



**REVIEW NOTES**  
**BRATTLEBORO BRO 1442(35) – BRIDGE NO. 7**  
**TEMPORARY BRIDGE DRAWINGS**  
**April 30, 2014**

**RE:** Temporary Bridge Drawings received from Renaud Bros. Inc on 4/15/2014.

**VHB Project No.:** 57428.00

*These notes accompany the review of the Temporary Bridge Drawings reviewed by VHB on 4/30/2014.*

General Notes:

1. Contractor is to provide erection or installation information with working drawings in accordance with Section 528 of the 2011 VTrans Standard Specifications for Construction.
2. Contractor is to provide drainage and/or cross slope information for temporary bridge.
3. Contractor is to provide temporary bridge rail-to-rail width of 20’-0” per Contract Plans
4. Contractor is to provide widths of detour pavement per Contract Plans
5. See the following sheets for additional comments.

**SUBMITTAL REVIEW**

Reviewed and approved but only for conformance to the Construction Contract Documents.

**Revise and Resubmit**

Corrections or comments made during this review do not relieve the Contractor or his Designer from compliance with professional requirements or for responsibility for the adequacy of the submittal information. This check is only for review of general conformance with industry standards and general compliance with the information given in the Contract Documents. VHB has not conducted a detailed review of the submittal and has not performed calculations or assessed the adequacy of loads, design criteria, quantities, dimensions, etc. Approval of the submittal does not constitute VHB's approval of any construction means, methods or techniques. These remain the responsibility of the Contractor.

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**Vanasse Hangen Brustlin, Inc.**  
7056 US Route 7 • Post Office Box 120  
North Ferrisburgh, VT 05473  
802.425.7788

Job Number: 57428.00 \_\_\_\_\_  
Reviewed By: E.A. Fiala  
Date: April 30, 2014

This submittal review is for sheets 1-15, inclusive, of the  
“Brattleboro(35)-TemporaryBypass1\_review” submittal received on 4/15/2014.

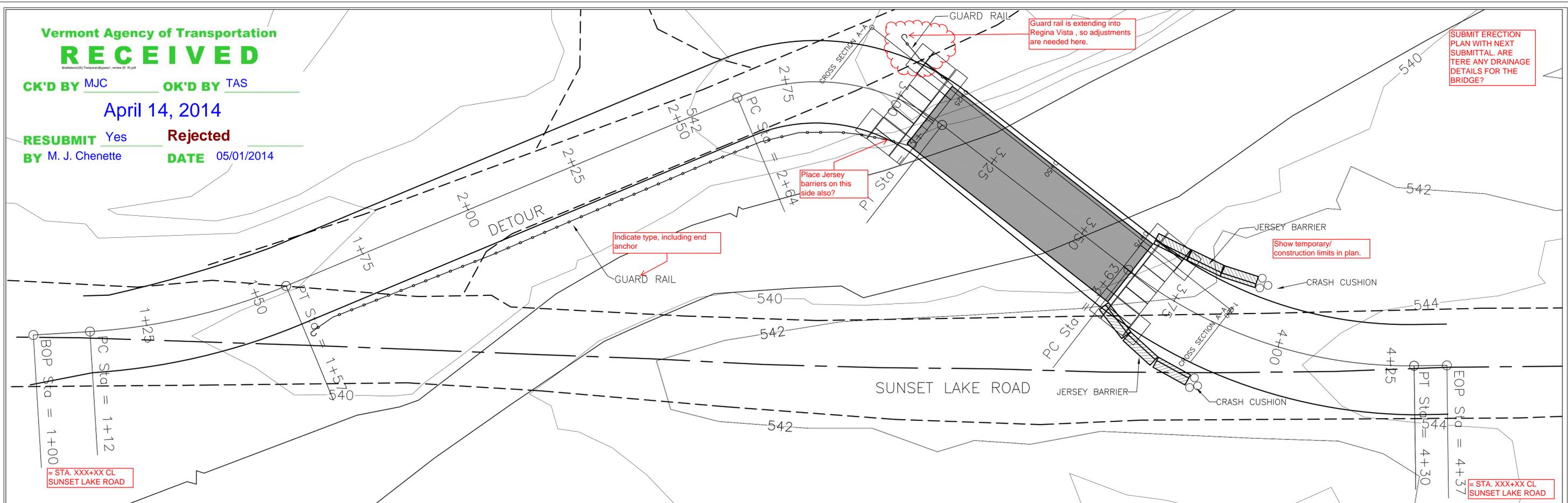
Vermont Agency of Transportation  
**RECEIVED**

CK'D BY MJC OK'D BY TAS

April 14, 2014

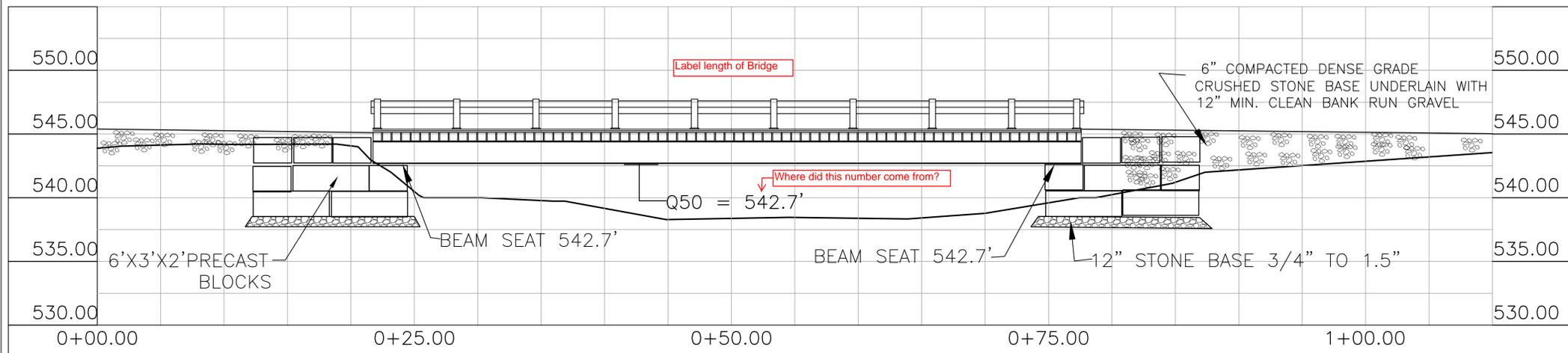
RESUBMIT Yes Rejected

BY M. J. Chenette DATE 05/01/2014

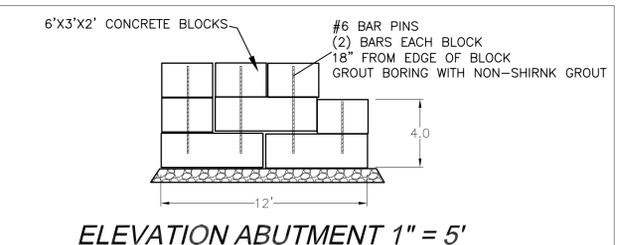


PLAN OF TEMPORARY BRIDGE 1" = 10'

