Heavy Equipment & Rigging Specialist Training

Module 3 Unit 1:

Crane Load Chart Basics

22Mar08 1

Unit Objective

After completion of this unit, you will be able to deploy a mobile crane safely and efficiently during critical US&R operations

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Enabling Objectives

- **Describe how to plan the lift**
- **Explain the quadrants of operations**
- **Identify what factors add to the load**
- **Explain load chart basics**
- **Demonstrate how to use crane load charts by completing example problems**
- **Recall the 20 questions that need to be answered when ordering a crane**

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Planning the Lift: Needed Information

- Total load, including all extras
- Actual radius—initial + deflection
- Height of lift (building roof?)
  - Boom over building face
- Size and type of load
  - Type of rigging needed—spreaders, etc.
- Final position of load—swing

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Basic Rigging Plan (from Crosby Group, Inc.)

- Who is responsible for the rigging?
  - Have communications been established?
- Is equipment in acceptable condition?
  - Appropriate type, proper identification
- Are the working load limits adequate?
  - What is weight of load?
  - Where is center of gravity
  - What is sling angle?
  - Will there be any side loading?
  - What is the capacity of the gear?

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Basic Rigging Plan (continued)

- Will the load be under control?
  - Tag line available?
  - Is there any possibility of fouling?
  - Clear of personnel?
- Are there unusual loadings or conditions?
  - Wind, temperature, or other?
- What are special requirements?
  - Lifting load off victims?
  - Where will you drop the load?

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US&R CRANE USE FORM Prepared by: _____ Date: _____ Page ____ of

Situation Name: _____	Date and Time of Lift: _____
Rigging Task: _____	Task Force Name: _____
Weather Conditions: _____	Task Force Leader: _____
Load Description: _____	Crane Operator: _____
Load Weight: _____	Crane Make & Model: _____
Block Weight: _____	Crane Serial No: _____
Rigging Weight: _____	Boom Length: _____
Jib Weight: _____	Jib Length: _____
Jib Ball Weight: _____	Jib Position: ☐ Stowed ☐ Retracted ☐ Offset at _____
Hoist Line Weight: _____	Size of Counterweights Installed: _____
Other Weight: _____	Front Outrigger Installed: Yes No
Total Weight: _____	Setup On: ☐ Crawlers ☐ Outriggers ☐ Tires
Lift will be On: ☐ On Main Block ☐ On Jib	☐ Extended ☐ Retracted ☐ Other

Max. Intended Working Radius	Boom Angle:	Rated Capacity:	Percent of Capacity : (Total Load / Rated Capacity)
Over Rear: _____	Over Rear: _____	Over Rear: _____	Over Rear: _____
Over Side: _____	Over Side: _____	Over Side: _____	Over Side: _____
Over Front: _____	Over Front: _____	Over Front: _____	Over Front: _____

Hazards: ☐ Electrical ☐ Fire ☐ Underground ☐ Other _____ Are Crane Mats, Blocking Reqd: _____

SKETCH:

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Planning Critical Lifts
(75% Capacity, 20 tons, Tandem, Special Risk)

- One qualified person in charge
- Experienced operators
- One qualified signaler (obey ALL stops)
- Approved rigging and procedure sketches
- Pre-lift meeting
- All items from Crosby's list

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Rigger's Pocket Partner

- Available from landmark engineering
  - Cost $6.25, (see manual for address)
- Detailed checklist for
  - Worksite
  - Load
  - Rigging
  - Crane
  - Plan
  - Multi-crane lifts

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Tandem Lift at OKC

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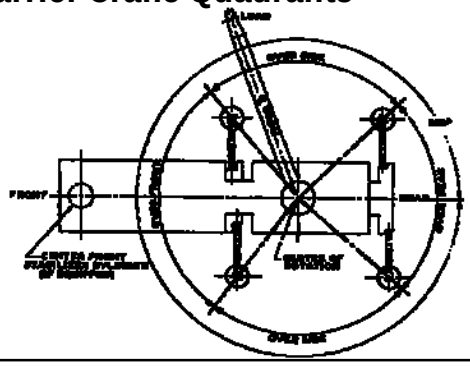
Carrier Crane Quadrants



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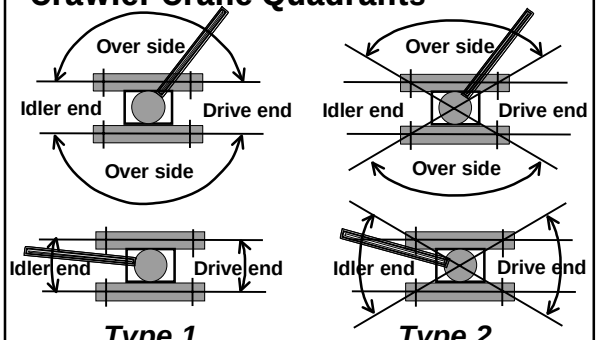
Crawler Crane Quadrants



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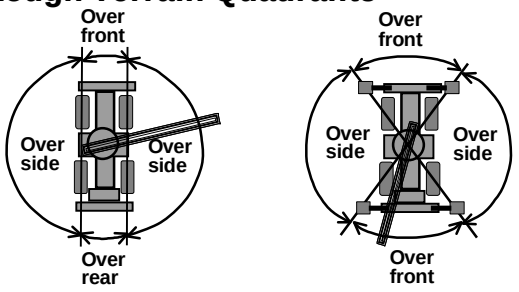
Rough Terrain Quadrants



On Rubber ***On Outriggers***

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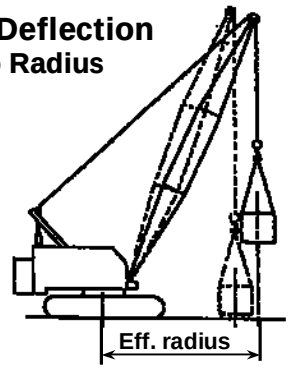
Boom Deflection
Adds to Radius



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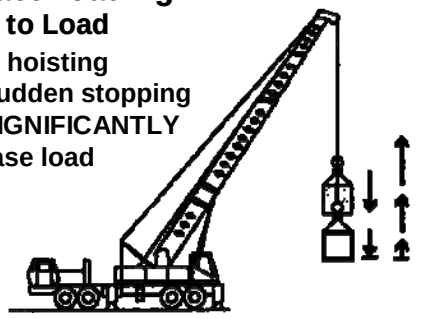
Impact Loading
Adds to Load

Rapid hoisting and sudden stopping can SIGNIFICANTLY increase load



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Increase in Hook Load

Based on Line Speed & Stopping Distance

Line speed	Stopping distance		
Ft/Min	10 ft	6 ft	2 ft
200	2%	3%	9%
400	7%	12%	34%
600	16%	26%	78%
800	28%	46%	138%
1000	43%	72%	215%

In 10-ft free fall, can attain 1500 ft/min

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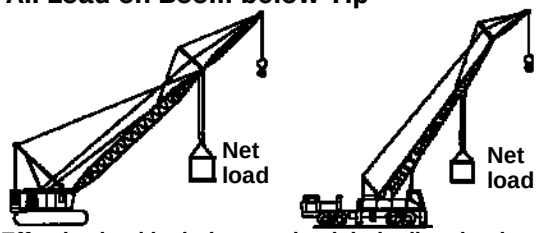
Effective Load – Main Block

All Load on Boom below Tip



Effective load includes: net load, hoist line, hook block, and rigging—and deductions for jib, boom extension, and ball—if installed or stowed on boom

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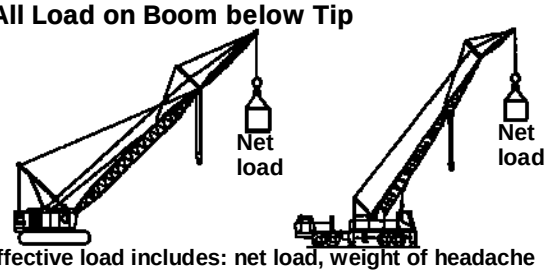
Effective Load – Whip Line

All Load on Boom below Tip



Effective load includes: net load, weight of headache ball and jib line, rigging, and deductions for main hook block and hoist line

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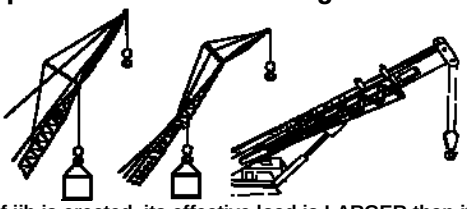
Effective Load – from Jib

Depends on how it is configured



- **If jib is erected, its effective load is LARGER than it's actual weight. See Load Chart**
- **If jib is stowed, its effective load is SMALLER than its actual weight. See Load Chart**

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Crane Capacity

- **Load moment indicator is safety device, NOT a lift capacity indicator**
  - **Should measure load on hook**
  - **Good safety check at initial lift off**
- **Don't use signs of tipping as indicator**
  - **Max capacity at min radius normally depends on strength of components**
  - **Operator may not notice point when crane starts to tip and/or be able to recover**

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Mobile Crane Charts

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3 Basic Crane Chart Configurations

- Boom extension—no jib
- Lifting from main load line but with boom extension or jib installed
- Load lifted with boom extension or jib

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Crane Capacity Chart Input

- Type of crane base
- Crane configuration
  - Including counterweight and number of parts of line
- Quadrants of operation
- Length of boom
- Angle of boom
- Load radius
- Weights of additional equipment
  - Not including rigging, impact, etc.

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Capacity Chart Example

Radius **Boom Length**

Feet	32	36	44	50
12	60,000	50,000	45,800	42,800
15	46,500	42,000	40,000	37,000
20	34,000	32,000	31,000	29,500
25	25,000	25,000	25,000	25,000
30		18,000	18,000	18,000
35			15,200	15,200

Shaded area governed by strength

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Capacity Chart Example

Radius (Feet)	Boom Length 32	36	44	50
12	60,000	50,000	45,800	42,800
15	46,500	42,000	40,000	37,000
20	34,000	32,000	31,000	29,500
25	25,000	25,000	25,000	25,000
30		18,000	18,000	18,000
35			15,200	15,200

Above line governed by strength

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Capacity Chart Example

Radius (Feet)	Boom Length 32	36	44	50
12	60,000*	50,000*	45,800*	42,800*
15	46,500*	42,000*	40,000*	37,000*
20	34,000	32,000*	31,000*	29,500*
25	25,000	25,000	25,000	25,000
30		18,000	18,000	18,000
35			15,200	15,200

***Values governed by strength**

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Crane Chart Rules

- **If radius or boom length is between chart values, USE NEXT HIGHER VALUE**
- **DO NOT GUESS**
- **DO NOT INTERPOLATE**
  - **Actually should be straight line interpolation if load is below the strength-determined part of the chart**

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Crane Capacity Nomenclature

- Boom length = center of boom hinge pin to center of sheave pin (main load line)
- Radius = horizontal distance from center of rotation axis to center of suspended load
- Boom angle = angle between horizontal and centerline of boom (radius governs)
- Maximum capacity = all load below the boom
- Boom point elevation = distance from level ground to center of boom tip

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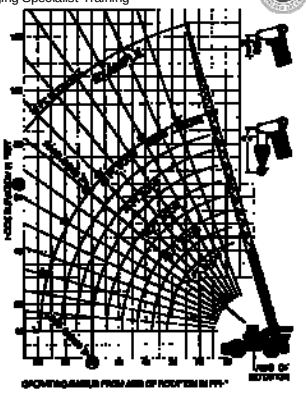
Range Diagram Example



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Calculating Capacity

- Boom capacity without attachments
- Boom capacity with attachments
- Jib capacity
  - Tipping capacity from boom chart
  - Jib strength capacity from jib chart based on jib offset or jib to ground angle
- Check chart notes for all deductions

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Example A
CA TF-3 40-Ton
Hydro Truck Crane

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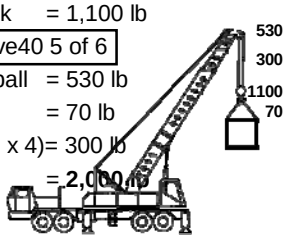
Example A Grove 40Ton Hydro Truck Crane
(Addendum 1, on Outriggers)

32-ft lattice boom extension, removed
(Pinned section retracted, 81-ft boom max)
With 45-ton, 3 sheave block = 1,100 lb
From chart on page - Grove40 5 of 6
Aux boom head + 7½ ton ball = 530 lb
Slings, rigging = 70 lb
Line from tip (1.5 plf x 50 ft x 4) = 300 lb
TOTAL COMPONENTS = **2,000 lb**



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Example A - Component Weight, Grove 40-Ton Hydro Truck Crane

HOISTS	CABLE SPECS.	PERMISSIBLE LINE PULLS
MAIN & AUX. Model 30	3/4 in. (19 mm) 18x19 Class or 35x7 Rotation Resistant Min. Breaking Str. 64,600 lbs.	12,920 lbs. **5 to 1**

WEIGHT REDUCTIONS FOR LOAD HANDLING DEVICES

32 ft. Boom Extension	
*Stowed -	430 lbs.
*Erected -	2,985 lbs.

Removed

*Reduction of main boom capacities

HOOKBLOCKS:	
50 Ton, 4 Sheave	700 lbs.
45 Ton, 3 Sheave	1,100 lbs.
15 Ton, 1 Sheave	400 lbs.
25 Ton, 2 Sheave	665 lbs.
Auxiliary Boom Head	190 lbs.
10 Ton Headache Ball	560 lbs.
7 1/2 Ton Headache Ball	338 lbs.

When lifting over swingaway and/or jib combinations, deduct total weight of all load handling devices reeved over main boom nose directly from swingaway or jib capacity.

NOTE: All load handling devices and boom attachments are considered part of the load and suitable allowances MUST BE MADE for their combined weights. Weights are for Grove furnished equipment.

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National Urban Search & Rescue Response System
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Example A1 - Grove 40-Ton Hydro

- **What is the max load capacity on outriggers, 360 deg (if front jack)?**
  - **At 30-ft, 40-ft, 50-ft and 60-ft radius? (page Grove40 3 of 6)**

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RATED LIFTING CAPACITIES IN POUNDS
34 ft. - 104 ft. BOOM
ON OUTRIGGERS - 360°

Grove40 3 of 6

Radius in Feet	#01 Main Boom Length in Feet (Power Pinned Fly Retracted)									#02 Power Pin. Fly & 81 ft.	#03 32 ft. Ext. & 81 ft.	#04 32 ft. Ext. & 104 ft.
	*34	38	44	50	56	62	68	74	81	104	113	136
10	80,000 (69)	68,000 (71.5)	64,000 (74.5)	60,000 (76.5)						See Warning	See Warning	See Warning
12	65,000 (65)	62,500 (68)	57,500 (71.5)	54,000 (74)	51,000 (76)	49,000 (77.5)				Note 3	Note 4	Note 5
15	57,000 (59.5)	55,000 (63)	50,000 (67.5)	46,500 (70.5)	43,900 (73)	41,900 (74.5)	40,000 (76.5)	38,600 (77.5)				
20	46,890 (48.5)	43,000 (54)	39,500 (60)	36,500 (64)	34,500 (67.5)	32,700 (70)	31,400 (72)	30,000 (73.5)	28,700 (76)			
25	29,450 (35.5)	29,450 (44)	29,450 (52)	29,450 (57.5)	28,100 (61.5)	26,500 (65)	25,300 (67.5)	24,200 (69.5)	23,100 (72)	20,000 (77)	17,500 (77.5)	
30	20,560 (14)	20,560 (31)	20,560 (43)	20,560 (50)	20,560 (55.5)	20,560 (59.5)	20,560 (62.5)	20,000 (65.5)	19,000 (68)	17,750 (74.5)	15,400 (75.5)	
35			15,450 (31.5)	15,450 (42)	15,450 (49)	15,450 (54)	15,450 (57.5)	15,450 (61)	15,450 (64.5)	15,600 (71.5)	13,700 (73)	9,600 (77.5)
40			11,410 (13.5)	11,410 (32)	11,410 (41.5)	11,410 (47.5)	11,410 (52.5)	11,410 (56.5)	11,410 (60)	13,100 (68.5)	12,200 (70.5)	8,750 (75.5)
45				8,450 (18)	8,450 (32.5)	8,450 (41)	8,450 (47)	8,450 (51.5)	8,450 (56)	10,990 (65.5)	10,800 (67.5)	7,900 (73)
50					6,630 (20.5)	6,630 (33)	6,630 (40.5)	6,630 (46)	6,630 (51.5)	8,750 (62)	8,970 (64.5)	7,050 (71)
55						5,280 (22.5)	5,280 (33)	5,280 (40)	5,280 (46.5)	7,130 (59)	7,300 (61.5)	6,350 (68.5)
60							4,090 (24)	4,090 (33.5)	4,090 (41)	5,650 (55.5)	5,890 (58.5)	5,800 (66)

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Heavy Equipment & Rigging Specialist Training

Example A1 - Grove 40-Ton Hydro

- **What is the max load capacity on outriggers, 360 deg (if front jack)?**
  - **At 30-ft, 40-ft, 50-ft and 60-ft radius? (page Grove40 3 of 6)**
  - **30 ft = 20,560 – 2000 = 18,560 lb**
  - **40 ft = 11,410 – 2000 = 9,410 lb**
  - **50 ft = 6,630 – 2000 = 4,630 lb**
  - **60 ft = 4,090 – 2000 = 2,090 lb (if power pinned sect is extended)**
  - **50 ft = 8,750 – 2000 = 6,750 lb**
  - **60 ft = 5,650 – 2000 = 3,650 lb**

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Example A2 - Grove 40-Ton Hydro

- **What is the max load capacity on outriggers, over rear?**
  - **At 30-ft, 40-ft, 50-ft and 60-ft radius? (page Grove40 4 of 6)**

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RATED LIFTING CAPACITIES IN POUNDS
34 ft. - 104 ft. BOOM
ON OUTRIGGERS - OVER REAR

Grove40 4 of 6

Radius in Feet	#01 Main Boom Length in Feet (Power Pinned Fly Retracted)									#02 Power Pin. Fly & 81 ft.	#03 32 ft. Ext. & 81 ft.	#04 32 ft. Ext. & 104 ft.
	*34	38	44	50	56	62	68	74	81	104	113	136
10	80,000 (69)	68,000 (71.5)	64,000 (74.5)	60,000 (76.5)						See Warning	See Warning	See Warning
12	65,000 (65)	62,500 (68)	57,500 (71.5)	54,000 (74)	51,000 (76)	49,000 (77.5)				Note 3	Note 4	Note 5
15	57,000 (59.5)	55,000 (63)	50,000 (67.5)	46,500 (70.5)	43,900 (73)	41,900 (74.5)	40,000 (76.5)	38,600 (77.5)				
20	47,000 (48.5)	43,000 (54)	39,500 (60)	36,500 (64)	34,500 (67.5)	32,700 (70)	31,400 (72)	30,000 (73.5)	28,700 (76)			
25	35,675 (35.5)	33,300 (44)	31,000 (52)	30,000 (57.5)	28,100 (61.5)	26,500 (65)	25,300 (67.5)	24,200 (69.5)	23,100 (72)*	20,000 (77)	17,500 (77.5)	
30	25,200 (14)	25,200 (31)	25,200 (43)	25,200 (50)	23,500 (55.5)	22,100 (59.5)	21,000 (62.5)	20,000 (65.5)	19,000 (68)	17,750 (74.5)	15,400 (75.5)	
35			19,340 (31.5)	19,340 (42)	19,340 (49)	18,700 (54)	17,700 (57.5)	16,800 (61)	16,000 (64.5)	15,600 (71.5)	13,700 (73)	9,600 (77.5)
40			15,190 (13.5)	15,190 (32)	15,190 (41.5)	15,190 (47.5)	15,190 (52.5)	14,400 (56.5)	13,600 (60)	13,100 (68.5)	12,200 (70.5)	8,750 (75.5)
45				12,310 (18)	12,310 (32.5)	12,310 (41)	12,310 (47)	12,310 (51.5)	11,700 (56)	11,300 (65.5)	10,800 (67.5)	7,900 (73)
50					10,000 (20.5)	10,000 (33)	10,000 (40.5)	10,000 (46)	10,000 (51.5)	9,930 (62)	9,410 (64.5)	7,050 (71)
55						8,180 (22.5)	8,180 (33)	8,180 (40)	8,180 (46.5)	8,710 (59)	8,230 (61.5)	6,350 (68.5)
60							6,650 (24)	6,650 (33.5)	6,650 (41)	7,680 (55.5)	7,240 (58.5)	5,800 (66)

National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Example A2 - Grove 40-Ton Hydro

- **What is the max load capacity on outriggers, over rear at a 30-ft, 40-ft, 50-ft and 60-ft radius (page Grove40 4 of 6)?**
  - **30 ft = 25,200 – 2000 = 23,200 lb**
  - **40 ft = 15,190 – 2000 = 13,190 lb**
  - **50 ft = 10,000 – 2000 = 8,000 lb**
  - **60 ft = 6,650 – 2000 = 4,650 lb**
    (if power pinned sect is extended)
  - **50 ft = 9,930 – 2000 = 7,930 lb**
  - **60 ft = 7,680 – 2000 = 5,680 lb**

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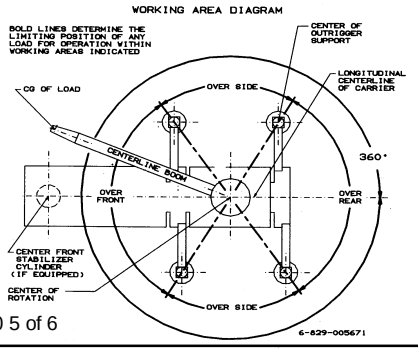
Example A - Areas of Operation
Grove 40-Ton Hydro Truck Crane



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Heavy Equipment & Rigging Specialist Training

Example B - CA TF-3, 15-Ton R.T.

