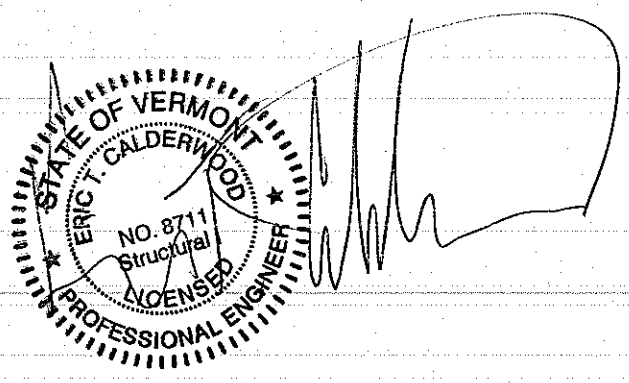
T. Buck Construction, Inc.

249 Merrow Road, Auburn, Maine 04210-8319
*(207) 783-6223 * (FAX) 783-3970*

Demolition Plan

BRIDGE PROJECT
Middlebury, VT
VERMONT AGENCY OF TRANSPORTATION
RS 0174(8)



Introduction

The existing bridge consists of a cast in place concrete arch structure. There are no known drawings showing the extent of the concrete arch but it is moderately deteriorated all over the arch and wing walls. This plan will outline our intentions on removing the existing concrete arch and a significant amount of ledge so the new precast structures can be erected.

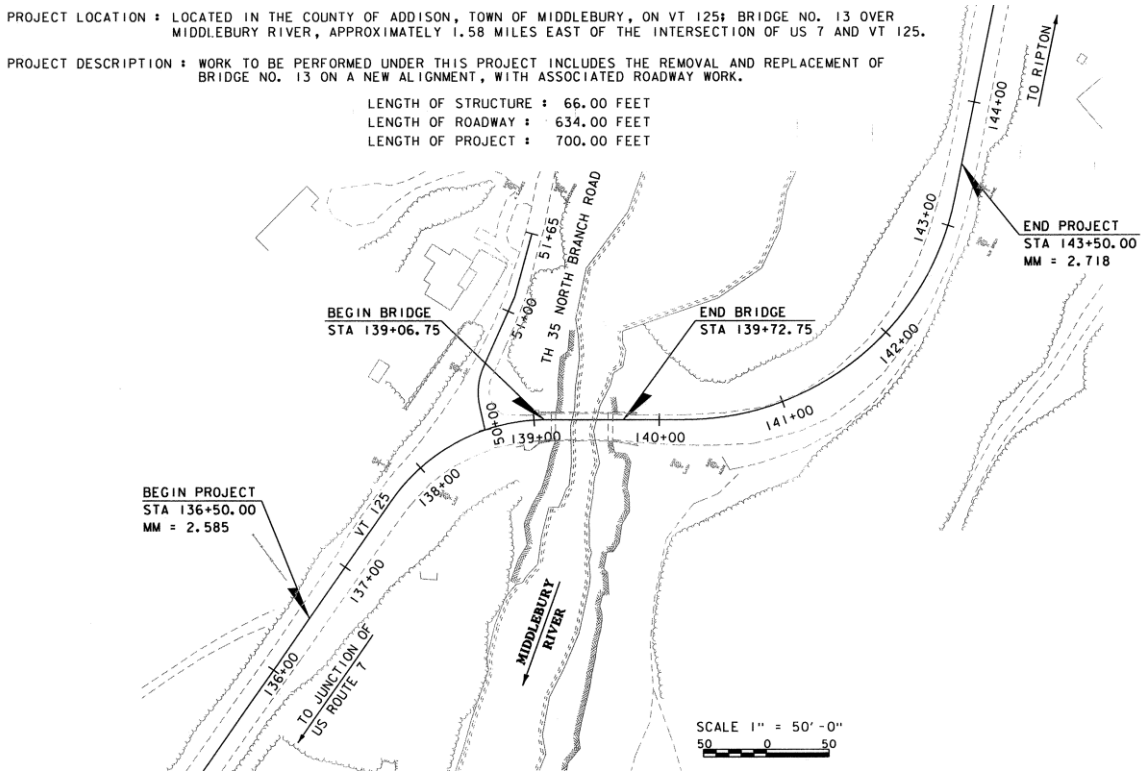
We acknowledge there is a waterline running down the approximate center of the road over the bridge. The waterline will be cut and capped before demolition begins.

General Sequence / Procedure

1. Close road at 7:00 am 4/19/14
2. Remove railings / pavement
3. Excavate approach #1
4. Blast rock on for Abutment #2
5. Excavate Abutment #2
6. Remove arch and wings from both sides
7. Clean debris off platform
8. Prepare ledge for subfootings
9. Construct project in accordance with plans and specs. (See Erection Plan)

Details on Site

The existing bridge is located on Route 125 in East Middlebury and it spans the Middlebury River. The site will be closed to traffic during demolition. Traffic will be maintained on the specified off site detour. Pedestrians will also be prohibited from entering the jobsite without authorization. The bridge is on a significant grade as route 125 towards Ripton goes up a mountain.



