PRIME
CRANE SERVICES
Russell Parker
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0408 929 885

For;

LIFT STUDY

TIDAL SOLUTIONS
CAPE LAMBERT SHIP LOADER - SL11
CHANGE OUT LUFFING RAMS

Revisions;

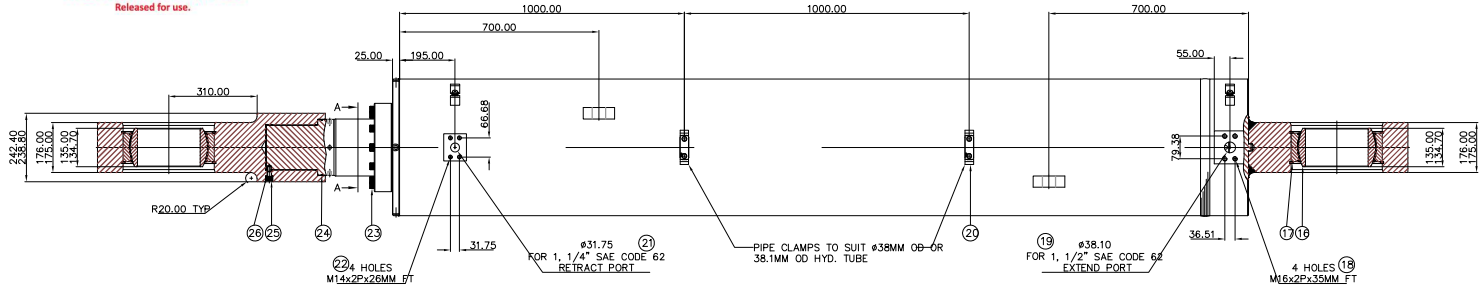
A	Issued for review	6.5.26	RP		
Rev	**Description**	**Date**	**Prepared**	**Checked**	**Approved**

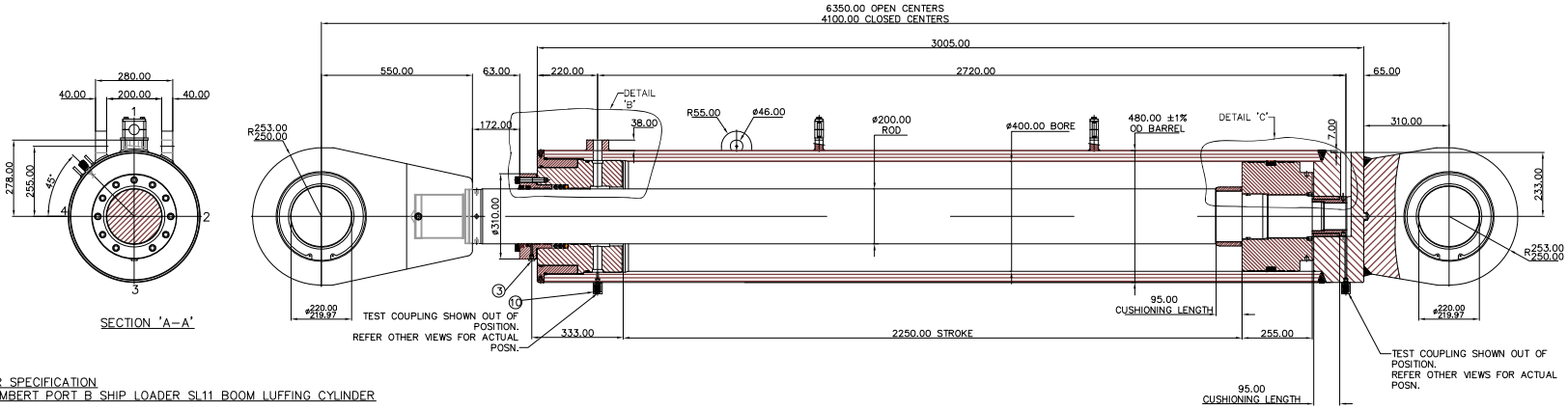
		Name	**Signature**	**Date**
For PCS;	Study created by	Russell Parker		6.5.26
	Chkd / Appr. by			
For Client	Chkd / Appr. by			
3rd Party Reviewer	Chkd / Appr. by			

NOTE; Ground bearing pressures, if provided in this lift study, are gained from manufacturers software. They represent the maximum pressures for the crane in a static condition. It is recommended that a minimum dynamic factor of 1.1 to 1.2 is considered when assessing the suitability of any crane supporting surface or structure. This is for lifts carried out at dead slow speeds.

Disclaimer; This lift study is provided at the request of the client named above (second row of signature table) and is based solely on information provided by them or other persons as directed by them. Prime Crane Services does not take any responsibility for the use of this document in relation to any rigging, lifting, crane or transport activities. It is the named client's responsibility to ensure all personnel involved in any activity related to this document are competent, suitably trained and legally certified and/or licensed to perform those activities. It is the named client's responsibility to ensure the activities are carried out in suitable weather conditions, and to verify that any area where related activities are carried out are suitable for the planned activities and can safely withstand any pressures exerted to the ground or supporting surface or structure/s by any equipment described in, or related to, this study.

Status: RELEASED
Released for use.





SECTION 'A–A'

CYLINDER SPECIFICATION
CAPE LAMBERT PORT B SHIP LOADER SL11 BOOM LUFFING CYLINDER

BORE: 400.00 GRADE ST52 BKS
ROD DIA.: 200.00 4140 HVOF
STROKE: 2250.00

WORK PRESS.: 250 BAR PULL ONLY
TEST PRESS.: 350 BAR
DRY WEIGHT: 3700 Kgs
WEIGHT WITH OIL IN FULL EXTN.: 3960 Kgs
WEIGHT WITH OIL IN FULL RETN.: 3900 Kgs

PUSH FORCE:

- PUSH FORCE OF 3,958 KN AT MINIMUM LUFF ANGLE (–13.1 DEG) WITH ROD BUCKLING SAFETY FACTOR OF 16.6:1.
- PUSH FORCE OF 2,414 kN AT MAXIMUM LUFF ANGLE (+5.1 DEG) WITH ROD BUCKLING SAFETY FACTOR OF 3.4:1.

