J. A. McDONALD, INC.

P.O. Box 132, Lyndon Center, VT 05850 (802) 626-5201
E-Mail jamcdonaldinc@charter.net

CLARENDON BRO 1443(48)
BRIDGE #11
ERECTION PLAN
Supplement to Address Review Comments Dated 6/15/16

- *Show overhead utilities on plan sheets.* Relocated overhead utilities have now been shown on plans. Precast components shall be erected in accordance with OSHA regulations regarding separation. JA McDonald has confirmed with Green Mountain Power representative (Eric McLellan) the line voltage of the relocated overhead power lines of 7200 Volts.

- *Specify requirements for outrigger supports.* Crane outriggers will be positioned on 4' X 12' timber outrigger mats, set on prepared firm, unyielding stone pad.

- *Specify rigging for approach slabs.* See Attached Rigging List

- *Per Contract Plans General Note 43 on Sheet 3/59, backfill shall be limited to the height of 3' below the bridge seat elevaction of the NEXT beams. This needs to be clear in the plan.* JA McDonald incorporates into its Erection Plan General Note 43 found on Sheet 3 of 59 which states: "The backfill behind the abutments shall be limited to a height of 3'-0" below the bridge seat and no cranes shall be closer than 1'-0" to the abutment during the erection of the superstructure" See attached Sketch SK-7

- *Specify support elevation.* The top elevation of the temporary shoring tower is 642.5 as noted on AH Harris Shoring Plan & Section. Elevation noted on Sketches SK-5 & SK-6

- *Abutment General Note #5 on Sheet C1 of the approved fabrication drawings states that vertical forces are to be applied to the lifting loops. The fabricator's lifting loop design for the abutments does not appear to account for horizontal lifting forces. If sling angles less than 90 degrees to the horizontal are required, provide documentation from the fabricator that this is acceptable with supporting design calculations stamped by a PE if necessary.* See attached documentation.

- *The abutments have 4 lifting loops but only 2 straps and shackles are specified in the rigging lists. Provide more information on how the abutments are rigged.* See attached revised rigging list.

Digitally signed by Andy White
Date: 2016.06.29 09:52:53
-04'00'

STATE OF VERMONT
ANDREW D. WHITE
NO. 9030
STRUCTURAL
LICENSED
PROFESSIONAL ENGINEER

CCS Constructors, Inc.
June 29, 2016

Rigging List

Project Clarendon
Customer JAM
Description Abutments

Grove GMK5275

104.2' Main Boom at 67.4°
Base: 100% Outriggers
Counterweight: 112,400 lbs
35' Lift Radius (360°)
Crane Capacity at 35' = 124,000 lbs

Item	Capacity	Weight	Qty	Total Weight
Hoist Line		200 lbs	1	200 lbs
Block		2,500 lbs	1	2,500 lbs
Hook			1	
Tuffy Flexi-Grip 40' Black V-53000#	26.5 t	126 lbs	4	504 lbs
Crosby Shackle G-209 2"	35 t	45 lbs	4	180 lbs
Total Rigging Weight				**3,384 lbs**
Load				115,400 lbs
Total Load				**118,784 lbs**

96% of capacity

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Rigging List

Project	Clarendon
Customer	JAM
Description	Abutment

Liebherr LTM 1220-5.2

85.9' Telescopic Boom (T) at 59°
Base: 100% Outriggers (29.2' x 27.2')
Counterweight: 163,100 lbs
40' Lift Radius (360°)
Crane Capacity at 40' = 125,300 lbs

Item	Capacity	Weight	Qty	Total Weight
Hoist Line		200 lbs	1	200 lbs
Block		2,500 lbs	1	2,500 lbs
Hook			1	
Tuffy Flexi-Grip 40' Black V-90000#	45 t	194 lbs	4	776 lbs
Crosby Shackle G-209 2"	35 t	45 lbs	4	180 lbs
Total Rigging Weight				**3,656 lbs**
Load				118,640 lbs
Total Load				**122,296 lbs**

98% of capacity

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Rigging List

Project Clarendon
Contractor JA McDonald, Inc.
Description Approach Slabs

Link-Belt RTC8050 Series II

80' Telescopic Boom
Base 100% Outriggers (22.5' X 22.5')
Counterweight: 12,500 lbs fixed
40' Lift Radius (360◦)
Crane Capacity at 40' = 21,500 lbs

Item	Capacity	Weight	Qty	Total Weight
Hoist Line		200 lbs	1	200 lbs
Block	40 t	700 lbs	1	700 Lbs
Hook			1	
4 Leg 10' Cable Bridle Sling	34 t	250 lbs	1	250 lbs
Crosby Shackle G-209 7/8"	6.5 t	3.38 lbs	4	13.52 lbs
Total Rigging Weight				**1163.52 lbs**
Load				12,900 Lbs
Total Load				**14,063.52 lbs**

65% of Capacity

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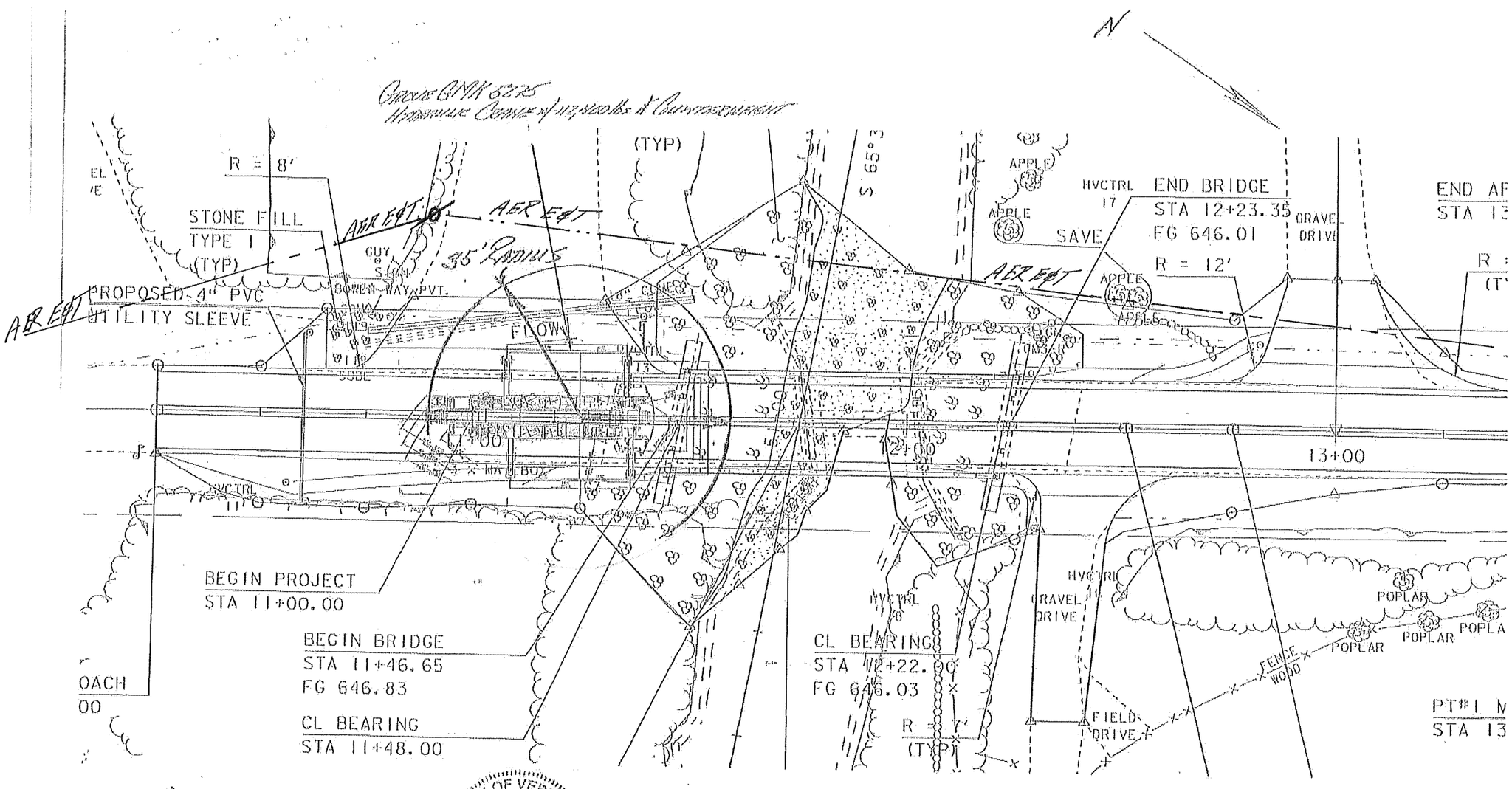

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Scale 1" = 20'

Clarendon BRO 1443(48) Erection Plan Abutment #1 SK-1.0

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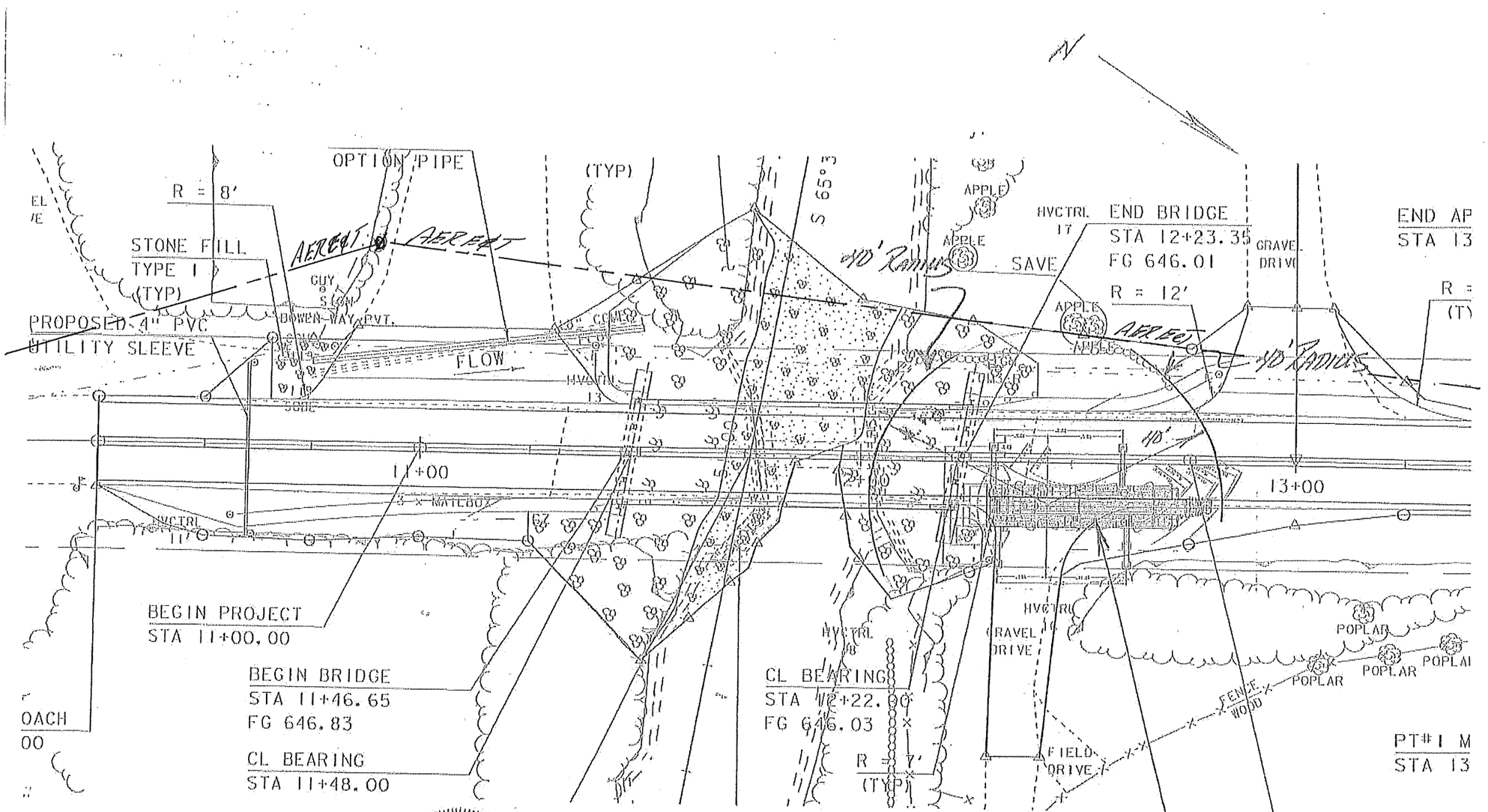
Rev 1.0 – Show Overhead Utilities



