PRE-CAST ABUTMENT AND NEXT-BEAM ERECTION PLAN FOR THE PITTSFIELD ER BRF 022-1(23)

STATE OF VERMONT
PHILIP J. SAVOY
No. 5671
REGISTERED PROFESSIONAL ENGINEER

6-20-14

PREPARED BY COLD RIVER BRIDGES, LLC

REVIEWED BY SAVOY ENGINEERING

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NEXT BEAM ERECTION PLAN

ERECTION SEQUENCE:

Crane #1 is a Demag AC 160 200 ton hydraulic crane. Crane #1 will be positioned at the abutment B Side. Crane # 2 is a Demag AC120 165 ton hydraulic crane.

Crane # 1 will unload the Next Beams from the trailer and place 1 end on the carriage of the launch beam and secured with chain and binders. The far end will be temporarily set onto blocking to allow crane #1 to disconnect the rigging at the launch beam. An excavator will be attached the carriage with chains and or straps and used in-tandem with crane #1 to move the next beams across the launch beam. After the Beam has been moved across the launch beam crane # 2 will be rigged to the next beam crane #1 and # 2 will work in tandem to lift and set the next-beam into its final location. The up-stream beam will be set first and work towards the down-stream beam.

This method was successfully used on the Chester BRF 025-1 (28) and the Plymouth ER BRS 0149(5) projects.

CRANE RADIUS AND WEIGHTS:

PICK AND RADIUS	**OFF LOAD RADIUS (FT)**	**SET ON LAUNCH BEAM RADIUS (FT)**	**OFF LOAD ON HOOK (KIPS)**	**RIGGING WEIGHT (KIPS)**	**TOTAL OFF-LOAD WEIGHT (Kips)**	**CRANE CAPACITY (Kips)**	**SET RADIUS LAUNCH BEAM TO ABUTMENT (FT)**	**TOTAL LOAD (KIPS)**	**CRANE CAPACITY (Kips)**
CRANE									
Demag AC-160	25	25	140.4	4	144.4	148	46	73.2	75.8
Demag AC 120	**N/A**	**N/A**	**N/A**	2	**N/A**	**N/A**	23	73.2	97

RIGGING:

Rigging will consist of 8-30’ (orange swg-500) synthetic sling with a capacity of 40 kips. The slings will be connected to make 4 slings at 60’ with 25 ton shackles. The 60 foot slings will maintain a 60 degree angle from the incline to the horizontal plane during the unloading and setting of the next beams.

LIFTING FORCES:

Lifting forces were analyzed as part of the shop drawings and calculations submitted by JPC Inc.

TEMPORARY STOPPAGE:

No temporary stoppage is anticipated. All work is being performed out-side of the detour.

ABUTMENT ERECTION PLAN

ERECTION SEQUENCE:

Crane #1 is a Demag AC 120 hydraulic crane. Crane #1 will be positioned as shown on the abutment erection plan. Pre-cast abutments will be picked from the truck as shown. Abutment # 1 will be set left to right. Abutment 2 will be set left to right.

CRANE RADIUS AND WEIGHTS: ***CRANE CAPACITY 360 DEGREE CHART

Demag AC 120
OUTRIGGERS FULLY EXTENDED
83,800 LBS. COUNTERWEIGHT
BOOM
LENGTH=88.6,73.2

DESCRIPTION	WEIGHT (KIPS)	RIGGING (KIPS)	TOTAL LOAD (KIPS)	SET RADIUS (FT)	CAPACITY (KIPS)	UNLOAD RADIUS (FT)	CAPACITY (KIPS)
ABUT # 1 SECT 13'-4"	45.3	1.2	46.5	40	76.7	30	86
ABUT # 1 SECT 12'-8"	50.3	1.2	51.5	43	69.2	30	86
ABUT #1 SECT 14.815	59.7	1.2	60.9	46	61.3	30	86
WW #1	35.6	1.2	36.8	30	86	30	86
WW#2	26	1.2	27.2	50	45.4	30	86

DESCRIPTION	WEIGHT (KIPS)	RIGGING (KIPS)	TOTAL LOAD (KIPS)	SET RADIUS (FT)	CAPACITY (KIPS)	UNLOAD RADIUS (FT)	CAPACITY (KIPS)
ABUT # 2 SECT 13'-4"	45.3	1.2	46.5	46	61.3	40	76.7
ABUT # 2 SECT 12'-8"	50.3	1.2	51.5	40	76.7	40	76.7
ABUT #2 SECT 14.815	59.7	1.2	60.9	39	76.7	40	76.7
WW #3	35.6	1.2	36.8	50	45.4	40	76.7
WW#4	26	1.2	27.2	33	77.7	40	76.7

RIGGING:

ABUTMENT AND APPROACH SLABS:

Rigging will consist of 4 orange swg-500 synthetic endless slings with a capacity of 40 kips. Slings will be connected directly to the crane block. 25 ton shackles will be used to connect the slings to the Dayton superior P52-20 ton lifting devices.

LIFTING FORCES:

Lifting forces were analyzed as part of the shop drawings and calculations previously submitted by Cold River Bridges, LLC.

TEMPORARY STOPPAGE:

This work is being performed on a closed section of road. No temporary stoppage is anticipated.