PULL FORCE:

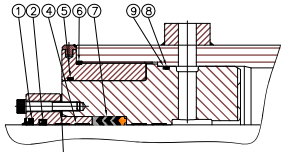
- PULL FORCE OF 1,900 kN AT 202 BAR
- THE MAXIMUM PULL FORCE AT 250 BAR IS 2,355 kN.

SEAL RATED TO MAXIMUM SPEED: 0.5m/sec.

RIO TINTO DRG. No.: CL–4551–VM–00032

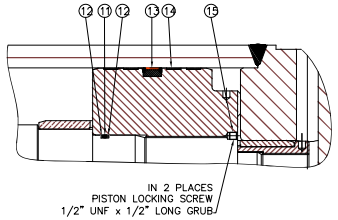
WELDING AND DIMENSIONAL TOLERANCES AS PER RIO TINTO
DRG. No.: CL–4551–VM–00007 REV 1

PAINTED TO RTIO SS–P118 AND SS–P122
PRIMER COAT: INTERZINC 52 > 75 MICRON
COATING: INTERPLUS 1180 MIO > 250 MICRON
TOP COAT: INTERFINE 629 > 75 MICRON
COLOUR: AS2700 – MANUFACTURER'S STANDARD MIO LIGHT GRAY



DETAIL 'B'
GLAND END SEALS ARRANGEMENT
SCALE 2:1

HALF SECTION



DETAIL 'C'
PISTON SEALS ARRANGEMENT
SCALE 2:1

26	ROD KNUCKLE LOCKING SCREW BONDED WASHER	1	'HALLITE' 40–229
25	ROD KNUCKLE LOCKING SCREW	1	GRADE 12.9 SHCS M16x2Px35MM LONG (MODIFIED)
24	ROD KNUCKLE 'O' RING	1	BS 264
23	GLAND CAP SCREW	11	GRADE 12.9 M16x2Px90MM LONG SHCS
22	FRONT PORT SCREW	4	M14 x 2P x 50MM LONG SHCS
21	FRONT PORT BLANK	1	'ALFA' A2FB–20M
20	HEAVY SERIES PIPE CLAMP TO SUIT 38MM OR 38.1MM OD TUBE	2 SET	'STAUFF' SPAL 5038 PP DPAL–AS M W3
19	REAR PORT BLANK	1	'ALFA' A2FB–24M
18	REAR PORT SCREW	4	M16 x 2P x 60MM LONG SHCS
17	INTERNAL CIRCLIP	4	D1300 – 3200
16	SPHERICAL BEARING	2	GE 220 UK – 2RS
15	PISTON LOCKING SCREW	2	1/2"UNF x 1/2" LONG GRUB
14	PISTON WEAR RING	4	A200 WRM400395X25P
13	PISTON SEAL	1	730 2359810
12	PISTON ROD 'O' RING B/UP	2	BU 437
11	PISTON ROD 'O' RING	1	BS 437
10	TEST COUPLING	2	SMK20–G1/4–PC ST. STEEL
9	GLAND REAR 'O' RING B/UP	1	BU 460
8	GLAND REAR 'O' RING	1	BS 460
7	VEE PACK ROD SEAL	1	13 4207050
6	GLAND NUT 'O' RING	1	BS 461
5	GLAND FRONT 'O' RING	1	BS 457
4	ROD WEAR RING	4	A200 WRM205200X25P
3	ALLEN KEY HEAD 1/4" BSPP PLUG	1	'CHILD' CR77S – 04 'RYCO' R8022–13–00
2	SECONDARY ROD WIPER	1	601 4609400
1	ROD WIPER	1	842 4748700
MARK	DESCRIPTION	NO. OFF	MATERIAL

TOLERANCES U.O.N (COMMERCIAL STOCK SIZES EXCEPTED)

SIZES	MACH.	STRUCT.*
6	±0.1	±0.5
30	±0.1	±0.5
100	±0.2	±0.5
300	±0.2	±0.5
1000	±0.2	±1.0
2000	±0.5	±1.0

* INCLUDES CASTINGS.

DO NOT SCALE IF IN DOUBT, ASK.

DRAWING TO AS1100.

PROJECTION SYSTEM THIRD ANGLE U.O.N

ALL DIMENSIONS U.O.N METRIC (MM)

DRAWING NO.	REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	BY	CHKD	APP'D
		0	13.02.203	ISSUED FOR CONSTRUCTION	RC	RT	RT

CLIENT PO:
CLIENT DOC. NO.: CL–4551–VM–00032

PRESSURE DYNAMICS

CLIENT: RIO TINTO
PROJECT: CAPE LAMBERT PORT B
TITLE: SHIP LOADER SL11
LUFFING CYLINDER
GENERAL ARRANGMENT

SIZE	SCALE	JOB NUMBER	DRAWING NUMBER	SHEET	REV
A3	NTS	107943	PD02388–0–001	1 OF 1	0

TOTAL LIFTED WEIGHT CALCULATIONS
(ALL WEIGHTS IN KILOGRAMS)

