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The following points should be noted (and made available):

- The receiving area for the shipment should be firm, well drained, and with good access roads allowing for a turnround for articulated vehicles.
- Timber blocks (e.g. rail ties) for the support of parts on delivery.
- Tarpaulins (sheets) for covering parts (mainly electrical).
- Mobile crane for unloading.
- Pre-assembly areas designated.
- Crew shelter, office and tool storage facilities.
- Electr. supply point for power tools, welding sets, etc.
- Electr. supply point for floodlighting (if required).
- Welding and cutting equipment in case of transport damage.
- KRØLL CRANES A/S (or their agent's) personnel should be informed on arrival of first-aid and telephone locations, together with any security arrangements made.
- Site access clearance should be obtained for them, together with any other relevant information.

**PRE-ERECTION CHECKS TO BE CARRIED OUT BY KRØLL'S (OR AGENT'S)
TECHN. ASSISTANT****A: EXPENDABLE-BASE-MOUNTED CRANES**

- Check** - The foundation pad has had sufficient curing time.
- Mast bolt diagonal centres.
 - With a level, the mast bolt block connection surfaces.
 - There is a min. of 400 mm (15¾") between underside of mast bolt block and the foundation top.

B: BOTTOM-CROSS (B-X) MOUNTED CRANES

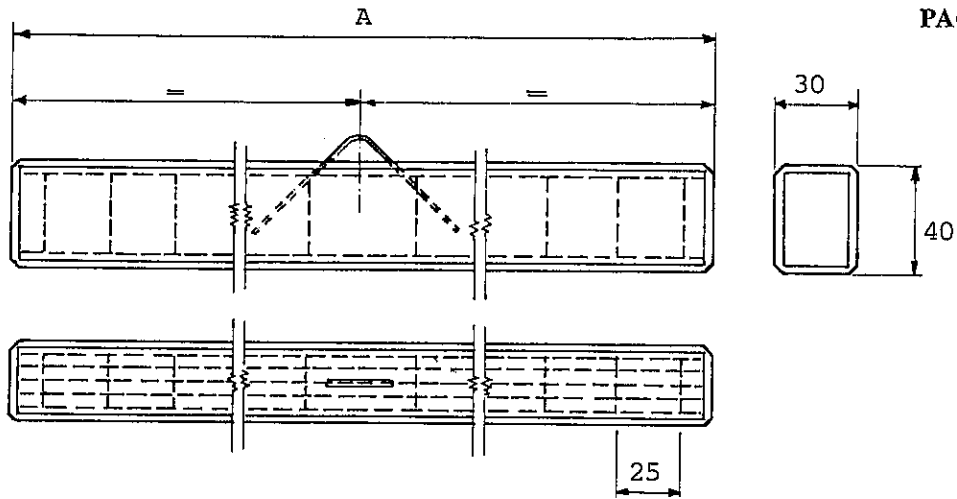
- Check** - The foundation pad has had sufficient curing time.
- Cast-in anchor bolt centres.
 - Cast-in anchor bolt height.
 - Clearance under the cross within the mast area.
 - Level of the base at anchor bolt position.
 - Packing plate available if required for levelling.
 - Hand wrench & die available for anchor bolt threads.

C: RAIL-MOUNTED CRANES

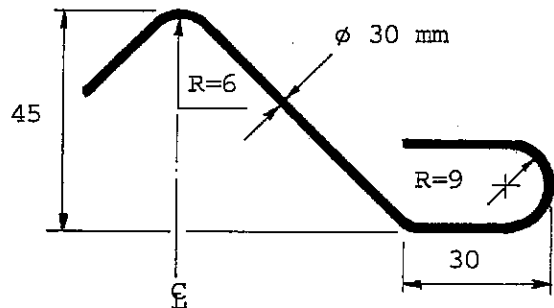
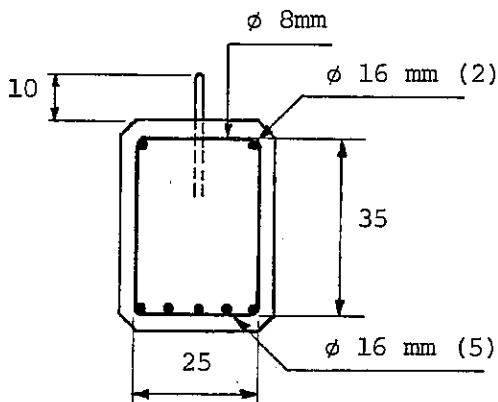
- Check** - Rail bed, bed drainage, sleeper type, sleeper quantity per meter (yard).
- Source of rail bed calculation.
 - Rail joints (fish-plate, bolts, tools available), rail joint alignment & sleeper support.
 - Rail to sleeper fitting, rail head (on used rails), rail spacing tie rods.
 - Earthing arrangement, end buffers, electr. stop arrangement.
 - Position/installation of power cable pick-up.
 - Power cable bed (if trailing cable), provisions for power cable if curve-running.
 - Special instructions for position of bogie motors, cable, drum, access ladder.
 - Number of ballast blocks on site, dimensions, quality, marked-up weight, total weight, quantity required.

D: ALL CRANES

- Check** - Pre-erection information complied with:
- Weather conditions likely for the period of erection, site drainage, equipment protection.
 - Power supply, also whether to be drawn on by other equipment.
 - Counterweights on site, dimensions, quality, marked-up weight, total weight, quantity required.
 - Parts for transport damage.
 - Parts against packing lists.
 - Booking of adequate size mobile crane (hooks & slings).
 - Availability of contractor labour.
 - Required lubricants are on site.
 - Crane tool box on site.
 - Storage or transport defects/deficiencies of any supplied tool items (e.g. hydr. torque wrench).
 - Storage or transport defects/deficiencies of any climbing/telescoping equipment.
 - Storage or transport defects/deficiencies of any KRØLL (or agents) hired-out equipment (e.g. mech./hydr. erection equipment).
 - Electrical equipment for transport/storage damage.
 - Weather/storage deterioration of any items.
 - For long jib cranes, provision for wind ballasting.
 - Test loading equipment available.
 - Suspension ropes with shackles and sufficient capacity.



RAIL GAUGE	A	WEIGHT
m	cm	kg
4,5	500	1450
6,0 - 9,0 and over	650	1875



Unspecified dimensions in cm's.

Corners should be chamfered

CONCRETE

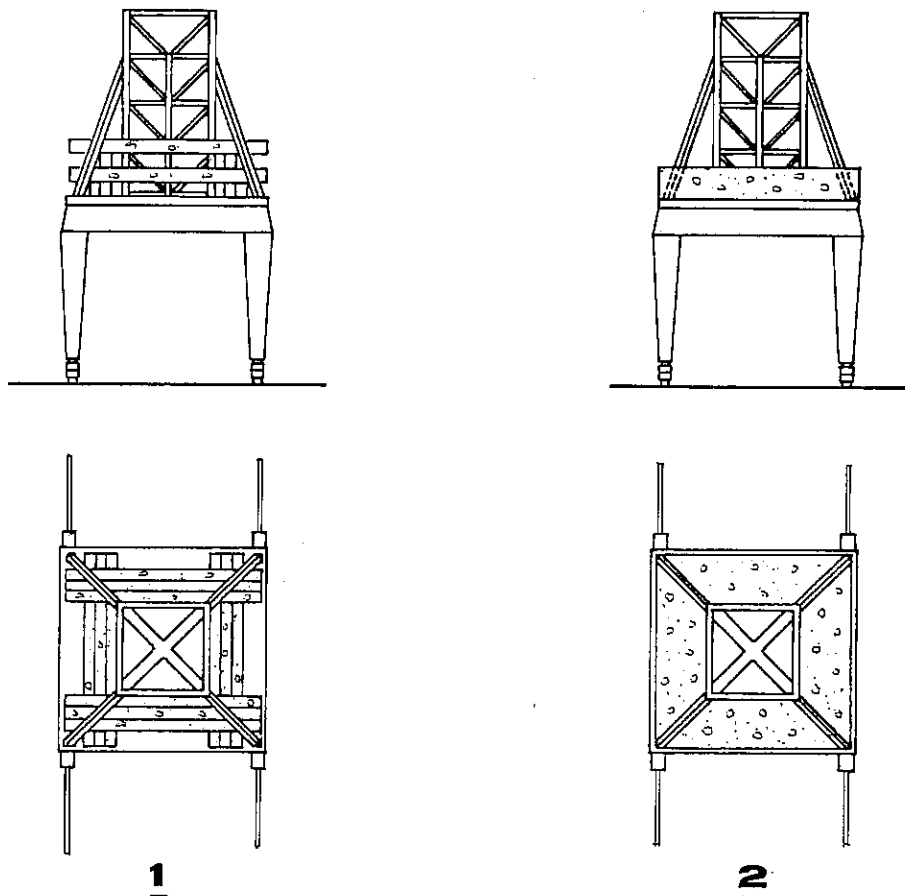
1 m³ = 2.35t = 5180 lbs = 150 lbs/cu. ft approx.
 Cube crushing str. \geq 300 kg/cm²

Weight tolerance \pm 1%

Mark check weight on each block
 Do not remove from form until hard.
 Allow 21 days before use.