Lifting capacities main boom in 1,000 lb

DEMAG AC 120

83,800 lb **25'1" x 24'7"** **360°** **85 %**

Length of main boom (ft)

Radius (ft)	42.3	57.7	73.2	73.2	88.6	88.6	88.6	104.0	104.3	119.1	119.4	119.4	135.2	135.2	135.2	150.6	150.6	150.6	166.0	166.0	181.4	181.8	189.3	197.0
ft												1,000 lb												
10	330.0*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
10	300.0*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
10	268.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
11	255.5	169.7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
13	231.1	169.7	97.0	169.7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
15	209.6	169.7	97.0	169.7	60.6	97.0	122.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
16	200.2	169.7	97.0	169.5	60.6	97.0	118.1	60.6	97.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
19	175.8	169.4	97.0	160.4	60.6	97.0	110.6	60.6	97.0	72.7	60.9	60.6	–	–	–	–	–	–	–	–	–	–	–	–
23	145.0	144.4	97.0	142.0	60.6	97.0	100.0	60.6	96.9	72.7	58.8	60.6	–	–	–	–	–	–	–	–	–	–	–	–
26	127.7	126.8	97.0	124.2	60.6	97.0	92.7	60.6	90.0	69.4	56.8	60.6	36.3	53.3	55.9	–	–	–	–	–	–	–	–	–
29	112.4	111.5	97.0	109.1	60.6	97.0	86.0	60.6	83.5	65.8	54.6	60.6	36.3	50.5	54.2	32.5	43.0	47.3	–	–	–	–	–	–
33	91.1	95.5	91.9	92.7	60.5	94.4	77.7	60.5	75.9	61.2	51.9	60.6	35.4	46.8	52.8	31.4	41.1	46.2	31.0	33.9	–	–	–	–
39	–	77.8	78.6	75.3	57.5	76.7	67.0	58.7	66.0	54.6	48.7	60.6	32.5	42.3	50.2	28.8	37.6	44.2	28.3	33.5	21.6	26.7	–	–
46	–	60.0	61.3	57.1	52.4	58.7	56.0	54.8	56.5	47.5	45.3	53.2	29.2	38.7	44.9	25.9	34.3	40.2	25.7	31.2	20.7	26.0	22.7	19.3
52	–	–	50.2	46.3	48.3	47.8	45.4	51.0	47.2	41.7	42.3	46.6	26.6	35.0	39.6	23.9	31.7	36.2	23.9	29.2	19.7	25.1	22.0	18.7
59	–	–	40.8	36.8	42.5	38.4	36.0	41.7	37.9	35.9	38.8	39.7	24.0	31.9	34.8	21.8	28.9	32.4	22.0	26.9	18.5	24.2	21.3	17.6
65	–	–	–	–	36.3	32.3	29.9	35.6	31.9	31.5	35.4	33.8	22.2	29.7	31.8	20.2	26.8	29.8	20.8	25.0	17.3	23.0	20.3	16.8
72	–	–	–	–	30.5	26.6	24.1	29.9	26.1	25.9	30.1	28.1	20.3	27.6	28.5	18.7	24.7	26.9	19.4	23.4	16.3	21.6	19.4	16.1
79	–	–	–	–	–	–	–	25.6	21.4	21.2	25.6	23.4	18.9	25.6	23.8	17.3	22.8	24.1	18.2	21.5	14.9	20.0	18.2	14.9
85	–	–	–	–	–	–	–	22.2	18.0	17.8	22.4	20.0	17.6	22.8	20.4	16.3	21.6	21.5	17.2	19.9	14.1	18.5	17.2	14.3
92	–	–	–	–	–	–	–	18.8	14.9	14.5	19.1	16.7	16.5	19.5	17.1	15.1	19.5	18.2	16.0	18.4	13.2	16.9	16.0	13.6
98	–	–	–	–	–	–	–	–	–	12.2	16.7	14.2	15.5	17.1	14.9	14.3	17.1	15.6	15.2	16.6	12.6	15.5	14.8	13.0
105	–	–	–	–	–	–	–	–	–	9.9	14.3	11.9	14.5	14.7	12.3	13.6	14.7	13.2	14.3	14.1	12.1	14.3	13.8	12.3
111	–	–	–	–	–	–	–	–	–	–	–	–	13.9	12.9	10.5	12.6	12.7	11.6	13.3	12.2	11.5	12.5	12.6	11.9
118	–	–	–	–	–	–	–	–	–	–	–	–	12.8	11.2	8.8	11.9	10.8	9.7	12.1	10.3	10.5	10.6	10.6	10.8
124	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11.3	9.6	8.1	10.7	9.1	9.9	9.1	9.3	9.6
131	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10.3	8.2	6.8	9.3	7.5	9.2	7.7	7.7	7.9
138	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9.6	7.0	5.4	7.9	6.3	8.1	6.5	6.5	6.8
144	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.8	5.1	7.1	5.3	5.5	5.7
151	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.7	4.1	6.1	4.3	4.3	4.8
157	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.1	3.3	3.5	4.0
164	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.4	2.6	2.6	2.8
170	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.0	2.2

Boom extension sequence %																								
Tele 1	0	0	0	50	30	50	75	40	67	83	50	70	30	60	80	20	70	85	65	90	50	95	100	100
Tele 2	0	50	50	50	30	50	75	40	67	83	50	70	30	60	80	60	70	85	65	90	100	95	100	100
Tele 3	0	0	50	0	30	50	0	60	67	83	70	70	80	60	70	90	70	70	90	70	100	95	92	100
Tele 4	0	0	0	0	30	0	0	30	0	0	40	20	80	60	35	90	70	55	90	75	100	83	92	100
Tele 5	0	0	0	0	30	0	0	30	0	0	40	20	80	60	35	90	70	55	90	75	100	83	92	100

