR PLATE, RAIL, POSTS, BLOCKS AND ATTACHMENT HARDWARE.

2. ALL APPROACH RAIL SPLICES SHALL BE LAPPED IN THE DIRECTION OF TRAFFIC FLOW.

3. TUBE AND STEEL POST MATERIALS, DIMENSION SIZES AND NOTES SHALL BE THE SAME AS THOSE OF THE BRIDGE RAIL UNLESS OTHERWISE NOTED.

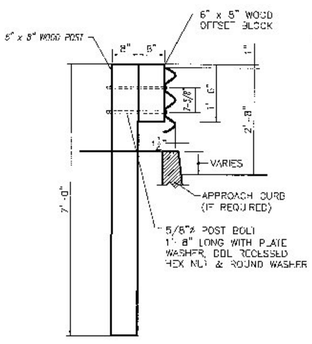
4. APPROACH RAIL BOLTS SHALL BE ASTM A307 GRADE A AND NUTS SHALL BE AASHTO M291 (ASTM 563 GRADE A OR BETTER (GALVANIZED), WASHERS SHALL BE ASTM F844.

5. WELD TOP SPLICE BAR TO FIT BEND. USE COMPLETE PENETRATION WELD (SEE 2).

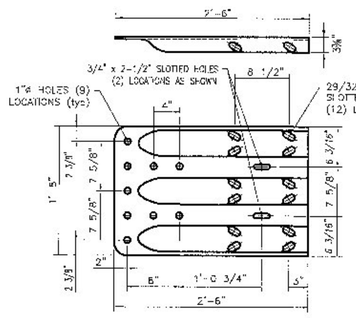


ANGLED SPLICE DETAIL

HSS 7 x 3 x 3/8 – FOR UPPER RAIL SPLICE
SEE BRIDGE RAIL SHEET FOR DETAIL ON LOWER RAIL SPLICE TUBE

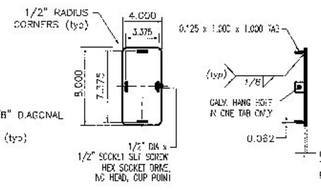


SECTION A–A



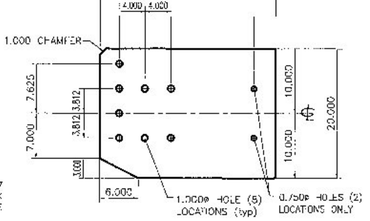
TERMINAL CONNECTOR

10 GAUGE (AASHTO M180 B2)



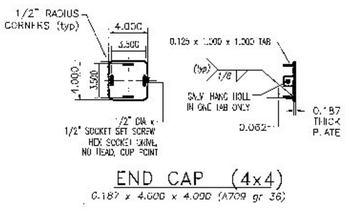
END CAP (8x4)

0.187 x 4.000 x 8.000 (A709 gr 36)



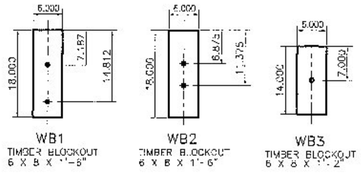
CONNECTION PLATE

0.375 x 20.000 x 27.000 (A709 gr 36)

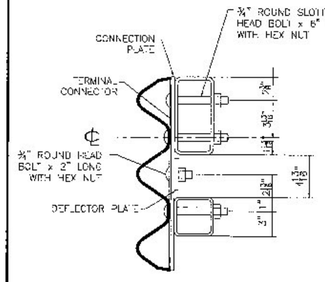


END CAP (4x4)

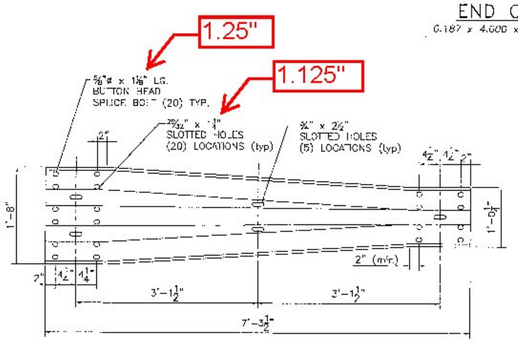
0.187 x 4.000 x 4.000 (A709 gr 36)