CRANE COMPONENTS - LIEBHERR LTM 1130-5.1

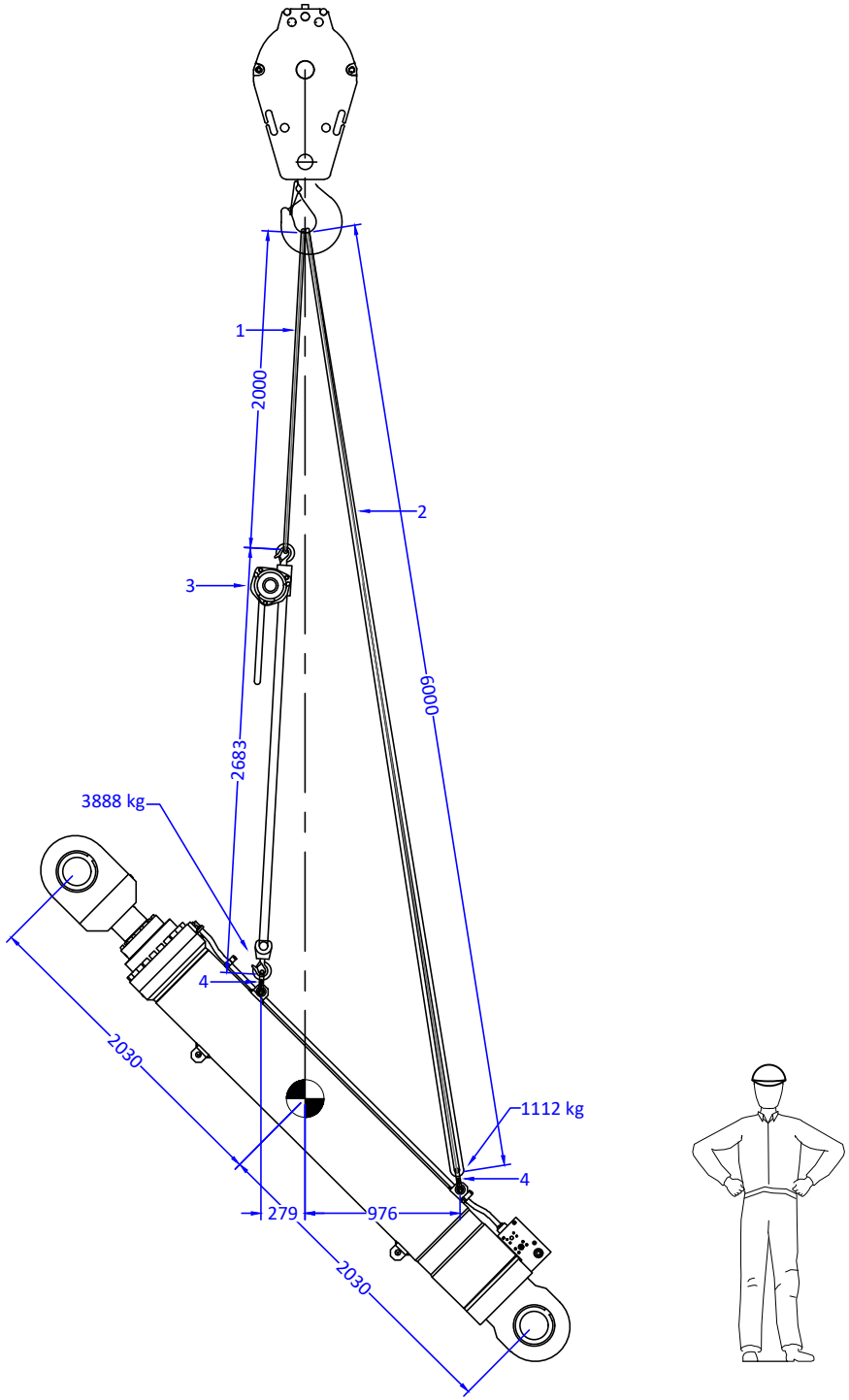
MAIN HOOK	SINGLE SHEAVE SWL 26.1t						450
MAIN ROPE	2.2	kg/m	20	m HEIGHT	2	FALLS	88
AUX. HOOK	NOT FITTED						0
AUX. ROPE	0	kg/m	0	m HEIGHT	0	FALLS	0
AUX. JIB	N/A						0
SUB TOTAL - CRANE COMPONENTS							538

RIGGING COMPONENTS

ITEM	DESCRIPTION	WEIGHT	QTY	MASS
1	2m 5t SYNTHETIC SLINGS	5	1	5
2	6m 5t SYNTHETIC SLINGS	8	1	8
3	5t CHAINBLOCK	55	1	55
4	SHACKLES - 8.5t (STD)	3	2	6
SUB TOTAL - RIGGING COMPONENTS				74
LOAD				5000
TOTAL LIFTED WEIGHT				**5612**

RIGGING NOTES;

1. "G80" DENOTES GRADE 80 CHAINS
2. "G100" DENOTES GRADE 100 CHAINS
3. FSWR SLINGS - (E) DENOTES ENDLESS GROMMET TYPE
4. FSWR SLINGS - (S) DENOTES SINGLE PART SOFT EYE TYPE
5. SHACKLES - (WB) DENOTES WIDE BODY SLING SAVER TYPE
6. SHACKLES - (STD) DENOTES STANDARD SAFETY PIN BOW TYPE
7. SLING LENGTHS SHOWN ARE THE MINIMUM REQUIRED. LONGER IS OK EXCEPT IF SPECIFICALLY NOTED.
8. SLINGS MUST ALWAYS BE AT LEAST 60° FROM THE HORIZONTAL



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CHANGE OUT LUFFING RAMS

RIGGING DETAILS

DRAWN	RP	6.5.26
CHECKED		
APPR. CLIENT		
APPR. CLIENT		

REVISIONS

REV	DATE	DESCRIPTION	CHKD	APPR.
A	6.5.26	ISSUED FOR REVIEW		

DRAWING No. PCS-NW26-031

REV A

CRANE DETAILS - SINGLE CRANE LIFT		
MAKE	LIEBHERR	
MODEL	LTM 1130-5.1	
CRANE MRC	130	t
LMI CODE	0041	
CONFIGURATION	T	
COUNTERWEIGHT	29.3	t
MAIN BOOM LENGTH	51.9	m
MAIN BOOM CONFIG.	92,92,92,92,46	%
JIB TYPE / OFFSET	NOT FITTED	°
JIB LENGTH	-	m
MAIN / AUX. HOOK?	MAIN	
MAX SWL THIS CONFIG.	16	t
OEM CHART WIND SPEED	11.1	m/sec