*) over rear

Lifting capacities main boom

109,800 lb 360° **85 %**

Main boom

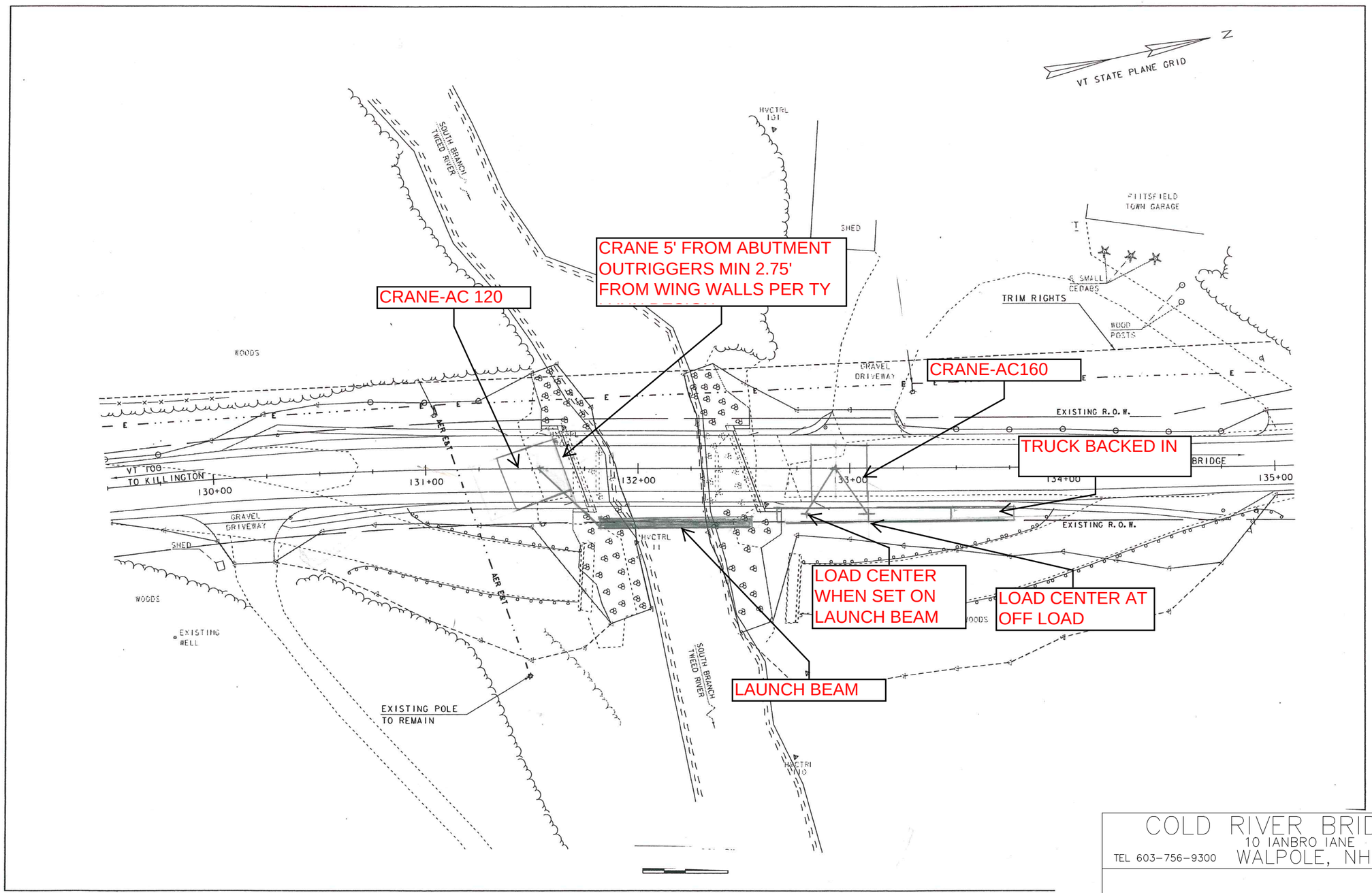
Radius ft	ft	43.0 *	43.0	58.1	73.2	88.3	103.3	118.4	133.5	148.6	163.7	178.8	193.9	209.6	Radius ft
								1,000 lb							
		352.7 **	-	-	-	-	-	-	-	-	-	-	-	-	10
10		286.6	281.1	277.8	264.6	-	-	-	-	-	-	-	-	-	11
11		265.7	257.9	255.7	249.1	-	-	-	-	-	-	-	-	-	13
13		246.9	238.1	238.1	230.4	190.7	-	-	-	-	-	-	-	-	15
15		230.4	221.6	220.5	215.2	184.5	-	-	-	-	-	-	-	-	16
16		215.8	206.6	206.1	201.5	178.4	139.1	-	-	-	-	-	-	-	19
19		190.7	181.4	181.2	178.8	166.2	132.3	97.0	-	-	-	-	-	-	23
23		169.3	161.6	161.2	159.8	154.1	125.4	93.3	79.6	-	-	-	-	-	26
26		148.6	144.4	144.2	142.6	142.2	118.4	89.7	73.4	-	-	-	-	-	29
29		129.0	129.0	129.9	128.1	129.4	111.1	86.2	68.1	59.1	-	-	-	-	33
33		102.1	102.1	116.2	113.1	114.2	103.8	82.5	63.3	54.9	47.2	-	-	-	39
39		-	-	93.7	93.0	91.7	89.7	75.2	55.3	48.3	42.3	35.1	28.0	-	46
46		-	-	77.8	77.4	75.8	77.4	67.7	48.9	42.8	38.1	32.6	28.0	20.5	52
52		-	-	-	65.5	65.0	65.7	62.6	42.5	38.4	34.6	29.5	26.7	20.5	59
59		-	-	-	54.9	56.4	54.9	56.9	39.2	34.0	31.5	27.3	24.7	20.5	65
65		-	-	-	-	48.1	48.1	48.3	36.4	30.9	28.2	25.4	22.9	19.6	72
72		-	-	-	-	41.4	43.2	41.7	33.7	28.2	25.6	23.1	21.4	18.5	79
79		-	-	-	-	-	37.9	36.4	31.3	25.8	23.6	21.2	19.8	17.4	85
85		-	-	-	-	-	33.5	32.0	29.5	23.1	21.6	19.8	18.3	16.5	92
92		-	-	-	-	-	30.0	28.2	28.0	21.4	19.8	18.3	17.0	15.4	98
98		-	-	-	-	-	-	25.1	26.2	19.8	17.9	17.0	15.9	14.3	105
105		-	-	-	-	-	-	23.1	23.6	18.5	16.5	15.4	15.0	13.4	111
111		-	-	-	-	-	-	-	21.4	17.4	15.4	14.1	13.9	12.6	118
118		-	-	-	-	-	-	-	19.2	16.5	14.3	13.2	12.8	11.7	124
124		-	-	-	-	-	-	-	-	15.9	13.0	12.3	11.9	11.0	131
131		-	-	-	-	-	-	-	-	15.2	12.1	11.5	11.2	10.1	138
138		-	-	-	-	-	-	-	-	-	11.5	10.6	10.4	9.5	144
144		-	-	-	-	-	-	-	-	-	11.0	9.7	9.7	8.8	151
151		-	-	-	-	-	-	-	-	-	-	9.3	9.0	8.2	157
157		-	-	-	-	-	-	-	-	-	-	8.8	8.4	7.7	164
164		-	-	-	-	-	-	-	-	-	-	8.4	7.9	7.1	177
177		-	-	-	-	-	-	-	-	-	-	-	6.4	6.2	190
190		-	-	-	-	-	-	-	-	-	-	-	-	4.9	