This image was taken directly from the title page of the contract drawings.

Details on Arch Demolition

This is an image taken from the southeast corner of the site.

We will begin the demolition by removing the guardrails and pavement from the bridge. Then the arch demolition can begin. The arch will be completely demolished by using hydraulic hammers and other various mechanical attachments on excavators. We will begin by exposing the concrete arch by excavating the approaches. The borings indicate that there is gravel located in between the head walls on the arch with large boulders and cobbles buried in the backfill.
Once the arch is exposed, hoe rams will begin to bust of the concrete as it will fall onto the platform below.

The extent of the concrete is unknown because there are no known as-built plans for this structure. However, there is a visible crack that appears to follow the joint between the arch and the headwalls. We are operating under the assumption that this crack represents the thickness of the concrete arch with the headwalls being connected in some fashion.

Details on Ledge Removal

The ledge to remove is mostly concentrated on the abutment 2 side of the river. The abutment one side may have a small amount of ledge to contend with but the vast majority of it is on the southern side of the river.

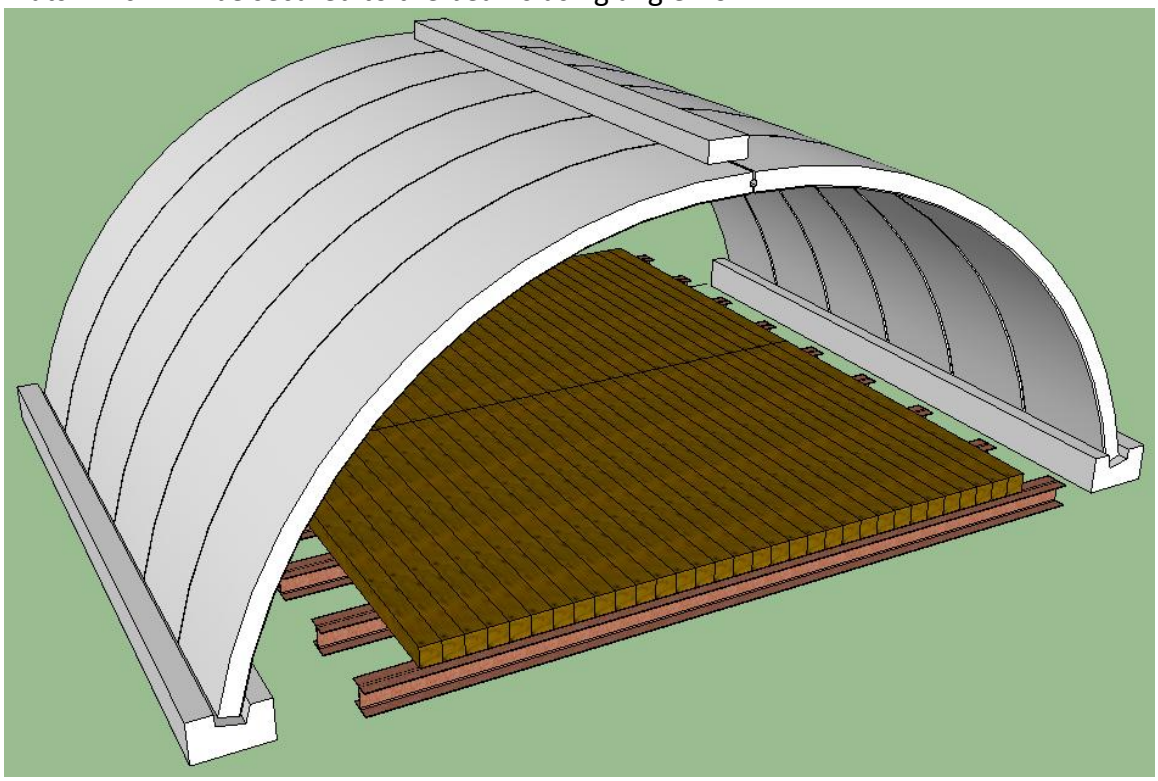
The ledge is weathered and visibly layered. Although we hope to be able to excavate the rock by using hoe rams and excavators, it seems as though the safest way to maintain the schedule is to blast the rock to ensure the area in question is sufficiently fractured enough to excavate it.

A detailed blasting plan is being developed and will be submitted as soon as possible. In general, the plan will propose a test blast to be conducted next to the existing roadway where the new bridge is going to be approximately 10’ wider. We intend on line drilling on the back side of the area in question. The thought process is that the line drilling will essentially prevent any back blast and give a tolerable surface to form against for the wing wall extensions.

We acknowledge that it will be virtually impossible to expose the entire test blast all the way to the bottom given the proximity to the existing roadway. Although conducting a test blast during the closure somewhat defeats the purpose of blasting to speed up the construction.

Details on Platform

The platform will be installed prior to the closure. It will consist of H-Pile beams running across the river with spacing close to 5'. The deck of the platform will be 4' x 20' crane mats which will be secured to the beams using angle iron.



The details and calculations can be seen in Appendix A of this plan.

