

**LOAD CHART  
LEARNING GUIDE**

**LATTICE FRICTION CRANE**

**Manitowoc 4100W Series 2**

**CraneSafe Certification**

Lattice Friction Crane LEARNING GUIDE  
LCR.LFC.MW4100WS2.LG1

21 October 2009



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**CraneSafe Certification + Fulford Harbour Group**  
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## **Introduction**

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These 3 questions are for you to use to help get ready for the load chart part of the CraneSafe Certification assessment for Friction Lattice Crane.

The questions on your assessment will be different from these but will be presented in the same format as these questions.

With the questions are the answers with the relevant load charts. The answers explain how we arrived at the correct answer and you can use this to help work through any questions you may have gotten incorrect. We have not included all of the charts for this crane - but everything you need to answer the questions is included. You do not need the crane manual or full load chart package to answer the questions.

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# Load Charts

## LIFTCRANE CAPACITIES

MEETS  
ANSI B30.5  
REQUIREMENTS

## 4100W SERIES 2

**BOOM NO. 22C WITH OPEN THROAT TOP**  
**146,400 LB. CRANE COUNTERWEIGHT**  
**60,000 LB. CARBODY COUNTERWEIGHT**  
**28'6" CRAWLERS EXTENDED**  
**360 DEGREE RATING**

CAPACITIES FOR VARIOUS BOOM LENGTHS AND OPERATING RADII ARE FOR FREELY SUSPENDED LOADS AND DO NOT EXCEED 75% OF A STATIC TIPPING LOAD. CAPACITIES BASED ON STRUCTURAL COMPETENCE ARE DENOTED BY AN ASTERISK (\*).

UPPER BOOM POINT CAPACITY FOR LIFTCRANE SERVICE WITH SINGLE PART WHIP LINE OR COMBINATION OF TWO SINGLE PART LINES IS 28,300 LBS. IN ALL CASES, UPPER BOOM POINT CAPACITIES CANNOT EXCEED THOSE LISTED FOR THE MAIN BOOM CAPACITY.

WEIGHT OF UPPER BOOM POINT, JIB, ALL LOAD BLOCKS, HOOKS, WEIGHT BALL, SLINGS, HOIST LINES, ETC., BENEATH BOOM AND JIB POINT SHEAVES, IS CONSIDERED PART OF THE MAIN BOOM LOAD. BOOM IS NOT TO BE LOWERED BEYOND RADII WHERE COMBINED WEIGHTS ARE GREATER THAN RATED CAPACITY. WHERE NO CAPACITY IS SHOWN, OPERATION IS NOT INTENDED OR APPROVED.

MACHINE TO OPERATE IN A LEVEL POSITION ON A FIRM UNIFORMLY SUPPORTING SURFACE WITH CRAWLERS FULLY EXTENDED AND GANTRY UP. REFER TO BOOM RIGGING NO. 190693 AND WIRE ROPE SPECIFICATION CHART NO. 6592-A. CRANE OPERATOR JUDGMENT MUST BE USED TO ALLOW FOR DYNAMIC LOAD EFFECTS OF SWINGING, HOISTING OR LOWERING, TRAVEL, WIND CONDITIONS, AS WELL AS ADVERSE OPERATING CONDITIONS AND PHYSICAL MACHINE DEPRECIATION.

OPERATING RADIUS IS THE HORIZONTAL DISTANCE FROM THE AXIS OF ROTATION TO THE CENTER OF VERTICAL HOIST LINE OR LOAD BLOCK. BOOM ANGLE IS THE ANGLE BETWEEN HORIZONTAL AND CENTERLINE OF BOOM BUTT AND INSERTS, AND IS AN INDICATION OF OPERATING RADIUS. IN ALL CASES, OPERATING RADIUS SHALL GOVERN CAPACITY. BOOM POINT ELEVATION IS VERTICAL DISTANCE FROM GROUND LEVEL TO CENTERLINE OF BOOM POINT SHAFT.

MACHINE EQUIPPED WITH 26'6" EXTENDIBLE CRAWLERS, 48" TREADS, 17' RETRACTABLE GANTRY, 12 PART BOOM HOIST REEVING, FOUR 1-3/8" BOOM PENDANTS, 1ST COUNTERWEIGHT = 41,900 LBS., 2ND COUNTERWEIGHT = 41,500 LBS., 3RD COUNTERWEIGHT = 39,000 LBS., TWO 12,000 LB. SIDE COUNTERWEIGHTS, AND TWO 30,000 LB. CARBODY COUNTERWEIGHTS.