METHOD OF FITTING

1st. layer across the rail track.



The ballasting of this type of undercarriage can be done by two methods:

- 1) By using removable ballast blocks as shown on the information sheets. Actual positioning being conditional on rail gauge and cable drum, access ladder, stairway position.
- 2) For permanent installation cranes, the ballasting required can be cast in position as 2 or 4 blocks over the support beams. The top of the blocks can be used as an access platform from portal to mast ladder.

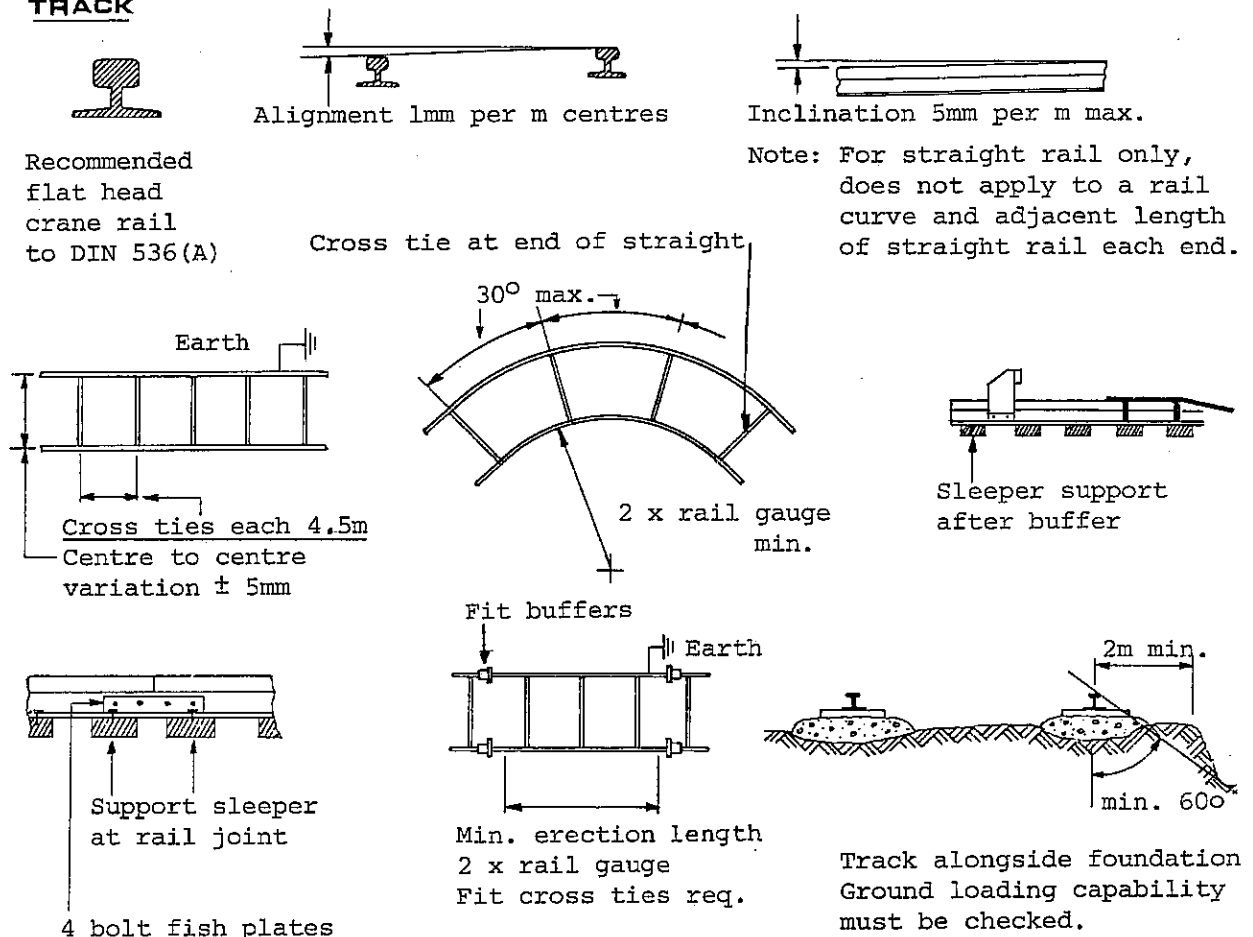
CONCRETE

1 m³ = 2.35 t = 5180 lbs = 150 lbs/cu.ft. approx.

Cube crushing str. 300 kg/cm²

- THE CRANE SHEET GIVES THE MAXIMUM CORNER LOAD IMPOSED ON THE TRACK
- RAIL GAUGE IS RAIL CENTRE TO RAIL CENTRE
- KRØLL accept no responsibility for track calculations. Rail bed and layout should be checked by a competent authority.
- Ground holding pressure should be checked at points along the track length.
- The track area should be well drained.
- Sleepers should be laid on ballast and inspection checks for level and centres should be made frequently within the standard crane maintenance programme.

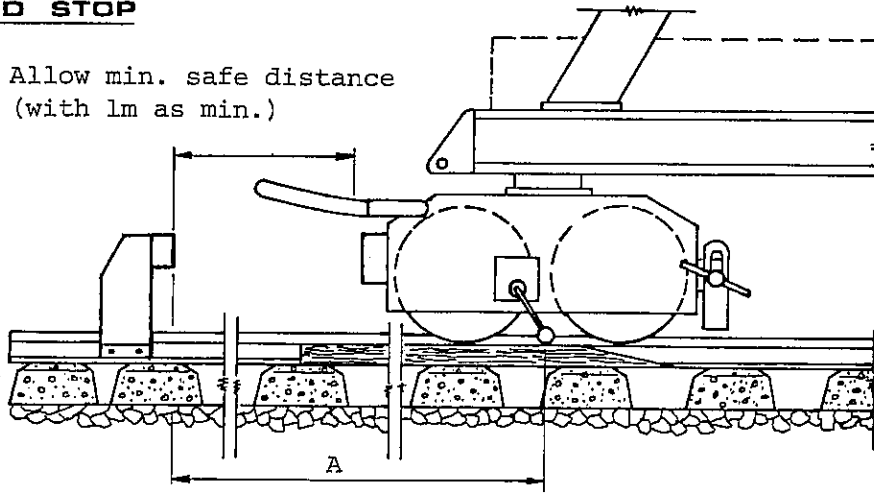
TRACK



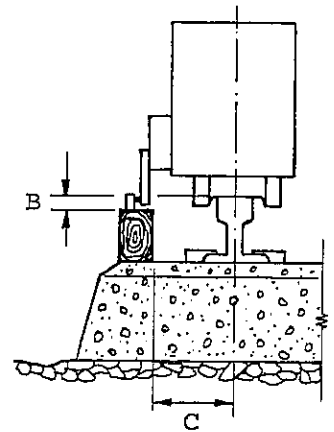
- Concrete or hard wood sleepers can be used. Full length sleepers should not be used.
- If other rail types are used the rail head should be ground flat over 75% of the head width.
- Used rail - trim for rail head burrs - do not mix rails of different manufacture - use fish plates for the rail type.
- For curves - cold rolled rail to the correct radius be installed.

END STOP

Allow min. safe distance
(with lm as min.)