The platform will also serve as a base for the staging towers which will support the arch segments. The details of the towers can be seen in the precast concrete erection plan. The picture above shows the new precast arch pieces with the platform below it.

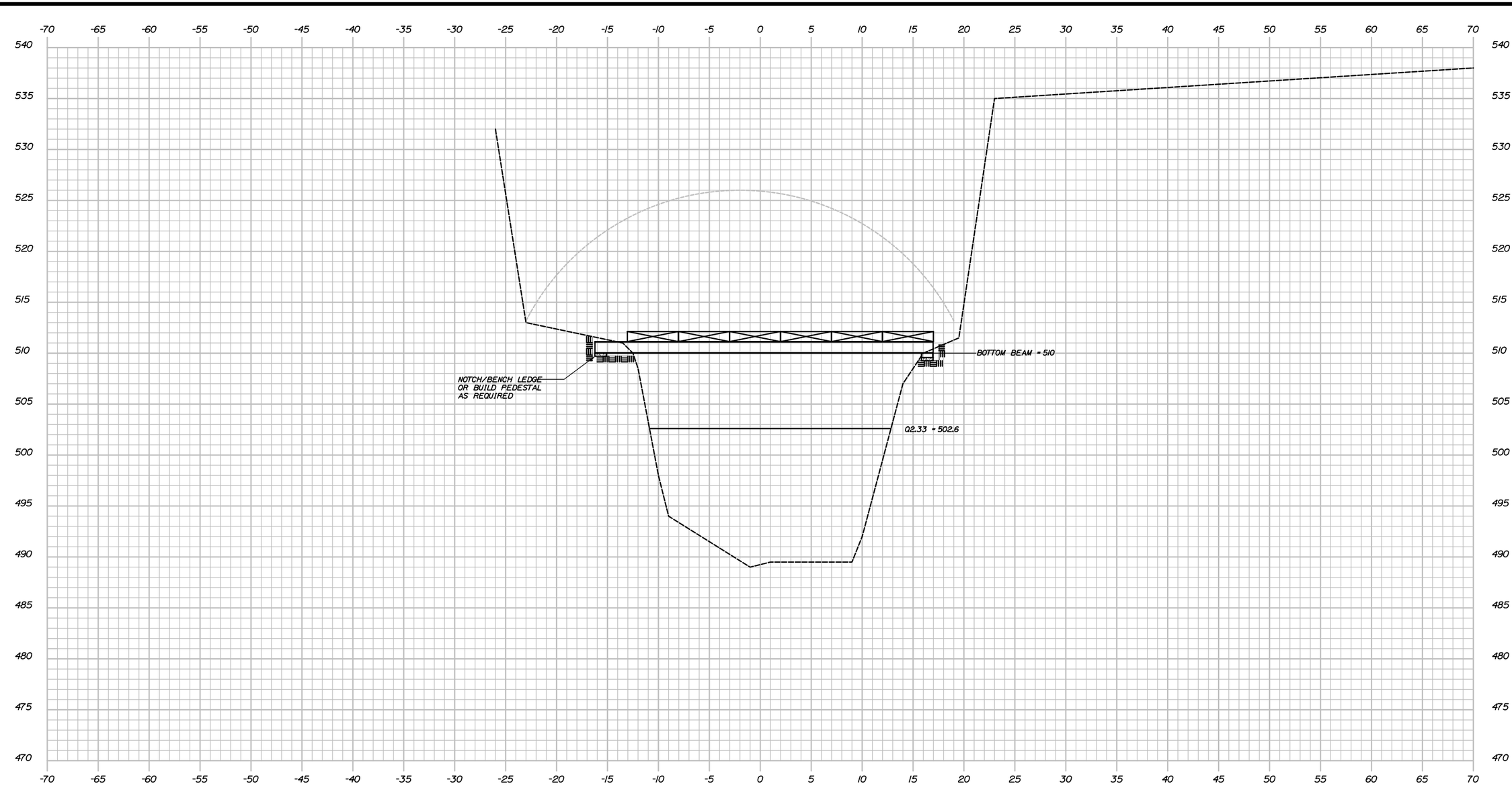
Details on Waste Area(s)

The waste area for this project is located at 14 Schoolhouse Rd. the pit is owned and operated by JP Carrara. We plan to take all debris there with the intension of bring back any useable gravel material. The concrete from the arch will be broken up to satisfy the owners and any exposed reinforcing steel will be cut off.

The pit is grandfathered and therefore exempt under the Off-Site Activity Exemption Record.