MAXIMUM BOOM AND JIB LENGTHS LIFTED UNASSISTED				DEDUCT FROM CAPACITIES WHEN UPPER BOOM POINT IS ATTACHED		DEDUCT FROM CAPACITIES WHEN JIB IS ATTACHED	
OVER END OF CRAWLERS		OVER SIDE OF EXTENDED CRAWLERS				JIB LGTH.	JIB NO. 123
BOOM LGTH.	JIB NO. 123	BOOM LGTH.	JIB NO. 123	ONE SHEAVE POINT	1,200 LBS.		
260'	---	260'	---	TWO SHEAVE POINT	1,500 LBS.	30'	3,000 LBS.
250'	---	250'	---	TO COMPLY WITH B30.5 REQUIREMENTS, UPPER BOOM POINT CANNOT BE USED ON 260' BOOM.		40'	3,600 LBS.
240'	40'	240'	40'			50'	4,200 LBS.
230'	60'	230'	60'			60'	4,900 LBS.
LOAD BLOCK, HOOK AND WEIGHT BALL ON GROUND AT START.						JIB DEDUCTS INCLUDE JIB ADAPTOR.	

HOIST REEVING FOR MAIN LOAD BLOCK						
NO. PARTS OF LINE	1	2	3	4	5	6
MAXIMUM LOAD-LBS.	32,500	65,000	97,500	130,000	162,500	195,000
MAXIMUM LOAD-kg	14,740	29,480	44,230	58,970	73,710	88,460
NO. PARTS OF LINE	7	8	9	10	11	12
MAXIMUM LOAD-LBS.	227,500	260,000	292,500	325,000	357,500	400,000
MAXIMUM LOAD-kg	103,190	117,930	132,680	147,420	162,160	181,440
HOIST LINE:	1-1/8" (29 mm) - 6 X 31 WARRINGTON-SEALE, EXTRA IMPROVED PLOW STEEL, REGULAR LAY, IWRC. MINIMUM BREAKING STRENGTH 130,000 LBS. (58,970 kg) APPROX. WEIGHT = 2.34 LBS. PER FT. (3.48 kg/m)					
WHIP LINE:	1-1/8" (29 mm) - 6 X 31 WARRINGTON-SEALE, IMPROVED PLOW STEEL, REGULAR LAY, IWRC. MINIMUM BREAKING STRENGTH 113,000 LBS. (51,260 kg) MAXIMUM LOAD = 28,300 LBS. (12,840 kg) PER LINE APPROX. WEIGHT = 2.34 LBS. PER FT. (3.48 kg/m)					

### Load Handling Devices

NOTE: Line weights based on boom lengths

- 230 Ton 7 Sheave Hook Block ..... 4,740 lbs
- 120 Ton 3 Sheave Hook Block ..... 1,950 lbs
- 50 Ton One Sheave Hook Block ..... 1,100 lbs
- 15 Ton Overhaul Ball ..... 900 lbs

*These charts are for assessment purposes only and should not be used to operate a crane. The individual crane's load chart, operating instructions and other instructional plates must be read and understood prior to operating the crane.*

## Load Chart Questions & Answers

### Determining Radius

1. What is the crane's maximum radius based on the following configuration?

- 200 feet of main boom
- 120 ton block 3 parts of line hanging 25 feet below boom tip
- Lift from 15 ton overhaul ball
- One sheave upper boom point installed
- Load weight 14,000 lbs
- Rigging 150 lbs

Answer: \_\_\_\_\_ feet

## Determining the Crane's Net Capacity (Main Boom)

2. What is the crane's net capacity based on the following configuration?

- 180 feet of main boom erected
- 40 foot jib erected with 10 degree offset
- 3 sheave block on main boom 2 parts of line
- 1 sheave block on jib 2 parts of line hanging 20 feet below jib tip
- Main boom angle 50 degrees
- Rigging 80 lbs

Answer: \_\_\_\_\_ pounds

## Determining the Crane's Net Capacity (Jib)

3. What is the crane's net capacity based on the following configuration?

- 180 feet of main boom erected
- 40 foot jib erected 20 degree offset
- 3 sheave block on main boom 2 parts hanging 25 feet below main boom tip
- 1 sheave block on jib 2 parts of line
- Rigging 120 lbs
- Radius 115 feet