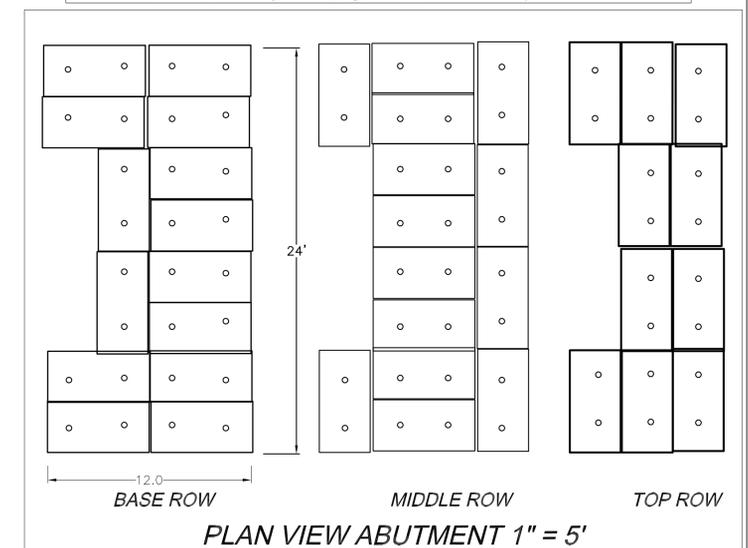
- Show bridge clear span dimension
- Show waterway area provided normal to the stream
- Show temporary roadway typical



PROFILE OF TEMPORARY BRIDGE 1" = 5'  
SECTION A-A



ELEVATION ABUTMENT 1" = 5'



PLAN VIEW ABUTMENT 1" = 5'



PLAN AND PROFILE OF TEMPORARY BRIDGE,  
ABUTMENTS & BYPASS ROAD

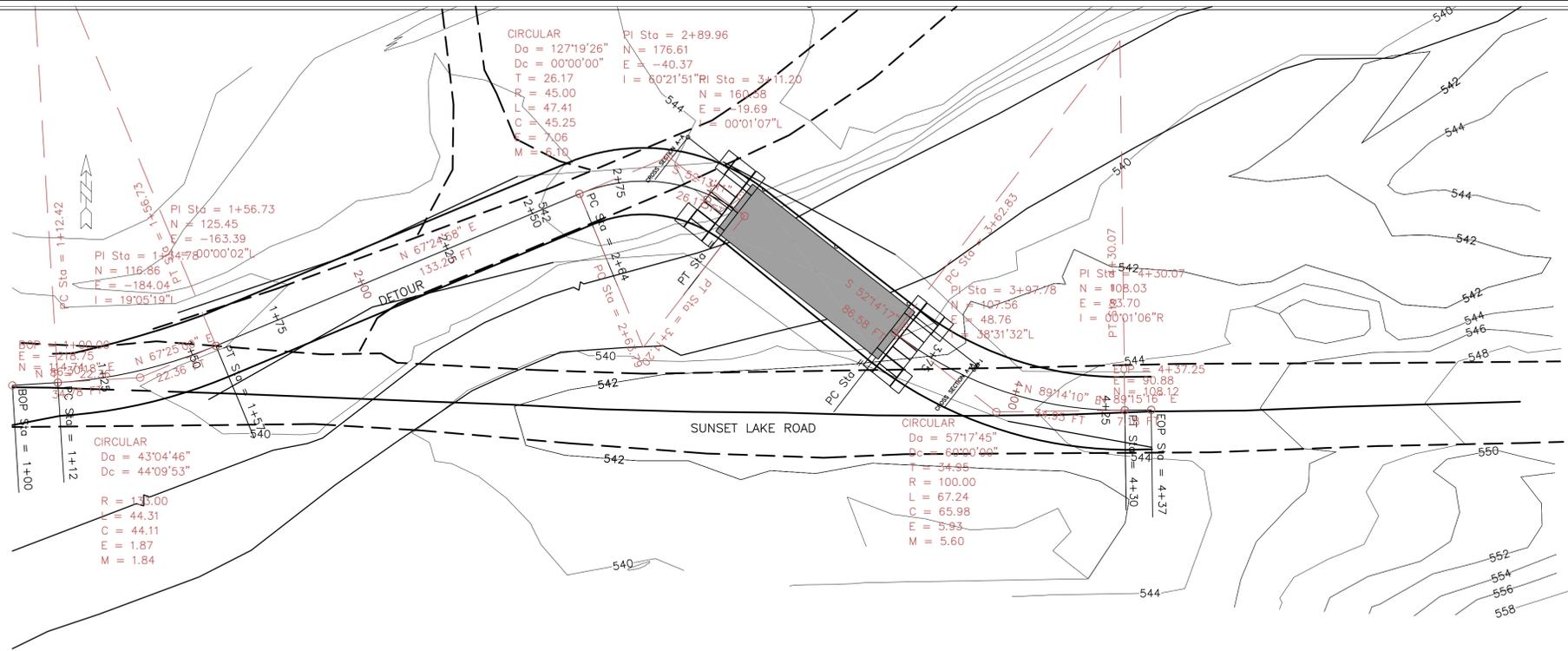
RENAUD BROS. INC.  
BR0 1444 (35)  
SUNSET LAKE ROAD  
BRATTLEBORO, VT