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Heavy Equipment & Rigging Specialist Training

Example B Grove 15Ton Hydro R.T. Crane (Addendum 2)

(27- to 70-ft boom with all extensions removed)

With 22-ton, 3 sheave block = lb

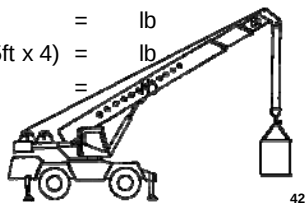
From chart on page Grove15T R.T. 3 of 9

Aux boom head + 5-ton ball = lb

Slings, rigging = lb

Line from tip (1.0 plf x 35ft x 4) = lb

TOTAL COMPONENTS =



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Example B Grove 15Ton Hydro R.T. Crane (Addendum 2)

HOISTS	CABLE SPECS.	PERMISSIBLE LINE PULLS
MAIN & AUX. Model 15	5/8 in. (16 mm) 18x19 Class or 35x7 Rotation Resistant Min. Breaking Str. 45,400 lbs.	8,074 lbs.

5.6 to 1 SF

25 ft. Fixed Extension with 27 ft. - 70 ft. Boom	
*Stowed -	294 lbs.
*Erected -	1,471 lbs.
25 ft. - 43 ft. Tele. Ext.	
*Stowed -	538 lbs.
*Erected (ret.) -	3,906 lbs.
*Erected (ext.) -	4,995 lbs.

*Reduction of main boom capacities

Extensions are Removed

HOOKBLOCKS:	
12 Ton, 1 Sheave	360 lbs.
15 Ton, 2 Sheave	462 lbs.
22 Ton, 3 Sheave	499 lbs.
Auxiliary Boom Head	145 lbs.
5 Ton Headache Ball	172 lbs.

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Example B1 - Grove 15-Ton R.T.

- **What is the max load capacity on outriggers, 360 deg?**
  - **At 20-ft, 30-ft, 40-ft and 50-ft radius? (page Grove15T R.T. 4 of 9)**

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Radius in Feet	#01 Main Boom Length in Feet				
	27	40	50	60	70
12	30,000 (54)	30,000 (66.5)	30,000 (71.5)	30,000 (75.5)	
15	28,000 (45)	28,000 (61.5)	28,000 (68)	28,000 (72)	22,000 (76.5)
20	20,200 (23)	20,200 (52.5)	20,200 (61.5)	20,200 (67)	17,650 (72)
25	See Warning	13,500 (42)	13,500 (54.5)	13,500 (61.5)	13,300 (67)
30	Note 16	10,400 (28.5)	10,400 (46.5)	10,400 (55.5)	10,400 (62.5)
35			8,370 (37.5)	8,370 (49.5)	8,370 (57.5)
40			6,630 (25)	6,630 (42.5)	6,630 (52)
45				5,370 (34)	5,370 (46)
50				4,410 (23.5)	4,410 (39.5)
55					3,660

Grove15T R.T. 4 of 9

National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Example B1 - Grove 15-Ton R.T.

- **What is the max load capacity on outriggers, 360 deg?**
  - **At 20-ft, 30-ft, 40-ft and 50-ft radius? (page Grove15T R.T. 4 of 9)**
  - **20 ft = 20,200 – 1,000 = 19,200 lb**
  - **30 ft = 10,400 – 1,000 = 9,400 lb**
  - **40 ft = 6,630 – 1,000 = 5,630 lb**
  - **50 ft = 4,410 – 1,000 = 3,410 lb**

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National Urban Search & Rescue Response System
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Example B2 - Grove 15-Ton R.T.

- **What is the max load capacity pick and carry over front?**
  - **At 20-ft, 30-ft, 40-ft and 50-ft?**
    (page Grove15T R.T. 6 of 9)

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Radius in Feet	#06 Main Boom Length in Feet				
	27	40	50	60	70
8	30,000 (64)				
9	30,000 (61.5)				
10	28,200 (59)				
12	20,750 (54)				
15	13,900 (45)	13,000 (61.5)	12,950 (68)		
20	8,520 (23)	8,520 (52.5)	8,520 (61.5)	8,520 (67)	
25		5,730 (42)	5,730 (54.5)	5,730 (61.5)	5,730 (67)
30		4,120 (28.5)	4,120 (46.5)	4,120 (55.5)	4,120 (62.5)
35			3,040 (37.5)	3,040 (49.5)	3,040 (57.5)
40			2,270 (25)	2,270 (42.5)	2,270 (52)
45				1,690 (34)	1,690 (46)
50				1,230 (23.5)	1,230 (39.5)
55					860 (31.5)

Grove15T R.T. 6 of 9

National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Example B2 - Grove 15-Ton R.T.

- **What is the max load capacity pick and carry over front?**
  - **At 20-ft, 30-ft, 40-ft and 50-ft? (page Grove15T R.T. 6 of 9)**
  - **20 ft = 8,520 – 1,000 = 7,000 lb**
  - **30 ft = 4,120 – 1,000 = 3,120 lb**
  - **40 ft = 2,270 – 1,000 = 1,270 lb**
  - **50 ft = 1,230 – 1,000 = 230 lb**
  - **Also same for on rubber over front (Grove15T R.T. 5 of 9)**

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National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Example B3 - Grove 15-Ton R.T.

- **What is the max load capacity on rubber, 360 deg?**
  - **At 20-ft, 25-ft, 30-ft and 35-ft? (page Grove15T R.T. 5 of 9)**

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Radius in Feet	#05 Main Boom Length in Feet				
	27	40	50	60	70
8	21,850 (64)				
9	17,600 (61.5)				
10	14,650 (59)	14,650 (70)			
12	10,750 (54)	10,750 (66.5)	8,900 (71.5)	8,900 (75.5)	
15	7,420 (45)	7,420 (61.5)	7,310 (68)	7,290 (72)	6,910 (76.5)
20	4,330 (23)	4,330 (52.5)	4,330 (61.5)	4,330 (67)	4,330 (72)
25		2,790 (42)	2,790 (54.5)	2,790 (61.5)	2,790 (67)
30		1,870 (28.5)	1,870 (46.5)	1,870 (55.5)	1,870 (62.5)
35			1,240 (37.5)	1,240 (49.5)	1,240 (57.5)
40			780 (25)	780 (42.5)	780 (52)

Grove15T R.T. 5 of 9

National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Example B3 - Grove 15-Ton R.T.

- **What is the max load capacity on rubber, 360 deg?**
  - **At 20-ft, 25-ft, 30-ft and 35-ft?**
    (page Grove15T R.T. 5 of 9)
  - **20 ft = 4,330 – 1,000 = 3,330 lb**
  - **25 ft = 2,790 – 1,000 = 1,790 lb**
  - **30 ft = 1,870 – 1,000 = 870 lb**
  - **35 ft = 1,240 – 1,000 = 240 lb**

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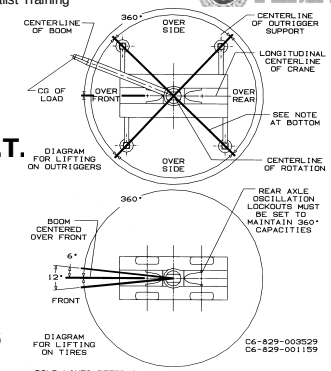
Heavy Equipment & Rigging Specialist Training

Example B
Areas of Operation
Grove 15-Ton R.T.



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National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Ordering a Crane

- **When you contact a rental source of heavy lift equipment, or a crane contractor, he or she will be very willing to assist you in obtaining the proper piece of equipment to do the job required**
- **However, you need to be prepared**

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National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Ordering a Crane (continued)

- When called, the staff will start asking questions that will permit them to give you what you need
- If you have answers to the following 20 questions, you will be well prepared for the agent's questions

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National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Twenty Questions

1. Who are you, and what are you doing?
2. How quickly do you want a machine?
3. What do you intend for this machine to do?
   - Pick and swing
   - Pick and carry
   - Lift large objects at small distance
   - Lift small objects at large distance
4. Will multiple machines be needed? (second one to set up primary machine)

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Heavy Equipment & Rigging Specialist Training

Twenty Questions (continued)

5. What are the capabilities of the on-site crew? Is it qualified to assist with setup?
6. If this machine is used for a single task, what is the load weight and what is the distance from the crane's center pin?

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Heavy Equipment & Rigging Specialist Training

Twenty Questions (continued)

7. If this is for multiple tasks, what are several combinations of load and distance?
   - Max load/min distance
   - Max distance/min load
   - Possible mid load/mid distance
8. Will this require pick and carry capability?
9. What are the limits of room available for operation of the machine?
   - Overhead clearance
   - Tail swing clearance
   - Underground obstructions

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National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Twenty Questions (continued)

10. Is there a place to assemble a boom (if lattice) and crane (counterweights) including room for assisting crane?
11. Are there limitations on delivery of crane or parts such as posted bridges, low clearances, and underground utilities?
12. What areas of operation are anticipated, such as over rear, over side, over front, and on rubber?

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Heavy Equipment & Rigging Specialist Training

Twenty Questions (continued)

13. Are two crane (simultaneous) picks anticipated?
14. Will work be performed on a continuous (24-hr) basis?
    - Will adequate auxiliary lighting be provided?
15. Will radio communication be required to control load?
    - Are dedicated radios available?

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National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Twenty Questions (continued)

16. How much boom is required?
    - Are special boom features (offset, open throat) needed?
17. What size hook block is needed?
    - Are shackles to fit hook available?
18. Is jib needed? What length? Offset? Load?
19. Are additional rigging components needed?
    - Load cell, lift beams, slings, shackles?

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Heavy Equipment & Rigging Specialist Training

Twenty Questions (continued)

Last and probably most important

20. Who is the contact person and the person directing the rigging operations?

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National Urban Search & Rescue Response System
Heavy Equipment & Rigging Specialist Training

Enabling Objectives - Review

- Understand how to plan the lift
- Be familiar with quadrants of operations
- Know what factors add to the load
- Understand load chart basics
- Complete load chart example problems
- Review examples of crane load chart in the addendum
- Be familiar with the 20 questions for ordering a crane—study on own

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Evaluation

Please complete the evaluation form for Module 3 Unit 1: Crane Load Chart Basics

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STUDENT MANUAL

HEAVY EQUIPMENT AND ADVANCED RIGGING COURSE

MODULE 3

UNIT 1: CRANE LOAD CHART BASICS

Unit Objective

After completion of this unit, you will be able to deploy a mobile crane safely and efficiently during critical US&R operations.

Enabling Objectives

You will:

- Describe how to plan the lift;
- Explain the quadrants of operations;
- Identify what factors add to the load;
- Explain load chart basics;
- Demonstrate how to use crane load charts by completing example problems; and
- Recall the 20 questions that need to be answered when ordering a crane.

I. Introduction

The intent of this section is to discuss the use of crane charts, both load and range. These charts should be included on board every crane in service in the U.S.

In order to interpret these charts properly, we will first discuss the information that must be collected and the limitations that must be understood. The following examples of crane load charts are included in the addenda at the end of this section:

- **Addendum 1** – Grove 40-Ton Hydro Truck Crane
- **Addendum 2** – Grove 15-Ton Rough Terrain Crane
- **Addendum 3** – P&H, 65-Ton Hydro Truck Crane

II. Planning the Lift

Every lift should be considered carefully, and some sort of a lifting plan should be formulated and discussed (and in critical situations, recorded) among all participants. The participants in a US&R incident will include:

- The crane operator and his rigging crew;
- The Heavy Equipment and Rigging Specialist (HERS);
- The Structures Specialist (StS);
- The Operations and Rescue Squad Leader in the affected area;
- All other task force personnel in affected area, including the Safety Officer;
- The Task Force Leader; and
- The Incident Commander or other person with his responsibility.

In order to formulate the lifting plan, **needed information** must first be determined based on responses to the following questions:

- What is the load and how far is it from the crane?
- How high does the crane need to reach to pick up and carry the load?
- How big is the load and how to attach to it?
- What will be the initial and final positions of the load?

Basic Rigging Plan

The basic rigging plan should include the answers to the questions listed below. Not all the items will be important for every lift, but **ALL** should be considered. A form for recording this and additional information for a US&R incident is presented later. Consider the following questions:

- Who is responsible for the rigging?
- Have communications been established?
- Is equipment in acceptable condition and is the appropriate type with proper identification?
- Are the working load limits adequate?
  - ♦ What is the weight of the load?
  - ♦ Where is the center of gravity?
  - ♦ What is the sling angle?
  - ♦ Will there be any side loading?
- What is the capacity of the gear?
- Will the load be under control?
  - ♦ Is a tag line available?
  - ♦ Is there any possibility of fouling?
  - ♦ Is the area clear of personnel?
- Are there unusual loadings or conditions?
  - ♦ Wind, temperature, or other?
- What are special requirements?
  - ♦ Lifting load off victims?
  - ♦ Where will you drop the load?

US&R Crane Use/Order Form CU-1 By: _____ Date: _____ Page ____ of ____

Situation Name: _____	Date and Time of Lift: _____
Rigging Task: _____	Task Force Name: _____
Weather Conditions: _____	Task Force Leader: _____
Load Description: _____	Crane Operator: _____
Load Weight: _____	Crane Make & Model: _____
Block Weight: _____	Crane Serial No: _____
Rigging Weight: _____	Boom Length: _____
Jib Weight: _____	Jib Length: _____
Jib Ball Weight: _____	Jib Position: ☐ Stowed ☐ Retracted ☐ Offset at _____
Hoist Line Weight: _____	Size of Counterweights Installed: _____
Other Weight: _____	Front Outrigger Installed: Yes No
Total Weight:	**Setup On:** ☐ Crawlers ☐ Outriggers ☐ Tires ☐ Extended ☐ Retracted ☐ Other
Lift will be On: ☐ On Main Block ☐ On Jib	

Max. Intended Working Radius	Boom Angle:	Rated Capacity:	Percent of Capacity : (Total Load / Rated Capacity)
Over Rear: _____	Over Rear: _____	Over Rear: _____	Over Rear: _____
Over Side: _____	Over Side: _____	Over Side: _____	Over Side: _____
Over Front: _____	Over Front: _____	Over Front: _____	Over Front: _____

Hazards: ☐ Electrical ☐ Fire ☐ Underground ☐ Other _____ Are Crane Mats, Blocking Reqd: _____

SKETCH

Critical Lifts

Critical lifts are defined as those with:

- A load greater than 75 percent of crane's rated capacity,
- A load of 20 tons or more,
- A tandem lift,
- Significant risk of release of hazardous material,
- Unacceptable risk of personal injury, and
- Work in confined areas where miscalculations could jeopardize other operations or the safety of individuals.

Most lifts at a US&R site during the rescue phase should be considered critical lifts. Requirements of a critical lift include:

- Experienced operators who have been trained to operate the specific equipment being used;
- Only one qualified signaler shall be used, though an operator shall obey a STOP signal no matter who gives it;
- The procedure and rigging sketches shall be reviewed and approved by the responsible manager prior to making the lift; and
- A pre-lift meeting involving all participating personnel shall be conducted, and the plan/procedure shall be reviewed, with all questions being resolved.

A *Rigger's Pocket Partner* is a very useful set of checklists to use for all critical lifts and is recommended for use at US&R disaster sites. Its checklists cover the following topics:

- The work site,
- Load,
- Rigging,
- Cranes,
- The plan,
- Multiple crane lifts, and
- Line, shackle, and sling weight estimators.

A *Rigger's Pocket Partner* is available from:

Landmark Engineering Services, Ltd.

2489 Rice St., Suite 204

Roseville, MN 55113-3723

(651) 482-9750

Cost postpaid is $6.25 each.

III. Quadrants of Operation

Quadrants of operations (sometimes referred to as areas of operation or working areas) refer to the four sectors of a circle in which a crane boom (when viewed from above) can be positioned to lift a load. They are:

- Rear,
- Each Side, and
- Front.

The different types and configurations of mobile cranes have different limitations placed on their capacities (by the manufacturer), depending on where the boom is positioned. Diagrams showing areas of operation and the limits placed on them should be included with or as a part of any crane's loading charts.

Most truck cranes can lift at their maximum capacity, with their outriggers fully extended and their booms positioned **over rear** and **over side.** Some, especially more recent all-terrain hydraulic truck cranes, can lift with no reduction in capacity in all directions (lift **over 360** degrees). Truck cranes that operate over 360 degrees usually have a stabilizer (a single outrigger that extends from the front of the truck). With outriggers retracted (**on rubber**), most truck cranes are limited to lifting **over rear** only.

Crawler cranes have their quadrants defined in a slightly different manner (one from the other), but most load charts for these cranes list the capacities as being the same for all quadrants (over 360 degrees).

Rough terrain cranes have their quadrants defined similar to truck cranes, except the rough terrain cranes normally lift best over front (as opposed to over rear for truck cranes). These smaller cranes may have listed capacities with outriggers 0 percent, 50 percent, and 100 percent extended. **On-rubber** capacities may be listed for **over front** (pick and carry) as well as 360 degrees.

IV. Factors Adding to Load

The following factors need to be considered for all lifts and are extremely important for critical lifts.

Boom Deflection

Boom deflection occurs because of deflection of the boom as a result of:

- Pendant stretch,
- Member shortening or bending,
- Soil compression, and
- Tire deflection (on rubber lifts).

On critical lifts, the radius should be re-measured after the load has been raised slightly; the crane capacity should then be re-evaluated.

Impact Loading

Even though a load is raised and lowered by a crane, the load capacity chart is based on static (load is stationary) loading.

The operator normally starts and stops the load very gradually so as not to add significant load resulting from acceleration. Starting and stopping the load gradually is not always possible, especially in US&R situations. Sometimes the load may need to be released and fall free. There may be other circumstances in which the load needs to be raised quickly, especially as large chunks of debris are being cut loose.

The following table gives values for increase in load depending on stopping (or starting) distance. It should be noted that an object that is allowed to fall freely for only a short distance can attain a great speed.

Ft/Min	10 ft	6 ft	2 ft
200	2%	3%	9%
400	7%	12%	34%
600	16%	26%	78%
800	28%	46%	138%
1000	43%	72%	215%

Actual Weight Versus Effective Load

For most crane load charts, anything hanging below the boom tip is considered as load.

If the jib is erected and the lift is from the main block, the jib's effective load is LARGER than its actual weight because its center of gravity is beyond the boom tip.

In the case of a hydraulic boom with the jib in the stowed (swing away) position, its effective load is actually less than actual weight since the CG is below the tip. Check load charts carefully for this data.

Gross Load on the Boom

As previously stated, when lifting with the main boom and reading a load chart, you find that the total load capacity is the load that is usually being listed.

The total load for any lift using the main boom should include:

- The net load being lifted;
- Hoist line below the boom tip;
- Hook and block;
- Rigging; and
- Deduction for jib, boom extension, and ball (if installed or stowed on boom).

Gross Load on the Jib

The total load for any lift using the jib (boom extension) should include:

- The net load being lifted,
- The weight of the headache ball and jib line,
- Rigging,
- Deductions for the main block and main hoist line.

Crane Capacity Warnings

Cranes are not very forgiving when overloaded. We cannot rely on signs of tipping as a warning of overload, especially when operating near capacity and at high boom angles. Structural failure normally governs under these conditions.

Load Moment Indicators (LMI) are safety devices and should not be used as lift capacity indicators.

Carefully measure the load plus the load radius and use the crane load charts to plan the lift. Some cranes may be able to measure the load on the hook. This should be used as a safety check or to help locate the CG of odd shaped loads. A portable load-indicating device may also be attached between the hook and load to measure the total lift or each attachment to the load.

V. Crane Chart Basics

Basic Chart Configurations

Three basic chart configurations include:

- Boom extensions—no jib;
- Lifting with main load line, with extensions or jib installed; and
- Lifting with boom extension or jib.

Crane Capacity Chart Information

The following information is required to use the charts:

- Type of crane base:
  - ♦ Outriggers fully extended (also 0 percent and 50 percent extended for some) and
  - ♦ On rubber.
- Crane configuration:
  - ♦ Size of counterweights, with or without (some cranes have several different configurations of counterweights);
  - ♦ Type of boom tip (open throat, hammerhead, etc.); and
  - ♦ Numbers of parts of line.
- Quadrants of operations—over rear, over side, over front, 360 degrees.
- Length of boom—especially for lattice boom cranes.
- Angle of boom—especially for jibs.
- Load radius—always measure it (laser range finder, throw tape and measuring tape).
- Weights of additional equipment—not including rigging, impact, etc.

Capacity Chart Example

Crane charts indicate when structural strength or overturning governs a particular value in three different ways.

- The shaded areas of the chart are governed by structural strength.
- Areas above the line are governed by structural strength.
- The values with asterisks are governed by structural strength.
  - ♦ Remember that structural strength values are usually based on a Safety Factor (SF) of about 3, while overturning is based on an SF of 1.25 to 1.33.

Crane Chart Rules and Nomenclature

Normally applied rules (intended to be conservative) are:

- If the radius is in between chart values, use the next higher value (the longer length);
- Do not guess; and
- Do not interpolate.
  - ♦ There should be a straight-line interpolation between values when the load is determined by overturning.
  - ♦ In critical emergency situations, proper interpolation will probably be justified.