APPENDIX A

Details on Platform



11+00

NOTES

1. NOTCH/BENCH EXISTING LEDGE OR BUILD PEDESTAL AS REQUIRED
2. MAXIMUM SPAN OF 37 FT BRG. TO BRG. - 36 FT CLEAR SPAN.
3. BEAMS TO BE HP14x73 GR. 50 KSI
4. PROVIDE A MINIMUM OF 152 SQUARE INCHES OF BEARING AREA/BEAM END
5. BEAMS SHALL BE NEW OR IN GOOD USED CONDITION.
6. THESE PLANS ARE NOT INTENDED TO BE USED ALONE BUT IN CONJUNCTION WITH THE ORIGINAL CONTRACT PLANS, SHOP DRAWINGS AND ALL RELEVANT PLANS.
7. REPORT ANY DISCREPANCY BETWEEN THESE PLANS AND THE ACTUAL OBSERVED FIELD CONDITIONS AND OR CONTRACT DRAWINGS IMMEDIATELY TO THE TEMPORARY SUPPORT ENGINEER OR RECORD.
8. DO NOT PROCEED WITH ANY RELATED WORK UNTIL SUCH ISSUE (NOTE 7) HAS BEEN RESOLVED TO THE SATISFACTION OF THE TEMPORARY SUPPORT ENGINEER OF RECORD.
9. CONTRACTOR SHALL PERIODICALLY CLEAN OFF PLATFORM DURING DEMOLITION. AT NO TIME SHALL PLATFORM HAVE MORE THAN 8 INCHES OF DEMOLISHED CONCRETE ON IT.

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PREPARED FOR:
T-BUCK CONSTRUCTION

VAOT RS 0174(8)
CEE 083-BR-13

STATE OF VERMONT
ERIC T. CALDERWOOD
NO. 8711
LICENSED PROFESSIONAL ENGINEER

P.E. NUMBER 8711
DATE: DECEMBER 2013

BY	DATE
DGK	DEC 2013

DESIGN-DETAILED
CHECKED-REVIEWED
REVISIONS 1
REVISIONS 2
REVISIONS 3
REVISIONS 4
FIELD CHANGES

MIDDLEBURY VT
VT ROUTE 125 BRIDGE NO. 13

DEMOLITION
TEMP CONST. SUPPORT

SHEET NUMBER
1

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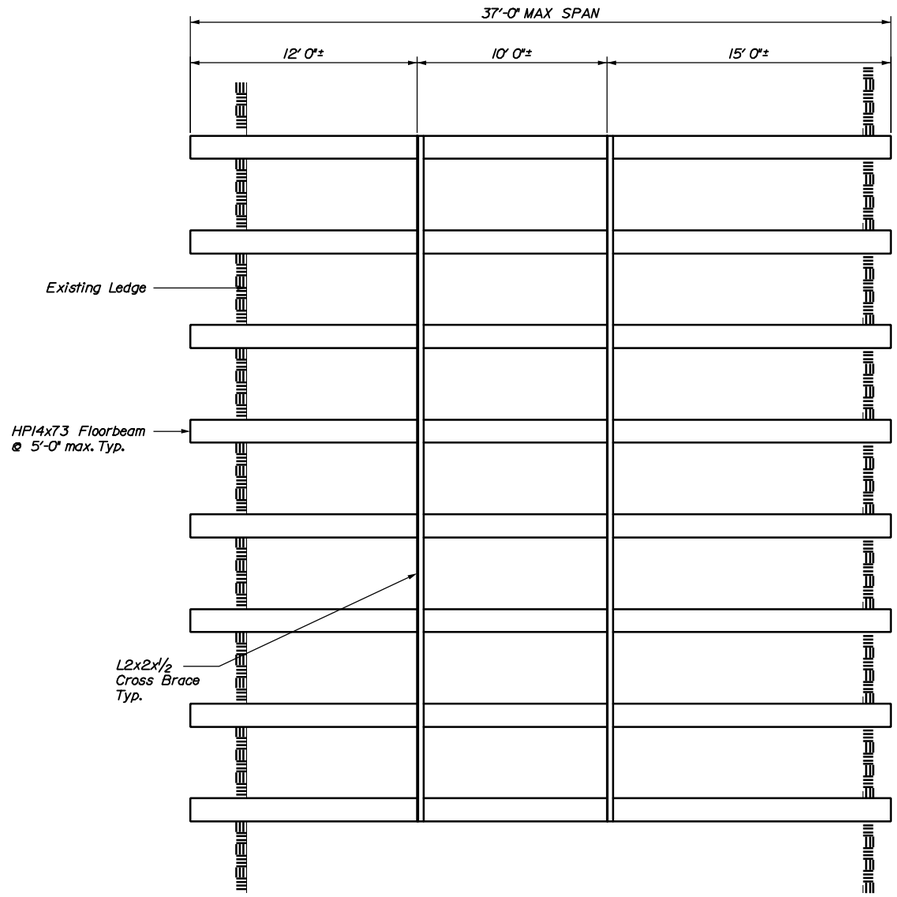
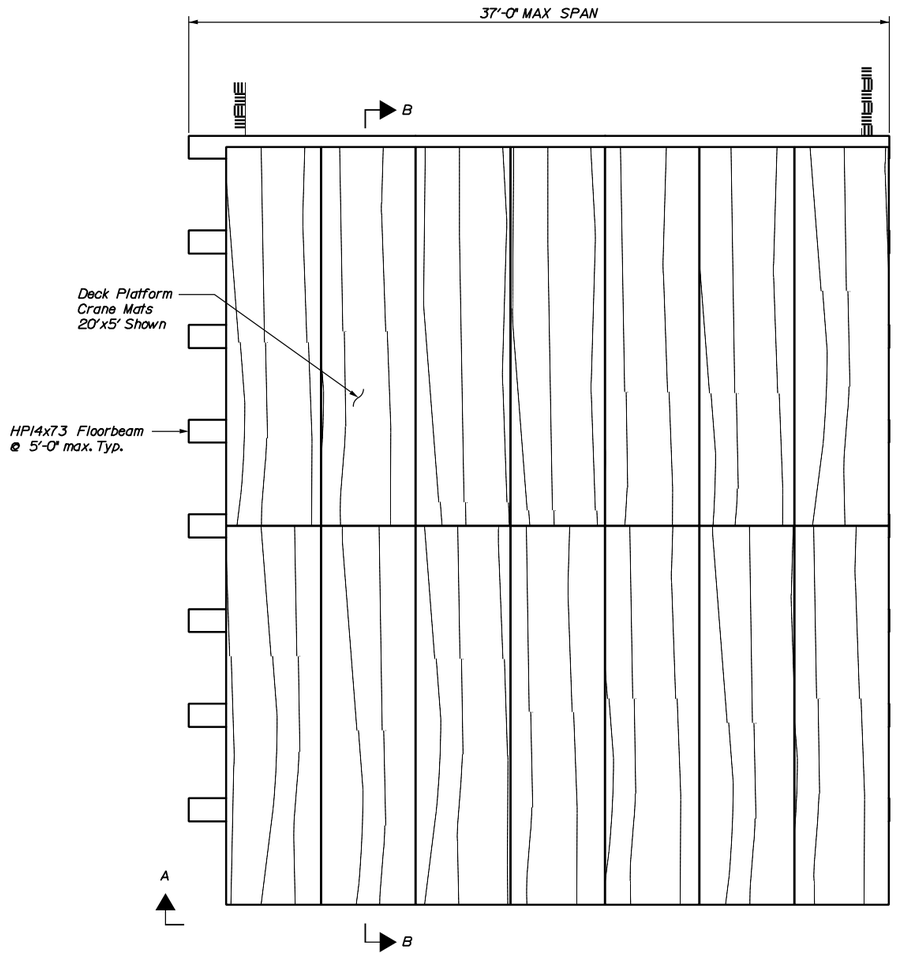
222 RIVER ROAD
RICHMOND, ME 04357
PH (207)737-2007 FAX (207)737-2008