DATE: 3-2-2014	



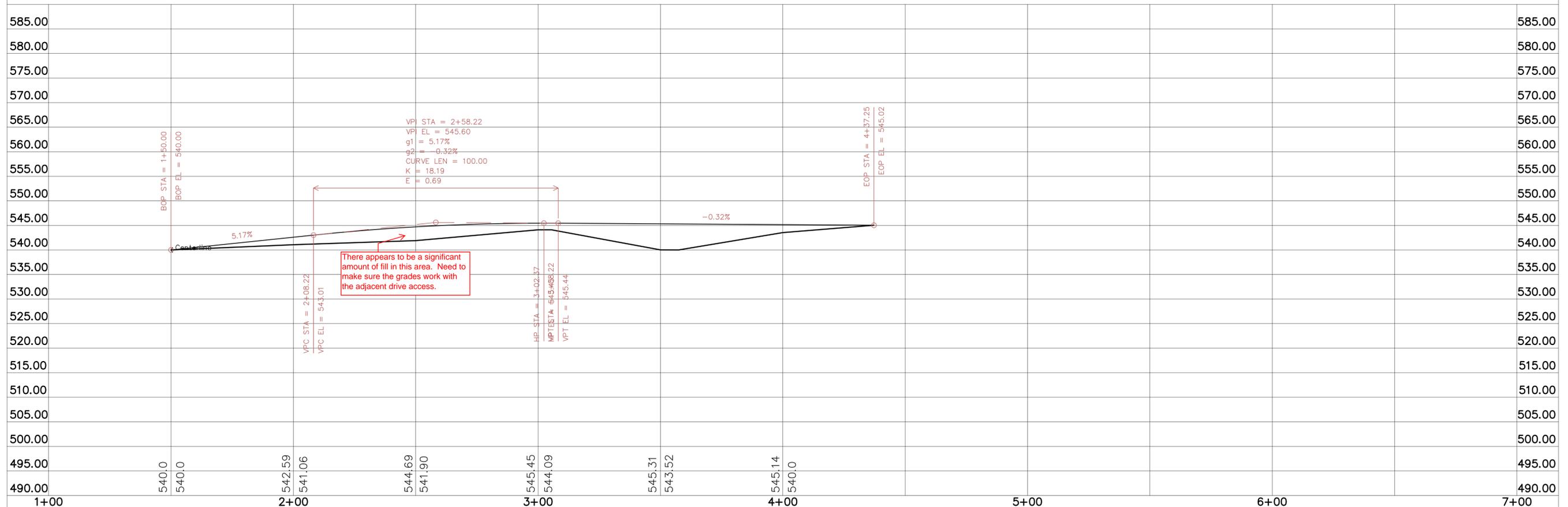
SHEET

1



SCALES:  
 1" = 20' HOR  
 1" = 10' VER

Vermont Agency of Transportation  
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 April 14, 2014  
 RESUBMIT Yes Rejected  
 BY M. J. Chenette DATE 05/01/2014

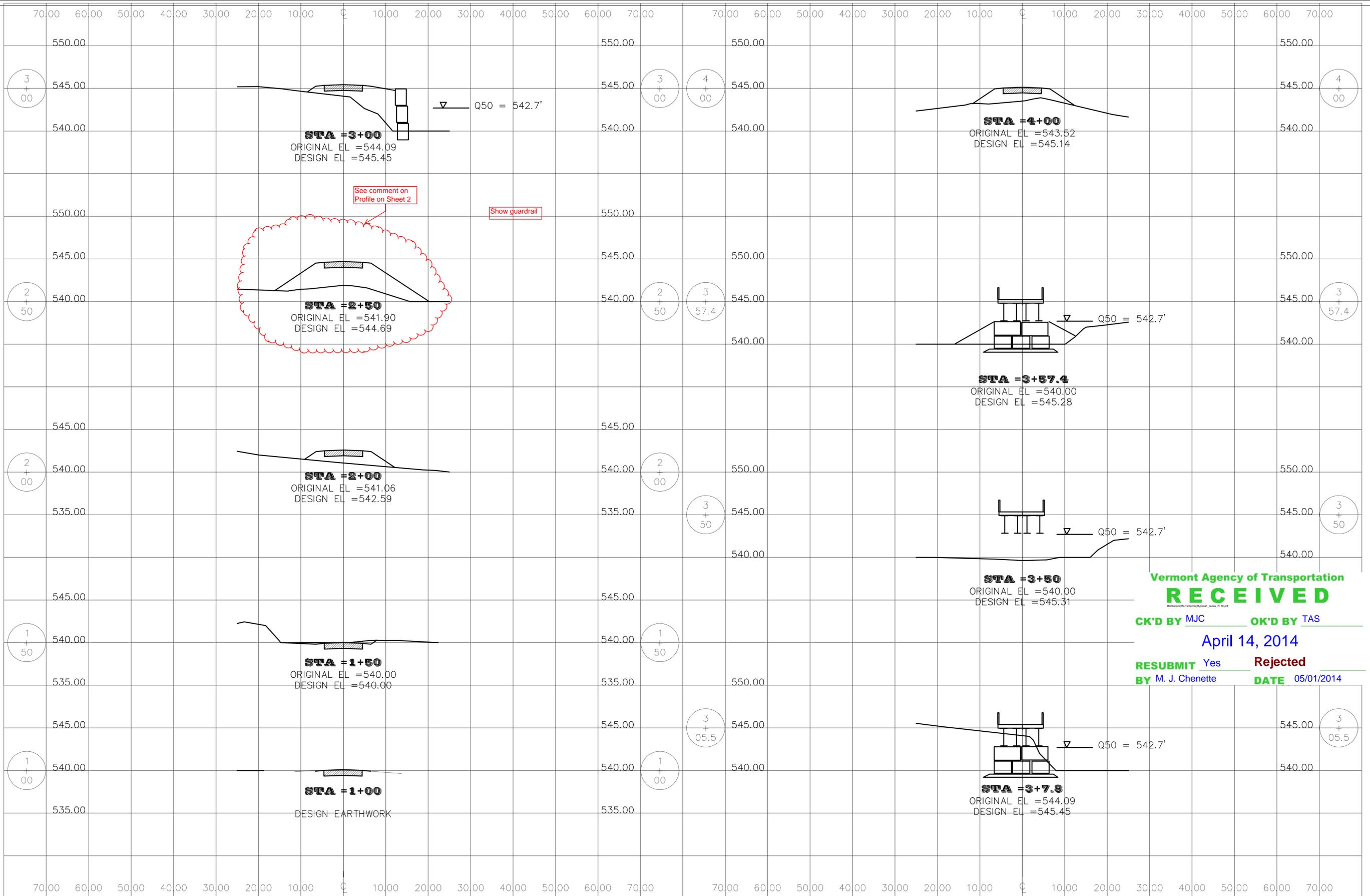


**PLAN AND PROFILE**

**RENAUD BROS. INC.**  
 BRO 1442 (35)  
 SUNSET LAKE ROAD  
 BRATTLEBORO, VT

DATE: 3-3-2014	





Vermont Agency of Transportation  
**RECEIVED**  
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 April 14, 2014  
 RESUBMIT Yes Rejected  
 BY M. J. Chenette DATE 05/01/2014