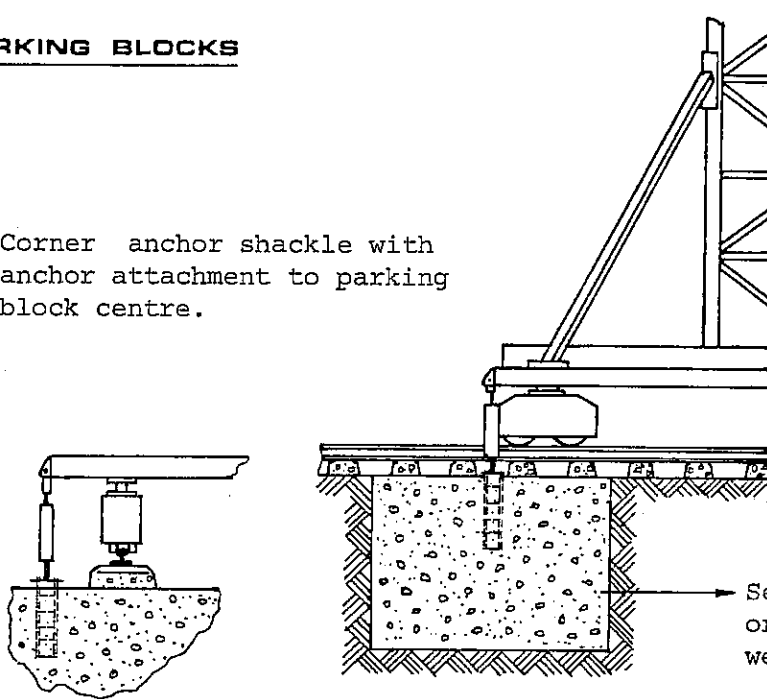
NOTE! Sleeper after end stop



A, B & C can be determined after the crane is erected

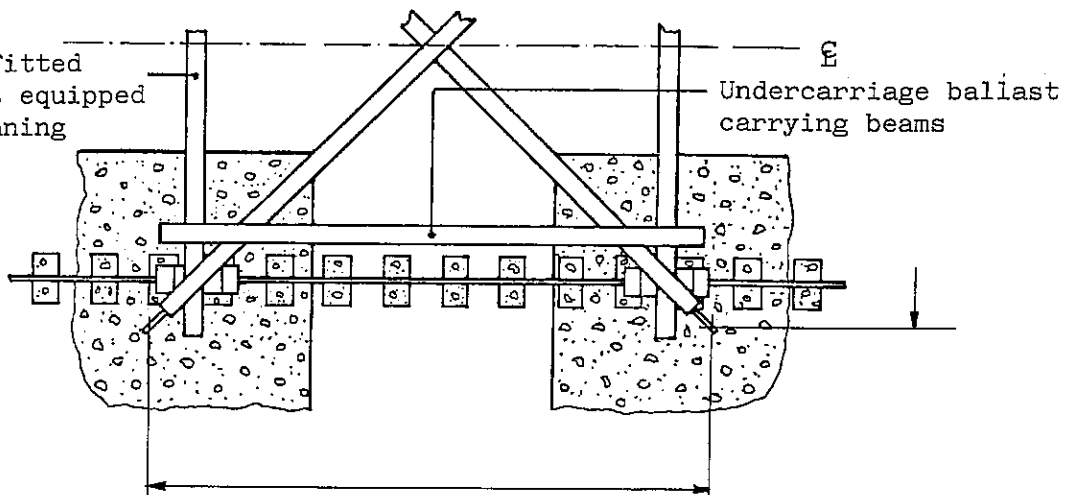
PARKING BLOCKS

Corner anchor shackle with anchor attachment to parking block centre.

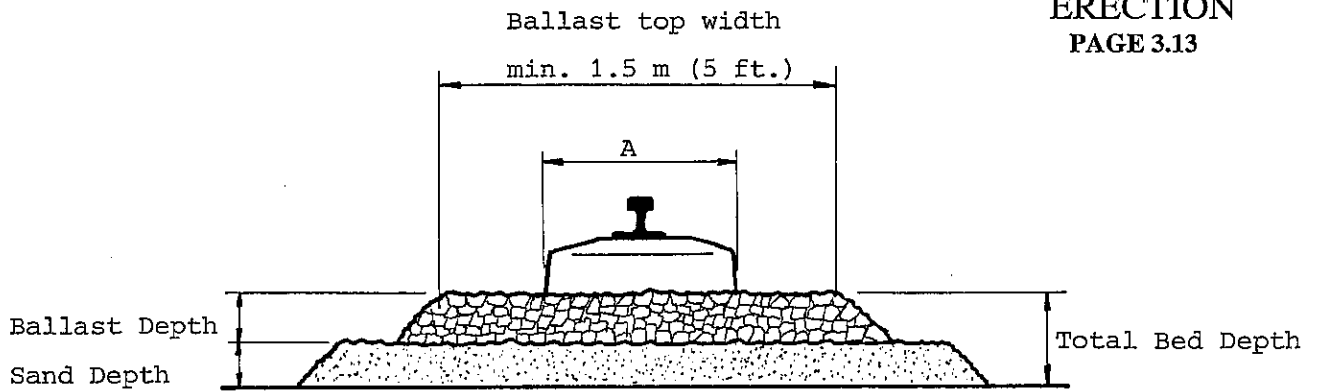


See crane spec. sheet or crane sheet for block weight required.

Cross beams fitted when crane is equipped for curve running



- 4,5m B-X = 5,2m □
- 6,0m B-X = 6,7m □
- 9,0m B-X = 9,7m □



PERMISSIBLE GROUND BEARING PRESSURE		SAND DEPTH		BALLAST DEPTH		TOTAL BED DEPTH	
kp/cm ²	lbs/sq.in	mm	in	mm	in	mm	in
0.5	7	430	17	270	11	700	28
1.0	14	180	7	270	11	450	18
1.5	21	80	3	270	11	350	14
2.0	28	-	-	270	11	270	11
and over							

The sand bed should be well compacted. A thick bed should be compacted in two or three layers until final height is reached.

The ballast bed should be composed of 12-25 mm (½-1") aggregate. The ballast top must be 1.5 m (5') wide as a minimum, with normally sloped edges. Laid ballast must be well compacted.

Checks should be made on the lateral and longitudinal levels of sand and ballast beds as work proceeds.

NOTE: Due regard must always be given to special ground conditions on site - pipe trenches excavations etc.

Concrete sleepers should be of vibrated reinforced concrete with a cube crushing strength of 400 kg/cm².

THIS INFORMATION IS GIVEN AS A GUIDE ONLY.

NO RESPONSIBILITY IS ACCEPTED FOR ACTUAL DESIGN OF THE RAIL BED.

No. of Units	1		2		3		4		End Cover	Bogie E - E
50 t.	380	1620	380	1620	380	1620	380	300*	2000	
60 t.	510	990	510	990	510	990	510	150	1500	
65 t.	420	880	420	880	420	880	420	450	1300	
70 t.	700	1300	700	1300	700	1300	700	150	2000	

Unit Centres
*50 t. incl.
Rail Clamps

SIDE CLEARANCE, TO BE ALLOWED.

	<u>Drive Side</u>	<u>Opp. Side</u>
50 t.	500	200
60 t.	600	200
65 t.	500	200
70 t.	700	300

All dimensions
in millimeters.

The drive side dimension applies also to parking block fittings.

For all cranes if running beside construction walls, walkway clearance outside the above dimensions must be allowed.

Clearance Heights over rail head under B-X cranes.

Bogie units	1	2	3	4
50 t	470	870	-	-
60 t	470	925	-	1450
65 t	500	1000	-	-
70 t	870	1250	1900	2100

Rail Head Width max. for Bogie Wheels.

50 t - 75 mm, 60 t - 75 mm, 70 t - 120 mm, 65 t - 75 mm

The above information is a guide. Any deviation will be shown on the crane sheet or drawing.

SUPPLY INSTALLATION

- If a trailing el. supply cable is fitted - to prevent wear a fine sand bed or leveled steel plates should be laid between the tracks for the cable to be towed on.
- The trailing cable will normally enter the crane structure on the track centre line.
- A trailing cable is not recommended for curve running cranes.
- If a cable drum is fitted, it's position is on the track centre line. For curve running crane fit guides to the rail ties within the curve.
- Portal cranes have a side mounted cable drum and guide roller fitted to lay the cable adjacent to the track on the inside of one side. (Customer order should give any relevant information).

Combination cranes can be supplied with different hoist winch units within the same crane type. The dimensioning of main fuses and feeder cables depends on the winch equipment and not the crane type. It is important that the supply voltage is correct to ensure proper functioning of the crane.

Note : KRØLL supply feeder cable to base of crane mast only, (whitout a connection box) or to the cable drum.

Introduction

This instruction contains the recommendations of Krøll Cranes A/S.

It is the responsibility of the owner / user of the crane to comply with local laws and regulations, which may call for i.e. different periods between, or purposes for testloads.

When to test load

- When the crane is erected, and before it is put into service.
- If the crane has been subjected to any form of shock loading, i.e. a load drop due to a faulty sling, or the emergency stop have been used.
- After major repairs.
- Within one year from the last recorded test load.

Test load weights

A set of test loads should be kept on the site. These should consist of concrete blocks and steel blocks, which have been dynamometer-tested with the checked weight marked on them and the weight percentage for max. and jib tip load.

In order to cover all test loadings recommended by Krøll, the following weights should be available:

A combination to reach 110%. Supplement to reach 125%. This is for **both** maximum load **and** jib tip load.



Precautions



- Windspeed during test loading max. 8 m/sec.
- All operations during test, are to be carried out slowly and carefully, one at the time.
- Test loading should always be carried out under the direction of the crane supervisor.

Test loading

Dynamic test

110% of the nominal load is lifted 10 - 20 cm of the ground. Actuate only 1 operation at the time.