WOOD BLOCK DETAILS

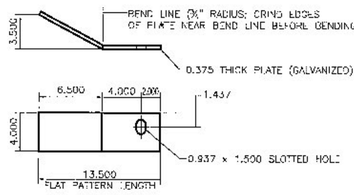


SECTION B–B



THRIE TRANSITION PANEL

10 GAUGE (AASHTO M180 B2)



DEFLECTOR PLATE

0.375 x 4.000 x 13.500 (A709 gr 36)
RIGHT HAND APPROACH SHOWN – LEFT HAND BENT OPPOSITE

BILL OF MATERIAL

ITEM 621.72 GUARDRAIL APPROACH SECTION, GALVANIZED 2 RAIL BOX BEAM = 4 UNITS

Qty	mk	Description	Spec.
4	01	W6x25 APPROACH POST - #1 x 8'-0" OAL (GALV)	A709 gr 50
4	02	W6x25 APPROACH POST - #2 x 8'-0" OAL (GALV)	A709 gr 50
4	03	W6x25 APPROACH POST - #3 x 8'-0" OAL (GALV)	A709 gr 50
4	04	W6x25 APPROACH POST - #4 x 8'-0" OAL (GALV)	A709 gr 50
4		UPPER RAIL APPROACH TUBE HSS 8 x 4 x 5/16 x 9'-4.000" w/ 3.500 SLOTS FOR 4" EXP GAP (GALV)	A500 gr B
4		LOWER RAIL APPROACH TUBE HSS 4 x 4 x 5/16 x 9'-4.000" w/ 3.500 SLOTS FOR 4" EXP GAP (GALV)	A500 gr B
4		CONNECTION PLATE PL 0.375" x 20.000" x 27.000" (GALV)	A709 gr 36
2		DEFLECTOR PLATE (RIGHT) PL 0.375 x 4.000 x 13.375 (GALV)	A709 gr 36
2		DEFLECTOR PLATE (LEFT) PL 0.375 x 4.000 x 13.375 (GALV)	A709 gr 36
4		END CAP FOR 8x4 TUBE 0.187 THICK PLATE 8.000 x 4.000 w/ WELDED TABS (GALV)	A709 gr 36
4		END CAP FOR 4x4 TUBE 0.187 THICK PLATE 4.000 x 4.000 w/ WELDED TABS (GALV)	A709 gr 36
4		(ANGLED) SPLICE TUBE (EXPANSION) FOR 8x4 UPPER RAIL HSS 7 x 3 x 3/8 x 1'-11.750" OAL (GALV)	A500 gr B
4		SPLICE TUBE (EXPANSION) FOR 4x4 LOWER RAIL HSS 3 x 3 x 5/16 x 1'-11.750" OAL (GALV)	A500 gr B
32		WOOD POST (WP1) 6 x 8 x 7'-0"	TIMBER
32		WOOD BLOCKOUT (WB1) 6 x 8 x 1'-6"	TIMBER
4		WOOD POST (WP2) 6 x 8 x 7'-0"	TIMBER
4		WOOD BLOCKOUT (WB2) 6 x 8 x 1'-6"	TIMBER
4		WOOD POST(WP3) 6 x 8 x 7'-0"	TIMBER
4		WOOD BLOCKOUT (WB3) 6 x 8 x 1'-2"	TIMBER
4		THRIE FLAT LIP BRIDGE SHOE (MODIFIED) 10 GA. GALV	aashto M180 B2
4		THRIE TRANSITION PANEL 6'-3" / 3'-1 1/2" 10 GA. GALV.	aashto M180 B2
8		THRIE PANEL 12'-6" / 1'-6 3/4" 12 GA. GALV.	aashto M180 A2
92		ROUND HEAD POST BOLT slot or wrench head - no shoulder 3/4" DIA x 6" LG. (GLV) w/ LOCK NUT & FLAT WASHER	A449
4		ROUND HEAD POST BOLT slot or wrench head - no shoulder 3/4" DIA x 2" LG. (GLV) w/ HEX NUT	A449
8		ROUND HEAD POST BOLT - oval shoulder 5/8" DIA x 1'-8" LG. (GALV) w/ DBL RECESS NUT, FLAT WASHER	A307
68		ROUND HEAD POST BOLT - oval shoulder 5/8" DIA x 1'-6" LG. (GALV) w/ DBL RECESS NUT, FLAT WASHER	A307
32		HEX HEAD BOLT 5/8 x 1-3/4" (GALV) w/ FLAT WASHER	A325
128		PANEL SPLICE BOLT 5/8 x 1-1/4" (GALV) w/ DOUBLE RECESSED NUT	A307
76		RECTANGULAR PLATE WASHER 0.187 x 1.750 x 3.000 (GALV)	A709 gr 36
32		SPACER PIPE - GALVANIZED 3/4" SCH. 40 x 1/2" LONG (GLV)	A53 gr B

Vermont Agency of Transportation

RECEIVED

CK'D BY FDB OK'D BY HIS

June 23, 2015

RESUBMIT No Approved AsNoted

BY Carolyn Carlson DATE 06/23/15

HIGHWAY SAFETY CORP
GLASTONBURY, CT
860-633-9445

ITEM 621.72 GUARDRAIL APPROACH, GALVANIZED 2 RAIL BOX BEAM (S-3608)

