

Erection Plan Support Calculations  
BRO 1448(41)

Fairfield, Vermont

CEE 38-mi-15



Prepared for:  
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By:  
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May 27<sup>th</sup>, 2015

Rev 1) May 5th, 2015  
Sheets 12-15: Push-Pull Calculations  
added  
Sheets 18-125: Crane specs added

Rev 2) May 27th, 2015  
Crane specs modified to show crane  
configurations during picks  
(Pages 19, 46)



## **Fairfield, Vermont**

### Erection Plan

TH 47 (Elm Brook Road) Bridge 46  
Fairfield BRO 1448(41)

#### Location:

Town of Fairfield in Franklin County on TH 47 (Elm Brook Road) over the Black Creek. Approximately 0.05 miles west of intersection with VT 36.

#### References:

- AASHTO LRFD BDS Seventh ed.
- Steel Construction, ASD
- Use Strength 1 Factors for construction

#### **Waste block bearing capacity:**

- Utilize crane mats to distribute loading
- Blocks: (2'x2'x6')
- Set-up: 3 blocks tall, 5 blocks long, sufficient crane mats on top of blocks.

$AB_1 := 38240 \text{ lbf}$      -assume abutment load fully on front axles  
 $Cr := 33996 \text{ lbf}$      -taken from Manual, upper facing front, front axles

#### Loading:

$$P := \frac{AB_1}{2} + \frac{Cr}{2} = 36.118 \text{ kip} , \text{ per outrigger.}$$

$LL := 1.75$       $DL := 1.25$      LRFD strength 1

$$P_{LL} := P \cdot LL = 63.207 \text{ kip}$$

$f'_c := 2000 \text{ psi}$

$A_1 := 1 \text{ ft}^2$      assume 1ft x 1ft outrigger

$m := 1$      assume, conservative

$\phi := 0.7$      bearing resistance, AASHTO LRFD

$$P_n := 0.85 \cdot f'_c \cdot A_1 \cdot m \quad (5.7.5-2, \text{ AASHTO})$$

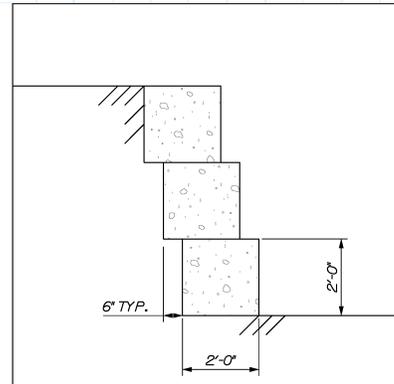
$$P_r := \phi \cdot P_n$$

$$P_r = 171.36 \text{ kip}$$

$check := \text{if } P_r > P_{LL}$	= "Bearing Resistance Okay"
"Bearing Resistance Okay"	
else	
"Inadequate Bearing Strength"	

**Check soil bearing resistance under waste blocks:**

- Model as a spread footing
- Load footing in center
- Bearing on granular fill
- Step waste blocks back 6" per tier



$$cN_{cm} := 0$$

$$\gamma D_f N_{qm} := 0$$

$$B := 2 \text{ ft}$$

$$L := 30 \text{ ft}$$

$$H := 6 \text{ ft}$$

$$\phi := 30 \text{ deg}$$

$$\gamma := 120 \text{ pcf}$$

$$N_\gamma := 22.4 \text{ Table 10.6.3.1.2a-1, AASHTO LRFD}$$

$$i_\gamma := 1$$

$$C_{w\gamma} := 1.0$$

$$s_\gamma := 1 - 0.4 \cdot \left( \frac{B}{L} \right)$$

$$N_{\gamma m} := N_\gamma \cdot s_\gamma \cdot i_\gamma$$

$$q_n := cN_{cm} + \gamma D_f N_{qm} + 0.5 \cdot \gamma \cdot B \cdot N_{\gamma m} \cdot C_{w\gamma} \text{ Eq. 10.6.3.1.2a-1, AASHTO LRFD}$$

$$q_n := 0.5 \cdot \gamma \cdot B \cdot N_{\gamma m} \cdot C_{w\gamma} \text{ , simplified}$$

$$q_n = 2.616 \text{ ksf , soil capacity}$$

$$w_{conc} := 6 \text{ ft} \cdot 2 \text{ ft} \cdot 2 \text{ ft} \cdot 150 \text{ pcf} = 3.6 \text{ kip} \text{ , per waste block}$$

$$n_{blocks} := 15$$

$$q := \frac{DL \cdot (w_{conc} \cdot n_{blocks}) + (P_{LL} \cdot 2)}{(6 \text{ ft} \cdot 5) \cdot 3 \text{ ft}} = 2.155 \text{ ksf}$$

, conservatively assume 50% LL on waste blocks even with crane mats present

$check := \text{if } q_n > q$    "Soil resistance Okay" else    "Bearing Resistance Inadequate"	= "Soil resistance Okay"
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### Check live load surcharge overturning:

- Crane drives up to waste blocks
- Use 3.11.6.4 AASHTO LRFD

$$M_{conc\_1} := (30 \text{ ft} \cdot 2 \text{ ft} \cdot 2 \text{ ft} \cdot 150 \text{ pcf}) \cdot 1 \text{ ft}$$

$$M_{conc\_2} := (30 \text{ ft} \cdot 2 \text{ ft} \cdot 2 \text{ ft} \cdot 150 \text{ pcf}) \cdot 1.5 \text{ ft}$$

$$M_{conc\_3} := (30 \text{ ft} \cdot 2 \text{ ft} \cdot 2 \text{ ft} \cdot 150 \text{ pcf}) \cdot 2 \text{ ft}$$

$$M_{res\_conc} := M_{conc\_1} + M_{conc\_2} + M_{conc\_3} = 81 \text{ kip} \cdot \text{ft}$$

According to AASHTO LRFD, Live load surcharge occurs at 1/2 wall height distance from wall. Therefore, crane will be 3 feet from wall when liveload occurs and loading will be distributed on the crane mats. Assume 4'-0" x 20'-0" crane mats.

$$A_{mat} := 4 \text{ ft} \cdot 20 \text{ ft} = 80 \text{ ft}^2$$

$$P = 36.118 \text{ kip}$$

$$w_{crane} := \frac{P}{A_{mat}} = 0.451 \text{ ksf}$$

$$A_{mat\_resist} := 2 \text{ ft} \cdot 6 \text{ ft}$$

$$P_{mat} := A_{mat\_resist} \cdot w_{crane} = 5.418 \text{ kip}$$

$$M_{res\_mat} := 2 \cdot (P_{mat} \cdot 1 \text{ ft}) = 10.835 \text{ ft} \cdot \text{kip} \quad (2 \text{ outriggers})$$

$$M_{res} := M_{res\_conc} + M_{res\_mat} = 91.835 \text{ ft} \cdot \text{kip}$$

Check overturning:

$$h_{eq} := 4 \text{ ft} \quad \text{Table 3.11.6.4-1}$$

$$\theta := 90 \text{ deg}$$

$$\beta := 0 \text{ deg}$$

$$\delta := 24 \text{ deg} \quad \text{Table 3.11.5.3-1, AASHTO LRFD}$$

$$\Gamma := \left( 1 + \sqrt{\frac{\sin(\phi + \delta) \cdot \sin(\phi - \beta)}{\sin(\theta - \delta) \cdot \sin(\theta + \beta)}} \right)^2 \quad \text{Eq. 3.11.5.3-2}$$

$$k_a := \frac{\sin(\theta + \phi)^2}{\Gamma \cdot (\sin(\theta)^2 \cdot \sin(\theta - \delta))} = 0.296 \quad \text{Eq. 3.11.5.3-1}$$

$$LS := \gamma \cdot k_a \cdot h_{eq} = 0.142 \text{ ksf}$$

$$M_o := LS \cdot (30 \text{ ft} \cdot H) \cdot \left( \frac{H}{2} \right) = 76.721 \text{ kip} \cdot \text{ft}$$

<i>check</i> := if $M_{res} > M_o$	= "Good"
"Good"	
else	
"Check overturning"	

**Deadman Push-pull System Calculations:**

- By inspection, HP 14x73 okay in tension/compression
- Design for FA-AB3

$M_{res} := 38.24 \text{ kip} \cdot 1.5 \text{ ft}$       Dead load resisting moment of abutment

$P := \frac{M_{res}}{5 \text{ ft}} = 11.472 \text{ kip}$       Force Req'd to adjust abutment

$P_f := P \cdot DL = 14.34 \text{ kip}$

Note: Chain, shackles, and binders must all have a minimum of a 6 ton capacity.

Check deadman stability:

$H := 27.2 \text{ in}$  , depth of two HP 14x73 beams

$k_p := 6.5$

$R := 0.467$  , AASTHO LRFD, Fig 3.11.5.4-2

$k_p := k_p \cdot R = 3.036$

$\gamma = 120 \text{ pcf}$

$P_p := \frac{(k_p \cdot \gamma \cdot H^2)}{2} = 935.743 \text{ plf}$

$L_{DM} := 26 \text{ ft}$  same as the abutment length for ease of construction.

$P_{allow} := P_p \cdot L_{DM} = 24.329 \text{ kip}$

$check :=$	if $P_{allow} > P_f$		= "Deadman stable"
	"Deadman stable"		
	else		
	"Deadman unstable"		

### Design Bolted Connection for Deadman:

$$P_{dead} := P_f \cdot DL = 17.925 \text{ kip} \quad \text{Strength 1}$$

$$P_p := P_{dead} \quad \text{passive pressure only resists as much as needed.}$$

$$V_{bolt} := 17.364 \text{ kip} \quad \text{model system as a cantilever beam @ bolted connection}$$

$$M_{bolt} := P_p \cdot \left(\frac{2}{3}\right) \cdot H = 325.04 \text{ kip} \cdot \text{in} \quad D_{bolt} := \frac{7}{8} \text{ in}$$

$$\text{Two HP beams attached to deadman:} \quad t_f := 0.505 \text{ in}$$

$$V_{bolt} := \frac{V_{bolt}}{2} = 8.682 \text{ kip}$$

$$M_{bolt} := \frac{M_{bolt}}{2} = 162.52 \text{ kip} \cdot \text{in}$$

Use (4) bolts.

Check shear resistance:

$$N_s := 1 \quad A_b := 4 \cdot \left( \frac{\left(\frac{7}{8} \text{ in}\right)^2 \cdot 3.1415}{4} \right) = 2.405 \text{ in}^2 \quad F_{ub} := 60 \text{ ksi}$$

$$R_n := 0.38 \cdot A_b \cdot F_{ub} \cdot N_s \quad \phi_t := 0.8 \quad (\text{Eq. 6.13.2.7-1, AASHTO LRFD})$$

$$R_n = 54.839 \text{ kip} \quad \phi_s := \phi_t$$

$$check := \begin{cases} \text{if } R_n > V_{bolt} & \text{= "Good"} \\ \text{|| "Good"} \\ \text{else} \\ \text{|| "Check Bolts"} \end{cases}$$

Check combined tension and shear (moment):

$$T_n := \begin{cases} \text{if } \frac{V_{bolt}}{R_n} \leq 0.33 & \\ \text{|| } 0.76 \cdot A_b \cdot F_{ub} & \\ \text{else} & \\ \text{|| } 0.76 \cdot (2 \cdot A_b) \cdot F_{ub} \cdot \sqrt{1 - \left(\frac{V_{bolt}}{\phi_s \cdot R_n}\right)^2} & \end{cases} = 109.678 \text{ kip}$$

Eq. 6.13.2.11-1/-2  
AASHTO LRFD



Find tension in bolts:

- say bolts spaced 6" apart
- moment = force couple

$$F_{bolt} := \frac{M_{bolt}}{6 \text{ in}} = 27.087 \text{ kip}$$

$check :=$  if  $T_n > F_{bolt}$  | = "Good"  
    || "Good"  
    else  
    || "Check bolts"

Use (4) 7/8" A325 bolts in a 6"x6" layout.

Check Spacing:

$$min := 3 \cdot D_{bolt} = 2.625 \text{ in}$$

$$max := 4 \text{ in} + 4 t_f = 6.02 \text{ in}$$



**Check if shackle okay for shear block failure:**

$$t_{flange} := 0.505 \text{ in}$$

$$d_{hole} := 1 \text{ in}$$

$$P_f = 14.34 \text{ kip} \quad \text{assume 90 degree pull, conservative.}$$

Try: Bolt 2.5" from edge of

Use ASD Table I-G

$$A_v := 2.5 \text{ in} \cdot t_{flange} = 1.263 \text{ in}^2$$

$$F_u := 65 \text{ ksi}$$

$$A_t := 0 \text{ in}^2$$

$$R_{BS} := 0.3 \cdot A_v \cdot F_u + 0.5 A_t \cdot F_u \quad (\text{"From AISC ASD Sect. J4"})$$

$$R_{BS} = 24.619 \text{ kip}$$

$$\text{check} := \begin{cases} \text{if } R_{BS} > P_f & \text{= "Good"} \\ \text{|| "Good"} & \\ \text{else} & \\ \text{|| "Check Shackle"} & \end{cases}$$



**Check HP 14x73 pile capacity for HLT150 loaded with FA-AB4 at max radius**

Load per pile:

$P := 93.9 \text{ kip}$  from BeamBoy, conservative because analyzed as if only rear and front most outriggers in use

Piles driven to rock:  
-Analyze as a totally unbraced section

$$P_{LL} := P \cdot LL = 164.325 \text{ kip}$$

$$L_1 := 18 \text{ ft} \text{ depth to bedrock, from Contract Details Boring Log}$$

$$E := 29000000 \text{ psi}$$

$$A_{pile} := 21.4 \text{ in}^2$$

$$r_{yy} := 3.49 \text{ in}$$

$$k_1 := 1.20$$

$$F_y := 50000 \text{ psi}$$

$$\varphi_{cm} := 0.7$$

Weak Axis Axial Compression

$$P_{ey1} := \frac{\pi^2 \cdot E}{\left(k_1 \cdot \frac{L_1}{r_{yy}}\right)^2} \cdot A_{pile} = 1110.43 \text{ kip} \quad \begin{array}{l} \text{Elastic Flexural Buckling} \\ \text{Resistance AASHTO 6.9.4.1.2} \end{array}$$

$$Q := 1.0$$

$$P_o := Q \cdot A_{pile} \cdot F_y = (1.07 \cdot 10^3) \text{ kip}$$

$$\frac{P_{ey1}}{P_o} = 1.038 \quad P_e/P_o > 0.44$$

$$P_{ny1} := \left(0.658 \left(\frac{P_o}{P_{ey1}}\right)\right) \cdot P_o = 714.87 \text{ kip}$$

$$P_{r1} := \varphi_{cm} \cdot P_{ny1} = 500.41 \text{ kip}$$

$check := \text{if } P_{r1} > P_{LL}$ $\quad \left\  \text{“Pile Capacity Okay”} \right\ $ $\quad \text{else}$ $\quad \left\  \text{“Check Pile Capacity”} \right\ $	$= \text{“Pile Capacity Okay”}$
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**Check steel plate on driven HP 14x73 in bending:**

4'x4'x1" plate

Use an outrigger area of 2'x2'

Analyze on a per inch basis

Calculate bending stress:

-Analyze as a cantilever with outrigger distributed load

-Edge of HP-beam acts as support

$$w := \frac{P_{LL}}{(2 \text{ ft} \cdot 2 \text{ ft})} = 0.285 \text{ ksi}$$

$$M_B := w \cdot 5.2 \text{ in} \cdot \frac{5.2 \text{ in}}{2} \cdot 1 \text{ in} = 3.857 \text{ in} \cdot \text{kip}$$

Calculate capacity:

$$f_y := 36 \text{ ksi} \quad b := 1 \text{ in}$$

$$S_x := \frac{b \cdot h^2}{6} \quad h := 1 \text{ in}$$

$$M_y := S_x \cdot f_y$$

$$M_y = 6 \text{ in} \cdot \text{kip}$$

$$\text{check} := \begin{cases} \text{if } M_y > M_B & \text{= "Good"} \\ \text{|| "Good"} \\ \text{else} \\ \text{|| "Check Plate"} \end{cases}$$

Check Crane outrigger placement tolerance:

$$L_{max} := \sqrt{\frac{2 \cdot M_y}{w \cdot 1 \text{ in}}} = 6.486 \text{ in}$$

Therefore: Crane outrigger must be placed directly on top of pile +/- 1 inch.