LOAD DETAILS		
LOAD	5000	kgs
CRANE COMPONENTS	538	kgs
RIGGING	74	kgs
TOTAL LIFT WEIGHT	***5612***	kgs

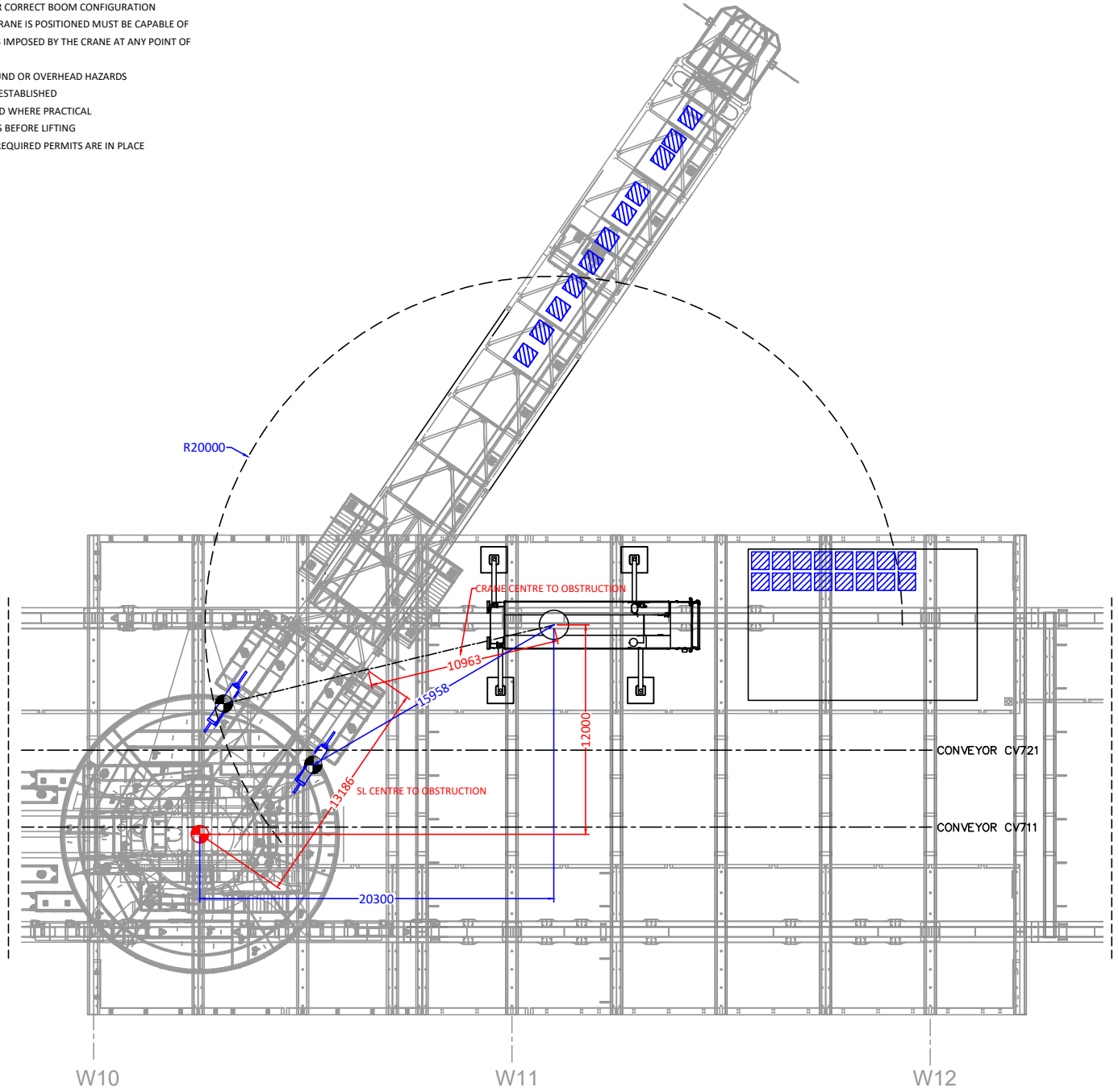
LIFT DETAILS		
MAXIMUM LIFT RADIUS	20	m
SWL AT MAX. RADIUS	11700	kgs
UTILISATION	***48.0***	%
SPARE CAPACITY	6088	kgs

REEVING CHECK		
LINE PULL	8800	kgs
No. OF PARTS	2	
FACTORED LINE PULL	17500	kgs
LOAD TO HOOK	5612	kgs
REEVING UTILISATION	***32.1***	%

GROUND BEARING PRESSURES				
OUTRIGGER PAD SIZE	1.5	x	1.5	m
OUTRIGGER PAD AREA	2.3			m2
OUTRIGGER PAD WEIGHT	0.3			t
MAXIMUM JACK FORCE	36.0			t
TOTAL DOWN FORCE	36.3			t
PRESSURE UNDER PAD	16.1			t/m2
PRESSURE UNDER PAD	158.3			kPa

LIFTING NOTES - GENERAL;

1. BOOM CONFIGURATION SHOWN IN DRAWING IS GENERIC ONLY
2. CHECK OEM CHARTS FOR CORRECT BOOM CONFIGURATION
3. THE AREA WHERE THE CRANE IS POSITIONED MUST BE CAPABLE OF SUPPORTING THE LOADS IMPOSED BY THE CRANE AT ANY POINT OF THE LIFTING OPERATION
4. CHECK FOR UNDERGROUND OR OVERHEAD HAZARDS
5. EXCLUSION ZONE TO BE ESTABLISHED
6. TAG LINES MUST BE USED WHERE PRACTICAL
7. PERFORM RADIO CHECKS BEFORE LIFTING
8. DO NOT LIFT UNTIL ALL REQUIRED PERMITS ARE IN PLACE



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CRANE DETAILS

DRAWN	RP	6.5.26
CHECKED		
APPR. CLIENT		
APPR. CLIENT		

REVISIONS

REV	DATE	DESCRIPTION	CHKD	APPR.
A	6.5.26	ISSUED FOR REVIEW		

DRAWING No. PCS-NW26-032

REV A

CRANE DETAILS - SINGLE CRANE LIFT		
MAKE	LIEBHERR	
MODEL	LTM 1130-5.1	
CRANE MRC	130	t
LMI CODE	0041	
CONFIGURATION	T	
COUNTERWEIGHT	29.3	t
MAIN BOOM LENGTH	51.9	m
MAIN BOOM CONFIG.	92,92,92,92,46	%
JIB TYPE / OFFSET	NOT FITTED	°
JIB LENGTH	-	m
MAIN / AUX. HOOK?	MAIN	
MAX SWL THIS CONFIG.	16	t
OEM CHART WIND SPEED	11.1	m/sec