BRF 0302 (29)
TH 3 – BRIDGE NO. 6
TOWN OF RICHFORD, FRANKLIN COUNTY VT

GENERAL CONTRACTOR

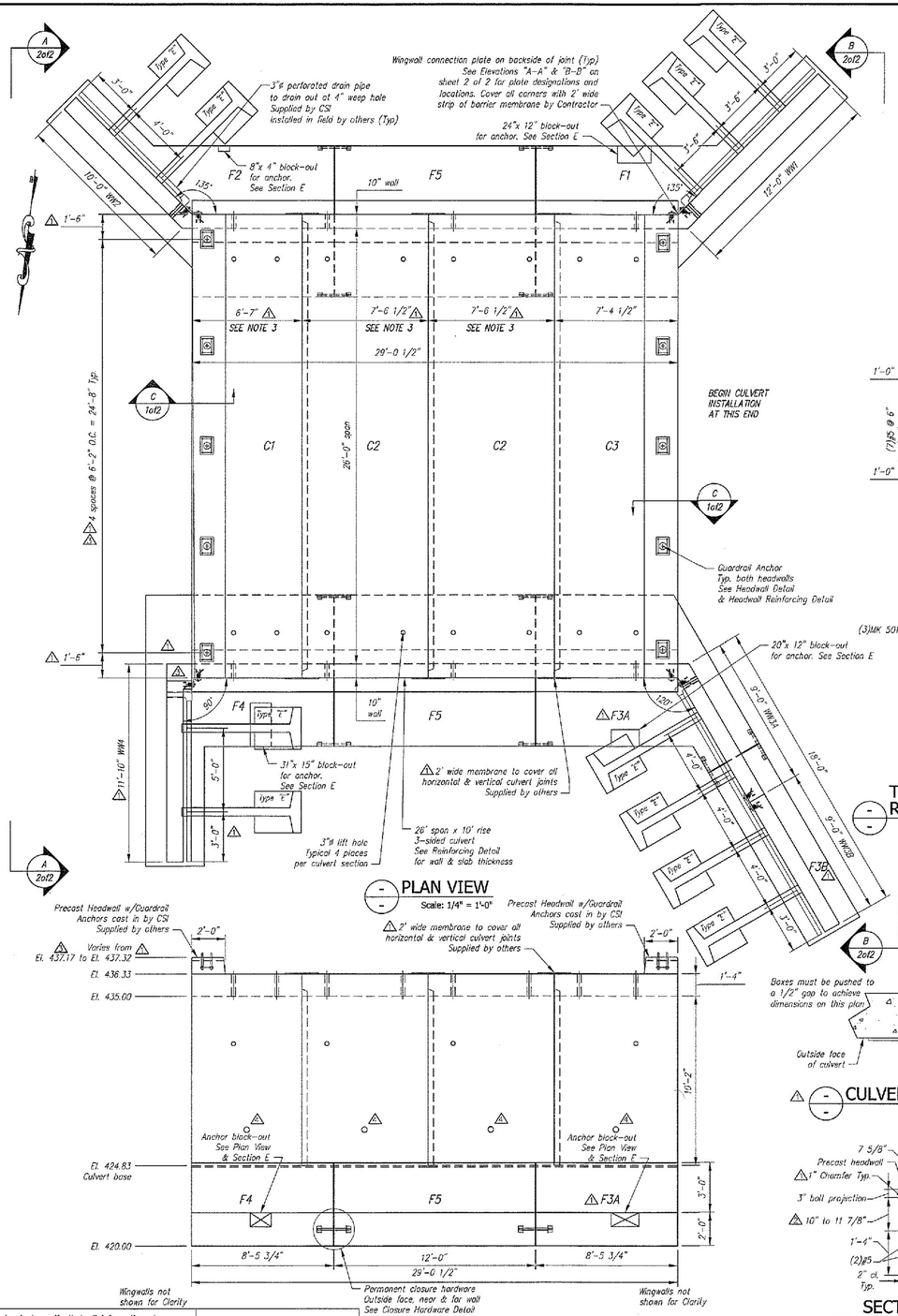
SUB CONTRACTOR LAFAYETTE

HSC JOB NO. 2039

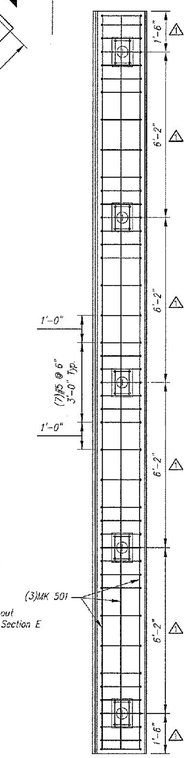
SHEET NO. 3 of 3

DRAWN PAR | CHECKED | DATE 04-27-15 | SCALE NONE | SIZE D

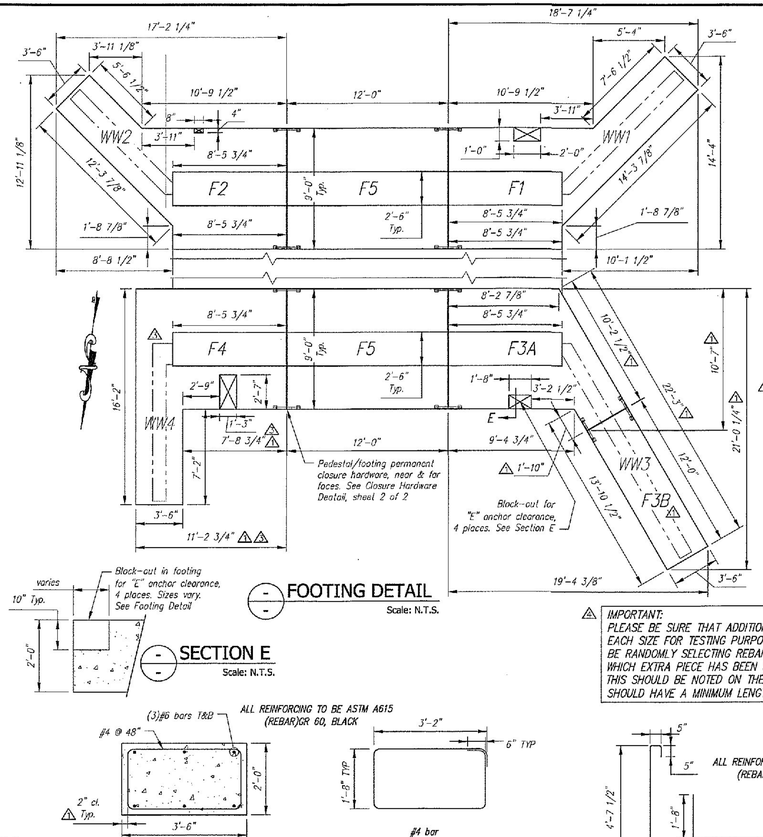
CERTIFIED FABRICATOR



PLAN VIEW
Scale: 1/4" = 1'-0"



TYPICAL HEADWALL REINFORCING DETAIL
Scale: N.T.S.

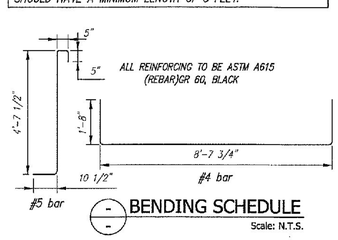


FOOTING DETAIL
Scale: N.T.S.

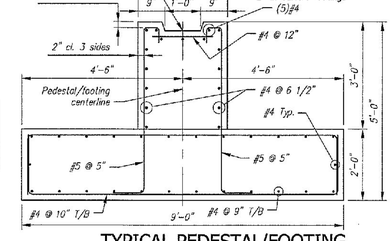
SECTION E
Scale: N.T.S.

WINGWALL FOOTING REINFORCING DETAIL
Scale: N.T.S.

BENDING SCHEDULE
Scale: N.T.S.