Remarks

* over rear

** Exceptional load, additional measures required

2



COLD RIVER BRIDGES, LLC
10 IANBRO IANE
TEL 603-756-9300 WALPOLE, NH FAX 603-756-9303

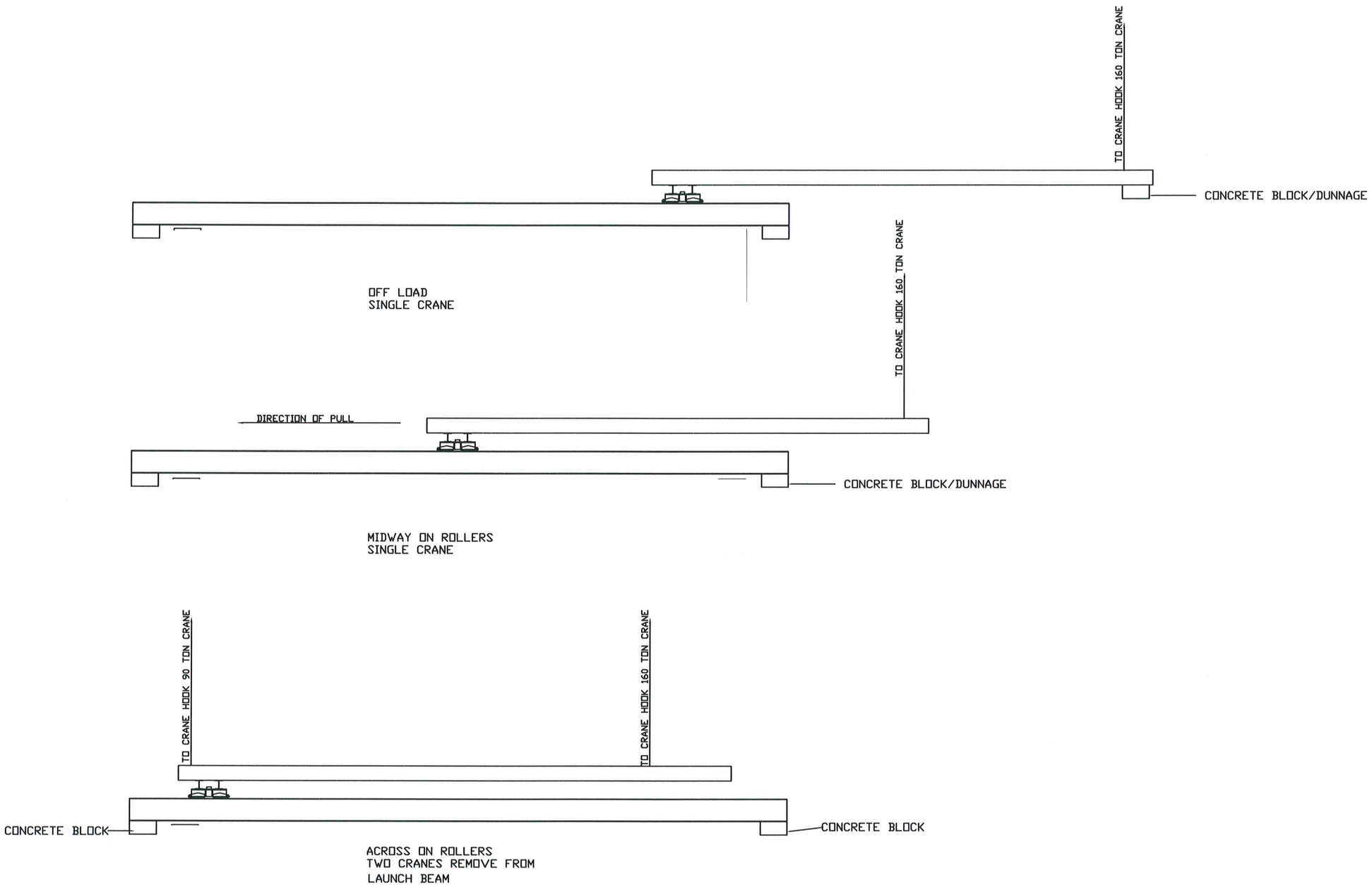
PITTSFIELD ER BRF 022-1(23)

next beam launch plan

SHEET NUMBER 7

DATE:

scale: NTS



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PITTSFIELD ER BRF 022-1(23)

PITTSFIELD ER BRF 0 2 2
1(23)