Static test

Supplement weight up to 125% of the nominal weight, is **carefully** placed on top of the load. Keep the load suspended for min. 5 minutes.

Records

Record all details of the test in the crane log book.

Always immediately inform the supervisor, and record any shock loading in the crane log book.

KNOWN INSTALLATION FAULTS WHICH HAVE OCCURRED BECAUSE OF NONE OR INSUFFICIENT PRE-PLANNING.

FOUNDATIONS

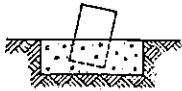
Base tilt when crane is in operational use because of none checking of ground holding pressure.

BALLAST AND COUNTERWEIGHTS

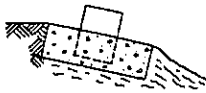
Concrete not to specification. Blocks crumble with weathering. Blocks removed too early from forms and blocks stacked leaning, upright or on uneven ground - result blocks when required are bowed or twisted and cannot be fitted.

RAIL TRACKS

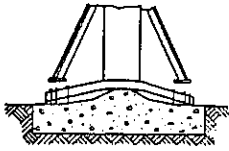
Tracks not designed to carry the given max. corner load.
Used rail of different type laid-result steps at rail joints.
Rail curve laid with inclination.
No support at rail joints, fishplates loose or only part of bolt quantity fitted - result rail spring as the crane moves over the joint.



Recheck Level
before concreting



Check Ground Holding
Pressure first



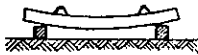
B-X Foundation
Relieve
the Base Centre.



Weathering Result
Concrete Mix to be
to Correct Crushing
Strength.



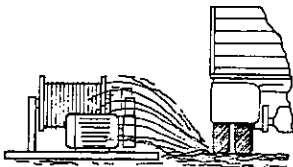
Removed before Curing
Stored incorrectly



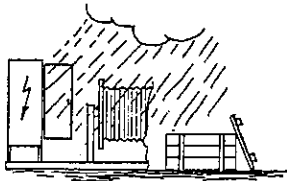
Removed from Form
before Curing.
Stored incorrectly,
use a min. of 4
Supports.



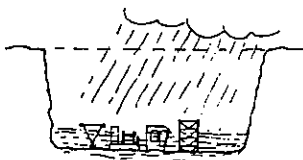
Power Supply to Site



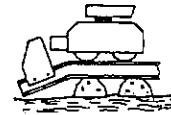
Don't Store close to Main
Access Dirt Roads.



Don't forget to close doors
and packages after delivery,
if opened.

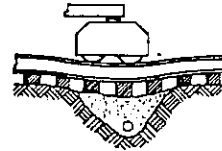


Don't forget the Weather Forecast.



Fit Sleepers after
the End Stops

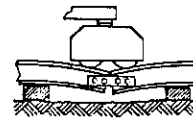
Fit El.Stop
Activating Ramps.



Check for Loose
Fill Trenches.



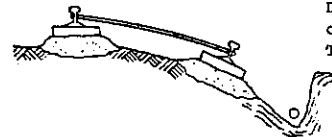
Check used Rails



Support Track
Joints.
Use correct Fish
Plate.
Tighten Bolts.



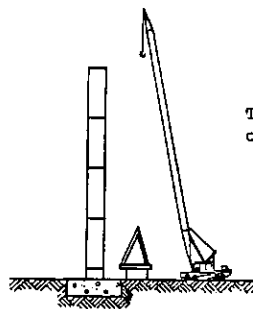
Don't save on
Track Spacers.



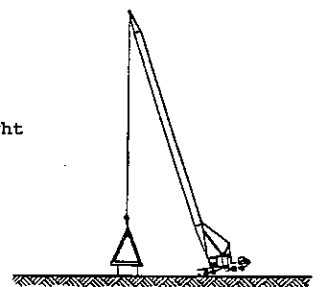
Don't Trench
close to the
Track.



Pre-Form Rail
Curves.



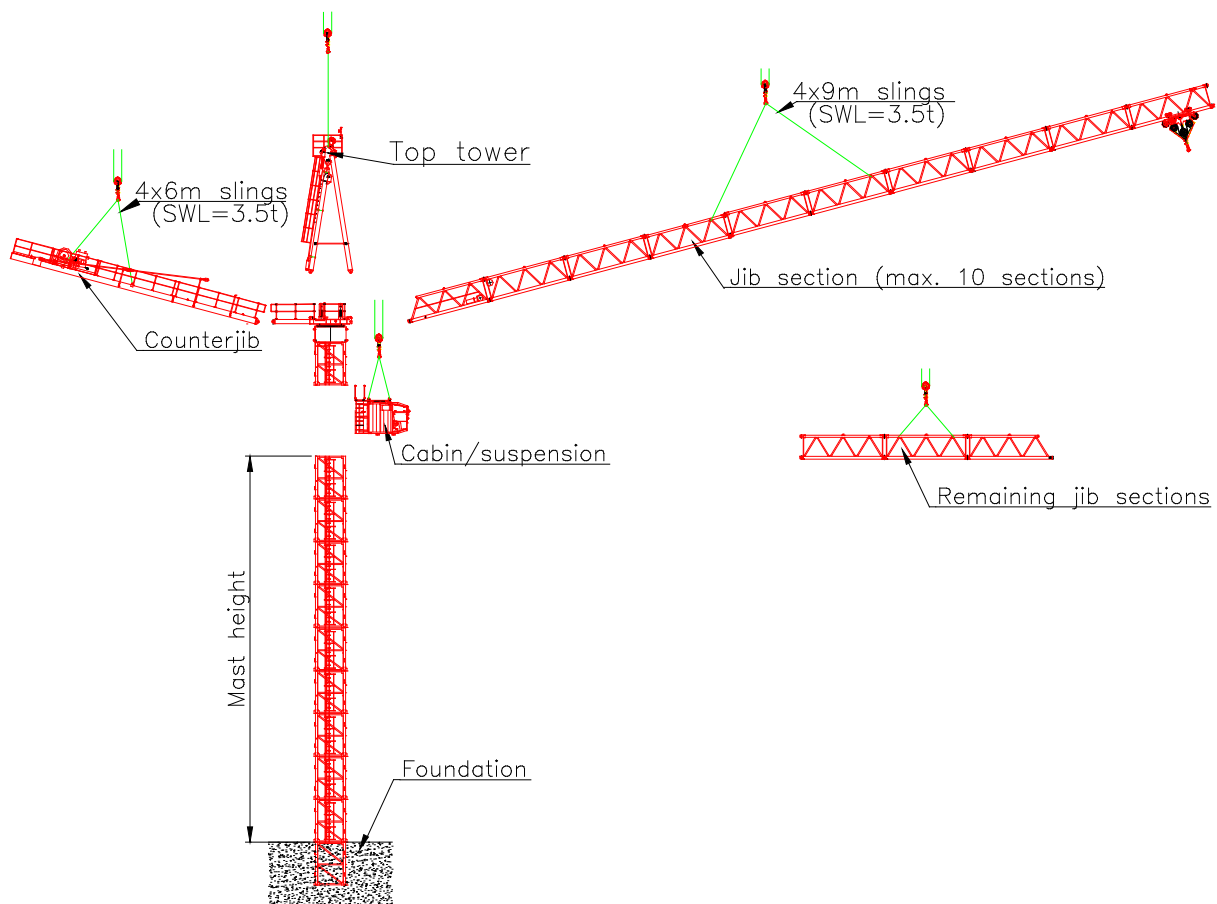
Too small
or too light



TIME COSTS MONEY - some faults and
non-attention to preplanning - some
with expensive or disasterous results
which have been met with over the
years by our Service Department.

REQUIRED HEIGHT UNDER HOOK FOR MOBILE CRANE

Required height under hook for mobile crane = Mast height + min. 15 m



For data regarding the height under hook for KRØLL tower crane see tower configurations.

If the crane will be erected on another substructure, the required height under hook of the crane increases by the structural dimension of substructure.

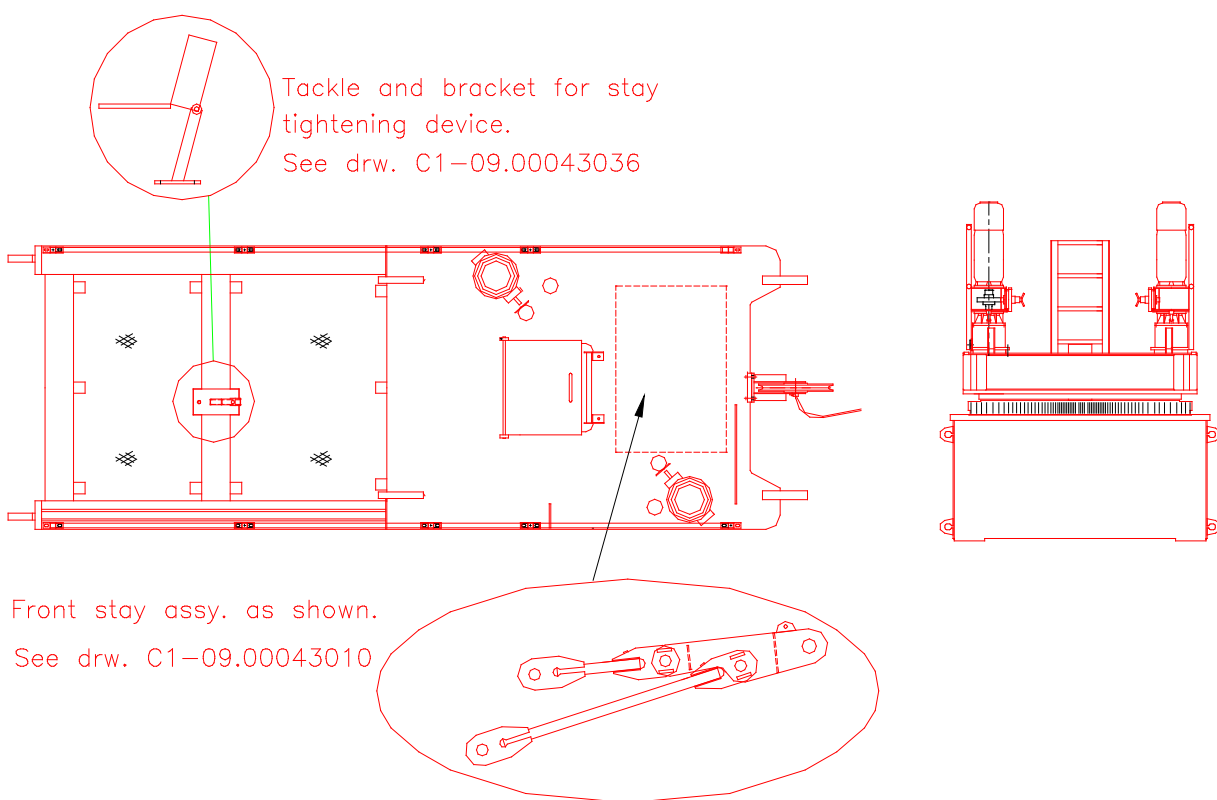
Differences in ground (mobile crane basis - tower crane basis) must be considered for erection.

SLEWING AND CABIN ASSEMBLY

Consult drawing no. C2-03.00043018 swing and mast head assy.

Before the slewing assy is fitted to the mast top, fit all railings, platforms and drives, and place the parts, as shown on Fig. 1, onto the slewing.

Fig. 1



Front stay assy. as shown.
See drw. C1-09.00043010

- Make up all bolt connections.
Total weight to be lifted 8750 kg.

DRIVERS CABIN AND SUSPENSION

Fit drivers cabin and suspension. Fit access platform and ladder (see drawing no. 3-03.00043029). Total weight to be lifted approx. 2000 kg.

TOP TOWER ASSY

Consult drawing no. C1-04.00043019.

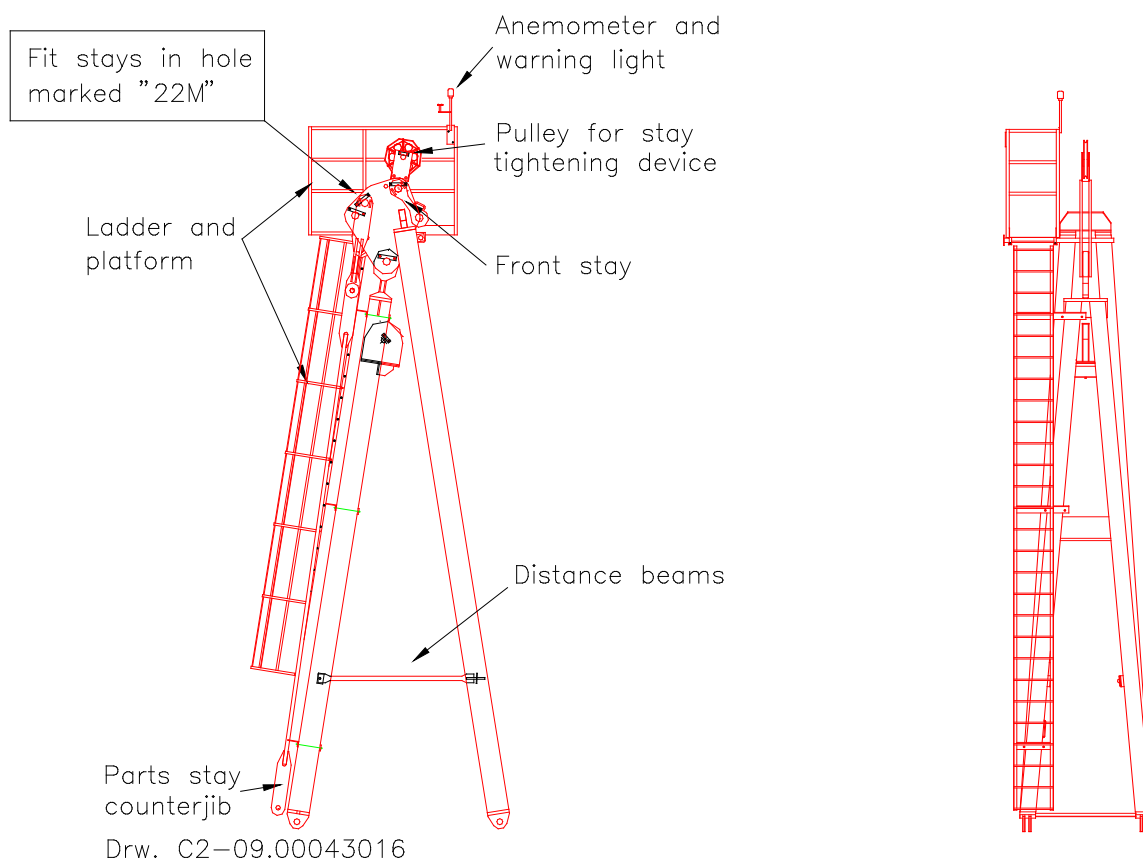
- Fit tower and part stays (see Fig. 2).

At the top tower the rear stays **MUST** be fitted in the holes marked "22M"

NOTE: Tower is placed on slewing section and set in connection position with the supplied distance beams, then removed.

- Fit pulley for stay tightening device, see Fig 2.
- Fit ladder, platform and remaining equipment.

Fig. 2



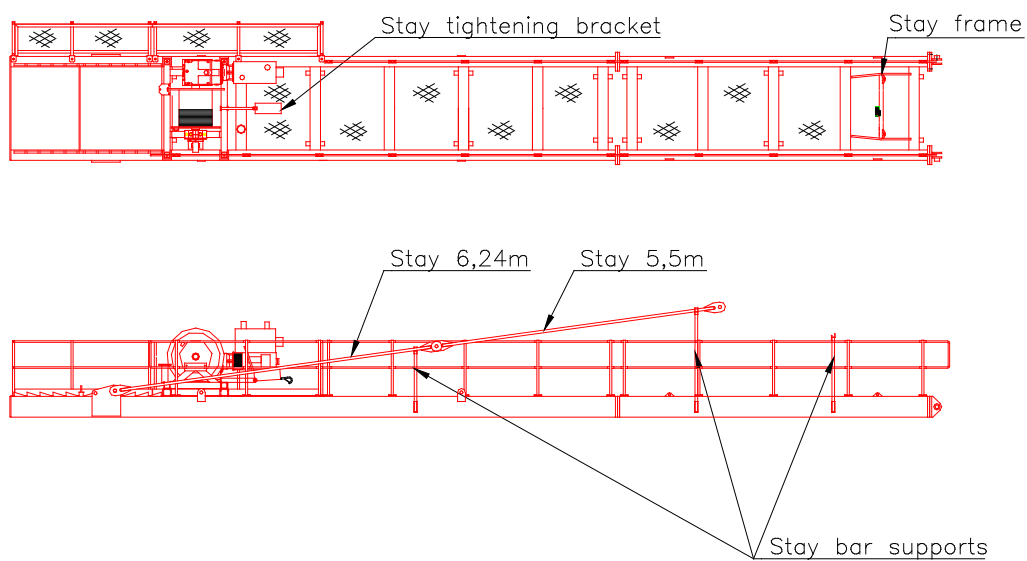
Total weight to be lifted 4100 kg.

COUNTER JIB ASSEMBLY (22 m)

Consult drawing no. C2-04.00043014.

- Assemble the counter jib inner and outer section. Tighten all bolts to 100% torque. Add railings and platforms.
- Consult drawing no. 2-09.00043016 and fit the rear stay pos. 1 (L = 6.24 m) and pos. 2 (L = 5.5 m) to the counter jib placed in the stay bar supports (see Fig. 3).
- Fit the stay tightening bracket on the hoist winch frame as shown in Fig. 3.
- Ensure that the connection pin bolts to the slewing frame and that stay frame are placed on the counter jib.

Fig. 3



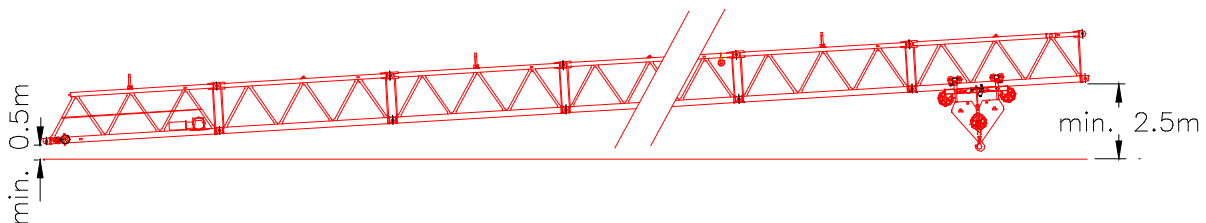
Total erection weight 9000 kg.

ASSEMBLY OF JIB SECTIONS

IMPORTANT: Erection note : Jib length up to 57.6 m reach can be assembled as one unit.

- Assemble all jib sections on the ground taking jib length into consideration, incl. trolley winch, trolley/hook arrangement, rope fittings, pulleys and part stays. Secure the trolley position so it doesn't move during the lift.
- The jib inner section should be placed close in and on the centre line of mast so there is a direct lift up to the connection point of the slewing assembly.
- The connection point of the jib foot should be supported at a height of 0.5 m to allow clearance for the jib foot pulley assemblies.
- Before the trolley assemblies are fitted a clearance under the jib at min. 2.5 m is required.
- It is advantageous at this point to reeve a sufficient rope through the trolley/hook assemblies. The hoist rope can then later easily be taken through the guide pulleys and fitted to the jib tip swivel.

Clearance requested for jib-trolley/hook assemblies.



Place the remaining jib inner and outer stays on the jib and attached to the respective stay support.

Use the removable stay support bracket when the pin connecting between one stay and another is made to avoid the stays from tumbling down.

Tighten all bolts to 100% torque.

Consult drawing no. C1-09.00043010 and stay combination and drawing no. C1-02.00043001 jib assembling.

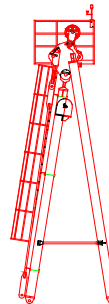
ERECTION SEQUENCE

The crane may be erected in various ways depending on the available mobile crane. This instruction should therefore be considered as a guide only.

MAST

- The mast is built up to the required height. All mast bolts should be tightened to the correct torque - see Info Sheet 2268.

Weight of M22-2 mast : 4020 kg



SLEWING / TOP TOWER

- Lift and fit the combined slewing/masthead on top of the mast. If sufficient crane capacity is available the top tower could be assembled on the slewing as well before fitting.

Tighten all bolts to 100% torque.

Weight of slewing/masthead : 8750 kg

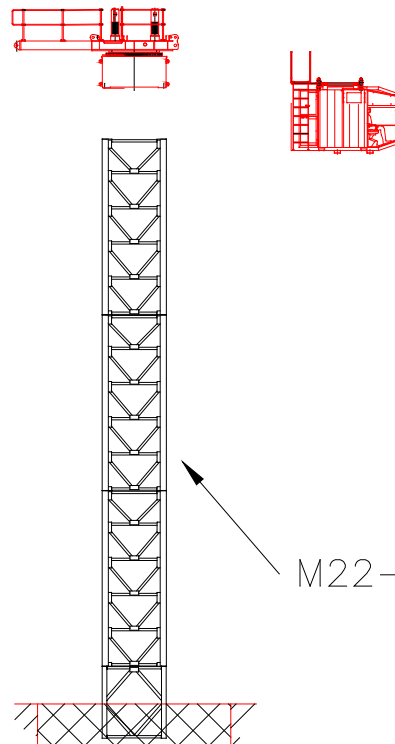
- Fit the driver's cabin.

Weight of driver's cabin : 2200 kg

- Lift and fit the pre-assembled top tower including stay pieces.

Lifting weight 4000 kg

Make up pin bolt connections.



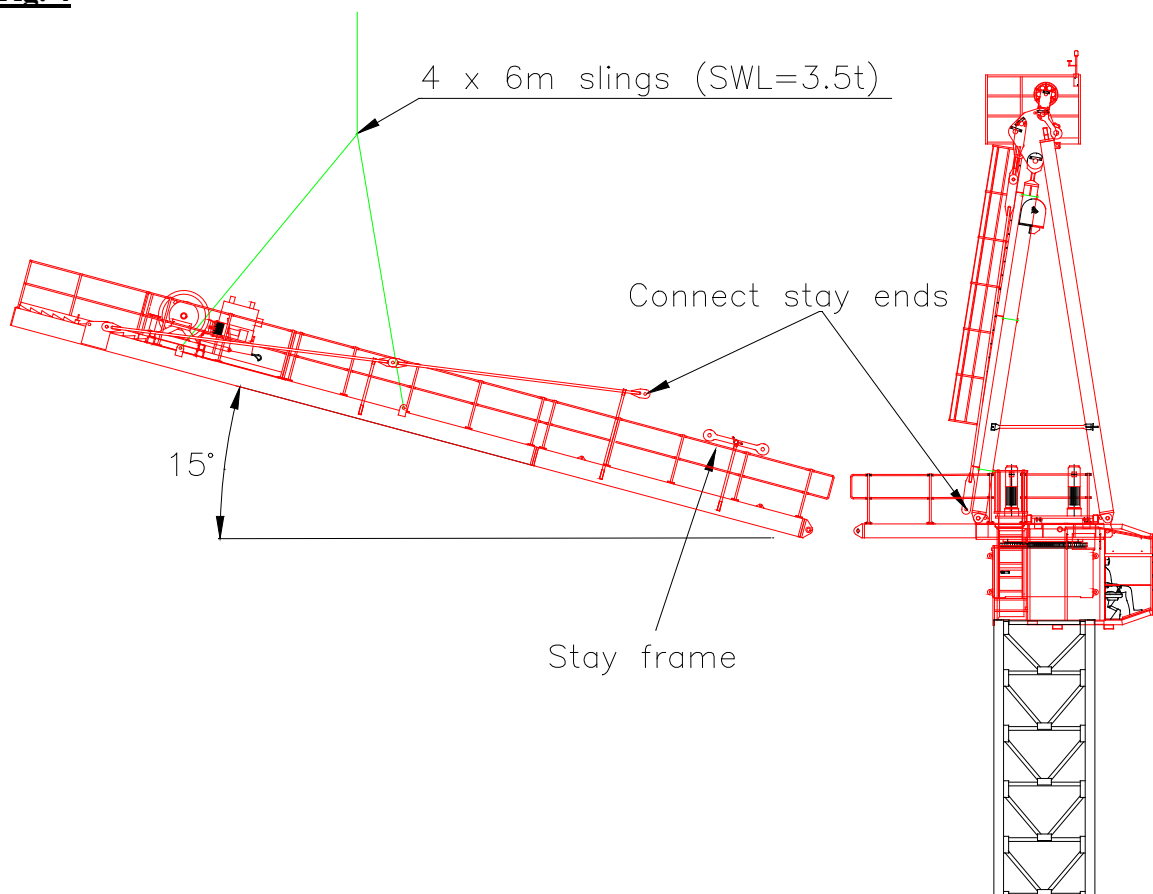
COUNTERJIB

- Lift and fit the pre-assembled counterjib as shown on Fig. 4 using the lifting eyes on the counterjib.

Weight of counterjib to be lifted : 9000 kg (long, 22 m) or 7300 kg (short, 16 m)

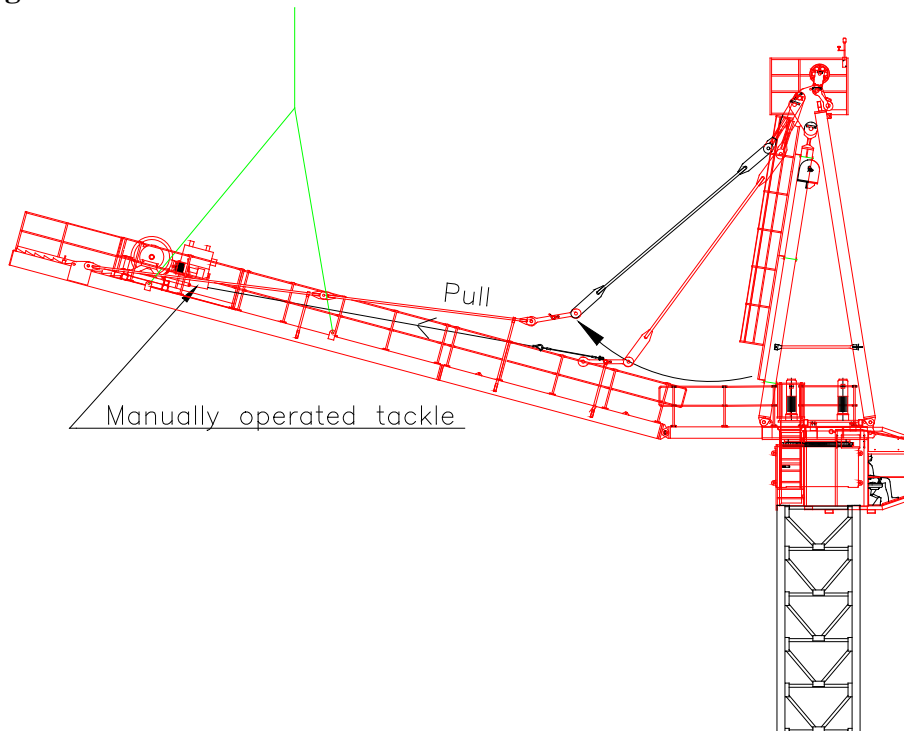
- Make up the pin bolt connections between counterjib and slewing.

Fig. 4



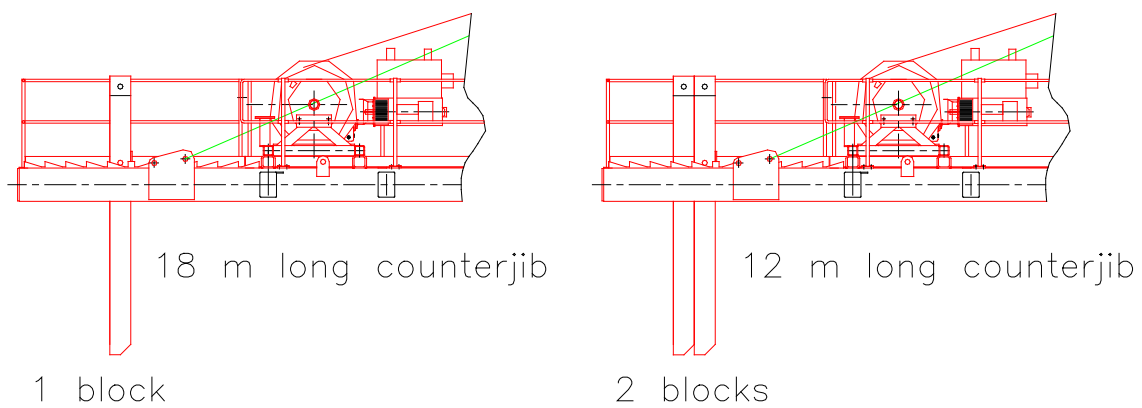
- Place the loose stay frame into its support on the counterjib and lift the stay bars hanging in the top tower to connection with the stay frame.
- The stay tensioning equipment can now be operated. Pull the stay frame from point A to B by operating the tackle to pull direction. Make up the pin bolt connections.

Fig. 5



- Ease off the tensioning equipment, then the mobile crane. Check that the counterjib is hanging properly before finally releasing and removing the equipment.

Fig. 6



- Before lifting and fitting the pre-assembled jib, lift and place one 3 tons counterweight block (two blocks for a short counterjib) onto the counterjib and place it as shown in Fig. 6.
- From this point in the erection sequence all jib combinations up to 57.6 m (10 sections) can be lifted as one unit and fitted to the crane.

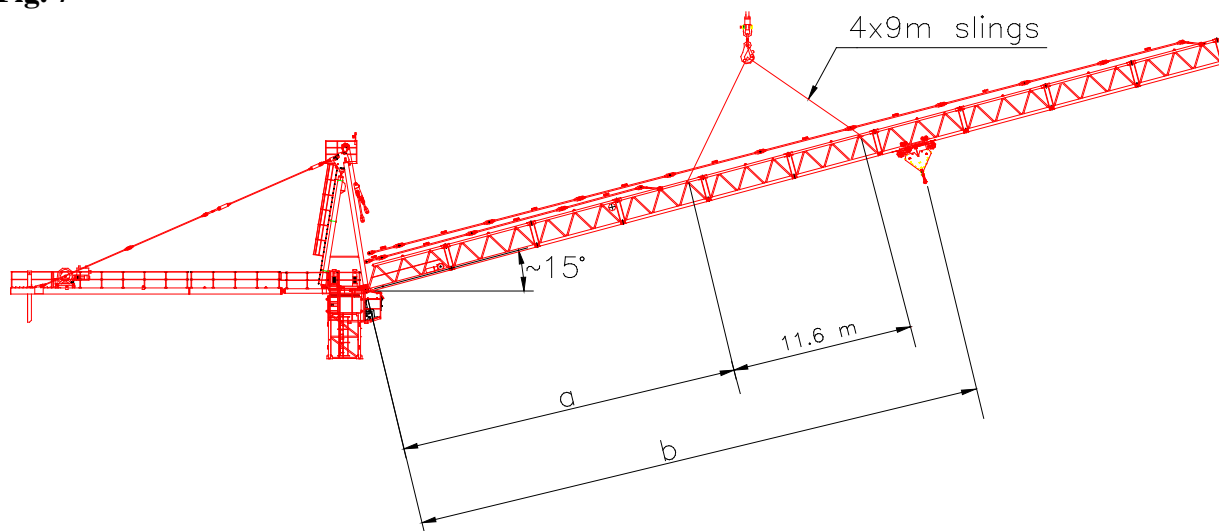
JIB

IMPORTANT: Jib lengths up to 57.6 m reach can be lifted as one unit. If the crane should be fitted with a longer jib, the jib must be erected in two stages.

Procedure :

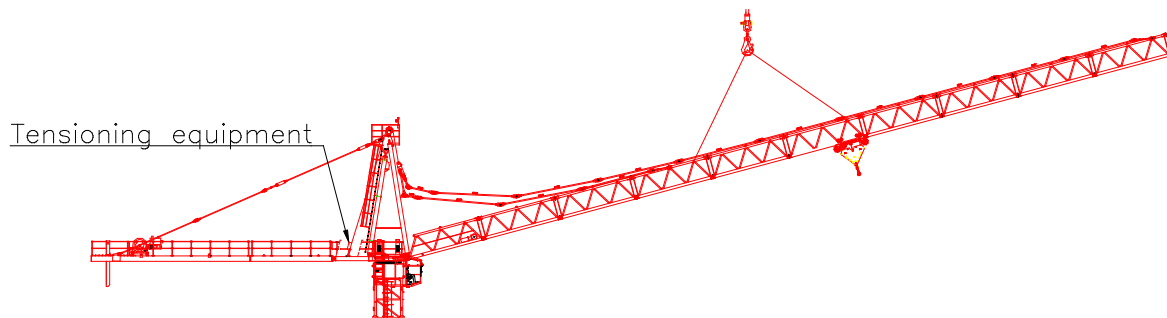
- Lift up the topmost parts of the stays from their position on the slewing frame using the stay tensioner equipment to a suitable height (approx 1.5m) to allow for connection with the inner and outer stays, see Fig. 7.
- Lift the complete jib assembly to connection height, see Fig. 7.

Fig. 7



Jib length [m]	Sling position a [m]	Trolley position b [m]	Mobile force [ton]	Mobile force +10% [ton]
34.4	12.6	14.2	9600	10500
40.2	14.5	13.1	10700	11800
46.0	18.4	35.0	11500	12700
51.8	20.3	33.5	13400	14800
57.6	28.0	35.7	14200	15600
63.4	28.0	35.7	14200	15600
69.2	28.0	35.7	14200	15600
75.0	28.0	35.7	14200	15600

- Make up the pin bolt connections between inner and outer stay point, see Fig. 8.
- The stay tensioning equipment can now be operated. Pull the stay up to connection height by operating the tackle and make up the pin connection between stay and tower, see Fig. 8.