The crane capacity nomenclature involves the following terms:

- *Boom length*: from the center of the boom hinge pin to the center of the sheave pin (main load line);
- *Radius*: horizontal distance from the center of the rotation axis to the center of the suspended load;
- *Boom angle*: angle between the horizontal and the centerline of boom (radius governs);
- *Maximum capacity*: all below the boom; and
- *Boom point elevation*: distance from level ground to center of boom tip.

Range Diagram

A range diagram should be included with the crane load charts and is useful in determining:

- The maximum height of the boom tip and
- The length of the boom required to reach a particular load, especially when the load is located behind some sort of a wall or other obstruction.

Calculating Capacity

In reading the load chart, you must be careful to understand all items that may apply.

Is the boom capacity given with and without attachments?

The jib capacity will be based on more than one section of the charts.

- The tipping capacity will be based on the radius in the boom chart.
- Find the jib capacity in the jib chart based on the:
  - ♦ Jib offset and
  - ♦ Jib-to-ground angle.
- The least value will govern.

Read ALL chart notes to be sure you have taken all the necessary deductions.

VI. Crane Chart Example Problems

Example A: Grove 40-Ton Hydro Truck Crane (see Load Chart Addendum)

In Example A, the main block has been reeved with 4 parts of line, and from the reeving information on page Grove40 5 of 6, we can find that the permissible pull for one part of line is 12,920 lb. Therefore, the max capacity of the crane as reeved (based only on the line pull) is 52,680 lb.

- The crane has an 81-ft maximum boom, a 45-ton main load block, with the 32-ft lattice extension removed, the pinned section retracted, auxiliary boom head + 7.5-ton ball and outriggers will be fully extended.
- From page Grove40 5 of 6, the 45-ton block weighs 1,100 lb. The auxiliary head is 190 lb, the 7.5-ton ball is 338 lb, and we estimate that the slings weigh 70 lb and the line 300 lb.
- The total weight of all the lifting components at the boom tip is, therefore, 2,000 lb (The 70 lb for slings has been rounded up to make the total an even 2,000 lb).

Determine

Example A -1 determine what the maximum load capacity is on outriggers at 360 degrees for a 30-, 40-, 50-, and 60-ft radius (net load).

- Go to page Grove40 3 of 6 and determine the total capacity for each radius.
- You should note that the crane's capacity is reduced by about half for each increase of 10 ft in radius and that the capacity can be increased if the pinned section is extended at radii of 50 and 60 ft.
- Note that the pinned section of boom may only be extended before the lift, when the boom is fully retracted.

Example A-2 What is maximum load capacity on outriggers lifting over the rear at a 30-, 40-, 50-, and 60-ft radius (net load)?

- Go to page Grove40 4 of 6 and determine the total capacity for each radius.
- You find similar results; however, the capacity is a minimum of 25 percent greater, indicating that if this capacity is needed, the crane needs to be appropriately positioned.

What is the max load capacity on outriggers over rear at a 30-ft, 40-ft, 50-ft, and 60-ft radius (page Grove40 4 of 6)? And 50 ft if power pinned sect is extended

- 30 ft =
- 40 ft =
- 50 ft =
- 60 ft = 50 ft power pin extended =

See the last page of this manual for the answers to Examples A & B

Example B: Grove 15-Ton Rough Terrain Hydro Crane (see Load Chart Addendum)

- (27- to 70-ft boom with all extensions removed)
- With 22-ton, 3 sheave block = 499 lb

  (from chart on page Grove15T R.T. 3 of 9)
- Aux boom head + 5-ton ball = 317 lb
- Slings, rigging = 44 lb
- Line from tip (1.0 plf x 35 ft x 4) = 140 lb

TOTAL COMPONENTS = 1,000 lb

We know that the main block has been reeved with four parts of line, and from the reeving information on page Grove15T R.T. 3 of 9, we can find that the permissible pull for one part of line is 8,074 lb. Therefore, the maximum capacity of the crane as reeved (based only on the line pull) is 32,296 lb.

- The crane has a 70-ft maximum, 22-ton main load block, lattice extension removed, auxiliary boom head + 5-ton ball.
- On page Grove15T R.T. 3 of 9, you find that the 22-ton block weighs 499 lb. The auxiliary head is 145 lb, the 5-ton ball is 172 lb, and we estimate that the slings weigh 44 lb and that the line weighs 140 lb. The total weight of components is 1,000 lb.

Determine

Example B-1 what is maximum load capacity on outriggers at 360 degrees for a 20-, 30-, 40-, and 50-ft radius (net load)?

Go to page Grove15T R.T. 3 of 9, and determine the total capacity for each radius.

- As for the Grove 40-ton, this crane's capacity is reduced by about half for each increase of 10 ft in radius.

Example B-2 what is maximum load capacity for pick and carry, lifting over the front, for a 20-, 30-, 40-, and 50-ft radius (net load)?

- Go to page Grove15T R.T. 6 of 9, and determine the total capacity for each radius.
- You find a much smaller capacity, as expected.
- Note that you could use the outriggers to pick a 7,000-lb load at a 30-ft radius from the side, then swing the load over the front, boom in to 20 ft, and safely pick and carry the load to another location.

Example B-3 what is the maximum load capacity on rubber at 360 deg at a 20-, 25-, 30-ft, and 35-ft radius (Grove15T R.T. 5 of 9)?

See the last page of this manual for the answers to Examples A & B

Additional - Example 1 (not covered in PowerPoint presentation)
The first part of the example is to determine **how many parts of line are required to lift a 20,000-lb load** and the other required components, using the P&H 65-ton crane in Addendum 3.

- The crane has 8,500-lb counterweight, a 65-ton main load block, a telescopic 40- to 60-ft lattice extension stowed, pinned section retracted, and outriggers fully extended.
- On page P&H65-12, Chart 15, you find that the 65-ton block weighs 1,320 lb, and you estimate that the slings weigh 300 lb.
- The total weight on the lifting rope at the block is, therefore, 21,620 lb.
- On Chart 2, page P&H65-5, you find it requires 2 parts of line to lift 30,000 lb (note that there is no reduction for friction).

Next, for Example 1, we need to find the deduction for ALL components for this P&H 65-ton crane.

These are listed as 2,100 pounds (found in Chart 15, page P&H65-12).

The above makes needed total lift capacity = 22,100 lb.

Determine

What is the MAXIMUM RADIUS to lift this load?

On Chart 4, page P&H65-7, you find the load ratings with pinned section retracted, 8.5-ton counterweights, at a 40-ft radius, we can lift 24,200 lb over side and 25,300 over end.

What is maximum height to which the hook can be raised with this load at 40-ft radius?

- On the same chart, at a maximum boom length of 97.3 ft we find we can lift 22,700 lb at an angle of 64 degrees (longest boom length will produce the highest hook).
- Go to page P&H65-6, Chart 3, Crane Range Diagram, and read that the tip of the 97.3-ft boom reaches a height of 97 ft. Subtract 7 ft for the hook (from picture); therefore, the height to hook is 90 ft.

Additional - Example 2

This example uses the same crane with the same configuration as in Example 1.

- An emergency lift of 3,000 lb needs to be made in which outriggers cannot be used. Lift ON TIRES.
- **What is the maximum radius to lift this load, on tires, over rear?**
- Total load is 3,000 lb + 2,100 lb components = 5,100 lb.
- On Chart 12, page P&H65-11 (Load Ratings with an 8,500 lb Counterweight), you find you can lift 5,500 lb at a 40-ft radius.
- What is maximum radius to lift this load, on tires, over the side?
- On the same chart, you find you can lift 5,800 lb at a 25-ft radius.

Additional - Example 3

This example involves P&H 65-ton crane, with 8,500-lb counterweight, a 65-ton main load block, a 40- to 60-ft telescopic lattice boom extension (jib) erected and set at 0-deg, 17-deg, or 30-deg offset, and a single ¾"-line, with the 8.5-ton ball. The main boom's pinned section has been extended, with the load on the extension (jib).

Note that when the main boom's pinned section is extended, the main boom length becomes 126 feet. Also note that this crane may be assembled with a 40-ft lattice boom extension, a 60-ft lattice boom extension, or the 40- to 60-ft telescopic boom extension that we are using in this problem. All of these extensions may be assembled on the main boom with or without the pinned section being extended.

The weight of all required deductions, from Chart 15, page P&H65-12, is 1,200 lb. The estimated weight of the line and rigging is 400 lb. Total deductions = 1,600 lb.

Note that the weight of the main boom's pinned section is accounted for in the load chart (just as for all configurations of the main boom).

What is net crane capacity for a load that is at a 100-ft radius over the rear, on outriggers?

On Charts 5, 6, and 7, pages P&H65-7 and 8, the maximum capacity at a 100-ft radius for pinned section extended, with a 40- to 60-ft telescopic jib is given in Chart 6 (17-deg offset):

- The 5th table section from right = 4,300 lb.
- The boom angle is at 57 degrees.
- Therefore, net capacity is 4,300 lb – 1,600 lb = 2,700 lb.

Note that if we had assembled the crane with the 40-ft lattice extension (not the 40- to 60-ft telescopic jib), and the main boom's pinned section is extended, the maximum capacity at a 100-ft radius is given in Chart 6:

- The 4th table section from right = 5,100 lb.
- The boom angle is also 57 degrees.
- The net capacity is 5,100 lb – 1,600 lb = 3,500 lb.

(From Chart 15, the deduction is the same 1,200 lb + the additional 400-lb rigging.)

For the same setup, if we did not use a jib and wanted to lift a load from the main boom with the pinned section extended and the jib stowed, the maximum capacity at a 100-ft radius is given in Chart 5:

- The 1st table section from right = 3,700 lb.
- The boom angle is down to 35 degrees.
- The net capacity is 3,700 lb – 1,800 lb = 1,900 lb.

(From Chart 15, the deduction is 1,600 lb when lifting from main boom, 65-ton block and 40- to 60-ft jib stowed + 400-lb rigging).

With either of the jibs erected, will the boom reach over a 90-ft high wall that is 50 ft from the center of rotation and pick this load?

- According to Chart 3, Crane Range Diagram, with the main boom at 57 deg, the boom will clear about 95 ft; therefore, the answer is YES!
- Note that we are in the main boom (straight) part of the range diagram.

You can see that the load charts are more complicated and that there are more variables if a jib is used.

However, the use of a boom extension (jib) does allow a crane to extend its ability to pick a load over a high wall or the face of a building. This may be useful in some US&R situations and requires that we become familiar with each crane's unique configurations.

We should now review the questions to ask when ordering a crane on the following page and also the addenda showing the crane load charts.

VII. Ordering a Crane for a US&R Incident

20 Questions to Answer When Ordering a Crane

When you contact a rental source of heavy lift equipment, they will start asking questions to permit them to give you what you need. If you can have answers to their questions ready beforehand, you will speed the process considerably. If you have answers to the following questions, you will be well prepared for the rental agent's questions.

1. Who are you, and what are you doing?
2. How quickly do you want a machine?
3. What do you intend for this machine to do?
    - ♦ Pick and swing and/or pick and carry
    - ♦ Lift large objects at small distance
    - ♦ Lift small objects at large distance
4. Will multiple machines be needed (such as a second machine to set up primary machine)?
5. What are the capabilities of the on-site crew? Are they qualified to assist with setup?
6. If this machine is for a single task, what is the load weight and what is the load radius?
7. If this is for multiple tasks, what are several combinations of load and distance (max load/min distance, max distance/min load, possible mid load/mid distance)?
8. Will this task require pick and carry capability?
9. What are the limits of room available for operation of the machine (overhead clearance, tail swing clearance, and underground obstructions)?
10. Is there a place to assemble a boom (if lattice) and crane (counterweights), including room for assisting crane?

11. Are there limitations on delivery of crane or parts, such as posted bridges, low clearances, and underground utilities?
12. What areas of operation are anticipated (over rear, over side, over front, and on rubber)?
13. Are two crane (simultaneous) picks anticipated?
14. Will work be performed on a continuous (24-hour) basis? Is auxiliary lighting available?
15. Will radio communication be required to control the load? Are dedicated radios available?
16. How much boom is required? Are special boom features (offset, open-throat) needed?
17. What size hook block is needed? Are shackles to fit hook available?
18. Will jib be needed? What length? Offset? Load?
19. Are additional rigging components needed (load cell, lift beams, slings, shackles)?
20. Who is the contact person and who is the person directing the rigging operations?

VIII. Unit Summary

Enabling objectives review:

- Described how to plan the lift;
- Explained quadrants of operations;
- Identified what factors add to the load;
- Explained load chart basics;
- Demonstrated how to use crane load charts by completing example problems; and
- Recalled the 20 questions that need to be answered when ordering a crane.

Answers to Example A

Ex. A-1

What is the max., net load capacity on outriggers for 360 degrees at a 30-ft, 40-ft, 50-ft, and 60-ft radius (page Grove40 3 of 6)?

- 30 ft = 20,560 – 2,000 = 18,560 lb
- 40 ft = 11,410 – 2,000 = 9,410 lb
- 50 ft = 6,630 – 2,000 = 4,630 lb
- 60 ft = 4,090 – 2,000 = 2,090 lb
- 50 ft = 8,750 – 2,000 = 6,750 lb (if power pinned sect is extended)

Ex. A-2

What is the max., net load capacity on outriggers over rear at a 30-ft, 40-ft, 50-ft, and 60-ft radius (page Grove40 4 of 6)?

- 30 ft = 25,200 – 2,000 = 23,200 lb
- 40 ft = 15,190 – 2,000 = 13,190 lb
- 50 ft = 10,000 – 2,000 = 8,000 lb
- 60 ft = 6,650 – 2,000 = 4,650 lb
- 50 ft = 9,930 – 2,000 = 7,930 lb (if power pinned sect is extended)

Answers to Example B

Ex. B-1

What is max., net load capacity on outriggers at 360 degrees for a 20-, 30-, 40-, and 50-ft radius (net load)? Go to page Grove15T R.T.8 of 9

- 20 ft = 20,200 – 1,000 = 19,200 lb
- 30 ft = 10,400 – 1,000 = 9,400 lb
- 40 ft = 6,630 – 1,000 = 5,630 lb
- 50 ft = 4,410 – 1,000 = 3,410 lb

Ex. B-2

What is max., net load capacity for pick and carry, lifting over the front, for a 20-, 30-, 40-, and 50-ft radius ? page Grove15T R.T. 6 of 9 (same for On-rubber, over front, Grove15T R.T. 6 of)

- 20 ft = 8,520 – 1,000 = 7,520 lb
- 30 ft = 4,120 – 1,000 = 3,120 lb
- 40 ft = 2,270 – 1,000 = 1,270 lb
- 50 ft = 1,230 – 1,000 = 230 lb

Ex. B-3

What is the maximum load capacity on rubber at 360 deg at a 20-, 25-, 30-ft, and 35-ft radius (Grove15T R.T. 5 of 9)?

- 20 ft = 4,330 – 1,000 = 3,330 lb
- 25 ft = 2,790 – 1,000 = 1,790 lb
- 30 ft = 1,870 – 1,000 = 870 lb
- 35 ft = 1,240 – 1,000 = 240 lb

CRANE LOAD CHART BASICS

LOAD CHARTS
TMS300B

PCSA CLASS 10-114

85% STABILITY

73,600 lb GVW

With power Pinned Fly
and 32ft Boom Extension

71321

SERIAL NUMBER

GENERAL NOTES

1. Do not exceed any rated lifting capacity. Rated lifting capacities are based on freely suspended loads with the machine leveled and standing on a firm supporting surface. Ratings with outriggers are based on outriggers being extended to their maximum position and tires raised free of crane weight before extending the boom or lifting loads.
2. Practical working loads for each particular job shall be established by the user depending on operating conditions to include: the supporting surface, wind and other factors affecting stability, hazardous surroundings, experience of personnel, handling of load, etc. No attempt must be made to move a load horizontally on the ground in any direction.
3. Operating radius is the horizontal distance from the axis of rotation before loading to the centerline of the vertical hoist line or tackle with loads applied.
4. "On Rubber" lifting (if permitted) depends on proper tire inflation, capacity and condition. "On Rubber" loads may be transported at a maximum vehicle speed of 2.5 mi/hr (4 km/hr) on a firm and level surface under conditions specified.
5. Jibs may be used for single line lifting crane service only. Jib capacities are based on structural strength of jib or main boom. Jib loads must not exceed main boom lifting capacities for the actual operating radius.
6. Operation is not intended or approved for any conditions outside of those shown hereon. Handling of personnel from the boom is not authorized except with equipment furnished and installed by Grove Manufacturing Company.
7. For clamshell or concrete bucket operation, weight of bucket and load must not exceed 80% of rated lifting capacities.
8. Power-telescoping boom sections must be extended equally at all times. Long cantilever booms can create a tipping condition when in extended and lowered position.
9. The maximum load which may be telescoped is limited by hydraulic pressure, boom angle, boom lubrication, etc. It is safe to attempt to telescope any load within the limits of rated lifting capacity chart.
10. With certain boom and hoist tackle combination, maximum capacities may not be obtainable with standard cable lengths.
11. With certain boom and load combinations, raising of load with boom lift cylinders may not be possible. Operational safety is not affected by this condition.
12. Keep load handling devices a minimum of 12 inches (30 cm) below boom head when lowering or extending boom.
13. If actual boom length and/or radius is between values listed, use lifting capacity for the next longer rated length and/or radius.
14. All load handling devices and boom attachments are considered part of the load and suitable allowances must be made for their combined weights.
15. Operation of this equipment in excess of rating charts or disregard of the instructions is hazardous and voids the warranty and manufacturer's liability.

LIFTING CAPACITY NOTES

1. Capacities appearing above the bold line are based on structural strength and tipping should not be relied upon as a capacity limitation. Capacities do not exceed 85% of tipping loads as determined by test in accordance with SAE recommended practice-Crane load stability test code - SAE J-765.
2. Do not exceed any rated load when lifting regardless of whether it is based on structural strength or stability.
3. For boom lengths less than 104 ft. with power pinned fly extended, the rated loads are determined by boom angle only in the column headed by 104 ft. boom. For boom angles not shown, use rating of next lower boom angle.
4. For boom lengths less than 113 ft. with power pinned fly retracted and 32 ft. boom extension erected, the rated loads are determined by boom angle only in the column headed by 113 ft. boom. For boom angles not shown, use rating of next lower boom angle.
5. For boom lengths less than 136 ft. with power pinned fly extended and 32 ft. boom extension erected, the rated loads are determined by boom angle only in the column headed by 136 ft. boom. For boom angles not shown, use rating of next lower boom angle.
6. Boom angle is the included angle between horizontal and the axis of the boom base section after lifting rated load.
7. * Capacities for the 34 ft. boom length shall be lifted with boom fully retracted. If boom is not fully retracted, capacities shall not exceed those shown for the 38 ft. boom length.
   NOTE: If machine is equipped with front jack cylinder, the front jack cylinder shall be set in accordance with written procedure. Radii less than 35 ft. not recommended when lifting over front of machine.

RATED LIFTING CAPACITIES IN POUNDS
34 ft. - 104 ft. BOOM

ON OUTRIGGERS - 360°

Radius in Feet	#01									#02	#03	#04
	Main Boom Length in Feet (Power Pinned Fly Retracted)									Power Pin. Fly & 81 ft.	32 ft. Ext. & 81 ft.	32 ft. Ext. & 104 ft.
	*34	38	44	50	56	62	68	74	81	104	113	136
10	80,000 (69)	68,000 (71.5)	64,000 (74.5)	60,000 (76.5)						See Warning	See Warning	See Warning
12	65,000 (65)	62,500 (68)	57,500 (71.5)	54,000 (74)	51,000 (76)	49,000 (77.5)				Note 3	Note 4	Note 5
15	57,000 (59.5)	55,000 (63)	50,000 (67.5)	46,500 (70.5)	43,900 (73)	41,900 (74.5)	40,000 (76.5)	38,600 (77.5)				
20	46,890 (48.5)	43,000 (54)	39,500 (60)	36,500 (64)	34,500 (67.5)	32,700 (70)	31,400 (72)	30,000 (73.5)	28,700 (76)			
25	29,450 (35.5)	29,450 (44)	29,450 (52)	29,450 (57.5)	28,100 (61.5)	26,500 (65)	25,300 (67.5)	24,200 (69.5)	23,100 (72)	20,000 (77)	17,500 (77.5)	
30	20,560 (14)	20,560 (31)	20,560 (43)	20,560 (50)	20,560 (55.5)	20,560 (59.5)	20,560 (62.5)	20,000 (65.5)	19,000 (68)	17,750 (74.5)	15,400 (75.5)	
35			15,450 (31.5)	15,450 (42)	15,450 (49)	15,450 (54)	15,450 (57.5)	15,450 (61)	15,450 (64.5)	15,600 (71.5)	13,700 (73)	9,600 (77.5)
40			11,410 (13.5)	11,410 (32)	11,410 (41.5)	11,410 (47.5)	11,410 (52.5)	11,410 (56.5)	11,410 (60)	13,100 (68.5)	12,200 (70.5)	8,750 (75.5)
45				8,450 (18)	8,450 (32.5)	8,450 (41)	8,450 (47)	8,450 (51.5)	8,450 (56)	10,990 (65.5)	10,800 (67.5)	7,900 (73)
50					6,630 (20.5)	6,630 (33)	6,630 (40.5)	6,630 (46)	6,630 (51.5)	8,750 (62)	8,970 (64.5)	7,050 (71)
55						5,280 (22.5)	5,280 (33)	5,280 (40)	5,280 (46.5)	7,130 (59)	7,300 (61.5)	6,350 (68.5)
60							4,090 (24)	4,090 (33.5)	4,090 (41)	5,650 (55.5)	5,890 (58.5)	5,800 (66)
65							3,060 (3)	3,060 (25)	3,060 (35)	4,500 (52)	4,760 (55.5)	5,190 (63.5)
70								2,150 (11.5)	2,150 (27.5)	3,600 (48)	3,780 (52.5)	4,440 (61.5)
75									1,300 (17)	2,840 (44)	3,000 (49)	3,690 (58.5)
80										2,150 (40)	2,340 (45)	2,950 (56)
85										1,550 (35)	1,740 (41)	2,370 (53.5)
90										1,020 (29.5)	1,170 (37)	1,930 (50.5)
95												1,530 (47.5)
100												1,130 (44.5)

Note: Boom angles are in degrees.