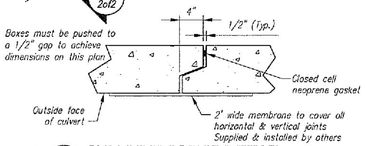


BENDING SCHEDULE
Scale: N.T.S.

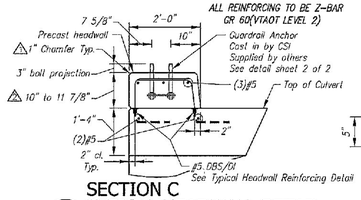


TYPICAL PEDESTAL/FOOTING REINFORCING DETAIL
Scale: N.T.S.

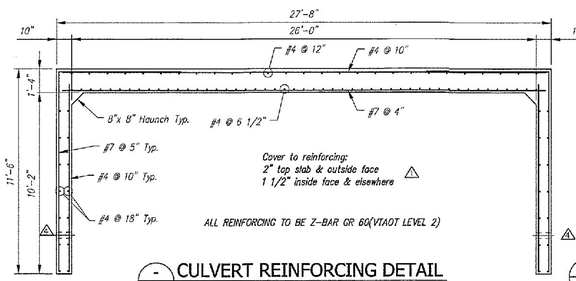
ELEVATION
Scale: 1/4" = 1'-0"



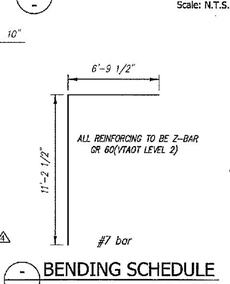
CULVERT JOINT DETAIL
Scale: N.T.S.



SECTION C
TYPICAL HEADWALL REINFORCING DETAIL
Scale: N.T.S.



CULVERT REINFORCING DETAIL
Scale: 3/8" = 1'-0"



BENDING SCHEDULE
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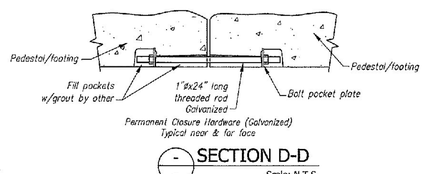
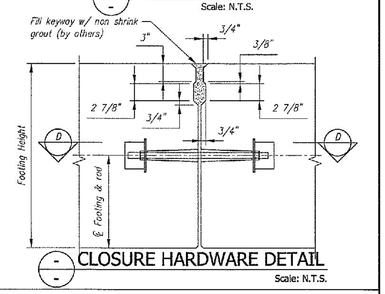
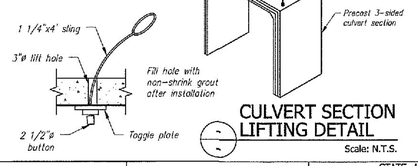


SECTION D-D
Scale: N.T.S.