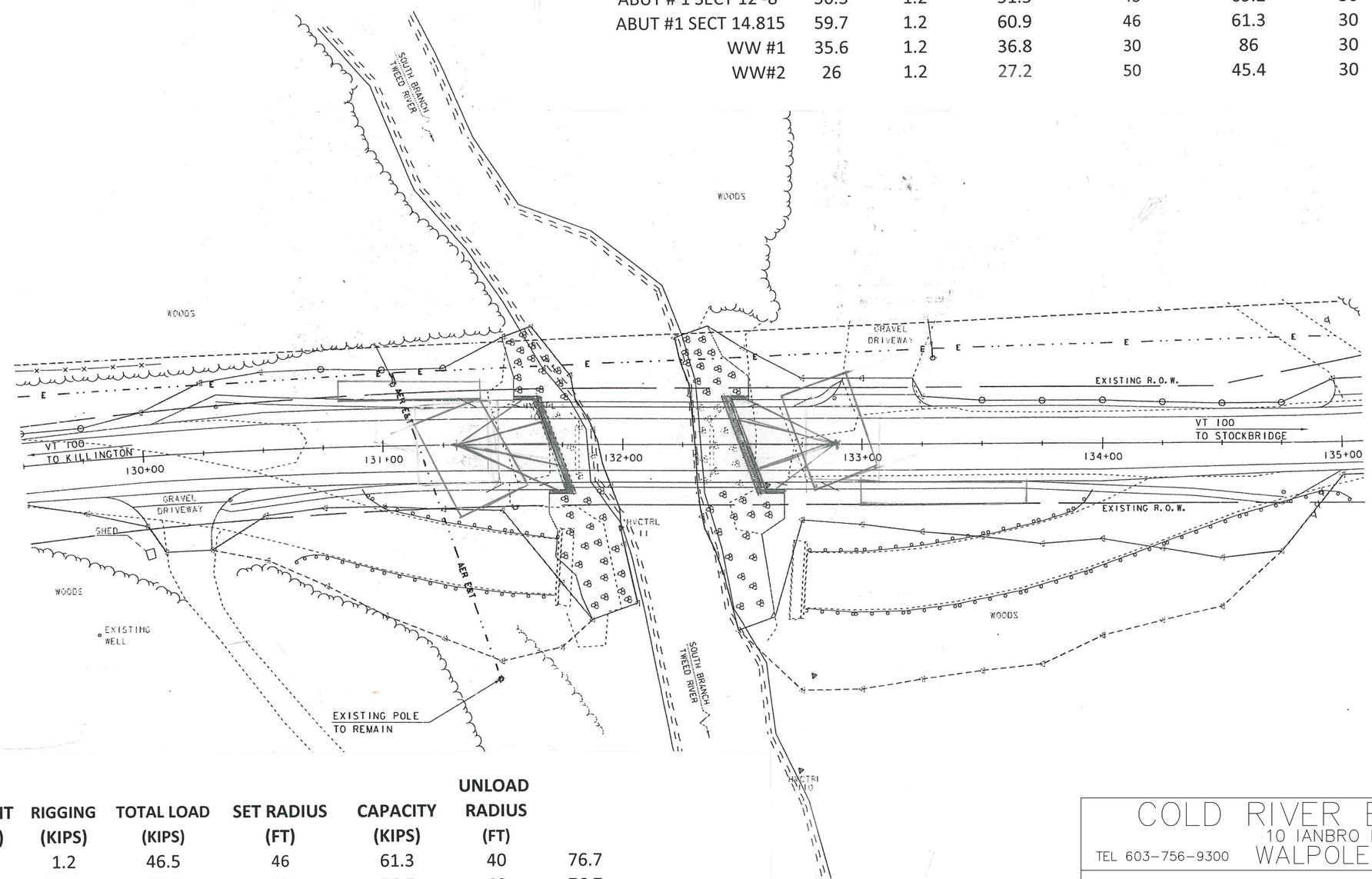
launch sequence

SHEET NUMBER
8

DATE:
scale: NTS

RANE DELMA A 120
UTRI ERS FULL E TENDED
T 83 800 LBS
B M LEN T 88 73 2

DESCRIPTION	WEIGHT (KIPS)	RIGGING (KIPS)	TOTAL LOAD (KIPS)	SET RADIUS (FT)	CAPACITY (KIPS)	UNLOAD RADIUS (FT)	CAPACITY (KIPS)	
ABUT # 1 SECT 13'-4"	45.3	1.2	46.5	40	76.7	30	86	
ABUT # 1 SECT 12'-8"	50.3	1.2	51.5	43	69.2	30	86	
ABUT #1 SECT 14.815	59.7	1.2	60.9	46	61.3	30	86	73.2 FT OF BOOM
WW #1	35.6	1.2	36.8	30	86	30	86	
WW#2	26	1.2	27.2	50	45.4	30	86	



DESCRIPTION	WEIGHT (KIPS)	RIGGING (KIPS)	TOTAL LOAD (KIPS)	SET RADIUS (FT)	CAPACITY (KIPS)	UNLOAD RADIUS (FT)	
ABUT # 2 SECT 13'-4"	45.3	1.2	46.5	46	61.3	40	76.7
ABUT # 2 SECT 12'-8"	50.3	1.2	51.5	40	76.7	40	76.7
ABUT #2 SECT 14.815	59.7	1.2	60.9	39	76.7	40	76.7
WW #3	35.6	1.2	36.8	50	45.4	40	76.7
WW#4	26	1.2	27.2	33	77.7	40	76.7

COLD RIVER BRIDGES, LLC
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PITTSFIELD ER BRF 022-1(23)

ABUTMENT PLAN

SHEET NUMBER 9

DATE:

scale: NTS

ATTACHMENT #1

Eckman Engineering, LLC
1950 Lafayette Road Suite 301, PO Box 3035
Portsmouth, NH 03801
(603) 433-1354 FAX (603) 433-2367

Client: Cold River Bridges
PROJECT: VT Route 103, Bridge 8, Chester, VT
PROJECT NUMBER: 10-225
CALCULATED BY: GDG DATE: 04/01/11
REVISED BY: DATE:
CHECKED BY: DEE DATE: 04/11/11

SUBJECT: Precast Superstructure Erection Plan Calculations

STATE OF VERMONT
DAVID E. ECKMAN
NO. 8211
CIVIL
LICENSED
PROFESSIONAL ENGINEER
4/11/11

References:

"AISC Steel Construction Manual", 13th Edition

Load Factors:

$\gamma_{DL} := 1.20$ $\gamma_{LL} := 1.60$

General Information:

$L_{ctr} := 56ft + 0in$ $Wt_{max} := 120kip$

Going to run (2) W30x173 beams across the bridge connected together using C12x33.9's.
Hillman rollers will be placed on top of the beam and use to support and roll one end of the precast sections across the bridge.
Need to check the capacity of the W30x173 beams to ensure they can handle the required loading.
Each beam will be required to support 1/4 of the precast section weight.