LOAD DETAILS		
LOAD	5000	kgs
CRANE COMPONENTS	538	kgs
RIGGING	74	kgs
TOTAL LIFT WEIGHT	***5612***	kgs

LIFT DETAILS		
MAXIMUM LIFT RADIUS	20	m
SWL AT MAX. RADIUS	11700	kgs
UTILISATION	***48.0***	%
SPARE CAPACITY	6088	kgs

REEVING CHECK		
LINE PULL	8800	kgs
No. OF PARTS	2	
FACTORED LINE PULL	17500	kgs
LOAD TO HOOK	5612	kgs
REEVING UTILISATION	***32.1***	%

GROUND BEARING PRESSURES				
OUTRIGGER PAD SIZE	1.5	x	1.5	m
OUTRIGGER PAD AREA	2.3			m2
OUTRIGGER PAD WEIGHT	0.3			t
MAXIMUM JACK FORCE	36.0			t
TOTAL DOWN FORCE	36.3			t
PRESSURE UNDER PAD	16.1			t/m2
PRESSURE UNDER PAD	158.3			kPa

LIFTING NOTES - GENERAL;

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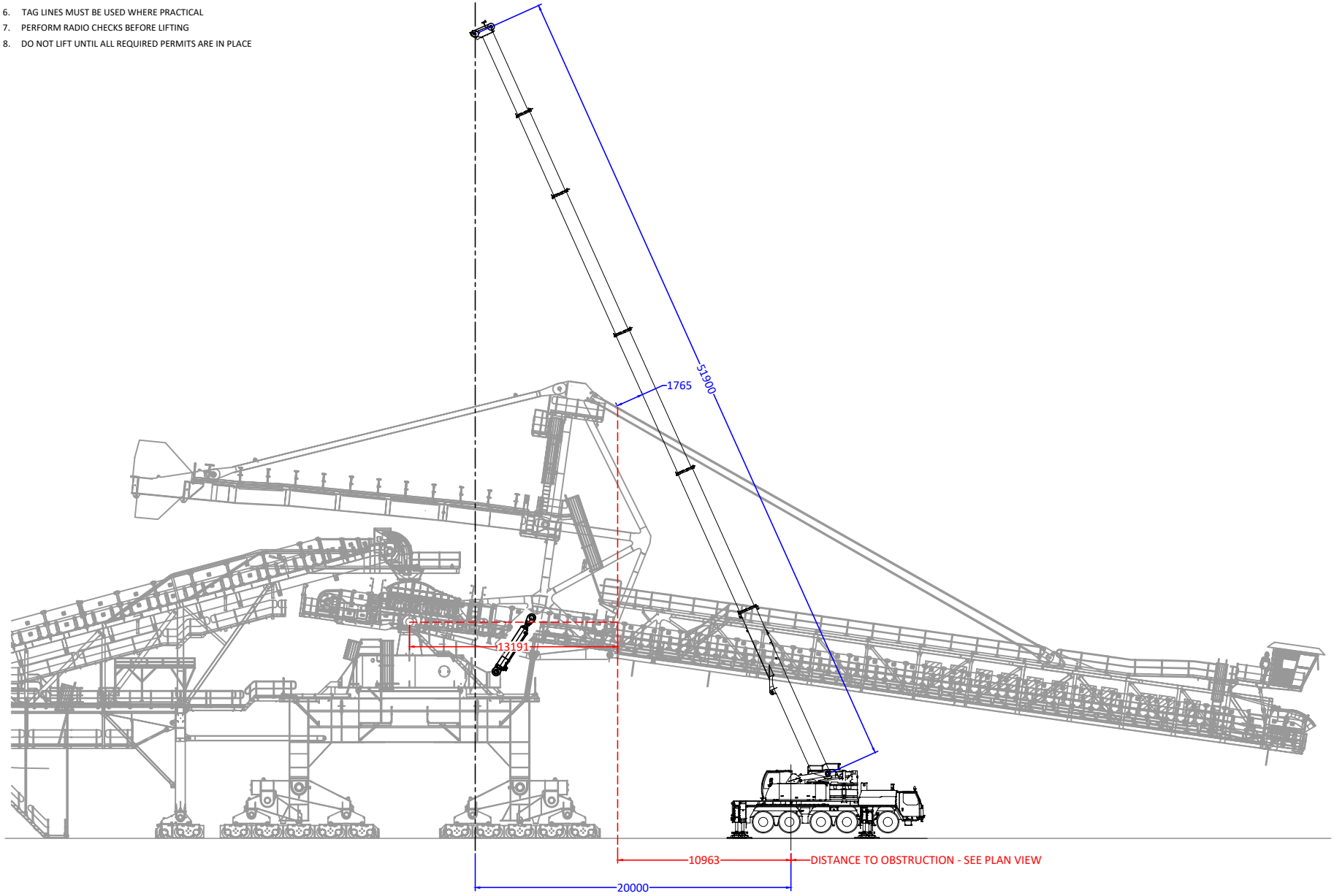

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CAPE LAMBERT SHIP LOADER - SL11
CHANGE OUT LUFFING RAMS

CRANE DETAILS

DRAWN	RP	6.5.26
CHECKED		
APPR. CLIENT		
APPR. CLIENT		

REVISIONS

REV	DATE	DESCRIPTION	CHKD	APPR.
A	6.5.26	ISSUED FOR REVIEW		

DRAWING No. PCS-NW26-033 REV A

CRANE DETAILS - SINGLE CRANE LIFT		
MAKE	LIEBHERR	
MODEL	LTM 1130-5.1	
CRANE MRC	130	t
LMI CODE	0041	
CONFIGURATION	T	
COUNTERWEIGHT	29.3	t
MAIN BOOM LENGTH	51.9	m
MAIN BOOM CONFIG.	92,92,92,92,46	%
JIB TYPE / OFFSET	NOT FITTED	°
JIB LENGTH	-	m
MAIN / AUX. HOOK?	MAIN	
MAX SWL THIS CONFIG.	16	t
OEM CHART WIND SPEED	11.1	m/sec

LOAD DETAILS		
LOAD	1800	kgs
CRANE COMPONENTS	538	kgs
RIGGING	50	kgs
TOTAL LIFT WEIGHT	***2388***	kgs

LIFT DETAILS		
MAXIMUM LIFT RADIUS	32	m
SWL AT MAX. RADIUS	5200	kgs
UTILISATION	***45.9***	%
SPARE CAPACITY	2812	kgs

REEVING CHECK		
LINE PULL	8800	kgs
No. OF PARTS	2	
FACTORED LINE PULL	17500	kgs
LOAD TO HOOK	2388	kgs
REEVING UTILISATION	***13.6***	%

GROUND BEARING PRESSURES				
OUTRIGGER PAD SIZE	1.5	x	1.5	m
OUTRIGGER PAD AREA	2.3			m2
OUTRIGGER PAD WEIGHT	0.3			t
MAXIMUM JACK FORCE	40.0			t
TOTAL DOWN FORCE	40.3			t
PRESSURE UNDER PAD	17.9			t/m2
PRESSURE UNDER PAD	175.7			kPa

LIFTING NOTES - GENERAL;

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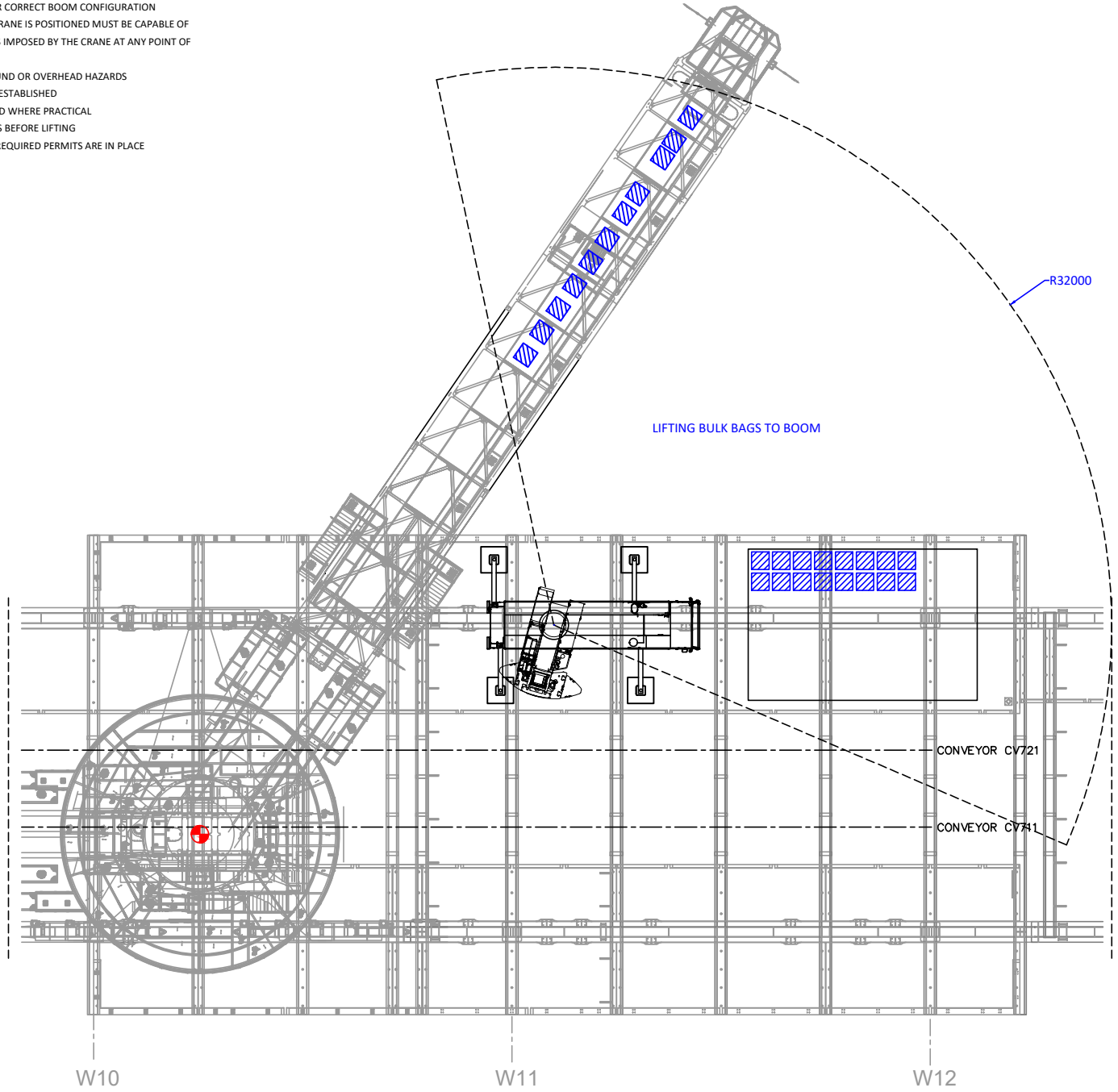

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CHANGE OUT LUFFING RAMS

CRANE DETAILS

DRAWN	RP	6.5.26
CHECKED		
APPR. CLIENT		
APPR. CLIENT		

REVISIONS

REV	DATE	DESCRIPTION	CHKD	APPR.
A	6.5.26	ISSUED FOR REVIEW		

DRAWING No. PCS-NW26-034

REV A

CRANE DETAILS - SINGLE CRANE LIFT		
MAKE	LIEBHERR	
MODEL	LTM 1130-5.1	
CRANE MRC	130	t
LMI CODE	0041	
CONFIGURATION	T	
COUNTERWEIGHT	29.3	t
MAIN BOOM LENGTH	51.9	m
MAIN BOOM CONFIG.	92,92,92,92,46	%
JIB TYPE / OFFSET	NOT FITTED	°
JIB LENGTH	-	m
MAIN / AUX. HOOK?	MAIN	
MAX SWL THIS CONFIG.	16	t
OEM CHART WIND SPEED	11.1	m/sec

LOAD DETAILS		
LOAD	1800	kgs
CRANE COMPONENTS	538	kgs
RIGGING	50	kgs
TOTAL LIFT WEIGHT	***2388***	kgs

LIFT DETAILS		
MAXIMUM LIFT RADIUS	32	m
SWL AT MAX. RADIUS	5200	kgs
UTILISATION	***45.9***	%
SPARE CAPACITY	2812	kgs

REEVING CHECK		
LINE PULL	8800	kgs
No. OF PARTS	2	
FACTORED LINE PULL	17500	kgs
LOAD TO HOOK	2388	kgs
REEVING UTILISATION	***13.6***	%

GROUND BEARING PRESSURES				
OUTRIGGER PAD SIZE	1.5	x	1.5	m
OUTRIGGER PAD AREA	2.3			m2
OUTRIGGER PAD WEIGHT	0.3			t
MAXIMUM JACK FORCE	40.0			t
TOTAL DOWN FORCE	40.3			t
PRESSURE UNDER PAD	17.9			t/m2
PRESSURE UNDER PAD	175.7			kPa

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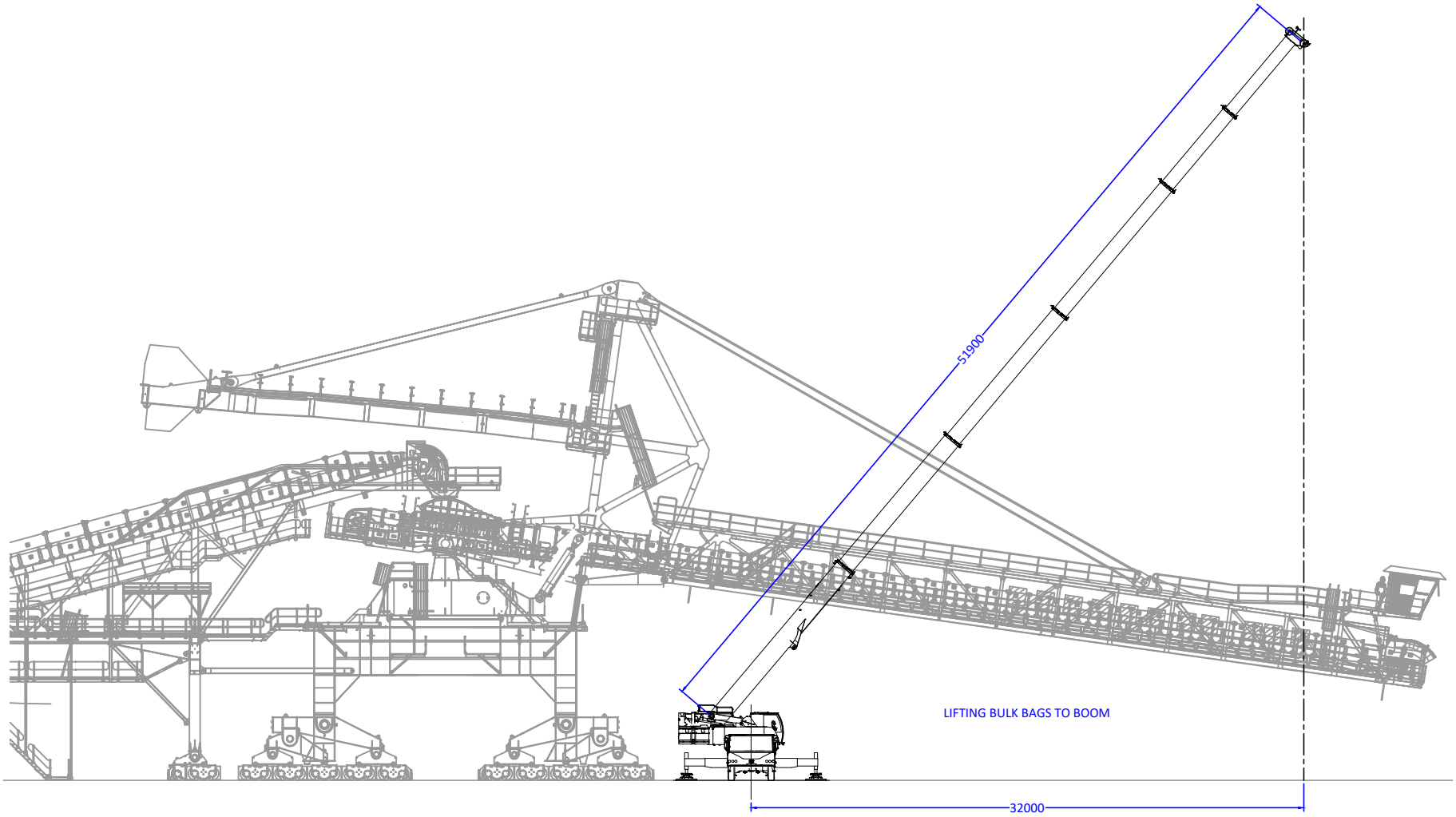

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CRANE DETAILS

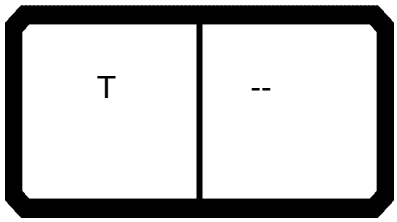
DRAWN	RP	6.5.26
CHECKED		
APPR. CLIENT		
APPR. CLIENT		

REVISIONS

REV	DATE	DESCRIPTION	CHKD	APPR.
A	6.5.26	ISSUED FOR REVIEW		

DRAWING No. PCS-NW26-035 REV A

ISO DIN



LIEBHERR LTM 1130-5.1

066206 21.11

m >< t CODE > 0041 < B182 2800 .x(x)