CLOSURE HARDWARE DETAIL
Scale: N.T.S.



CULVERT SECTION LIFTING DETAIL
Scale: N.T.S.

GENERAL NOTES:
1. Reference Standards:
   AASHTO "LRFD Bridge Design Specifications"
   ASTM C1577
2. Design Parameters:
   Live load: HL-93
   Earth Cover: 0.5' to 1.0'
   Concrete: Design strength f'c = 5000 psi
   Unit weight = 150 pcf
   Reinforcing: Pedestal/Footing – ASTM A615 (rebar) GR 60, plain(VTAOT Level I)△
   Culvert/Headwall/Wingwall – Z-Bar(rebar), GR 60(VTAOT Level II)
   Soil: Unit weight = 140 pcf
   Minimum lateral pressure coefficient .25
   Maximum lateral pressure coefficient .50
   Cover to reinforcing: 2" Top of top slab & outside faces of walls
   1 1/2" elsewhere u.n.o.
3. Dimensions include a joint gap. Actual culvert piece length is ½" shorter (i.e. C2 = 7'-6").
4. DBS are Dowel Bar Splicers and DI are Dowel Ins. Both are supplied by CSI. DI's are to be installed and cut/bent in the field by others as required.
5. Headwall design taken from contract drawing S-360A.
6. Water repellant by CSI on all exposed faces of culvert to 1' in, headwalls and △△ wingwalls. Water repellant to be Certi-Vex Penseal 244-40% (Silane-Siloxane in △ accordance with Vtrans 540.04).
7. Provide engineer a minimum fourteen (14) days notice prior to the start of fabrication and a detailed casting schedule.

△ CULVERT PIECE SCHEDULE (MX-FA5000SC30)

MARK	QTY	LENGTH	YDS	WEIGHT	
C1	1	6.54 '	15.40	31.19	TONS
C2	2	7.50 '	15.20	30.78	TONS
C3	1	7.38 '	16.50	33.41	TONS
WW1	1	12.00 '	7.77	15.73	TONS
WW2	1	10.00 '	6.35	12.86	TONS
WW3A	1	9.00 '	6.03	12.21	TONS
WW3B	1	9.00 '	5.31	10.75	TONS
WW4	1	11.83 '	8.13	16.46	TONS
F1	1	18.58 '	11.37	23.02	TONS
F2	1	17.17 '	10.85	21.97	TONS
F3A	1	13.33 '	9.80	19.85	TONS
F3B	1	12.00 '	3.11	6.30	TONS
F4	1	16.17 '	11.70	23.69	TONS
F5	2	12.00 '	11.19	22.66	TONS

△ IMPORTANT:
PLEASE BE SURE THAT ADDITIONAL REBAR IS PROVIDED FOR EACH SIZE FOR TESTING PURPOSES. VAOT INSPECTORS WILL BE RANDOMLY SELECTING REBAR FOR TESTS. DESIGNATE WHICH EXTRA PIECE HAS BEEN SELECTED FOR EACH SIZE AND THIS SHOULD BE NOTED ON THE PLANS. THE BARS SELECTED SHOULD HAVE A MINIMUM LENGTH OF 5 FEET.

STATE OF VERMONT CHRISTOPHER M. WORK NO. 77023 Structural LICENSED PROFESSIONAL ENGINEER 6/24/15
Stamp for structural design only

Rev.	Date	DESCRIPTION	By
7			
6			
5			
4	17JUN2015	REVISED PER CUSTOMER REVIEW	BSS
3	04JUN2015	REVISED PER CUSTOMER REVIEW	RY
2	28MAY2015	REVISED PER CUSTOMER REVIEW, SECTION C-10" DIM WAS 9 1/2", EXTENDED WINGWALLS EVEN WITH HDWALL	RY
1	14MAY2015	REVISED PER CUSTOMER REVIEW, MOVED WW4, ADDED F3A & F3B, REVISED GUARDRAIL ANCHORS	RY

REVISIONS

This drawing is based on information provided from the following documents and/or sources:
Engineer: ——
Project Drawing: TITLE OF VT/AOT PROJECT IMPROVEMENT BRIDGE PROJECT, TOWN OF RICHFORD
SHEETS 1 AND 2 OF 2
Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011
Other Sources: ——