A6-829-006678 & -002137D

#LMI operating code. Refer to LMI manual for instructions.
*See lifting capacity notes on page 2.

RATED LIFTING CAPACITIES IN POUNDS
34 ft. - 104 ft. BOOM

ON OUTRIGGERS - OVER REAR

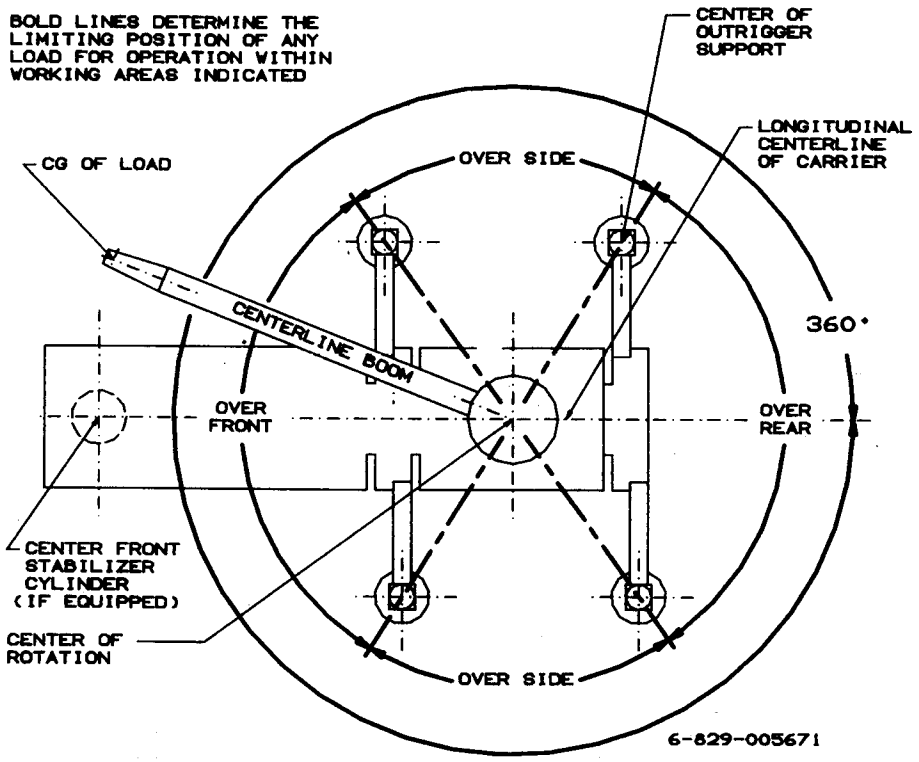
Radius in Feet	#01									#02	#03	#04
	Main Boom Length in Feet (Power Pinned Fly Retracted)									Power Pin. Fly & 81 ft.	32 ft. Ext. & 81 ft.	32 ft. Ext. & 104 ft.
	*34	38	44	50	56	62	68	74	81	104	113	136
10	80,000 (69)	68,000 (71.5)	64,000 (74.5)	60,000 (76.5)						See Warning	See Warning	See Warning
12	65,000 (65)	62,500 (68)	57,500 (71.5)	54,000 (74)	51,000 (76)	49,000 (77.5)				Note 3	Note 4	Note 5
15	57,000 (59.5)	55,000 (63)	50,000 (67.5)	46,500 (70.5)	43,900 (73)	41,900 (74.5)	40,000 (76.5)	38,600 (77.5)				
20	47,000 (48.5)	43,000 (54)	39,500 (60)	36,500 (64)	34,500 (67.5)	32,700 (70)	31,400 (72)	30,000 (73.5)	28,700 (76)			
25	35,675 (35.5)	33,300 (44)	31,000 (52)	30,000 (57.5)	28,100 (61.5)	26,500 (65)	25,300 (67.5)	24,200 (69.5)	23,100 (72)*	20,000 (77)	17,500 (77.5)	
30	25,200 (14)	25,200 (31)	25,200 (43)	25,200 (50)	23,500 (55.5)	22,100 (59.5)	21,000 (62.5)	20,000 (65.5)	19,000 (68)	17,750 (74.5)	15,400 (75.5)	
35			19,340 (31.5)	19,340 (42)	19,340 (49)	18,700 (54)	17,700 (57.5)	16,800 (61)	16,000 (64.5)	15,600 (71.5)	13,700 (73)	9,600 (77.5)
40			15,190 (13.5)	15,190 (32)	15,190 (41.5)	15,190 (47.5)	15,190 (52.5)	14,400 (56.5)	13,600 (60)	13,100 (68.5)	12,200 (70.5)	8,750 (75.5)
45				12,310 (18)	12,310 (32.5)	12,310 (41)	12,310 (47)	12,310 (51.5)	11,700 (56)	11,300 (65.5)	10,800 (67.5)	7,900 (73)
50					10,000 (20.5)	10,000 (33)	10,000 (40.5)	10,000 (46)	10,000 (51.5)	9,930 (62)	9,410 (64.5)	7,050 (71)
55						8,180 (22.5)	8,180 (33)	8,180 (40)	8,180 (46.5)	8,710 (59)	8,230 (61.5)	6,350 (68.5)
60							6,650 (24)	6,650 (33.5)	6,650 (41)	7,680 (55.5)	7,240 (58.5)	5,800 (66)
65							5,280 (3)	5,280 (25)	5,280 (35)	6,800 (52)	6,380 (55.5)	5,200 (63.5)
70								4,140 (11.5)	4,140 (27.5)	5,990 (48)	5,640 (52.5)	4,750 (61.5)
75									3,320 (17)	5,000 (44)	4,910 (49)	4,350 (58.5)
80										4,060 (40)	4,090 (45)	4,050 (56)
85										3,290 (35)	3,420 (41)	3,700 (53.5)
90										2,730 (29.5)	2,830 (37)	3,280 (50.5)
95										2,210 (22.5)	2,330 (32)	2,870 (47.5)
100										1,680 (10.5)	1,890 (26.5)	2,470 (44.5)
105											1,470 (19)	2,080 (41)
110												1,700 (37.5)
115												1,340 (33.5)
120												1,010 (29)

Note: Boom angles are in degrees.

A6-829-006309A & -002137D

#LMI operating code. Refer to LMI manual for instructions.
*See lifting capacity notes on page 2.

WORKING AREA DIAGRAM



LINE PULLS & REEVING INFORMATION

HOISTS	CABLE SPECS.	PERMISSIBLE LINE PULLS
MAIN & AUX. Model 30	3/4 in. (19 mm) 18x19 Class or 35x7 Rotation Resistant Min. Breaking Str. 64,600 lbs.	12,920 lbs.

WEIGHT REDUCTIONS FOR LOAD HANDLING DEVICES

32 ft. Boom Extension	
*Stowed -	430 lbs.
*Erected -	2,985 lbs.

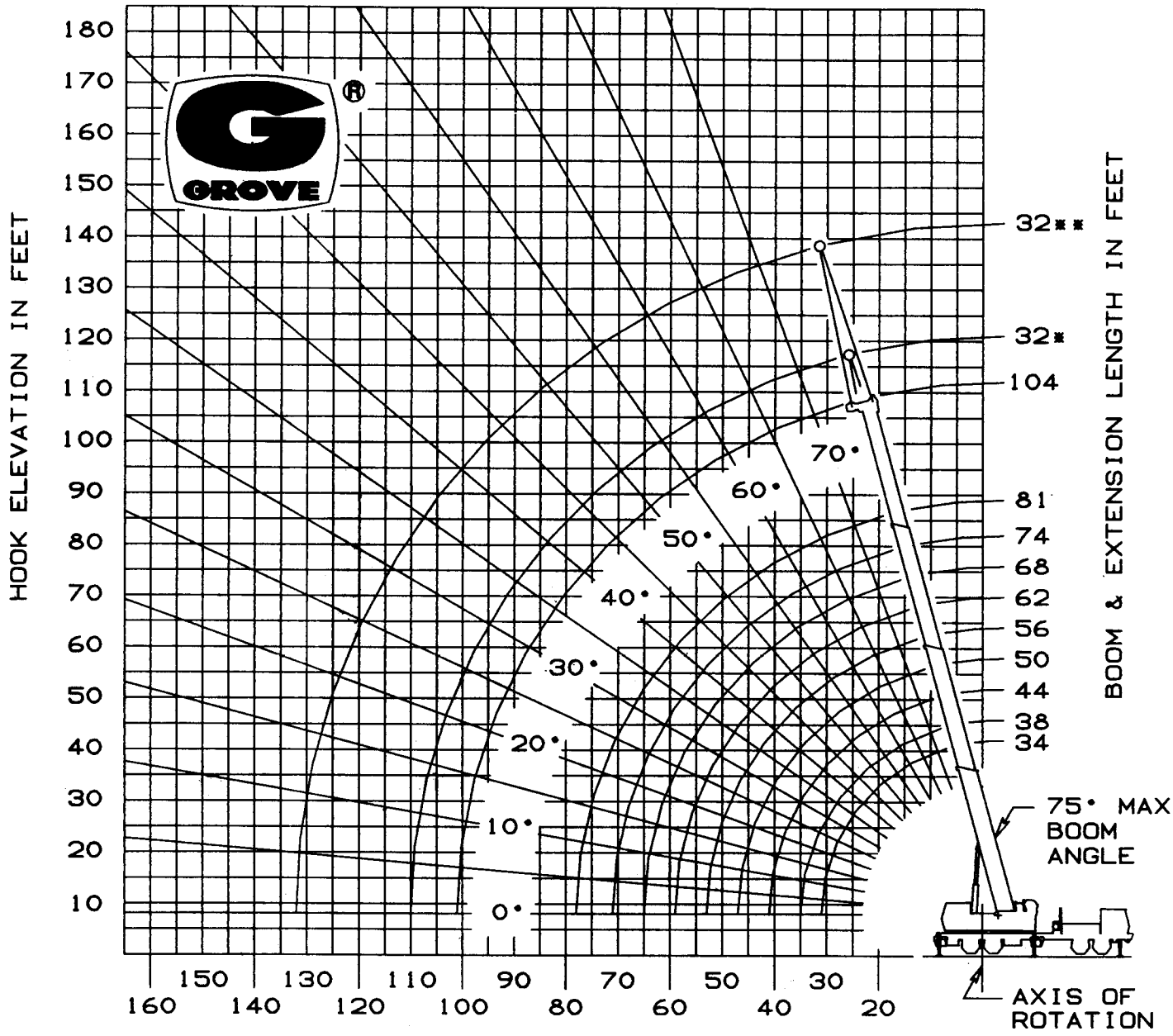
*Reduction of main boom capacities

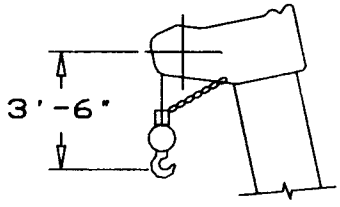
HOOKBLOCKS:	
50 Ton, 4 Sheave	700 lbs.
45 Ton, 3 Sheave	1,100 lbs.
15 Ton, 1 Sheave	400 lbs.
25 Ton, 2 Sheave	665 lbs.
Auxiliary Boom Head	190 lbs.
10 Ton Headache Ball	560 lbs.
7 1/2 Ton Headache Ball	338 lbs.

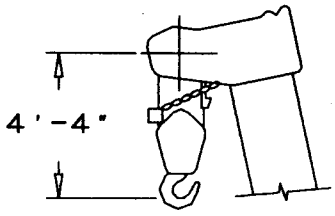
When lifting over swingaway and/or jib combinations, deduct total weight of all load handling devices reeved over main boom nose directly from swingaway or jib capacity.

NOTE: All load handling devices and boom attachments are considered part of the load and suitable allowances MUST BE MADE for their combined weights. Weights are for Grove furnished equipment.

RANGE DIAGRAM (UNLADEN BOOM) D6-829-008865







DIMENSIONS ARE FOR LARGEST GROVE FURNISHED HOOK BLOCK AND HEADACHE BALL. WITH ANTI-TWO BLOCK ACTIVATED.

* WITH 81 FOOT BOOM

** WITH 104 FOOT BOOM

TMS300B - S/N 71321

LOAD CHARTS
RT415

85% STABILITY
ON OUTRIGGERS

75% STABILITY
ON RUBBER

39,000 lb G.V.W.

73450

SERIAL NUMBER

NOTES FOR LIFTING CAPACITIES

GENERAL.

1. Rated loads as shown on lift chart pertain to this machine as originally manufactured and equipped. Modifications to the machine or use of optional equipment other than that specified can result in a reduction of capacity.
2. Construction equipment can be hazardous if improperly operated or maintained. Operation and maintenance of this machine shall be in compliance with the information in the operator's parts and safety manual supplied with this machine. If these manuals are missing, order replacements from the manufacturer through the distributor.
3. The operator and other personnel associated with machine shall fully acquaint themselves with the latest American National Standards Institute (ANSI) Safety Standards for cranes.

SETUP:

1. The machine shall be leveled on a firm supporting surface. Depending on the nature of the supporting surface, it may be necessary to have structural supports under the outrigger floats or tires to spread the load to a larger bearing surface.
2. For outrigger operation, outriggers shall be fully extended with tires raised free of crane weight before operating the boom or lifting loads.
3. If machine is equipped with front jack cylinder, the front jack cylinder shall be set in accordance with written procedure.
4. When equipped with extendable counterweight, the counterweight shall be fully extended before operation.
5. Tires shall be inflated to the recommended pressure before lifting on rubber.
6. With certain boom and hoist tackle combinations, maximum capacities may not be obtainable with standard cable lengths.
7. Do not travel with crane boom extension or jib erected.

OPERATION:

1. Rated loads at rated radius shall not be exceeded. Do not tip the machine to determine allowable loads. For clamshell or concrete bucket operation, weight of bucket and load must not exceed 80% of rated lifting capacities.
2. All rated loads have been tested to and meet minimum requirements of SAE J1063 OCT80 - Cantilevered Boom Crane Structures - Method of Test, and do not exceed 85% of the tipping load on outriggers as determined by SAE J765 OCT80 Crane Stability Test Code.
3. Rated loads include the weight of hook block, slings and auxiliary lifting devices and their weights shall be subtracted from the listed rating to obtain the net load to be lifted. When more than the minimum required hoist reeving is used, the additional rope weight shall be considered part of the load to be handled.
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 (32km/h), rated loads and boom lengths shall 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 machine may overturn without any load on the hook.
8. The maximum load which can be telescoped is not definable because of variations in loadings and crane maintenance, but it is safe to attempt retraction and extension within the limits of the capacity chart.
9. 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.
10. For safe operation, the user shall make due allowances for his particular job conditions, such as: soft or uneven ground, out of level conditions, high winds, side loads, 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.
11. Power telescoping boom sections must be extended equally at all times.
12. Handling of personnel from the boom is not authorized except with equipment furnished and installed by Grove Manufacturing Company.
13. Keep load handling devices a minimum of 18 inches (45.7 cm) below boom head at all times.
14. The boom angle before loading should be greater than the loaded boom angle to account for deflection.
15. Capacities appearing above the bold line are based on structural strength and tipping should not be relied upon as a capacity limitation.
16. Capacities for the 27 ft. (8.3 m) boom length shall be lifted with boom fully retracted. If boom is not fully retracted, capacities shall not exceed those shown for the 40 ft. (12.2 m) boom length.

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 (Shown in Parenthesis on Main Boom Capacity Chart): 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 center line 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.

LINE PULLS & REEVING INFORMATION

HOISTS	CABLE SPECS.	PERMISSIBLE LINE PULLS
MAIN & AUX. Model 15	5/8 in. (16 mm) 18x19 Class or 35x7 Rotation Resistant Min. Breaking Str. 45,400 lbs.	8,074 lbs.

WEIGHT REDUCTIONS FOR LOAD HANDLING DEVICES

25 ft. Fixed Extension with 27 ft. - 70 ft. Boom	
*Stowed -	294 lbs.
*Erected -	1,471 lbs.
25 ft. - 43 ft. Tele. Ext.	
*Stowed -	538 lbs.
*Erected (ret.) -	3,906 lbs.
*Erected (ext.) -	4,995 lbs.

*Reduction of main boom capacities

HOOKBLOCKS:	
12 Ton, 1 Sheave	360 lbs.
15 Ton, 2 Sheave	462 lbs.
22 Ton, 3 Sheave	499 lbs.
Auxiliary Boom Head	145 lbs.
5 Ton Headache Ball	172 lbs.

When lifting over swingaway and/or jib combinations, deduct total weight of all load handling devices reeved over main boom nose directly from swingaway or jib capacity.

NOTE: All load handling devices and boom attachments are considered part of the load and suitable allowances MUST BE MADE for their combined weights. Weights are for Grove furnished equipment.

RATED LIFTING CAPACITIES IN POUNDS
27 ft. - 70 ft. BOOM

ON OUTRIGGERS - 360°

Radius in Feet	#01				
	Main Boom Length in Feet				
	27	40	50	60	70
12	30,000 (54)	30,000 (66.5)	30,000 (71.5)	30,000 (75.5)	
15	28,000 (45)	28,000 (61.5)	28,000 (68)	28,000 (72)	22,000 (76.5)
20	20,200 (23)	20,200 (52.5)	20,200 (61.5)	20,200 (67)	17,650 (72)
25	See Warning	13,500 (42)	13,500 (54.5)	13,500 (61.5)	13,300 (67)
30	Note 16	10,400 (28.5)	10,400 (46.5)	10,400 (55.5)	10,400 (62.5)
35			8,370 (37.5)	8,370 (49.5)	8,370 (57.5)
40			6,630 (25)	6,630 (42.5)	6,630 (52)
45				5,370 (34)	5,370 (46)
50				4,410 (23.5)	4,410 (39.5)
55					3,660 (31.5)
60					3,060 (21.5)
Minimum boom angle (deg.) for indicated length (no load)					0
Maximum boom length (ft.) at 0 deg. boom angle (no load)					70

Note: ( ) Boom angles are in degrees. A6-829-009577

#LMI operating code. Refer to LMI manual for instructions.

ON RUBBER CAPACITIES WITH 16.00 x 24 TIRES

STATIONARY CAPACITIES - 360°

Radius in Feet	#05				
	Main Boom Length in Feet				
	27	40	50	60	70
8	21,850 (64)				
9	17,600 (61.5)				
10	14,650 (59)	14,650 (70)			
12	10,750 (54)	10,750 (66.5)	8,900 (71.5)	8,900 (75.5)	
15	7,420 (45)	7,420 (61.5)	7,310 (68)	7,290 (72)	6,910 (76.5)
20	4,330 (23)	4,330 (52.5)	4,330 (61.5)	4,330 (67)	4,330 (72)
25		2,790 (42)	2,790 (54.5)	2,790 (61.5)	2,790 (67)
30		1,870 (28.5)	1,870 (46.5)	1,870 (55.5)	1,870 (62.5)
35			1,240 (37.5)	1,240 (49.5)	1,240 (57.5)
40			780 (25)	780 (42.5)	780 (52)

STATIONARY CAPACITIES - DEFINED ARC OVER FRONT (SEE NOTE 3)

Radius in Feet	#05				
	Main Boom Length in Feet				
	27	40	50	60	70
8	30,000 (64)				
9	30,000 (61.5)				
10	29,100 (59)	16,600 (70)			
12	20,750 (54)	16,600 (66.5)	9,950 (71.5)	8,900 (75.5)	
15	13,900 (45)	13,900 (61.5)	9,950 (68)	8,900 (72)	6,910 (76.5)
20	8,520 (23)	8,520 (52.5)	8,520 (61.5)	8,520 (67)	6,500 (72)
25		5,730 (42)	5,730 (54.5)	5,730 (61.5)	5,730 (67)
30		4,120 (28.5)	4,120 (46.5)	4,120 (55.5)	4,120 (62.5)
35			3,040 (37.5)	3,040 (49.5)	3,040 (57.5)
40			2,270 (25)	2,270 (42.5)	2,270 (52)
45				1,690 (34)	1,690 (46)
50				1,230 (23.5)	1,230 (39.5)
55					860 (31.5)

A6-829-009108 & -009578

ON RUBBER CAPACITIES WITH 16.00 x 24 TIRES (cont'd.)