Answer: \_\_\_\_\_ pounds

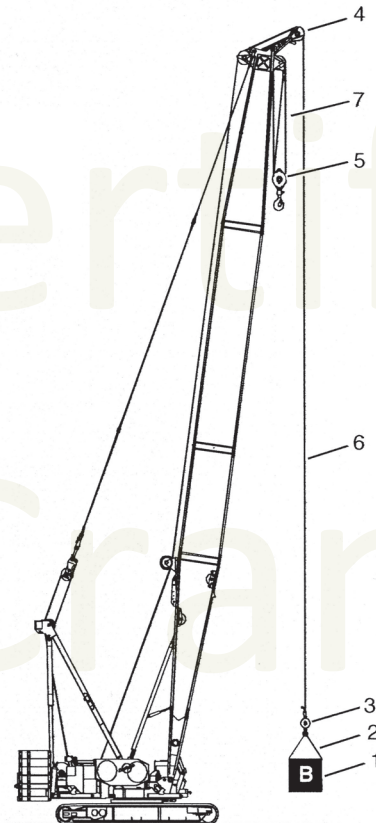
## Load Chart Answers

### Q1 – Determining Radius

**Gross Load**

1. Load weight	14,000 lbs
2. Rigging	150 lbs
3. 15 ton overhaul ball	900 lbs
4. Upper sheave upper boom point	1,200 lbs
5. 120 ton main block	1,950 lbs
6. Whip line weight (200 x 2.34)	468 lbs
7. Main line weight (25 x 3 x 2.34)	176 lbs
<b>Total Gross Load</b>	<b>18,844 lbs</b>

Maximum radius is **145 feet**.



<b>200</b>	34	81.4	204.7	157,200*
	36	80.8	204.4	153,500*
	38	80.2	204.1	147,400
	40	79.6	203.7	136,900
	45	78.2	202.8	115,900
	50	76.7	201.6	100,000
	55	75.2	200.4	87,500
	60	73.7	199.0	77,400
	65	72.2	197.5	69,200
	70	70.7	195.8	62,300
	75	69.2	194.0	56,400
	80	67.7	192.0	51,400
	85	66.1	189.9	47,000
	90	64.5	187.6	43,200
	95	62.9	185.1	39,800
100	61.3	182.5	36,800	
105	59.7	179.6	34,100	
110	58.0	176.6	31,600	
115	56.3	173.4	29,400	
120	54.5	169.9	27,400	
125	52.8	166.3	25,600	
130	50.9	162.3	23,900	
135	49.1	158.1	22,300	
140	47.2	153.6	20,900	
145	45.2	148.8	19,600	
150	43.1	143.7	18,300	
155	41.0	138.2	17,200	

## Q2 – Determining the Crane’s Net Capacity (Main Boom)

**\*\* Note:**

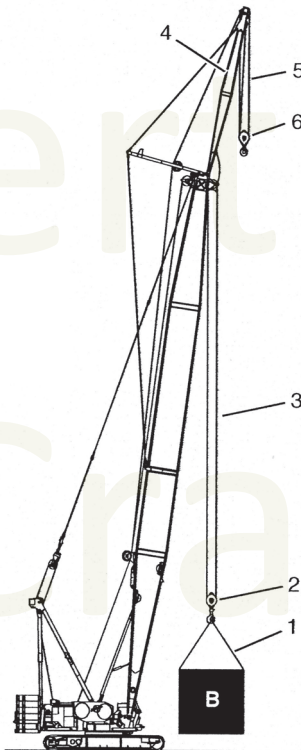
When between values listed, you must go to the next lower boom angle: 49.9 degrees

### Deductions from Gross Capacity

1. Rigging	80 lbs
2. 3 sheave block	1,950 lbs
3. Main line weight (2 x 180 x 2.34)	843 lbs
4. 40 foot jib weight	3,600 lbs
5. Whip line weight (2 x 20 x 2.34)	94 lbs
6. 1 sheave block	1,100 lbs
<b>Total Deductions</b>	<b>7,667 lbs</b>

Gross Capacity of the crane at 50 degrees is 28,500 pounds.