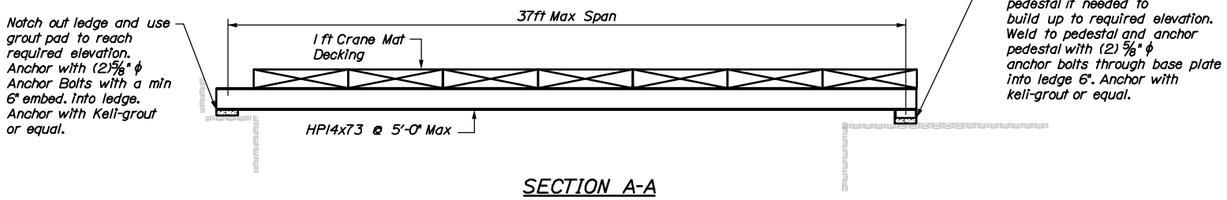
Filename: ...\001_Demo.dgn Workgroup: Structures Division Username: common Date:2/3/2014



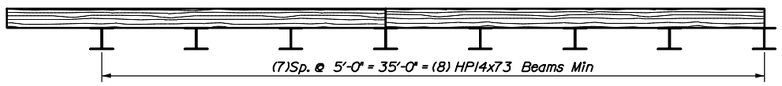
FRAMING PLAN
1/4" = 1'-0"



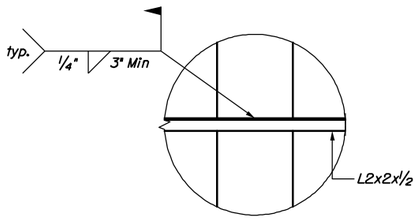
PLATFORM PLAN
1/4" = 1'-0"



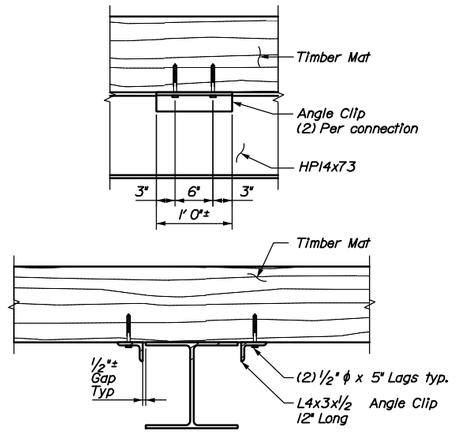
SECTION A-A



SECTION B-B



LATERAL BRACE DETAIL



TYPICAL MAT CONNECTION

Each Timber Crane Mat Shall Have a Minimum of (2) Connections as Shown. Mats Placed Under Erection Shoring Tower Legs Shall Have a monimum of (5) Connections as Shown.