PICK & CARRY CAPACITIES - UP TO 2.5 MPH
BOOM CENTERED OVER FRONT (SEE NOTE 7)

Radius in Feet	#06				
	Main Boom Length in Feet				
	27	40	50	60	70
8	30,000 (64)				
9	30,000 (61.5)				
10	28,200 (59)				
12	20,750 (54)				
15	13,900 (45)	13,000 (61.5)	12,950 (68)		
20	8,520 (23)	8,520 (52.5)	8,520 (61.5)	8,520 (67)	
25		5,730 (42)	5,730 (54.5)	5,730 (61.5)	5,730 (67)
30		4,120 (28.5)	4,120 (46.5)	4,120 (55.5)	4,120 (62.5)
35			3,040 (37.5)	3,040 (49.5)	3,040 (57.5)
40			2,270 (25)	2,270 (42.5)	2,270 (52)
45				1,690 (34)	1,690 (46)
50				1,230 (23.5)	1,230 (39.5)
55					860 (31.5)

Note: ( ) Boom angles are in degrees. A6-829-009579

#LMI operating code. Refer to LMI manual for instructions.

1. Capacities are in pounds and do not exceed 75% of tipping loads as determined by test in accordance with SAE J765 OCT80.
2. Capacities are applicable to machines equipped with 16.00 x 24 (16 ply) bias ply tires, at 80 psi cold inflation pressure (65 psi for 2.5 mph pick & carry capacities).
3. Defined Arc - Over front includes 6° on either side of longitudinal centerline of machine.
4. Capacities appearing above the bold line are based on structural strength and tipping should not be relied upon as a capacity limitation.
5. Capacities are applicable only with machine on firm level surface.
6. On rubber lifting with boom extensions not permitted.
7. For pick and carry operation, boom must be centered over front of machine, mechanical swing lock engaged and load restrained from swinging. When handling loads in the structural range with capacities close to maximum ratings, travel should be reduced to creep speeds.
8. Axle lockouts must be functioning before lifting on rubber. (Check automatic lockout system for proper functioning: refer to "Operation and Maintenance Manual" for description of a proper functioning lockout system).
9. All lifting depends on proper tire inflation, capacity and condition. Capacities must be reduced for lower tire inflation pressures. See lifting capacity chart for tire used. Damaged tires are hazardous to safe operation of crane.
10. Creep - not over 200 ft. of movement in any 30 minute period and not exceeding 1 mph.

	No Load Stability Data	MainBoom 70 ft.
Front	Min. boom angle (deg.) for indicated length	23
(No load)	Max. boom length (ft.) at 0 deg. boom angle	60
360 Deg.	Min. boom angle (deg.) for indicated length	48
(No load)	Max. boom length (ft.) at 0 deg. boom angle	40

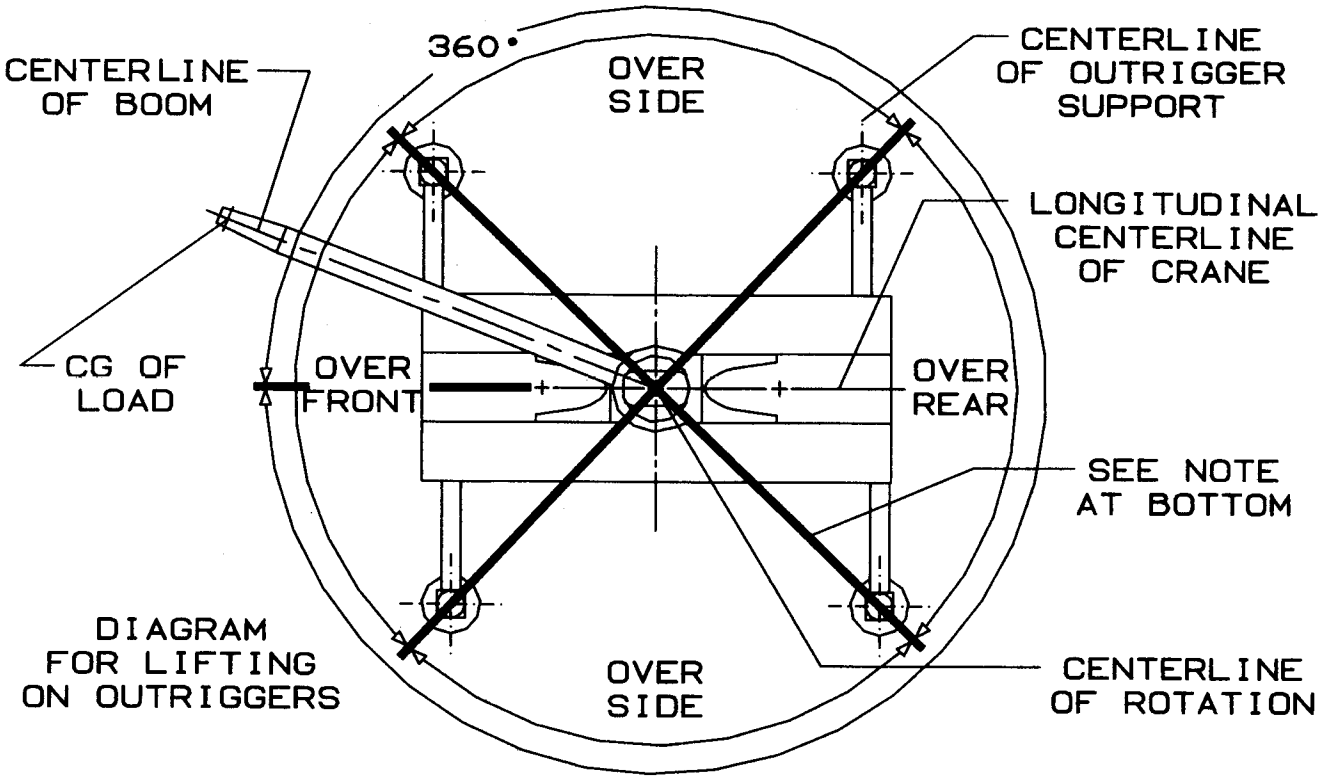


DIAGRAM FOR LIFTING ON OUTRIGGERS

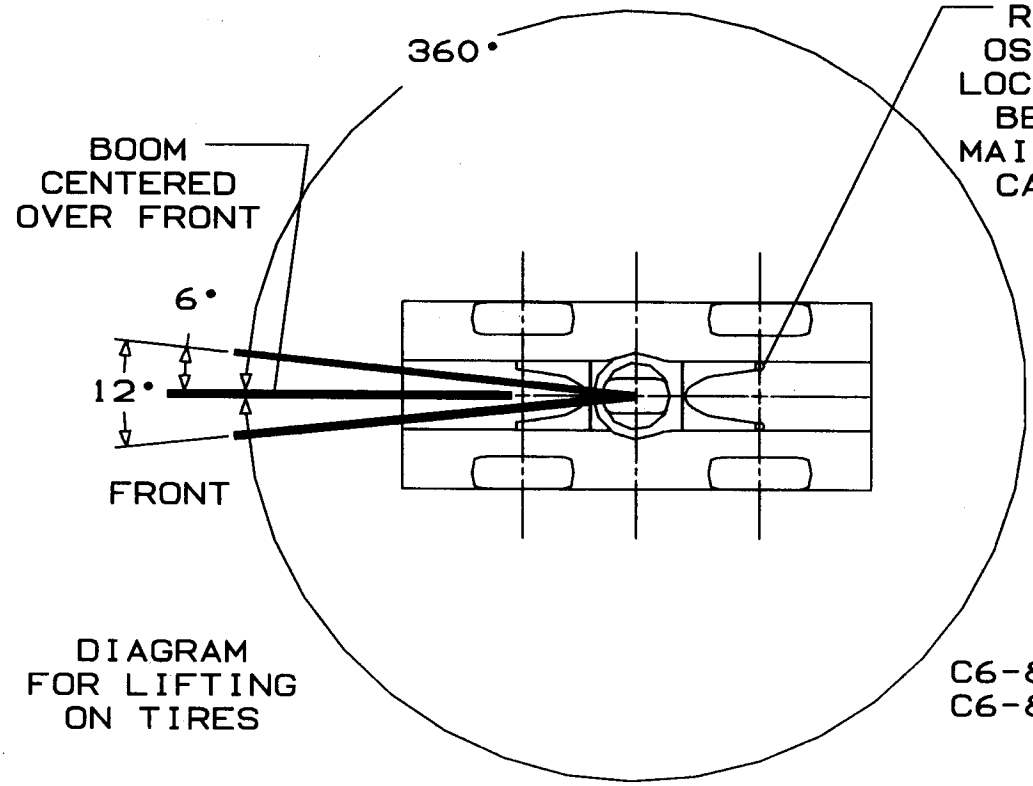


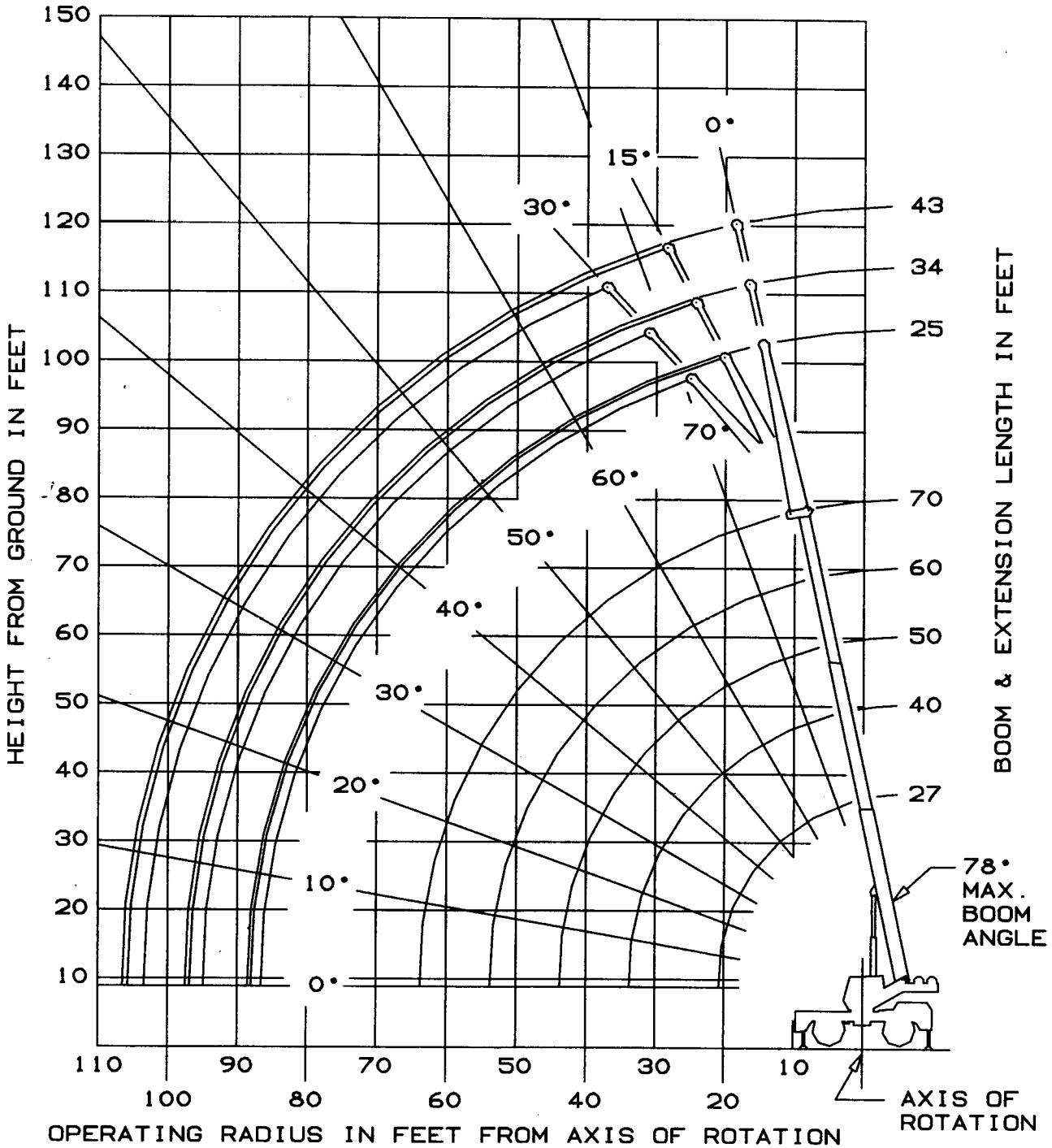
DIAGRAM FOR LIFTING ON TIRES

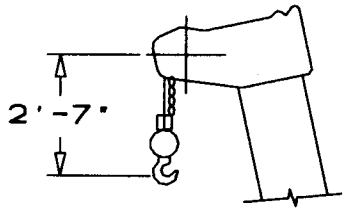
C6-829-003529
C6-829-001159

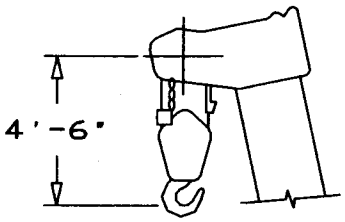
BOLD LINES DETERMINE THE LIMITING POSITION OF ANY LOAD FOR OPERATION WITHIN WORKING AREAS INDICATED

WORKING AREA DIAGRAM

WORKING RANGE DIAGRAM
(BOOM DEFLECTION NOT SHOWN) D6-829-008024







DIMENSIONS ARE FOR LARGEST GROVE FURNISHED HOOK BLOCK AND HEADACHE BALL. WITH ANTI-TWO BLOCK ACTIVATED.

ZERO DEGREE BOOM ANGLE CHARTS

ON OUTRIGGERS - 360 DEGREES

Boom Angle	Main Boom Length in Feet				
	27	40	50	60	70
0°	16,550 (21.1)	8,910 (33.7)	5,650 (43.7)	3,830 (53.7)	2,680 (63.8)

ON RUBBER

Stationary Capacity Defined Arc (3) Over Front and
Pick & Carry Capacities Up To 2.5 MPH Boom Centered (7)Over Front

Boom Angle	Main Boom Length in Feet			
	27	40	50	60
0°	7,670 (21.1)	2,670 (33.7)	1,010 (43.7)	950 (53.7)

Stationary Capacity 360° Arc

Boom Angle	Main Boom Length in Feet		
	27	40	50
0°	3,860 (21.1)	1,380 (33.7)	510 (43.7)

A6-829-009364

Note: ( ) Reference radii in feet

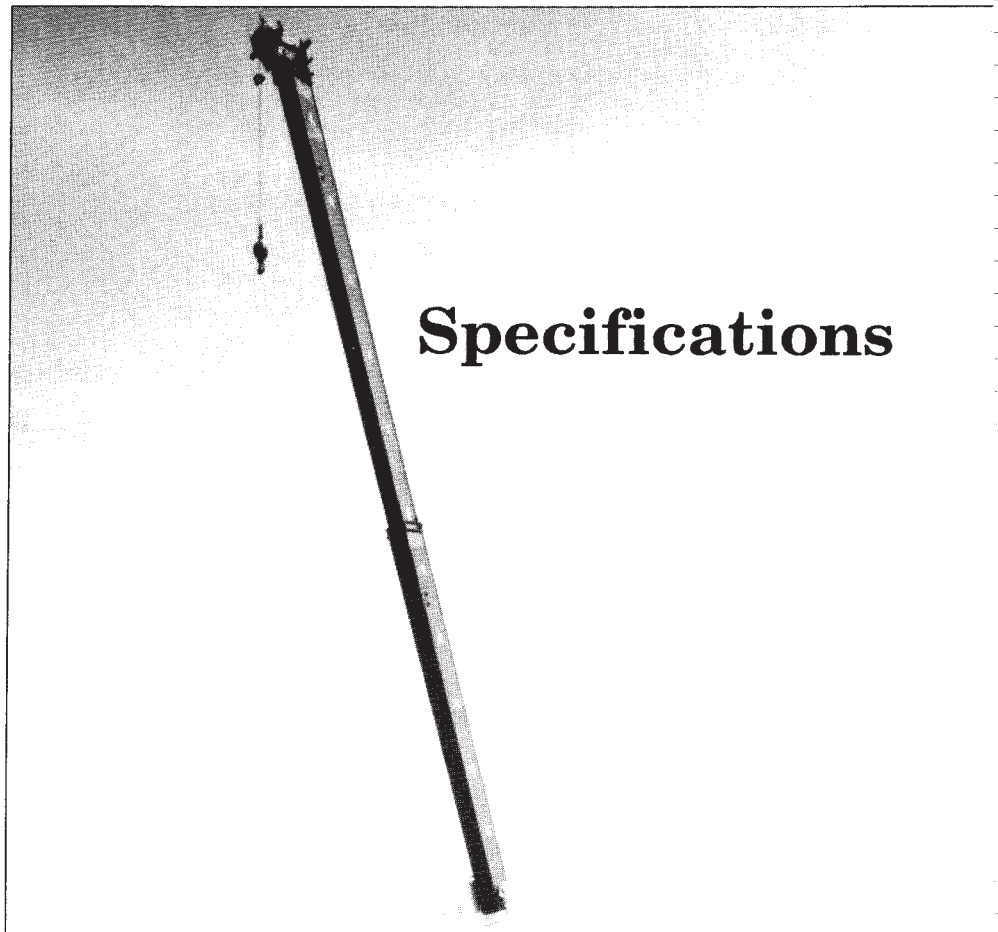
Refer to in-cab load chart for notes.

CRANE LOAD CHART BASICS

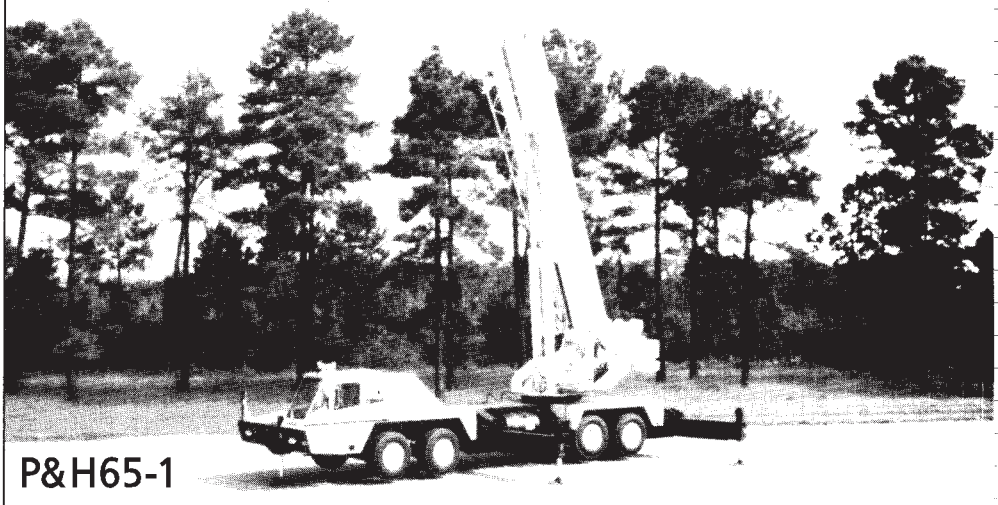
P&H® Century T-650

Hydraulic Truck Crane
65 Ton (60 tonnes)Capacity
186 Ft. (56.7m) Max. Boom and Extension

- 40 to 60 ft. telescopic lattice extension offsets 17° or 30° for reaching over structures.
- Four plate boom is welded inside and out for extra strength. No derate for bucket work on main boom or 40 ft. extension.
- Pinned tip section of 4 section hydraulic boom extends and pins by remote control from operator's cab.
- Boom will telescope any rated load - an advantage when loads must be placed through openings in structures.
- P&H model 2080 main winch has two speeds, line pull to max. of 22, 410 pounds, line speeds to max. of 481 fpm.
- Powerful P&H carrier travels 51 mph on highway, climbs 36.9% grade off highway. Roadranger transmission has 13 speeds forward, 2 reverse.
- Hydraulic outriggers spread to 23 ft. 7 inches; gives rock-solid stability for precise handling of 186 feet of boom and extension.
- Hydraulic, mechanical and electrical systems are extra rugged to take on the heaviest duty jobs with ease.
- Roomy, environmental operator's cab has deluxe operator's seat with joystick controls in arm rests, adjustable positioning, torsion bar suspension. Keeps operators fresh and productive all day long.



Specifications



P&H65-1

Specifications

ITEM NO. This P&H crane meets the requirements of ANSI B30.5 (1987). Boom structure (boom, lattice extension and jib) has been tested per SAE J1063, machine stability tested per SAE J765. LOAD RATINGS shown apply only to machine as manufactured and marketed by P&H.

1 BASIC MACHINE

Attachment

Boom: 40 ft. (12.2 m) retracted to 126 ft. (38.4 m) extended length, four section boom consisting of a boom base, two hydraulically extended and retracted sections and a fourth pinned section which can be hydraulically extended and retracted with pinning by hydraulic cylinders remotely controlled from the operator's cab. Boom point has five 17.75" (451mm) dia. main metalic sheaves with roller bearings and two idler sheaves with bronze bearings.

Each section of this rectangular boom consists of four plates welded both inside and out for superior strength. Large, non-metallic slider pads are adjustable.

For performance characteristics, see Chart no. 3, Crane Range Diagram, and Chart nos. 4 and 8, Lifting Capacities on 126 ft. Boom.

See Optional Equipment for lattice extensions, auxiliary sheave, and hook blocks.

Counterweight: 8500 lbs. (3856kg) with 5897 lbs. (2675kg) removable with a self contained raising or lowering device using the winch.

1367 lbs. (620kg) auxiliary counterweight to be used on units without auxiliary winch.