### **Check Welded Push-Pull System:**

- Design for FA-AB4
- Use HP 14x73 w/ 6" weld to steel plates on piles
- Same shackle, chain, and binder set-up as other system

$$M_{res} := 57.88 \text{ kip} \cdot 1.5 \text{ ft} \quad \text{Dead load resisting moment of abutment}$$

$$P := \frac{M_{res}}{7 \text{ ft}} = 12.403 \text{ kip} \quad \text{Force Req'd to adjust abutment}$$

$$P_f := \frac{(P \cdot DL)}{2} = 7.752 \text{ kip} \quad \text{Two HP 14x73 sections}$$

Note: Chain, shackles, and binders must all have a minimum of a 6 ton capacity.

Determine Point of Fixity:

$$E_p := 29000 \text{ ksi}$$

$$I_w := 0.0126 \text{ ft}^4 \quad \text{Moment of inertia, weak axis}$$

$$n_h := 1.11 \quad \text{Table C10.4.6.3-2}$$

$$y_{fix} := 1.8 \text{ ft} \cdot \left( \frac{E_p \cdot I_w}{n_h} \right)^{0.2} \quad \text{Eq. C10.7.3.13.4-2, LRFD}$$

$$y_{fix} = 5.738 \text{ ft}$$

Force will be applied directly to top of pile:

$$P_{r1} = 500.411 \text{ kip} \quad \text{Axial Pile Resistance} \quad \begin{matrix} R_b := 1 \\ R_h := 1 \end{matrix}$$

$$P := 93.9 \text{ kip} \quad \text{Axial Load} \quad F_{yc} := 50 \text{ ksi}$$

$$\frac{P}{P_{r1}} = 0.188 \quad \lambda_{rf} := 0.56 \cdot \sqrt{\frac{E_p}{0.7 \cdot F_{yc}}} \quad \begin{matrix} \text{Eq.} \\ 6.10.8.2.2-4 \\ \text{LRFD} \end{matrix}$$

$$M_{ux} := P_f \cdot y_{fix} = 44.48 \text{ kip} \cdot \text{ft}$$

$$b_{fc} := 14.6 \text{ in} \quad t_{fc} := 0.505 \text{ in} \quad S_y := 35.8 \text{ in}^3$$

$$\lambda_f := \frac{b_{fc}}{2 \cdot t_{fc}} = 14.455$$

$$\lambda_{pf} := 9.2 \quad \text{Table C6.10.8.2.2-1}$$

$$S_x := 107 \text{ in}^3$$

$$F_{mc} := \text{if } \lambda_f \leq \lambda_{pf}$$

$$\left\| \begin{array}{l} R_b \cdot R_h \cdot F_{yc} \end{array} \right\|$$

else

$$\left\| \begin{array}{l} \left( 1 - \left( 1 - \frac{F_{yc}}{R_h \cdot F_{yc}} \right) \cdot \left( \frac{\lambda_f - \lambda_{pf}}{\lambda_{rf} - \lambda_{pf}} \right) \right) \cdot R_b \cdot R_h \cdot F_{yc} \end{array} \right\|$$

$$= 50 \text{ ksi}$$

Eqs. 6.10.8.2.2-(1/2) LRFD

$$M_{rx} := F_{mc} \cdot S_y = 149.167 \text{ kip} \cdot \text{ft}$$

$$\text{check} := \text{if } \frac{P}{P_{r1}} < 0.2 \quad \left\| \begin{array}{l} = 0.392 \end{array} \right\|$$

$$\left\| \begin{array}{l} \frac{P}{2 \cdot P_{r1}} + \left( \frac{M_{ux}}{M_{rx}} \right) \end{array} \right\|$$

else

$$\left\| \begin{array}{l} \frac{P}{P_{r1}} + \frac{8}{9} \cdot \left( \frac{M_{ux}}{M_{rx}} \right) \end{array} \right\|$$

Eqs. 6.9.2.2-(1/2) LRFD

$$\text{check2} := \text{if } \text{check} < 1.0 \quad \left\| \begin{array}{l} = \text{"Good"} \end{array} \right\|$$

$\left\| \begin{array}{l} \text{"Good"} \end{array} \right\|$

else

$\left\| \begin{array}{l} \text{"Check Flexure"} \end{array} \right\|$



### **Check Fillet weld connection:**

-Weld HP 14x73 braces to bearing steel plates under HL-150 outriggers

$$P_f = 7.752 \text{ kip}$$

$$\phi_{e2} := 0.8$$

$$F_{exx} := 70 \text{ ksi}$$

$$R_r := 0.6 \cdot \phi_{e2} \cdot F_{exx} = 33.6 \text{ ksi} \quad \text{Eq. 6.13.3.2.4b-1 LRFD}$$

$$L_{weld} := 6 \text{ in}$$

$$W_{weld} := \frac{5}{16} \text{ in} \cdot 0.707 = 0.221 \text{ in} \quad \text{6.13.3.4 LRFD}$$

$$A_{weld} := L_{weld} \cdot W_{weld} = 1.326 \text{ in}^2$$

$$P_r := 2 \cdot (A_{weld} \cdot R_r) = 89.082 \text{ kip} \quad \text{2 welds on each HP 14x73}$$

$$\text{check} := \begin{array}{l} \text{if } P_r > P_f \\ \quad \parallel \text{ "Good" } \\ \text{else} \\ \quad \parallel \text{ "Check Weld" } \end{array} \quad \Bigg| \quad = \text{ "Good" }$$



**Check if shackle okay for shear block failure:**

-For FA-AB4 shackle connection

$$t_{flange} := 0.505 \text{ in}$$

$$d_{hole} := 1 \text{ in}$$

$$P_f = 7.752 \text{ kip} \quad \text{assume 90 degree pull, conservative.}$$

Try: Bolt 2.5" from edge of

Use ASD Table I-G

$$A_v := 2.5 \text{ in} \cdot t_{flange} = 1.263 \text{ in}^2$$

$$F_u := 65 \text{ ksi}$$

$$A_t := 0 \text{ in}^2$$

$$R_{BS} := 0.3 \cdot A_v \cdot F_u + 0.5 A_t \cdot F_u \quad (\text{"From AISC ASD Sect. J4"})$$

$$R_{BS} = 24.619 \text{ kip}$$

$$\text{check} := \begin{cases} \text{if } R_{BS} > P_f & \text{= "Good"} \\ \quad \parallel \text{"Good"} & \\ \text{else} & \\ \quad \parallel \text{"Check Shackle"} & \end{cases}$$

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BEAMBOY V2.2 REPORT

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HLT 150 Reactions

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LOAD CONFIGURATION

Point Loads

- A) 28900 lb., x=0 ft.
- B) 8750 lb., x=64.9 ft.
- C) 20800 lb., x=67 ft.
- D) 6000 lb., x=76.4 ft.

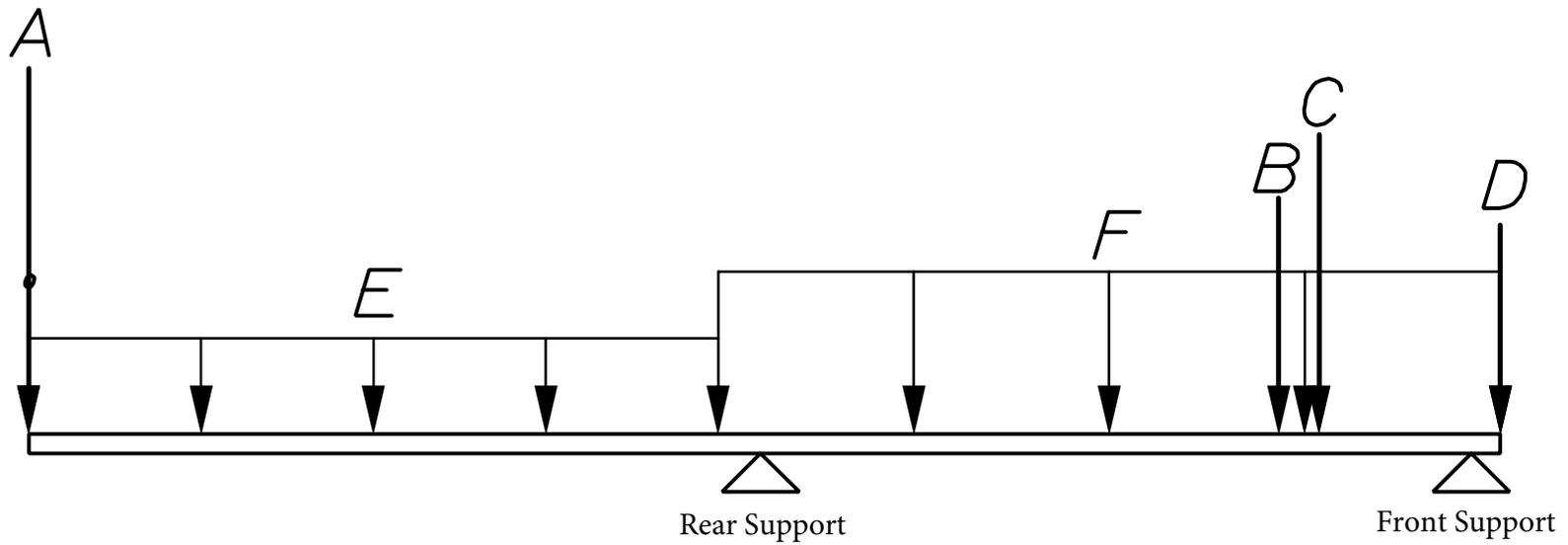
Distributed Loads

- E) Start=131 lb./ft., x=0 ft.; End=131 lb./ft., x=35.8 ft.
- F) Start=1020 lb./ft., x=35.8 ft.; End=1020 lb./ft., x=76.4 ft.

Supports

Rear Support: Simple support; 38 ft., Reaction=93900 lb.  
Front Support: Simple support; 74.9 ft., Reaction=16800 lb.

4/21/2015



HLT 150 LOADING



GROVE®  
worldwide



Lattice Boom Truck Crane Specifications

# HM150T

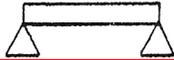
# STERLING CRANE



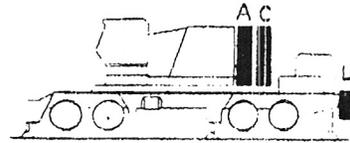
## LIFTING CHARTS - Conventional Truck Cranes

### GROVE MODEL HL150T - 150 TON CAPACITY

68A BOOM - ON OUTRIGGERS OVER REAR  
85% STABILITY



CAPACITY IN POUNDS  
WITH A C + L COUNTERWEIGHTS



COUNTERWEIGHT CONFIGURATION

BOOM LGTH	LOAD RAD	BOOM ANG	SHEAVE HGT	RATED LOAD	BOOM LGTH	LOAD RAD	BOOM ANG	SHEAVE HGT	RATED LOAD	BOOM LGTH	LOAD RAD	BOOM ANG	SHEAVE HGT	RATED LOAD
50	12	81.9	57.1	300,000	80	50	55.5	73.1	68,200	120	80	51.1	100.4	35,500
50	13	80.7	57.0	294,900	80	60	46.2	64.7	53,300	120	90	44.6	91.2	30,200
50	14	79.6	56.8	273,400	80	70	34.9	52.6	43,300	120	100	37.2	79.4	26,100
50	15	78.4	56.6	254,800	80	80	18.4	31.9	36,200	120	110	28.3	63.5	22,800
50	16	77.2	56.3	238,400	90	19	81.0	96.5	198,700	120	120	14.9	37.4	20,000
50	17	76.0	56.0	224,100	90	20	80.4	96.3	188,400	130	25	81.1	136.1	147,600
50	18	74.8	55.7	211,300	90	25	77.1	95.3	149,300	130	30	78.9	135.1	121,700
50	19	73.6	55.4	199,900	90	30	73.8	93.9	123,300	130	35	76.6	134.0	103,200
50	20	72.4	55.1	189,500	90	35	70.5	92.2	104,700	130	40	74.3	132.7	89,200
50	25	66.2	53.1	150,400	90	40	67.0	90.2	90,700	130	45	72.0	131.1	78,200
50	30	59.7	50.4	124,300	100	20	81.3	106.5	188,000	130	50	69.7	129.3	67,400
50	35	52.7	46.8	105,600	100	25	78.4	105.5	149,900	130	60	64.9	125.0	52,500
50	40	44.9	42.2	91,600	100	30	75.5	104.3	122,900	130	70	59.9	119.6	42,500
50	45	35.8	36.0	78,900	100	35	72.5	102.8	104,300	130	80	54.6	113.1	35,300
50	50	23.7	26.8	68,200	100	40	69.4	101.0	90,300	130	90	49.0	105.1	30,000
60	14	81.3	66.9	273,100	100	45	66.3	98.9	78,800	130	100	42.8	95.2	26,000
60	15	80.3	66.8	254,500	100	50	59.8	85.0	68,200	130	110	35.7	82.7	22,600
60	16	79.4	66.6	238,200	100	60	52.1	78.0	53,300	130	120	27.1	65.9	19,900
60	17	78.4	66.3	223,800	100	70	43.4	68.7	43,400	130	130	14.3	38.7	17,600
60	18	77.4	66.1	211,000	100	80	32.8	55.6	36,200	140	27	80.9	148.9	135,800
60	19	76.4	65.8	199,600	100	90	17.3	33.4	30,900	140	30	79.7	145.3	121,200
60	20	75.4	65.6	189,300	110	22	81.1	116.3	169,900	140	35	77.6	144.3	102,900
60	25	70.4	63.9	150,100	110	25	79.5	115.7	148,500	140	40	75.5	143.0	88,700
60	30	65.2	61.8	124,100	110	30	76.8	114.6	122,500	140	45	73.4	141.6	78,000
60	35	59.8	59.0	105,400	110	35	74.1	113.3	104,000	140	50	71.2	139.9	67,200
60	40	54.0	55.5	91,400	110	40	71.4	111.7	89,900	140	60	66.8	136.0	52,300
60	45	47.7	51.4	79,000	110	45	68.6	109.8	78,600	140	70	62.3	131.1	42,200
60	50	40.7	46.0	68,300	110	50	65.8	107.6	67,800	140	80	57.5	125.2	35,100
60	60	21.5	28.6	53,300	110	60	59.9	102.3	52,900	140	90	52.5	118.1	29,700
70	16	80.9	76.7	237,900	110	70	53.6	95.6	42,900	140	100	47.1	109.4	25,700
70	17	80.1	76.6	223,600	110	80	46.7	87.1	35,800	140	110	41.1	98.9	22,400
70	18	79.2	76.3	210,800	110	90	39.0	76.0	30,500	140	120	34.3	85.8	19,600
70	19	78.4	76.1	199,400	110	100	29.6	61.0	26,400	140	130	26.1	68.2	17,300
70	20	77.6	75.9	189,100	110	110	15.6	36.2	23,000	140	140	13.7	39.8	15,400
70	25	73.3	74.5	149,900	120	24	80.9	126.1	154,600	150	28	81.2	155.8	130,200
70	30	69.0	72.7	123,900	120	25	80.4	125.9	148,000	150	30	80.4	155.5	120,800
70	35	64.5	70.4	105,300	120	30	77.9	124.9	122,000	150	35	78.4	154.5	102,400
70	40	59.8	67.7	91,200	120	35	75.5	123.7	103,600	150	40	76.5	153.4	88,400
70	45	54.9	64.4	79,000	120	40	73.0	122.2	89,500	150	45	74.5	152.0	77,700
70	50	49.6	60.3	68,400	120	45	70.5	120.5	78,400	150	50	72.5	150.5	66,900
70	60	37.5	49.4	53,500	120	50	67.9	118.5	67,600	150	60	68.4	146.9	52,000
70	70	19.8	30.3	43,400	120	60	62.6	113.8	52,700	150	70	64.3	142.4	42,000
80	17	81.3	86.7	223,200	120	70	57.1	107.8	42,700	150	80	59.9	137.0	34,800
80	18	80.6	86.5	210,400	120	80	46.7	87.1	35,800	150	90	55.4	130.5	29,400
80	19	79.9	86.3	199,000	120	90	39.0	76.0	30,500	150	100	50.5	122.8	25,500
80	20	79.1	86.1	188,700	120	100	29.6	61.0	26,400	150	110	45.4	113.7	22,100
80	25	75.5	84.9	149,500	120	110	15.6	36.2	23,000	150	120	39.6	102.6	19,400
80	30	71.7	83.4	123,500	130	24	80.9	126.1	154,600	150	130	33.1	88.8	17,100
80	35	67.9	81.4	104,900	130	25	80.4	125.9	148,000	150	140	25.2	70.5	15,100
80	40	63.9	79.1	90,900	130	30	77.9	124.9	122,000	150	150	13.3	41.0	13,500
80	45	59.8	76.3	78,900	130	35	75.5	123.7	103,600					

# Superstructure specifications

<b>Boom 68A</b>	General purpose, optimized for straight boom or boom and fixed jib operations, consisting of basic 50 ft. (15.2m) boom (25 ft. [7.6m] base, 25 ft. [7.6m] point). Open throat point section is equipped with six sheaves mounted on heavy duty roller bearings, offset for improved throat clearance, 22 in. (559mm) pitch diameter. Boom extensions are 10 ft. (3m), 20 ft. (6.1m) and 40 ft. (12.2m) in length. Maximum boom length is 280 ft. (85.3m). Overall boom cross section dimensions are 68 in. (1727mm) deep by 76 in. (1930mm) wide. May be fitted with optional 32A fixed jib or 4 ft. (1.2m) auxiliary sheave point.	<b>Load Moment &amp; Anti-Two Block System</b>	Standard load moment and anti-two block system with audio-visual warning and control lever lockout. These systems provide electronic display of boom angle, length, radius, tip height, relative load moment, maximum permissible load, load indication and warning of impending two-block condition.
<b>Boom 76A</b>	More versatile, larger and heavier than 68A boom, may be fitted with 32A fixed jib or 46A luffing jib assembly. 76A basic 50 ft. (15.2m) boom consists of two piece 25 ft. (7.6m) base and 25 ft. (7.6m) point section. Boom point section is equipped with six sheaves mounted on heavy duty roller bearings, offset for improved throat clearance, 22 in. (559mm) pitch diameter. Maximum boom length is 240 ft. (73.2m). Boom extensions are 10 ft. (3m), 20 ft. (6.1m) and 40 ft. (12.2m) in length. Overall boom cross section is 76 in. (1930mm) deep by 89 in. (2261mm) wide. Wind speed monitor with audible warning.	<b>Cab</b>	Full vision, steel fabricated with acoustical lining and tinted safety glass throughout. Sliding left side door, sliding right side window for ventilation. Hinged skylight with electric wiper. Full engine instrumentation with fuel gauge and audio/visual warning system for all important machine functions. Fabric seat with short stroke levers at arm rest positions. Seat tilts back 10 degrees for increased high boom angle visibility.
<b>Mast Assembly</b>	27 ft. (8.2m) Live Mast equipped with 23 in. (584mm) pitch diameter roller bearing sheaves. Can be used as auxiliary lifting boom with standard component handling equipment, for self erection of machine counterweights, boom componentry and outrigger assemblies.	<b>Engine</b>	Detroit Diesel 6V-92TA, V-6, 2 cycle, turbocharged and after cooled, 552 cu. in. (9.0 liter), 345 HP (257 kw) (Gross) @ 2100 RPM, 330 HP (246 kw) (SAE NET) @ 2100 RPM.
<b>32A Fixed Jib</b>	Maximum length is 90 ft. (27.4m) variable in 20 ft. (6.1m) increments to basic 30 ft. (9.1m) length consisting of 15 ft. (4.6m) base and 15 ft. (4.6m) point section. This jib may be mounted on the 68A boom and the 76A boom utilizing an adaptor assembly. Jib overall cross section is 32 in. (813mm) deep by 38 in. (965mm) wide.	<b>Optional Engine</b>	Cummins LTA10-C325 six cylinder turbocharged and after cooled diesel, 611 cu. in. (10 liter), 325 HP (242 kw) (Gross) @ 2100 RPM. Maximum torque 975 ft. lbs. (1450 kg/m) @ 1300 RPM.
<b>46A Luffing Jib (For 76A Boom Only)</b>	Four piece 80 ft. (24.4m) basic jib consisting of 20 ft. (6.1m) base, two 20 ft. (6.1m) jib extensions and 20 ft. (6.1m) tip section. Maximum jib length is 160 ft. (48.8m). Cross section dimensions are 46 in. (1168mm) deep and 59 in. (1499mm) wide. Includes electronic wind speed indication.	<b>Fuel Tank Capacity</b>	85 gallons (322 liter)
<b>Boom Hoist System</b>	Hydraulic driven dual drum with standard ratchets and pawls, enclosed multi-disc wet brake spring set, hydraulically released. Drums utilize 1 in. (25.4mm) wire rope and have a pitch diameter of 23 in. (584mm). 10 part reeving standard, optional 12 part reeving necessary for 76A boom and 46A luffing jib operation. Gantry and mast utilize 23 in. (584mm) pitch diameter sheaves with anti-friction bearings. Automatic boom hoist kickout at 81 degrees.	<b>Swing</b>	Ball bearing swing circle with 360° continuous rotation. Planetary glide swing with static holding multi-disc wet brake actuated with brake hold button on control lever and/or switch operated parking brake. Rotation is stopped by back plugging swing controller. Plunger type, 2 position, mechanical house lock. Maximum speed: 2.5 rpm.
		<b>Counterweights</b>	Two piece totaling 59,000 lbs. (26762 kg). Counterweight "A" equals 17,500 lbs. (7938 kg), and counterweight "C" equals 41,500 lbs. (18825 kg). Counterweights hook on for quick and easy handling.

# Superstructure specifications (continued)

## HYDRAULIC SYSTEM

<b>Pumps</b>	Four main pumps, one for each function: front hoist, rear hoist, boom hoist, and swing. All main pumps are variable displacement axial piston type. Pumps driven by common gearbox with disconnect clutch.
<b>Controls</b>	Short stroke low pressure hydraulic controllers stroke pumps to determine direction and speed of each function.
<b>Filtration</b>	100% 7 micron filtration of charge and control pressure circuits.
<b>Reservoir</b>	75 gallon (284 liter) capacity with internal diffusers and magnets. Electric fill pump with spin-on filter cartridge provided.
<b>Oil Cooler</b>	Remote mounted with thermostatically controlled hydraulic motor powered fan. High oil temperature warning light provided in operator's cab.

## HOIST SPECIFICATIONS

	Power up and down 2 speed operation standard with ratchet and pawl. Semi-automatic hoist brake feature with free fall to 10,000 lbs. (4535 kg) capacity on foot operated caliper brake pedals. Electronic hoist drum rotation indicators.
<b>MAKE/MODEL</b>	Front and Rear Hoists Grove H060-29
<b>Drum Dimensions</b>	21 in. (533mm) diameter 29 in. (737mm) length 35 in. (889mm) flange diameter

## Line Pull and Line Speed Combinations (4th Layer)

Based on Maximum Permissible Single Line Pull of 29,500 lbs. (13,381 kg) for 1 in. (25.4mm) diameter wire rope - main hoist drums only.

Single Line Pull		Low Speed Mode	
Pounds	Kilograms	FPM	Speed m/min.
29,500	13381	185	56.4
25,000	11340	220	67.1
20,000	9072	240	73.1
15,000	6804	250	76.2
10,000	4536	255	77.7
5,000	2268	260	79.2
1,000	454	260	79.2

Single Line Pull		High Speed Mode	
Pounds	Kilograms	FPM	Speed m/min.
15,000	6804	320	97.5
12,500	5670	390	118.9
10,000	4536	455	138.7
7,500	3402	485	147.8
5,000	2268	500	152.4
2,500	1134	515	157.0
1,000	454	520	158.5

## Maximum Permissible

### Line Pull Based On

1 in. dia. (25.4mm) 6 x 25 w/3.5:1 F.O.S.  
29,500 lbs. (13381 kg)  
1 in. dia. (25.4mm) 18 x 19 w/5:1 F.O.S.  
22,760 lbs. (10324 kg)  
25 mm (0.984 in.) 34 x 7 w/5:1 F.O.S.  
27,170 lbs. (12325 kg)

### Rope Stowage

Usable - 1,190 ft. (363m)  
Stowable - 1,440 ft. (439m)

### Third Hoist

Luffing jib hoist, power up and down, 2 speed operation standard with ratchet and pawl, enclosed multi-disc wet brake, spring set hydraulically released. Drum utilizes 3/4 in. (19mm) dia. wire rope. Stowable capacity - 790 ft. (241m). Recommended length - 680 ft. (207m), required for luffing jib.

\*Denotes optional equipment.

# Carrier specifications

<b>Frame</b>	High strength alloy steel, triple box rear section and channel front section, all welded, with machined surface for turntable bearing.	<b>Transmission</b>	Fuller gearbox with 9 speeds forward and 2 reverse, with 2 speed auxiliary.
<b>Bumper Counterweight</b>	Counterweight "L", one piece - 12,000 lbs. (5443 kg). Pin connected to front of carrier, power removed and installed with mast component handling equipment. (Refer to capacity chart for counterweight requirements).	<b>Axles</b>	Axles 1 & 2, steering, tubular steel, 115.4 in. (2931mm) track. Axles 3 & 4, single reduction drive, 100 in. (2540mm) track.
<b>HYDRAULIC SYSTEM</b>		<b>Suspension</b>	Front axles (1 & 2) spring mounted tandem. *Optional hydraulic spring suspension lockout system. Rear axles (3 & 4) solid mount tandem with equalizing beam and solid steel saddles.
<b>Pump</b>	Single vane type pump driven by carrier engine provides flow to the steer and outrigger circuits.	<b>Tires</b>	14.00x24-20PR highway tread, tube type-front and rear. *14.00R24-20PR radial, tube type - front and rear. *16.00R21-22PR radial, tubeless type - front only.
<b>Filter</b>	Return line type, full flow with bypass protection and filter bypass indicator, replaceable 25 micron cartridge, remote mounted.	<b>Brakes</b>	Full air on all wheels. Air dryer provided to preclude moisture accumulation. Spring set, air released emergency/parking brake on both rear axles.
<b>Reservoir</b>	35 gallon (132.5 liters) capacity with spin on breather, external sight gauges, clean out access, internal diffusers and magnet.	<b>Lights</b>	Full lighting including head, tail, braking, reversing, directional and hazard warning lights.
<b>Outrigger System</b>	Hydraulic single stage double box telescopic beam and jack outriggers with integral holding valves. Removable, pinned to carrier frame. Mid frame box equipped with tilting jack and suspended on integral rail, allowing box to roll out from under frame. Standard 5th vertical jack mounted to the front center section to permit 360° lifting capacities. *Optional mechanical outrigger spin locks, for main jacks only. *Optional rear stabilizing jacks, for erecting certain boom lengths (Refer to capacity charts for rear stabilizer requirements). All steel fabricated quick release type outrigger floats 30.5" (775mm) diameter for main jacks, 24" (610mm) diameter for front jack and rear stabilizers.	<b>Cab</b>	One man design, all steel fabricated with acoustical lining and tinted safety glass throughout. Deluxe fabric covered fully adjustable seat. Complete driving controls with full engine instrumentation, low air A/V warning system, air circulating fan, heater, defroster, windshield washer/wiper, sliding right side window, roll up left side window, fire extinguisher and seat belt.
<b>Outrigger Controls</b>	Located on both sides of carrier. Controls provided for beam and jack extension/retraction as well as engine speed.		
<b>Engine</b>	Detroit Diesel 6V-92TA, V6, 2 cycle, turbocharged and after cooled, 552 cu. in. (9.0 liter), 335 HP (250 kw) (Gross) @ 2100 RPM, 304 HP (227 kw) (SAE NET) @ 2100 RPM.		
<b>*Optional Engine</b>	Cummins N14-460E, six cylinder turbocharged and after cooled diesel. 855 cu. in. (14 liter), 460 HP (343 kw) @ 1600 RPM, 350 HP (261 kw) @ 2100 RPM Maximum torque 1550 ft. lbs. (2102 kg/m) @ 1200 RPM with engine brake and audio-visual engine distress system.		
<b>Fuel Tank Capacity</b>	100 gallons (379 liters).		
<b>Electrical</b>	Four 12 volt - maintenance free batteries, 750 CCA @ 0 degrees F. 24 volt starting, 90 amp alternator.		
<b>Drive</b>	8 x 4		
<b>Steering</b>	Front axle steering, gear type with hydraulic assist.		

# Carrier specifications (continued)

## SPEED AND GRADEABILITY 90,000 LBS. (40824 kg) GVW

SPEED RANGES AT MAXIMUM GOVERNED RPM		% GRADEABILITY AT MAXIMUM TORQUE	
AUXILIARY LOW	AUXILIARY DIRECT	AUXILIARY LOW	AUXILIARY DIRECT
1.8 to 23.2 mph (2.9 to 37.3 kph)	3.7 to 48 mph (6.0 to 77.2 kph)	72.3 to 4.3%	34.7 to 1.3%

NOTE: Performance data based on 90,000 lbs. (40824 kg) GVW, standard engine, transmission, axles and 14:00x24-20PR tires. Performance data may vary  $\pm$  10% due to variations in engine performance and vehicle weights.

<b>Miscellaneous Standard Equipment</b>	Tire inflation kit, mud flaps, pressure protected air system, outrigger controls (on both sides of carrier) outrigger pad storage, cold start aid (less canister), engine distress A/V warning system, air cleaner service indicator, air dryer, air horn, front tow loops, west coast mirrors (both sides), pump disconnect, hoist drum rotation indicators and back up alarm.
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<b>Miscellaneous Optional Equipment</b>	Jacobs engine brake, cold weather package, front suspension lockout, hydraulic powered foot pins, auxiliary rear stabilizers, mechanical outrigger spinlocks, rigging box, 360° swing lock, rotating beacon, boom mounted floodlights, extendible work platforms (both sides of superstructure), component handling assembly and third hoist.
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\*Denotes optional equipment.

## AXLE LOADINGS AND WEIGHTS - (APPROXIMATE)

Quick Reference Combinations	(Boom Foot Pins to Rear)			(Boom Foot Pins to Front)	
	Front Axles	Rear Axles	GVW	Front Axles	Rear Axles
A. Std. Machine with Boom Hoist Rope - No Mast. Bridle is at Boom Foot. No Outrigger Boxes, Counterweights, Boom Stops or Boom, Full Fuel Tanks	41,615 lbs. (18876 kg)	41,417 lbs. (18787 kg)	83,032 lbs. (37663 kg)	19,887 lbs. (9021 kg)	63,145 lbs. (28642 kg)
B. ADD: Mast and 1,000 ft. (305m) of Hoist 1 in. rope to Front and Rear Hoist Drums	39,131 lbs. (17750 kg)	50,233 lbs. (22786 kg)	89,364 lbs. (40536 kg)	23,156 lbs. (10504 kg)	66,208 lbs. (30032 kg)
C. ADD: 25 ft. (7.6m) 68A Boom Base Section with Component Handling Option	37,824 lbs. (17157 kg)	56,093 lbs. (25444 kg)	93,917 lbs. (42600 kg)	26,306 lbs. (11932 kg)	67,611 lbs. (30668 kg)
D. ADD: 25 ft. (7.6m) 76A Boom Base Section with Component Handling Option in lieu of Item C	34,551 lbs. (15672 kg)	62,314 lbs. (28265 kg)	96,865 lbs. (43937 kg)	30,765 lbs. (13955 kg)	66,100 lbs. (29982 kg)
E. Complete Std. Crane with 50 ft. (15.2m) 68A Basic Boom	107,090 lbs. (48576 kg)	76,470 lbs. (34687 kg)	183,560 lbs. (83263 kg)	26,725 lbs. (12122 kg)	156,835 lbs. (71140 kg)
F. Complete Std. Crane with 50 ft. (15.2m) 76A Basic Boom	98,943 lbs. (44880 kg)	92,247 lbs. (41842 kg)	19,190 lbs. (86722 kg)	36,621 lbs. (16611 kg)	154,569 lbs. (70111 kg)

# Axle Loadings and Weights (continued)

## WEIGHT ADJUSTMENTS FOR COMPLETE STANDARD CRANE WITH 50 FT. (15.2m) 68A OR 76A BASIC BOOM - ITEMS E OR F

Quick Reference Combinations	(Boom Foot Pins to Rear)			(Boom Foot Pins to Front)	
	Front Axles	Rear Axles	GVW	Front Axles	Rear Axles
<b>REMOVE:</b>					
Counterweight "A"	-15,937 lbs. (-7229 kg)	-1,563 lbs. (-709 kg)	-17,500 lbs. (-7938 kg)	8,878 lbs. (4027 kg)	-26,378 lbs. (-11965 kg)
Counterweight "C"	-41,151 lbs. (-18666 kg)	-349 lbs. (-158 kg)	-41,500 lbs. (-18824 kg)	24,412 lbs. (11073 kg)	-65,912 lbs. (-29898 kg)
Bumper Counterweight "L"	-18,841 lbs. (-8546 kg)	6,841 lbs. (3103 kg)	-12,000 lbs. (-5443 kg)	-18,841 lbs. (-8546 kg)	6,841 lbs. (3103 kg)
Boom Point Section (68A)	8,974 lbs. (4070 kg)	-13,100 lbs. (-5942 kg)	-4,126 lbs. (-1872 kg)	-10,638 lbs. (-4825 kg)	6,512 lbs. (2953 kg)
Boom Base Section (68A)	2,151 lbs. (976 kg)	-5,335 lbs. (-2420 kg)	-3,184 lbs. (-1444 kg)	-3,435 lbs. (-1558 kg)	251 lbs. (114 kg)
Boom Point Section (76A)	14,586 lbs. (6616 kg)	-21,206 lbs. (-9619 kg)	-6,620 lbs. (-3002 kg)	-17,256 lbs. (-7827 kg)	10,636 lbs. (4825 kg)
Boom Base Section (76A) (Include 10' Ext.)	3,750 lbs. (1700kg)	-9,880 lbs. (-4481 kg)	-6,130 lbs. (-2780 kg)	-6,225 lbs. (-2823 kg)	95 lbs. (43 kg)
Front Outrigger Box Assembly with Pads	-5,620 lbs. (-2549 kg)	-2,585 lbs. (-1173 kg)	-8,205 lbs. (-3722 kg)	-5,620 lbs. (-2549 kg)	-2,585 lbs. (-1173 kg)
Rear Outrigger Box Assembly with Pads	2,571 lbs. (1166 kg)	-11,071 lbs. (-5022 kg)	-8,500 lbs. (-3856 kg)	2,571 lbs. (1166 kg)	-11,071 lbs. (-5022 kg)
Mast	2,345 lbs. (1064 kg)	-5,128 lbs. (-2326 kg)	-2,783 lbs. (-1262 kg)	-3,467 lbs. (-1573 kg)	684 lbs. (310 kg)
Bridle	1,639 lbs. (743 kg)	-2,982 lbs. (-1353 kg)	-1,343 lbs. (-609 kg)	-2,181 lbs. (-989 kg)	838 lbs. (380 kg)
Boom Stops	-223 lbs. (-101 kg)	-509 lbs. (-231 kg)	-732 lbs. (-332 kg)	-73 lbs. (-33 kg)	-659 lbs. (-299 kg)
Outrigger Pads (5)	-86 lbs. (-39 kg)	-353 lbs. (-160 kg)	-439 lbs. (-199 kg)	-86 lbs. (-39 kg)	-353 lbs. (-160 kg)
Front Hoist Assembly	-665 lbs. (-302 kg)	-3,465 lbs. (-1572 kg)	-4,130 lbs. (-1873 kg)	-665 lbs. (-302 kg)	-3,465 lbs. (-1572 kg)
Rear Hoist Assembly	-1,498 lbs. (-679 kg)	-2,673 lbs. (-1212 kg)	-4,171 lbs. (-1892 kg)	-184 lbs. (-83 kg)	-3,987 lbs. (-1809 kg)
<b>ADD:</b>					
Cummins Engines	1,440 lbs. (653 kg)	-290 lbs. (-131 kg)	1,150 lbs. (522 kg)	1,440 lbs. (653 kg)	-290 lbs. (-131 kg)
Front Hoist Rope (1,000 ft.)	373 lbs. (169 kg)	1,477 lbs. (670 kg)	1,850 lbs. (839 kg)	373 lbs. (169 kg)	1,477 lbs. (670 kg)
Rear Hoist Rope (1,000 ft.)	643 lbs. (292 kg)	1,207 lbs. (548 kg)	1,850 lbs. (839 kg)	103 lbs. (47 kg)	1,747 lbs. (792 kg)
Third Hoist Assembly (76A)	220 lbs. (100 kg)	2,158 lbs. (979 kg)	2,378 lbs. (1079 kg)	1,179 lbs. (535 kg)	1,199 lbs. (544 kg)
Third Hoist Rope (76A)	65 lbs. (29 kg)	642 lbs. (291 kg)	707 lbs. (321 kg)	351 lbs. (159 kg)	356 lbs. (161 kg)
Boom Base Component Handling Equipment (68A)	-737 lbs. (-334 kg)	1,184 lbs. (537 kg)	447 lbs. (203 kg)	917 lbs. (416 kg)	-470 lbs. (-213 kg)
Boom Base Component Handling Equipment (76A)	-1,053 lbs. (-477 kg)	1,692 lbs. (767 kg)	639 lbs. (290 kg)	1,311 lbs. (595 kg)	-672 lbs. (-305 kg)
Auxiliary Stabilizers	1,490 lbs. (676 kg)	-470 lbs. (-213 kg)	1,020 lbs. (463 kg)	1,490 lbs. (676 kg)	-470 lbs. (-213 kg)
Outrigger Spinlocks	67 lbs. (30 kg)	293 lbs. (133 kg)	360 lbs. (163 kg)	67 lbs. (30 kg)	293 lbs. (133 kg)
Hydraulic Spring Suspension Lockouts	199 lbs. (90 kg)	91 lbs. (41 kg)	290 lbs. (131 kg)	199 lbs. (90 kg)	91 lbs. (41 kg)
Michelin Tires I.L.O.S.	376 lbs. (171 kg)	752 lbs. (341 kg)	1,128 lbs. (512 kg)	376 lbs. (171 kg)	752 lbs. (341 kg)
Rigging Box	172 lbs. (78 kg)	259 lbs. (117 kg)	431 lbs. (195 kg)	172 lbs. (78 kg)	259 lbs. (117 kg)

# Dimensions

## Tailswing

No Counterweight - 14' 1" (4293)

"A" Counterweight - 14' 11" (4547)

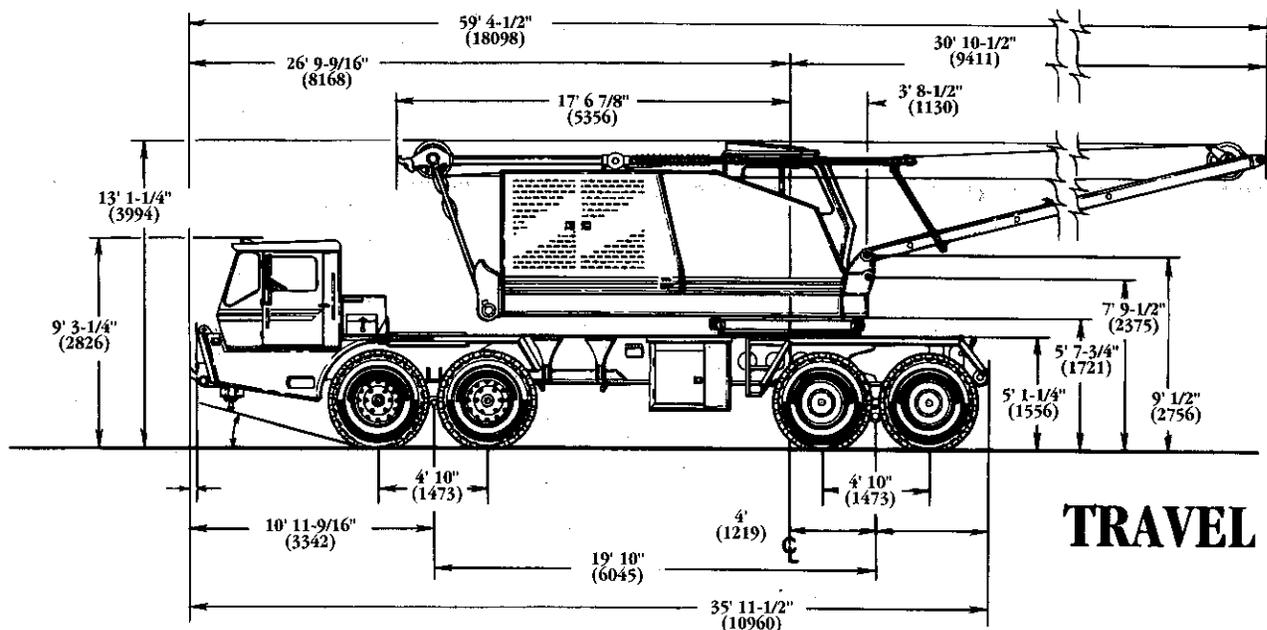
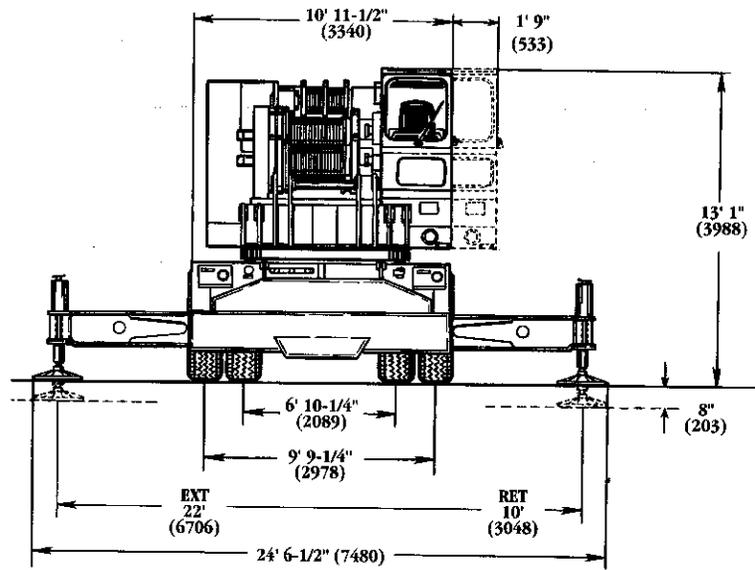
"C" Counterweight - 17' (5182)

## Turning Clearance

Over Bumper - 53' 3" (16.3m)

At Curb - 51' 2-1/2" (15.6m)

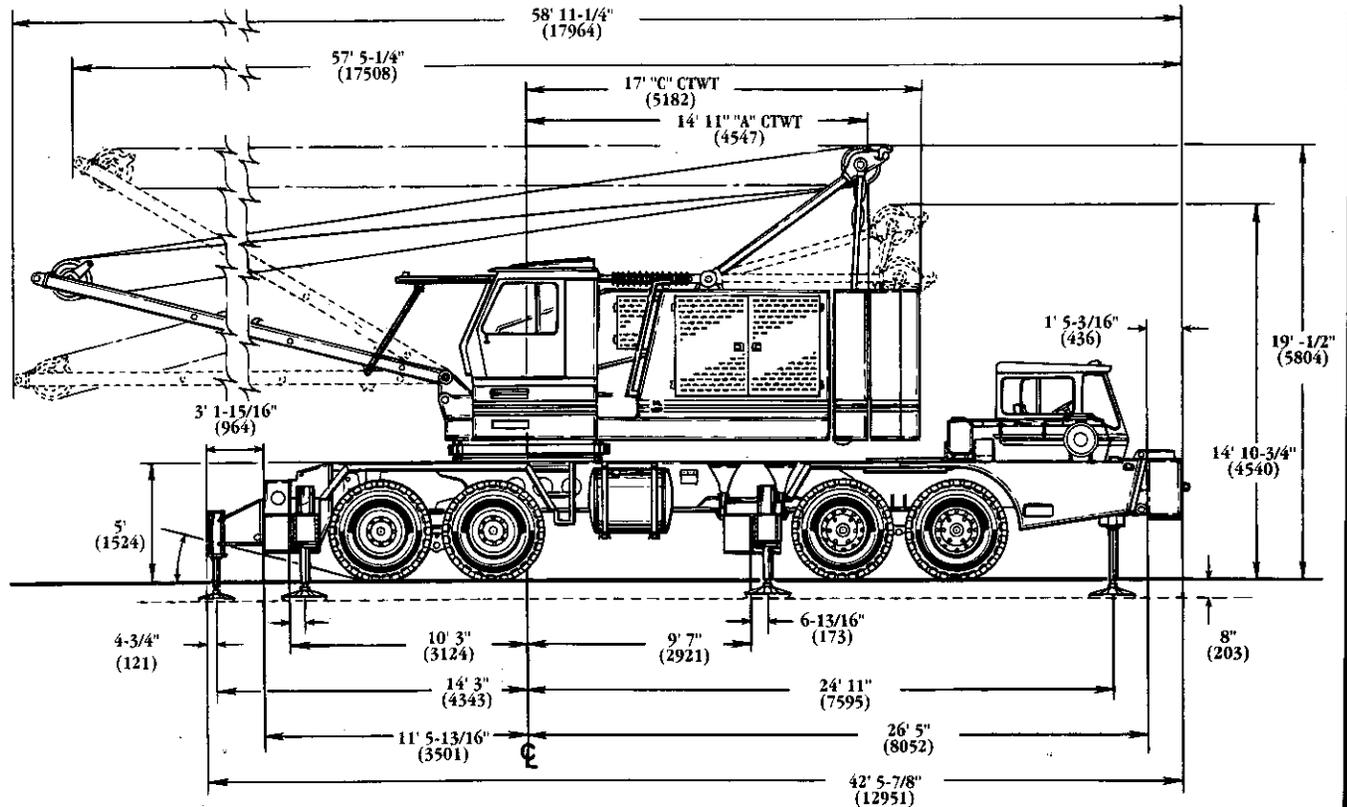
## REAR



## TRAVEL

# Dimensions

# HL150T



## WORKING



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Distributed By:

## NOTES TO LIFTING CAPACITIES

### GENERAL:

1. Rated loads as shown on capacity chart pertain to this crane as originally manufactured and equipped. Modifications to the crane or use of optional equipment other than that specified can result in a reduction of capacity. Use only the jib or boom extension supplied with this crane. Do not substitute jibs or boom extensions without the written approval of Grove Manufacturing Co.
2. Construction equipment can be hazardous if improperly operated or maintained. Operation and maintenance shall be in compliance with the information in the Operator's and Safety Handbook. Service, Parts, and Roding/Rigging manuals supplied with this crane. If these manuals are missing, order replacements from the manufacturer.
3. The operator and other personnel associated with this crane shall fully acquaint themselves with the latest applicable American National Standards Institute (ANSI) Safety Standards for cranes.
4. **WARNING!** Do not attempt to operate this crane unless you have read and are thoroughly familiar with the Operator's and Safety Handbook, and Roding/Rigging manuals.

### SETUP:

1. The crane shall be leveled on a firm supporting surface. Depending on the nature of the supporting surface, it may be necessary to have structural supports of sufficient strength under the outrigger floats or tires to spread the load to a larger bearing surface.
2. For outrigger operation, outriggers shall be fully extended to 22 ft. 0 in. (6.7 m) width with tires raised free of crane weight before operating boom or lifting loads.
3. The front jack cylinder shall be set in accordance with the written procedure. See Carrier Operator's Safety Handbook Section 4.
4. With certain boom and hoist tackle combinations, maximum capacities may not be obtainable with standard cable lengths.
5. Rotation resistant wire rope is best suited for single line lifting operations. Consult the wire rope manufacturer for specific recommendations concerning multiple part reeving.
6. Consult the Roding and Rigging Manual for the proper boom-counterweight configuration for jobsite moves.
7. **WARNING!** Never raise boom from ground, operate boom, or rotate upperstructure without consulting Roding and Rigging manual to assure machine is in proper operating configuration. That is outriggers extended and set, or front axle lockouts engaged, and proper counterweights installed.
8. When lowering boom over rear, caution must be taken to assure boom does not contact carrier deck or rear outrigger. Blocking may be required under boom point.
9. **WARNING:** Never erect jibs unless outriggers are fully extended to 22 ft. 0 in. (6.7 m) and set.
10. **WARNING:** When erecting booms longer than 190 ft. (57.9 m) for 68A boom or 220 ft. (67.1 m) for 76A boom, Mid Point Suspension must be installed. Consult Roding/Rigging manual for proper location of mid point suspension.

### OPERATION:

1. Rated loads at rated radius shall not be exceeded. Do not tip the machine to determine allowable loads. For clamshell and concrete bucket operation, see respective load charts.
2. All rated loads have been tested to and meet minimum requirements of SAE J-987 Crane Structures - Method of Test, and do not exceed the percentage of the tipping load shown on capacity charts as determined by SAE J-765, Crane Stability Test Code.
3. Rated loads include the weight of hook block, slings and auxiliary lifting devices and their combined weights shall be subtracted from the listed ratings to obtain the net load which may be lifted.
4. Load ratings are based on freely suspended loads. No attempt shall be made to move a load horizontally on the ground in any direction.
5. Rated loads do not account for wind on lifted load or boom. It is recommended when wind velocity is above 20 mph (32 km/h), rated loads and boom lengths be appropriately reduced.
6. Rated loads are for lift crane service only.
7. Do not operate at a radius or boom length where capacities are not listed. At these positions, the crane may over turn without any load on the hook.
8. When either boom length or radius or both are between values listed, the smallest load shown at either the next larger radius or boom length shall be used.
9. For safe operation, the user shall make due allowances for his particular job conditions, such as soft or uneven ground, high winds, pendulum action, jerking or sudden stopping of loads, hazardous conditions, experience of personnel, two machine lifts, traveling with loads, electric wires, etc. Side pull on boom or jib is extremely dangerous.
10. Handling of personnel from the boom is strictly prohibited.
11. Keep load handling devices a minimum of 18 in. (45.7 cm) below head at all times.
12. The boom angle before loading should be greater than the loaded boom angle to account for deflection.
13. Capacities appearing above the bold line or within shaded areas are based on structural strength and tipping should not be relied upon as a capacity limitation.
14. Radii less than 40 ft. (12 m) not recommended when lifting over the front of machine.

### DEFINITIONS:

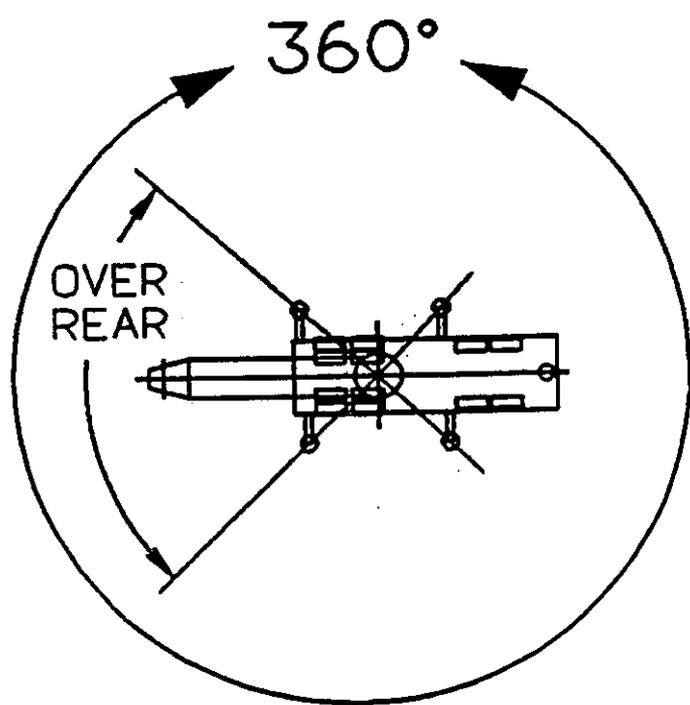
1. Operating Radius: Horizontal distance from a projection of the axis of rotation to the supporting surface before loading to the center of the vertical hoist line or tackle with load applied.
2. Loaded Boom Angle: Is the angle between the boom base section and the horizontal after lifting the rated load at the rated radius with the rated boom length.
3. Working Area: Areas measured in a circular arc about the centerline of rotation as shown on the working area diagram.
4. Freely Suspended Load: Load hanging free with no direct external force applied except by the lift cable.
5. Side Load: Horizontal force applied to the lifted load either on the ground or in the air.
6. No Load Stability Limit: The stability limit radius shown on the range diagram is the radius beyond which it is not permitted to position the boom plus block configuration, because machine can overturn without any load on the hook.

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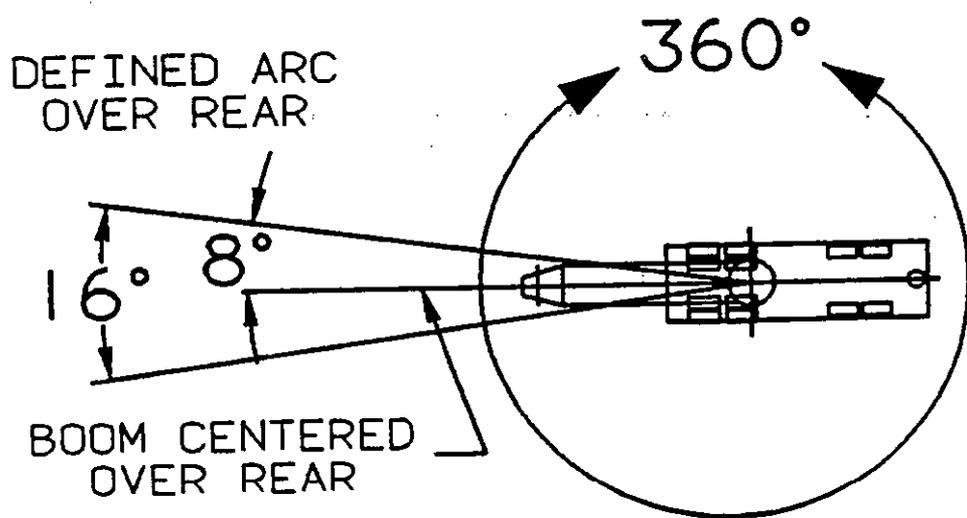
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Pg. 1 of 2

HL150T  
IDENTIFICATION





LIFTING AREA DIAGRAM  
ON OUTRIGGERS



LIFTING AREA DIAGRAM  
ON TIRES

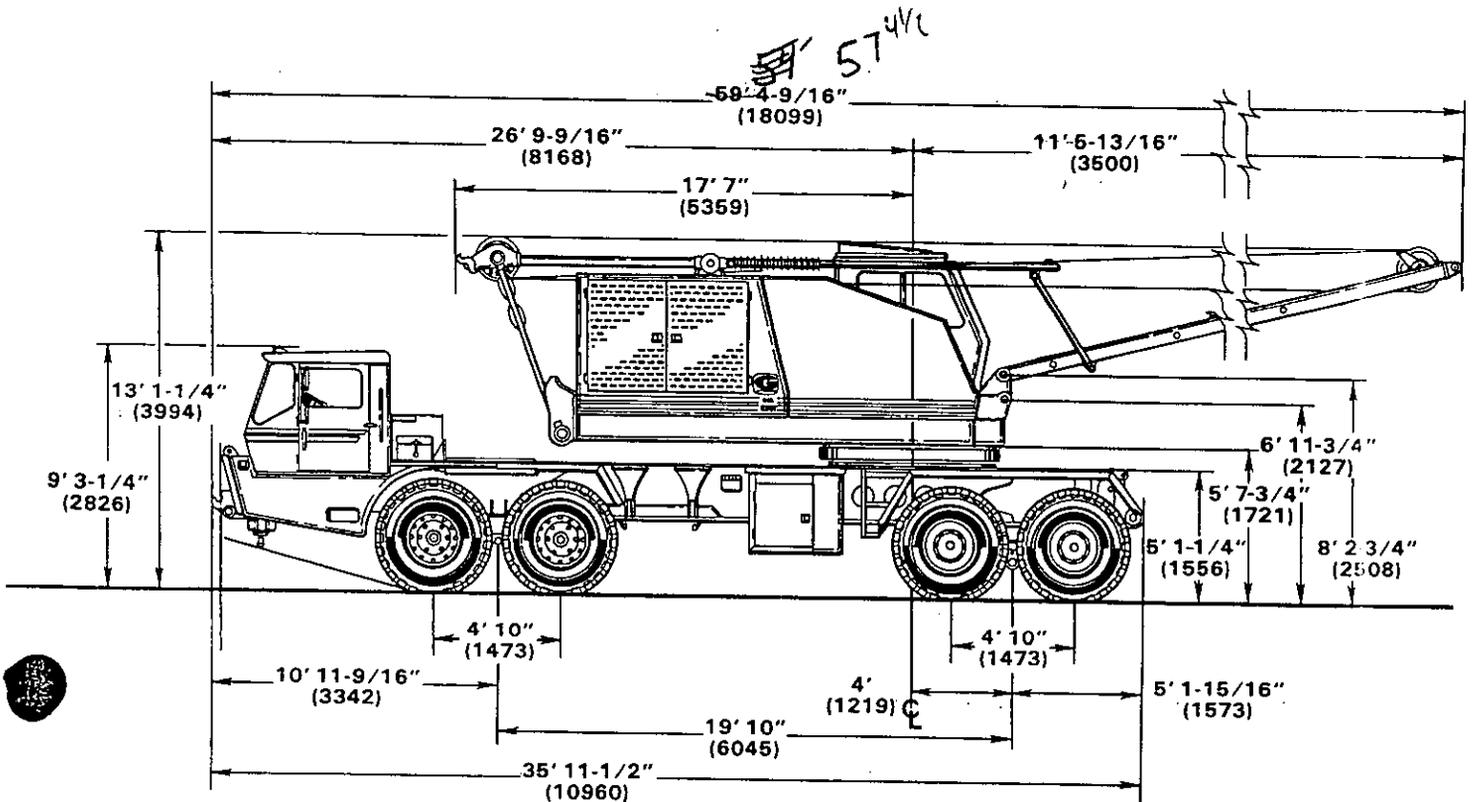
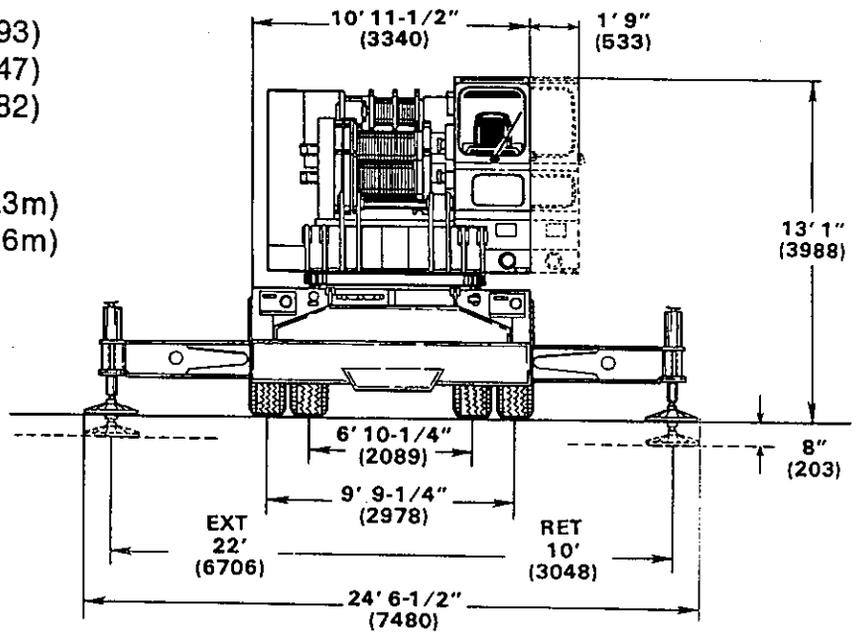
# REAR

## Tailswing

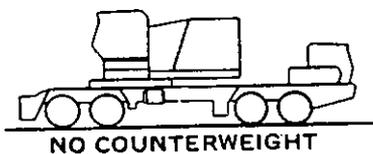
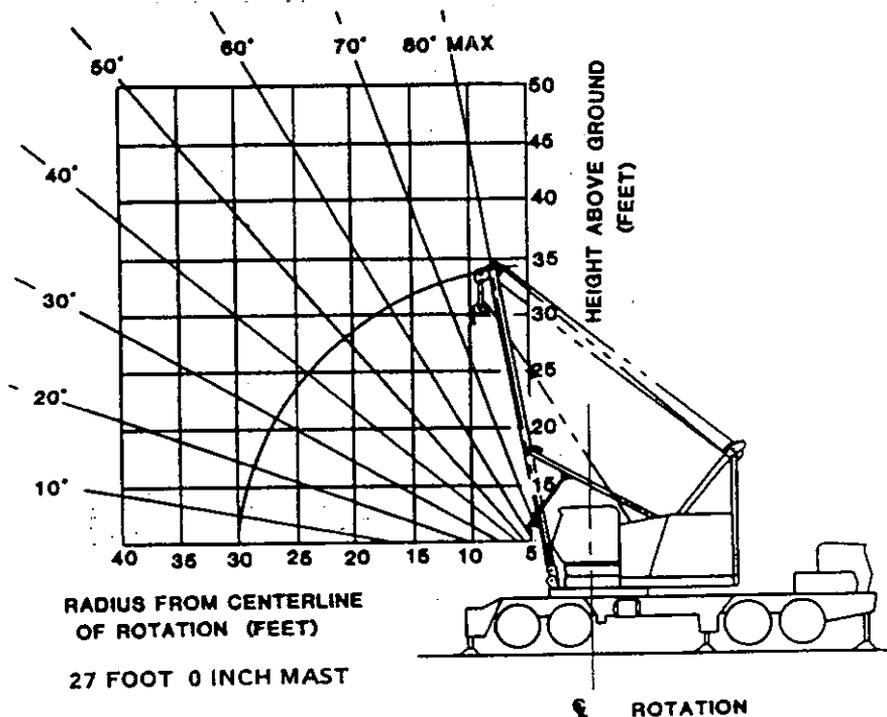
- No Counterweight - 14' 1" (4293)
- "A" Counterweight - 14' 11" (4547)
- "C" Counterweight - 17' (5182)

## Turning Clearance

- Over Bumper - 53' 3" (16.3m)
- At Curb - 51' 2-1/2" (15.6m)



**MAST RANGE AND CAPACITY 360°  
85% STABILITY ON OUTRIGGERS  
75% STABILITY ON TIRES**



RADIUS	MAST ANGLE	ON TIRES FRONT AXLE FREE	ON TIRES FRONT AXLE LOCKED (7)	ON OUTRIGGERS
9	78.7	45,000	45,000	45,000
13	69.9	26,900	39,100	45,000
14	67.6	24,300	35,000	45,000
15	65.3	22,100	31,500	45,000
16	62.9	20,200	28,600	45,000
17	60.5	18,700	26,200	45,000
18	58.0	17,200	24,200	45,000
19	55.5	16,100	22,500	45,000
20	52.9	15,000	20,900	40,600
25	37.9	11,100	15,400	27,200
30	13.2	8,700	12,000	17,500

1. Rated loads appearing in shaded areas are based on structural strength and tipping should not be relied upon as a capacity limitation.
2. Rated loads are in pounds and do not exceed 85% of tipping loads on outriggers and 75% of tipping loads on tires as determined by test in accordance with SAE J-765 OCT80.
3. On tire rated loads are for the machine with outrigger boxes removed.
4. Rated loads are applicable to machines equipped with 14.00 x 24 (20 ply) bias ply or radial tires at 115 psi cold inflation pressure or 16.00 x 21 (22 ply) radial ply tires at 85 psi cold inflation pressure.
5. All lifting depends on proper tire inflation, capacity and condition. Rated loads must be reduced for lower tire inflation pressures. Damaged tires are hazardous to safe operation of crane.
6. Rated loads are applicable only with machine on a firm level surface.
7. Front axles must be locked on both axles before lifting on tires over side or front.
8. Gantry must be pinned in high position before lifting loads.
9. Use of the heaviest hookblock allowable within load chart limits also works best to prevent overhauling.

SERIAL NUMBER

HL150T  
IDENTIFICATION



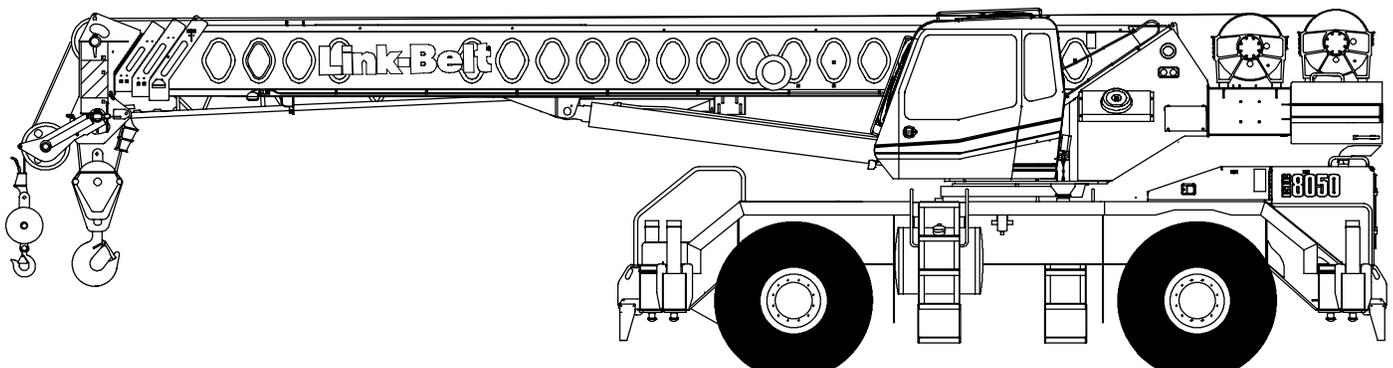
# Technical Data

## Specifications & Capacities

# RTC 8050

**Series II**

Telescopic Boom Rough Terrain Crane  
**50 ton (50 metric ton)**



**CAUTION:** This material is supplied for reference use only. Operator must refer to in-cab Crane Rating Manual and Operator's Manual to determine allowable crane lifting capacities and assembly and operating procedures.



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# Boom, Attachments, and Upper Structure

## ■ Boom

**Design** – Four section, box type construction of high tensile steel consisting of one base section and three telescoping sections. The vertical side plates have diamond shaped steel impressions for superior strength to weight ration. The first telescoping section extends independently by means of one double-acting, single stage hydraulic cylinder with integrated holding valves. The second and third telescoping sections extend proportionally by means of one double-acting, single stage cylinder with integrated holding valves and cables.

## Boom

- 35 ft 6 in–110 ft (10.8–33.5m) four section full power boom
- Two mode boom extension: *A-max* mode provides superior capacities by extending the first telescoping section to 60 ft 4 in (18.4m). Standard mode synchronizes all the telescoping sections proportionally to 110 ft (33.5m). Controlled from the operator's cab.
- Mechanical boom angle indicator
- Maximum tip height for *A-max* mode is 70 ft (21.3m) and standard mode is 118 ft 5 in (36.1m).

## Boom Head

- Four 16.5 in (41.9cm) root diameter nylon sheaves to handle up to eight parts of line
- Easily removable wire rope guards
- Rope dead end lugs on each side of the boom head
- Boom head is designed for quick-reeve of the hook block

## Boom Elevation

- One double acting hydraulic cylinder with integral holding valve
- Boom elevation:  $-3^{\circ}$  to  $78^{\circ}$

## Auxiliary Lifting Sheave – Optional

- Single 16.5 in (41.9m) root diameter nylon sheave
- Easily removable wire rope guards
- Does not affect erection of the fly or use of the main head sheaves

## Hook Blocks and Balls – Optional

- 40 ton (36.3mt) 4 sheave quick-reeve hook block with safety latch
- 60 ton (54.4mt) 4 sheave quick-reeve hook block with safety latch
- 8.5 ton (7.7mt) swivel and non-swivel hook balls with safety latch

## Fly – Optional

- 28 ft 6 in (8.7m) one piece lattice fly, stowable, offsettable to  $2^{\circ}$ ,  $20^{\circ}$ , and  $40^{\circ}$ . Maximum tip height is 146 ft (44.5m).
- 28 ft 6 in–51 ft (8.7–15.5m) two piece bi-fold lattice fly, stowable, offsettable to  $2^{\circ}$ ,  $20^{\circ}$ , and  $40^{\circ}$ . Maximum tip height is 168 ft (51.2m).

## ■ Operator's Cab and Controls

**Environmental Cab** – Fully enclosed, one person cab of galvaneal steel structure with acoustical insulation.

Equipped with:

- Tinted and tempered glass windows
- Extra-large fixed front window with windshield wiper and washer
- Swing up roof window with windshield wiper
- Sliding left side door with large fixed window
- Sliding rear and right side windows for ventilation
- Six way adjustable, cushioned seat with seat belt and storage compartment
- Diesel fired warm-water heater with air ducts for front windshield defroster and cab floor
- Defroster fan for the front window
- Bubble level
- Circulating fan
- Adjustable sun visor
- Dome light
- Cup holder
- Fire extinguisher
- Left side viewing mirror
- Two position travel swing lock

**Air Conditioning – Optional** – Integral with cab heating system utilizing the same ventilation outlets

**Engine Dependent Heater – Optional** – Flameless, warm-water system that does not have a separate fuel tank

**Steering Column** – Pedestal type with tilt and telescope functions for operator comfort. Column includes the following controls and indicators:

Left and right levers include:

- Horn button
- Turn signal switch
- Driving light switch
- Transmission direction switch

Panel mounted switches for:

- Travel park brake
  - Steer mode selector
  - 4 wheel drive
  - Transmission gear selector
  - Hazard flasher
- Panel mounted indicator/warning lights for:
- Transmission display
  - Transmission temperature
  - Engine oil pressure
  - Travel park brake
  - Service brake
  - Turn signals
  - Rear wheel offset
  - Emergency steer – optional

**Armrest Controls** – Two dual axis hydraulic joystick controllers or optional single axis hydraulic controllers for:

- Swing
- Boom hoist
- Main rear winch
- Auxiliary front winch – optional
- Drum rotation indication
- Drum rotation indicator activation switch
- Winch high/low speed and disable switch(es)
- Third wrap selector switch – optional
- Telescopic override switches
- Warning horn button
- Swing park brake

**Outrigger Controls** – Hand held control box with umbilical cord gives the operator the freedom to view operation while setting the outriggers.

#### **Foot Controls**

- Boom telescope
- Swing brake
- Engine throttle

**Right Front Console** – Controls and indicators for:

- |                                     |   |
|-------------------------------------|---|
| • Engine ignition                   | • Bubble level                            |
| • Engine throttle lock              | • 12 volt power connection                |
| • Function disable                  | • Air conditioning – optional             |
| • Front windshield wiper and washer | • Boom floodlight – optional              |
| • Cab floodlights                   | • Rotating beacon/Strobe light – optional |
| • Warning horn                      | • Third wrap indicator – optional         |
| • Heating controls                  |   |
| • Console dimmer switch             |   |

**Cab Instrumentation** – Ergonomically positioned, analog instrumentation for crane operation including:

- Engine coolant temperature with warning indicator
- Hydraulic oil temperature with warning indicator
- Fuel level with warning indicator
- Tachometer

**Rated Capacity Limiter** – Microguard 434 graphic audio–visual warning system integrated into the dash with anti–two block and function limiter. Operating data available includes:

- Crane configuration
- Boom length and angle
- Boom head height
- Allowed load and % of allowed load
- Boom angle
- Radius of load
- Actual load
- Operator settable alarms (include):
  - Maximum and minimum boom angles
  - Maximum tip height
  - Maximum boom length
  - Swing left/right positions
  - Operator defined area (imaginary plane)

**Internal RCL Light Bar – Optional** – Visually informs the operator when crane is approaching maximum load capacity with a series of green, yellow, and red lights.

**External RCL Light Bar – Optional** – Visually informs the ground crew when crane is approaching maximum load capacity with a series of green, yellow, and red lights.

## ■ Swing

**Motor/Planetary** – Bi–directional hydraulic swing motor mounted to a planetary reducer for 360° continuous smooth swing at 2.5 rpm.

**Swing Park Brake** – 360°, electric over hydraulic, (spring applied/hydraulic released) multi–disc brake mounted on the speed reducer. Operated by a switch from the operator’s cab.

**Swing Brake** – 360°, foot operated, hydraulic applied disc brake mounted to the speed reducer.

**Swing Lock** – Two–position swing lock (boom over front or rear) operated from the operator’s cab.

**360° Positive Swing Lock – Optional** – Meets New York City requirement.

## ■ Electrical

**Swing Alarm** – Audio warning device signals when the upper is swinging.

#### **Lights**

- Two working lights on front of the cab
- One rotating amber beacon on top of the cab – optional
- One amber strobe beacon on top of the cab – optional
- Boom floodlight – optional

## ■ Load Hoist System

### Load Hoist Performance

Main (Rear) and Auxiliary (Front) Winches – 3/4 in (19mm) Rope										
Layer	Maximum Line Pull		Normal Line Speed		High Line Speed		Layer		Total	
	lb	kg	ft/min	m/min	ft/min	m/min	ft	m	ft	m
1	15,390	6 980.8	168	51.2	337	102.7	114	34.7	114	34.7
2	14,150	6 418.3	183	55.8	366	111.6	124	37.8	238	72.5
3	13,094	5 939.3	198	60.4	396	120.7	134	40.8	372	113.4
4	12,185	5 527.0	212	64.6	425	129.5	144	43.9	516	157.3
5	11,394	5 168.2	227	69.2	455	138.7	154	46.9	670	204.2

Wire Rope Application		Diameter		Type	Maximum Permissible Load	
		in	mm		lb	kg
Main (Rear) Winch	Standard	3/4	19	18x19 rotation resistant – right regular lay (Type RB)	12,920	5 860.5
	Optional	3/4	19	36x7 rotation resistant – right regular lay (Type ZB)	15,600	7 076.2
Auxiliary (Front) Winch	Standard	3/4	19	18x19 rotation resistant – right regular lay (Type RB)	12,920	5 860.5
	Optional	3/4	19	36x7 rotation resistant – right regular lay (Type ZB)	15,600	7 076.2

### 2M Main and Optional Auxiliary Winches

- Bi-directional gear-type (2-speed) hydraulic motors driven through planetary reduction unit for positive control under all load conditions.
- Grooved lagging
- Power up/down mode of operation
- Hoist drum cable follower
- Drum rotation indicator
- Drum diameter: 16 in (40.6cm)
- Rope length:
  - Main: 600 ft (182.9m)
  - Auxiliary: 600 ft (182.9m)
- Maximum rope storage: 834 ft (254.2m)
- Terminator style socket and wedge

**Third wrap indicator – optional** – Visually and audibly warns the operator when the wire rope is on the first/bottom layer and when the wire rope is down to the last three wraps.

### ■ Hydraulic System

**Counterbalance Valves** – All hoist motors, boom extend cylinders, and boom hoist cylinders are equipped with counterbalance valves to provide load lowering and prevents accidental load drop when hydraulic power is suddenly reduced.

### ■ Counterweight

Total of 12,500 lb (5 670kg) of counterweight bolted to the upper structure frame with capacities for the 12,500 lb (5 670kg) configuration.

## Carrier

### General

- 10 ft 10.5 in (3.31m) wide
- 12 ft 7 in (3.83m) wheelbase (centerline of first axle to centerline of second axle).

**Frame** – Box–type, torsion resistant, welded construction made of high tensile steel. Equipped with front and rear towing and tie–down lugs, tow connections, and access ladders.

### Outriggers

**Boxes** – Two double box, front and rear welded to carrier frame.

**Beams and Jacks** – Four single stage beams with Confined Area Lifting Capacities (CALC™) provide selectable outrigger extensions of full, intermediate, and retracted. Hydraulically controlled from the operator's cab with integral check valves.

**Pontoons** – Four lightweight, quick release, 19.25 x 19.25 in (48.90 x 48.90cm), steel pontoons with contact area of 307 in<sup>2</sup> (1 980.6cm<sup>2</sup>) can be stored for road travel in storage racks on the carrier.

**Main Jack Reaction** – 63,500 lb (28 803kg) force and 213 psi (1 469kPa) ground bearing pressure.

### Steering and Axles

**Steering** – Four independent modes consisting of two wheel front, two wheel rear, four wheel, and crab. Each mode is controlled from the steering wheel and is selected by a switch in the operator's cab.

**Drive** – Two modes: 4 x 2 and 4 x 4 for off highway travel

**Axle 1** – Steered, non–driven for 4 x 2 and steered, driven for 4 x 4

**Axle 2** – Steered, driven

### Suspension

**Front** – Rigid mount to the carrier frame

**Rear** – The rear axle is suspended on the oscillation cylinders with motion of the axle controlled by a four bar linkage system. The oscillation cylinders lockout when the upper structure rotates 2.5° past centerline.