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8711
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	BY	DATE
DESIGN-DETAILED	OGK	DEC 2013
CHECKED-REVIEWED		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

MIDDLEBURY VT
VT ROUTE 125 BRIDGE NO. 13

DEMOLITION
TEMP CONST. SUPPORT

SHEET NUMBER
2

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222 RIVER RD.
RICHMOND, ME 04357

Username: common Date:1/31/2014
Workgroup: Structures Division
Filename: ...\002_Demo.dgn

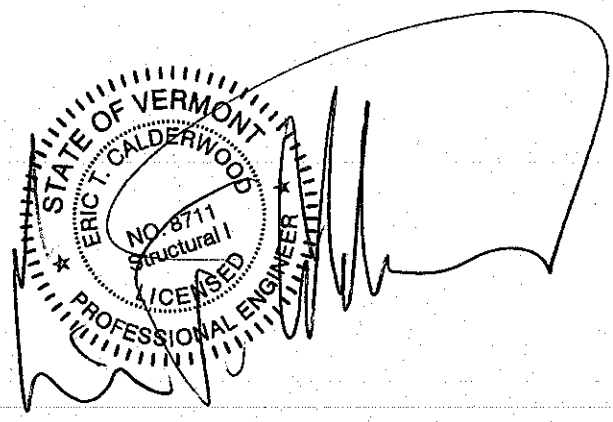
Demolition Calculations – Support Platform

For

VT Route 125, Bridge No. 13

Middlebury, VT

RS 0174(8)
CEE 083-Br-13



Prepared for:

T. Buck Construction, Inc.

By:
Calderwood Engineering etc
January 30th 2014

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SHEET NO. 1 OF
CALCULATED BY OK DATE 12/2013
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SCALE

MIDDLEBURY

TRY USING HP 14x73 BEAMS - SPAN FROM LEDGE TO LEDGE
TRY SPACING BEAMS AT 5FT.

HP 14x73: $S_x = 107\,in^3$ $r_x = 5.84\,in$ $r_{ts} = 4.0$
$Z_x = 118\,in^3$ $r_y = 3.49\,in$ $\lambda_f = 14.4$
$F_y = 50\,ksi$ $\lambda_p = 9.14$ $\lambda_r = 24.1$

$M_p = F_y Z_x = 50^{ksi}(118\,in^3) = 5900^{in\text{-}k}$ - (AISC 13TH ED. CHAPTER F.)

$L_p = 1.76 r_y \sqrt{E/F_y} = 147.93\,in$

$L_r = \pi r_{ts} \sqrt{\frac{E}{0.7F_y}} = 361.72\,in$

SAY MAX SPAN OF 37 FT, USE (2) BRACE POINTS

SAY MAX UNBRACED LENGTH IS 15FT = 180in

$M_n = M_p - (M_p - 0.7F_y S_x)\left(\frac{L_b - L_p}{L_r - L_p}\right)$

$M_n = 5900^{in\text{-}k} - (5900^{in\text{-}k} - 0.7 \times 50^{ksi} \times 107\,in^3)\left(\frac{180\,in - 147.93\,in}{361.72\,in - 147.93\,in}\right)$

$M_n = 5576.73^{in\text{-}k}$

$M_n = M_p - (M_p - 0.7F_y S_x)\left(\frac{\lambda - \lambda_p}{\lambda_r - \lambda_p}\right) = 5900 - (2155^{in\text{-}k})\left(\frac{14.4 - 9.15}{24.1 - 9.15}\right)$

$M_n = 5143.23^{in\text{-}k}$ ← CONTROLS

$M_a = M_n/\Omega = 5143.23^{in\text{-}k} / 1.67 = 3079.8^{in\text{-}k}$

$M_a = 3079.8^{in\text{-}k} / 12^{in/ft} = 256.6^{k\text{-}ft}$

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DEMOLITION

LOADS

BEAM SELF-WT = 73 LB/FT

LIVE LOAD = 40 psf * 5 FT = 200 LB/FT

DEMO ~ SAY 8" CONCRETE = (8 IN/12)(150 pcf)(5 FT) = 500 LB/FT

DECK = 40 pcf x 1 FT CRANE MAT x 5 FT = 200 LB/FT

ω_{TOT} = 73 LB/FT + 200 LB/FT + 500 LB/FT + 200 LB/FT = 973 LB/FT
WITH A MAXIMUM LENGTH OF 37 FT

$M_u = [973 \text{ FT} \times 37 \text{ FT}^2 / 8] / 1000 \text{ LB/K} = 166.5 \text{ K-FT}$

166.5 K-FT < 256.6 K-FT ✓ O.K.

R_n = 973 LB/FT (37 FT)/2 = 18,000 LB

NOTE: SOME ANTICIPATED ERECTION LOADS ARE GREATER THAN DEMOLITION LOADS. THESE LOADS WILL BE USED FOR PLATFORM DESIGN TO BE CONSERVATIVE. SEE SEPARATE ERECTION CALCS FOR THESE LOADS.