Upperstructure

Operator's Cab: Fully enclosed, all-weather steel cab with full vision safety glass and hinged top window with tinted glass. Cab is cushion-mounted for vibration isolation.

Operator's Cab Standard Equipment: Contains all crane function controls. Front control console includes: engine water temperature gauge, engine oil pressure gauge, hydraulic oil temperature gauge, air pressure gauge, fuel gauge, volt meter, winch high speed indicators; main winch drum turn indicator, dash light, electrical horn, windshield wiper, tachometer, machine level, brake warning indicator, check gauges indicator. Deluxe operator's seat with torsion suspension and fabric covering, and seat belt. Front window fan, windshield wiper and washer, and fire extinguisher.

Controls: Joy-stick controls are an integral part of the seat arm rests. Left hand side operates swing and auxiliary winch. Right hand side operates main winch and boom hoist. Front floor mounted foot pedals for swing brake, boom telescope and engine throttle. Front console instrument panel contains ignition switch, hand throttle control, swing lock control, electrical outrigger control panel, tachometer, oil pressure, voltage, water temperature and fuel level gauges. Left hand joystick has warning horn.

Electrical System: 24 volt negative ground. Wiring Harnesses have protective covering and are independently clamped to the framework, and have environmentally sealed Deutsch connectors. engine speed drive ratio.

Throttle Control: Variable electrical control for foot operation, and positive position cable control for hand use.

Side console has hand throttle control, swing lock control, electric outrigger panel and control switches, and indicators for automatic pinning system for four section boom.

Operational Aids

Krueger (ATB) anti-two block warning device with audio-visual warning. For main boom only.

Krueger (HAP) boom angle indicator with audio-visual warning.

Mechanical boom angle indicator also included.

Winches

Main Winch: P&H model 2080 with two speed, bent axial piston motor, mounted on rear of revolving frame. Planetary gearing andequal speed, power raising and lowering. Infinitely variable speed control. Spring applied, hydraulically released load holding multi-disc brake is automatic. Complete with 550' of .75" wire rope.

Drum: 17.375" (441mm) pitch diameter
22.81" (579mm) wide
27.75" (705mm) flange diameter

Wire Rope: .75 " (19mm) dia. 6 x 37 extra improved plow steel with 7x7 IWRC. Strength limit: 16,800 lbs. (7,619 kg).

Drum Capacity: 778 ft.(237m) x .75" (19mm) dia., 5 layers.

Line Pull (max.): 22,410 lbs. (10165 kg) 1st layer, low speed.
16845 lbs. (7640 kg) 5th layer.

Available Line Pull (for starting loads in mid-air) (max.):
15,000 lbs. (6802 kg) 5th layer

Line Speed (max.): (At engine no load high speed)
481 ft./min. (146 m/min.) 5th layer, high speed.

See Chart No. 2, Hoist Reeving, for rope capacities and parts of line required.

Auxiliary Winches: See Optional Equipment.

SHEAVE AND DRUM TO WIRE ROPE RATIOS:
(Pitch Diameters)

	Sheave to Wire Rope	Drum to Wire Rope
Main Boom Sheaves .75" Wire Rope	24.66:1	-
Main & Aux. Winch Model 2080 .75" Wire Rope	-	23.16:1
Aux. Winch Model 1580 .75" Wire rope		20.1:1

Boom Hoist: Two 8.25" (210mm) I.D. cylinders, double-acting. Hydraulically powered raising and lowering with holding valve.

Boom Telescope: Two 6.5" (165mm) I.D. cylinders, double-acting. Hydraulically powered raising and lowering with holding valve. Supplied by a single hose loop.

Hydraulic System

Pump Drive: Driven off carrier engine crankshaft, with manual pump disconnect for highway travel. 1.26 pump speed to 1.0 engine speed ratio.

Pumps: One tandem gear pump operating at full load rpm, the cover end section provides 51 gpm (193 l/m) to the boom hoist and telescope circuits, and the shaft end section provides 42 gpm (159 l/m) to the main and auxiliary winch circuits.

One tandem gear pump operating at full load rpm, the cover end section provides 35 gpm (132 l/m) to the swing circuit, and the shaft end section provides 26 gpm (98 l/m) to the outrigger and steer circuits or the winch boost.

Oil Reservoir: 177 gallons (670 liters) mounted between the tires on the left side of the carrier frame.

Oil Cooler: Oil to air, tube and fin type with internal turbulators.

Control Valves: One single-spool valve for swing circuit.

One two spool valve with one spool for boom hoist and one spool for telescope circuits.

One two spool valve with one spool for the main winch and one spool for the auxiliary winch circuits.

Filters: Two return line filters, 7 micron nominal, externally mounted to the hydraulic reservoir.

Swing System

Swing Unit: Hydraulic motor driving through gear reducer to pinion gear. Drive pinion supported with outboard bearing housing. 360° continuous rotation to 2.1 rpm full load.

Swing Gear: Single shear ball swing bearing with internal spur gear.

Swing Brake: Spring applied, hydraulically released, wet disc brake, integral with swing reducer. Hand brake control lever mounted on side console in cab. A manual foot pedal applies brake for static holding.

House Lock: 360 degree swing lock. Gear segment type.

Carrier

Type: P&H 8 x 4

Weight: Including ball bearing swing circle, hydraulic outriggers, standard tires and Detroit Diesel engine: 45,123 lbs. (20,468 kg).

Frame: Rectangular frame members of 100,000 psi (70 kg/mm²) and 80,000 psi (56 kg/mm²) yield strength alloy steel, reinforced with box constructed cross members of 80,000 psi (56 kg/mm²) yield strength alloy steel.

Outriggers: Hydraulic out and down type. Eight double-acting hydraulic cylinders for independent horizontal and vertical motion of each beam operated from the operator's cab or at each side of the carrier. Each vertical cylinder is equipped with a holding valve.

Outrigger beams: 100,000 psi (70 kg/mm²) and 80,000 psi (56 kg/mm²) yield strength alloy steel box extending to a maximum spread of 23' 7" (7.2 m) from centerline of float to centerline of float with the machine fully raised on the outriggers. Retracted width of the outriggers without floats is 9' 10" (3 m).

Outrigger Floats: Lightweight aluminum individually removable floats with storage on carrier. Float size 24" (610mm) dia. with effective nominal surface area of 452 sq. in. (2920 sq. cm) per float.

Carrier Cab: One man, left side, low profile fully enclosed all weather steel cab with full vision safety glass. Cab is cushion mounted for vibration isolation.

Cab Equipment: Contains all controls and instrumentation for travel, including adjustably illuminated instrument panel with speedometer, tachometer, hourmeter, voltmeter, air pressure gauges, low air pressure indicator lights, fuel gauge, oil pressure gauge, low oil pressure warning light, water temperature gauge, high water temperature warning light,, hi-beam indicator, turn signal indicator lights, air horns, west coast rear view mirrors, electric windshield wiper, engine condition alarm, heater and defroster. Deluxe operator's seat with torsion suspension and fabric covering. Seat belt with tethers. Fire extinguisher.

Lights: Dual headlights, taillights, stop lights, front and rear directional signals with emergency flashers, rear license plate light, front, rear and side clearance lights with reflectors, front and rear identification lights, and dome light.

Carrier Standard Equipment: Front bumper, full fenders, sliding engine hood, tow hooks front and rear, carrier mounted boom rack, side storage boxes, float storage racks, tool boxes, backup warning device, and hydraulically operated front stabilizer with 24" (610mm) diameter float.

Brakes, Service: Dual air circuits front and rear.

Front axles - air operated, cam actuated drum and shoe type.

Rear Axles - air operated, spring type chambers, cam actuated drum and shoe type.

Brakes, Parking: Cam actuated drum and shoe type on rear axles. Spring applied, air released.

Front Axle: Steerable tubular tandem.

Rear Axle: Single reduction with inter-axle differential. Ratio 6.070:1.

Suspension: Front axle: Four spring mounted tandem with torque rods.

Rear axle: Solid bogie mounted tandem with torque rods.

Steering: Hydraulic powered gear and integral valve with a hydraulic power assist cylinder on each front axle.

Tires: Front - 425/65R 22.5 LRJ. Rear - 12.00 R 20 LRJ.

For crane ratings on tires see chart nos. 12, 13 and 14.

Power Plant:

Make:	Detroit Diesel 6V92TA DDEC
Max. HP:	350 HP (261 kw) @ 2100 rpm
Max Torque:	1020 lb. ft. (1387 Nm) @ 1200 rpm
Cylinders:	Six: 4.85" (123 mm) bore x 5.00" (127mm) stroke.
Displacement:	552 cu. in. ((9.05 liter)
Cycle:	Two

(Power Plant Cont. next page)

(Power Plant cont.)

Alternator:	Delco 24 volt, 65 amp.
Aspiration:	Turbocharged and after-cooled.
Air Compressor:	12 CFM (340 Liters/min.) @1250 rpm

Radiater: Water to air, tube and fin type core with bottom tank transmission oil cooler. Thermostatically temperature controlled.

Air Cleaner: Donaldson FHG 16-0049 two stage primary dry air cleaner with "Duralife" filter media and restriction indicator.

Muffler: Resonator and muffler.

Fuel Tank: DOT approved steel tank of 100 gal. (378 liters) mounted on right side of carrier, behind front outriggers.

Electrical: 24 volt system with negative ground. Two 8D batteries with a reserve capacity of 442 min. and CCA at 0° of 970 amps. Harnesses have environmentally sealed Deutsch connectors. Switches used in operator's cab are environmentally sealed, rocker type.

Transmission: Eaton Corp. Fuller Roadranger, RTO-11613, 13 speeds forward, 2 reverse.

Clutch: Spicer 14" (356mm) two plate with ceramic linings, coaxial torque dampener, upshift clutch brake and air actuated assist.

Performance:

GVW:	96,000 lbs. (43546kg)
Tires:	425/65 R 22.5 front, 12.00 R 20 Rear
Counterweight:	8500 lbs. (3856kg)
Low Gear:	2.0 mph (3.3 Km/h) @ 36.9% Grade
High Gear:	51.4 mph (82.8 km/h) @ .4% grade

ITEM NO.

Options and Accessories

125 **Lattice Extension:** 40 ft. (12.2m)(Item 145 included w/ new machine). Swingaway lattice structure with a detachable point section for easy conversion to telescopic type extension with a single metallic sheave. It can be put into operating condition by pivoting from its stored position on right side of boom base section. Self storing pins connect extension to boom head. In the operating position the extension is offset 2° from the main boom. Includes anti-two block material.

135 **Telescopic Lattice Extension**: 40 ft. to 60 ft. (12.2m to 18.3m) (Item 150 included w/ new machine). Swingaway lattice structure boom extension with a welded four plate telescope section with a single metallic sheave. It can be put into operating condition by pivoting from its stored position on the right side of the boom base section and pinned to the boom head. Telescopic section is then extended on rollers and pinned. The telescopic section can be replaced with a stub head section when extra length is not required. In the operating position the extension is offset 2° from the main boom. Includes ant- two-block material.

For performance characteristics see Chart no. 3: Crane Range Diagram, and Chart nos. 5, 6 and 7; 9, 10 and 11 Load Ratings for Lattice Extension.

140 **Offset Mechanism:** Pivoting links which allow items 125 and 135 to offset 17° or 30° from the main boom.

160 **Auxiliary Boom Point Sheave:** Boom point mounted with single metallic sheave, includes anti-two block material.

205 **Auxiliary Winch:** P&H model 1580 with two speed motor, mounted to rear of revolving frame on the counterweight. Planetary gearing and equal speed, power raising and lowering. Infinitely variable speed control. Spring applied, hydraulically released load-holding multi-disc brake is automatic. Drum turn indicator.

Drum:	15" (381 mm) P.D. 18.5" (470 mm) wide 23.50 " (597 mm) dia. flange.
Drum Capacity:	554 ft. (169m) x .75" (19mm), 5 layers.
Line Pull (max.):	17,240 lbs. (7820 kg) 1st layer low speed, 12,469 lbs. (5656 kg) 5th layer.
Maximum Available Line Pull for Starting Load in Mid Air:	11,000 lbs. (4991 kg), 5th layer.
Line Speed:	643 fpm (196 m/m), 5th layer, high speed (At engine no load high speed).

220 **Wire Rope For Aux. Winch:** Same as Main Winch

225 **Wire Rope for Auxiliary Winch:** .75" x 550', 8 x 19 spin resistant

235 **Hook Block:** 65 ton, 5 sheaves

240 **Hook Block:** 20 ton, 1 sheave

245 **Weighted Jib Hook:** 8.5 ton, with swivel

ITEM NO.

260 **Cable Spooling Device:** Main or auxiliary winch drum.

270 **Pilot Operated Lever Controls**: In lieu of joysticks

410 **Window Wiper:** Roof

415 **Heater & Defroster:** Diesel.

420 **Heater & Defroster:** Propane w/out tank.

435 **Vandalism Kit:** Lexan Glass.

440 **Tinted Glass**

455 **Rotating Beacon:** Amber, on roof of cab.

505 **Tires:** 14:00 R 20 18 ply Front and rear.

For performance characteristics, see chart nos. 12, 13 and 14.

550 **Spare Wheel & Tire:** 425/65R 22.5 LR-J front tire.

555 **Spare Wheel & Tire:** 12:00 R 20 LR-J rear tire.

560 **Spare Wheel & Tire:** 14:00 R 20 LR-J front or rear tire.

625 **Pintle Hook:** Rear

635 **Cold Weather Starting Aid**

645 **Tire Inflation Kit**

ITEM NO.

Operational Aids

735 **Krueger (HLAP)** boom angle, length, radius indicators with angle preset and audio-visual warning.

745 **Krueger load moment system (Mark IIIe)**. Includes load moment device w/ audio-visual warning, radius, angle, length w/ angle preset. Includes Control Lever Lockouts.

END OPTIONS AND ACCESSORIES

CHART 1

Weight Distribution

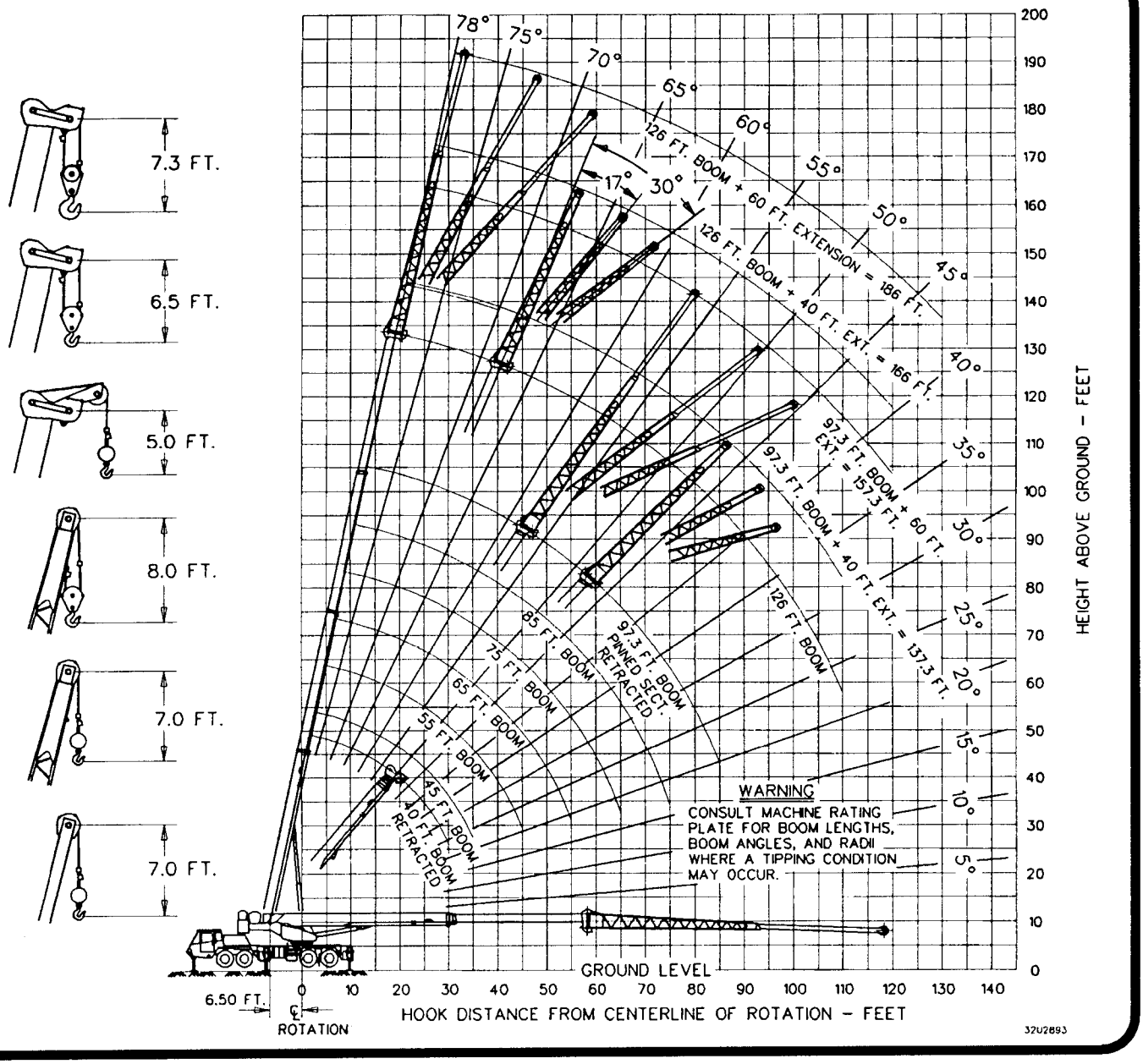
	Pounds			Kilograms		
	Gross	Front	Rear	Gross	Front	Rear
Basic Carrier	37756	15739	22017	17126	7139	9987
Basic Upper	6687	179	6508	3033	81	2952
Standard Components:						
126 ft. 4-section Boom	21473	15867	5606	9740	7197	2543
Boom Sheaves - steel	408	745	-337	185	338	-153
Boom Hoist Cylinder	3078	1537	1541	1396	697	699
Main Winch (#2080)	1799	-650	2449	815	-296	1111
Aux. Winch Plumbing & Controls	108	-31	139	49	-14	63
.75 x 550' Main Winch Wire Rope	584	-135	719	265	-61	326
Slab Counterweight or Aux. Winch	1367	-666	2033	620	-302	922
Front Tires - 425/65R 22.5	1338	1338	0	607	607	0
Rear Tires - 12.00R 20	2216	0	2216	1005	0	1005
DD 6V92TA Engine	3828	3534	294	1736	1603	133
Removable Counterweight	5897	-2842	8739	2675	-1289	3964
Counterweight Shell - 2599 lbs.	2599	-1209	3808	1179	-548	1727
Hydraulic Front Stabilizer	496	721	-225	225	327	-102
HD Battery	48	24	24	22	11	11
Air Dryer	33	23	10	15	11	4
360° Houselock	42	11	31	19	5	14
Basic Machine	**89757**	**34185**	**55572**	**40712**	**15506**	**25206**
Adjustments for Options (basic machine)						
Front Tires 14.00 R 20	185	185	0	84	84	0
Rear Tires 14.00 R 20	911	0	911	414	0	414
Additions for Options (Attachments)						
20 ton Hook Block (on rear deck)	580	-198	778	263	-90	353
8.5 ton Ball Hook (on rear deck)	264	-90	354	120	-41	161
Auxiliary Sheave	154	293	-139	70	133	-63
.75 x 550' Aux. Winch Wire Rope	584	-284	868	265	-127	392
40' Lattice Extension	1753	1556	197	795	706	89
40 ' to 60' Lattice Extension	2804	2126	678	1272	965	307
Offset Material - boom extension	147	266	-119	67	121	-54
65 ton Hook Block at Front Bumper	1131	1891	-760	513	858	-345
65 ton Hook Block at Rear Outrigger	1131	-395	1526	513	-179	692
Additions for Options - Upper						
Diesel Heater	55	-5	60	25	-2	27
Propane Heater	53	-4	57	24	-2	26
Propane Tank - Full	49	-5	54	22	-2	24
Floodlights	29	17	12	13	8	5
Additions for Options - Carrier						
Rear Pintle Hook	27	-11	38	12	-5	17

CHART 2

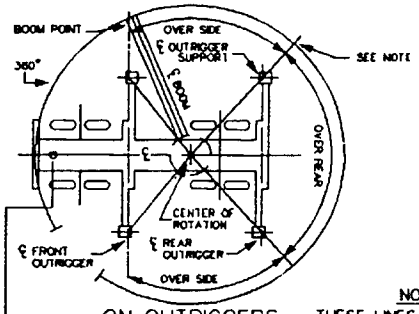
MAIN HOIST REEVING										
3/4" DIA. WIRE ROPE BREAKING STRENGTH 58,800 LBS. 6X37 FW I.W.R.C. 3.5:1										
Part of line	1	2	3	4	5	6	7	8	9	10
Maximum Load	15000	30000	45000	60000	75000	90000	105000	120000	130000	-
AUXILIARY HOIST REEVING										
3/4" DIA. WIRE ROPE BREAKING STRENGTH 51,800 LBS. 8X19 I.W.R.C. 5.0:1										
Part of line	1	2	3	4	5	6	7	8	9	10
Maximum Load	10000	20000	30000	40000	50000	60000	70000	80000	90000	100000

Crane Range Diagram - 126 Foot Boom

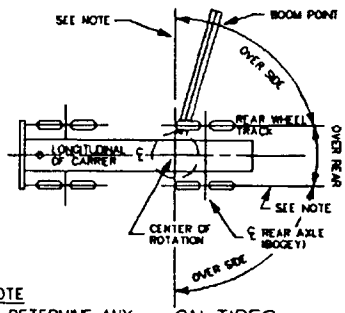
CHART 3



Areas of Operation



WHEN HYDRAULIC FRONT STABILIZER IS SET, "OVER SIDE" RATINGS ARE APPLICABLE TO "OVER FRONT" AREA OF OPERATION.