- Hydro–gas rear suspension – optional

### Tires and Wheels

**Front and Rear** – Four (single) 23.5 x 25–20 ply rating, earthmover type tires on steel disc wheels

- Spare tires and wheels – optional

### Brakes

**Service** – Full hydraulic, dual circuit, disc type brakes on all wheel ends

**Parking/Emergency** – Spring loaded type, acting on front axle

### Electrical

Three batteries provide 12 volt operation and starting

#### Lights

- Front lighting includes two main headlights, and two parking/directional indicators.
- Side lighting includes two parking/directional indicators per side.
- Rear lighting includes two parking/directional indicators, two parking/brake lights, and two reversing lights.
- Other equipment includes hazard/warning system, cab light, instrument panel light, and signal horn.

### Engine

Specification	CAT C6.6
Numbers of Cylinders	6
Cycle	4
Bore and Stroke: inch (mm)	4.13 x 5.00 (105 x 127)
Piston Displacement: in <sup>3</sup> (L)	402.7 (6.6)
Max. Brake Horsepower: hp (kW)	174 (130) @ 2,200 rpm
Peak Torque: ft lb (Nm)	512 (694) @ 1,500 rpm
Alternator: volts – amps	12 – 150
Crankcase Capacity: qt (L)	18.4 (17.4)
<ul style="list-style-type: none"> <li>• Mechanically driven fan and thermostatically controlled radiator</li> <li>• Water/Fuel separator</li> <li>• 110–volt block heater</li> <li>• Glow plugs/block heater</li> </ul>	

### Transmission

**Powershift** – Three speed with high/low range for 6 forward and 6 reverse gears. Front axle disconnect for two or four wheel drive. Front axle disconnect in high range.

## ■ Carrier Speeds and Gradeability

Dana Spicer		Speed		Gradeability (@ 70% Converter efficiency)	
Gear		Ratio	mph	km/h	% Grade
6th	Forward 2WD Hi	0.82	22.4	36.05	3.0
5th		2.25	8.2	13.20	11.8
4th		4.67	3.9	6.28	27.4
3rd	Forward 4WD Low	2.40	7.6	12.23	12.7
2nd		6.54	2.8	4.51	40.9
1st		13.60	1.3	2.09	137.3
2nd	Reverse 2WD	4.67	3.9	6.28	27.4
1st	Reverse 4WD	13.60	1.3	2.09	137.3

Based on a gross vehicle weight of 80,000 lb (36 287kg)

Crane operating angle must not exceed 35° (77% grade).

## ■ Fuel Tank

One 75 gallon (283.9L) capacity tank

## ■ Hydraulic System

All functions are hydraulically powered allowing positive precise, control with independent or simultaneous operation of all functions.

### Main Pumps

- Three fixed displacement gear pumps for the main and auxiliary winches, swing, boom hoist, and telescope circuits with a manual disconnect to aid during cold weather starts.
- One gear pump for the outriggers, power steering, brakes, and telescope circuits.
- One pressure compensated piston pump is used in the control and service brake circuits.
- Combined pump capacity of 139 gpm (526.2Lpm).

**Hydraulic Reservoir** – 131 gal (495.9L) capacity equipped with sight level gauge. Diffusers built in for deaeration.

**Filtration** – One 10 micron, full flow, line filter in the control circuit. All oil is filtered prior to return to sump tank. Accessible for easy filter replacement.

## ■ Pump Drive

All pumps are mechanically driven by the diesel engine. Main and auxiliary winches, swing, boom hoist, and telescope pumps are mounted to a mechanical pump disconnect on the transmission torque convertor to aid in cold weather starting.

## Axle Loads

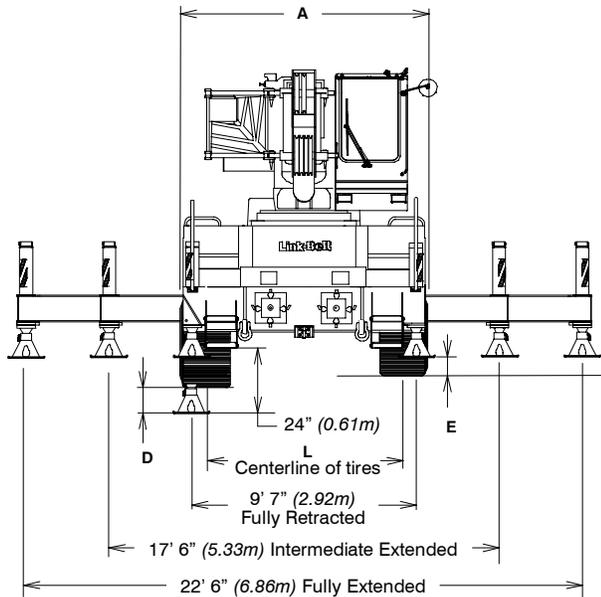
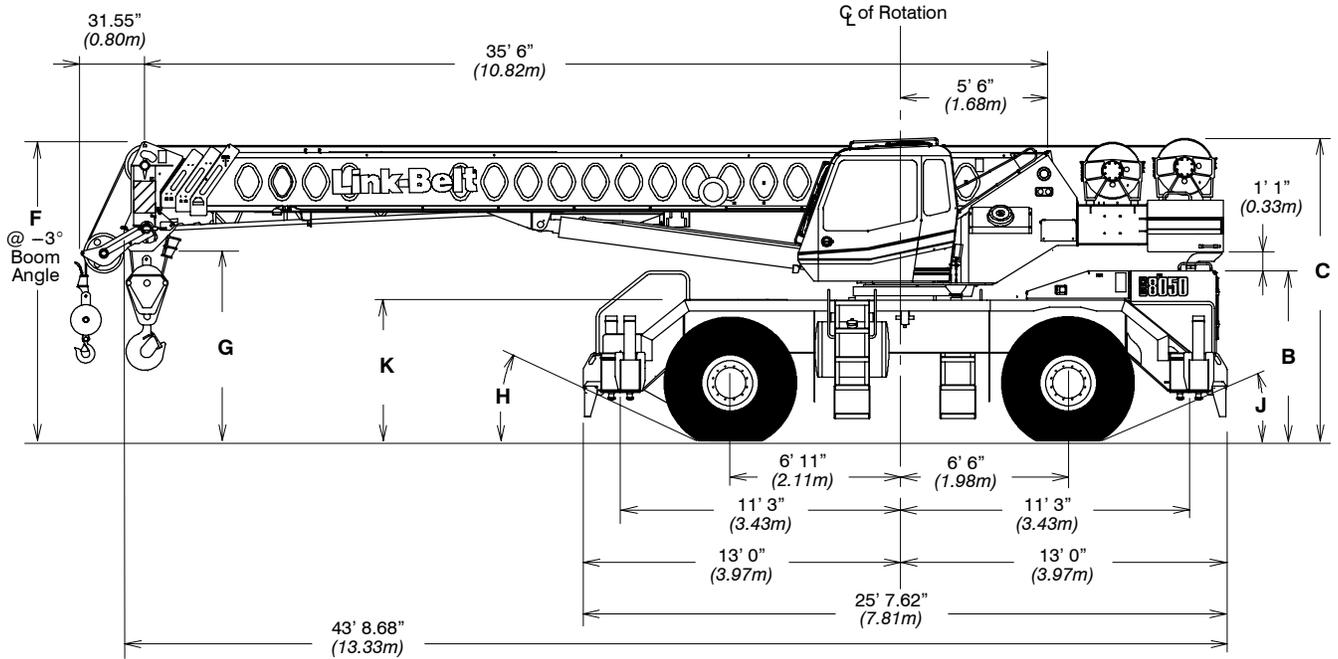
Base crane with full tank of fuel	Gross Vehicle Weight <sup>(1)</sup>		Upper Facing Front				Upper Facing Rear			
			Front Axles		Rear Axles		Front Axles		Rear Axles	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
	72,495	32 883	33,996	15 420	38,499	17 463	32,896	14 921	39,599	17 962
23.5R25 tires and wheels	368	167	183	83	185	84	183	83	185	84
Pintle hook, front	13	6	18	8	-5	-2	18	8	-5	-2
Pintle hook, rear	13	6	-5	-2	18	8	-5	-2	18	8
Rear steer indicator	3	1	0	0	3	1	0	0	3	1
Hydro-gas suspension	52	24	18	8	34	15	18	8	34	15
Winch roller – rear winch	93	42	-39	-18	132	60	129	59	-36	-17
Winch roller – front winch	93	42	-19	-9	112	51	109	49	-16	-7
2M auxiliary winch	19	9	-2	-0.9	21	10	21	10	-2	-0.9
600 ft (182.9m) of 3/4 in (19mm) wire rope on auxiliary winch	669	303	-88	-40	757	343	734	333	-65	-30
Air conditioning in operator's cab	315	143	74	34	241	109	231	105	84	38
360° swing lock	76	34	28	13	48	22	45	20	31	14
Emergency steer system	136	62	15	7	121	55	116	53	20	9
Fly storage brackets to boom base section for fly options	99	45	146	66	-47	-21	-51	-23	150	68
28.5 ft (8.68m) offset fly – stowed	1,291	585	2,237	1 015	-947	-430	-990	-449	2,281	1 035
28.5–51 ft (8.68–15.54m) offset fly – stowed	1,861	844	3,060	1 388	-1,199	-544	-1,263	-573	3,124	1 417
Floodlight to boom base section	10	5	23	10	-13	-6	-13	-6	23	10
60 ton (54.4mt) hook block at front/rear bumper	1,109	503	1,530	694	-421	-191	-459	-208	1,568	711
40 ton (36.3mt) hook ball at front/rear bumper	720	327	994	451	-274	-124	-298	-135	1,108	462
8.5 ton (7.7mt) hook ball at front/rear bumper	360	163	497	225	-137	-62	-149	-68	509	231
Auxiliary lifting sheave	91	41	257	117	-166	-75	-169	-77	260	118

Tire	Maximum Load @ 25 mph (40.2km/h)
23.5 x 25 (20–PR)	38,000 lb (17 600kg)
23.5R25 2 Star	37,500 lb (17 010kg)

(1) Adjust gross vehicle weight and axle loading according to component weight.

Note: All weights are ±3%.

# General Dimensions



Turning Radius – Front Wheel (4x2) Steering		English	Metric
Wall to wall over carrier		39' 0"	11.9m
Wall to wall over boom		47' 7"	14.5m
Wall to wall over boom attachment		49' 7"	15.1m
Curb to curb		37' 3"	11.4m
Centerline of tire		36' 0"	11.0m

Turning Radius – All Wheel (4x4) Steering		English	Metric
Wall to wall over carrier		23' 4"	7.1m
Wall to wall over boom		34' 0"	10.4m
Wall to wall over boom attachment		35' 6"	10.8m
Curb to curb		21' 4"	6.5m
Centerline of tire		20' 0"	6.1m

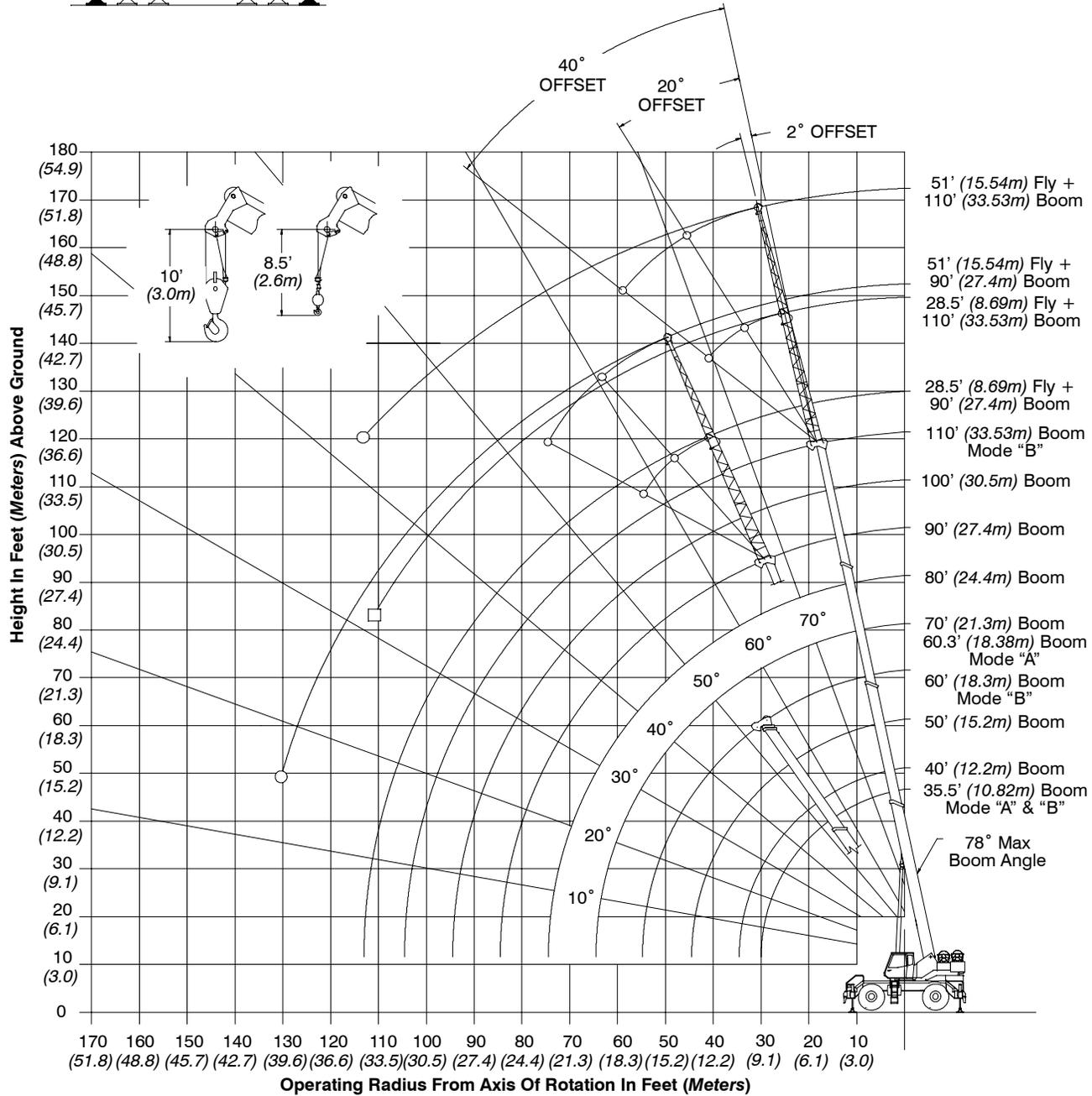
Tail Swing		English	Metric
With counterweight		12' 8"	3.9m
Without counterweight		N/A	N/A

General Dimensions	Tire Size			
	23.5 x 25 bias		23.5R25 radial	
	English	Metric	English	Metric
A	10' 3.5"	3.14m	10' 3"	3.12m
B	6' 7.75"	2.03m	6' 9.5"	2.06m
C	11' 11.75"	3.65m	12' 1.5"	3.70m
D	7.75"	0.20m	7"	0.18m
E	10"	0.25m	11.75"	0.30m
F	10' 0.25"	3.05m	10' 2"	3.10m
G	7' 6"	2.29m	7' 7.75"	2.33m
H	24"	--	24.8"	--
J	21"	--	22"	--
K	6' 6.75"	1.69m	6' 8.5"	1.74m
L	8' 3"	2.51m	8' 3"	2.51m