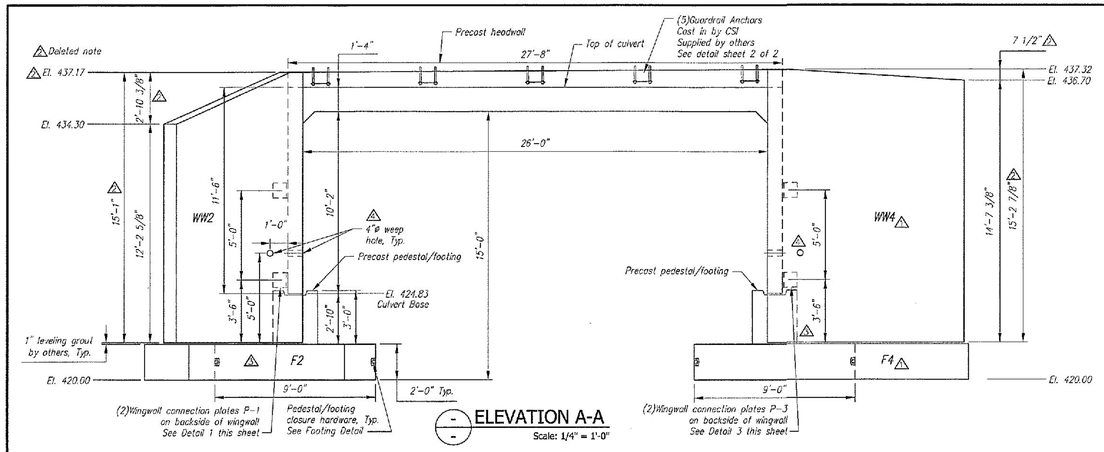
CK'D BY FDB OK'D BY HIS
RESUBMIT No Approved
BY Carolyn Carlson DATE 06/29/15

Concrete Systems Inc.
9 Commercial St., Hudson, NH, 03051
Phone 603-889-4163
Fax 603-889-2417

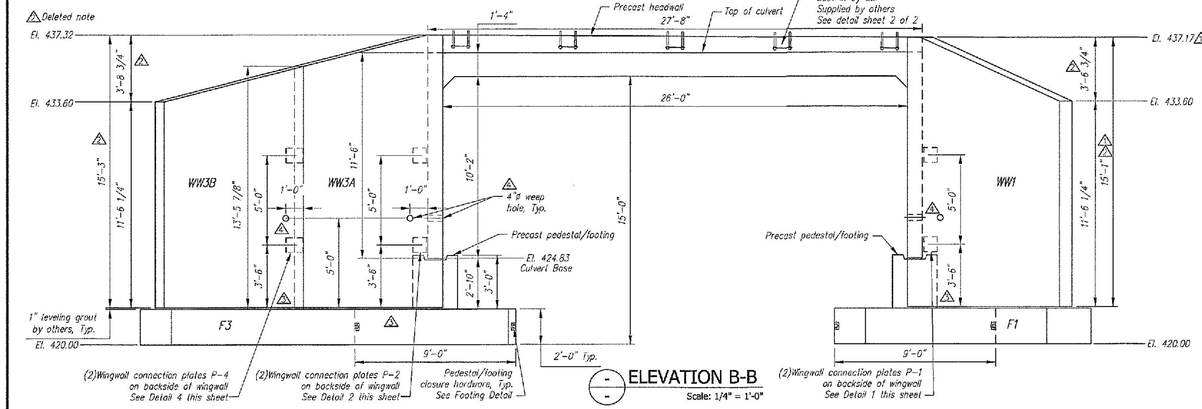
STATE AGENCY
VTrans
Drawn By: R. YEAGER Date: 31MAR2015
Reviewed By: B. KOLAWOLE Date:
Approved By: C. VICK Date: 17JUN2015

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

D | 26' SPAN X 10' RISE 3-SIDED CULVERT | REV 4
Drawing No. C22312-L01A
Quantity: 1 | Project No: BRF030229 | SHEET 1 OF 2



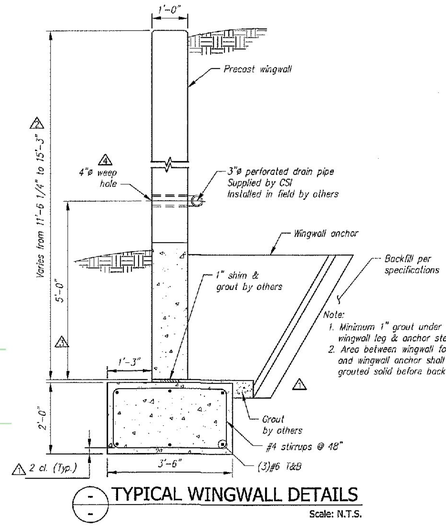
ELEVATION A-A
Scale: 1/4" = 1'-0"



ELEVATION B-B
Scale: 1/4" = 1'-0"

WINGWALL GENERAL NOTES:
1. Reference standard:
   AASHTO LRFD Specifications
2. Design Parameters:
   Nominal Bearing Resistance: 10 ksf (Footing width > 6ft.)
   Earth Cover: 1.0'±
   Concrete: Design strength f'c = 5000 psi
   Unit weight = 150 pcf
   Reinforcing: Z-BAR(rebar), GR. 60(VTAOT Level II)
   Soil: Unit weight = 125 pcf
   Minimum lateral pressure coefficient .25
   Maximum lateral pressure coefficient .50
   Cover to reinforcing: 2" u.n.o.
3. The wingwalls have been designed for general site conditions. The project engineer shall be responsible for the structure's suitability to the existing site conditions and for the hydraulic evaluation, including scour and confirmation of soil conditions.
4. Prior to construction, contractor must verify all elevations shown through the engineer.