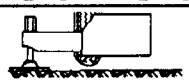


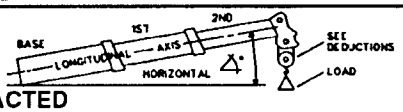
NOTE
THESE LINES DETERMINE ANY LIMITING POSITION OF ANY LOAD FOR OPERATION WITHIN WORKING AREAS INDICATED.

Load Ratings - with 8,500 lbs. Counterweight
PCSA Class 10-242

CHART 4

RATED LOADS IN POUNDS ON OUTRIGGERS





POWERED BOOM LENGTH IN FEET - MANUAL RETRACTED

OPERATING RADIUS FT.	40 FT. ∠	40 FT. RATED LOAD POUNDS SIDE	40 FT. RATED LOAD POUNDS REAR	45 FT. ∠	45 FT. RATED LOAD POUNDS SIDE	45 FT. RATED LOAD POUNDS REAR	55 FT. ∠	55 FT. RATED LOAD POUNDS SIDE	55 FT. RATED LOAD POUNDS REAR	65 FT. ∠	65 FT. RATED LOAD POUNDS SIDE	65 FT. RATED LOAD POUNDS REAR	75 FT. ∠	75 FT. RATED LOAD POUNDS SIDE	75 FT. RATED LOAD POUNDS REAR	85 FT. ∠	85 FT. RATED LOAD POUNDS SIDE	85 FT. RATED LOAD POUNDS REAR	97.3 FT. ∠	97.3 FT. RATED LOAD POUNDS SIDE	97.3 FT. RATED LOAD POUNDS REAR	OPERATING RADIUS FT.
10	68	130000	130000	71	102000	102000	74	94800	94800													10
12	65	115000	115000	68	98400	98400	72	88000	88000	75	80400	80400										12
15	60	90000	90000	64	90000	90000	69	84000	84000	73	72800	72800	75	60500	60500							15
20	51	67000	67000	56	67000	67000	63	66900	66900	68	63500	63500	72	53000	53000	74	44500	44500	77	33000	33000	20
25	40	52000	52000	48	52000	52000	57	51900	51900	63	51700	51700	68	45000	45000	71	39000	39000	74	32500	32500	25
30	27	41700	41700	38	41700	41700	50	41600	41600	58	41600	41600	63	40000	40000	67	34200	34200	71	29000	29000	30
35				25	31700	32400	43	31700	32400	52	31700	32400	59	31700	32400	63	30200	30200	67	25500	25500	35
40							34	24200	25300	46	24200	25300	54	24200	25300	59	24200	25300	64	22700	22700	40
45							22	18700	19900	39	18700	19900	49	18700	19900	55	18700	19900	61	18700	19900	45
50										31	15000	16200	43	15000	16200	51	15000	16200	57	15000	16200	50
55										21	12100	13400	37	12100	13400	46	12100	13400	53	12100	13400	55
60													29	9700	10900	41	9700	10900	49	9700	10900	60
65													19	7900	9000	35	7900	9000	45	7900	9000	65
70																28	6400	7500	40	6400	7500	70
75																18	5100	6200	35	5100	6200	75
80																			29	4000	5000	80
85																			22	3100	4000	85

(32R998)

Information:

1. Crane load ratings on outriggers do not exceed 85% of tipping.
2. Ratings above heavy line are based on the machine's hydraulic or structural competence and not on machine stability.
3. Deductions must be made from rated loads for stowed lattice extension, optional attachments, hooks and hook blocks.

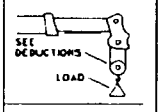
See deductions Chart no. 15 on page 12. Weights of slings and all other load handling devices shall be considered part of the load.

4. Crane load ratings with outriggers are based on outriggers fully extended and set to a distance of 11 ft. 9 3/4 in. from the longitudinal axis of the carrier to the outrigger float pivot connection with all load removed from carrier wheels.
5. Counterweight 8,500 lbs. with 5900 lb. removable.

CHART 5

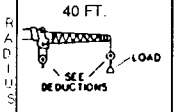
LOAD RATINGS IN POUNDS WITH OUTRIGGERS EXTENDED

PINNED SECTION EXTENDED

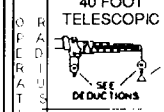


OPERATING RADIUS FT. FOR 125 FOOT BOOM ONLY	∠	RATED LOAD IN POUNDS SIDE	RATED LOAD IN POUNDS REAR
30	76	20700	20700
35	74	19000	19000
40	72	17500	17500
45	69	16500	16500
50	67	15000	15000
55	64	14000	14000
60	62	11700	12800
65	59	9900	11000
70	56	8300	9400
75	53	7000	8100
80	50	5900	6900
85	45	5000	5900
90	43	4200	5000
100	35	2700	3700
110	25	-	2500

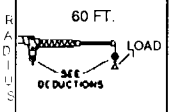
LATTICE EXTENSION WITH PINNED SECTION RETRACTED



OPERATING RADIUS FT. FOR 153 FOOT BOOM ONLY	40 FT. ∠	40 FT. RATED LOAD IN POUNDS SIDE	40 FT. RATED LOAD IN POUNDS REAR
30	77	16000	16000
35	75	14800	14800
40	73	13700	13700
45	71	12800	12800
50	69	12000	12000
55	66	11000	11000
60	64	10500	10500
65	62	9900	9900
70	59	8900	9400
75	57	7500	8500
80	54	6400	7300
85	51	5400	6300
90	48	4500	5400
100	42	3100	3900
110	35	2000	2600

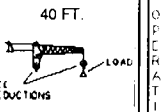


OPERATING RADIUS FT. FOR 173 FOOT BOOM ONLY	40 FOOT TELESCOPIC ∠	40 FOOT TELESCOPIC RATED LOAD IN POUNDS SIDE	40 FOOT TELESCOPIC RATED LOAD IN POUNDS REAR
30	77	15600	15600
35	75	14200	14200
40	73	13000	13000
45	71	12100	12100
50	69	11100	11100
55	67	10300	10300
60	64	9700	9700
65	62	9100	9100
70	60	8200	8600
75	57	6800	7700
80	54	5700	6600
85	51	4700	5500
90	48	3800	4600
100	42	2300	3200
110	35	-	1900

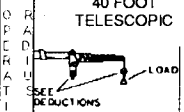


OPERATING RADIUS FT. FOR 153 FOOT BOOM ONLY	60 FT. ∠	60 FT. RATED LOAD IN POUNDS SIDE	60 FT. RATED LOAD IN POUNDS REAR
30			
35	77	10000	10000
40	75	9300	9300
45	74	8600	8600
50	72	8000	8000
55	70	7500	7500
60	68	7000	7000
65	66	6600	6600
70	64	6200	6200
75	62	5900	5900
80	60	5600	5600
85	58	5300	5300
90	56	5000	5000
100	51	3500	4300
110	46	2300	3100
120	40	-	2000

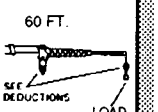
LATTICE EXTENSION WITH PINNED SECTION EXTENDED



OPERATING RADIUS FT. FOR 185 FOOT BOOM ONLY	40 FT. ∠	40 FT. RATED LOAD IN POUNDS SIDE	40 FT. RATED LOAD IN POUNDS REAR
30			
35			
40	77	11200	11200
45	76	10500	10500
50	74	9800	9800
55	72	9200	9200
60	71	8600	8600
65	69	8100	8100
70	67	7700	7700
75	65	7200	7200
80	63	6800	6800
85	61	6100	6500
90	59	5300	6100
100	54	3800	4600
110	49	2600	3400
120	44	-	2300



OPERATING RADIUS FT. FOR 185 FOOT BOOM ONLY	40 FOOT TELESCOPIC ∠	40 FOOT TELESCOPIC RATED LOAD IN POUNDS SIDE	40 FOOT TELESCOPIC RATED LOAD IN POUNDS REAR
30			
35			
40	78	10300	10300
45	76	9600	9600
50	74	9000	9000
55	72	8400	8400
60	71	7800	7800
65	69	7300	7300
70	67	6800	6800
75	65	6400	6400
80	63	6000	6000
85	61	5400	5600
90	59	4500	5300
100	54	3100	3800
110	49	1800	2500
	-		



OPERATING RADIUS FT. FOR 185 FOOT BOOM ONLY	60 FT. ∠	60 FT. RATED LOAD IN POUNDS SIDE	60 FT. RATED LOAD IN POUNDS REAR
30			
35			
40			
45	78	8000	8000
50	77	7500	7500
55	75	7000	7000
60	73	6600	6600
65	72	6100	6100
70	70	5700	5700
75	69	5400	5400
80	67	5100	5100
85	65	4800	4800
90	64	4500	4500
100	60	4000	4000
110	56	3000	3500
120	52	1900	2600

(32R998)

NOTE:

1. When boom is not fully extended, use only boom angles, not operating radius to determine load rating.
2. For boom angles not shown, use rating of next lower boom angle.
3. For bucket rating on 60 ft. extensions, deduct 20% from load ratings.

WARNING:

A tipping condition will occur (with or without hook block) with 40 or 60 ft. boom extension due to the following conditions:

1. Do not exceed 120 feet operating radius with pinned main boom section retracted.
2. Do not exceed 120 feet operating radius with pinned main boom section extended.

Load Ratings for Offset Extension with 8,500 lb. counterweight

CHART 6

17° OFFSET EXTENSION IN POUNDS WITH OUTRIGGERS EXTENDED AND SET

LATTICE EXTENSION WITH PINNED SECTION RETRACTED

OPERATING RADIUS FT. FOR 136.3 FT. BOOM ONLY	40 FT. (FOR ALL BOOM LENGTHS 79 TO 136.3 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 137.3 FT. BOOM ONLY	40 FT. TELESCOPIC (FOR ALL BOOM LENGTHS 80 TO 137.3 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 157.3 FT. BOOM ONLY	60 FT. (FOR ALL BOOM LENGTHS 100 TO 157.3 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR
36	78	9300	9300	36				36			
40	76	8900	8900	40	76	8000	8000	40			
45	74	8500	8500	45	74	7700	7700	45			
50	72	8100	8100	50	73	7300	7300	50	77	5100	5100
55	69	7800	7800	55	70	7000	7000	55	75	4900	4900
60	67	7500	7500	60	68	6700	6700	60	73	4700	4700
65	65	7200	7200	65	66	6400	6400	65	71	4500	4500
70	62	7000	7000	70	63	6200	6200	70	69	4300	4300
75	60	6800	6800	75	61	6000	6000	75	67	4100	4100
80	57	6600	6600	80	58	5800	5800	80	65	3900	3900
85	54	6100	6400	85	55	5400	5600	85	63	3800	3800
90	52	5200	6000	90	53	4500	5300	90	61	3700	3700
100	45	3600	4400	100	46	2800	3700	100	56	3400	3400
110	37	2200	3000	110	38	-	2200	110	51	3000	3200
								120	45	1900	2500

LATTICE EXTENSION WITH PINNED SECTION EXTENDED

OPERATING RADIUS FT. FOR 165 FT. BOOM ONLY	40 FT. (FOR ALL BOOM LENGTHS 97.7 TO 165 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 166 FT. BOOM ONLY	40 FT. TELESCOPIC (FOR ALL BOOM LENGTHS 96.7 TO 166 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 186 FT. BOOM ONLY	60 FT. (FOR ALL BOOM LENGTHS 126.7 TO 186 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR
36				36				36			
40				40				40			
45				45				45			
50	77	8300	8300	50	77	7300	7300	50			
55	75	8100	8100	55	76	7100	7100	55			
60	73	7700	7700	60	74	6900	6900	60	78	4800	4800
65	71	7300	7300	65	72	6400	6400	65	76	4600	4600
70	69	6900	6900	70	70	6000	6000	70	74	4400	4400
75	67	6500	6500	75	68	5700	5700	75	73	4200	4200
80	65	6200	6200	80	66	5400	5400	80	71	4000	4000
85	63	5900	5900	85	64	5100	5100	85	69	3800	3800
90	61	5600	5600	90	62	4800	4800	90	68	3700	3700
100	57	4400	5100	100	57	3600	4300	100	64	3400	3400
110	52	3100	3800	110	52	2300	3100	110	60	3100	3100
120	47	2000	2700	120	47	-	1900	120	56	2500	2900
								130	52	-	2200

(32U2636)

NOTES

1. See Main Load Rating Chart on outriggers for warnings, definitions, information and reeving.
2. For Bucket Ratings on 60 ft. extension, deduct 20% from load ratings.
3. Stability ratings do not exceed 85% of tipping loads.
4. When boom is not fully extended, use only boom angles, not operating radius to determine load rating.
5. For boom angles not shown, use rating of next lower boom angle.
6. 8,500 lb. counterweight with 5,900 lb. removable.

CHART 7

30° OFFSET EXTENSION IN POUNDS WITH OUTRIGGERS EXTENDED AND SET

LATTICE EXTENSION WITH PINNED SECTION RETRACTED

OPERATING RADIUS FT. FOR 136.3 FT. BOOM ONLY	40 FT. (FOR ALL BOOM LENGTHS 79 TO 136.3 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 137.3 FT. BOOM ONLY	40 FT. TELESCOPIC (FOR ALL BOOM LENGTHS 80 TO 137.3 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 157.3 FT. BOOM ONLY	60 FT. (FOR ALL BOOM LENGTHS 100 TO 157.3 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR
36				36				36			
40				40				40			
45	77	7100	7100	45	77	6300	6300	45			
50	75	6900	6900	50	76	6100	6100	50			
55	73	6700	6700	55	73	5900	5900	55			
60	71	6500	6500	60	71	5700	5700	60	77	3900	3900
65	68	6300	6300	65	69	5500	5500	65	75	3700	3700
70	66	6100	6100	70	66	5400	5400	70	73	3600	3600
75	63	6000	6000	75	63	5200	5200	75	71	3500	3500
80	60	5900	5900	80	61	5100	5100	80	69	3400	3400
85	57	5800	5800	85	58	5000	5000	85	67	3300	3300
90	55	5600	5700	90	55	4900	4900	90	64	3200	3200
100	48	3900	4700	100	48	3300	4000	100	60	3000	3000
110	40	2400	3200	110	41	1800	2500	110	54	2900	2900
								120	48	2300	2800
								130	40	-	1800

LATTICE EXTENSION WITH PINNED SECTION EXTENDED

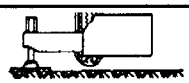
OPERATING RADIUS FT. FOR 165 FT. BOOM ONLY	40 FT. (FOR ALL BOOM LENGTHS 97.7 TO 165 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 166 FT. BOOM ONLY	40 FT. TELESCOPIC (FOR ALL BOOM LENGTHS 96.7 TO 166 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 186 FT. BOOM ONLY	60 FT. (FOR ALL BOOM LENGTHS 126.7 TO 186 FT.) ∠°	RATED LOAD IN POUNDS SIDE	REAR
36				36				36			
40				40				40			
45				45				45			
50				50				50			
55	78	6800	6800	55	78	5900	5900	55			
60	76	6600	6600	60	76	5800	5800	60			
65	74	6500	6500	65	74	5600	5600	65			
70	72	6400	6400	70	73	5500	5500	70	78	3700	3700
75	70	6100	6100	75	71	5300	5300	75	76	3600	3600
80	68	5800	5800	80	69	5000	5000	80	74	3500	3500
85	66	5600	5600	85	66	4700	4700	85	73	3400	3400
90	64	5300	5300	90	64	4500	4500	90	71	3300	3300
100	59	4800	4900	100	60	4100	4100	100	67	3200	3200
110	54	3400	4100	110	55	2700	3400	110	63	3000	3000
120	49	2300	3000	120	49	-	2200	120	59	2700	2700
130	42	-	1900					130	55	1800	2500

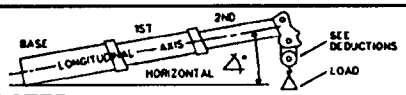
(32U2636)

Load Ratings - with 2500 lbs. Counterweight
PCSA Class 10-195

CHART 8

RATED LOADS IN POUNDS ON OUTRIGGERS





POWERED BOOM LENGTH IN FEET - MANUAL RETRACTED

OPERATING RADIUS FT.	40 FT. ∠°	40 FT. RATED LOAD POUNDS SIDE	40 FT. RATED LOAD POUNDS REAR	45 FT. ∠°	45 FT. RATED LOAD POUNDS SIDE	45 FT. RATED LOAD POUNDS REAR	55 FT. ∠°	55 FT. RATED LOAD POUNDS SIDE	55 FT. RATED LOAD POUNDS REAR	65 FT. ∠°	65 FT. RATED LOAD POUNDS SIDE	65 FT. RATED LOAD POUNDS REAR	75 FT. ∠°	75 FT. RATED LOAD POUNDS SIDE	75 FT. RATED LOAD POUNDS REAR	85 FT. ∠°	85 FT. RATED LOAD POUNDS SIDE	85 FT. RATED LOAD POUNDS REAR	97.3 FT. ∠°	97.3 FT. RATED LOAD POUNDS SIDE	97.3 FT. RATED LOAD POUNDS REAR	OPERATING RADIUS FT.
10	68	130000	130000	71	102000	102000	74	94800	94800													10
12	65	115000	115000	68	98400	98400	72	88000	88000	75	80400	80400										12
15	60	87000	87000	64	86900	86900	69	84000	84000	73	72800	72800	75	60500	60500							15
20	51	63500	63500	56	63500	63500	63	63400	63400	68	63200	63200	72	53000	53000	74	44500	44500	77	33000	33000	20
25	40	49000	49000	48	49000	49000	57	49000	49000	63	48900	48900	68	45000	45000	71	39000	39000	74	32500	32500	25
30	27	35800	36700	38	35800	36700	50	35800	36700	58	35800	36700	63	35800	36700	67	34200	34200	71	29000	29000	30
35				25	25800	27400	43	25800	27400	52	25800	27400	59	25800	27400	63	25800	27400	67	25500	25500	35
40							34	19500	21200	46	19500	21200	54	19500	21200	59	19500	21200	64	19500	21200	40
45							22	14800	16500	39	14800	16500	49	14800	16500	55	14800	16500	61	14800	16500	45
50										31	11600	13300	43	11600	13300	51	11600	13300	57	11600	13300	50
55										20	9100	10700	37	9100	10700	46	9100	10700	53	9100	10700	55
60													29	7000	8500	41	7000	8500	49	7000	8500	60
65													19	5500	6900	35	5500	6900	45	5500	6900	65
70																28	4200	5500	40	4200	5500	70
75																18	3100	4400	35	3100	4400	75
80																			29	2100	3400	80
85																			22	-	2500	85

(32R1010)

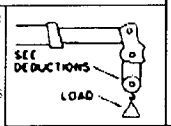
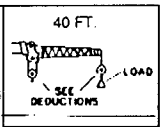
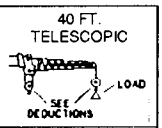
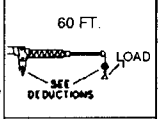
INFORMATION:

1. Crane load ratings, on outriggers, do not exceed 85% of tipping.
2. Ratings above the heavy line are based on the machine's hydraulic or structural competence and not on machine stability.
3. Deductions must be made from rated loads for stowed lattice extension, optional attachments , hooks and hookblocks (see chart no. 15, deductions). Weights of slings and all other load handling devices shall be considered a part of the load.
4. Crane load ratings with outriggers are based on outriggers fully extended and set to a distance of 11 feet 9 3/4 inches from the longitudinal axis of the outrigger float pivot connection with all load removed from carrier wheels.
5. Counterweight 2500 lbs. with none removable.