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4,0								27,8	23,7	20,8	11,6	29,2	26,7	23,2
4,5								27,8	23,6	20,6	11,2	29,1	26,5	22,9
5,0								27,8	23,4	20,4	10,8	29,1	26,3	22,7
6,0								27,8	23,1	20,0	10,2	29,1	26,0	22,3
7,0								27,8	22,9	19,6	9,6	29,1	24,4	21,9
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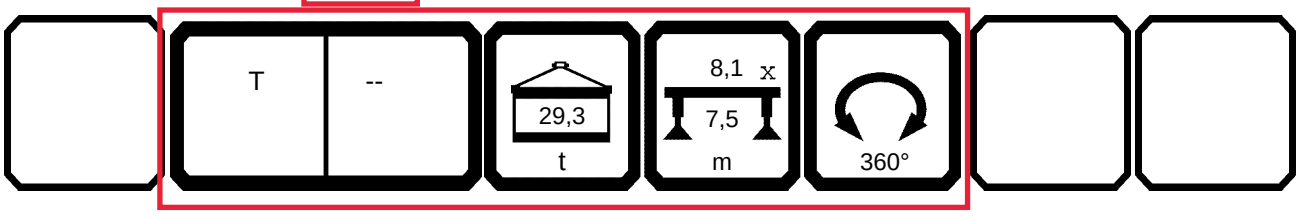
~~18,0~~	11,4	10,7	~~12,7~~	11,5	10,5	11,1	9,8		14,7	14,2	5,0		15,6	15,4
20,0	10,4	9,9	11,7	10,7	9,8	10,4	9,2			11,8	4,7			12,9
~~22,0~~	9,6	9,0	~~10,7~~	9,9	9,2	9,8	8,6			9,9	4,5			10,9
24,0	8,9	8,3	9,3	9,2	8,5	9,1	8,1				4,4			
26,0	8,2	7,7	8,1	8,6	7,9	8,2	7,6				4,4			
28,0	7,6	7,1	7,1	7,8	7,4	7,2	7,0							
~~30,0~~	7,1	6,6	~~6,1~~	6,9	6,9	6,4	6,2							
32,0	6,3	6,1	5,2	6,0	6,1	5,5	5,5							
~~34,0~~	5,5	5,6	~~4,5~~	5,3	5,3	4,8	4,8							
36,0	4,9	4,9	3,9	4,6	4,7	4,2	4,1							
38,0	4,3	4,4	3,3	4,1	4,1	3,6	3,6							
40,0	3,8	3,9	2,8	3,6	3,6	3,1	3,1							
42,0	3,4	3,4	2,3	3,1	3,2	2,7	2,7							
44,0	3,0	3,0	1,9	2,7	2,8	2,3	2,3							
46,0		2,6	1,6	2,3	2,4	1,9	1,9							
48,0		2,3	1,3	2,0	2,1	1,6	1,6							
50,0					1,8	1,3	1,3							
52,0					1,5	1,0	1,0							
*** n ***	2	2	2	2	2	2	2	4	3	3	2	4	4	3
1	0+	0+	92+	46+	46+	92+	100+	0+	0+	46-	92-	0+	0+	0+
2	92+	100+	92+	92+	100+	92+	100+	0+	46-	46+	46+	0+	0+	46-
3	92+	100+	92+	92+	100+	92+	100+	46-	46+	46+	46+	0+	46-	46+
4	92+	100+	92+	92+	100+	92+	100+	0+	0+	0+	0+	46-	46+	46+
5	92+	100+	46+	92+	100+	92+	100+	0+	0+	0+	0+	0+	0+	0+
%														
m/s	11,1	11,1	11,1	11,1	11,1	11,1	11,1	14,3	12,8	12,8	11,1	14,3	12,8	12,8
TAB ***	1053	1053	1053	1053	1053	1053	1053	1053	1053	1053	1053	1053	1053	1053



END >?< 100% x y ABC 0° t typ1 n=2

LTM 1130-5.1 000000000 CODE >0041< B182 2800

Inclination angle

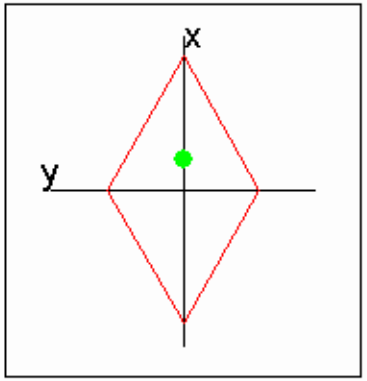
Longitud.incl. [°]

0.0

Transverse incl. [°]

0.0

Center of gravity



x: 0.5 m 87.2 t

y: 0.0 m

z: 8.2 m

t

[36] [35]

31 30

15 16

[31] [33]

t (max) 5 6 11 7

m 20.0 65.8°

m 50.8

m % 51.9 92+ 92+ 92+ 92+ 46+

0°

V 6.27

LIFTING THE CYLINDERS

END >?< 100% x y ABC 0°

LTM 1130-5.1 000000000 CODE >0041< B182 2800

Inclination angle

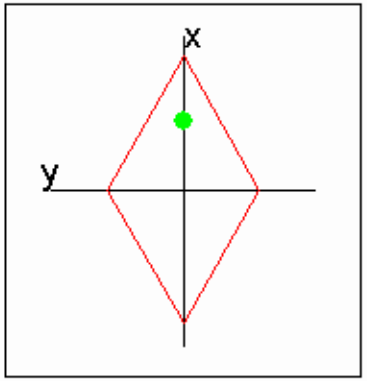
Longitud.incl. [°]

0.0

Transverse incl. [°]

0.0

Center of gravity



x: 1.1 m 83.9 t
y: 0.0 m
z: 5.7 m

t

[40] [38]

33 32

12 13

[34] [36]

t typ1 n=2
(max) 2^4 5^2

m 32.0 49.8°

m 42.8

m % 51.9
92+ 92+ 92+ 92+ 46+

0°

V 6.27

LIFTING THE BULK BAGS