**CROSS SECTIONS**

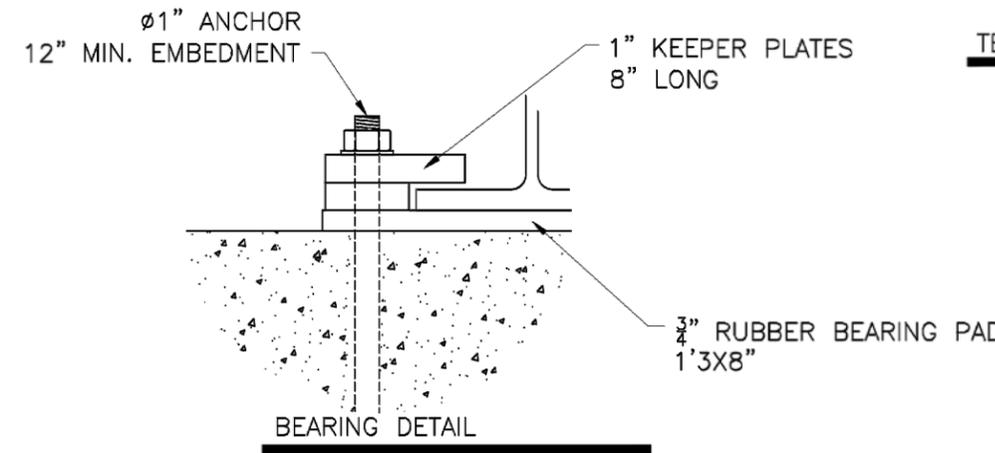
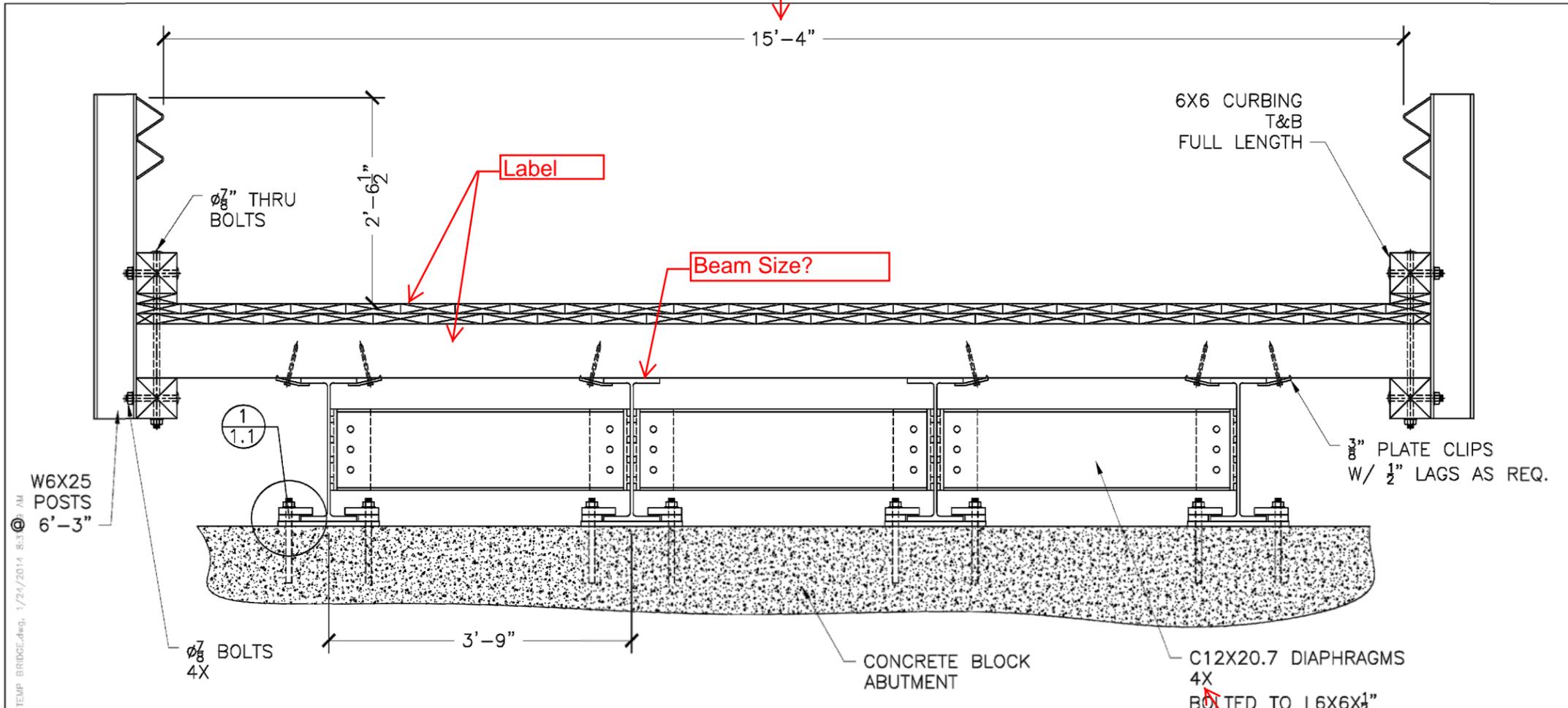
**RENAUD BROS. INC.**  
 BRO 1442 (35)  
 SUNSET LAKE ROAD  
 BRATTLEBORO, VT

DATE: 3-3-2014	



Per Contract Plans, should be 20'-0" rail to rail, revise bridge calcs for correct width

This does not meet the width shown on the Traffic Control Plan.



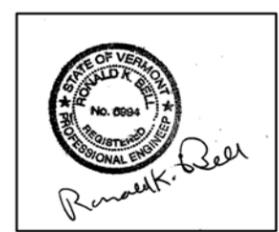
TEMPORARY BRIDGE END VIEW

Vermont Agency of Transportation  
**RECEIVED**

CK'D BY MJC OK'D BY TAS

April 14, 2014

RESUBMIT Yes Rejected  
BY M. J. Chenette DATE 05/01/2014



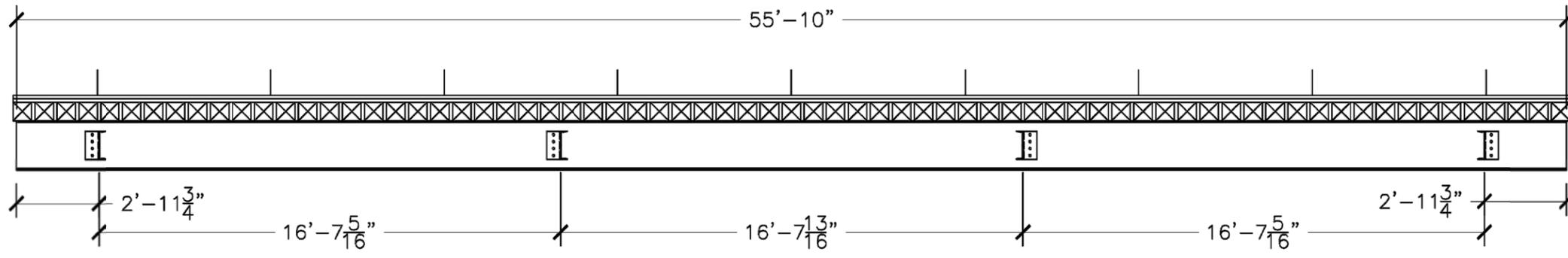
DO NOT SCALE DRAWINGS

DATE:	1/24/14	REV.		JOB NAME:	BRATTLEBORO
DRAWN BY:	A.D.	NO.		JOB NO.:	BRO 1442(35)
CHK'D BY:	C.E.	DATE	COMMENTS	SHEET NAME:	TEMP BRIDGE ELEVATION