$P_u := \gamma_{DL} \cdot \left(\frac{1}{4} \cdot Wt_{max}\right)$ $P_u = 36.0\,kip$

Beam Properties

Assume the beams are made of A36 steel

$f_y := 36ksi$ $f_u := 58ksi$ $f_r := 10ksi$ $E_s := 29000ksi$

$A_b := 51.0in^2$ $d_b := 30.4in$ $t_w := 0.655in$ $b_f := 15.0in$ $t_f := 1.07in$

$k_{des} := 1.85in$ $w_{beam} := 173plf$ $b_{2t} := 7.04$ $h_{tw} := 40.8$

$I_x := 8230in^4$ $S_x := 541in^3$ $Z_x := 607in^3$ $r_y := 3.42in$

$r_{ts} := 4.03in$ $h_o := 29.4in$ $J := 15.6in^4$ $c_b := 1.0$

The W30x173 beams each have a C12x25 on top as part of the Hillman roller setup

$w_{ch} := 25plf$

Maximum Shear and Moment

$w_u := \gamma_{DL} \cdot (w_{beam} + w_{ch})$ $w_u = 238\,plf$

$V_u := P_u + \left(\frac{w_u \cdot L_{ctr}}{2}\right)$ $V_u = 42.7\,kip$

$M_u := \frac{P_u \cdot L_{ctr}}{4} + \frac{w_u \cdot L_{ctr}^2}{8}$ $M_u = 597\,ft\,kip$

Lateral-Torsional Buckling

$L_b := 20ft + 0in$

$L_p := 1.76 \cdot r_y \cdot \sqrt{\frac{E_s}{f_y}}$ $\quad L_p = 14.2\ ft$

$M_p := f_y \cdot Z_x$ $\quad M_p = 1821\ kip \cdot ft$

$F_L := f_y - f_r$ $\quad F_L = 26\ ksi$

$M_r := F_L \cdot S_x$ $\quad M_r = 1172\ kip \cdot ft$

$$L_r := 1.95 \cdot r_{ts} \cdot \frac{E_s}{0.7 \cdot f_y} \cdot \sqrt{\frac{J \cdot c_b}{S_x \cdot h_o}} \cdot \sqrt{1 + \sqrt{1 + 6.76 \cdot \left(\frac{0.7 \cdot f_y}{E_s}\right) \cdot \left(\frac{S_x \cdot h_o}{J \cdot c_b}\right)}}$$ $\quad L_r = 45.1\ ft$

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Since $L_p > L_b > L_r$, the allowable moment equation is:

$$M_n = C_b \cdot \left[M_p - \left(M_p - 0.7 \cdot f_y \cdot S_x\right) \cdot \left(\frac{L_b - L_p}{L_r - L_p}\right)\right] \le M_p$$

Check Bending Moment

$\phi_b := 0.90$ $\quad M_u = 597\ kip \cdot ft$

$M_a := 468 kip \cdot ft$ (Moment at 1/4 point of unbraced length)

$M_b := 597 kip \cdot ft$ (Moment at 1/2 point of unbraced length)

$M_c := 487.3 kip \cdot ft$ (Moment at 3/4 point of unbraced length)

$$C_b := \frac{12.5 \cdot M_u}{2.5M_u + 3M_a + 4M_b + 3M_c}$$ $\quad C_b = 1.11$

$$M_n := \min\left[C_b \cdot \left[M_p - \left(M_p - 0.7 \cdot f_y \cdot S_x\right) \cdot \left(\frac{L_b - L_p}{L_r - L_p}\right)\right], M_p\right]$$ $\quad M_n = 1821\ kip \cdot ft$

$\phi M_n := \phi_b \cdot M_n$ $\quad \phi M_n = 1639\ kip \cdot ft$

$$Check := \begin{cases} \text{"W30x173 Beam Bending Moment OK"} & \text{if } \phi M_n > M_u \\ \text{"W30x173 Beam Bending Moment Not OK"} & \text{otherwise} \end{cases}$$

Check = "W30x173 Beam Bending Moment OK"

Check Shear

$\phi_v := 0.90$ $\quad V_u = 43\ kip$

$A_w := d_b \cdot t_w$ $\quad A_w = 19.9\ in^2$

$$C_v := \begin{cases} 1.0 & \text{if } h_{tw} \le 2.24 \cdot \sqrt{\frac{E_s}{f_y}} \\ \text{"Calculate"} & \text{otherwise} \end{cases}$$ $\quad C_v = 1.0$

$V_n := 0.60 \cdot f_y \cdot A_w \cdot C_v$ $\qquad V_n = 430\,\text{kip}$

$\phi V_n := \phi_v \cdot V_n$ $\qquad \phi V_n = 387\,\text{kip}$

$$\text{Check} := \begin{cases} \text{"W30x173 Beam Shear OK"} & \text{if } \phi V_n > V_u \\ \text{"W30x173 Beam Shear Not OK"} & \text{otherwise} \end{cases}$$

Check = "W30x173 Beam Shear OK"

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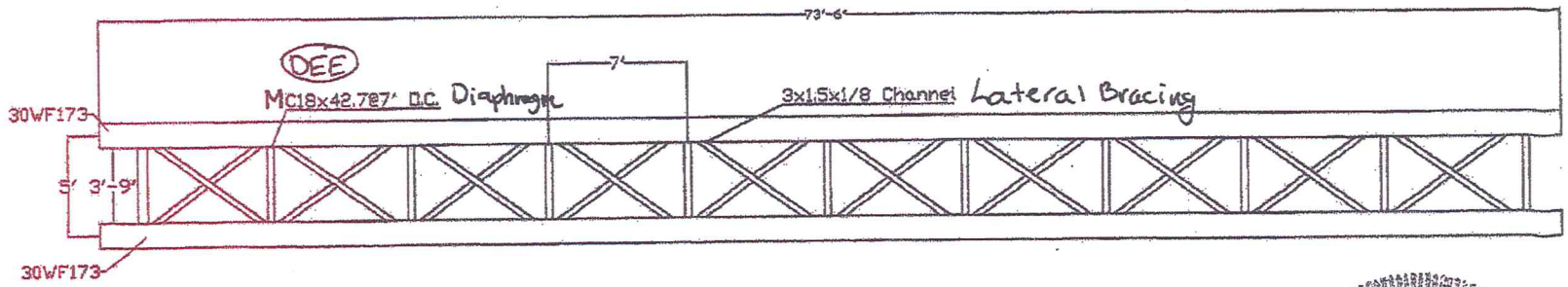