Not To Scale

# Working Range Diagram

## Working Range Diagram On Fully Extended Outriggers

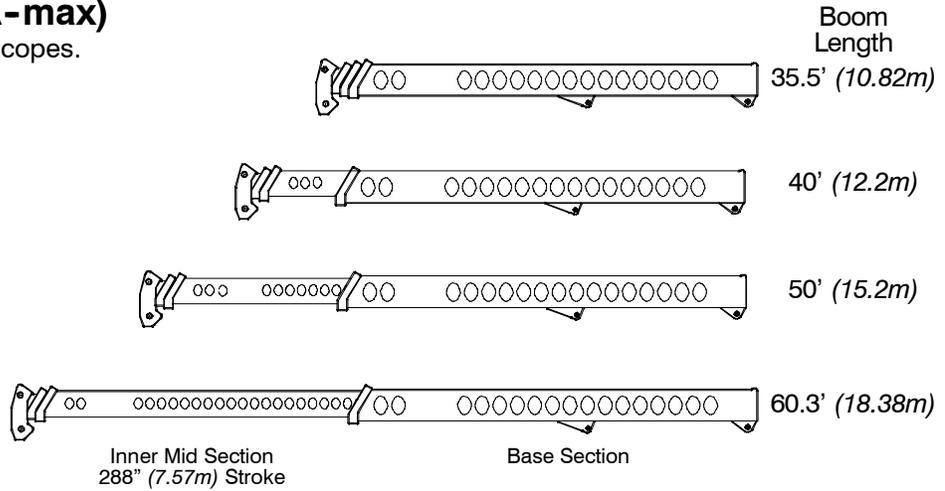


- Denotes Main Boom + 51' (15.5m) Fly–Boom Mode "B"
- Denotes Main Boom + 28.5' (8.7m) Fly–Boom Mode "B"

# Boom Extend Modes

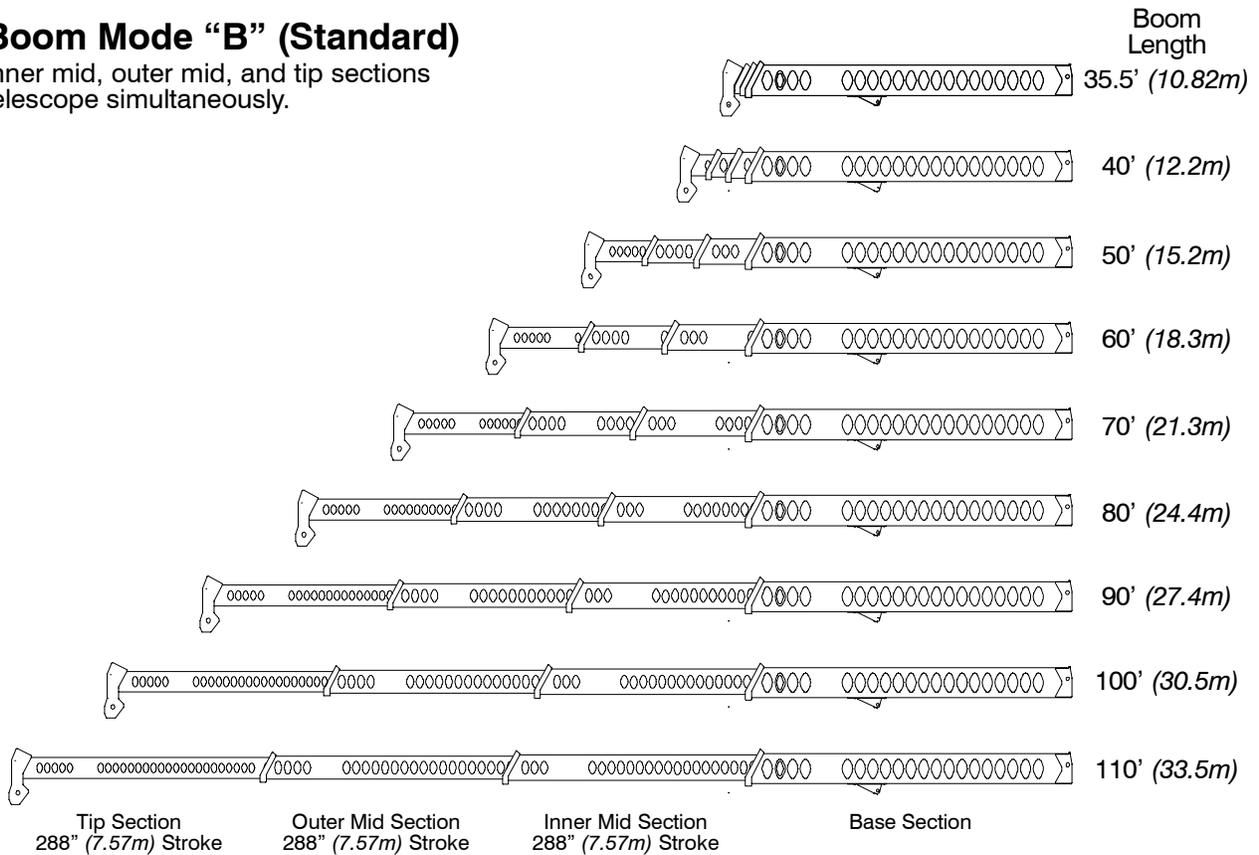
## Boom Mode “A” (A-max)

Only inner mid section telescopes.



## Boom Mode “B” (Standard)

Inner mid, outer mid, and tip sections telescope simultaneously.



# Main Boom Lift Capacity Charts – Standard

## Fully Extended Outriggers – 360° Rotation (All Capacities Are Listed In Pounds)

Radius (ft)	Boom Length (ft)									Radius (ft)
	35.5	40	50	60/60.3	70	80	90	100	110	
10	100,000	78,400	72,600							10
12	73,900	73,100	65,600	50,900**	37,900					12
15	63,200	63,000	57,500	46,900**	37,900	35,400				15
20	50,300	50,100	47,600	39,200**	37,900	34,700	28,900			20
25	<del>39,000</del>	<del>38,900</del>	38,500	37,900	37,900	34,200	28,200	24,000	19,500	25
30		31,300	31,900	32,300	32,500	30,300	24,800	22,500	19,500	30
35			26,100	26,500	26,700	26,900	22,000	19,900	18,300	35
40			20,800	21,200	21,400	21,500	19,700	17,800	16,400	40
45				17,100	17,300	17,400	17,500	15,900	14,600	45
50				13,900	14,200	14,300	14,400	14,400	13,200	50
55					11,900	12,100	12,200	12,200	12,100	55
60					10,000	10,200	10,300	10,300	10,400	60
65						8,600	8,700	8,800	8,900	65
70						7,300	7,500	7,500	7,600	70
75							6,400	6,500	6,500	75
80							5,400	5,500	5,600	80
85								4,700	4,800	85
90								4,000	4,100	90
95									3,500	95
100									2,900	100

\* Special Conditions Or Wire Rope Required

\*\* 60.3 A–max Mode

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.

**On Tires – Stationary – Boom Centered Over Front Between Tire Tracks**  
(All Capacities Are Listed In Pounds)

Radius (ft)	Boom Length (ft)					Radius (ft)
	35.5	40	50	60	70	
10	47,300	47,100				10
12	41,600	41,400				12
15	35,100	35,000	35,800			15
20	27,400	27,300	28,200	28,500		20
25	21,900	21,700	22,900	23,200	23,400	25
30		16,100	16,700	17,100	17,200	30
35			12,600	12,900	13,100	35
40			9,700	10,100	10,300	40
45				7,900	8,200	45
50				6,300	6,500	50
55					5,200	55
60					4,200	60

**On Tires – Pick & Carry (Creep) – Boom Centered Over Front**  
(All Capacities Are Listed In Pounds)

Radius (ft)	Boom Length (ft)					Radius (ft)
	35.5	40	50	60	70	
10	44,100	43,900				10
12	38,400	38,200				12
15	31,800	32,000	32,400			15
20	24,000	24,300	24,700	25,000		20
25	18,600	19,000	19,500	19,800	19,900	25
30		15,100	15,600	15,900	16,100	30
35			12,600	12,900	13,100	35
40			9,700	10,100	10,300	40
45				7,900	8,200	45
50				6,300	6,500	50
55					5,200	55
60					4,200	60

**On Tires – Stationary – 360° Rotation**  
(All Capacities Are Listed In Pounds)

Radius (ft)	Boom Length (ft)					Radius (ft)
	35.5	40	50	60	70	
10	37,200	37,400	37,700			10
12	31,100	31,400	31,800			12
15	24,000	24,400	24,900			15
20	14,500	14,800	15,400	15,700		20
25	9,400	9,800	10,300	10,700	10,900	25
30		6,600	7,100	7,500	7,700	30
35			5,000	5,300	5,500	35
40			3,400	3,700	3,900	40
45				2,500	2,700	45

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.

## Fly Attachment Lift Capacity Charts – Optional

Fully Extended Outriggers – 360° Rotation (All Capacities Are Listed In Pounds)								
110 ft Main Boom Length 2° Fly Offset			110 ft Main Boom Length 20° Fly Offset			110 ft Main Boom Length 40° Fly Offset		
Radius (ft)	Fly Length (ft)		Radius (ft)	Fly Length (ft)		Radius (ft)	Fly Length (ft)	
	28.5	51		28.5	51		28.5	51
35	9,400		45	9,500		50	7,500	
40	9,400		50	9,100		55	7,300	
45	9,400	6,200	55	8,400		60	7,100	
50	9,400	6,200	60	7,800	4,800	65	6,900	
55	9,200	6,200	65	7,300	4,600	70	6,500	
60	8,500	6,200	70	6,800	4,400	75	6,100	3,400
65	7,900	6,000	75	6,400	4,300	80	5,800	3,400
70	7,300	5,700	80	6,000	4,100	85	5,500	3,300
75	6,800	5,300	85	5,700	4,000	90	5,200	3,200
80	6,200	4,900	90	5,000	3,800	95	4,600	3,200
85	5,300	4,600	95	4,300	3,700	100	3,900	3,100
90	4,600	4,300	100	3,700	3,500	105	3,300	3,100
95	4,000	4,000	105	3,200	3,300	110	2,800	3,000
100	3,500	3,800	110	2,700	3,200	115		2,900
105	3,000	3,500	115	2,300	3,000	120		2,800
110	2,500	3,000	120		2,600	125		2,400
115	2,100	2,600	125		2,200	130		2,000
120		2,200	130		1,900			

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.

## Main Boom Lift Capacity Charts – Optional (Metric)

Fully Extended Outriggers – 360° Rotation (All Capacities Are Listed In Kilograms)										
Radius (m)	Boom Length (m)									Radius (m)
	10.82	12.2	15.2	18.3/18.38	21.3	24.4	27.4	30.5	33.53	
2.5	50 000									2.0
3.0	45 350	35 550	33 250							3.0
3.5	34 550	34 050	30 550							3.5
4.0	31 550	31 350	28 350	23 050**	17 150					4.0
4.5	29 000	28 900	26 350	21 450**	17 150					4.5
5.0	26 750	26 700	24 650	20 200**	17 150	16 050				5.0
6.0	23 100	23 050	21 850	17 950**	17 150	15 700	13 100			6.0
7.0	19 650	19 600	19 450	17 150	17 150	15 700	13 100	10 850		7.0
8.0	16 650	16 850	17 100	17 150	16 600	15 050	12 400	10 850	8 800	8.0
9.0	13 000	14 400	14 700	14 800	14 900	13 850	11 400	10 300	8 800	9.0
10.0		11 700	12 050	12 150	12 200	12 250	10 500	9 500	8 750	10.0
12.0			8 550	8 700	8 800	8 850	8 900	8 200	7 550	12.0
14.0				6 550	6 650	6 700	6 750	6 750	6 500	14.0
16.0				5 050	5 200	5 250	5 300	5 350	5 350	16.0
18.0					4 100	4 200	4 250	4 250	4 300	18.0
20.0						3 350	3 400	3 450	3 450	20.0
22.0						2 700	2 750	2 800	2 850	22.0
24.0							2 250	2 300	2 350	24.0
26.0								1 850	1 900	26.0
28.0								1 500	1 550	28.0
30.0									1 250	30.0

\* Special Conditions Or Wire Rope Required  
\*\* 18.38 A – max Mode

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 75% of the tipping loads and on tires do not exceed 65% of the tipping loads.

<b>On Tires – Stationary – Boom Centered Over Front Between Tire Tracks</b> (All Capacities Are Listed In Kilograms)						
Radius (m)	Boom Length (m)					Radius (m)
	10.82	12.2	15.2	18.3	21.3	
3	21 700					3
3.5	19 500	19 400				3.5
4	17 650	17 600				4
4.5	16 150	16 250	16 450			4.5
5	14 800	14 950	15 150			5
6	12 650	12 750	12 950	13 100		6
7	10 150	10 300	10 550	10 650	9 900	7
8	7 900	8 100	8 350	8 450	8 500	8
9	6 300	6 500	6 750	6 900	6 950	9
10		5 350	5 600	5 750	5 800	10
12			3 950	4 100	4 200	12
14				3 000	3 050	14
16				2 200	2 300	16
18					1 700	18

<b>On Tires – Pick &amp; Carry (Creep) – Boom Centered Over Front</b> (All Capacities Are Listed In Kilograms)						
Radius (m)	Boom Length (m)					Radius (m)
	10.82	12.2	15.2	18.3	21.3	
3	20 250					3
3.5	18 000	17 950				3.5
4	16 200	16 300				4
4.5	14 600	14 750	14 900			4.5
5	13 250	13 400	13 550			5
6	11 050	11 200	11 400	11 500		6
7	9 350	9 500	9 700	9 850	9 900	7
8	7 900	8 100	8 350	8 450	8 500	8
9	6 300	6 500	6 750	6 900	6 950	9
10		5 350	5 600	5 750	5 800	10
12			3 950	4 100	4 200	12
14				3 000	3 050	14
16				2 200	2 300	16
18					1 700	18

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 75% of the tipping loads and on tires do not exceed 65% of the tipping loads.

<b>On Tires – Stationary – 360° Rotation</b> (All Capacities Are Listed In Kilograms)						
Radius (m)	Boom Length (m)					Radius (m)
	10.82	12.2	15.2	18.3	21.3	
3	17 100					3
3.5	14 750	14 900				3.5
4	11 850	12 000				4
4.5	9 700	9 850	10 050			4.5
5	8 100	8 250	8 450			5
6	5 850	6 000	6 200	6 350		6
7	4 400	4 550	4 750	4 900	4 950	7
8	3 300	3 450	3 700	3 800	3 900	8
9	2 500	2 650	2 900	3 050	3 100	9
10		2 050	2 300	2 400	2 500	10
12			1 400	1 500	1 600	12
14					1 000	14

## Fly Attachment Lift Capacity Charts – Optional (Metric)

<b>Fully Extended Outriggers – 360° Rotation</b> (All Capacities Are Listed In Kilograms)								
33.53m Main Boom Length 2° Fly Offset			33.53m Main Boom Length 20° Fly Offset			33.53m Main Boom Length 40° Fly Offset		
Radius (m)	Fly Length (m)		Radius (m)	Fly Length (m)		Radius (m)	Fly Length (m)	
	8.69	15.54		8.69	15.54		8.69	15.54
12	4 250		14	4 250		16	3 350	
14	4 250	2 800	16	4 000		18	3 250	
16	4 250	2 800	18	3 600	2 200	20	3 100	
18	3 900	2 800	20	3 300	2 100	22	2 850	1 600
20	3 550	2 700	22	3 000	1 950	24	2 650	1 550
22	3 050	2 500	24	2 750	1 850	26	2 400	1 500
24	2 550	2 250	26	2 300	1 800	28	2 000	1 450
26	2 100	2 050	28	1 900	1 700	30	1 650	1 400
28	1 750	1 900	30	1 550	1 650	32	1 350	1 400
30	1 450	1 650	32	1 250	1 500	34	1 050	1 350
32	1 150	1 350	34	1 000	1 300	36		1 200
34	950	1 150	36	800	1 100	38		950
36		950	38		900	40		750

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 75% of the tipping loads and on tires do not exceed 65% of the tipping loads.

**Link-Belt Construction Equipment Company**      Lexington, Kentucky      [www.linkbelt.com](http://www.linkbelt.com)

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