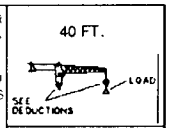
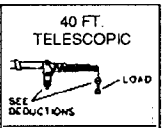
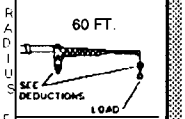
CHART 9

LOAD RATINGS IN POUNDS WITH OUTRIGGERS EXTENDED

LATTICE EXTENSION WITH PINNED SECTION RETRACTED

OPERATING RADIUS FT. FOR 85 FOOT BOOM ONLY	∠°	 FOR ALL BOOM LENGTHS FROM 66.7' TO 126FT. RATED LOADS IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 153 FOOT BOOM ONLY	∠°	40 FT.  FOR ALL BOOM LENGTHS FROM 79.7' TO 136.3FT. RATED LOADS IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 153 FOOT BOOM ONLY	∠°	40 FT. TELESCOPIC  FOR ALL BOOM LENGTHS FROM 89.0' TO 153.3FT. RATED LOADS IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 153 FOOT BOOM ONLY	∠°	60 FT.  FOR ALL BOOM LENGTHS FROM 100.0' TO 157.3FT. RATED LOADS IN POUNDS SIDE	REAR
30	76	20700	20700	30	77	16000	16000	30	77	15600	15600	30									
35	74	19000	19000	35	75	14800	14800	35	75	14200	14200	35	77	10000	10000						
40	72	17500	17500	40	73	13700	13700	40	73	13000	13000	40	75	9300	9300						
45	69	16500	16500	45	71	12800	12800	45	71	12100	12100	45	74	8600	8600						
50	67	13800	15000	50	69	12000	12000	50	69	11100	11100	50	72	8000	8000						
55	64	11300	12800	55	67	11000	11000	55	67	10300	10300	55	70	7500	7500						
60	61	9100	10500	60	64	9700	10500	60	64	9000	9700	60	68	7000	7000						
65	59	7500	9000	65	62	8000	9300	65	62	7300	8600	65	66	6600	6600						
70	56	6100	7500	70	60	6700	7900	70	60	6000	7200	70	64	6200	6200						
75	53	5000	6300	75	57	5500	6700	75	57	4800	6000	75	62	5900	5900						
80	49	4100	5300	80	55	4500	5600	80	54	3800	4900	80	60	5000	5600						
85	46	3200	4400	85	52	3600	4700	85	51	2900	4000	85	58	4100	5100						
90	43	2500	3600	90	49	2900	3900	90	48	2100	3200	90	56	3400	4300						
100	35	-	2300	100	43	-	2500	100	42	-	1800	100	51	2000	3000						
												110	46	-	1800						

LATTICE EXTENSION WITH PINNED SECTION EXTENDED

OPERATING RADIUS FT. FOR 85 FOOT BOOM ONLY	∠°	40 FT.  FOR ALL BOOM LENGTHS FROM 107.7' TO 165FT. RATED LOADS IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 85 FOOT BOOM ONLY	∠°	40 FT. TELESCOPIC  FOR ALL BOOM LENGTHS FROM 108.7' TO 165FT. RATED LOADS IN POUNDS SIDE	REAR	OPERATING RADIUS FT. FOR 85 FOOT BOOM ONLY	∠°	60 FT.  FOR ALL BOOM LENGTHS FROM 128.7' TO 186FT. RATED LOADS IN POUNDS SIDE	REAR
30				30				30			
35				35				35			
40	77	11200	11200	40	78	10300	10300	40			
45	76	10500	10500	45	76	9600	9600	45	78	8000	8000
50	74	9800	9800	50	74	9000	9000	50	77	7500	7500
55	72	9200	9200	55	72	8400	8400	55	75	7000	7000
60	70	8600	8600	60	71	7800	7800	60	73	6600	6600
65	69	8100	8100	65	69	7300	7300	65	72	6100	6100
70	67	7400	7700	70	67	6700	6800	70	70	5700	5700
75	65	6300	7200	75	65	5500	6400	75	69	5400	5400
80	63	5300	6300	80	63	4500	5600	80	67	5100	5100
85	60	4400	5400	85	61	3600	4700	85	65	4700	4800
90	58	3600	4600	90	59	2900	3900	90	64	4000	4500
100	53	2400	3300	100	54	-	2400	100	60	2700	3600
110	48	-	2100					110	56	-	2400

(32R1010)

NOTE::

1. When boom is not fully extended, use only boom angles, not operating radius to determine load rating.
2. For boom angles not shown, use rating of next lower boom angle.
3. For bucket ratings on 60 ft. extension, deduct 20% from load ratings

WARNING:

A tipping condition will occur (with or without hookblock) with 40 or 60 ft. boom extension due to the following conditions:

1. Do not exceed 110 ft. operating radius with pinned main boom section retracted.
2. Do not exceed 110 ft. operating radius with pinned main boom section extended.

Load Ratings for Offset Extension with 2500 lbs. Counterweight

CHART 10

17° OFFSET EXTENSION IN POUNDS WITH OUTRIGGERS EXTENDED AND SET

Lattice Extension with Pinned Section Retracted

OPERATING RADIUS FT.	40 FT. FOR ALL BOOM LENGTHS 79 TO 362 FT.			40 FT. TELESCOPIC FOR ALL BOOM LENGTHS 80 TO 372 FT.			60 FT. FOR ALL BOOM LENGTHS 79 TO 573 FT.		
		RATED LOAD IN POUNDS			RATED LOAD IN POUNDS			RATED LOAD IN POUNDS	
FOR 136.3 FT. BOOM ONLY	∠°	SIDE	REAR	∠°	SIDE	REAR	∠°	SIDE	REAR
36	78	9300	9300						
40	76	8900	8900	76	8000	8000			
45	74	8500	8500	74	7700	7700			
50	72	8100	8100	73	7300	7300	77	5100	5100
55	69	7800	7800	70	7000	7000	75	4900	4900
60	67	7500	7500	68	6700	6700	73	4700	4700
65	65	7200	7200	66	6400	6400	71	4500	4500
70	62	7000	7000	63	6200	6200	69	4300	4300
75	60	6400	6800	61	5700	6000	67	4100	4100
80	57	5300	6400	58	4600	5700	65	3900	3900
85	54	4400	5400	55	3700	4700	63	3800	3800
90	52	3500	4500	53	2800	3800	61	3700	3700
100	45	2100	3100	46	-	2300	56	2900	3400
110	37	-	1800				51	-	2500

Lattice Extension with Pinned Section Extended

OPERATING RADIUS FT.	40 FT. FOR ALL BOOM LENGTHS 07.7 TO 65 FT.			40 FT. TELESCOPIC FOR ALL BOOM LENGTHS 06.7 TO 66 FT.			60 FT. FOR ALL BOOM LENGTHS 26.7 TO 66 FT.		
		RATED LOAD IN POUNDS			RATED LOAD IN POUNDS			RATED LOAD IN POUNDS	
FOR 165 FT. BOOM ONLY	∠°	SIDE	REAR	∠°	SIDE	REAR	∠°	SIDE	REAR
36									
40									
45									
50	77	8300	8300	77	7300	7300			
55	75	8100	8100	76	7100	7100			
60	73	7700	7700	74	6900	6900	78	4800	4800
65	71	7300	7300	72	6400	6400	76	4600	4600
70	69	6900	6900	70	6000	6000	74	4400	4400
75	67	6500	6500	68	5700	5700	73	4200	4200
80	65	6000	6200	66	5300	5400	71	4000	4000
85	63	5100	5900	64	4400	5100	69	3800	3800
90	61	4300	5300	62	3600	4600	68	3700	3700
100	57	2900	3800	57	2100	3100	64	3400	3400
110	52	1800	2600	52	-	1800	60	2300	3100
							56	-	2100

(32U 2671)

NOTES

1. See Main Load Rating Chart on outriggers for warnings, definitions, information and reeving.
2. For Bucket Ratings on 60 ft. extension, deduct 20% from load ratings.
3. Stability ratings do not exceed 85% of tipping loads.
4. When boom is not fully extended, use only boom angles, not operating radius to determine load rating.
5. For boom angles not shown, use rating of next lower boom angle.
6. 2500 lb. counterweight with none removable.

CHART 11

30° OFFSET EXTENSION IN POUNDS WITH OUTRIGGERS EXTENDED AND SET

Lattice Extension with Pinned Section Retracted

OPERATING RADIUS FT.	40 FT. FOR ALL BOOM LENGTHS 79 TO 363 FT.			40 FT. TELESCOPIC FOR ALL BOOM LENGTHS 80 TO 372 FT.			60 FT. FOR ALL BOOM LENGTHS 79 TO 573 FT.		
		RATED LOAD IN POUNDS			RATED LOAD IN POUNDS			RATED LOAD IN POUNDS	
FOR 136.3 FT. BOOM ONLY	∠°	SIDE	REAR	∠°	SIDE	REAR	∠°	SIDE	REAR
36									
40									
45	77	7100	7100	77	6300	6300			
50	75	6900	6900	76	6100	6100			
55	73	6700	6700	73	5900	5900			
60	71	6500	6500	71	5700	5700	77	3900	3900
65	68	6300	6300	69	5500	5500	75	3700	3700
70	66	6100	6100	66	5400	5400	73	3600	3600
75	63	6000	6000	63	5200	5200	71	3500	3500
80	60	5900	5900	61	5100	5100	69	3400	3400
85	57	4900	5800	58	4200	5000	67	3300	3300
90	55	4000	5000	55	3300	4300	64	3200	3200
100	48	2400	3400	48	-	2700	60	3000	3000
110	40	-	2000				54	2200	2900
							48	-	1800

Lattice Extension with Pinned Section Extended

OPERATING RADIUS FT.	40 FT. FOR ALL BOOM LENGTHS 07.7 TO 65 FT.			40 FT. TELESCOPIC FOR ALL BOOM LENGTHS 06.7 TO 66 FT.			60 FT. FOR ALL BOOM LENGTHS 26.7 TO 66 FT.		
		RATED LOAD IN POUNDS			RATED LOAD IN POUNDS			RATED LOAD IN POUNDS	
FOR 165 FT. BOOM ONLY	∠°	SIDE	REAR	∠°	SIDE	REAR	∠°	SIDE	REAR
36									
40									
45									
50									
55	78	6800	6800	78	5900	5900			
60	76	6600	6600	76	5800	5800			
65	74	6500	6500	74	5600	5600			
70	72	6400	6400	73	5500	5500	78	3700	3700
75	70	6100	6100	71	5300	5300	76	3600	3600
80	68	5800	5800	69	5000	5000	74	3500	3500
85	66	5600	5600	66	4700	4700	73	3400	3400
90	64	4800	5300	64	4100	4500	71	3300	3300
100	59	3300	4200	60	2500	3500	67	3200	3200
110	54	2000	3000	55	-	2200	63	2800	3000
120	49	-	1800				59	-	2400

(32U 2671)

WARNINGS:

1. Do not exceed 120 ft. radius (with or without hookblock) with 40 ft. or 60 ft. boom extension or a tipping condition will occur.
2. Deductions for offset extension load ratings must be applied according to chart no. 15 on page 12.

Load Ratings on Tires

CHART 12

With 8,500 lbs. Counterweight

Load Ratings in Pounds 14.00 R 20 - 18 PR Tires				ORPAD RIUS INFGT.	Load Ratings in Pounds 12.00 R 20 - 16 PR Tires			
STATIONARY		TRAVEL RATINGS OVER REAR			STATIONARY		TRAVEL RATINGS OVER REAR	
OVER REAR	OVER SIDE	CREEP	2 1/2 MPH		OVER REAR	OVER SIDE	CREEP	2 1/2 MPH
39400	21500	31400	29200	10	39000	21500	31200	29000
34000	17900	27800	25800	12	33700	17900	27600	25600
28400	13800	23800	22000	15	28200	13800	23500	21900
21000	9000	18700	17700	20	21000	9000	18500	17400
14500	5800	14500	14100	25	14500	5800	14500	13900
10300	3200			30	10300	3200		
7500				35	7500			
5500				40	5500			
3900				45	3900			

(32U2643) (32U2638)

With 2,500 lbs. Counterweight

CHART 13

Load Ratings in Pounds 14.00 R 20 - 18 PR Tires				ORPAD RIUS INFGT.	Load Ratings in Pounds 12.00 R 20 - 16 PR Tires			
STATIONARY		TRAVEL RATINGS OVER REAR			STATIONARY		TRAVEL RATINGS OVER REAR	
OVER REAR	OVER SIDE	CREEP	2 1/2 MPH		OVER REAR	OVER SIDE	CREEP	2 1/2 MPH
35900	19100	30200	28200	10	35900	19100	30200	28200
31200	15700	26000	24700	12	31200	15700	26000	24700
26200	11800	21600	20400	15	26200	11800	21600	20400
17200	6800	17000	16000	20	17200	6800	17000	16000
11600	3500	11600	11600	25	11600	3500	11600	11600
8000				30	8000			
5500				35	5500			
3700				40	3700			
2300				45	2300			

(32U2670) (32U2669)

DEFINITIONS:

1. Creep is motion for less than 200 feet in a 30 minute period and not exceeding 1 mph.

INFORMATION:

1. Deductions must be made from rated loads for stowed lattice extension, optional attachments, hooks and hookblocks. (See Chart no. 15) Weights of slings and all other load handling devices shall be considered a part of the load.

2. Ratings above the heavy line are based on structural competence and not on machine stability.

3. It is recommended that outriggers be extended as far as possible and clear of ground when lifting on tires.

4. Stability ratings do not exceed 75% of tipping loads.

WARNINGS:

1. Crane load ratings without outriggers depends on tire capacity and condition of tires inflated per Chart no. 14.

2. When transporting a load, machine must be on firm, level surface with mechanical house lock engaged. The load must be centered over rear of machine and restrained from swinging. See "Areas of Operation" on page 6 for working ranges.

3. Lift loads with minimum boom length: Do not exceed 75 feet boom length when lifting on tires.

4. Do not attempt lifts on tires with extension erected.

5. Maximum recommended boom angle on tires is 68° without load.

WARNINGS:

1. Loaded boom angles at specified boom lengths give only an approximation of the operating radius. The boom angle before loading should be greater to account for deflections. Do not exceed the operating radius for rated loads.
2. Positioning or operation of powered boom lengths at radii beyond the maximums or minimums shown, is not intended or approved.
3. Positioning or operation of lattice extensions at boom angles beyond the maximums or minimums shown, is not intended or approved.
4. For powered boom lengths not shown, use rating of next longer powered boom. For load radii not shown, use rating of next longer radius.
5. Crane Load ratings on outriggers are based on freely suspended loads with the machine leveled and standing on a firm uniform supporting surface. No attempt shall be made to move a load horizontally on the ground in any direction.
6. Practical working loads depend on supporting surface, wind and other factors affecting stability. Hazardous surroundings, experience of personnel, and proper handling, all of which must be taken into account by the operator.
7. The maximum load which may be telescoped is limited by hydraulic pressure, boom angle, and powered boom lubrication. It is safe to attempt to telescope any load within the limits of the load rating chart.
8. When lifting a load all sections of powered boom must be equally extended within one foot.

DEFINITIONS

1. Operating radius is the horizontal distance from the axis of rotation before loading to the center of the vertical hoist line or tackle with load applied.
2. Loaded boom angle, as shown in the column headed by △ is the included angle between the horizontal and longitudinal axes of the boom base after lifting rated load at rated radius.

NOTE:
Operation of this equipment in excess of rated loads and disregard of instructions is an unsafe practice and will result in denial of warranty claims!

CHART 14

	Tire Air Pressure - PSI					
	DESC.	STATIC	CREEP	2 1/2 MPH	50 MPH
FR & RR tire	14.00R20 G286	130	130	120	(S) 100 (D) 90
Rear Tire	12.00R20 G188	150	150	130	110
Front	425/65R22.5 G165	115	105	105	105

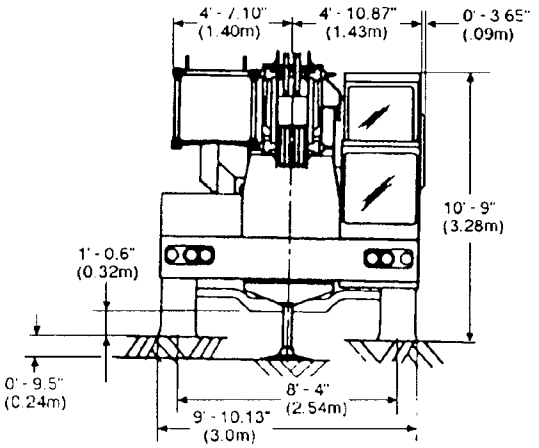
CHART 15

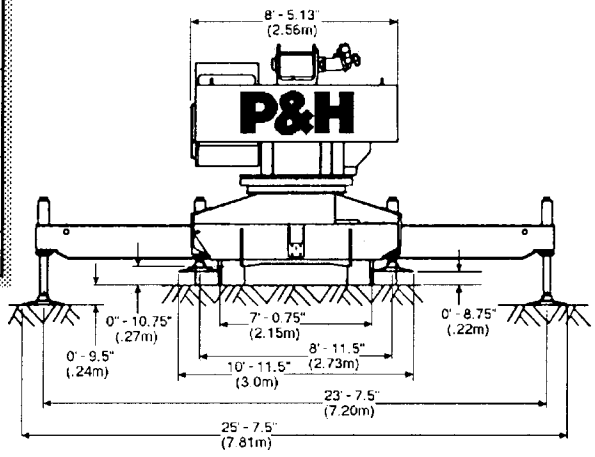
DEDUCTIONS TO BE MADE FROM LOAD RATINGS IN POUNDS

	DESCRIPTION		WITHOUT HOOK BLOCK ON BOOM POINT	HOOK BLOCK ON POWERED BOOM POINT			
				8.5 - 20 TON	65 TON	8.5 - 20 TON WITH AUXILIARY SHEAVE	65 TON TON WITH AUXILIARY SHEAVE
HOISTING LOAD FROM POWERED BOOM	HOOK BLOCK WEIGHT		-	580	1130	780	1320
	40 FT. LATTICE EXTENSION	Stowed	-	950	1500	1150	1700
		Erected only	-	4000	4550	4200	4750
		8.5-15 ton Ball	-	5650	6200	5850	6400
		20 ton Block	-	6050	6600	6250	6800
	40 - 60 FT. LATTICE EXTENSION	Stowed	-	850	1400	1050	1600
		Erected only	-	5700	6250	5900	6450
		8.5-15 ton Ball	-	7400	7900	7550	8100
		20 ton Block	-	7800	8300	7950	8500
	60 FT. LATTICE EXTENSION	Erected only	-	5700	6250	5900	6450
		8.5-215 ton Ball	-	7800	8350	8000	8550
		20 ton Block	-	8300	8850	8500	9050
HOISTING LOAD FROM EXTENSION	40 FT. LATTICE EXTENSION	8.5-15 ton Ball	470	800	1100	900	1200
		20 ton Block	580	900	1200	1000	1300
	40 - 60 FT. LATTICE EXTENSION	8.5-15 ton Ball	470	800	1100	900	1200
		20 ton Block	580	900	1200	1000	1300
	60 FT. LATTICE EXTENSION	8.5-15 ton Ball	470	750	1000	850	1100
		20 ton Block	580	850	1100	950	1200

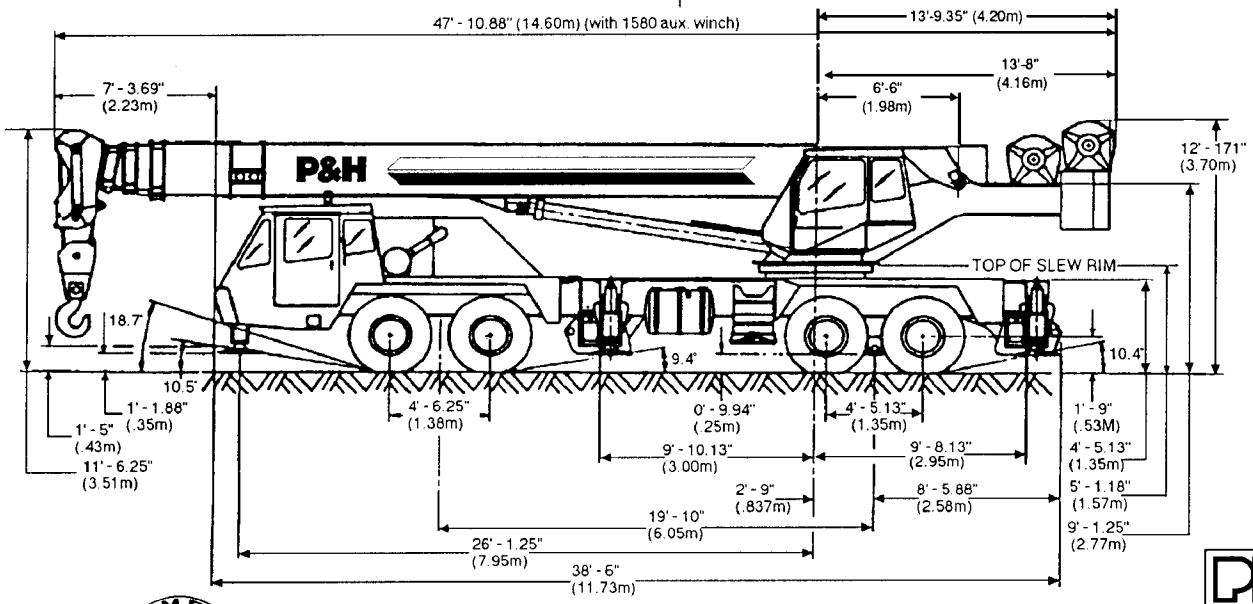
NOTE: THESE LOAD DEDUCTIONS APPLY ONLY TO P&H SUPPLIED EQUIPMENT

General Dimensions





	TIRES	425/65R 22.5	14.00R 20
VEHICLE TURNING DIAMETER	TIRE CENTERLINE	84.02 FT. (25.61M)	87.38 FT. (26.63M)
VEHICLE CLEARANCE DIAMETER	TIRE CLEARANCE/ WITH CURB	85.55 FT. (28.97M)	88.79 FT. (27.07M)
	CARRIER CLEARANCE	95.02 FT. (28.96M)	98.05 FT. (29.89M)
	BOOM CLEARANCE	98.97 FT. (30.17M)	101.55 FT. (30.96M)
	EXTENSION CLRNCE	103.12 FT. (31.43M)	105.89 FT. (32.28M)



NOTE: All designs, specifications and components of the equipment described above are subject to change at the manufacturer's sole discretion at any time and without advance notice. Data published herein is informational in nature and shall not be construed to warrant suitability of the machine for any particular purpose as performance may vary with conditions encountered. The only warranty applicable is our standard warranty for this machine.

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P&H65-12