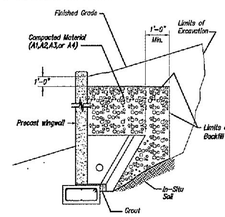
Vermont Agency of Transportation
RECEIVED
C0106-26-2015 Submittal.pdf
CK'D BY FDB OK'D BY HIS
June 29, 2015
RESUBMIT No Approved
BY Carolyn Carlson DATE 06/29/15



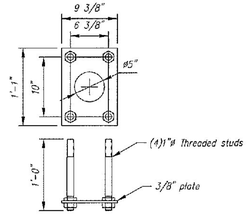
TYPICAL WINGWALL DETAILS
Scale: N.T.S.

BACKFILL DESCRIPTION						
Group Classification	A-1		A-3	A-2		
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7
Sieve Analysis, Percent Passing						
No. 10	50 max.					
No. 40	30 max.	50 max.	51 min.			
No. 200	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.
Characteristics of Fraction Passing No. 40						
Liquid Limit				40 max.	41 min.	40 max.	41 min.
Plasticity Index	6 max.		N.P.	10 max.	10 max.	11 min.	11 min.
Usual Types of Significant Constituent Materials	Stone Fragments, Gravel & Sand		Fine Sand	Silty or Clayey Gravel and Sand			
General Rating as Subgrade	Excellent to Good						

NOTES
1. BACKFILLING OPERATIONS WITHIN THE C.B.Z. SHALL BE PERFORMED IN LIFTS OF 8" OR LESS (LOOSE DEPTH).
2. MAXIMUM DRY DENSITY SHALL BE DETERMINED BY AASHTO T-99 OR OTHER APPROVED METHODS.
3. BACKFILL SHALL BE COMPACTED IN LAYERS UNTIL THE DENSITY IS NOT LESS THAN 95% OF THE MAXIMUM DRY DENSITY.



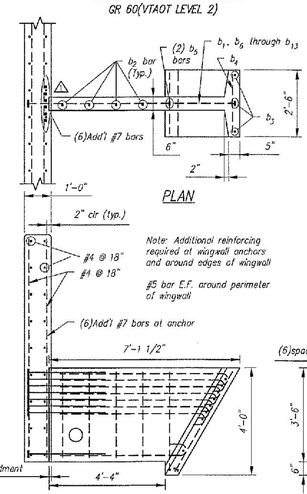
WINGWALL BACKFILL REQUIREMENTS



Reference VT/AOT drawing Standard S-360A

GUARDRAIL ANCHOR DETAIL
Scale: N.T.S.

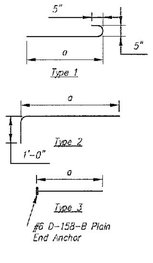
ALL REINFORCING TO BE Z-BAR GR. 60(VTAOT LEVEL 2)

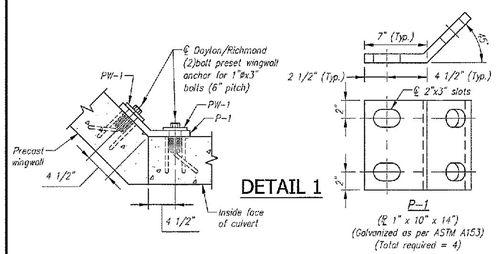


Note: Additional reinforcing required at wingwall anchors and around edges of wingwall

BAR LIST					
MARK	QTY.	SIZE	a	TYPE	LENGTH
b_1	8	#6	3'-0"	3	——
b_2	4	#5	——	Str.	3'-2"
b_3	4	#5	——	Str.	4'-3"
b_4	11	#5	——	Str.	2'-2"
b_5	2	#5	3"-8"	2	——
b_6	1	#5	4'-9"	1	——
b_7	1	#5	5'-4"	1	——
b_8	1	#5	5'-6"	1	——
b_9	1	#5	5'-8"	1	——
b_{10}	1	#5	5'-10"	1	——
b_{11}	1	#5	6'-0"	1	——
b_{12}	1	#5	6'-1"	1	——
b_{13}	1	#5	6'-3"	1	——

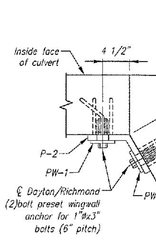
Note: "Str." denotes straight bar. Standard clearance = 2"



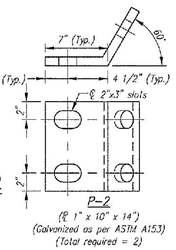


DETAIL 1

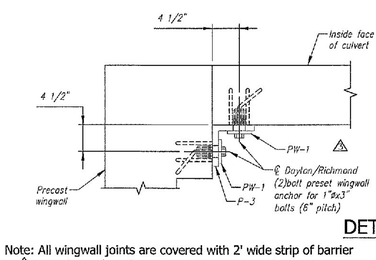
P-1
(℄ 1" x 10" x 14")
(Galvanized as per ASTM A153)
(Total required = 4)