Net Capacity is 28,500 – 7,667 = **20,833 pounds.**



32	81.1	184.8	180,000•
34	80.4	184.5	174,100•
36	79.8	184.1	160,300
38	79.1	183.8	148,300
40	78.5	183.4	137,900
45	76.8	182.3	116,900
50	75.2	181.0	101,000
55	73.5	179.6	88,500
60	71.9	178.1	78,500
65	70.2	176.4	70,300
70	68.5	174.5	63,400
75	66.8	172.4	57,500
80	65.0	170.2	52,500
85	63.3	167.8	48,100
90	61.5	165.1	44,300
95	59.6	162.3	40,900
100	57.8	159.3	37,900
105	55.9	156.0	35,200
110	53.9	152.5	32,700
115	51.9	148.7	30,500
120	49.9	144.6	28,500
125	47.8	140.3	26,700
130	45.6	135.6	25,000
135	43.3	130.5	23,500
140	40.9	124.9	22,000
145	38.4	118.9	20,700
150	35.8	112.3	19,500
155	33.0	105.0	18,300
160	29.9	96.8	17,200
165	26.6	87.5	16,200
170	22.7	76.6	15,300
175	18.2	63.2	13,500•

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### Q3 – Determining the Crane’s Net Capacity (Jib)

**\*\* Note:**

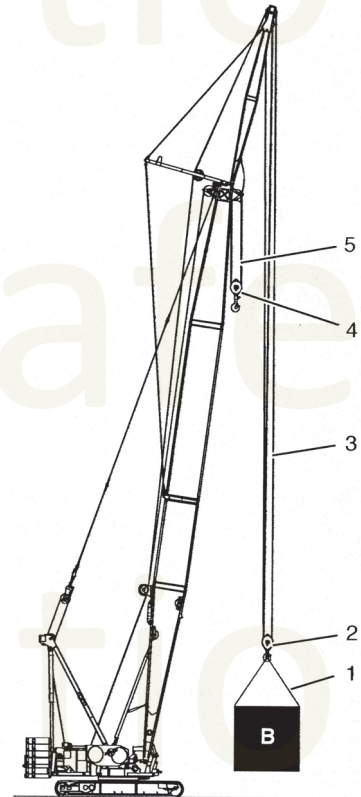
When between values listed, you must go to the next longer radius: 120 feet

Deductions from Gross Capacity

- |                                      |                  |
|--------------------------------------|------------------|
| 1. Rigging                           | 120 lbs          |
| 2. 1 sheave block                    | 1,100 lbs        |
| 3. Whip line weight (2 x 220 x 2.34) | 1,030 lbs        |
| 4. 3 sheave block                    | 1,950 lbs        |
| 5. Main line weight (2 x 25 x 2.34)  | 117 lbs          |
| <b>Total Deductions</b>              | <b>4,317 lbs</b> |

Gross Capacity of the crane at 115 foot radius is 26,400 pounds.

Net Capacity of Jib is  
 26,400 – 4,317 = **22,083 pounds.**



BOOM LGTH. FEET	JIB OPER. RAD. FEET	0 DEGREE OFFSET			10 DEGREE OFFSET			20 DEGREE OFFSET			JIB OPER. RAD. FEET
		BOOM ANG. DEG.	JIB POINT ELEV. FEET	CAPACITY POUNDS	BOOM ANG. DEG.	JIB POINT ELEV. FEET	CAPACITY POUNDS	BOOM ANG. DEG.	JIB POINT ELEV. FEET	CAPACITY POUNDS	
<b>180</b>	50	80.2	225.8	30,000*	80.6	223.6	30,000*	79.5	218.8	30,000*	50
	55	78.9	224.6	30,000*							55
	60	77.6	223.4	30,000*							60
	65	76.2	222.1	30,000*	77.9	221.0	30,000*				65
	70	74.9	220.6	30,000*	76.6	219.5	30,000*				70
	75	73.6	219.0	30,000*	75.2	217.9	30,000*				75
	80	72.2	217.2	30,000*	73.9	216.1	30,000*				80
	90	69.4	213.3	30,000*	71.1	212.2	30,000*				90
	100	66.6	208.9	30,000*	68.3	207.8	30,000*				100
	110	63.8	203.8	30,000*	65.4	202.7	30,000*				110
	120	60.8	198.1	28,800	62.4	196.9	29,500				63.9
	130	57.8	191.6	25,200	59.3	190.4	25,800	60.7	187.9	25,400*	130
	140	54.6	184.4	22,100	56.1	183.1	22,700	57.5	180.5	23,100	140
	150	51.3	176.3	19,500	52.8	174.9	20,000				150
	160	47.8	167.1	17,200	49.3	165.7	17,600				160
	170	44.1	156.7	15,300							170
180	40.1	144.8	13,500							180	