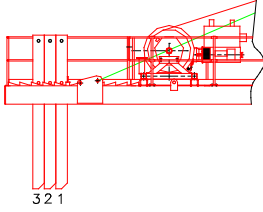
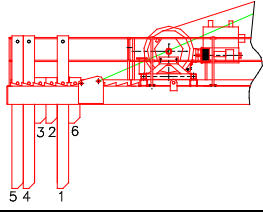
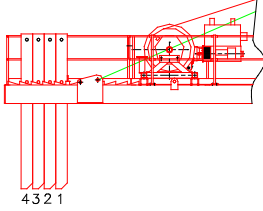
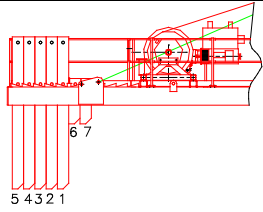
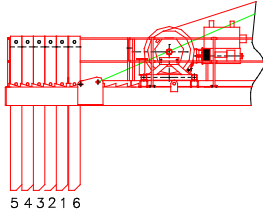
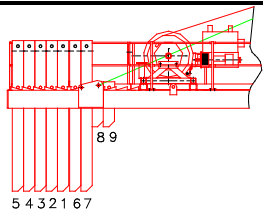
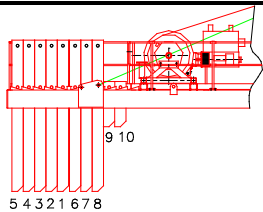
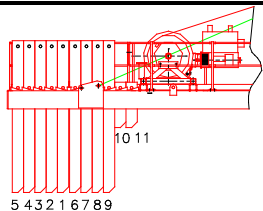


- Add counterweight according to the actual jib length as follows.
 - ***Cranes erected with jib length up to and included 51.8m***
 - Fit the remaining counterweight blocks according to the next pages.
 - ***Cranes erected with jib length over 57.6m***
 - Add 15 tons counterweight (5x3 tons blocks) before lifting the remaining jib sections.

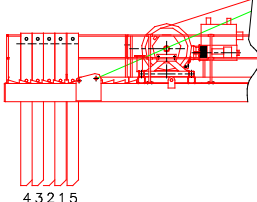
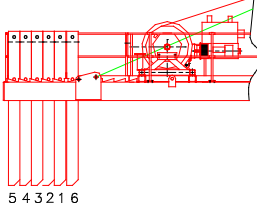
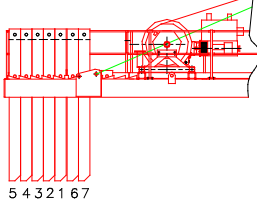
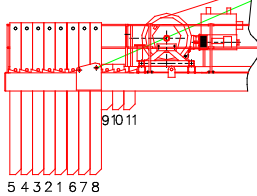
Note: Always place the counterweight in sequence and position as shown on the counterweight combination sheets starting with block no. 1 and upwards.

- Ease off the tensioning equipment, then the mobile crane and check that the jib is hanging properly before finally releasing and removing the equipment.

Counterweight combination sheet – LONG COUNTERJIB

Jib length [m]	Counterblocks [kg]	Fitting sequence and position
34.4	3 x 3000	 <p>3 2 1</p>
40.2	3 x 3000 3 x 500	 <p>3 2 6 5 4 1</p>
46.0	4 x 3000	 <p>4 3 2 1</p>
51.8	5 x 3000 2 x 500	 <p>6 7 5 4 3 2 1</p>
57.6	6 x 3000	 <p>5 4 3 2 1 6</p>
63.4	7 x 3000 2 x 500	 <p>8 9 5 4 3 2 1 6 7</p>
69.2	8 x 3000 2 x 500	 <p>9 10 5 4 3 2 1 6 7 8</p>
75.0	9 x 3000 2 x 500	 <p>10 11 5 4 3 2 1 6 7 8 9</p>

Counterweight combination sheet – SHORT COUNTERJIB

Jib length [m]	Counterblocks [kg]	Fitting sequence and position
34.4	5 x 3000	 <p>4 3 2 1 5</p>
40.2	6 x 3000	 <p>5 4 3 2 1 6</p>
46.0	7 x 3000	 <p>5 4 3 2 1 6 7</p>
51.8	8 x 3000 3 x 500	 <p>9 10 11 5 4 3 2 1 6 7 8</p>

FINAL STAGES

- Make up all electrical connections. Connect the height/depth stops on the hoist winch.
- Reeve the trolley rope, see Fig. 9, and remove the trolley security clamp.
- Reeve the hoist rope, see Fig. 10, and make up the jib swivel connection.

Fig. 9

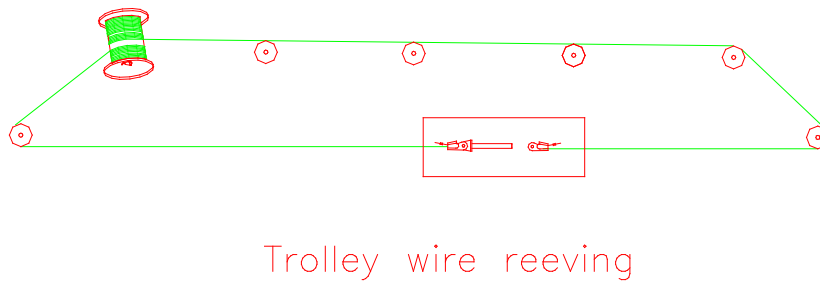
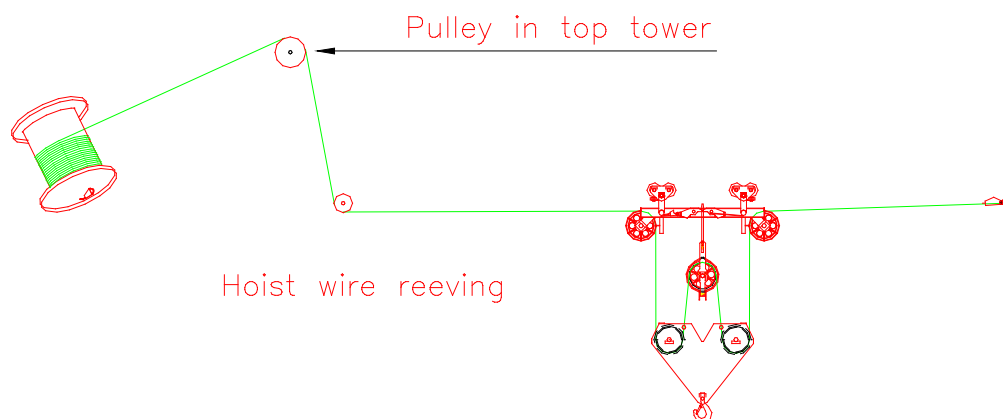
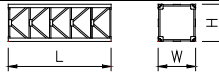
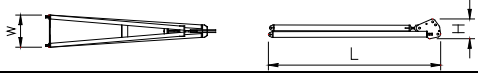
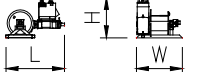

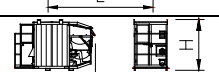
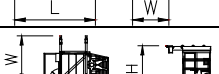

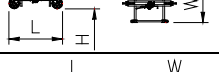
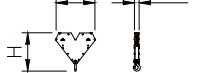

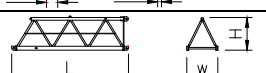
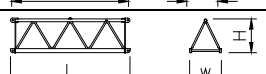
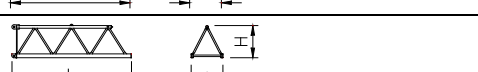
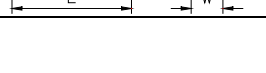

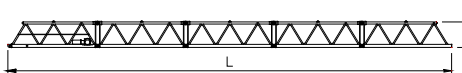


Fig. 9



- Check all motions and check the line part change-over system.
- Carry out an inspection. Check connections bolts between units for 100% torque.
- Check the paint work for erection damage.
- The crane is now ready for operational check, adjustments and test loading.

Unit sizes and weights

Description		Dimension			Weight [kg]	
		L [m]	W[m]	H [m]		
M22-2 mast, 6 m			6.000	2.186	2.186	4020
Top tower			9.100	1.700	1.050	1680
Hoist winch			2.600	1.920	1.690	2300
Slewing and masthead			3.600	2.000	2.870	8500
Driver's cabin, type K5			3.830	1.720	2.400	1600
Driver's cabin and suspension			3.830	2.600	2.460	2000
Trolley			2.630	1.860	1.000	465
Hook block			1.750	0.200	1.700	570
Intermediate block			1.600	0.200	0.550	75
Jib, inner section			5.800	1.750	1.670	1225
Jib, middle section			5.800	1.630	1.670	1080
Jib, tip section			5.800	1.750	1.670	760
Jib complete with trolley winch, trolley/hook	75.0 m		75.500	1.750	1.670	13900
	69.2 m		69.700	1.750	1.670	13140
	63.4 m		63.900	1.750	1.670	12350
	57.6 m		58.100	1.750	1.670	11600
	51.8 m		52.300	1.750	1.670	10680
	46.0 m		46.500	1.750	1.670	9600
	40.2 m		40.700	1.750	1.670	8550
34.4 m	34.900	1.750	1.670	7330		
Counterjib section, 6 m			6.000	2.120	0.500	1420
Counterjib section, 12 m			11.700	2.120	1.850	3066
Counterjib complete with hoist winch.			18.700	2.120	1.850	8075