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ERECTION / DEMO - BEARINGS

MAXIMUM REACTION ON PLATFORM BEAM ANTICIPATED IS 20.7k DURING STAGE 5 OF ERECTION

DETERMINE THE MINIMUM AMOUNT OF BEARING AREA REQUIRED ON THE EXISTING LEDGE

WITH FLANGE WIDTH OF 14in, TRY STARTING WITH A BEARING LENGTH OF 10in

$A = 14in \times 10in = 140in^2$

$A = 140in^2 / 144in^2/ft^2 = 0.972ft^2$

$f_{BRG} = 20.7k / 0.972ft^2 = 21.3ksf$

DEMOLITION - MAX BEARING LOAD IS 18,000LB

FOR DESIGN PURPOSE USE ANTICIPATED ERECTION LOAD OF 20,700LB.

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Bearing Capacity

$q_{ult} = N_{ms} C_o$ (4.4.8.1.2-1 AASHTO 5th Spec)

C_o = 150MPa - 300MPa = 3100 - 6200 ksf (Quartzite)

Quartzite Category C (Table 4.4.8.1.2B)

Say Rock Mass Quality is 'Poor' per Table 4.4.8.1.2A

$N_{ms} = 0.019$

$q_{ult} = (3100 \text{ ksf min})(0.019) = 58.9$ ksf

With 1.5 x 2.5 keek $q_{reg} = 15.22$ ksf

$$F.S. = \frac{58.9 \text{ ksf}}{21.3 \text{ ksf}} = 2.76 < 3.0$$

$$\frac{58.9 \text{ ksf}}{3} = 19.63 \text{ ksf}$$

$A \geq 20^k / 19.63 \text{ ksf} = 1.05 \text{ sf}$

$A \geq 152 \text{ in}^2$

For Demo $18^k / 0.972 \text{ sf} = 18.52$ ksf

F.S. = 58.9/18.52 = 3.18 - OK w/ 14 x 10.2 Brg.

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BEARING STRENGTH

IF CONCRETE PEDESTAL IS USED

$F_{B\,ALLOW} = 0.85 f'_c / \Omega$ $\quad \Omega = 2.5$ (ASSUME 13" x 18")

USE $f'_c = 3000$psi MIN

$0.85(3000\text{psi})/2.5 = 1020$psi

$20{,}700^{LB}/15\text{-}2{:}IN^2 = 136$psi

TIMBER MAT

LOAD = 40PSF LIVE + (8:12)150PCF CONC. DEAD + 40PCF(1FT) SELF-WT
= 180PSF

ASSUME SIMPLE SPAN OF 5FT - CONSERVATIVE

$M = 180\text{PSF} \times 1\text{FT} \times 5\text{FT}^2/8 = 562.5$ LB-FT

$S_{x\,NOMINAL} = 253.5\text{ IN}^3$

$f_b = 562.5^{LB\text{-}FT} \times 12^{IN}/_{FT} / 253.5\text{ IN}^3 = 26.63$ psi

✓ OK BY INSPECTION

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LATERAL BRACE

SIZE CROSS BRACE TO RESTRAIN 2% OF VERTICAL STRESS IN TOP FLANGE OF HP14x73.

$S_{MAX} = 27.9$ ksi - STAGE 5, TOWER 1

DEMO

$S_{MAX} = \frac{166.5^{k\text{-ft}} \times 12}{107 in^3} = 18.67$ ksi

USE S_{MAX} ANTICIPATED FOR ERECTION

$A_F = 14.6 in \times 0.505 in = 7.373 in^2$

$P_c = 7.373 in^2 (27.9 ksi) = 205.7^k$

$P_{BC} = 0.02 \times 205.7^k = 4.1^k$

TRY USING AN L2x2x1/4 M.D FOR LATERAL BRACE

$A = 0.938 in^2$ $r_x = 0.605$ $L = 5ft \times 12 in/ft = 60 in$

$L/r_x = 99.17 > 80$

$\frac{KL}{r} = 32 + 1.25 \frac{L}{r_x} = 156$

$\frac{KL}{r} > 4.71\sqrt{E/F_y}$ $F_e = \frac{\pi^2 E}{\left(\frac{KL}{r}\right)^2} = 11.76^{ksi}$

$F_{cr} = 0.877 F_e = 10.3^{ksi}$

$P_c = F_{cr} A_g / \Omega = 10.3^{ksi} \times (0.938 in^2)/1.67 = 5.78^k$

$5.78^k > 4.1^k$ (2.8% P_c)

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LATERAL BRACE

WELD TO BEAMS, SIZE FOR 6K MIN

USE 1/4" FILLET WELD

$R_n = 0.707 w L F_w$ $F_w = 42^{ksi}$ $w = 1/4$ (J2-4 AISC)

$R_n = 0.707(0.25in)\,42ksi = 7.42^k/in$

$R_e = R_n/\Omega = 7.42^k/in / 2.0 = 3.71^k/in$ WELD

$L_{MIN} \geq 6^k / 3.71^k/in = 1.61 in$

USE A MINIMUM OF 2 INCHES OF WELD/BEAM

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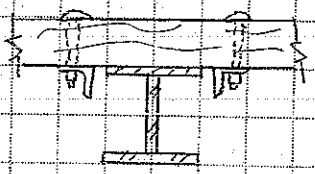
DEMOLITION / ERECTION

USE ANGLES ON THE UNDERSIDE OF THE DECKING, THROUGH BOLTED TO KEEP TIMBER MAT FROM SLIDING.