Launch Beam Plan View

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LAUNCH BEAM NOTES:

1) DESIGN METHOD USED IS LOAD RESISTANCE FACTOR DESIGN (LRFD)

2) ALL NEW STRUCTURAL STEEL SHALL CONFORM TO AASHTO M 270, GRADE 50.

3) ALL WELDING AND THE PREPARATION AND ASSEMBLY OF MATERIAL FOR WELDING SHALL CONFORM TO THE VTRANS STANDARD SPECIFICATIONS, THE WELDING CODE, AND ALL INTERIM REVISIONS.

4) ALL WELDING SHALL BE COMPLETED BY A CERTIFIED WELDER.

5) ALL BOLTED CONNECTIONS SHALL BE SLIP-CRITICAL WITH HOLES $\frac{1}{16}$" ø LARGER THAN THE REQUIRED BOLT. ALL BOLTS, NUTS, AND WASHERS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 164 (ASTM A 325) UNLESS OTHERWISE NOTED. BOLT THREADS SHALL BE EXCLUDED FROM THE SHEAR PLANE.

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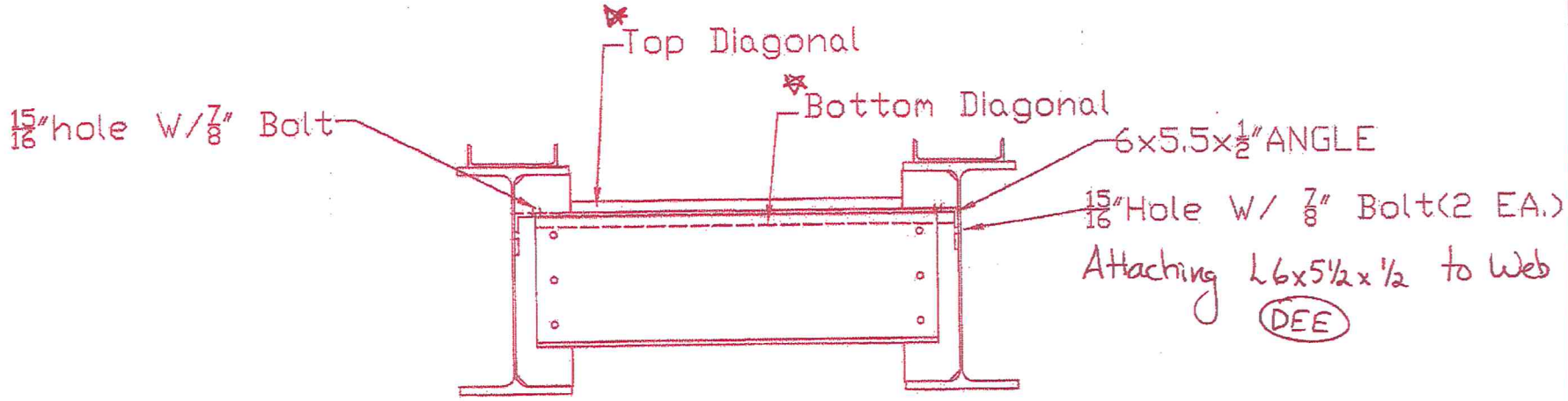
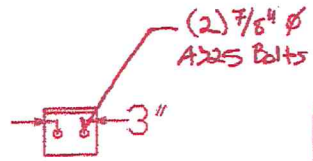
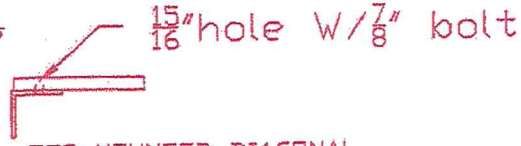
CHESTER BRF 025-1(28)	
LAUNCH BEAM DETAILS	SHEET NUMBER 5
DATE 4-29-11 Scale:	





6x5.5x½"ANGLE
Connection
To W30x173



TOP MOUNTED DIAGONAL

BOTTOM MOUNTED DIAGONAL

Connections To
L6x5½x½

*Note

① Top & Bottom diagonal to provide lateral bracing of the W30x173 compression flange.

② See connection details for lateral bracing this plan.