BRATTLEBORO, VT. 05743  
PH: (802) 251-1559 FAX: (802) 251-1506

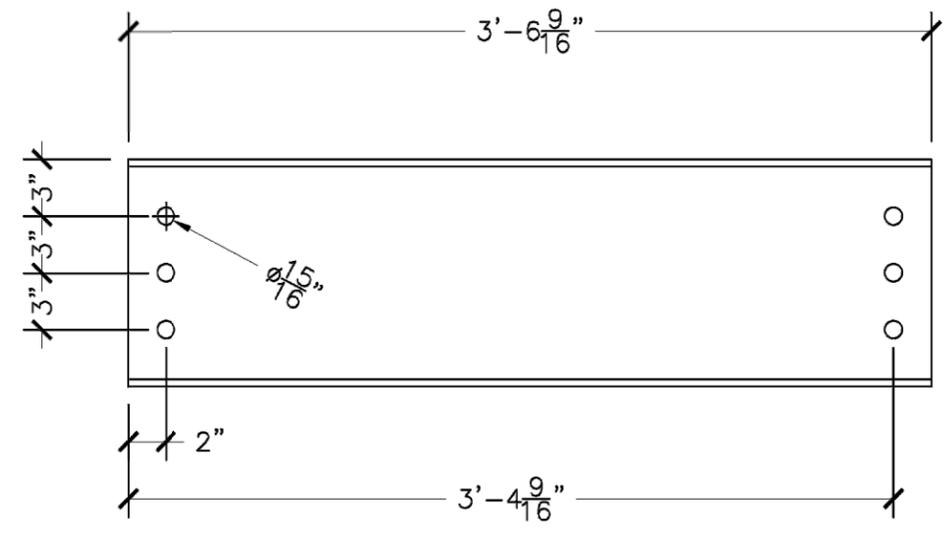
SHEET: 1 OF 3

S:\Users\Adunkie\Documents\Works In Progress 2014\SAGE HILL TEMP BRIDGE.dwg, 1/24/2014 8:37:49 AM

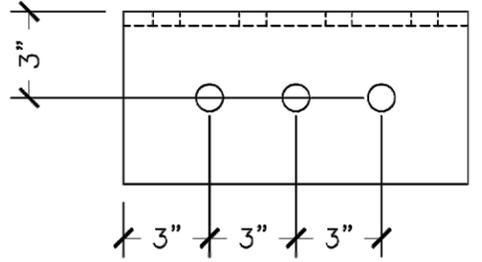
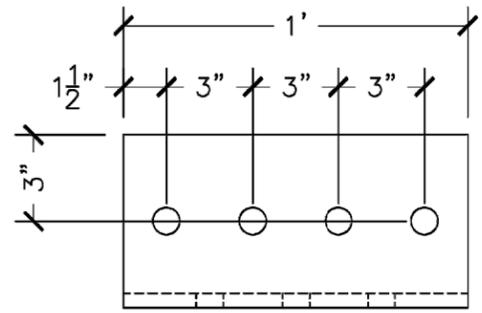


Label Materials

**BRIDGE SIDE ELEVATION**



**DIAPHRAGMS— 12 REQ.**  
MAT'L: C12X20.7



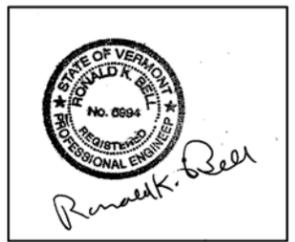
**ANGLES— 24 REQ.**  
MAT'L: L6X6X1/2"

Vermont Agency of Transportation  
**RECEIVED**

CK'D BY MJC OK'D BY TAS

April 14, 2014

RESUBMIT Yes Rejected  
BY M. J. Chenette DATE 05/01/2014



DO NOT SCALE DRAWINGS

REV.			JOB NAME: BRATTLEBORO	
NO.	DATE	COMMENTS	JOB NO:	BRO 1442(35)
			SHEET NAME:	SID ELEVATION & DIAPHRAGM DET.
				SHEET:
				2

DATE: 1/24/14  
DRAWN BY: A.D.  
CHK'D BY: C.E.



## Temporary Bridge Calculations

Design = HL 93

Design Load: Large of:

TO CHECK GOVERNING VEHICLE:  
 (USED ONLY FULL POINT LOAD OF VEHICLE)

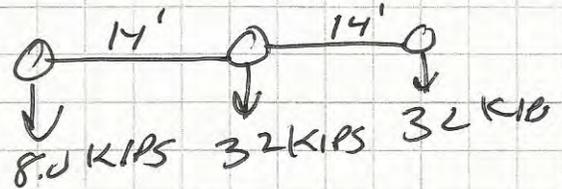
TRUCK LOAD = 657.7 K-ft  
 WITH WHEELS @ 7.7, 21.3 + 35.3'

FOR TANK TRUCK

M = 600 K-ft  
 WITH WHEELS @ 24' + 28'

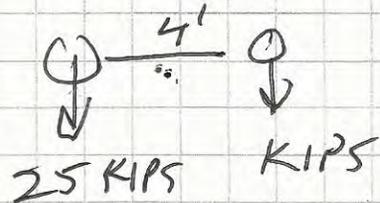
DESIGN TRUCK GOVERNS

Design Truck



OR

DESIGN Tandem



+

DESIGN LANE LOAD  
 OF 0.640 KLF  
 DISTRIBUTED OVER 10'

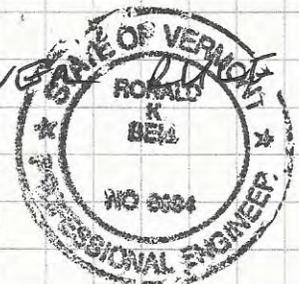
### LOAD DISTRIBUTION

$$\text{UNIFORM LANE LOAD} = \frac{9}{10} = \frac{3.75}{10} = 0.375 \times 0.9 \times 0.64 = 0.216 \text{ KLF}$$

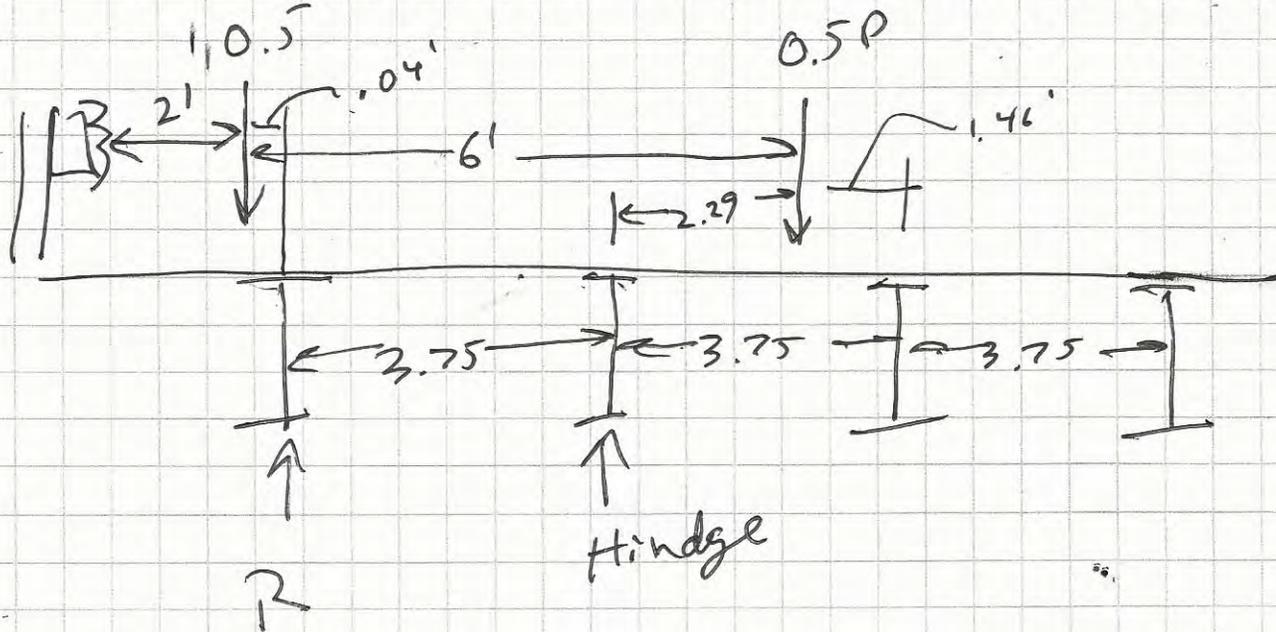
with temp modification

WHEEL LOAD MOMENTS:

From Table 4.6.2.2.2d-1 USE LEVER RULE  
 FOR EXTERIOR BEAMS



DISTRIBUTION ON ~~EXTERIOR~~ EXTERIOR BEAMS



$$M_{\text{Hinge}} = -(-2.29)(0.5P) + (3.75)(0.5P) - (3.75)(R) = 0$$

$$R = 0.2P$$

DISTRIBUTION ON INTERIOR BEAMS:

FROM TABLE 4.6.2.2. & -1 DISTRIBUTION FOR

$$\text{PLANK DECK} = 9/6.7 = \frac{3.75}{6.7} = 0.56$$

↑  
ON WHEEL LOAD

$$\frac{0.56}{2 \text{ wheels}} = 0.28 P$$



LOAD CALC. CONT.

DYNAMIC LOAD ALLOWANCE = 1.33

Trans Temp Bridge Load Modifier = 0.9

FACTORS FOR STRENGTH I CASE:

LL = 1.75  
IM = 1.75  
DL = 1.25

DEAD LOAD = 185 #/ft

Applied wheel loads =  $DF (0.25) \times IM (1.33) \times 0.9 = 0.34P$

8 KIPS  $\times 0.34 = 2.72$  KIPS FRONT WHEELS

32 KIPS  $\times 0.34 = 10.88$  KIPS REAR WHEELS





PROJECT NAME/ LOCATION: **Battleboro 1442(35)**  
 SHEET #: **4** OF **9**  
 CALCULATED BY: **Ron Bell** DATE: **4-17-2014**  
 CHECKED BY: DATE:  
 SCALE:

**CHECK MAX. BENDING & SHEAR STRESS RATIOS;  
 FROM ENERCALC**



Project Title: BRO 1442 135  
 Engineer: RON BELL  
 Project Descr: TEMPORARY BRIDGE

Project ID: 2014-32

Printed: 14 APR 2014, 8:57AM

File = C:\Users\Ron\DOCUME~1\ENERCA~1\SUC4E3~1.EC6  
 ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.12.31

**Steel Beam**

Lic. #: KW-06009396

Description: --None--

Licensee: Bell Engineering

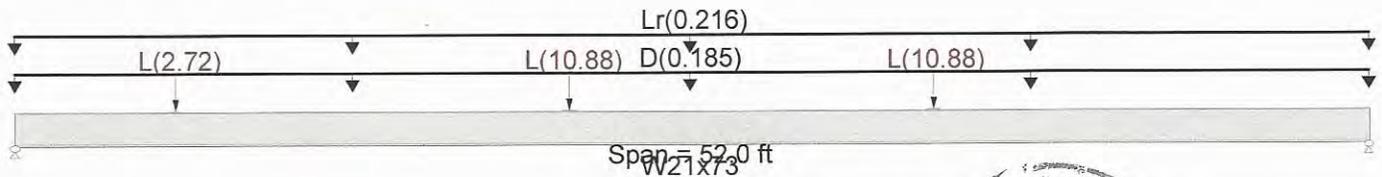
**CODE REFERENCES**

Calculations per AISC 360-05, IBC 2006, CBC 2007, ASCE 7-05  
 Load Combination Set: ASCE 7-05

**Material Properties**

Analysis Method: Load Resistance Factor Design  
 Beam Bracing: Beam is Fully Braced against lateral-torsional buckling  
 Bending Axis: Major Axis Bending  
 Load Combination ASCE 7-05

Fy : Steel Yield : 50.0 ksi  
 E : Modulus : 29,000.0 ksi



**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

- Load(s) for Span Number 1
  - Point Load : L = 2.720 k @ 6.20 ft
  - Point Load : L = 10.880 k @ 21.30 ft
  - Point Load : L = 10.880 k @ 35.30 ft
  - Uniform Load : D = 0.1850 k/ft, Tributary Width = 1.0 ft
  - Uniform Load : Lr = 0.2160 k/ft, Tributary Width = 1.0 ft



**Label beams  
 in plans**

**DESIGN SUMMARY**

Maximum Bending Stress Ratio =	<b>0.898 : 1</b>	Maximum Shear Stress Ratio =	<b>0.127 : 1</b>
Section used for this span	<b>W21x73</b>	Section used for this span	<b>W21x73</b>
Mu : Applied	578.951 k-ft	Vu : Applied	36.787 k
Mn * Phi : Allowable	645.000 k-ft	Vn * Phi : Allowable	289.380 k
Load Combination	+1.125D+1.750Lr+1.750L	Load Combination	+1.125D+1.750Lr+1.750L
Location of maximum on span	22.100ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

**Design OK**

# DEFLECTION CALCS

5/9

Printed: 14 APR 2014, 8:55AM

File = c:\Users\Ron\DOCUME~1\ENERCA~1\SUB031~1\EC6  
 ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.12.31

## Steel Beam

Lic. #: KW-06009396

Licensee: Bell Engineering

Description: --None--

**NOTE! DEFLECTION DISTRIBUTED EQUALLY OVER ALL BEAMS. UNIFORM LANE LOAD NOT INCLUDED.**

### CODE REFERENCES

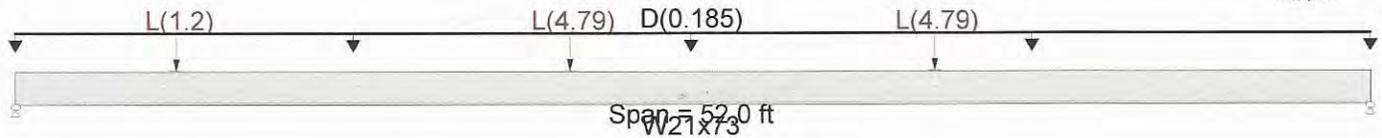
Calculations per AISC 360-05, IBC 2006, CBC 2007, ASCE 7-05

Load Combination Set: ASCE 7-05

### Material Properties

Analysis Method: Load Resistance Factor Design  
 Beam Bracing: Beam is Fully Braced against lateral-torsional buckling  
 Bending Axis: Major Axis Bending  
 Load Combination ASCE 7-05

Fy: Steel Yield: 50.0 ksi  
 E: Modulus: 29,000.0 ksi



### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

- Load(s) for Span Number 1
  - Point Load: L = 1.20 k @ 6.20 ft
  - Point Load: L = 4.790 k @ 21.30 ft
  - Point Load: L = 4.790 k @ 35.30 ft
  - Uniform Load: D = 0.1850 k/ft, Tributary Width = 1.0 ft

### DESIGN SUMMARY

Maximum Bending Stress Ratio =	<b>0.370</b> : 1	Maximum Shear Stress Ratio =	<b>0.051</b> : 1
Section used for this span	<b>W21x73</b>	Section used for this span	<b>W21x73</b>
Mu : Applied	238.487 k-ft	Vu : Applied	14.902 k
Mn * Phi : Allowable	645.000 k-ft	Vn * Phi : Allowable	289.380 k
Load Combination	+1.125D+1.750Lr+1.750L	Load Combination	+1.125D+1.750Lr+1.750L
Location of maximum on span	21.320 ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward L+Lr+S Deflection	0.986 in	Ratio =	<b>632</b>
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	<b>0</b> < 180
Max Downward Total Deflection	1.647 in	Ratio =	<b>379</b>
Max Upward Total Deflection	0.000 in	Ratio =	<b>0</b> < 160

**Design OK**

### Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	1.6474	26.260		0.0000	0.000

### Vertical Reactions - Unfactored

Support notation: Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	10.233	10.167
D Only	4.810	4.810
L Only	5.423	5.357
D+L	10.233	10.167

### Steel Section Properties : W21x73

Depth	=	21.200 in	Ixx	=	1,600.00 in <sup>4</sup>	J	=	3.020 in <sup>4</sup>
Web Thick	=	0.455 in	Sxx	=	151.00 in <sup>3</sup>	Cw	=	7,410.00 in <sup>6</sup>
Flange Width	=	8.300 in	Rxx	=	8.640 in			
Flange Thick	=	0.740 in	Zx	=	172.000 in <sup>3</sup>			
Area	=	21.500 in <sup>2</sup>	Iyy	=	70.600 in <sup>4</sup>	Wno	=	42.500 in <sup>2</sup>
Weight	=	73.186 plf	Syy	=	17.000 in <sup>3</sup>	Sw	=	65.200 in <sup>4</sup>
Kdesign	=	1.240 in	Ryy	=	1.810 in	Qf	=	29.700 in <sup>3</sup>
K1	=	0.875 in	Zy	=	26.600 in <sup>3</sup>	Qw	=	85.000 in <sup>3</sup>
rts	=	2.190 in	rT	=	2.130 in			
Ycg	=	10.600 in						

6/9

TIMBER DECK CALCS

**Wood Beam**

Lic. # : KW-06009396

Description : --None-- Per 4.6.2.1.3  $W_p = 7.5/10"$

**CODE REFERENCES**

Calculations per NDS 2005, IBC 2006, CBC 2007, ASCE 7-05

Load Combination Set : ASCE 7-05

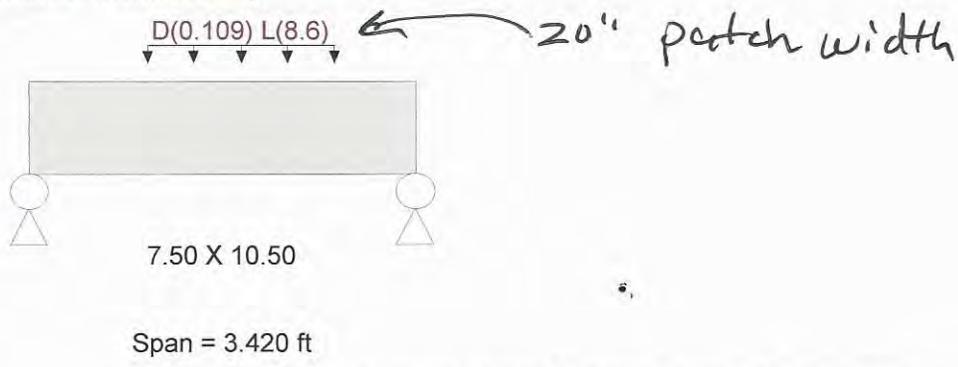
**Material Properties**

Analysis Method : Load Resistance Factor D  
 Load Combination ASCE 7-05

Wood Species : Spruce - Pine - Fir (South)  
 Wood Grade : NO.1

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	1,200.0 psi	E : Modulus of Elasticity	
Fb - Compr	600.0 psi	Ebend- xx	1,200.0 ksi
Fc - Prll	1,200.0 psi	Eminbend - xx	440.0 ksi
Fc - Perp	600.0 psi		
Fv	105.0 psi	Density	23.190 pcf
Ft	725.0 psi		



**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Load for Span Number 1

Uniform Load : D = 0.1090, L = 8.60 k/ft, Extent = 1.045 -->> 2.705 ft, Tributary Width = 1.0 ft

**DESIGN SUMMARY**

		<b>Design OK</b>	
Maximum Bending Stress Ratio =	<b>0.543</b> : 1	Maximum Shear Stress Ratio =	<b>0.958</b> : 1
Section used for this span	<b>7.50 X 10.50</b>	Section used for this span	<b>7.50 X 10.50</b>
fb : Actual =	1,408.08psi	fv : Actual =	217.34 psi
FB : Allowable =	2,592.00psi	Fv : Allowable =	226.80 psi
Load Combination	+1.250D+1.750L	Load Combination	+1.250D+1.750L
Location of maximum on span	= 1.797ft	Location of maximum on span	= 2.546ft
Span # where maximum occurs	= Span # 1	Span # where maximum occurs	= Span # 1
<b>Maximum Deflection</b>			
Max Downward L+Lr+S Deflection	0.021 in	Ratio =	<b>1944</b>
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 < 360
Max Downward Total Deflection	0.021 in	Ratio =	<b>1920</b>
Max Upward Total Deflection	0.000 in	Ratio =	0 < 180

**Overall Maximum Deflections - Unfactored Loads**

Load Combination	Span	Max. "+" Defl	Location in Span	Load Combination	Max. "-" Defl	Location in Span
D+L	1,	0.0214	1.747		0.0000	0.000

**Vertical Reactions - Unfactored**

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	6.531	7.926
D Only	0.082	0.099
L Only	6.449	7.827
D+L	6.531	7.926



SUB STRUCTURE DESIGN

1 TRUCK =  $72 \text{ KIPS} \times 1.75 \times 1.33 = 168 \text{ KIPS}$

DECK =  $52' \times (19/2) (50 \text{ ft}^3) \times 15' = 35 \text{ KIPS}$  } 218 KIPS

Steel beams =  $4752' \times 73 \text{ lb/ft} = 15 \text{ KIPS}$

CONC. BLOCK FOUNDATION =  $38 \text{ BLOCKS} \times 3 \times 2 \times 6 \times 150 \text{ lb/ft}^3 = 205 \text{ KIPS}$

$P_u = \frac{218 \text{ KIPS}}{2 \text{ sides}} + 205 \text{ KIPS} = 314 \text{ KIPS/SIDE}$

$q_u = \text{Factored Load/ft}^2 = \frac{314 \text{ KIPS}}{252 \text{ ft}^2} = 1.25 \frac{\text{KIPS}}{\text{ft}^2}$

From C.10.6.2.6.1-1

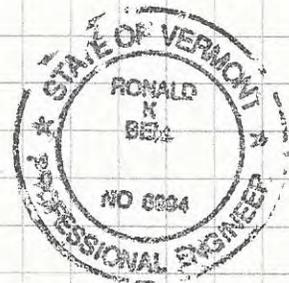
FOR SW, SP MEDIUM DENSE TO DENSE RECOMMEN

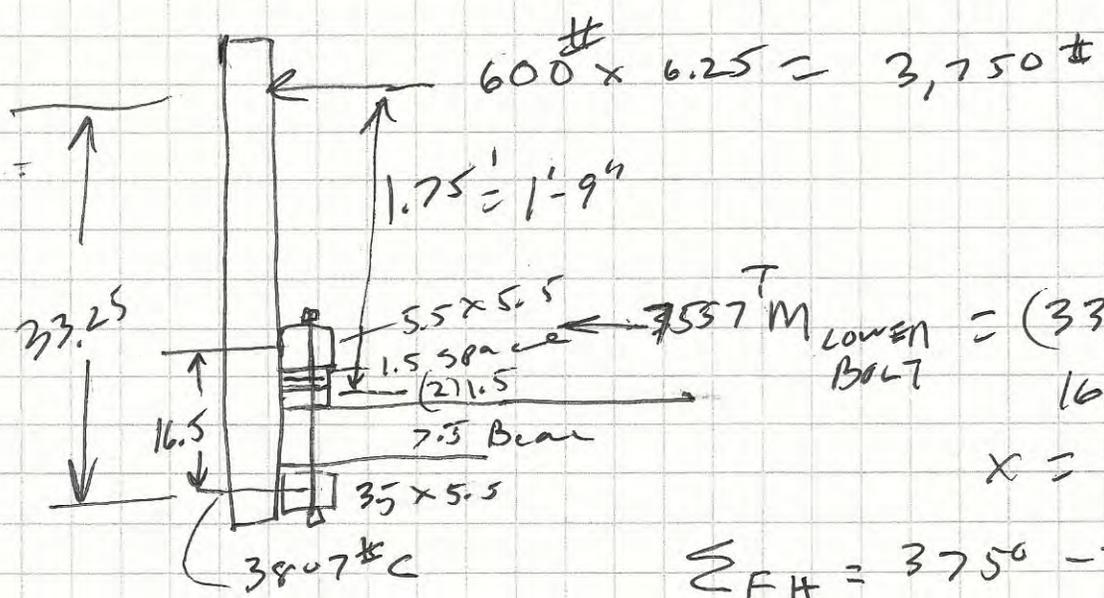
BEARING CAPACITY = 6.0 KSF

FOR FOUNDATION RESISTANCE FACTOR = 0.45

$6 \text{ KSF} \times 0.45 = 2.7 \text{ KSF}$

$2.7 \text{ KSF} > 1.25 \text{ KSF}$  OK





$$600 \times 6.25 = 3,750 \text{ lb}$$

$$1.75' = 1'-9''$$

$$5.5 \times 5.5$$

$$1.5 \text{ space}$$

$$(2) 1.5$$

$$7.5 \text{ Beam}$$

$$3.5 \times 5.5$$

$$3807 \text{ lb C}$$

$$7557 \text{ T LOWER BOLT}$$

$$= (33.25)(3750) - 16.5(x) = 0$$

$$x = 7557 \text{ lb TENSION}$$

$$\sum F_H = 3750 - 7557 = 3807 \text{ lb COMPRESSION}$$

CHECK SIDE BEARING OF 6x6

$$3/4" \text{ Dia bolt} + 1/8" \text{ hole} = 7/8" \times 5.5" \times 4 \text{ Bolts} = 19.25 \text{ in}^2$$

$$\frac{7557 \text{ lb}}{19.25 \text{ in}^2} = 392 \text{ psi}$$

SYP || To Grain  $F_c = 525 \text{ psi} > 392 \text{ psi}$  OK

CHECK TOP TENSION BOLTS

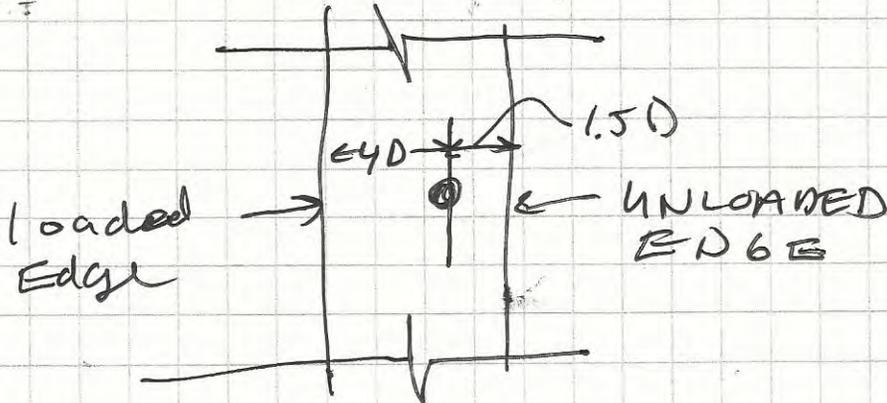
$$\frac{7557 \text{ lb}}{2 \text{ Bolts}} = 3,778 \text{ lb/bolt}$$

$$\text{Bearing area required} = \frac{3778 \text{ lb}}{525 \text{ psi}} = 7.2 \text{ in}^2$$

$$\text{Provide washer } 4" \times 2" \times 1/4" \quad 8 \text{ in}^2 - 0.5 \text{ in}^2 = 7.5 \text{ in}^2$$

↑  
Hole      OK

TO PREVENT SIDE BLOWOUT COMPLY WITH MIN. EDGE DISTANCE SET FORTH IN NDS:



4 x .75" = 3" MIN. EDGE DISTANCE

**SUBSTRUCTURE:**

BEAMS TO SIT ON (2) ROWS 6x3x2 HIGH CONCRETE BLOCKS - STAGGE JOINTS TO DISTRIBUTE LOADS TO SOIL.

AREA PROVIDED FOR SOIL BEARING BASED ON 3.75' BEAM SPACING = 3.75' x 6' = 22.5 ft<sup>2</sup>

FACTORED BEAM REACTION = 34 KIPS

$$\frac{34}{22.5} = 1.5 \frac{\text{KIPS}}{\text{ft}^2} \gg \gg 2000 \text{ psc min OF NATIVE SOIL.}$$