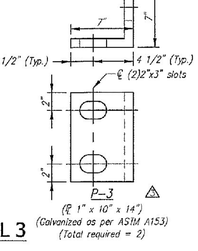
DETAIL 2



P-2
(℄ 1" x 10" x 14")
(Galvanized as per ASTM A153)
(Total required = 2)



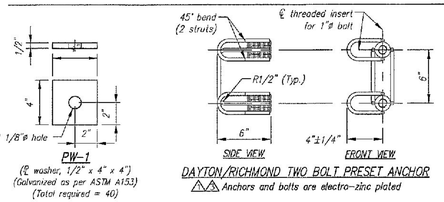
DETAIL 3

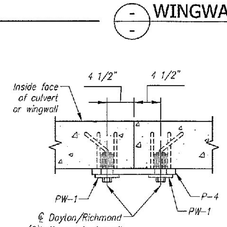


P-3
(℄ 1" x 10" x 14")
(Galvanized as per ASTM A153)
(Total required = 2)

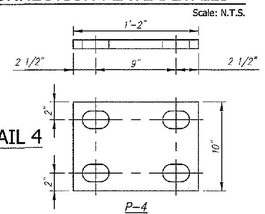
WINGWALL CONNECTION PLATE DETAILS
Scale: N.T.S.

Note: All wingwall joints are covered with 2' wide strip of barrier membrane by others. See note, Sheet 1, Plan View.

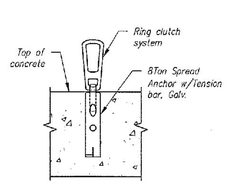




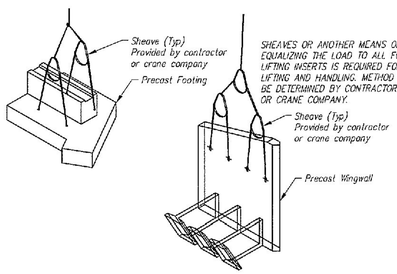
DETAIL 4

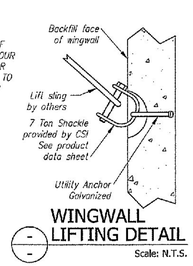


P-4
(℄ 1" x 10" x 14")
(Galvanized as per ASTM A153)
(Total required = 2)

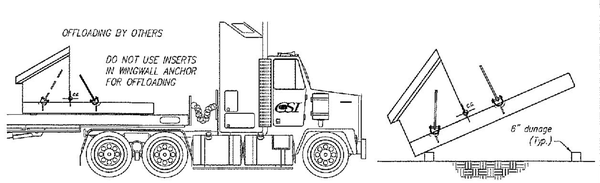


FOOTING LIFTING HARDWARE DETAIL
Scale: N.T.S.





WINGWALL LIFTING DETAIL
Scale: N.T.S.



WINGWALL OFFLOADING & TRIPPING DETAIL
Scale: N.T.S.

Contractor is to verify that all information shown on drawings has been thoroughly checked, complies with the contract documents and is adequate to meet the field conditions. Some dimensions and details may differ slightly from contract drawings to accommodate the manufacturing or design process. Approval of this drawing indicates that any deviation from the contract documents has been reviewed and found to be acceptable. Production will not commence until receipt of signed, approved shop drawings.

STATE OF VERMONT CHRISTOPHER M. WISE NO. 77628 Structural LICENSED PROFESSIONAL ENGINEER
6/24/15
Stamp for structural design only

Rev.	Date	REVISIONS	By
7			
6			
5			
4	17JUN2015	REVISED PER CUSTOMER REVIEW	BSS
3	04JUN2015	REVISED PER CUSTOMER REVIEW	RY
2	28MAY2015	EL A-A & B-B: 437.17 WAS 437.13, EXTENDED WINGWALLS EVEN WITH HEADWALL	RY
1	14MAY2015	REVISED PER CUSTOMER REVIEW, SEE SHEET 1	RY

This drawing is based upon information provided from the following documents and/or sources:
Engineer: STATE OF VT/AOT PROGRAM DEVELOPMENT
Project No: ----
Drawings: STATE OF VT/AOT PROPOSED IMPROVEMENT BRIDGE PROJECT, TOWN OF RICHFORD SHEETS 1,2,4,22,23,24 OF 36
Specifications: STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011

Other Sources: ----

Concrete Systems Inc.
9 Commercial St., Hudson, NH,03051
Phone 603-889-4163
Fax 603-889-2417

STATE AGENCY
VTrans Working to Get You There!

G.W. TATRO CONSTRUCTION, INC.
VT/AOT BRIDGE REPLACEMENT– ROAD IMPROVEMENT
RICHFORD, VT.

Drawn By	Date
R. YEAGER	31MAR2015
Reviewed By	Date
B. KOLAWOLE	
Approved By	Date
C. VICK	17JUN2015

D
26' SPAN X 10' RISE 3-SIDED CULVERT
Drawing No. C22312-L01B
REV 4
Quantity: 1
Project No: BRF030229
SHEET 2 OF 2