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Liebherr LTM 1220-5.2
Hydraulic Crane w/ 163,100 lbs of Counter-Weight

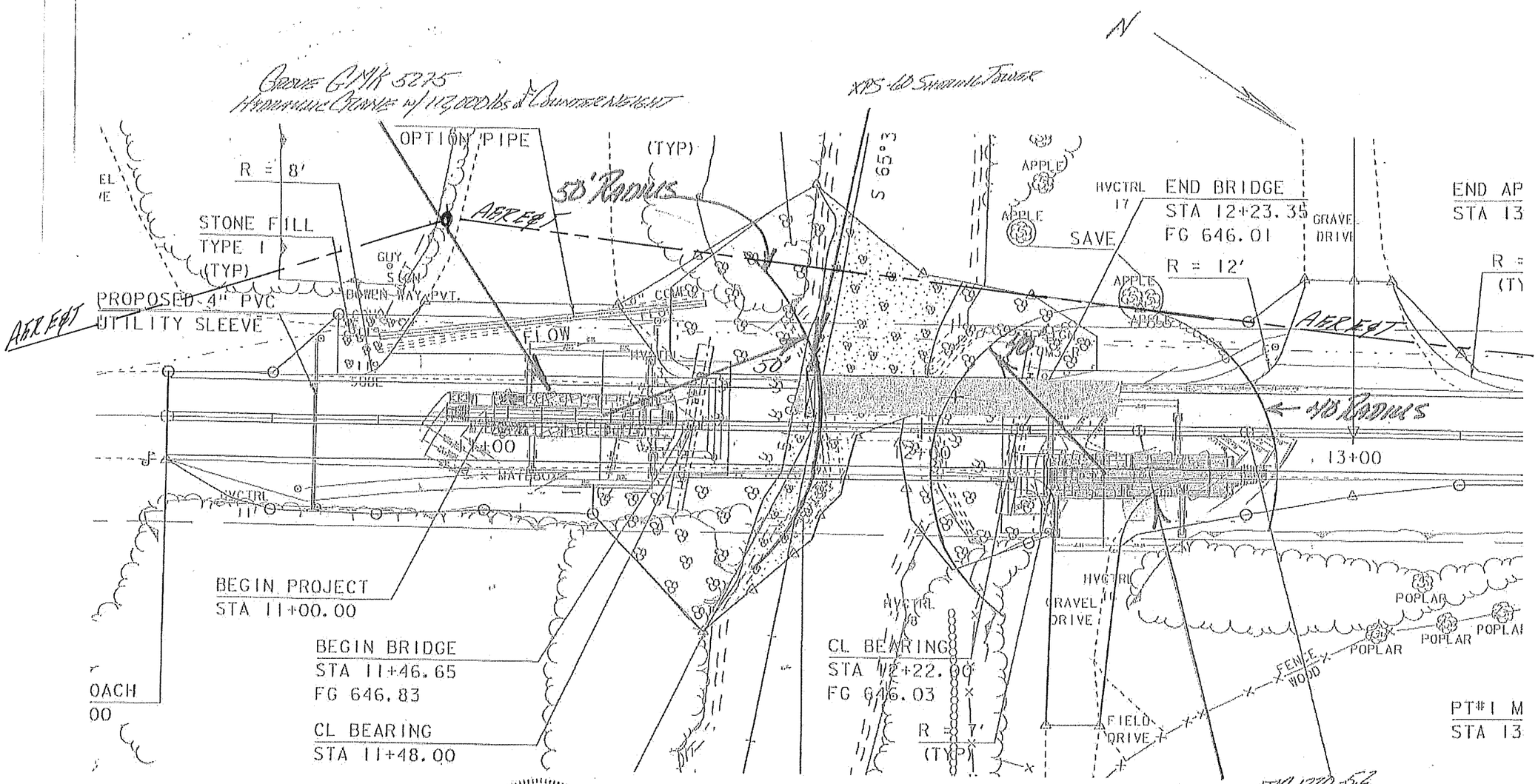
Scale 1" = 20'

Clarendon BRO 1443(48) Erection Plan Abutment #2

SK2.0

CCS CONSTRUCTORS, INC.

Rev 1.0 Show Overhead Utilities



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Scale 1" = 20'

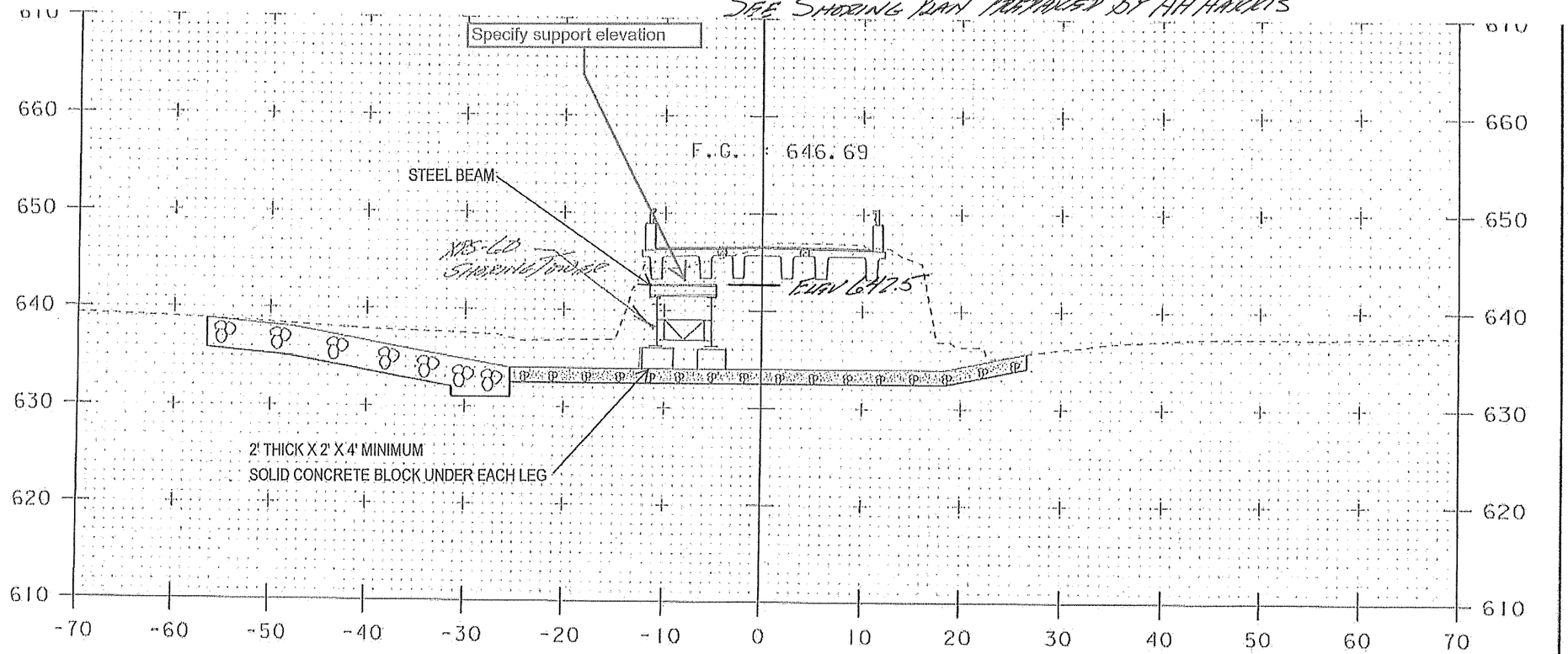
Clarendon BRO 1443(48) Erection Plan Next Beams

SK 3.0

CCS CONSTRUCTORS, INC.

Rev 1.0 Show Overhead Utilities

SEE SHORING PLAN PREPARED BY AH HARRIS



NOTE: FOUR SHORING TOWER FOUNDATION BLOCKS SHALL BE LEVEL
AND SHORING TOWER SHALL BE PLUMB FOR SUPPORTING NEXT BEAM WEIGHT.

11+75

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SK-5

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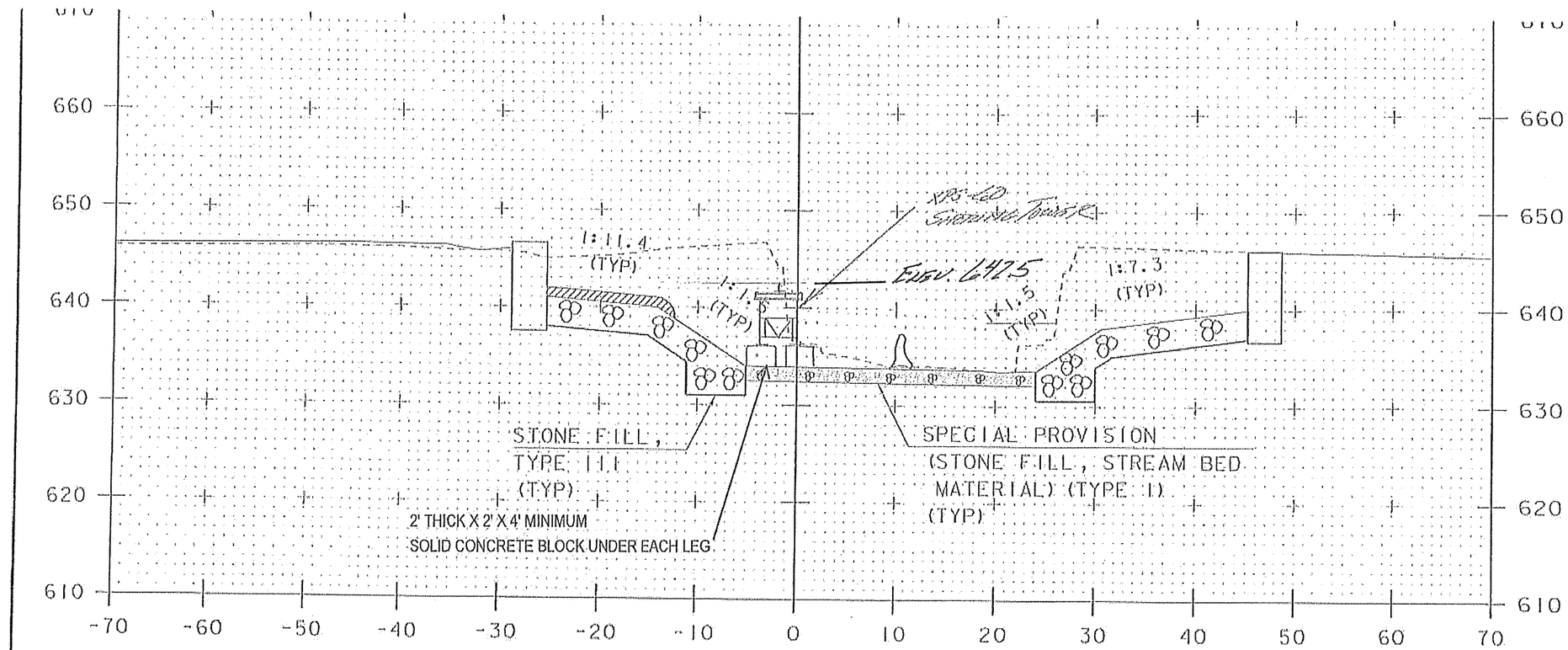
REV 1.0 SPECIFY SUPPORT ELEV.



NOTE: FOUR SHORING TOWER FOUNDATION BLOCKS SHALL BE LEVEL
AND SHORING TOWER SHALL BE PLUMB FOR SUPPORTING NEXT BEAM WEIGHT.

51+10

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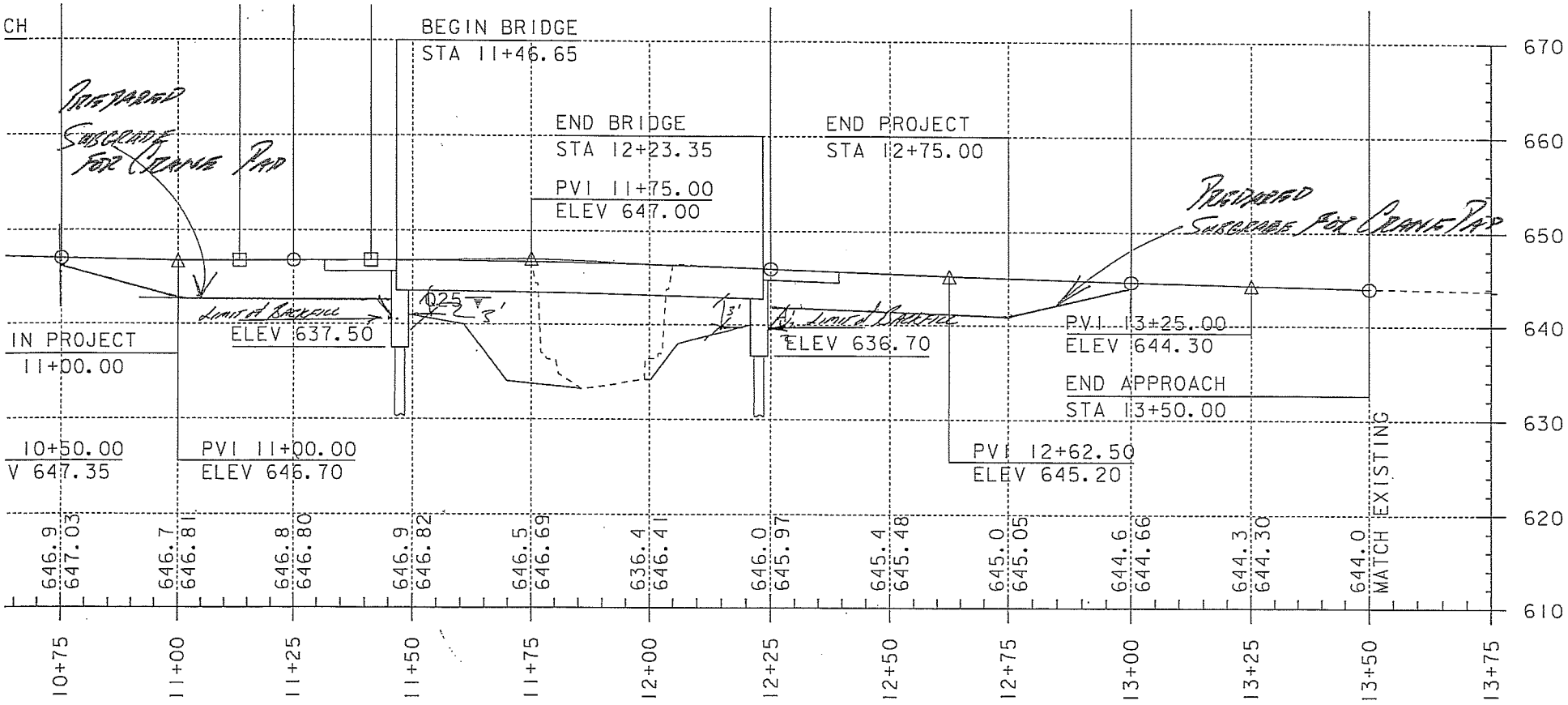
SK-6

CCS CONSTRUCTORS, INC.

Rev 1.0. Specify Support Elev



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ANDREW D. WHITE
NO. 9030
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Clarendon BRO 1443(48)

See General Note #43
Sheet 3 of 57

43. THE BACKFILL BEHIND THE ABUTMENTS SHALL BE LIMITED TO A HEIGHT OF 3'-0" BELOW THE BRIDGE SEAT AND NO CRANES SHALL BE CLOSER THAN 1'-0" TO THE ABUTMENT DURING THE ERECTION OF THE SUPERSTRUCTURE.

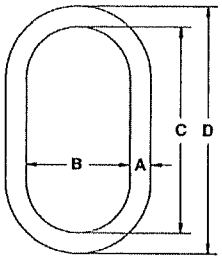
SK-7

Sling Removal Criteria
The Flexibility of Slings
Rigging Guidelines
Unirope Tag System

DETAILED WIRE ROPE LIFTING SLING DATA:

9-part Gator-Flex® Slings
9-part Gator-Laid® Slings (for short sling lengths)
3-part Tri-Flex® Slings
Single Part Standard Slings
2-Leg Uni-Loc® Bridle Slings
3-Leg Uni-Loc® Bridle Slings
4-Leg Uni-Loc® Bridle Slings
Endless Swaged Grommet Slings

Additional Information – 4-Leg Uni-Loc® Bridle Slings



SLING LINKS DIMENSIONS

Sling Dia. Inch	A	B	C	D
1/4	1/2	2.76	4.72	5.72
5/16	5/8	3.15	5.50	6.75
3/8	3/4	3.54	5.90	7.50
-	7/8	3.75	6.30	8.05
7/16 to 9/16	1	4.33	7.50	9.50
5/8	1-1/4	4.75	7.88	10.28
3/4	1-1/2	5.91	9.84	12.84
7/8, 1	1-3/4	7.09	11.81	15.30
1-1/8	2	7.67	13.77	17.75
1-1/4	2-1/4	8.66	16.12	20.62
1-3/8, 1-1/2	2-3/4	10.43	19.30	24.75

STANDARD SLING COMPONENTS

Sling Dia. Inch	4-Leg WLL 60° horiz. Tons	Shackle Size Nominal	Shackle WLL Tons	Shackle Pin. Dia. Inch	Eye Hook Size Tons	Swivel Hook Size Tons	Self Locking Hook Size Nominal	Self Locking Swivel Hook Size Nominal
1/4	2.2	5/16	0.75	0.38	0.75 C	0.75 C	8	8
5/16	3.5	3/8	1.00	0.44	1 C	1 C	8	8
3/8	5.0	7/16	1.50	0.50	1.50 C	1.50 C	8	8
7/16	6.7	1/2	2.00	0.63	2 C	2 C	8	8
1/2	8.8	5/8	3.25	0.75	3 A	3 A	10	10
9/16	11.0	5/8	3.25	0.75	5 A	5 A	13	13
5/8	14.0	3/4	4.75	0.88	5 A	5 A	13	13
3/4	19.0	7/8	6.50	1.00	7 A	7 A	16	16
7/8	26.0	1	8.50	1.13	7 A	7 A	16	16
1	34.0	1-1/4	12.00	1.38	11 A	11 A	19	19
1-1/8	42.0	1-1/4	12.00	1.38	15 A	15 A	22	22
1-1/4	51.0	1-1/2	17.00	1.63	15 A	15 A	26	26
1-3/8	62.0	1-3/4	25.00	2.00	22 A	22 A	26	26
1-1/2	73.0	1-3/4	25.00	2.00	22 A	22 A	28	n/a
1-3/4	98.0	2	35.00	2.25	30 A	30 A	n/a	n/a
2	127.0	2-1/2	55.00	2.75	37 A	n/a	n/a	n/a

JOSEPH P. CARRARA & SONS, INC.

LETTER OF TRANSMITTAL

2464 CASE STREET
MIDDLEBURY, VERMONT 05753

TEL (802) 388-6363
FAX (802) 388-9010

DATE: June 23, 2016

JOB NO.: 23476-016

ATTENTION: Mark Boudreau

RE: Walker Mountain Road Bridge Bridge #11
Rutland, VT
VTAOT Project # BRO 1443 (48)

TO: J.A. McDonald, Inc.
585 Gilman Road PO Box 132
Lyndon Center, VT 05850

P 802-626-5201 F 802-626-8011

WE ARE SENDING YOU [x] Attached [ ] Under separate cover via _____ the following items:

[ ] Shop Drawings [ ] Prints [ ] Plans [ ] Samples [ ] Specifications

[ ] Copy of Letter [ ] Change Order [ ] Other:

COPIES	DATE	NO.	DESCRIPTION
1			Abutment Lifting Loop Calculations - Supplement 1

THESE ARE TRANSMITTED as checked below:

[x] For approval [ ] Approved as submitted [ ] Resubmit ____ copies for approval

[x] For your use [ ] Approved as noted [ ] Submit ____ copies for distribution

[x] As requested [ ] Returned for corrections [ ] Return ____ corrected prints

[ ] For review and comment [ ]

[ ] FOR BIDS DUE _____ 20 [ ] PRINTS RETURNED AFTER LOAN TO US

REMARKS:

Mark

See Revised Lifting Loop Calculations for Clarendon Abutments which allows for a 60 degree minimum sling angle. Please forward to EOR for approval.

COPY TO:

SIGNED: MA Davis
Michael A. Davis

If enclosures are not as noted, please notify us at once.

TH3, BRIDGE 11 BRO 1443 (48)
CLARENDON, VT

STATE OF VERMONT
ERNEST J. BROD
NO. 3814
CIVIL
LICENSED
PROFESSIONAL ENGINEER

LIFT LOOP DESIGN CALCULATIONS

SUPPLEMENT #1

(WORK WITH JPC SHOP DRAWINGS)

THIS SUPPLEMENT IS ISSUED TO EVALUATE THE CONTRACTOR REQUEST TO LIFT PRECAST ABUTMENTS WITH A NON-VERTICAL LIFTING ANGLE IN THE FIELD. THE HANDLING OF ABUTMENTS IN THE PLANT AND HANDLING OF ALL OTHER PRECAST SHALL BE IN ACCORDANCE WITH PREVIOUSLY ISSUED DESIGN CALCULATIONS.

PRECAST ABUTMENTS $f'_c = 5000$ PSI $f'_{ci} = 5000$ PSI

FIELD HANDLING (FROM PREVIOUS CALCULATIONS)

'C-AB1' $W_T = 115{,}600$ # $R_1 = 55.7^K$ $R_2 = 64.3^K$

'C-AB2' $W_T = 120{,}000$ # $R_1 = R_2 = 57.8^K$

VERTICAL REACTIONS FROM ORIGINAL DESIGN CALCULATIONS

IN REVIEW, MAX. DESIGN LOAD ON (2) LIFT LOOPS IN FIELD, BASED ON 60° MIN. SLING ANGLE IS $64.3^K / 0.866(2) = 37.1^K$

▷ FROM PCI LITERATURE, TABLE 5.2.3:

USE (4) 0.600" ϕ 270 KSI STRAND LIFT LOOPS,

MINIMUM EMBEDMENT 5'-0".

SWL (4:1 S.F.) = $\left(\frac{41+29}{2}\right) \times 1.1 = 38.5^K \rightarrow 37.1^K$, O.K. ✓

▷ ALSO CHECK USING PCI FIGURE 6.15.7A, CASE 6, ATTACHED:

$$\phi P_c = \phi 2.67 \lambda (f'_c)^{0.5} (x_1)(y_1)$$

$$= (0.85)(2.67)(1.0)(5000)^{0.5}(42")(51")/1000$$

$$= 343.7^K$$

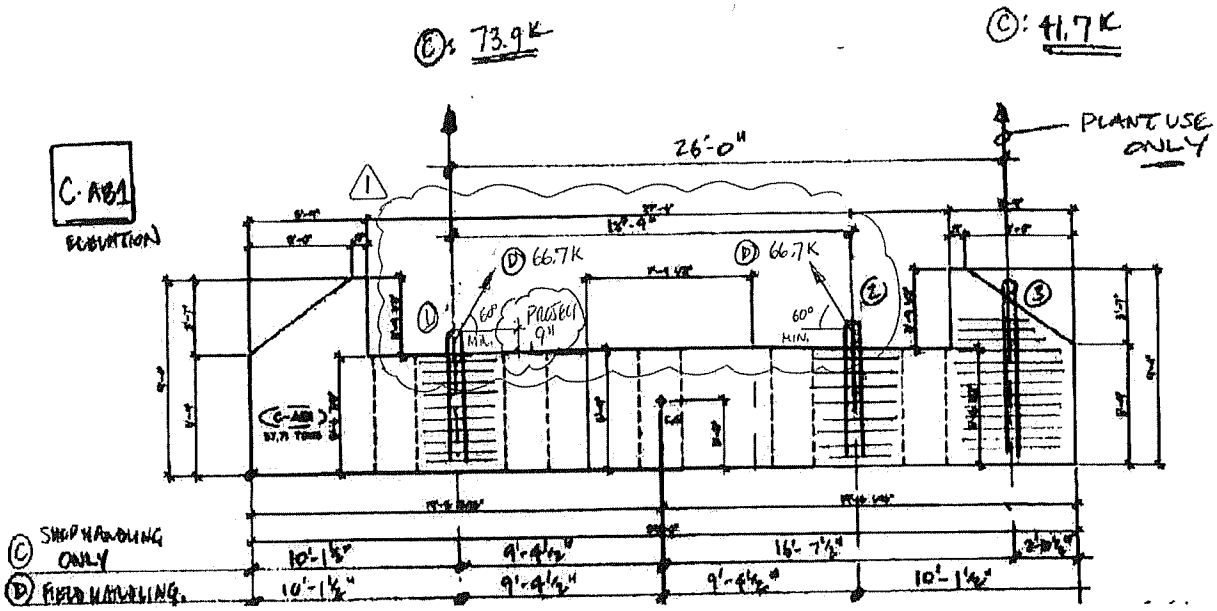
FOR S.F. 4:1

$$SWL = 343.7/4 = 85.9^K \text{ FOR (2) LOOPS} > (2) \times 37.1^K = 74.2^K, \text{ O.K.} ✓$$

IN SUMMARY, IT IS ACCEPTABLE TO HANDLE ABUTMENTS WITH LIFT LOOPS DESIGNATED FOR FIELD USE WITH A MINIMUM 60° FROM HORIZONTAL SLING ANGLE. THESE LIFT LOOPS SHALL BE SHORTENED TO PROJECT 9" ABOVE THE BEARING SEAT TO FACILITATE HANDLING. RIGGING LENGTHS SHALL BE ADJUSTED FOR 'C-AB2' TO PICK ABOVE CG WHILE MAINTAINING MIN. 60° ANGLE.

Bridge 11, Clarendon, VT
Abutment Handling

J. P. Carrara & Sons, Inc.
Project 23476-015



C-AB1 Abutment Elevation Schematic

Install (3) sets of (2) Lift Loops consisting of (4) 0.6" diameter 270 ksi prestressing strands each, with minimum 5'0" embedment and projection above cheek walls. In plant use lift loops at location 1 & 3 with lift plate A or B at location 1 and (3) 25-ton cranes. In field use lift loops at location 1 & 2.

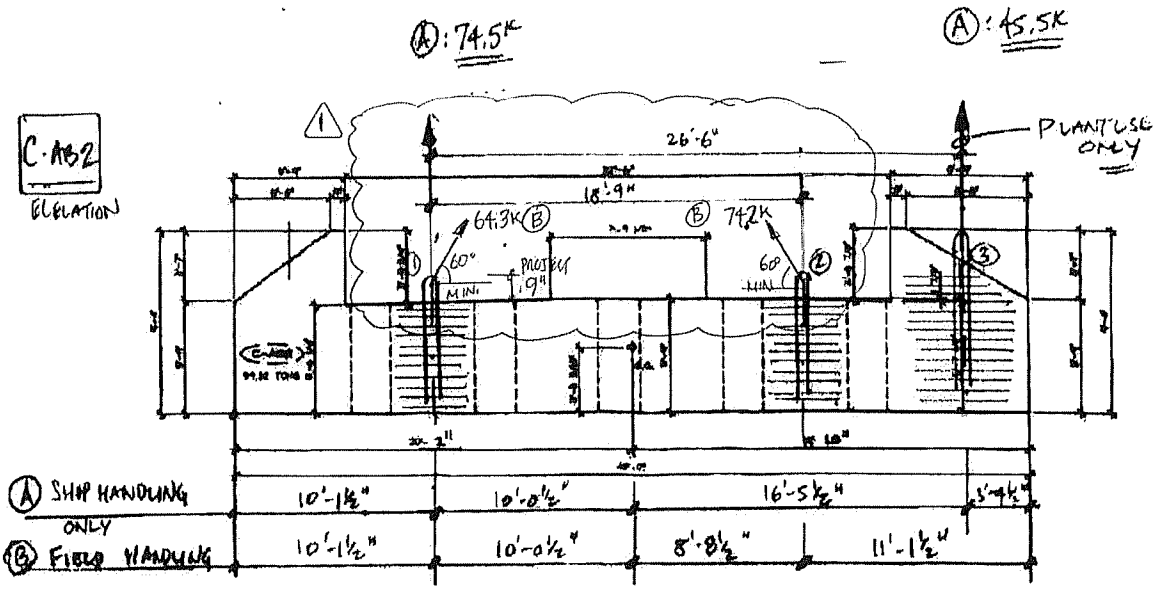
NTS.

1 ORIGINAL $R_1 = R_2 = 57.8K$

$R_{1-60°} = R_{2-60°} = 57.8/0.866 = 66.7K$ EA (2) LOOPS

Bridge 11, Clarendon, VT
Abutment Handling

J. P. Carrara & Sons, Inc.
Project 23476-015



C-AB2 Abutment Elevation Schematic

Install (3) sets of (2) Lift Loops consisting of (4) 0.6" diameter 270 ksi prestressing strands each, with minimum 5'0" embedment and projection above cheek walls. In plant use lift loops at location 1 & 3 with lift plate A or B at location 1 and (3) 25-ton cranes. In field use lift loops at location 1 & 2.

NTS.

1

ORIGINAL $R_1 = 55.7K$

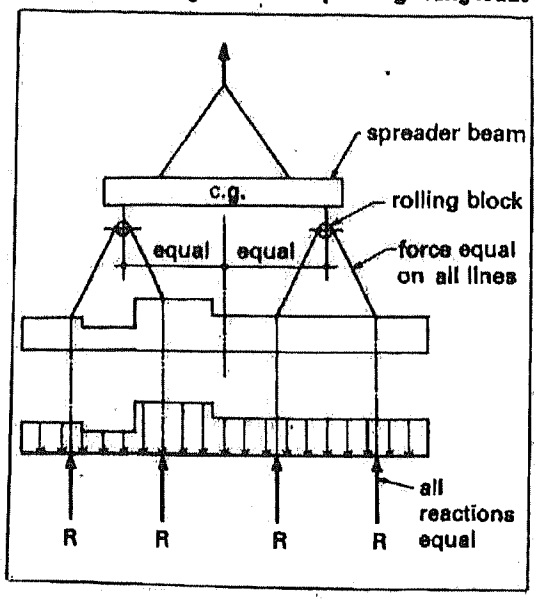
NEW $R_{1\text{-}60°} = 55.7/0.866 = 64.3K$ FOR (2) LOOPS

ORIGINAL $R_2 = 64.3K$

NEW $R_{2\text{-}60°} = 64.3/0.866 = 74.2K$ FOR (2) LOOPS

S-5

Fig. 5.2.10 Arrangement for equalizing lifting loads



lines equal. The member can then be analyzed as a beam with varying load supported by equal reactions.

The force in inclined lift lines can be determined from Fig. 5.2.7.

5.2.8 Handling devices

The most common lifting devices are prestressing strand or cable loops projecting from the concrete, threaded inserts, or special proprietary devices.

Since lifting devices are subject to dynamic loads, ductility of the material is part of the design requirement. Deformed reinforcing bars should not be used since the deformations result in stress concentrations from the shackle pin. Also, reinforcing bars are often hard-grade or re-rolled rail steel with little ductility and low impact strength at cold temperatures. Smooth bars of a known steel grade may be used if adequate embedment or mechanical anchorage is provided. The diameter must be such that localized failure will not occur by bearing on the shackle pin.

Prestressing strand is often used for lifting loops. The variables involved make it almost impossible to calculate a capacity which can be used for all situations. Generally, producers will establish standard criteria for use in handling the standard products manufactured by that plant. Table 5.2.3 is an example which has been used successfully.

Reduced capacities for shorter embedment lengths may be suitable. In shallow products, providing a 90° bend can reduce the required embedment length significantly. Lightly rusted strand has better bond than bright strand.

The diameter of the bend of the loop should be at least 4 in. For smaller diameters, the loop capacities in Table 5.2.3 should be reduced to:

1 in. dia. — 70 %
2 in. dia. — 85 %
3 in. dia. — 90 %

The angle of incline of lifting has little effect on the strand lifting loop capacity if the angle from the horizontal is more than about 20°. Typical handling methods are usually such that this angle is no less than 60°.

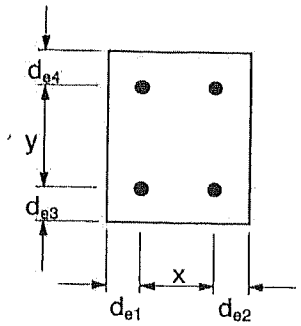
Table 5.2.3 Capacity of ½ in. diameter, 270 ksi strands used as lifting loops

Lifting angle	Embedment length (in.)	Single loop (kips)	Double loop (kips)	Triple loop (kips)
45 degrees	16	5	8.5	11.5
	22	8	13	17.5
	28	10	18	23
	34	11	23	29
Vertical	16	7.5	12.5	16.5
	22	11.5	19	24.5
	28	15.5	25.5	33
	34	16	32.5	41

1. These values are limited by slippage rather than strand strength, with a factor of safety of 4. For other strand diameters, multiply table values by 0.75 for ⅜ in. diameter, 0.85 for 7/16 in. diameter, and 1.1 for 0.6 in. diameter.
2. Minimum f'_c = 3000 psi.
3. Multiple strand loops must be fabricated to ensure equal force on each strand.

S-6

Figure 6.15.7A (continued) Design tensile strength for $h \geq h_{min}$, ϕP_{c1}—Case 6



x and y are the overall dimensions (width and length) of the stud group.

Case 6: Free edges on four adjacent sides

$\phi P_{c1} = \phi 2.67 \lambda \sqrt{f'_c}\,(x_1)(y_1)$

$\phi = 0.85$

where: x_1 and y_1 are the dimensions of the flat bottom of the part of the truncated pyramid.

For Case 6: $x_1 = x + d_{e1} + d_{e2}$ $\quad y_1 = y + d_{e3} + d_{e4}$

Note: Table values are based on $\lambda = 1.0$ and $f'_c = 5000$ psi;

for different material properties, multiply table values by $\lambda\sqrt{f'_c/5000}$

ℓ_e In.	y_1, in. \ x_1, in.	Design tensile strength, ϕP_{c1} (kips)														
		2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	1	1	2	3	3	4	5	5	6	7	7	8	9	9	9
	4	1	3	4	5	7	8	9	10	11	13	14	15	17	18	19
	6	2	4	6	8	9	11	13	15	17	19	21	23	25	27	29
	8	3	5	8	10	13	15	18	21	23	25	29	31	33	36	39
	10	3	7	9	13	16	19	23	25	29	32	35	39	42	45	48
	12	4	8	11	15	19	23	27	31	35	39	42	46	50	54	58
	14	5	9	13	18	23	27	31	36	41	45	49	54	59	63	67
	16	5	10	15	21	25	31	36	41	46	51	35	61	67	72	77
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	1	1	2	3	3	4	5	5	6	7	7	8	9	9	9
	4	1	3	4	5	7	8	9	10	11	13	14	15	17	18	19
	6	2	4	6	8	9	11	13	15	17	19	21	23	25	27	29
	8	3	5	8	10	13	15	18	21	23	25	28	31	33	36	39
	10	3	7	9	13	16	19	23	25	29	32	35	39	42	45	48
	12	4	8	11	15	19	23	27	31	35	39	42	46	50	54	58
	14	5	9	13	18	23	27	31	36	41	45	49	54	59	63	67
	16	5	10	15	21	25	31	36	41	46	51	57	61	67	72	77
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	1	1	2	3	3	4	5	5	6	7	7	8	9	9	9
	4	1	3	4	5	7	8	9	10	11	13	14	15	17	18	19
	6	2	4	6	8	9	11	13	15	17	19	21	23	25	27	29
	8	3	5	8	10	13	15	18	21	23	25	28	31	33	36	39
	10	3	7	9	13	16	19	23	25	29	32	35	39	42	45	48
	12	4	8	11	15	19	23	27	31	35	39	42	46	50	54	58
	14	5	9	13	18	23	27	31	36	41	45	49	54	59	63	67
	16	5	10	15	21	25	31	36	41	46	51	57	61	67	72	77
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	1	1	2	3	3	4	5	5	6	7	7	8	9	9	9
	4	1	3	4	5	7	8	9	10	11	13	14	15	17	18	19
	6	2	4	6	8	9	11	13	15	17	19	21	23	25	27	29
	8	3	5	8	10	13	15	18	21	23	25	28	31	33	36	39
	10	3	7	9	13	16	19	23	25	29	32	35	39	42	45	48
	12	4	8	11	15	19	23	27	31	35	39	42	46	50	54	58
	14	5	9	13	18	23	27	31	36	41	45	49	54	59	63	67
	16	5	10	15	21	25	31	36	41	46	51	57	61	67	72	77