DESIGN FOR ROUGHLY 10% OF VERTICAL LOAD.

DEMOLITION - 180 psf × 37 FT × 5 FT = 33,300 LB/BM LINE

ERECTION - MAXIMUM TOWER REACTION ON BEAM LINE WAS 27.5^K - STAGE 5, TOWER 1.

37 FT (40 PSF DECK + 20 psf LIVE) 5 FT + 27,500 LB = 38,600 LB/BM

ERECTION LOAD CONTROLS. P_{DESIGN} = 38,600 LB (0.1) = 3,860 LB/BM LINE

ALSO LOOK AT MAX LOAD / DECK PANEL. SAY P_{TOWER} / 2 PANELS

ERECTION = [(10^K + 9^K)/2] × 1000 LB/K + (40 psf + 20 psf) × 20 × 5 = 61,000 LB

DEMOLITION = 180 PSF (20 FT × 5 FT) = 18,000 LB

P_{design} = 61,000 LB (0.1) = 6,100 LB

SAY (2) CONNECTIONS / PANEL MIN. TRY USING A MIN. 5/8" Ø A307 BOLT

$R_{rv} = A_b F_{nv} / \Omega$ $A_b = 0.3068 in^2$ $F_{nv} = 24 ksi$ $\Omega = 2.0$

$R_{rv} = (0.3068 in^2)(24 ksi)/2.0 = 3.68^K$/BOLT

3.68^K/BOLT × 2 BOLT/PANEL = 7.36^K > 6.1^K ✓ O.K.

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JOB Middlebury, VT
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DEMOLITION/ERECTION

CHECK A LAG BOLT IN PLACE OF THROUGH BOLT.

TRY USING (2) 3/8" ϕ LAGS/CLIP.

CHECK REQUIRED LENGTH FOR 1,800 LB (DOWN LOAD/PANEL)

ASSUME MIXED MAPLE GRADE MAT G = 0.55 (NDS 11.3.2A)

W' = W × C_D (NDS 2005 TABLE 10.3.1) C_D = 1.25 SNOW LOAD

W = 352 LB/IN (TABLE 11.2A / EQ 11.2-1)

W' = 352 LB/IN (1.25) = 440 LB/IN

USE A MIN OF (2) CLIP SETS ~ 50 (4) LAGS/MAT

1800 LB/4 = 450 LB L_{MIN} = 450/440 = 1.02 IN

TRY 3/8" ϕ × 4" T-C = 2 9/32" (TABLE L2) S = 1.5 IN

W = 2 9/32 × 440 LB/IN = 1004 LB/LAG

IF ASSUME 6100 LB - N_L = 6100 LB / 1004 LB/LAG = 6.08 LAGS

USE (3) SETS OF CLIPS = 6 LAGS / ERECTION MAT

TRY 1/2" × 5" LAG T-C = 2 11/16" W' = 1.25 (352) 2.6875" = 1182.5 LB

N = 6100 LB / 1182.5 LB = 5.1 ⇒ 6_{MIN}

$Z_{\perp}$ = 540 LB (1/4" STEEL W/ MIXED MAPLE) TABLE 11K Z' = 1.25 (540) = 675 LB/LAG

6100 LB / 675 LB/LAG = 9 LAGS → 5 CLIP SETS = 10 LAGS/ERECTION MAT

1800 LB / 675 LB/LAG = 2.67 → 2 CLIP SETS = 4 LAGS/REG. MAT.

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DEMO PLATFORM

MAX REACTION / BEARING = 18^K

MIN DEAD LOAD = 73^{LB}/FT SW + 200^{LB}/FT DECK = 273 LB/FT
MIN LENGTH OF 27'9"
MIN LOAD OF 27.75FT (273 LB/FT) = 7,576^{LB}/BM LINE
/2 = 3788 LB/BRG

A 50psf WIND LOAD x 5FT = 250^{LB}/LF < 273 LB/FT, NO UPLIFT

0.9 D = 3788^{LB} (0.9) = 3409 LB/BR
50psf (5FT)(27.75FT) 1/2 = 3469 ≈ 0.9D SAY OK

SIZE ANCHOR BOLTS TO RESIST 10% OF MAX VERTICAL LOAD

18^K/BRG (0.1) = 1.8^K/BRG

USE (2) 5/8" ANCHOR BOLTS MIN

ASSUME A36 THREAD ROD $F_{nv} = 0.4 F_u = 0.4(58^{ksi}) = 23.2^{ksi}$ (4.4.3.07)

$A_b = 0.307 in^2$/BOLT

$R_{ev} = (0.307 in^2/BOLT)$ 2 BOLT/BRG x 23.2^{ksi} = 14^K ✓ OK