MILLER CONSTRUCTION, INC.

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TRANSMITTAL

TO: Kristin Higgins Vermont Agency of Transportation	DATE	PROJECT NO.
	7/9/2013	Jamaica ER-BRF 015-1 (23)

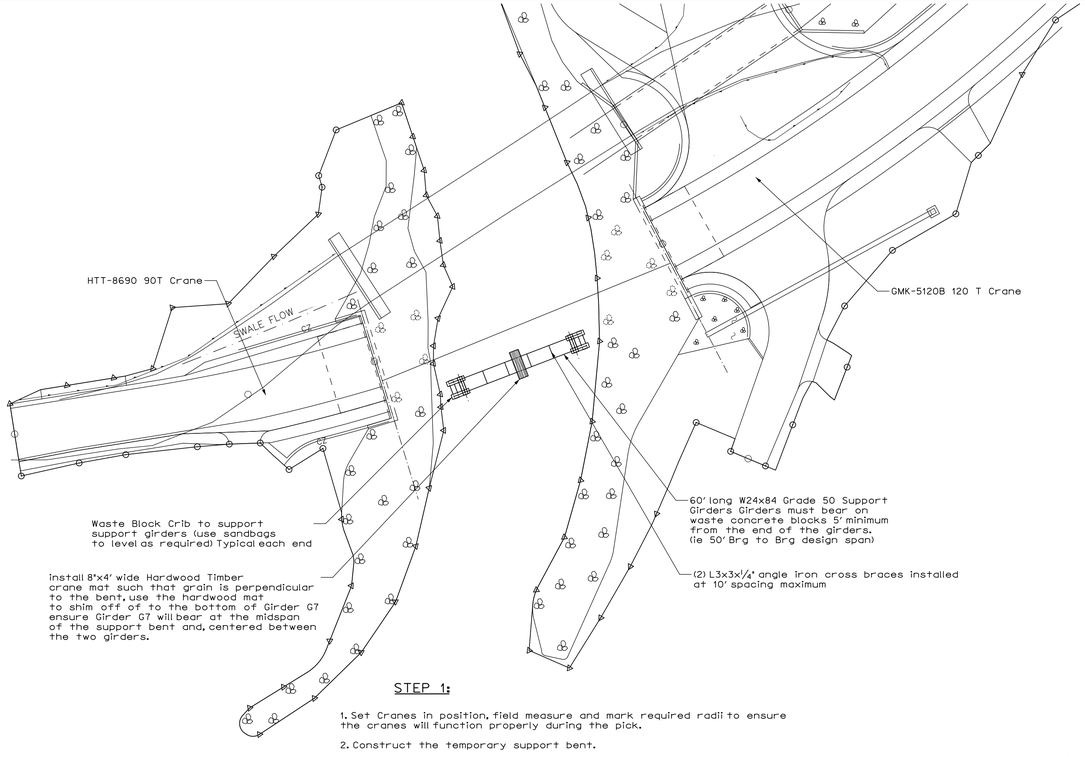
XX WE ENCLOSE THE FOLLOWING: _____ UNDER SEPARATE COVER WE ARE SENDING THE FOLLOWING

COPIES	NUMBER	DESCRIPTION	CODE
1		Structural Steel Erection Plan	H

CODE:

A FOR INITIAL APPROVAL
B FOR FINAL APPROVAL
C APPROVED AS NOTED-RESUBMISSION REQUIRED
D APPROVED AS NOTED-RESUBMISSION NOT REQUIRED
E DISAPPROVED-RESUBMIT
F QUOTATION REQUESTED
G APPROVED
H FOR APPROVAL
I AS REQUESTED OR REQUIRED
J FOR USE IN ERECTION
K LETTER FOLLOWS
L FOR FIELD CHECK
M FOR YOUR USE

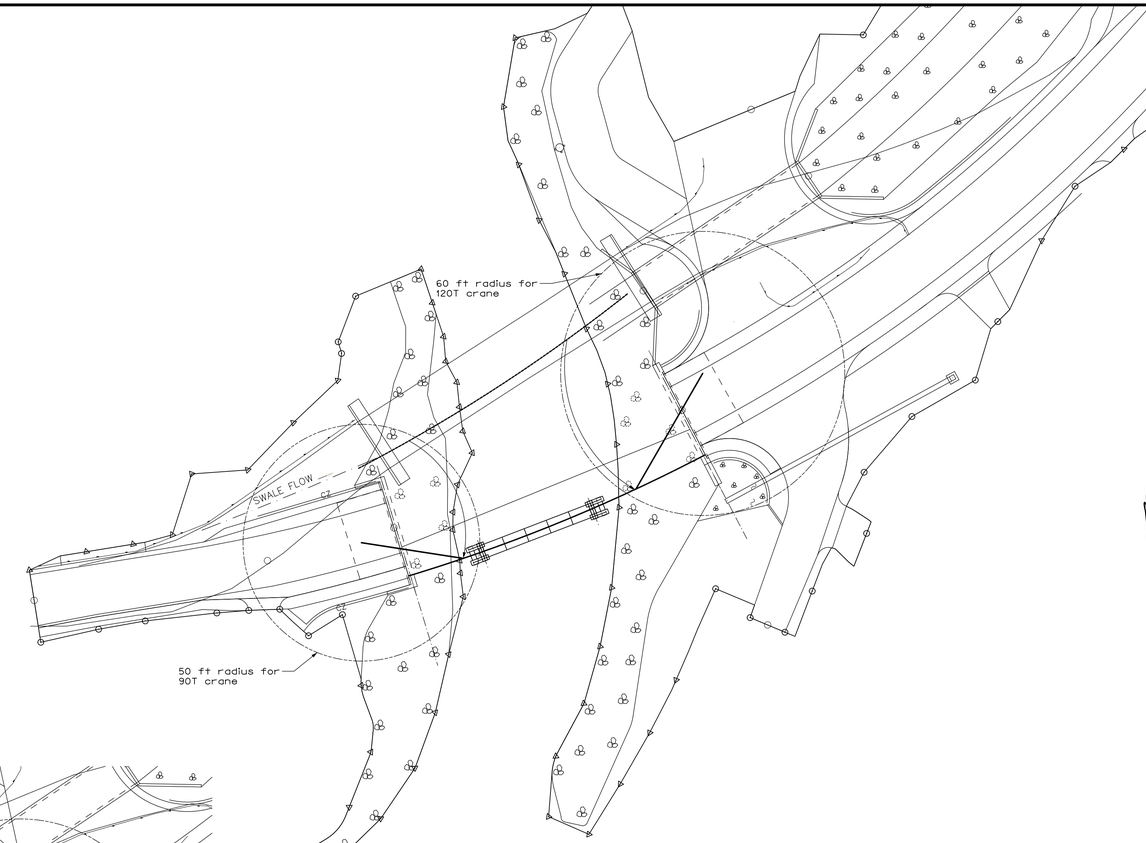
BY: Paul [illegible]



STEP 1:

1. Set Cranes in position, field measure and mark required radii to ensure the cranes will function properly during the pick.

2. Construct the temporary support bent.



STEP 2:

1. Pick Girder G7 from the pick points shown in G7 Pick Point Details

2. Set G7 down at each abutment, with the cranes still connected shim the twin W24x84 girder bents such that the web of Girder G7 is plumb at midspan.

3. Install angle iron on one side of the girder web at each abutment, through bolt with plate washers on each side of the web using the 2" ϕ rebar holes through the girder web to connect the angle iron. Install a 3x3x1/4" or larger angle iron at 45°± from the outstanding leg of the angle to a clip angle connected to the top of the abutment with 2 3/4"ϕ wedge bolt with 4½" min embedment. Use Angle iron to ensure girder G7 Web is plumb, weld or bolt angle iron to clip angle with the web in the plumb position.

PICK POINTS G1-G5

CRANE CAPACITY REQUIRED AT EACH ENDs (MAX G5)
90T REACTION = 22.0k x 1.3 = 28.6k
Chart capacity radius = 22.0 k/75k = 29.6 k
Radius up to 50 ft allowed for 90ft boom with 39,500* otwt

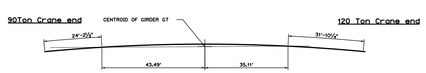
120T REACTION = 22.0k K Chart capacity radius = 29.6k
Radius up to 65 ft allowed for 89' boom with 68,300* otwt

Girder	Dim A
G1	27'-11¾"
G2	27'-11¾"
G3	27'-11¾"
G4	27'-11¾"
G5	28'-1¾"

PICK POINTS G6

CRANE CAPACITY REQUIRED AT EACH ENDs
90T REACTION = 44.7k x 33.01'/(33.01'+45.47') = 18.8 k
Chart capacity radius = 18.8 k/75k = 25.1 k
Radius up to 55 ft allowed for 90ft boom with 39,500* otwt

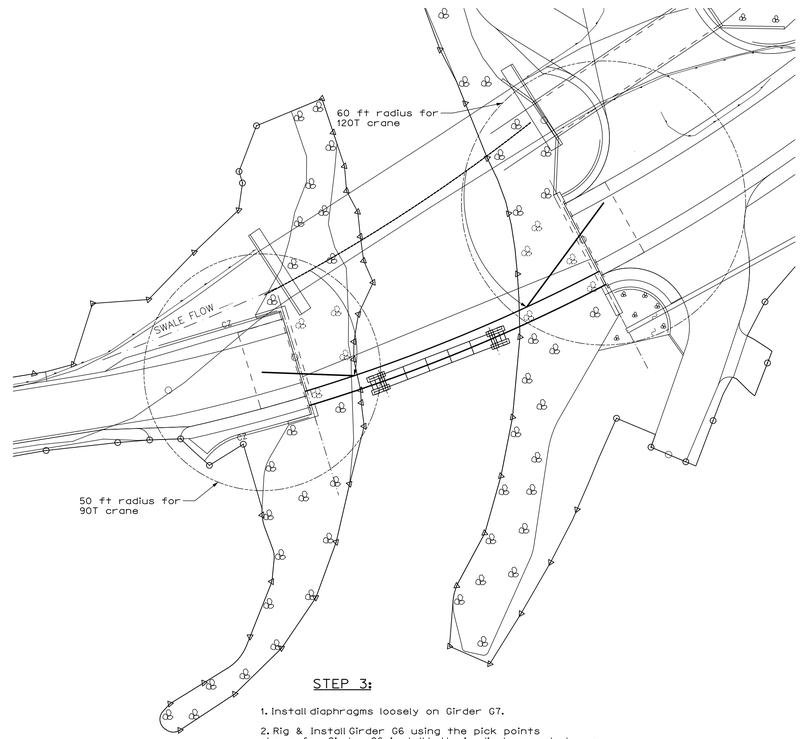
120T REACTION = 44.7k-18.8k = 25.93 K
Chart capacity radius = 25.93 k/75k = 34.6 k
Radius up to 60 ft allowed for 89' boom with 68,300* otwt



PICK POINTS G7

CRANE CAPACITY REQUIRED AT EACH ENDs
90T REACTION = 47.7k x 35.11'/(35.11'+43.49') = 21.3 k
Chart capacity radius = 21.3 k/75k = 28.4 k
Radius up to 50 ft allowed for 90ft boom with 39,500* otwt

120T REACTION = 47.7k-21.3k = 26.4 K
Chart capacity radius = 26.4 k/75k = 35.2 k
Radius up to 60 ft allowed for 89' boom with 68,300* otwt



STEP 3:

1. Install diaphragms loosely on Girder G7.

2. Rig & Install Girder G6 using the pick points shown for Girder G6 install bolts in diaphragms between Girder G6 & G7 and snug tighten all diaphragm bolts prior to cutting loose the cranes.

3. Repeat steps 1 and 2 with remaining girders G5 through G1.

GENERAL NOTES

1. Ensure a minimum of 2 Girders are installed with all diaphragms installed and bolted snug tight at a minimum prior to leaving the bridge partially erected overnight.

2. These plans are not intended to be worked alone but are intended to be worked with the VTrans contract drawings for the Jamaica Bridge ER-BRF 015-1(23)

3. Report any discrepancy between these plans, contract plans and actual observed field conditions to the Erection Plan engineer of record immediately

4. Do not proceed with any dependent work until any such reported discrepancy is addressed to the satisfaction of the Erection Plan engineer of record.

5. All welding shall be performed by a certified welder who is qualified in the position, process and procedure required.

6. All temporary steel W Shapes shall be Grade 50, all temporary steel angle may be grade 36 larger sized steel members may be substituted directly for temporary steel members required at the discretion of the contractor.

7. All bolts shall be installed and tightened as per VTrans Specifications.

8. Concrete Waste blocks assumed to be 8' long x 2' high x 3' wide

CALDERWOOD ENGINEERING, ETC.
STRUCTURAL ENGINEERING • DETAILING SERVICES
222 RIVER RD, RICHMOND, ME 04357 PH/FX (207)737-2007/(207) 737-2008

PREPARED FOR:

Miller Construction

CEE 053-BR-13

STATE OF VERMONT ERIC T. CALDERWOOD NO. 8?? Structural LICENSED PROFESSIONAL ENGINEER

P.E. NUMBER

DATE

	BY	DATE
DESIGN-DETAILED	ETC	7/2013
CHECKED-REVIEWED	ETC	
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

Jamaica Vermont

Steel Girder Erection Plan

SHEET NUMBER

1

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

Filename: ...\001_053-br-13 Jamaica Vermont Workgroup: Structures Division Username: Eric Date:7/9/2013

Design Calculations
For
Curved Girder Erection Plan

Jamaica, Vt

ER-BRF 015-1(23)
CEE 053-br-13

Prepared for:

Miller Construction, Inc

By:
Calderwood Engineering etc
July, 9th, 2013

CALDERWOOD ENGINEERING ETC, LLC
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RICHMOND, ME 04357
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www.calderwoodengineering.com

TOTAL WEIGHT OF GIRDERS:

GIRDER G7

AREA = 1.25 IN (20 IN) + 2.25 IN (20 IN) + 48" * ½"

A = 94 IN²

110% FOR WT OF CONN & WELDS ETC.

$\omega = \frac{94 \text{ IN}^2}{144 \text{ IN}^2/\text{FT}^2} * 490 \text{ PCF} * 1.10 = 352 \text{ lbs/LF}$

∴ LENGTH = 135.45 ft

WEIGHT = 352 lbs/FT * 135.45 FT = 47,700 lbs

CENTROID = 1.0594 FT FROM OUTSIDE OF CURB

2.048 ft FROM CHORD LINE THROUGH ℄ BRG.

GIRDER G6 & G5

AREA = 1.25" * 20" + 2.00" * 20" + 48 * ½"

A = 89 IN²

110%

$\omega = \frac{89 \text{ IN}^2}{144 \text{ IN}^2/\text{FT}^2} * 490 \text{ PCF} * 1.10 = 333 \text{ lbs/LF}$

LENGTH = 134.27 ft G6 & 133.13 ft G5

WT = 134.27 * 333 lbs/LF = 44,730 lbs G6

& 133.13 * 333 lbs/LF = 44,350 lbs G5

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JOB 053 - BR-B JAMAICA
SHEET NO. 2 OF 7
CALCULATED BY ETR DATE 7/13
CHECKED BY DATE
SCALE

G4 THRU G1

AREA = 1" * 20" + 1.25"(20") + 1/2"(48") = 69 in^2

$$w = \frac{69\ in^2}{144\ in^2/ft^2} * 490\ pcf * 1.10 = 258\ lbs/LF$$

LF = 131.96 ft (FOR G4) & 128.48 ft FOR G1

TOTAL WEIGHT

= 131.96' * 258 lbs/LF = 34,100 lbs G4

&

128.48' * 258 lbs/LF = 33,200 lbs G1

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ERECT GIRDER G7 W/ BENT SUPPORTING MIDSPAN OF G7

CENTROID OF GIRDER = 2.048 ft FROM A CHORD RUNNING THRU INT. ℄ GIRDER W/ ℄ BRGS

REACTION @ SHORING =

47.70 k * 2.048 ft / 3.107 ft = 31.44 KIPS

USE (2) W24x84's 60 ft LONG (OVERALL)

BEAR @ MIDSPAN INSTALL X-FRAMES BTW. W24x84's INSTALL CRIBBING OR WASTE BLOCKS TO SUPPORT W24x84's @ 5' FROM EA END 5'-9" BTW. W24's

MOMENT IN W24x84's =

$(31.44^k/2)(25\,ft) + 0.084\,k/LF * 50\,ft^2/8 = 419.3\,k\text{-}ft$

$= 5{,}031\,k\text{-}in \qquad f_b = 5031/196\,in^3 = 25.67\,ksi$

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ERECT GIRDER G7 w/
DIAPHRAGMS ATTACHED

TOTAL WEIGHT OF GIRDER = 47,700 lbs

TOTAL WEIGHT OF DIAPHRAGMS
= 135 lbs/LF * 5.20 ft * 10 LOCATIONS = 7,020 lbs

CENTROID OF GIRDER = 2.048 ft FROM
A CHORD RUNNING THROUGH ℄ BRG & ℄ GIRDER

CENTROID OF DIAPHRAGMS =

$$2.048\text{ ft} - \frac{6.25\text{ ft}}{2} = -1.077\text{ ft FROM CHORD LINE}$$

CENTROID OF GIRDER w/ DIAPHRAGMS

$$= \left[47{,}700^{\#}(2.048') + 7020^{\#}(-1.077')\right] / (47{,}700 + 7020)$$

$$= 1.647\text{ ft}$$

O.T. MOMENT = $(47700^{\#} + 7020^{\#})(1.647\text{ ft}) = 90129.1$ lb-ft

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USE GRADE 50 STEEL

INSTALL X-BRACING @

$$25.67 \text{ ksi} = \frac{12000}{l\,(3.47)} \qquad l = \left(25.67\,(3.47)/12000\right)^{-1}$$

d/A_G

$$l = 134.7 \text{ in} = 11.23 \text{ ft}$$

INSTALL X BRACES @ 10 ft CTRS

USE 8" x 10 ft CRANE MATT 4 ft MIN WIDTH

TIMBER = MIXED MAPLE OR OAK

M_u IN CRANE MATT

$$= \frac{31{,}440 \text{ lbs}}{2} * 5.75 \text{ ft}/2 = 45{,}195 \text{ lb-ft} =$$

$$542{,}340 \text{ lb-in} \qquad S_x = \frac{(8)^2(48 \text{ in})}{6} = 512 \text{ in}^3$$

$$f_b = \frac{542{,}340 \text{ lb-in}}{512 \text{ in}^3} = 1060 \text{ psi} \quad (\text{SAY O.K.})$$

5120B

42 - 167 ft. (12.8 - 51.0 m) | 68,300 lbs. (31,000 kg) | 100% 24'7" Spread | 360°

Pounds (thousands)

Feet	42*	42	58	73	89	105	120	136	152	167
8	240.0									
9	228.0									
10	211.0	220.0	192.0	139.0	121.0	90.0				
15	168.0	168.0	161.0	139.0	121.0	90.0	63.0	47.0		
20	138.0	138.0	134.0	129.0	108.0	88.0	63.0	47.0	35.8	
25	114.0	114.0	114.0	110.0	94.0	80.0	60.0	47.0	35.8	29.6
30	88.0	88.0	98.0	95.0	82.0	73.0	55.0	46.0	35.8	29.6
35			81.0	80.0	66.0	66.0	49.0	43.6	35.6	29.6
40			67.0	67.0	55.0	57.0	44.0	40.6	35.2	29.6
45			57.0	56.0	49.0	48.0	40.4	36.6	33.0	29.0
50				47.0	42.6	41.8	36.8	33.4	30.6	28.4
55				40.8	37.2	36.4	34.0	30.8	28.6	26.8
60					32.8	32.0	31.0	28.2	26.4	25.0
65					29.2	28.4	29.0	25.8	24.2	23.4
70					26.0	25.2	26.6	23.8	22.4	21.8
75						23.0	23.8	21.6	21.0	20.4
80						21.8	21.4	20.2	19.6	18.8
85						20.2	19.4	18.8	17.8	17.4
90							17.4	17.8	16.0	15.8
95							15.8	16.4	14.6	14.6
100								15.0	14.0	13.8
105								13.6	13.4	12.6
110								12.4	12.4	11.4
115								11.2	11.2	10.4
120									10.2	9.4
125									9.4	8.4
130									8.6	7.6
135										6.8
140										6.0
145										5.4
150										

* Over rear only.
Lifting capacities greater than 210,000 lbs require additional equipment.
Note: Above chart is available with reduced outriggers.

42 - 167 ft. (12.8 - 51.0 m) | 24,200 lbs. (11,000 kg) | 100% 24'7" Spread | 360°

Pounds (thousands)

Feet	42*	42	58	73	89	105	120	136	152	167
8	240.0									
9	228.0									
10	211.0	220.0	192.0	139.0	121.0	90.0				
15	168.0	168.0	161.0	139.0	121.0	90.0	63.0	47.0		
20	138.0	132.0	125.0	114.0	107.0	77.0	63.0	47.0	35.8	
25	93.0	93.0	93.0	97.0	83.0	61.0	56.0	47.0	35.8	29.6
30	65.0	65.0	69.0	67.0	66.0	49.0	49.0	44.0	35.8	29.6
35			53.0	55.0	53.0	41.0	41.2	38.6	35.6	29.6
40			42.2	43.6	43.6	37.4	34.8	33.4	30.0	29.6
45			34.4	35.8	35.8	31.4	29.6	29.4	28.2	25.8
50				30.2	30.0	26.8	26.0	25.8	24.4	22.2
55				25.4	27.2	22.8	23.4	22.4	21.2	19.2
60					23.2	20.0	20.2	19.6	18.6	16.6
65					20.0	17.4	17.6	16.8	16.2	14.4
70					17.2	15.0	15.2	14.6	14.2	12.6
75					15.0	13.0	13.4	12.6	12.4	11.0
80						11.4	11.6	11.0	10.6	9.4
85						10.0	10.2	9.6	9.2	8.2
90							8.8	8.2	8.0	7.0
95							7.8	7.2	6.8	6.0
100								6.2	5.8	4.8
105								5.2	5.0	4.0
110								4.4	4.2	3.2
115								3.6	3.4	2.4
120									2.8	
125									2.0	
130										

* Over rear only.
Lifting capacities greater than 210,000 lbs require additional equipment.
Note: Above chart is available with reduced outriggers.

42 - 167 ft. (12.8 - 51.0 m) | 15,400 lbs. (7,000 kg) | 100% 24'7" Spread | 360°

Pounds (thousands)

Feet	42*	42	58	73	89	105	120	136	152	167
8	240.0									
9	228.0									
10	211.0	219.0	192.0	139.0	121.0	90.0				
15	168.0	167.0	161.0	139.0	94.0	90.0	63.0	47.0		
20	123.0	123.0	114.0	104.0	74.0	68.0	62.0	47.0	35.8	
25	81.0	81.0	81.0	76.0	57.0	53.0	62.0	46.0	35.8	29.6
30	57.0	57.0	61.0	61.0	46.0	45.0	42.2	39.8	35.8	29.6
35			46.0	46.0	37.4	37.8	34.6	34.2	29.4	29.6
40			36.4	38.2	31.6	31.6	30.8	28.8	27.2	24.8
45			29.0	31.0	26.6	26.6	26.4	24.8	23.0	21.0
50				25.4	22.6	22.6	22.6	21.0	19.8	17.8
55				20.8	19.2	19.2	19.4	18.0	17.0	15.0
60					16.2	16.2	16.4	15.6	14.6	12.8
65					13.8	14.0	14.0	13.4	12.6	11.0
70					11.8	11.6	12.0	11.4	10.8	9.2
75						10.2	10.4	9.8	9.4	7.8
80						8.6	9.0	8.4	8.0	6.4
85						7.4	7.6	7.0	6.8	5.4
90							6.4	6.0	5.6	4.4
95							5.4	5.0	4.6	3.4
100								4.0	3.8	2.6
105								3.2	3.0	
110								2.4	2.2	
115										

* Over rear only.
Lifting capacities greater than 210,000 lbs require additional equipment.
Note: Above chart is available with reduced outriggers.

THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE.
The individual crane's load chart, operating instructions and other instructional plates must be read and understood prior to operating the crane.

7

39,500 lb Counterweight -- Fully Extended Outriggers -- 360° Rotation
(All Capacities Are Listed In Pounds)

Radius (ft)	Boom Length (ft)											Radius (ft)
	38	50	60	70	80	90	100	110	120	130	140	
8	180,000*											8
9	167,600*											9
10	158,800*	152,100*	117,900	89,700								10
12	143,600*	138,700*	108,800	85,000	85,100							12
15	123,700	122,600	106,500	78,800	78,400	57,700						15
20	91,300	93,500	93,800	70,300	76,500	56,200	49,100	42,500				20
25	71,000	73,300	73,800	63,600	73,300	55,300	45,800	42,500	33,700	29,700		25
30	57,200	59,600	60,100	58,100	61,100	54,500	45,200	38,300	31,200	29,400	24,400	30
35		49,700	50,300	51,400	51,200	50,900	42,500	35,500	30,900	29,100	24,100	35
40		42,200	43,700	44,000	43,800	43,400	38,200	33,400	30,600	28,800	24,000	40
45			37,900	38,200	38,100	37,700	34,600	30,300	29,900	28,600	23,800	45
50			32,400	32,700	32,500	32,000	31,500	27,900	27,800	26,800	23,700	50
55				28,200	28,000	27,600	27,300	25,600	25,800	24,800	23,600	55
60				24,600	24,500	24,100	24,100	23,600	24,200	23,000	22,100	60
65					21,500	22,300	21,100	21,400	21,600	21,300	20,600	65
70					19,700	19,900	18,700	19,500	19,100	19,200	19,200	70
75						17,700	17,500	17,400	17,000	17,700	17,400	75
80						16,000	16,000	15,600	15,900	15,900	15,600	80
85							14,600	14,600	14,800	14,400	14,100	85
90							13,800	13,700	13,400	13,000	12,700	90
95								12,500	12,300	11,900	11,600	95
100								11,500	11,200	10,900	10,600	100
105									10,200	9,900	9,600	105
110									9,400	9,000	8,800	110
115										8,300	8,000	115
120										7,500	7,300	120
125											6,600	125
130											6,000	130

* Special Conditions Or Wire Rope Required

This information is not for crane operation. Operator must refer to the in-cab information for crane operation. Rated lifting capacities shown on fully extended outriggers do not exceed 85% of the tipping loads and on tires do not exceed 75% of the tipping loads.