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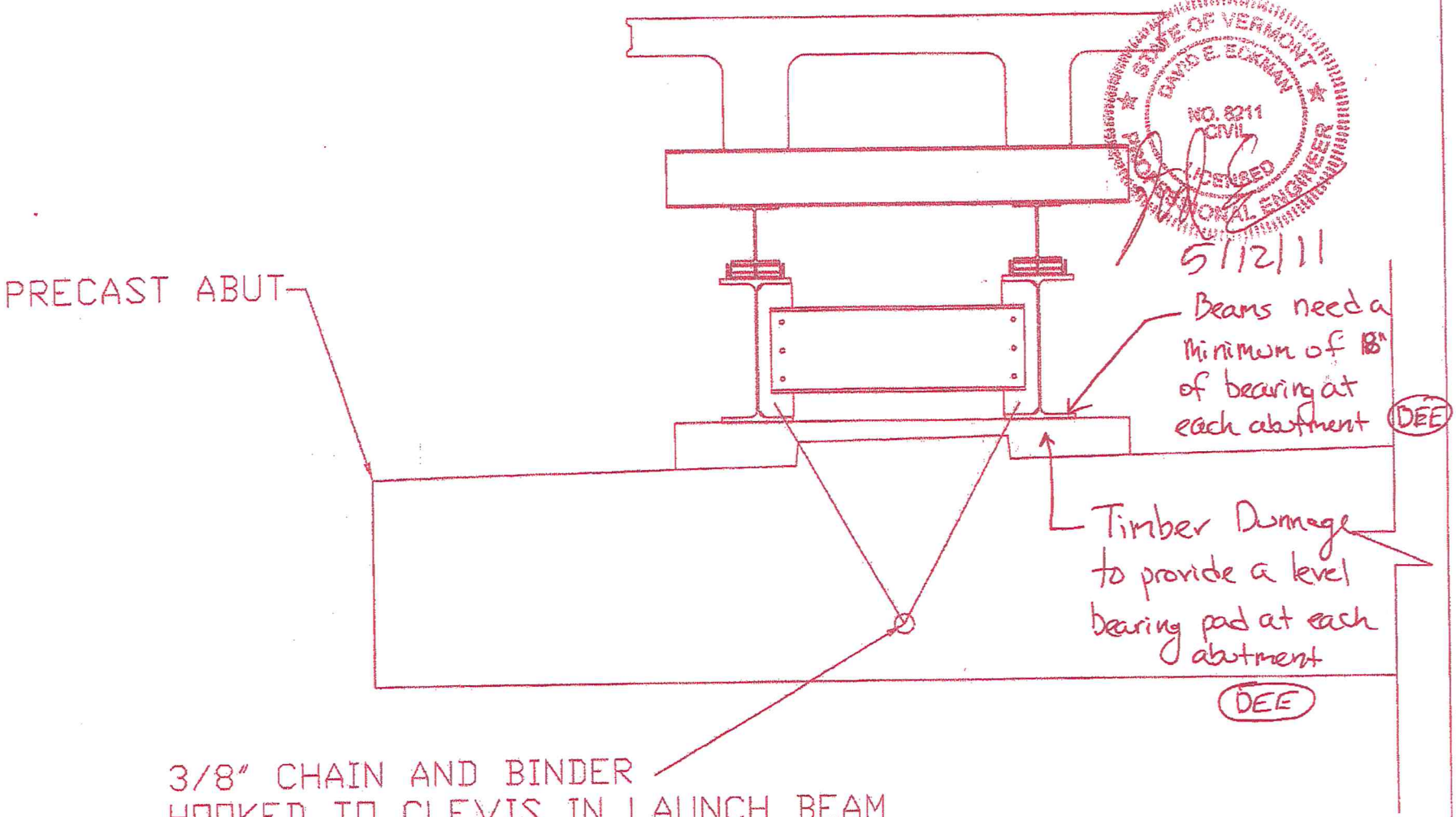
LAUNCH BEAM DETAILS	SHEET NUMBER 4
DATE: 4-28-11	Scale:



3/8" CHAIN AND BINDER
HOOKED TO CLEVIS IN LAUNCH BEAM
FRONT SIDE ONLY. 1" ROD W/ EYE BOLT
THREW WEEP HOLE

* TOP DIAGONAL NOT SHOWN FOR CLARITY

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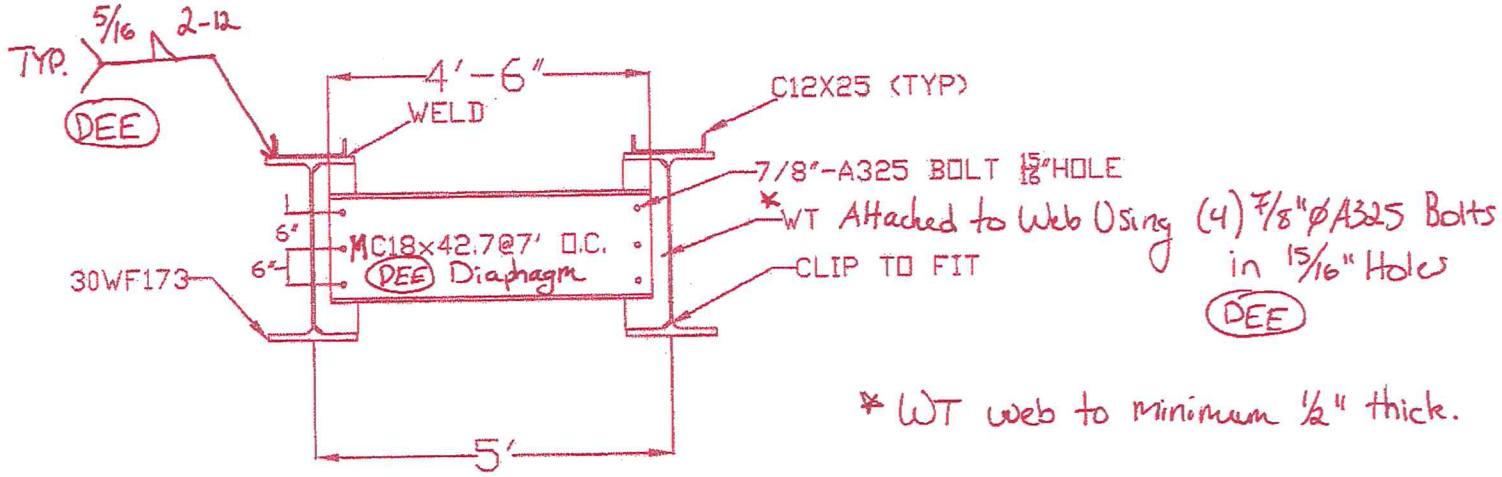
CHESTER BRF 025-1(28)

LAUNCH BEAM DETAILS

SHEET NUMBER 2

DATE: 4-25-11 SCALE:



TYPICAL NEXT BEAM LAUNCH BEAM DETAIL

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* TOP DIAGONAL NOT SHOWN FOR CLARITY

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CHESTER BRF 025-1(28)	
LAUNCH BEAM DETAILS	SHEET NUMBER 3
DATE: 4-25-11	scale: