

QUY260F/20. CY

ZOOMLION ® Crawler Crane

QUY260

QUY260/20.CY



CRAWLER CRANE

QUY260

Operating manual

QUY260CR/20.1

2013.10

The operating manual is part of the crane!

Always keep on hand!

**Comply with road travel and crane operating
regulations!**

Zoomlion Heavy Industry Science & Technology Co.,Ltd

Contents

0 Foreword	0066340-200-00Y.C
1 Safety instructions.....	0066340-200-01Y.C
2 Description of the crane.....	0066340-200-02Y.C
2.1 Product model	
2.1.1 Product name plate and its position	
2.1.2 Engine type and its manufacturer	
2.2 Terminology	
2.2.1 Boom configuration	
2.2.2 Description of component parts	
2.3 Product description	
2.3.1 Crawler travel gear	
2.3.2 Crane superstructure	
2.3.3 Overall dimensions	
2.4 Technical data	
2.4.1 Main technical parameter	
2.4.2 Type of load hook and applicable rope reeving	
2.4.3 Hoisting rope reeving and specification of wire rope	
2.4.4 Lifting height	
2.4.5 Lifting capacity charts	
3 Safety Guidelines.....	0066340-200-03Y.C
3.1 Operational planning	
3.2 Safety—Technical Notes	
3.2.1 Safety Instructions	
3.2.2 Selecting an operating site	
3.2.3 Slopes and trenches	
3.2.4 Permissible ground pressure	
3.2.5 Checking safety measures	
3.2.6 Crane operation with a load	
3.2.7 Electromagnetic influences	
3.2.8 Safety signs	

3.2.9 Hand signals for controlling crane operations

4 Crane operation 0066340-200-04Y.C

4.1 Operating and control instruments

4.1.1 Overview of crane operator's cab

4.1.2 Left control box

4.1.3 Right control box

4.1.4 Control panel assy

4.2 Instruction for digital display system

4.2.1 Load moment limiter

4.2.2 Display of control system

4.3 Startup of crane

4.3.1 Adjustment of crane operator's seat

4.3.2 Checks before startup

4.3.3 Turn on power supply

4.3.4 Start engine

4.4 Safety devices

4.4.1 Emergency stop button

4.4.2 Battery master switch

4.4.3 Load moment limiter

4.4.4 Boom angle indicator

4.4.5 Derrick limiter

4.4.6 Lowering limiter

4.4.7 Hoisting limiter

4.4.8 Support cylinder locking device

4.4.9 Overflow valve

4.4.10 Anemometer

4.5 Crane operation

4.5.1 Operation of traveling mechanism

4.5.2 Operation of crane winches

4.5.3 Operation of synchronizing A-frame and main boom derricking winch and

synchronizing reeving winch and working winch

4.5.4 Operation of slewing mechanism

4.5.5 Simultaneous operation

4.5.6 Operation of movements of crane operator's cab

4.5.7 Auxiliary remote control box

4.5.8 Undercarriage remote control box

4.5.9 Operation of A-frame erection cylinder and mounting cylinder on A-frame

4.5.10 Emergency control box

4.6 Rope reeving

4.6.1 Heavy duty boom (S)

4.6.2 Light duty boom (SL)

4.6.3 Fixed jib on heavy duty boom (SF)

4.6.4 Luffing jib on heavy duty boom (SW)

4.6.5 Main boom derricking rope guidance and reeving

4.6.6 luffing jib derricking rope guidance and reeving

5 Assembly and dismantling 0066340-200-05Y.C

5.1 Safety-technical notes

5.1.1 Notes on assembly

5.1.2 Checking safety measures

5.1.3 Inspection of wire rope, load hook, rope pulley and anchoring rods

5.1.4 Connecting or disconnecting the hydraulic lines with quick-release couplings

5.1.5 Setting-up and taking-down

5.2 A-frame

5.2.1 Connecting the hydraulic lines to mounting cylinder on A-frame

5.2.2 Operation of A-frame

5.3 Attaching the crawler carriers

5.3.1 Unloading of basic machine

5.3.2 Attaching the first crawler carrier

5.3.3 Attaching the second crawler carrier

5.3.4 Connecting the hydraulic lines to the crawler carrier

5.4 Attaching the central counterweight

5.5 Assembling the rear counterweight

5.6 Available boom configurations for crawler crane QUY260

5.7 Boom configuration

5.7.1 Heavy duty boom (S)

5.7.2 Light duty boom (SL)

5.7.3 Fixed jib on heavy duty boom (SF)

5.7.4 Heavy fixed jib on heavy duty boom (SFV)

5.7.5 Luffing jib on heavy duty boom (SW)

5.8 Assembly and dismantling of heavy duty boom (S)

5.8.1 Preparations for assembly

5.8.2 Assembling main boom

5.8.3 Connect electrics to main boom

5.8.4 Erecting main boom

5.8.5 Lowering and disassembling the main boom

5.9 Assembly and dismantling of main boom with luffing jib (SW)

5.9.1 Preparations for assembling luffing jib

5.9.2 Assembling main boom with luffing jib

5.9.3 Connect electrics to luffing jib

5.9.4 Erection and set-down of main boom with luffing jib

5.10 Assembly and dismantling of light duty boom (SL)

5.11 Assembly and dismantling of main boom with fixed jib (SF)

5.11.1 Preparations

5.11.2 Assembling main boom with fixed jib

5.11.3 Connect electrics to fixed jib

5.11.4 Erecting and lowering main boom with fixed jib

5.12 Assembly and dismantling of main boom with heavy fixed jib (SFV)

5.13 Assembly and dismantling of tip boom

5.14 Transport dimensions and weights of main components

5.15 Requirement for crane transport

6 Maintenance 0066340-200-06Y.C

6.1 General

6.1.1 Crane maintenance

6.1.2 Requirements for crane inspection

6.1.3 Attached tools for maintenance

6.2 Superstructure maintenance and inspection plan

6.2.1 Maintain and inspect superstructure every day or every 5 hours

6.2.2 Maintain and inspect superstructure every month or every 100 hours

6.2.3 Maintain and inspect superstructure every 3 months or every 250 hours

6.2.4 Maintain and inspect superstructure every 6 months or every 600 hours

6.3 Undercarriage maintenance and inspection plan

6.3.1 Maintain and inspect undercarriage every day or every 5 hours

6.3.2 Maintain and inspect undercarriage every month or every 100 hours

6.3.3 Maintain and inspect undercarriage every 3 months or every 250 hours

6.3.4 Maintain and inspect undercarriage every 6 months or every 600 hours

6.4 Boom frame maintenance and inspection plan

6.5 Maintenance and inspection for engine

6.6 Instructions for lubrication and oil change

6.6.1 Hydraulic oil

6.6.2 Gear oil

6.6.3 Lubricating grease

6.6.4 Engine oil

6.6.5 Fuel

6.6.6 Coolant

6.6.7 Lubrication and maintenance of crane in irregular conditions

7 Crane inspections 0066340-200-07Y.C

7.1 General

7.2 Inspection of steel bearing structures

7.3 Inspection of hosting and luffing winches

7.3.1 Inspections

7.3.2 Requirements for monitoring the winches

7.4 Inspection of load hook

7.5 Inspection of rope pulleys

7.6 Inspection and maintenance of anchoring rods

7.7 Inspection and maintenance of wire rope

7.7.1 Handling and transport of wire rope

7.7.2 Inspection of wire rope

7.7.3 Discard of wire rope

7.7.4 Maintenance and care of wire rope

7.8 Inspection of oil and fuel tanks

7.9 Inspection of load bearing components

7.10 Inspection of engine

8 Additional equipment. 0066340-200-08Y.C

8.1 Air conditioning

8.1.1 Control panel for air conditioning

8.1.2 Methods for operating air conditioning

8.1.3 Maintenance of air conditioning system

8.2 Media Player

9、Crane inspection log

Foreword

Thank you for purchasing ZOOMLION crawler crane produced by Changsha Zoomlion Heavy Industry Science & Technology Development Co., Ltd. We are glad to provide high quality and high-efficiency service for you.

The operating manual are intended to put you in a position to operate the crane safely and utilize its capabilities to the fullest extend possible.

Certain terms are used in the operating manual, and in order to avoid misunderstandings while operating, these terms should be used consistently.

Danger: Only qualified and especially trained personnel are permitted to work on the crane!

If this is not assured, the chance of causing a serious accident is greatly increased!

All regulations and guidelines applicable to the job site, such as accident prevention regulations and all guidelines and regulations stated in the Operating Manual must be strictly adhered to.

All accident prevention and operating guidelines and regulations, etc. assume that the crane is strictly used for lifting and transporting of loads, which are not stuck. Any other application or use does not constitute specified and proper use.

Any risks associated with unspecified and improper use are the sole responsibility of the crane's owner, operator or user.

Using this instructions in the manual:

- makes it easier to become familiar with the crane
- avoids malfunctions due to improper operation

Observing these instructions in the manual:

- increases reliability in operations
- extends the service life of the crane
- reduces repair costs and down-time

Always keep the operating manual handy in the driver's and crane cab-it is an integral part of the crane. Operate this crane if you are well familiarized with the capabilities and limitations of the crane, and always follow these operating instructions.

If you have received additional information about the crane from us, e.g. in the form of technical information letters, then this information must also be followed and kept with the operating manual.

If there is anything in the operating manual or the individual chapters that you do not understand, please do no hesitate to ask us or our agents before you begin operation.

No parts of the operating manual may be copied or distributed, nor used for competitive purposes.

All rights are expressly reserved in accordance with copyright laws.

The content with respect to the safety is marked with “”, the safety instructions involved in the book are only the conventional contents.

The operating manual must be read and the regulations in it must be observed by all persons operating, maintaining, or otherwise working in any capacity on this crane.

The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded. Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer.

A thorough, annual inspection of the hoisting machinery shall be made by a competent person, or by a government or private agency recognized by the U.S. Department of Labor. The employer shall maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment.

Notes:

The following terms that are used in the operating manual “Note”, “Caution”, and “Danger” are intended to point out certain **important rules of conduct** to all persons who work with the crane.

The term “Note” is used whenever the observance of certain instructions or notes is economically meaningful to the utilization of the crane.

The term “Caution” is used whenever damage to the crane can occur if the operating instruction(s) is not observed and adhered to.

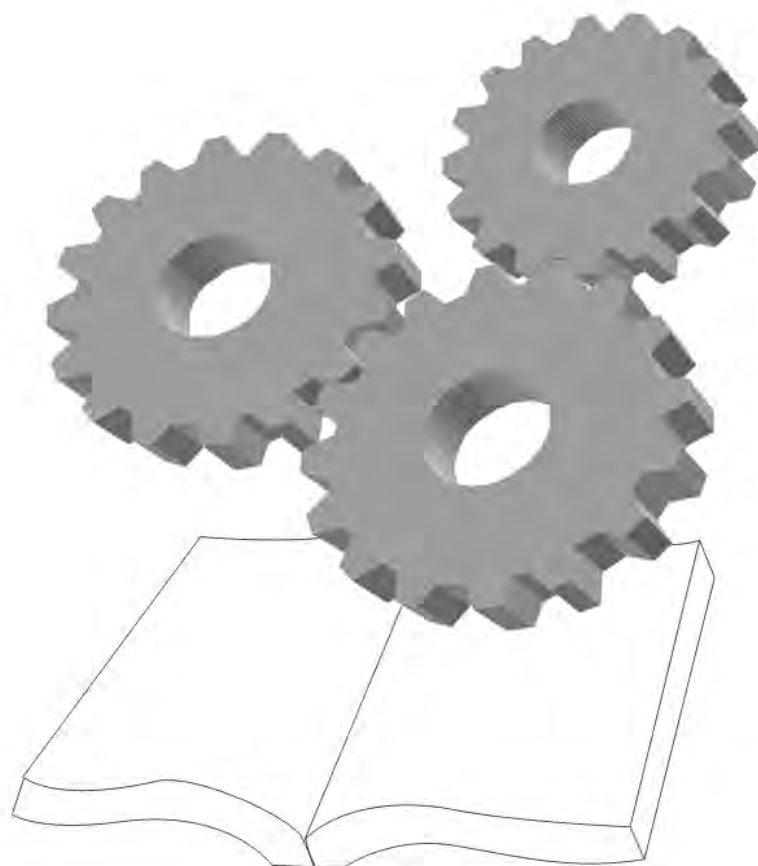
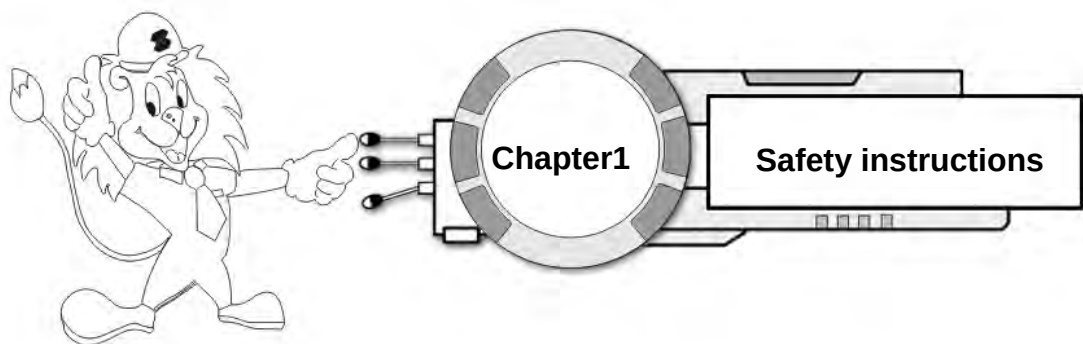
The term “Danger” is used whenever the nonobservance of the warning given may insure or lead to the death of persons and damaged to the crane.

Safety device

The safety devices built into the crane system deserve your special attention. They must always be checked to see that they are functioning properly. If they do not function or function incorrectly, the crane may not be operated. Your motto must always be **Safety First**.

Caution:

When welding work is conducted on crane, the operator should unplug all power source plugs of controllers, otherwise, he should bear all consequences incurred.



ZOOMLION

1.1 Notes

- a) Read this manual and familiarize yourself with any associated documentation before operating this product.
- b) Ensure that a copy of this manual is available for any persons installing, using, maintaining or repairing this equipment.

Training should be provided to ensure safe working practices.

Initial commissioning and starting must only be undertaken by a competent person who has read and fully understands the information provided in the manual pack.

- c) To avoid the risk of electric shock always isolate this equipment from the supply prior to carrying out any maintenance adjustment or removing any guards or covers.
- d) Always follow the procedures outlined in the operating and maintenance instruction.
- e) If in doubt ask, do not take personal risk.
- f) Only trained personal can be allowed to install, set, operate, maintain, and decommission this equipment.

1.2 Alarms and warnings

- a) You can be injured if you do not obey the safety instructions as indicated on warning stickers.
- b) Ensure that safety instructions and warnings attached to the plant are always complete and perfectly legible
- c) Keep warnings and instruction labels clean.
- d) Replace unreadable or missing labels with new ones before operating the plant. Make sure replacement parts include warning or instruction labels where necessary.



Caution:

To assure personnel safety, all safety instructions and warnings should be observed; for the position of labels and warnings, please refer to Chapter 3 "Safety Guidelines"

1.3 Component Safety Features

- a) Do not use this equipment with guards removed or incorrectly fastened.
- b) Do not use this equipment with safety devices maladjusted or removed.
- c) Do not use this equipment before the portable fire extinguisher with a basic minimum extinguisher rating of 5 BC is installed in the cab and minimum 10 BC outside the cab.

1.4 Features for Operator Saf

- a) Safety components – crane emergency stop buttons. Ensure all Guards are bolted down.

- b) Steps, handrails, tread plates and fixed guards are provided where personnel are required to climb on the machine.

1.5 Environmental safety

- a) It is essential that the service intervals detailed in the maintenance procedures are followed to ensure that engine emission are kept to a minimum.
- b) Consumable materials
 - 1) Diesel spillages must be dealt with immediately.
 - 2) Only use the Lubricating Oils recommended in the maintenance schedule.
 - 3) Local and National regulations must be observed when disposing of waste.
 - 4) Improperly disposing of waste can threaten the environment and ecology and is illegal.
 - 5) Potentially harmful waste used on this equipment includes such items as oil, fuel, coolant, filters and batteries, ect.
 - 6) Use leak proof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.
 - 7) Do not pour waste onto the ground, down a drain or into any water source.
 - 8) Ensure that all consumables and replaced parts are disposed of safely and with minimum environmental impact.
- c) Machine disposal. This machine must only be disposed of at a specialist machine breaker.

1.6 Personal protective Equipment (PPE)

- a) Loose or baggy clothing can get caught in running machinery.
- b) Where possible when working close to engines or machinery, only do so when they are stopped. If this is not practical, remember to keep tools, test equipment and all other parts of your body well away from the moving parts.
- c) For reasons of safety, long hair must be tied back or otherwise secured, garments must be close fitting and no jewellery such as rings may be worn.
- d) Always wear correctly fitting personal protective equipment.
- e) Recommended personal protective equipment includes:
 - 1) Hard Hat
 - 2) Safety Glasses/Goggles
 - 3) Hearing Protection
 - 4) Close Fitting Overalls
 - 5) Safety Boots

6) Industrial Gloves

7) High Visibility Vest or Jacket

1.7 Measured Noise Level

The product and local conditions will affect the noise levels.

The sound pressure level and sound power level, measured using EN13000 Annex G and 2000/14/ EC standards is respectively 73.9dB (A) and 107dB (A)

The sound pressure level measured using ISO 7731 at the position 3'3" away from the warning device is 97.7dB(A).

1.8 Vibration Levels

Suitable seating has been installed to reduce the risk of whole body vibrations, in line with current industry standards.

The crane body vibrations, measured using ISO 2631—1 under normal operating condition, is A(1): 1.3m/s², A(4): 0.6m/s², A(8): 0.4m/s²

1.9 Organizational Safety Measures

- a) This vehicle must only be driven and the crane operated by a suitably qualified operative who holds a current license in line with National/ International legislation.
- b) Understand the service procedure before doing work. Keep area clean and dry.
- c) Never lubricate, clean, service or adjust machinery while it is moving(excluding central lubrication).
- d) Keep hands, feet and clothing clear of power driven parts and in running nip-points.
- e) Keep all parts in good condition. Ensure that all parts are properly installed. Fix damage immediately. Replace worn and broken parts. Removed any build up of grease, oil and debris.
- f) Disconnect battery ground cable before making adjustments on electrical systems.
- g) Disconnect battery ground cable and ECM connecting cable and unplug all plugs of controllers before welding on machine.
- h) During maintenance only use the correct tool for the job.
- i) Never make any modifications, additions or conversions which might affect safety without the manufacturer's approval.
- j) In the event of safety relevant modifications or changes in the behavior of the machine during operation, stop the machine and lock out immediately and report the malfunction to the competent authority/ person.
- k) No modifications or additions which affect the capacity or safe operation of the equipment shall be made by the employer without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction

plates, tags, or decals, shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

1.10 Personnel Qualification, Requirements and Responsibilities

- a) Any work on and/ or with the machine must be executed by trained, reliable and authorized personnel only.
- b) Maintenance work must only be undertaken by suitable qualified engineers with specialist knowledge of this equipment.
- c) Work on the hydraulic system must be carried out only by personnel with special knowledge and experience of hydraulic equipment.

1.11 Safety Advice Regarding Specific Operational Phases

- a) Standard operation
 - 1) Take necessary precautions to ensure that the machine is used only when in a safe and reliable state.
 - 2) Operate the machine only for it's designed purpose and only if all guarding, protective and safety orientated devices, emergency shut-off equipment, sound proofing elements and exhausts, are in place and fully functional.
 - 3) Ensure that any local barriers erected to stop unauthorized entry to this equipment are in place.
 - 4) Before starting the engine ensures it is safe to do so.
- b) Malfunction

In the event of any malfunction or operational difficulty, stop the machine immediately.
- c) Unguarded areas
 - 1) In-running nip points on moving machinery can cause serious injury or even death.
 - 2) Do not reach into unguarded machinery. Your arm could be pulled in and amputated.
 - 3) Switch off the machine before removing any safety devices or guarding.
 - 4) Limit access to the machine and its surrounds where appropriate erect barrier guards to reduce the risk of residual mechanical hazards, falling lifted loads.

1.12 Machine maintenance and repairs

Observe the adjusting, maintenance and intervals set out in these operating instructions, except where:

- 1) Warning, horn/ light/ gauge or indicator calls for immediate action.
- 2) Adverse conditions necessitate more frequent servicing.
- 3) Always read instructions supplied with replacement of parts and equipment. Ensure

only properly trained personnel undertake these tasks.

a) Isolation

When undertaking maintenance and repair work, the plant must be first made safe.

- 1) Switch off the engine and remove the ignition key.
- 2) Attaching a warning sign(s) to the plant in appropriate positions.

b) Maintenance site conditions

Prior to starting any maintenance work, ensure the machine is positioned on stable and level ground and has been secured against inadvertent movement and bucking.

c) Replacement and removal of components

- 1) Always observe handling instructions itemized in this manual, the Original Equipment Manufacturer's Manuals or the Spare Parts Supplier's instructions.
- 2) Never allow untrained staff to attempt to remove or replace any part of the plant.
- 3) The removal of large or heavy components without adequate lifting equipment is prohibited.
- 4) To avoid the risk of accidents, individual parts and large assemblies being moved for replacement purposes should be carefully attached to lifting tackle and secured. Use only suitable and technically adequate lifting gear supplied or approved by the supplier.
- 5) Never work or stand under suspended loads.
- 6) Limit access to the machine and its surrounds where appropriate erect barrier guards to reduce the risk of residual mechanical hazards, falling lifted loads.

d) Climbing, falling

- 1) Falling from and/ or onto this machine could cause injury or even death.
- 2) Never climb on the machine whilst it is in operation.
- 3) Always keep the area around the machine clear of debris and trip hazards.
- 4) Beware of moving equipment in the vicinity of the machine.
- 5) For carrying out overhead assembly work always use specially designed or otherwise safety-oriented ladders and working platforms.
- 6) Only use any walkway/ platforms provided on the machine or on an approved safe and secure platform.
- 7) Only use CE certified safety harness when reaching any points 3'3" or more above the ground level.
- 8) Keep all handles, steps, handrails, platforms, landing and ladders free from dirt, oil,

snow and ice.

e) Safety consideration during advanced maintenance

- 1) Prior to undertaking all but normal planned maintenance activities, it is essential that a method statement regarding safe working practices for the job in hand is produced.
- 2) Restrict access to the maintenance area to essential staff only. Where appropriate erect barrier guards and post warnings.
- 3) The fastening of loads and instructing of crane operators should be entrusted to qualified persons only.
- 4) If a marshal is used to provide instructions, the marshal must be within sight or sound of the operator with an all round view of the operation.
- 5) Always ensure that any safety fitment such as locking wedges, securing chains, bars or struts are utilized as indicated in the operating instructions.
- 6) Particularly make sure that any part of the plant raised for any reason is prevented from falling by securing in a safe reliable manner.
- 7) Never work under unsupported equipment.
- 8) Never work alone.

f) Safety consideration during cleaning

- 1) This equipment must be isolated prior to cleaning.
- 2) Do not direct power washers near or into control boxes and devices.
- 3) After cleaning, examine all fuel, lubricant, and hydraulic fluid lines for leaks, loose connections, chafe marks and damage. Any defects found must be rectified without delay.

g) Removal of safety devices and guards

- 1) All safety devices (control device or guard) temporarily removed for set-up, maintenance or repair purposes must be refitted and checked immediately upon completion of the maintenance and repair work prior to operation.
- 2) Never operate the machine with safety devices and guards removed or unsecured.
- 3) Always report any defects regarding guards, safety device or control devices.

h) Safety when refilling

- 1) Only refuel with diesel from approved storage and supply equipment.
- 2) Diesel fuel is flammable.
- 3) Never remove the filler cap, or refuel, with the engine running.
- 4) Never add gasoline or any other fuels mixed to diesel because of increased fire or

explosion risks and damage to the engine.

- 5) Do not carry out maintenance on the fuel system near naked lights or sources of sparks, such as welding equipment or whilst smoking.
- 6) To avoid spillages use drip trays.
- 7) Immediately clear up spilt fuel and dispose of correctly to minimize any environmental impact.

1.13 Special Hazards

1.13.1 Electrical energy

a) External considerations and hazards

When working with the machine, maintain a safe distance from overhead electric lines.

If overhead cables are in the vicinity a risk assessment must be completed prior to operating this equipment.

If your machine comes into contact with a live wire:

- 1) Vacate the area.
- 2) Warn others against approaching and touching the machine.
- 3) Report the incident and have the live wire de-energized.

b) Machine - Electrical

The electrical equipment of the plant is to be inspected and checked at regular intervals. Defects such as loose connections or scorched or otherwise damaged cables must be rectified immediately. Use only original fuses with the specified current rating. Switch off the machine immediately if trouble occurs in the electrical system.

This plant is wired on a negative earth. Always observe correct polarity.

c) Battery

- 1) Always disconnect battery leads before carrying out any maintenance to the electrical system.
- 2) Recharge the battery in a well ventilated area.
- 3) The battery contains sulphuric acid, an electrolyte which can cause severe burns and produce explosive gases.
- 4) Avoid contact with the skin, eyes or clothing.
- 5) No smoking when maintaining battery.
- 6) Wear appropriate PPE.

1.13.2 Gas, dust, steam, smoke and noise

- a) Always operate internal combustion engines out of doors or in a well ventilated area.
- b) If plant is operated for maintenance purposes in an enclosed area, ensure that there is sufficient ventilation or provide forced ventilation.
- c) Observe the regulations in force at the respective site.
- d) Dust found on the plant or produced during work on the plant must not be removed by blowing with compressed air.
- e) Toxic dust/ waste must only be handled by authorized persons dampened, placed in a sealed container and marked, to ensure safe disposal.

1.13.3 Welding or naked flames

- a) Welding, flame cutting and grinding work on the plant must only be carried out if this has been expressly authorized, as there may be a risk of explosion and fire.
- b) No welding should be undertaken on this equipment as it will affect its structural integrity.
- c) Avoid all naked flames in the vicinity of this equipment.

1.13.4 Hydraulic equipment

- a) Work on hydraulic system must be carried out by persons having special knowledge and experience of hydraulic system.
- b) Check all lines, hoses and screwed connections regularly for leaks and obvious damage. Repair damage immediately. Splashed oil may cause injury and fire.
- c) Always relieve pressure from the hydraulic system before carrying out any kind of maintenance or adjustment.
- d) Depressurize all system sections and pressure pipes to be removed in accordance with the specific instructions for the unit concerned before carrying out any repair work.
- e) Hydraulic lines must be laid and fitted properly. Ensure that no connections are interchanged. The fittings, lengths and quality of the hoses must comply with the technical requirements.
- f) Only fit replacement components of a type provided by the manufacturer.
- g) Always practice extreme cleanliness servicing hydraulic components.
- h) Hydraulic fluid under pressure can penetrate the skin causing serious injury. Once the fluid is injected under the skin, seek medical help immediately.
- i) If the fluid is injected under the skin, seek medical help immediately.

1.13.5. Necessary clothing and personal belongings shall be stored in such a manner as to not interfere with access or operation.

1.13.6. Tools, oil cans, waste, extra fuses, and other necessary articles shall be stored in the tool

box, and shall not be permitted to lie loose in or about the cab.

1.13.7. The employer **shall** comply with Power Crane and Shovel Association Mobile Hydraulic Crane Standard No. 2.

1.13.8. Operating and maintenance personnel shall be made familiar with the use and care of the fire extinguishers provided.

1.13.9 Modified, altered and / or repaired cranes

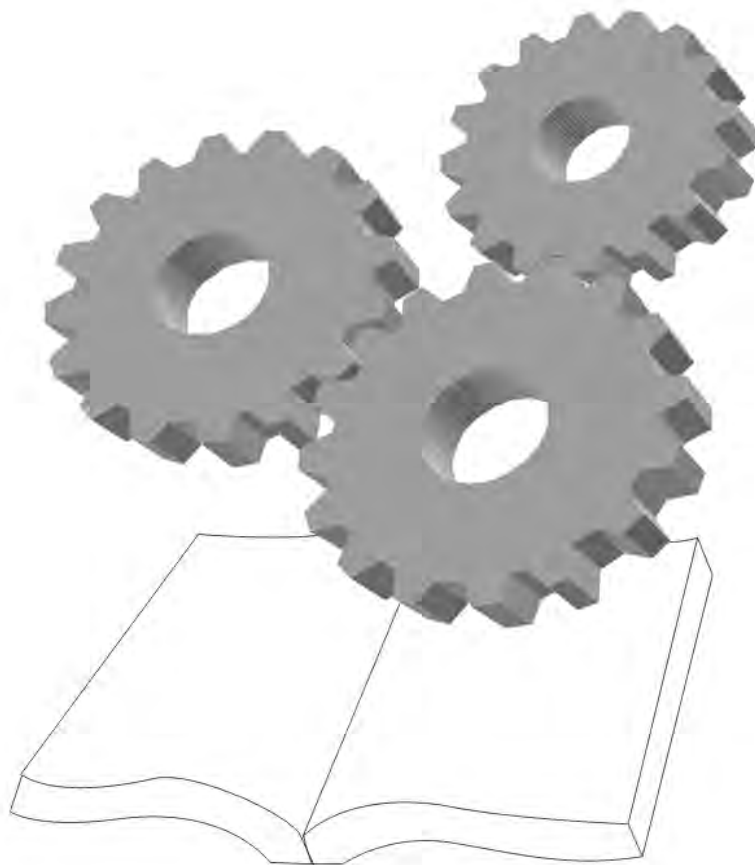
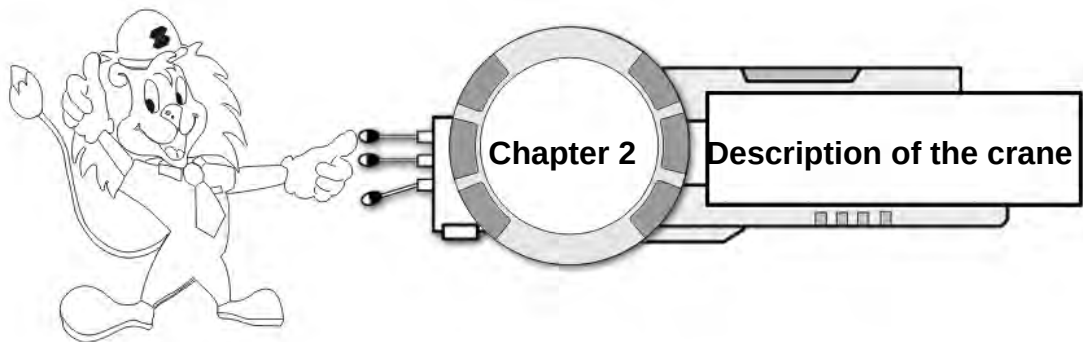
the employer of the crane must conform with the requirements of 1926.1412

1.13.10 Wire rope inspections

the employer of the crane must conform with the requirements of wire rope inspections as per the requirements of 1926.1413

1.13.11 Wire rope—selection and installation criteria

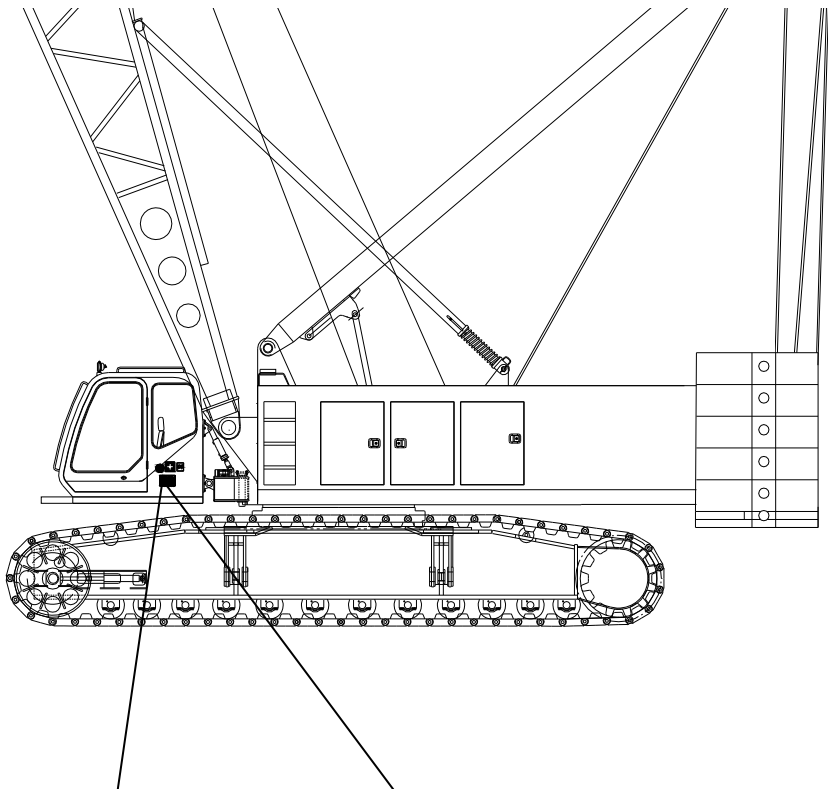
the employer of the crane must conform with the requirements of wire rope selection and installation as per the requirements of 1926.1414



ZOOMLION

2.1 Product model

2.1.1 Product name plate and its position



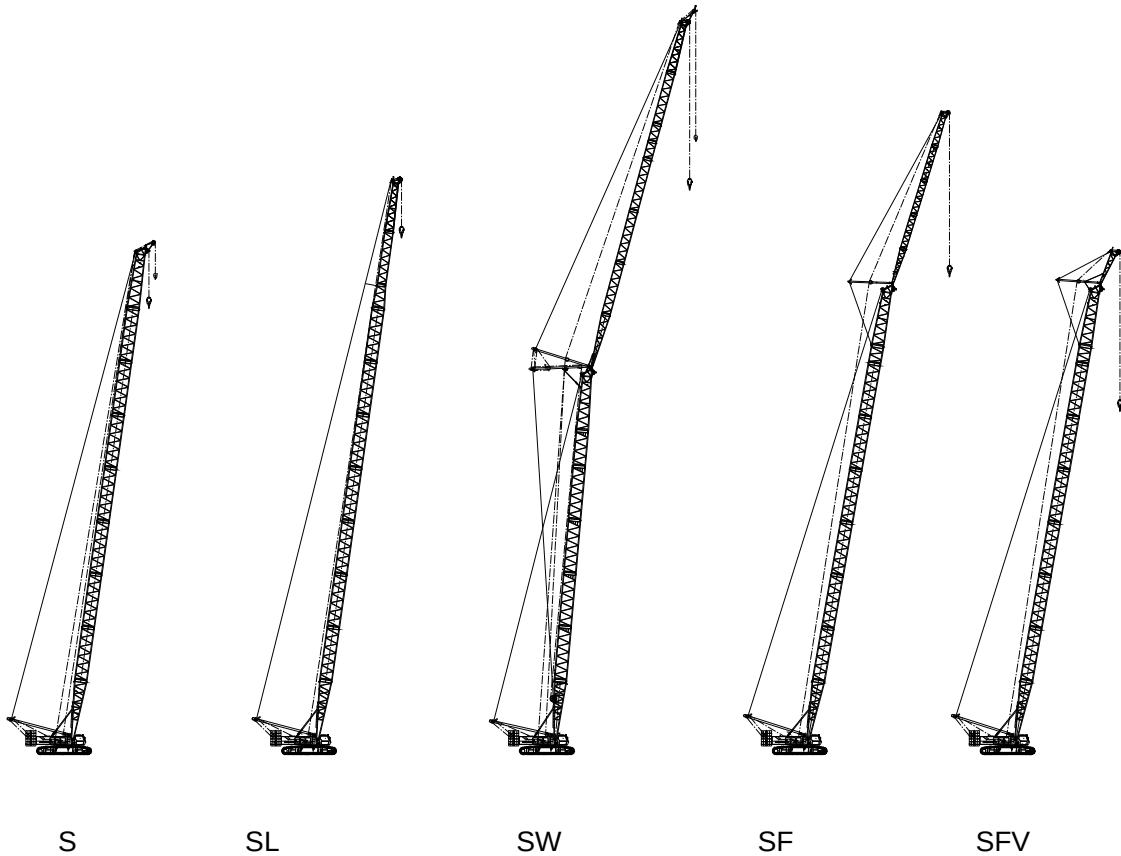
		履带起重机 CRAWLER CRANE	
品牌	Trade Mark	ZOOMLION	
型号	Model	QUY260	
蓄电池信息(电流电压) Information of storage battery		200 (A·H)	24 (V)
最大额定总起重量 Max. Rated Lifting Capacity			
发动机型号 Engine Model		QSL-C305	
发动机额定功率 Engine Rated Power		227 kW	
最大设计总质量 Max. Design Total Mass			
外形尺寸(长×宽×高) Overall Dimensions			
出厂编号 Serial No.			
生产日期 Year of Manufactur		年(Y.)	月(M.)
首次使用日期 Year of first commissioning		年(Y.)	月(M.)
生产地址:中国湖南长沙岳麓区银盆南路361号		Address.:No.361.Yin Pen Road.Changsha Hunan.P.R.China	
中联重工科技发展股份有限公司			
ZOOMLION HEAVY INDUSTRY SCIENCE & TECHNOLOGY DEVELOPMENT CO.,LTD.			

2.1.2 Engine type and its manufacturer

QSL-C305—CUMMINS, USA

2.2 Terminology

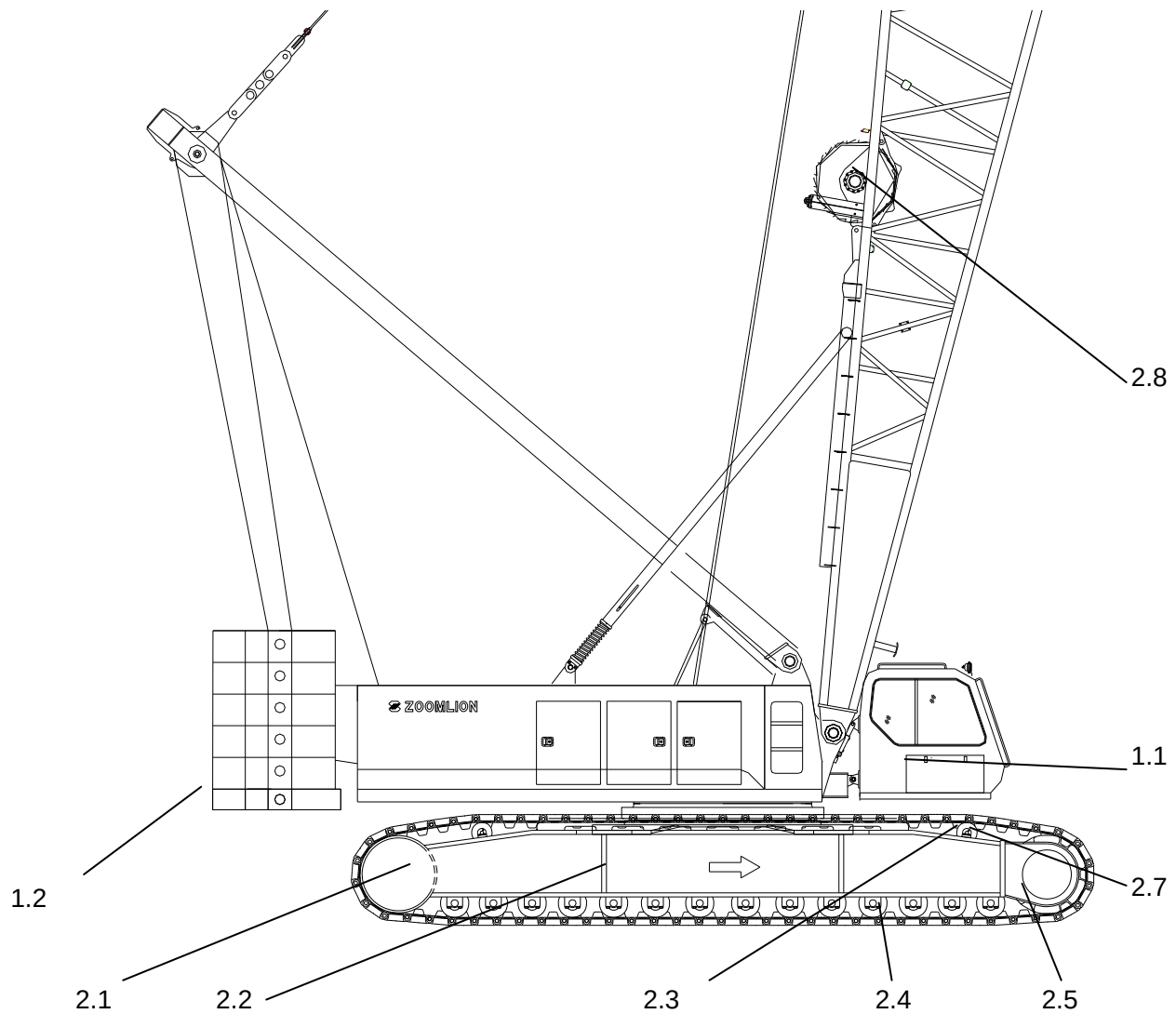
2.2.1 Boom configuration

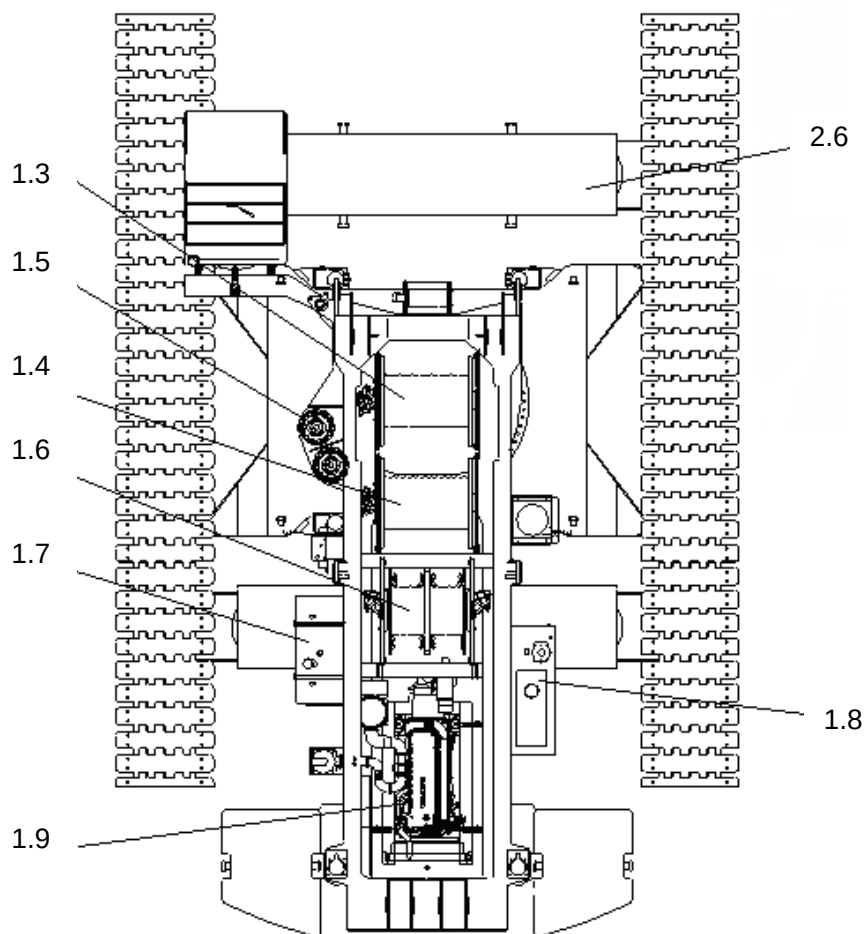


Instructions for boom configuration

Configuration no.	Description	Parameters
S	Heavy duty boom	S = 65'7" ~ 272'3"
SL	Light duty boom	SL = 282'1" ~ 311'8"
SW	Luffing jib on heavy duty boom	S = 75'5" ~ 203'4" W = 68'10" ~ 196'10"
SF	Fixed jib on heavy duty boom	S = 95'1" ~ 252'6" F = 34'9" ~ 98'5"
SFV	Heavy fixed jib on heavy duty boom	S = 134'5" ~ 252'6" FV = 19'8"

2.2.2 Description of component parts





Description of component parts

Part No.	Description	Part No.	Description
1.1	Operator's cab	2.1	Drive sprocket
1.2	Counterweight	2.2	Crawler carrier
1.3	Hoisting winch 1	2.3	Track carrier roller
1.4	Hoisting winch 2	2.4	Track roller
1.5	Slewing reducer	2.5	Driven sprocket
1.6	Main boom derricking winch	2.6	Central counterweight
1.7	Diesel oil tank	2.7	Track pad
1.8	Hydraulic oil tank	2.8	Luffing jib derricking winch
1.9	Engine		



Note:

The luffing jib derricking winch (2.8) is optional.

2.3 Product description

2.3.1 Crawler travel gear

Travel gear

Maintenance-free crawler travel gear with 3'11" track pad;

Distance between track center: 20'11"

Travel device

The crawlers driven independently through hydraulic motor and planetary reducer;

Allow such traveling moments available as traveling straight ahead/ backwards, turning on the spot, turning with a crawler and differential steering

Drive performance

Infinitely variable speed from 0 to 0.98km/h

2.3.2 Crane superstructure

Slewing table

Self-manufactured and high-rigid welded structure of high-strength structural steel;

Connected to undercarriage via a 3-row roller slewing ring for 360°continuous rotation

Crane engine

6-cylinder four cycle diesel engine, manufactured by America Cummins, type QSL9-C305;

displacement : 8.9L water-cooled, turbo charge, air cooling(air- air)

Rated power/rotational speed: 227kW (305HP) / 2000rpm;

Maximum torque/ rotational speed: 1505N.m /1400rpm

Type of starting equipment and voltage if applicable----- staring motor and 24V voltage

Type of generating equipment including---24V DC, negative ground, 2 batteries of 195AH each.

fuel tank capacity-----700L

altitude limitations-----≤9997'5"

cooling system refill capacity-----44L

lubrication oil refill capacity-----23L

slope operation limitations-----30% of grade

Crane drive

Driving force, provided by diesel engine, is transmitted by transfer case to a dual variable pump, a piston variable pump and a dual gear pump.

Crane control

CAN bus technology connecting engine, PLC controller and digital display;

All motions controlled independently by two 4-way control levers.

Winches

Used in hoisting mechanism and derricking mechanism

Slewing mechanism

Hydraulically powered by axial piston variable displacement pump and planetary reducer with spring-loaded multi-disk brake;

The infinitely variable slewing speed from 0 to 1.0rpm by closed oil circuit.

Hoisting mechanism

available line pull-----210kN(the six layer)

permissible line pull-----147kN(the six layer)

available line speed-----109m/min(the six layer)

drum pitch diameter----2' 1"

rope spooling capacity----1968' -1"

Rear counterweight

187400 Ib, consisting of 10 counterweight plates 14600 Ib each and a 41900 Ib counterweight base plate;

Fitted on the tail end of crane superstructure

Crane operator's cab

Pressure-proof steel construction cab with safety glass;

With operator's seat, operating and control instruments;

Swiveling sideways and tiltable backwards

Safety equipment

Angle indicator, load moment limiter, hoisting limit switch, overflow valves, support cylinder locking device, derricking (luffing) limiter and so on

Electrical system

Single wire system; 24v DC; negative ground

The crane classification group is A1, and the classification group of working mechanism are: traveling mechanism (M1), slewing mechanism (M2), hoisting mechanism (M3) and derricking mechanism (M2).

Pumps

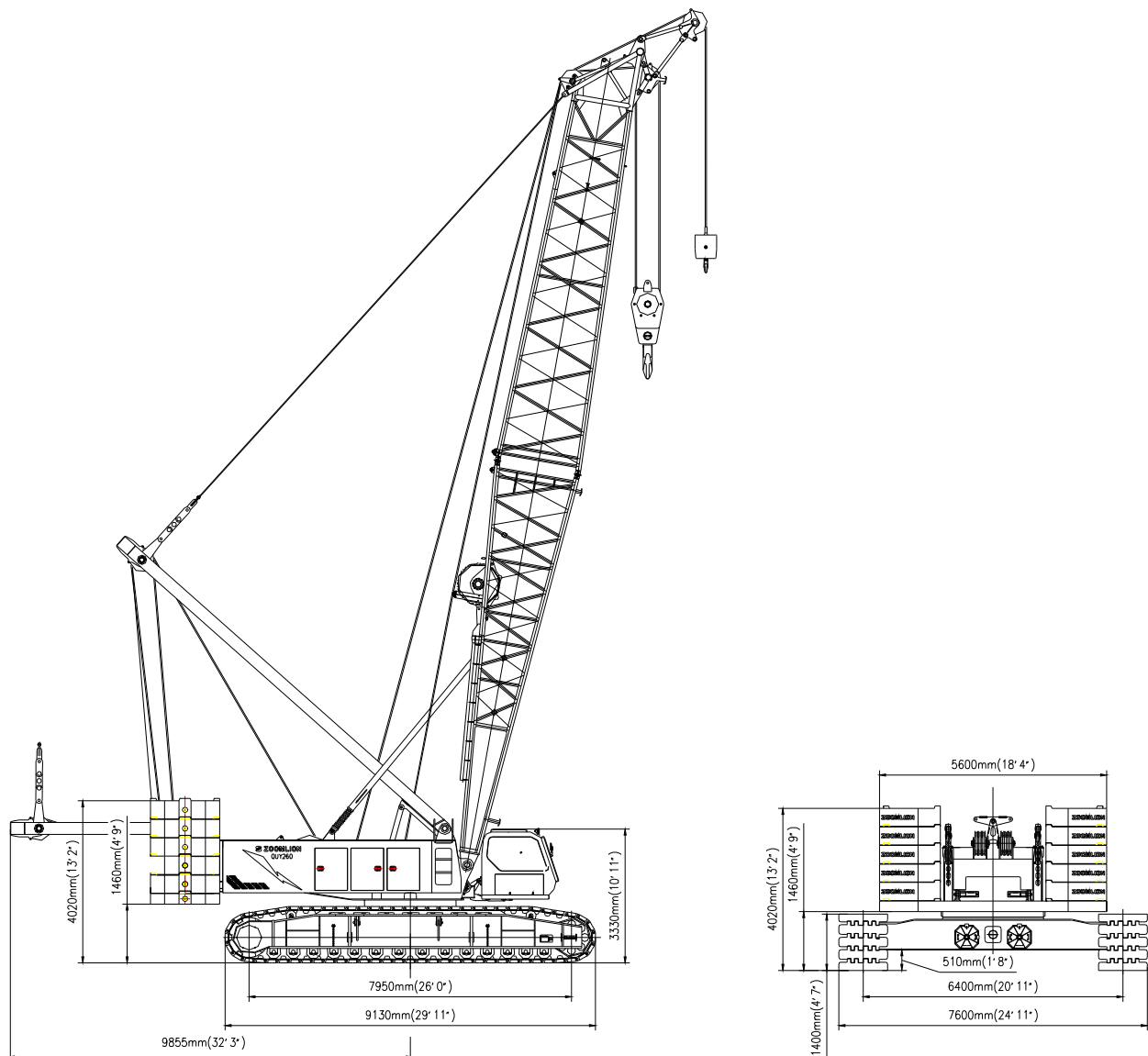
Type----- A8V0140LA1H2/63R1-NZG05F174

engine to pump speed ratio-----1.04

flow, L/min (gpm) at specified pressure, kPa (psi), and speed, rpm-----2*285 L/min

maximum working pressure-----42mpa

2.3.3 Overall dimensions



2.4 Technical data

2.4.1 Main technical parameter

a) Weight

Basic machine	187400 lb
Rear counterweight	105800 lb
Central counterweight	70600 lb
Crawler carrier	2×55100 lb

b) Speed

Mechanism	Speed	Rope diameter
Hoisting winch 1	360'9" /min (maximum speed of single rope, the 6 th rope layer)	Φ 1.12"
Hoisting winch 2	360'9" /min (maximum speed of single rope, the 6 th rope layer)	Φ 1.12"
Main boom derricking winch	95'1" m/min (maximum speed of single rope, the 6 th rope layer)	Φ 1.12"
Luffing jib derricking winch	150'10" /min (maximum speed of single rope, the 6 th rope layer)	Φ 1.12"
Slewing mechanism	0 — 1.0rpm	
Gradeability	30%	

2.4.2 Type of load hook and applicable rope reeving

Type of load hook	Maximum rope reeving	Weight of load hook (lb)
573300 lb	20	9300
352800 lb /220500 lb	12/8	6200
110250 lb	4	3900
66150 lb	2	2400
35280 lb	1	2000

2.4.3 Hoisting rope reeving and specification of wire rope

2.4.3.1 Hoisting rope reeving table

Reeving	Lifting capacity	Reeving	Lifting capacity	Reeving	Lifting capacity
1	28665	8	233730	15	410130
2	61740	9	260190	16	434385
3	92610	10	286650	17	456435
4	121275	11	313110	18	478485
5	149940	12	337365	19	500535
6	178605	13	363825	20	573300
7	207270	14	388080		



Note:

1. If crane is working with hoisting rope reeving less than the value listed in the above table, single hoisting rope load must be checked to make sure that the max. permissible load capacity of single hoisting rope is not exceeded.
2. Maximum permissible load capacity of single rope is 33100 lb.

2.4.3.2 Specification of wire rope

Description and intended use	Hoisting rope for winch1	Hoisting rope for winch 2	Derricking rope
Torsion-resistance or not	Yes	Yes	No
Nominal rope diameter	Φ 1.12"	Φ 1.12"	Φ 1.12"
Rope length	1574'4"	1574'4"	459'2"×2
Direction and type of lay	Left-hand lang lay	Left-hand lang lay	Right-hand ordinary lay

2.4.3.3 Use length of hoisting rope and derricking rope

When A-frame remains in its transport position on the superstructure, the shortest length of derricking rope is about 65'7";

When A-frame tilts forwards to maximum angle (i.e., the angle of A-frame to front horizontal line reaches the minimum value), the longest length of derricking rope is about 705'2"

Crane operation with main boom: when main boom length is 114'9" and the rope reeving is 12, the longest possible hoisting rope is 1508'9".

Crane operation with main boom and luffing jib: when main boom angle is 85°, main boom length is 154'1", luffing jib length is 88'6" and the rope reeving is 5, the longest possible hoisting rope is 1098'9".

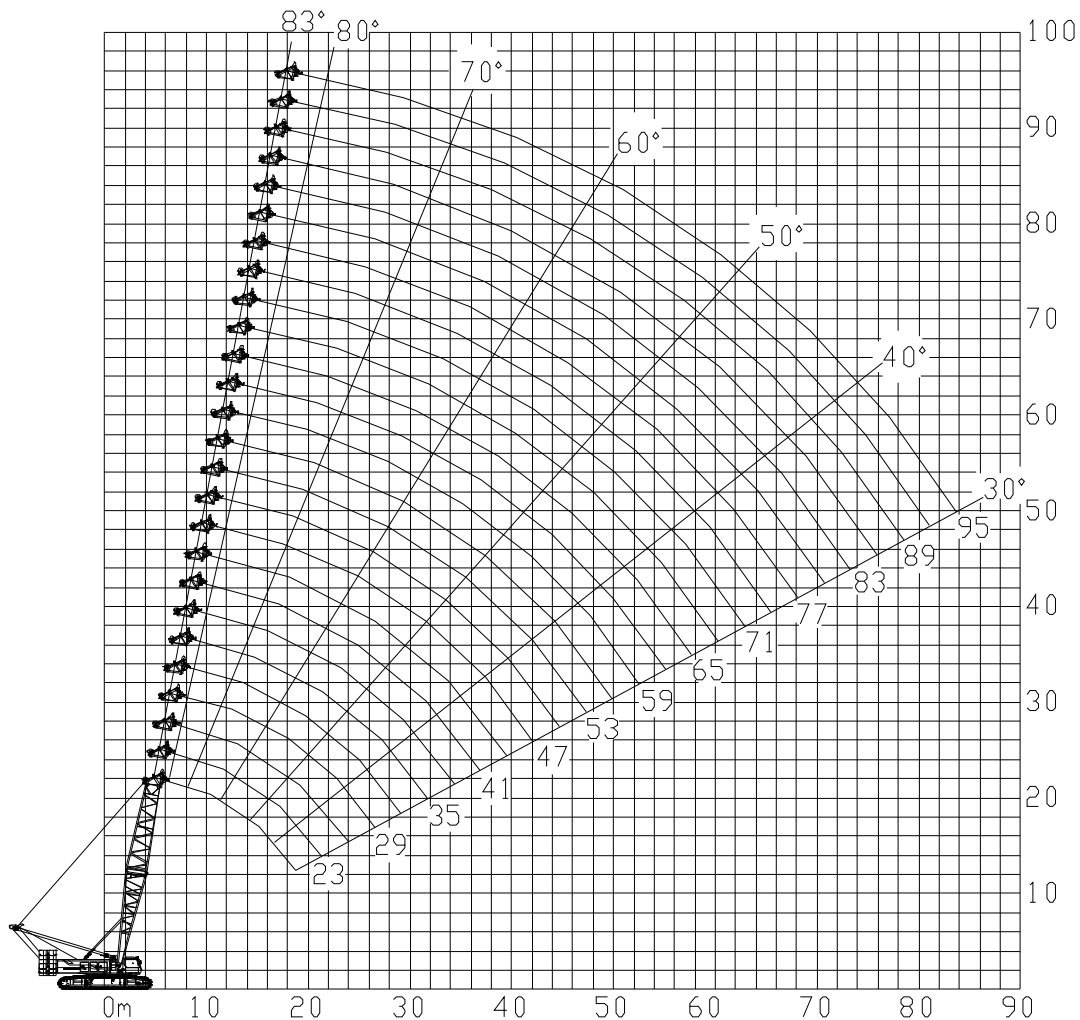
Crane operation with main boom and fixed jib: when main boom length is 252'6", fixed jib length is 39'4" and the rope reeving is 3, the longest possible hoisting rope is 1197'2".

2.4.4 Lifting height



Note: The main boom lifting height curve is drawn without considering boom deflection.

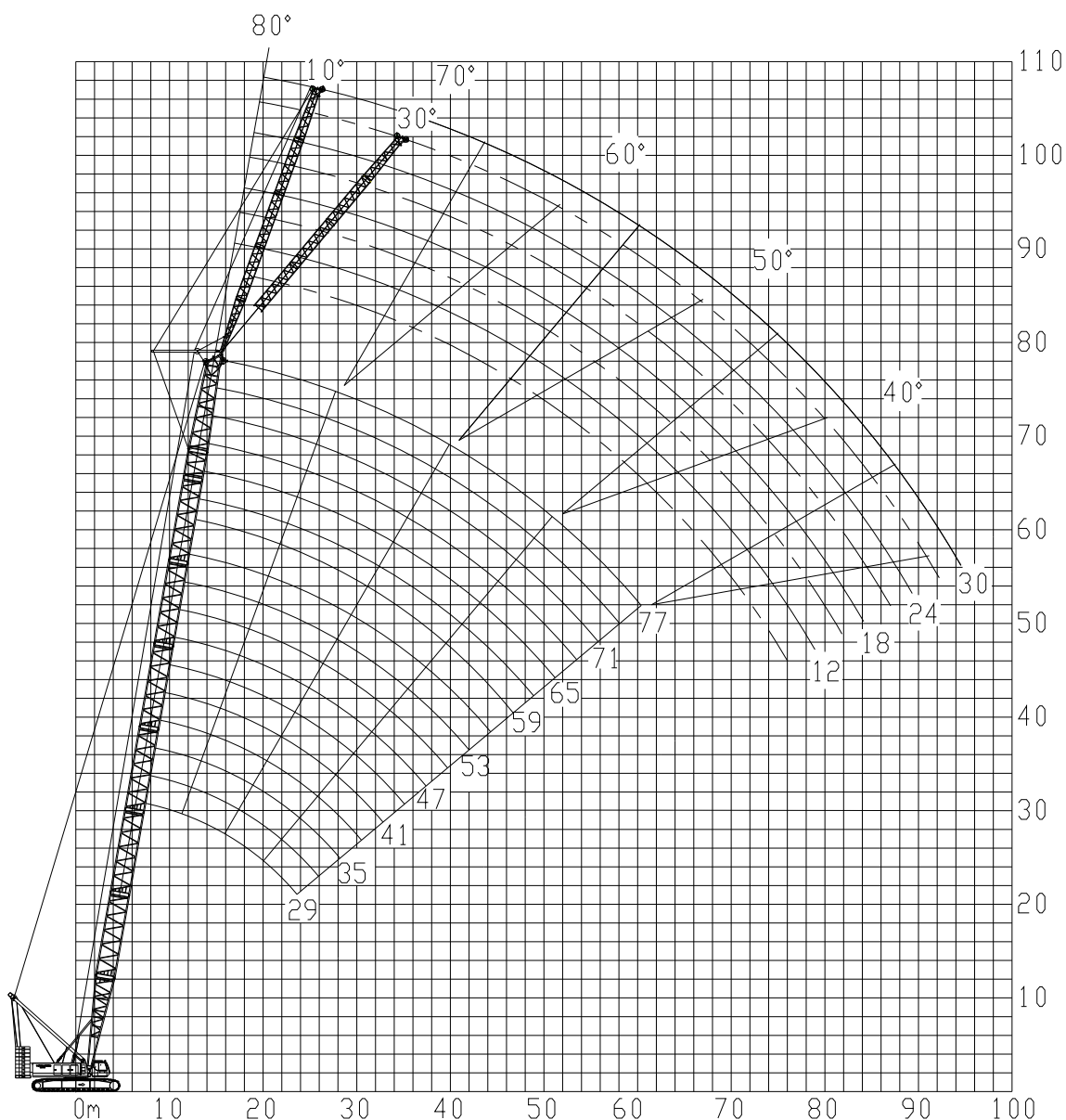
2.4.4.1 Lifting height on S&SL boom



Note:

1. The horizontal direction indicates working radius (in **ft**) and the vertical direction indicates lifting height (in **ft**).
2. **For S boom configuration**, the heavy duty boom length varies from **65'7"~272'3"**;
For SL boom configuration, the light duty boom length varies from **282'1"~311'8"**.

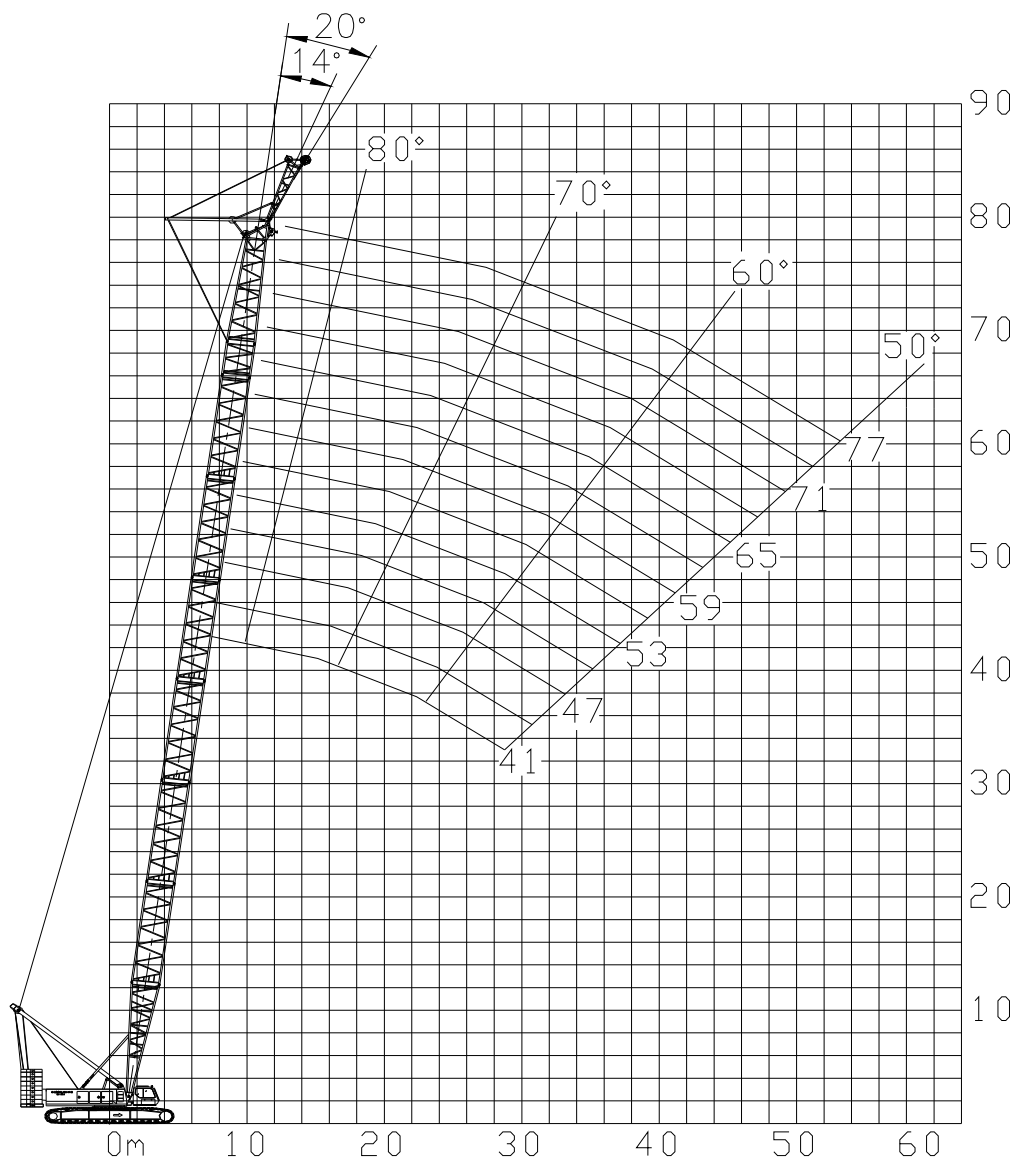
2.4.4.2 Lifting height SF boom/fixed jib combination



Note:

1. The horizontal direction indicates working radius (in **ft** and the vertical direction indicates lifting height (in **ft**).
2. **For SF boom configuration**, the main boom length varies from **95'1"~252'6"**, the fixed jib length varies from **34'9"~98'5"** and offset angle of fixed jib is **10°** and **30°**.

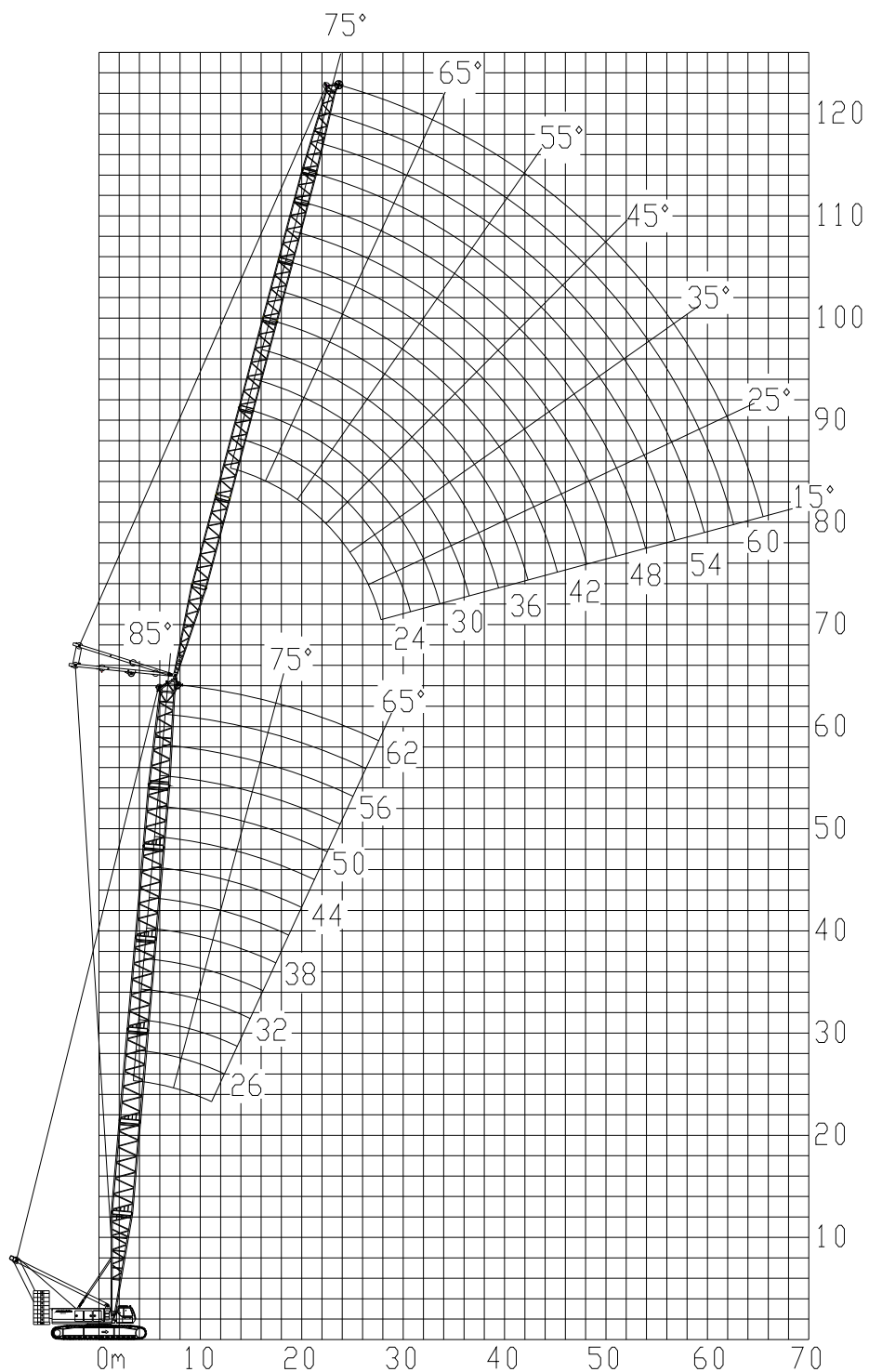
2.4.4.3 Lifting height on SFV boom/ heavy fixed jib combination



Note:

1. The horizontal direction indicates working radius (in **ft**) and the vertical direction indicates lifting height (in **ft**).
2. **For SFV boom configuration**, the main boom length varies from **134'5"~252'6"** the heavy fixed jib length is **19'8"**, and offset angle of fixed jib is **14°** and **20°**.

2.4.4.4 Lifting height on SW boom/ luffing jib combination



Note:

1. The horizontal direction indicates working radius (in **ft**) and the vertical direction indicates lifting height (in **ft**).

For SW boom configuration, the main boom length varies from 75'5"~203'4"

2. , and the luffing jib length varies from 68'10"~196'10".

2.4.5 Lifting capacity charts

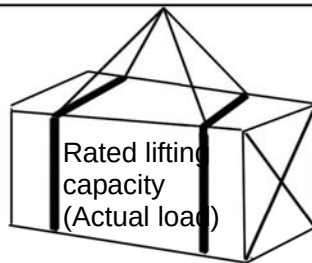
The valid lifting capacity charts for all machine configurations can be found in a special volume.



Note:

1. The values in lifting capacity charts are applicable to 360° working range.
2. The value in lifting capacity charts is the rated total lifting capacity of crane, which is the maximum permitted lifting capacity under various boom configurations. It includes the weight of load hook, wire rope and other load handling devices.

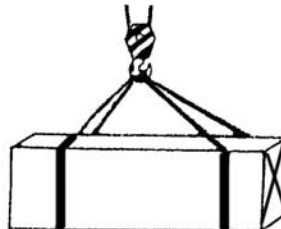
Rated total lifting capacity =



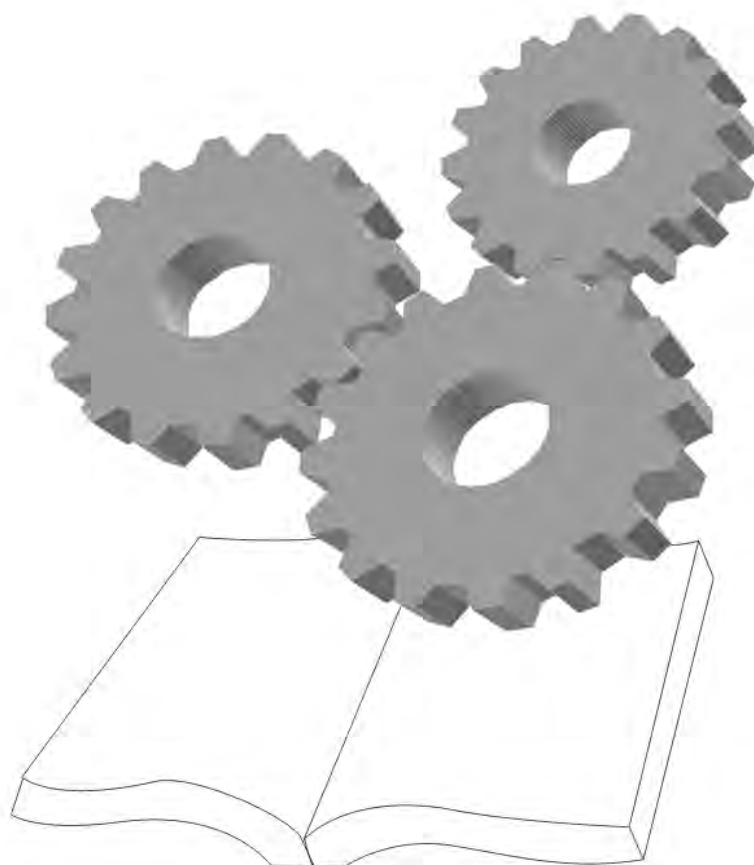
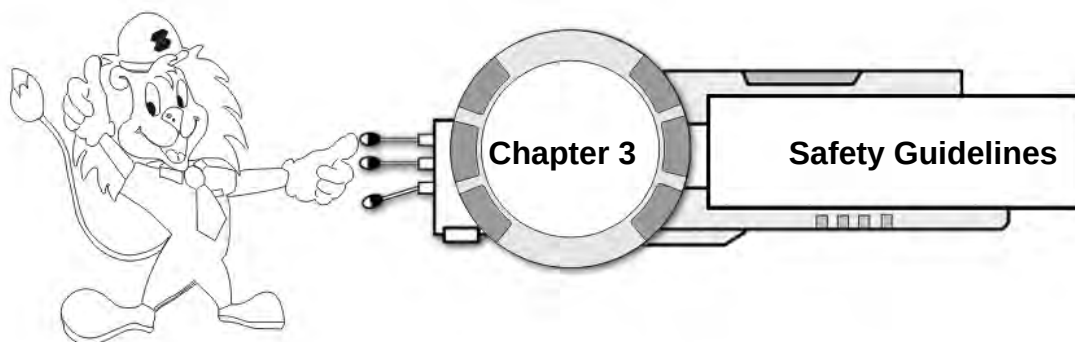
+



(Weight of load hook, wire rope and other load handling devices)



3. The radius in lifting capacity charts is the horizontal distance from central axle of slewing ring to centerline of hook when crane is loaded.
4. The rated total lifting capacity indicates the crane's lifting capacity under different boom configurations when it is operated on firm and flat ground.



ZOOMLION

3.1 Operational planning

In addition to a perfectly working crane and a well-trained crew, operational planning is an important precondition for safe and reliable crane operation.

The crane operator must obtain or receive the necessary information (familiarize himself with the operating manual, basic knowledge about pneumatic, electrical and hydraulic drive, and notes for safe operation as well as operating environment) before starting the crane operation, in particular:

- a) Clearly define the area of responsibility of all personnel concerned.
- b) Type of crane operation and required working mode;
- c) Distance between the lifting points and surrounding buildings;
- d) Influence of communal facilities (including the overhead high/low voltage lines and underground gas pipes);
- e) Space requirements at the work site
- f) Movement restrictions due to surrounding structures (e.g. is there another crane nearby in working);
- g) Number, weight, dimensions, material of load(s) to be lifted
- h) Required lifting height and slewing radius
- i) Load-bearing capacity of soil or surface to be operated upon
- j) Height and widths of thoroughfares leading to the site;
- k) Other factors affecting the site (e.g. weather, live lines, etc.);
- l) Communication means adopted between signaller and crane operator;
- m) Take appropriate measures to keep people unconcerned and equipment away from the working area;
- n) Equipment modifications: the employer of the equipment shall adhere to the requirements of 1926:1434

Based on the above information, the crane operator must assemble the equipment required to operate the crane:

- Required working mode for crane operation
- Hook blocks/load hook (with or without hook blocks)
- Counterweight



Caution:

1. A correct and complete operational planning is vital for safe and problem-free operation of the machine. The operation planner must plan a safe and reliable operational planning by obtaining and analyzing all necessary information about the operation and considering all the factors that may impair safety of crane operation.
2. If the crane operator does not possess all necessary and required information, it may prove impossible to carry out the intended work and accidents may be the result!

3.2 Safety—Technical Notes

3.2.1 Safety Instructions

3.2.1.1 Safety instructions for crane operator

The crane operator's primary responsibility is to control, operate and adjust the crane in a manner that is safe for both himself and others. Therefore the crane operator should meet the following requirements.

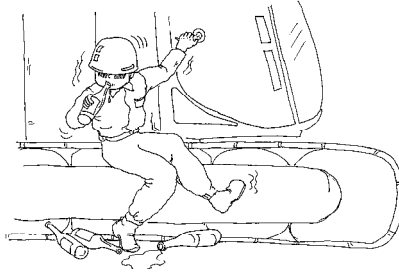
- a) The operator must be familiar with the operating manual for the crane, and know the working principle, structure performance and the safety devices' function, as well as master the operation essentials and maintenance skills.



- b) The operator should inspect brake, hook, wire rope and safety device before operating the crane. Any irregularities detected during inspection should be removed immediately.
- c) The operator must focus his attention on his work during operation and is forbidden to chat with others. Generally speaking, operator can only follow signal sent out by appointed persons. For a stop signal, the operator should obey it at all times, no matter who gives it. He should refuse to accept signal which violates operation regulations.

Stop the crane immediately if somebody is found climbing the crane.

- d) Operator who is in low spirits or poor healthy is not allowed to operate the crane.
- e) Crane operator and slinger/banks man should be familiar with safety rules, signals and symbols. Prohibit drinking and driving.



- f) Be qualified with the work in hearing, eyesight and reaction ability; be strong enough to operate safely, and has the ability to estimate distance, height and clearance correctly.
- g) Be familiar with the usage of fire extinguishing equipment and be well trained; know how to survive under emergent conditions.
- h) Make sure that only authorized personnel are allowed to operate the crane.

To make sure that the crane is kept in good working order, the crane operator should perform the following checks before operating the crane:

- a) Check the daily record of work to ensure that all regular inspections, maintenance and repair work is performed.
- b) Check the hoisting limiter, boom angle indicator, tilting-back support and other safety equipment for functional work;
- c) Check the load-bearing parts carefully, such as wire rope (hoisting rope, derricking rope and sling etc.), boom, outriggers, hook and load handling devices;
- d) Check if there are some bolts, nuts and pins lost, and the components are cracked or damaged.
- e) Ensure that no modification has been made to the crane without permission, e.g., increase or decrease in counterweight plate and improper repair of boom frame.
- f) Check fuel lines and hydraulic oil lines for leakage.
- g) Check all control mechanisms for functional work after starting up the engine.
- h) Check all control devices for functional work.
- i) Check the brakes. Test the braking performance by lifting a load away from the ground and suspend it in the air for a moment.
- j) Check whether lubricating oil, grease or anti-freeze liquid is sufficient.
- k) Check for contamination.

The following improper operating errors, which are made again and again while operating, should be avoided.

- a) Slewing too quickly;
- b) quick braking of the load;
- c) diagonal pulling of the load to be lifted which is still in contact with the ground;
- d) Loose wire rope formations;
- e) overloading or improperly attaching the load;
- f) driving(or slewing) too fast with a load, or setting up and loading on an uneven surface;
- g) diagonal pulling, breaking away stuck loads;
- h) swinging of suspended load, crashing into bridges, roofs or high voltage wiring;
- i) Incorrect assembly or disassembly of booms

3.2.1.2 Safety instructions for the rigger

The rigger's job is to hang or detach load from hook and to decide which hook or component to be used in accordance with work plan. rigger also has the responsibility to guide operator's safe operation.

Qualifications for rigger:

- a) With crane operation certificate;
- b) Be qualified with the work in hearing, eyesight and reaction ability;
- c) Be strong enough to carry hook or component;
- d) Be able to estimate the load, balance the load and judge the distance, height and clearance correctly;
- e) Be trained in the skill of handling load;
- f) Be able to choose proper load handling device and components according to the loading condition;
- g) Be trained in hand signals for operation and familiar to use them;
- h) Be able to safely use audio equipment (such as interphone) to send out oral order exactly and clearly;
- i) Be capable of conducting the operation of crane to move the load safely;
- j) Make sure that only authorized personnel are allowed to carry out work.

3.2.1.3 Safety instructions for the signalman

The main job of signalman is to assist crane operator to carry out safe operation. Potential damage to property or personal injury could be avoided if the crane operator carries out the crane movement following the signals given out by appointed signalman. However, only one signalman may work with the crane operator at a time.

Qualifications for signalman:

- a) Familiar with the lifting task so as to cooperate with crane operator and other workers;
- b) Make sure that only authorized personnel are allowed to carry out work;
- c) Be qualified with the work in hearing, eyesight and reaction;
- d) Be able to estimate the distance, height and clearance correctly;
- e) Be trained in hand signals for operating and familiar to use them;
- f) Use standard hand signals for crane operation. If necessary, use a radio device to send out correct and clear order;
- g) Be capable of conducting the operating of crane to move the load safely;
- h) Position himself in a safe location from where he can see the whole process of operation and be seen clearly by the crane operator.



Danger:

In order to assure yourself and other person's interest, please operate crane in accordance with specified regulations, and take precautions against possible dangers caused by improper operation.

3.2.1.4 Points for attention for crane operating crew

- a) Any unsafe operation must be corrected or any dangerous situations must be reported to supervisor.
- b) All the persons in vicinity of crane must observe the acoustic warning signals of the machine so as to ensure himself and others safety.
- c) All the worker must know about the content of task and working sequence;
- d) Check whether dangerous situations occur during operation of the machine, and inform crane operator and signalman of the unsafe factors such as high-voltage power line, unauthorized persons, obstacles and poor ground conditions.

3.2.2 Selecting an operating site

It is very important to choose an appropriate location for crane operation in order to minimize safety risks. The operating site should be selected so that:

- a) crane movement can be carried out within the smallest possible radius;

- b) no obstacles hinder necessary movements;
- c) the ground an the operating site is able to support expected loads;
- d) Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, shall be barricaded in such a manner as to prevent an employee from being struck or crushed by the crane



Danger:

The most essential requirement for safe crane operation is working on firm ground with the capacity to support you loads.

3.2.3 Slopes and trenches

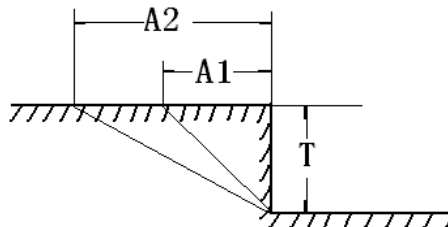
The crane may not be set up too close to slopes or trenches. A safety distance must always be kept from them depending on the type of soil.

Note:

Safety distance is measured from the foot of the trench and is:

Soft or backfilled soil = $2 \times$ depth of trench ($A2 = 2 \times T$)

Hard or grown soil = $1 \times$ depth of trench ($A1 = 1 \times T$)



Danger:

If a safe distance is not maintained, the slope or trench must be firmly filled. Otherwise, there is a danger that the edge of the slope or trench will give away.

3.2.4 Permissible ground pressure

Soil type	10^{-1} MPa
A) back-filled, not naturally compacted ground	0 — 1
B) Natural soil, apparently undisturbed	

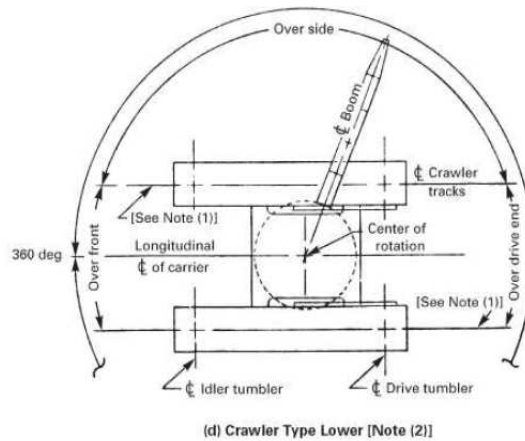
1. mud, peat, marshy soil	0
3. non-cohesive, sufficiently compactly layered soil: Fine to medium grained sand; From coarse-grained sand to gravel	5 3.0
3. cohesive soil: loamy; soft; stiff; Semi-solid; hard	0 4 0 0 4.0
4. rock with few fissures, in healthy, un-weathered condition and in a favorable location: In cohesive layer order In massive or column-style shape	15 30
C) artificially compacted ground	
1. asphalt;	5 — 15
3. concrete concrete group B I; Concrete group B II	50 — 250 350 — 550
 Caution: If there is any doubt about the load-bearing capacity of the ground at the operating site, soil test should be carried out, for example, with a penetrometer.	

3.2.5 Checking safety measures

The safety condition of the crane should be checked thoroughly prior to operating the crane, including:

- Check whether the ground provides adequate load-bearing capacity.;
- Check whether there is sufficient safety clearance to slopes and trenches;
- Check whether the crane is adjusted to be horizontal;
- Check whether there are live electrical wires within the working range of the crane.
- Check whether there are obstacles which will hinder required crane operation.

working radius:

**Caution:**

The crane operation belongs to dangerous operation; so much attention should be given to the working condition of crane before and during crane operation.

3.2.6 Crane operation with a load

Before beginning any work, the crane operator must be convinced that the crane is in safe operating condition. All safety devices, such as load moment limiter, hoist limiter switches, brakes, etc., are in good working order.

- The load moment limiter must be set according to the current crane configuration.
- The load capacities as given in the load lifting capacity tables must be adhered to. The loads given in the load lifting capacity tables must not be exceeded.
- The crane operator must know the weight and dimensions of the load before operating the crane.
- Load handling devices, lifting equipment and tackle must be in accordance with specified requirements.
- It must be ensured that the weight of the hook block and the weight of the tackle are subtracted from the load given in the lifting capacity table.

Example:

Maximum permissible load according to table	66150 lb
Weight of the hook block	2359 lb
Weight of the slinging rope	88 lb
Actual useful load of the crane	63702 lb

In this case, the load to be lifted may no exceed 63702 lb

3.2.6.1 Counterweight

The required counterweight should be installed prior to operation according to specified requirements.



Danger:

If the counterweight is not installed according to the lifting capacity table, there is a danger of the crane toppling over.

3.2.6.2 Hoisting gear, hoisting rope

The lifting capacity of the crane is a function of the tension force of the hoisting rope and hoisting rope reeving. When working with a single cable, the crane can only lift as much of a load as the hoisting gear is able to pull.

If the load to be lifted is heavier than the hoisting gear is capable of lifting, the hoisting rope must be configured using block and tackle principles by appropriate reeving between the pulley head on the boom and the hook block. Possible hoisting rope reeving is listed as follows:

Hoisting rope reeving

reeving	Lifting load	reeving	lifting load	reeving	lifting load
1	28665	8	233730	15	410130
2	61740	9	260190	16	434385
3	92610	10	286650	17	456435
4	121275	11	313110	18	478485
5	149940	12	337365	19	500535
6	178605	13	363825	20	573300
7	207270	14	388080		



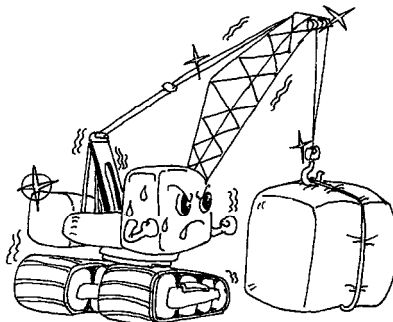
Caution:

1. If crane is working with hoisting rope reeving less than the value listed in the above table, single hoisting rope load must be checked to make sure that the max. permissible lifting capacity of single hoisting rope is not exceeded.
2. Max. permissible lifting capacity of single hoisting rope is **33075 lb**
3. If the maximum tensile force is exceeded, there is the danger that the rope(s) may break or that the hoisting gear and /or drive motor may be damaged.

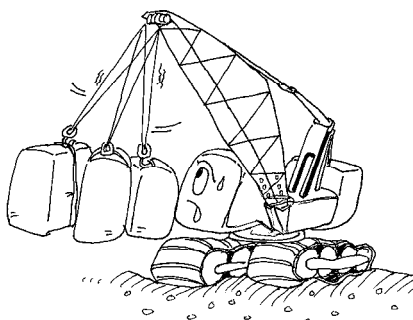
3.2.6.3 Crane operation

3.2.6.3.1 Operating conditions

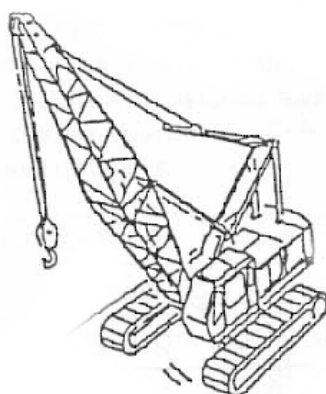
- a) All components of crane are in running-in state at the initial operating period. So, for the first 100 operating hours, the working load should not be too great and the working speed should not be too high. The maximum lifting load can not exceed 80% of its rated load. And the maximum working speed is forbidden.



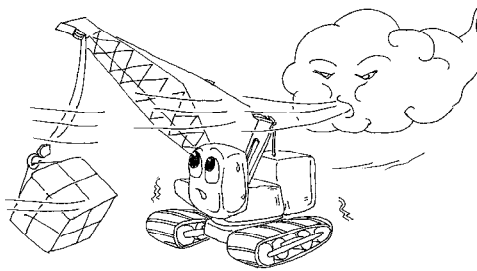
- b) The ground on jobsite should be firm and flat and the gradient should not be greater than 5/1000. The complete vehicle should be level and the supporting ground should not give away during operating. If the ground is soft, a steel plate should be placed under the track shoe.



- c) The permitted temperature range for crane's operation is $-20^{\circ}\text{C} \sim 40^{\circ}\text{C}$. Humidity should not exceed 85%; however, high humidity up to 100% is only permitted for a short period of time. The crane should be operated and supported on a ground lower than 1000m above seal level.



- d) The maximum in-service wind speed should be not more than 9.8m/s during operation; the maximum out-of-service wind speed should be no more than 21m/s when only main boom is assembled, and no more than 15m/s when fly jib is assembled.



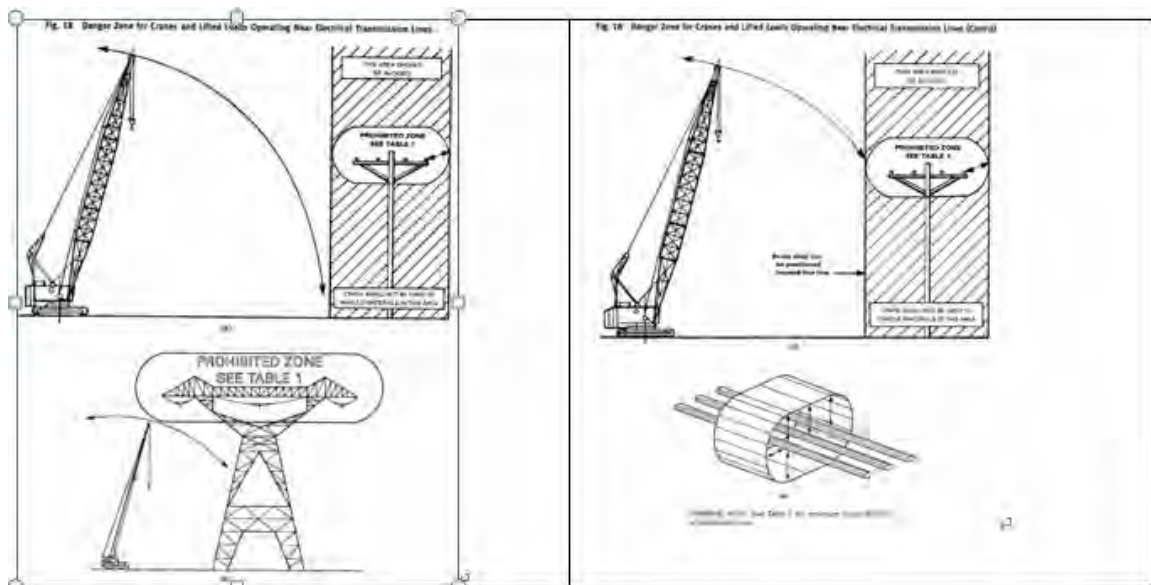
With the following table, the wind force and wind velocity can be estimated correctly:

Wind force beaufort

Wind force		Effects of the wind in the inland	
Beaufort	description	m/s	
0	Calm	0~0.2	No wind, smoke rises straight up
1	Light air	0.4~1.4	Wind direction is shown only by observing the trail of smoke, not by the wind sock
2	Light breeze	1.6~3	Wind can be felt on the face, the leaves rustle, wind sock moves slightly
3	Gentle breeze	3.4~5.3	Leaves and thin twigs move. Wind extends a small breeze flag.
4	Moderate breeze	5.5~7.8	Swirls up dust and loose paper, moves twigs and thin branches
5	Fresh breeze	8~10.6	Small deciduous trees begin to sway, foam forms at sea.
6	Strong breeze	10.8~13.7	Thicker branches move; telephone lines begin to whistle, umbrellas are difficult to use
7	Stiff wind	13.9~17	Entire trees swaying; difficult to walk into wind
8	Gale force wind	17.2~20.6	Breaks twigs off trees, walking becomes difficult
9	Gale	20.8~24.5	Minor damage to property(chimney tops and roofing tile are blown off)
10	Severe gale	24.7~28.3	Trees are uprooted, significant damage to property

- e) When crane is working near the high-voltage power line, the safe clearance between any part of crane and overhead power line should comply with the following regulations:

Cutline:



The safe clearance from high-voltage power lines:

Operation near high-voltage power lines

	Ft(m) / Note(I)
Up to 50	10 / 3.05
Over 50 to 200	15 / 4.60
Over 200 to 350	20 / 6.10
Over 350 to 500	25 / 7.62
Over 500 to 750	35 / 10.67
Over 750 to 1000	45 / 13.72
Over 1000	(as established by the utility owner / operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution)

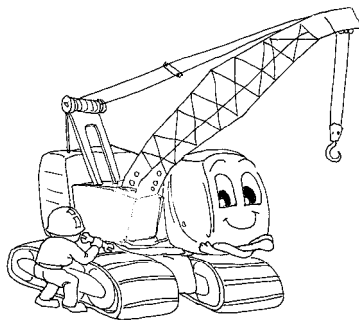
Note: the value that follows "to" is up to and includes that value ,for example over 50 to 200 means up to and including 200kv.

Operation in transit with no load and boom or mast lowered

	Ft(m) / Note(I)
Up to 0.75	4 / 1.22
Over 0.75 to 50	6 / 1.83
Over 50 to 345	10 / 3.05
Over 345 to 750	16 / 4.87

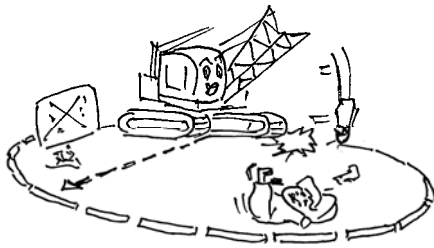
Over 750 to 1000	20 / 6.10
Over 1000	(as established by the utility owner / operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution)

- aa) Equipment or machinery, have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with the following:
- bb) For lines rated 50 kV. or below, minimum clearance between the lines and any part of the crane or load **shall** be 10 feet; Except where electrical distribution and transmission lines have been deenergized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the
- cc) For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load **shall** be 10 feet plus 0.4 inch for each 1 kV. over 50 kV., or twice the length of the line insulator, but never less than 10 feet;
- dd) In transit with no load and boom lowered, the equipment clearance **shall** be a minimum of 4 feet for voltages less than 50 kV, and 10 feet for voltages over 50 kV, up to and including 345 kV., and 16 feet for voltages up to and including 750 kV.
- ee) A person **shall** be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means;
- ff) Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices **shall** not alter the requirements of any other regulation of this part even if such device is **required** by law or regulation;
- gg) Any overhead wire **shall** be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded
- f) Only the crane without fault is allowed to work.



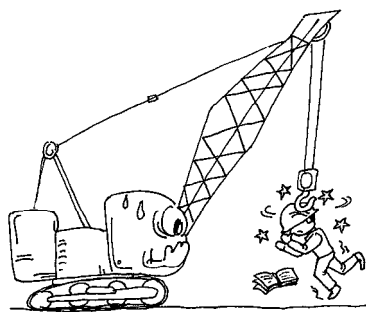
3.2.6.3.2 Instructions for Safety Operation

- a) No person is allowed to stand under boom when crane is operated.

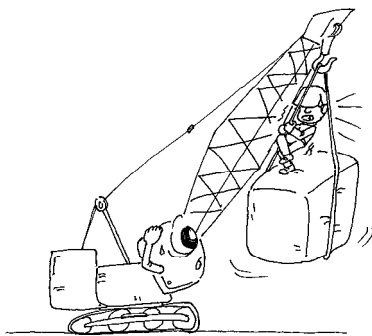


- b) No person is allowed to stand on slewing table during operation.

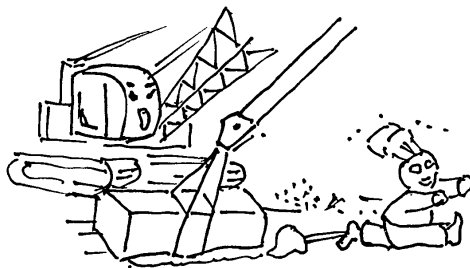
- c) It is forbidden to lift load over people.



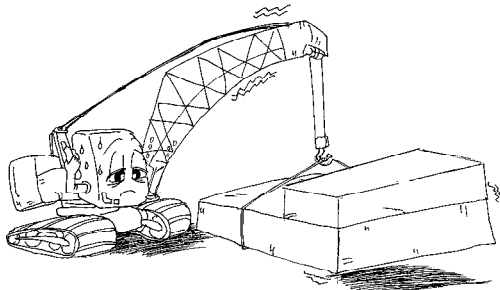
- d) It is forbidden to lift the load when someone is standing on it.



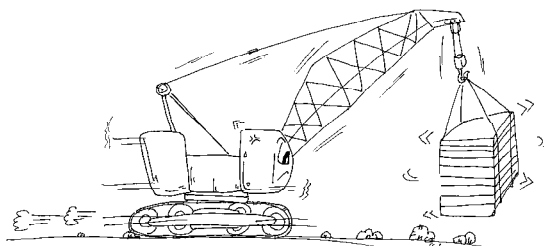
- e) Overloading operation and lifting staggered load is prohibited. Never pull load obliquely.



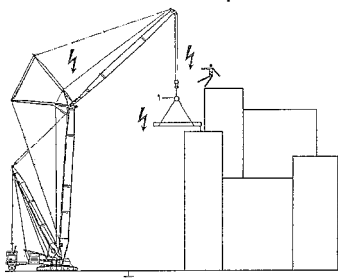
- f) It is forbidden to lift load hidden in the ground or frozen on the ground.



- g) The crane can travel with a load of 70% of the rated load. In this case, the ground should be firm and its gradient should not be more than 5/1000. The driving speed must be less than 0.5km/h. The boom frame must be located in the driving direction.



- h) If the crane is operated in the vicinity of transmission systems (e.g. transmitters), strong electromagnetic field will be generated there, so measures should be taken to protect the crane against high frequency interference and all workers who stand on large metal plate should wear special isolating gloves and clothes to avoid being burnt.

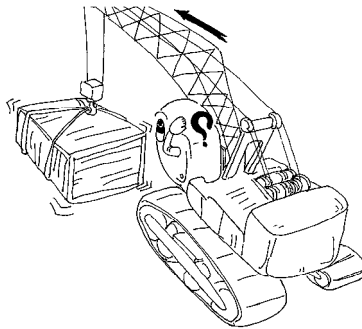


- aa) Prior to work near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter **shall** be de-energized or tests **shall** be made to determine if electrical charge is induced on the crane. The following precautions **shall** be taken when necessary to dissipate induced voltages:
- bb) The equipment **shall** be provided with an electrical ground directly to the upper rotating structure supporting the boom; and

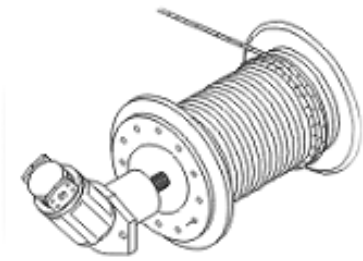
cc) Ground jumper cables **shall** be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews **shall** be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load

dd) Combustible and flammable materials **shall** be removed from the immediate area prior to operations

- i) The brake of hoist mechanism is not allowed to be adjusted when the crane is lifting a load.

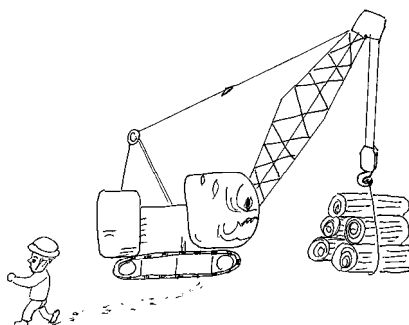


- j) Under any condition, there must be three windings of wire rope left on the hoisting drum.

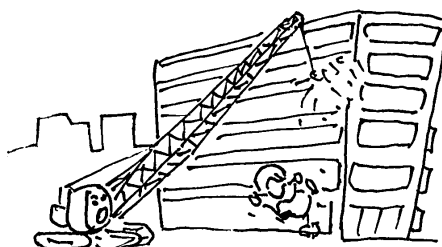


- k) When a load is suspending in the air, the operator is not allowed to leave the cab.

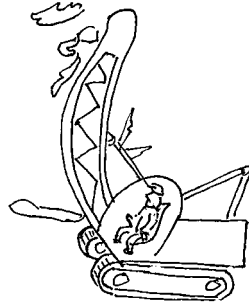
- l) Operation and gently. jerkily and carry abruptly.



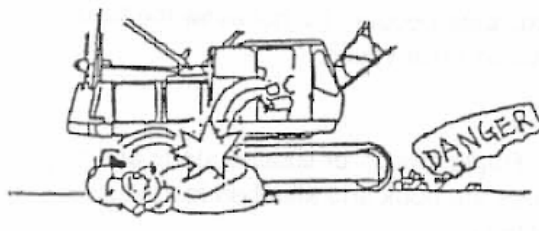
should be carried out stably
Never operate control lever
out switchover operation



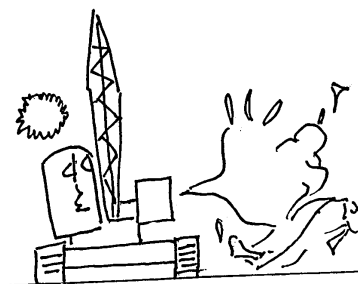
- m) When actual load reaches 90% of the rated one, the load moment limiter will sound an alarm, to which high attention should be given.



- n) Getting on and off the crane should be careful to avoid casualty.

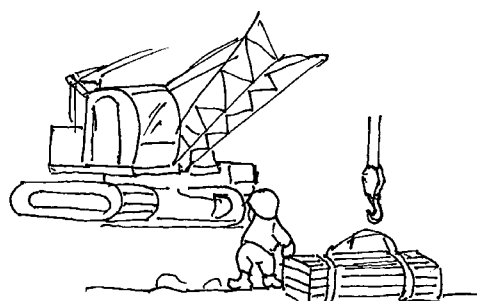


- o) It is prohibited to make any modifications to the crane without permission; otherwise you should take the consequences.

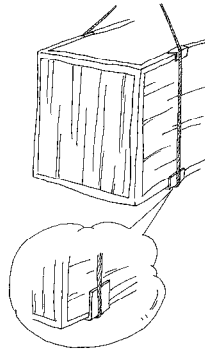


- p) Stop the crane operation if one of the following conditions occurs:

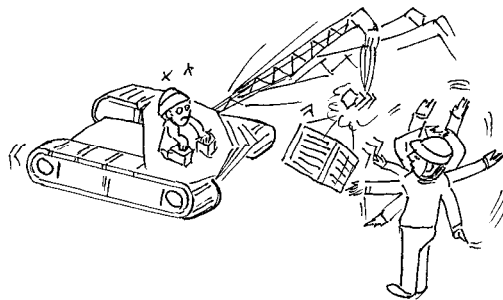
- 1) The crane is overloaded or the weight of load is uncertain;
- 2) Load's binding or hanging is not good or load may fall due to imbalance;



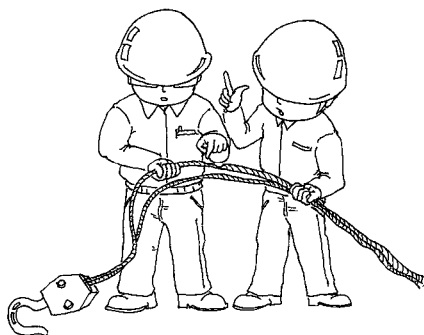
- 3) No protective mat is added between the edges of load and wire rope;



- 4) In case of poor visibility and /or darkness, it is difficult to identify load or conduct signal;

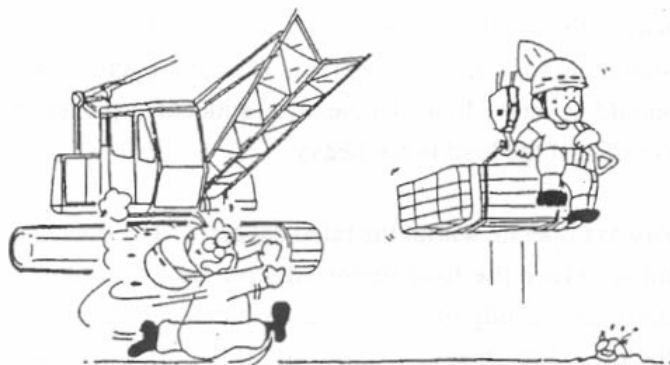


- 5) There is defect or damage of configuration or components which will impair safe operation, for example, the brake and safety equipment fail, or the wire rope is damaged etc.

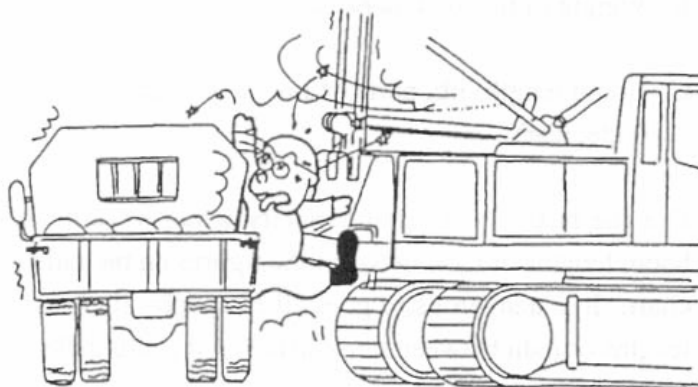


q) Anyone is
hook, slings or load.

not permitted to climb on the load



- r) Leave an ample space for stopping crane; otherwise persons nearby may be hurt by crane counterweight due to narrow distance between counterweight and surrounding building.



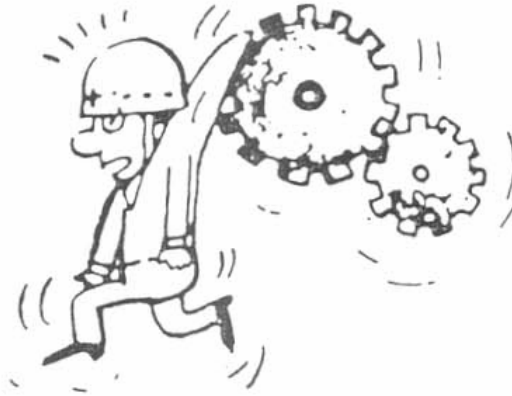
- s) Keep the windows of crane operator's cab clean to ensure good visibility; stop crane operation immediately in case of poor visibility; replace the broken window as soon as possible.



- t) Persons may only access and leave the crane following permission from the crane operator and only when the crane is at a complete standstill!
- u) Keep crane clean and dry, since slippery walkway, ladder, tools or loose parts

may cause operator to fall down from crane.

- v) Do not lift the load which adheres to other objects forcibly. Otherwise, crane may topple over, boom frame may buckle or objects may be damaged. Therefore, the operator must ensure that the load is not in contact with other objects before lifting.
- w) Drive crane with great cautiousness, in working site or not. Observe the conditions surrounding crane such as overhead power line, low-lying land, narrow clearance, restriction to bridge and road, uneven ground and gradient of road. If necessary, appoint a signalman to assist operator to move crane. Lock slewing mechanism during traveling.
- x) It is more dangerous that two cranes carry out lifting operations together. Therefore, a careful calculation must be made before commencing the work, and following import requirements for this type of operation must be observed.
 - 1) The load is not casually attached to the crane. It must be calculated carefully so that the actual lifting capacity of crane can not exceed the rated lifting capacity.
 - 2) Ensure that each lifting tackle can bear specified load weight which is calculated during design.
 - 3) The crane operator, signalman and other worker must evaluate the operational planning together before operation.
 - 4) Ensure that crane can move properly in the whole process of operation.
- y) When you leave the machine in an emergency, you are putting your lift at risk. Therefore, you must take following measures prior to leaving the machine.
 - 1) Detach the load from the hook and set it down on the ground; if necessary, lower the boom frame;
 - 2) Apply slewing brake or lock slewing mechanism;
 - 3) Apply parking brake;
 - 4) Lock traveling mechanism;
 - 5) Cut off power supply or switch off engine;
- z) Do not wear loose clothing, scarves, open jackets or open shirt sleeves, and do not wear jewellery (rings, bracelets, earrings or similar). Otherwise, there is serious danger of injury from being pulled into moving machine parts.



- aa) Do not stop crane near the bank which is possible to collapse or on low-lying land that may be washed down by water.
- bb) Take away the key when machine remains idle. In this way, the unauthorized person can not start the machine without permission.
- cc) Unqualified person is forbidden to repair crane and change parts.

3.2.6.3.3 Preparation for crane operation

Crane operator should perform the following checks before operating the crane:

- a) Check the daily record of work to ensure that all regular inspections maintenance and repair works are performed.
- b) Check the hoisting limiter, boom angle indicator, tilting-back support and other safety equipment for functional work.
- c) Check if the load-bearing parts such as wire rope (hoisting rope, derricking rope and sling etc.), boom, outriggers, hook and load handling devices are kept in good working order.
- d) Check if there are some bolts, nuts and pins lost, and the components are cracked or damaged.
- e) Ensure that no modification has been made to the crane without permission, e.g., increase or decrease in counterweight plate and improper repair of boom frame.
- f) After starting up the engine, check if the values shown on instruments are normal.
- g) Check fuel lines and hydraulic oil lines for leakage.
- h) Check all control mechanisms for functional work.
- i) Check brakes and clutch. Test the braking performance by lifting a load away from the ground and suspend it in the air for a moment.
- j) Keep communication between the operator and rigger.

- k) Estimate the weight and dimensions of load to be lifted in advance.
- l) Crane operation can be carried out within minimum working radius. No obstacles hinder the necessary movements. The ground at the operating site is able to support expected loads.
- m) Ensure that no obstacles are within working radius and operator can see the load clearing from the cab. Check if the communication between operator and signalman is kept smooth so as to ensure safe crane operation.
- n) Determine the load-bearing capacity of ground to be operated upon. Ensure that crane is supported properly and never operate the crane on the soft and uneven surface or on the ground of high water content or covered with frozen soil. If crane is set up close to trenches, reinforce the trenches to avoid landslide. If the ground does not have adequate load-bearing capacity, the crane is liable to turnover. In this case, crosstie, steel plates should be padded underneath the crawler to distribute load so that the load-bearing capacity of the ground will not be exceeded; make sure that the crane is leveled.

3.2.6.3.4 Notes for crane operation

- a) Estimate the weight and dimensions of load to be lifted in advance.
- b) Use load handling devices (wire rope or chain) correctly. Make the vertical line of hook pass through center of gravity of load.
- c) If any part of crawler crane or load handling devices come in contact with high-voltage line, or emergent situation occurs, the operator should stop the vehicle at once.
- d) The load capacities as given in the load lifting capacity tables must be adhered to. The loads given in the load lifting capacity tables must not be exceeded. Driving(or slewing) too fast with a load, or setting up and loading on an uneven surface, and swinging of suspended load should be avoided.
- e) Diagonal pulling of the load to be lifted which is still in contact with the ground is prohibited.
- f) It should be avoided that the load or auxiliary lifting device collides with structural members of crawler crane.
- g) If crane gets caught in a thunderstorm during operation, following measures should be taken at once:
 - Stop work on the crane immediately
 - always set down the load and boom frame on the ground.
 - apply brake or lock winch and slewing gear
 - switch off the crane engine and cut off the power of load moment limiter and limit switch

--ask all crane workers to leave away.

h) If the crane is struck by thunderbolt, following checks should be performed:

--check whether there are burnt or damaged components

--check the performance of electrical parts and load moment limiter

--check the associated components for functional work

i) If earthquake occurs when crane is operated, following measures should be taken immediately:

-- Stop work on the crane immediately

--always set down the load and boom frame on the ground.

--apply brake or lock winch and slewing gear

--switch off the crane engine and cut off the power of load moment limiter and limit switch

--ask all crane workers to leave away.

After earthquake, following checks should be performed prior to crane operation:

--check the performance of electrical parts and load moment limiter

--check the associated components for functional work

j) If any part of crawler crane or load handling device is in contact with high-voltage lines, the best way to guarantee the personal safety of operator is to stay in operator's cab until the danger is obviated. If operator must leave the crane, he'd better jump rather than climb down the cab.

k) The operator's cab should be equipped with an emergency hammer which can be used to smash the window in an emergency so that operator can run away from the cab.

l) The load moment limiter, once be triggered, should be kept in that state until the crane is not overloaded.

m) If the load moment limiter is not set to the actual configuration status of the crane, it can not fulfill its function as a safety device.

n) Examine if the angle indicators and the strain gauges are in function.

o) The crane may topple over backwards if a load is suddenly freed since the tension created in the boom can cause it to jerk back violently.

p) Make sure that the loads and working radius contained in the lifting capacity tables are not exceeded.

q) When working in the vicinity of power cables, a sufficient safety clearance must be maintained, if the cables are not isolated by electricity engineers or the hazardous

area is not fenced off.

- r) For all crane movements, the crane operator must always keep the load, as well as the crane hook or loading equipment when the crane is not loaded, in his field of vision. If this is not possible, the crane operator may only operate the crane according to instructions given to him by a signalman. These instructions may be given in the form of hand signals or over a two-way radio. Whatever method is used, precautions must be taken to eliminate the risk of misunderstanding.
- s) All employees shall be kept clear of loads about to be lifted and of suspended loads



Note:

If, despite all precautions having been taken, a flashover occurs, carry out the following procedure:

1. Keep calm!
2. Do not leave the crane cab.
3. Warn those around the crane not to move and not touch the crane.
4. Move the crane away from the danger area.

Not adhering to the above points may lead to risk of accidents or damage!

3.2.6.3.5 Checks after operation

- a) When crawler crane and auxiliary lifting device are in non-working condition, never park the vehicle near the embankment liable to collapse or low-lying land subject to be washed by water.
- b) Set down the load on the ground, and if necessary low the boom frame to some extent; lock the slewing gear and traveling gear and apply the brake.
- c) Shut down the engine and cut off power.
- d) Check if there is leakage in someplace and repair it if necessary.
- e) Clean such components as movable parts and exposed part of the piston rod of cylinder.
- f) Check if bolts and nuts are fitted tightly. Any defects found should be eliminated at once. It is prohibited to operate the crane with fault.
- g) Record the operating conditions and abnormal symptoms.
- h) Check if the quantity of tools and accessories meet specified requirements.
- i) Lock the operator's cab or safety devices.
- j) Take precaution measures against storm or lightning strikes.
- k) Take precaution measures against frostbite in winter.



Caution:

To avoid engine from freezing in winter, drain all cooling water when park the vehicle, if no anti-freeze is added into the cooling water.

3.2.7 Electromagnetic influences

Strong electromagnetic fields are likely to be present if the construction site is close to a transmitter.



Caution:

These electromagnetic fields can pose direct or indirect danger to persons or objects, for example:

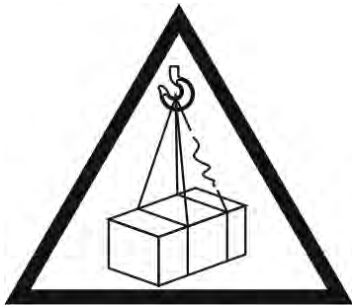
1. Effect on human organs due to temperature increase.
2. Danger of burns or inflammation due to temperature increase.
3. Spark or electric arc formation.

In any case, before working with the crane near transmitters, contact Zoomlion representative. In addition, consult a high frequency specialist.

- l) Every crane must be “totally” grounded. Check visually or with a simpler tester to ensure that ladder, cab and cable pulleys are grounded.
- m) All personnel working on the crane or with large metal objects must protect themselves from burns by wearing non-conductive gloves and suitable clothing while working.
- n) If one feels an increase in temperature, there is no need to panic. Always work under the assumption that the respective workpiece, structural steel member or support is “hot”.
- o) The temperature of objects affected by high frequency radiation depends on their ‘size’. Cranes, carriers and coverings, for example, are “hooter”.
- p) Contact with other crane loads is not permitted when operating the crane (arcing). Since defects caused by burns considerable reduce rope carrying capacity, any such occurrences must be reported immediately to the machinery supervisor so that the ropes can be inspected.
- q) An insulator is required at all times between the crane load hook and tackle. It is strictly prohibited to remove this insulator.
- r) The ropes may not be touched above the insulator. This is strictly prohibited!
- s) Crane with attached loads may not be touched by any unprotected parts of the body after the load has been lifted or set down.
- t) Do not work with a bare upper torso or in short pants, this is prohibited.
- u) To minimize absorption of high frequency radiation, large loads should be transported horizontally if possible.
- v) Loads must be grounded, or additional insulation used (rubber material between the object and gloves) when manual work is required.
- w) To avoid accidents, use a safety belt when working on components that are high off the ground.

- x) Handling explosive matter (such as refueling) may only be carried out at least 6 m away from the place where sparks could form due to handling of larger metal parts. Use only conductive rubber hoses to refuel.
- y) Any accidents and unexpected events must immediately be reported to the local construction supervisor and the safety engineer.

3.2.8 Safety Signs



1) Warning: Suspended load



2) Warning: Dragging/entanglement



3) Danger: Crush hazard



4) Warning: Crushing/collisions



5) Note: Lift point



6) Warning: Risk of falling



7) Danger: snagging/dragging



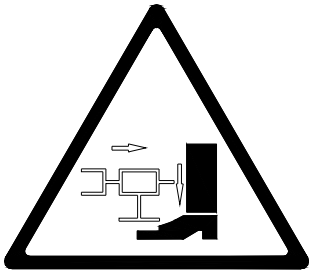
8) Danger: Risk of burn



9) Prohibited: No access for unauthorized personnel



10) Prohibited: Access prohibited



11) Warning: Keep off outriggers



12) Prohibited: Naked flames



13) Note: First aid kit



14) Note: Fire extinguisher

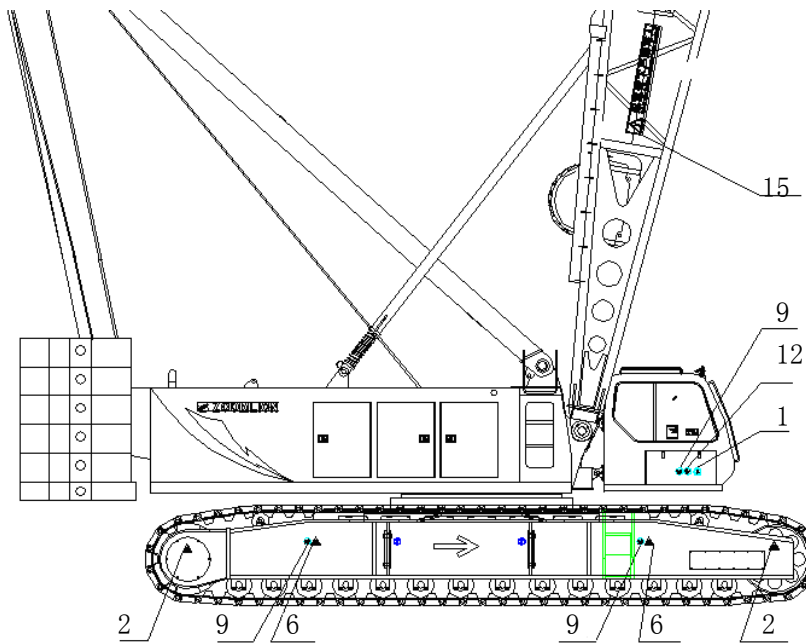


15) No standing under the boom.

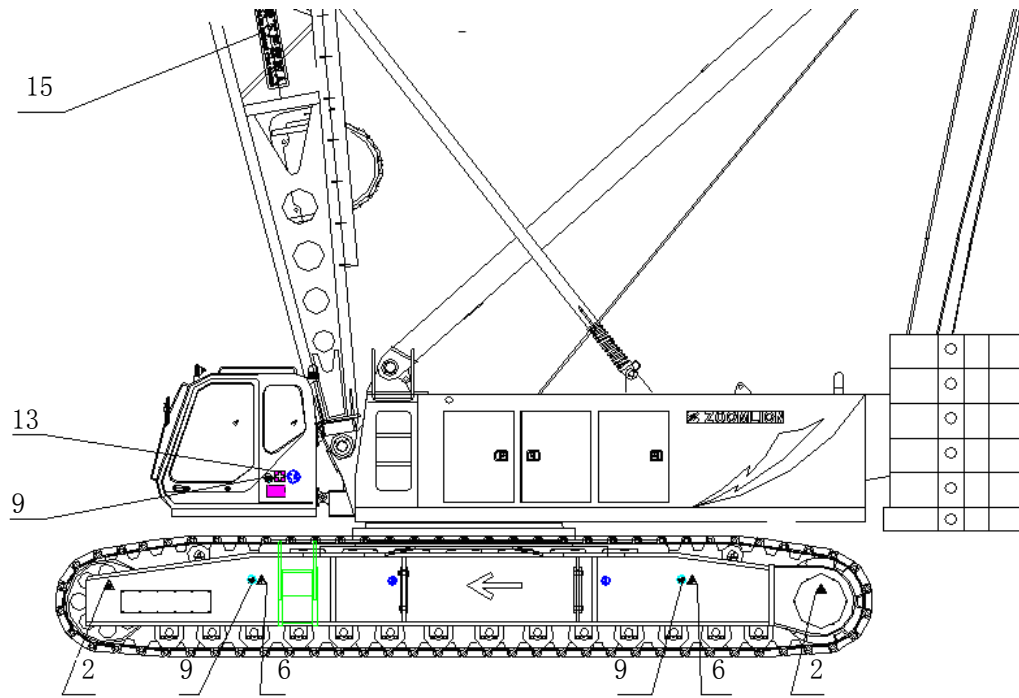


16) Be careful in the working radius.

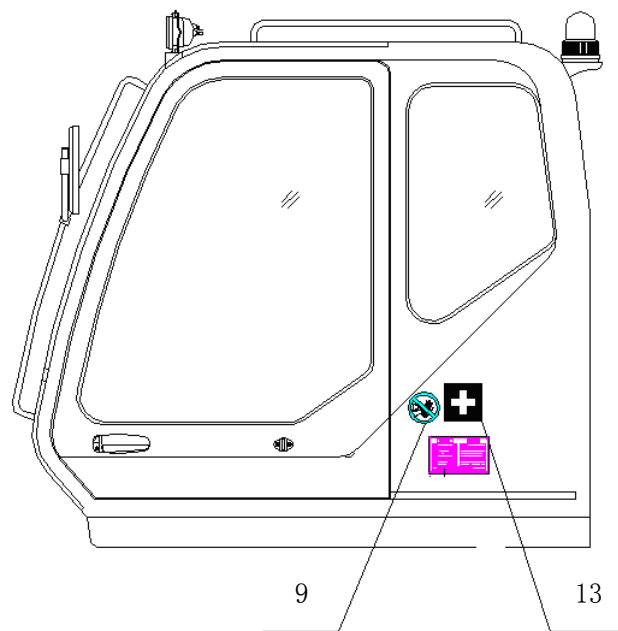
As to the position of safety signs, please see following diagrams.



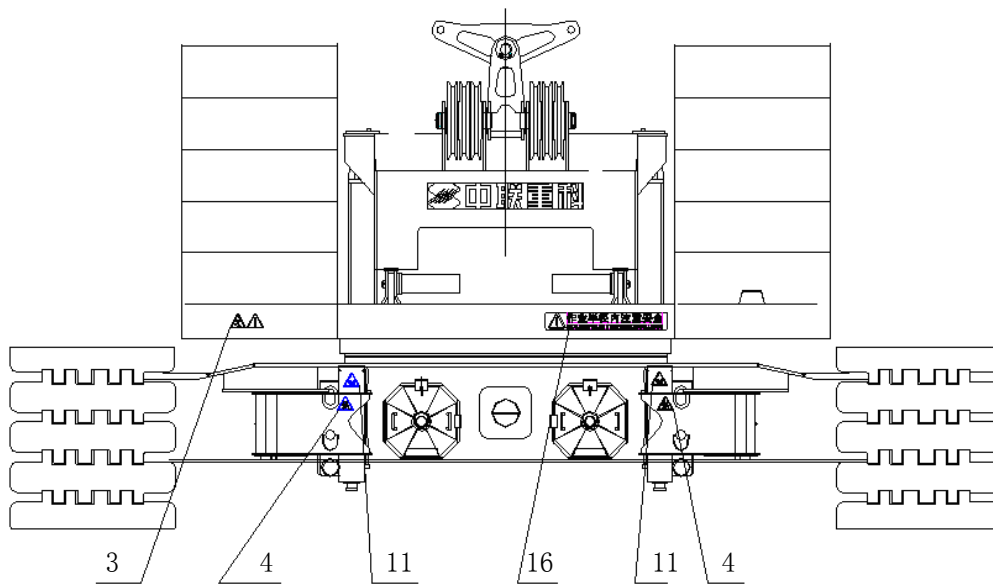
Safety signs position diagram 1



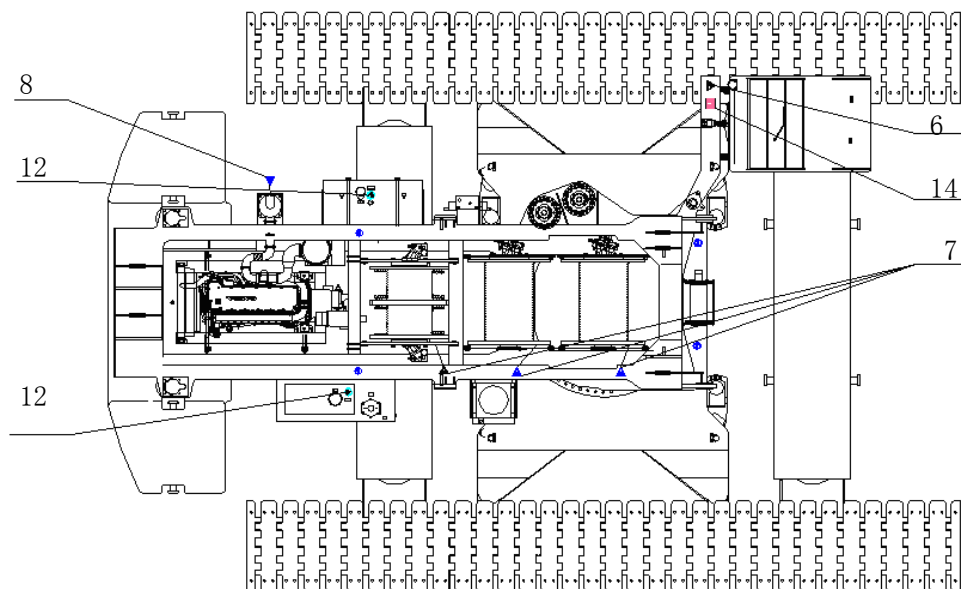
Safety signs position diagram 2



Safety signs position diagram 3



Safety signs position diagram 4



Safety signs position diagram 5



Caution:

1. When the safety sign is damaged or illegible, please order it from appointed service supplier.
2. It is forbidden to cover or take off safety signs casually.
3. If the safety sign is covered with dust, clean it in time.
4. The operator's cab should be equipped with an emergency hammer which can be used to smash the window in an emergency so that operator can run away from the cab.

3.2.9 Hand Signals for Controlling Crane Operations

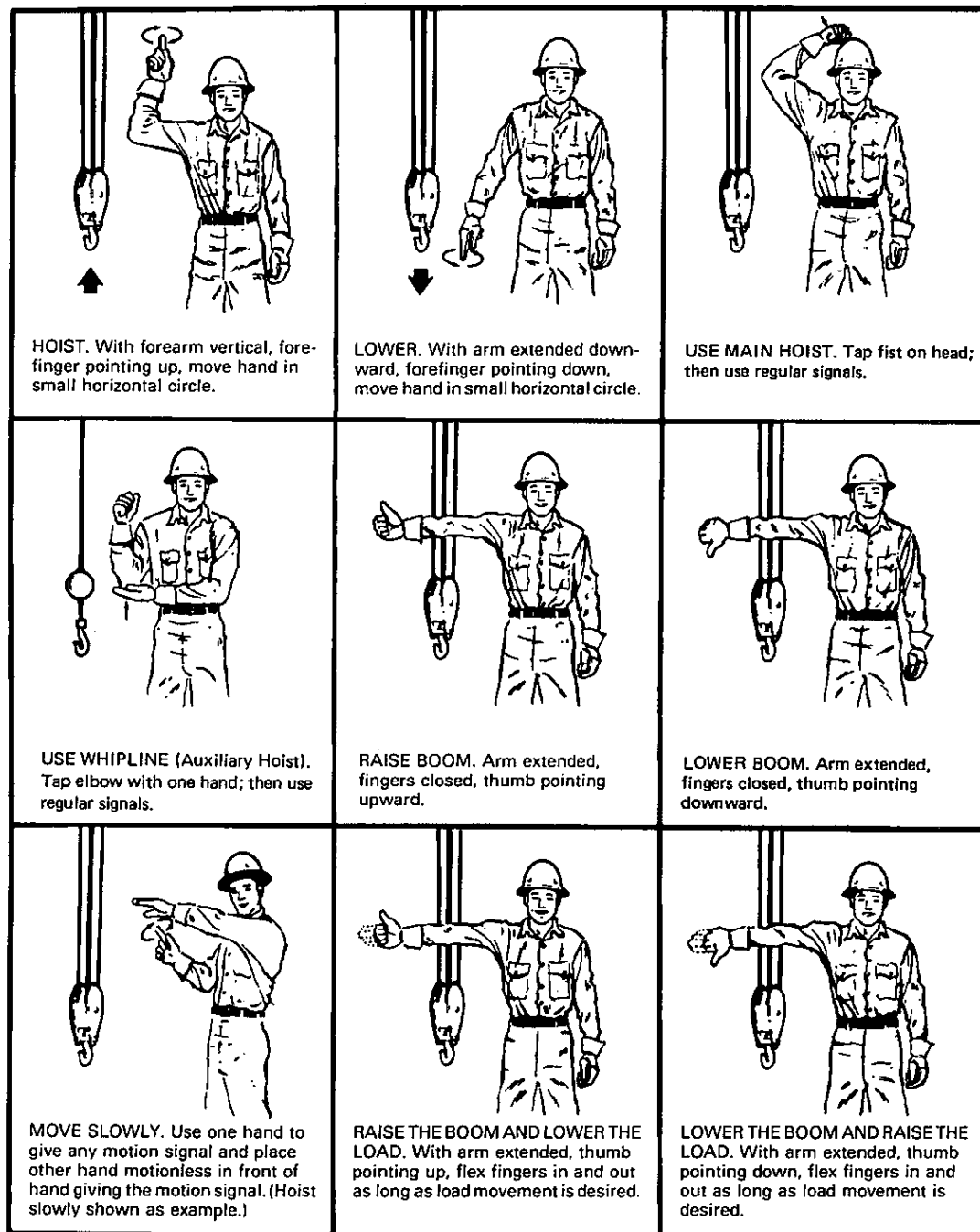


Fig. 17 Standard Hand Signals for Controlling Crane Operations

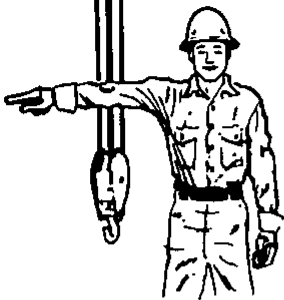
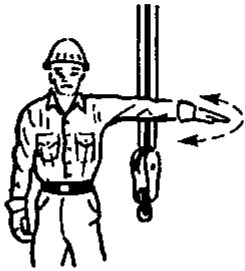
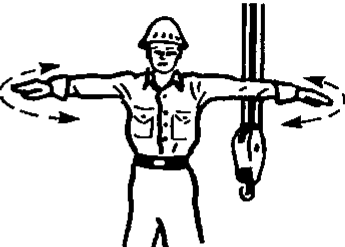
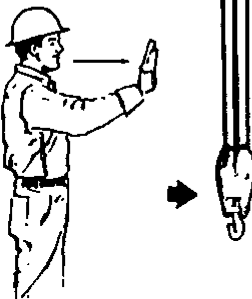
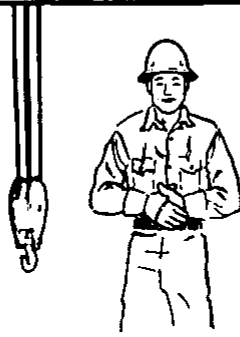
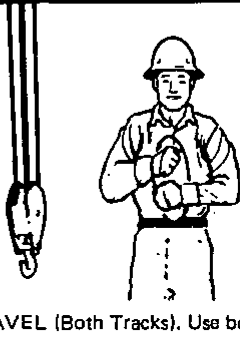
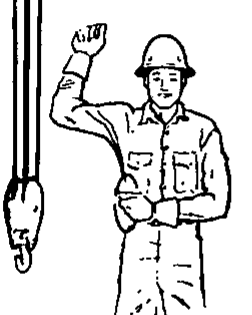
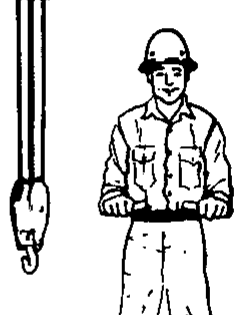
 SWING. Arm extended, point with finger in direction of swing of boom.	 STOP. Arm extended, palm down, move arm back and forth horizontally.	 EMERGENCY STOP. Both arms extended, palms down, move arms back and forth horizontally.
 TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.	 DOG EVERYTHING. Clasp hands in front of body.	 TRAVEL (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward. (For land cranes only.)
 TRAVEL. (One Track) Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For land cranes only.)	 EXTEND BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing outward.	 RETRACT BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing toward each other.

Fig. 17 Standard Hand Signals for Controlling Crane Operations (Cont'd)

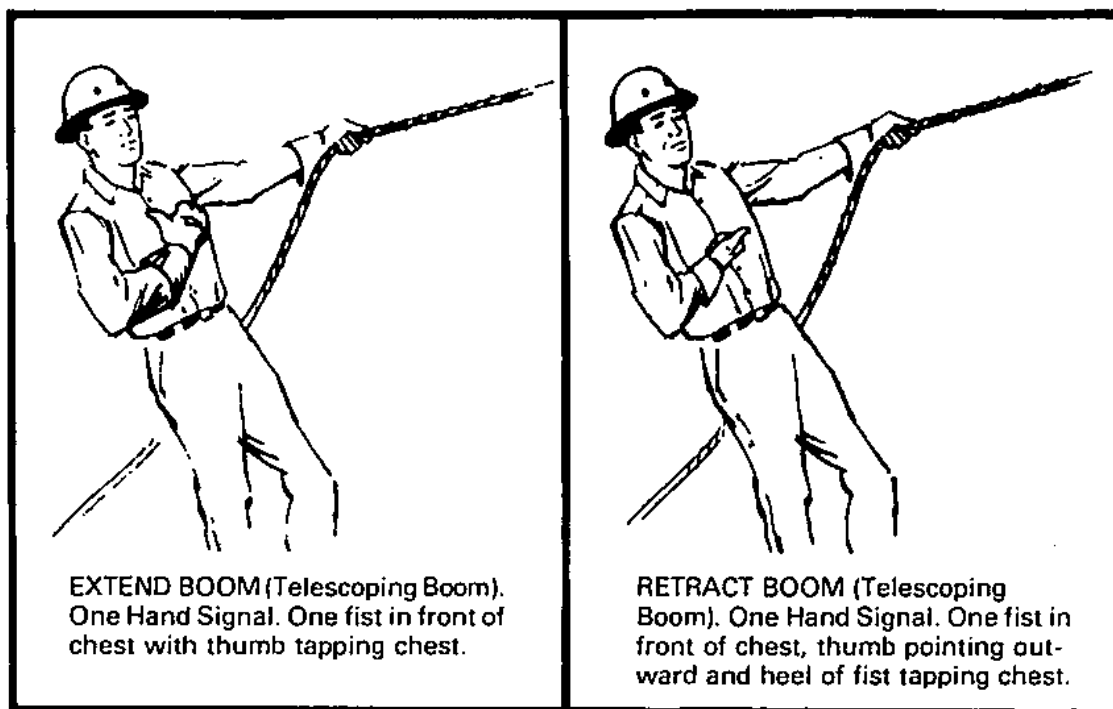
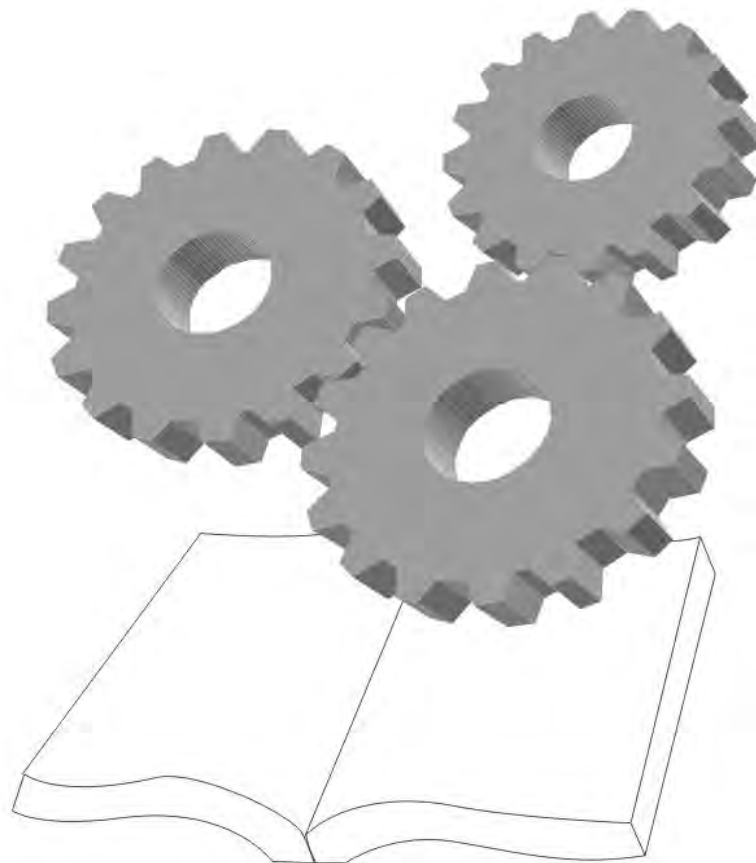
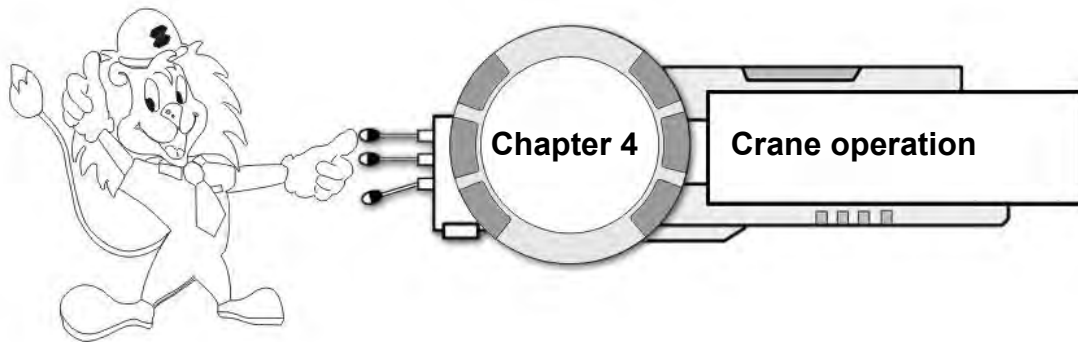


Fig. 17 Standard Hand Signals for Controlling Crane Operations (Cont'd)



Caution:

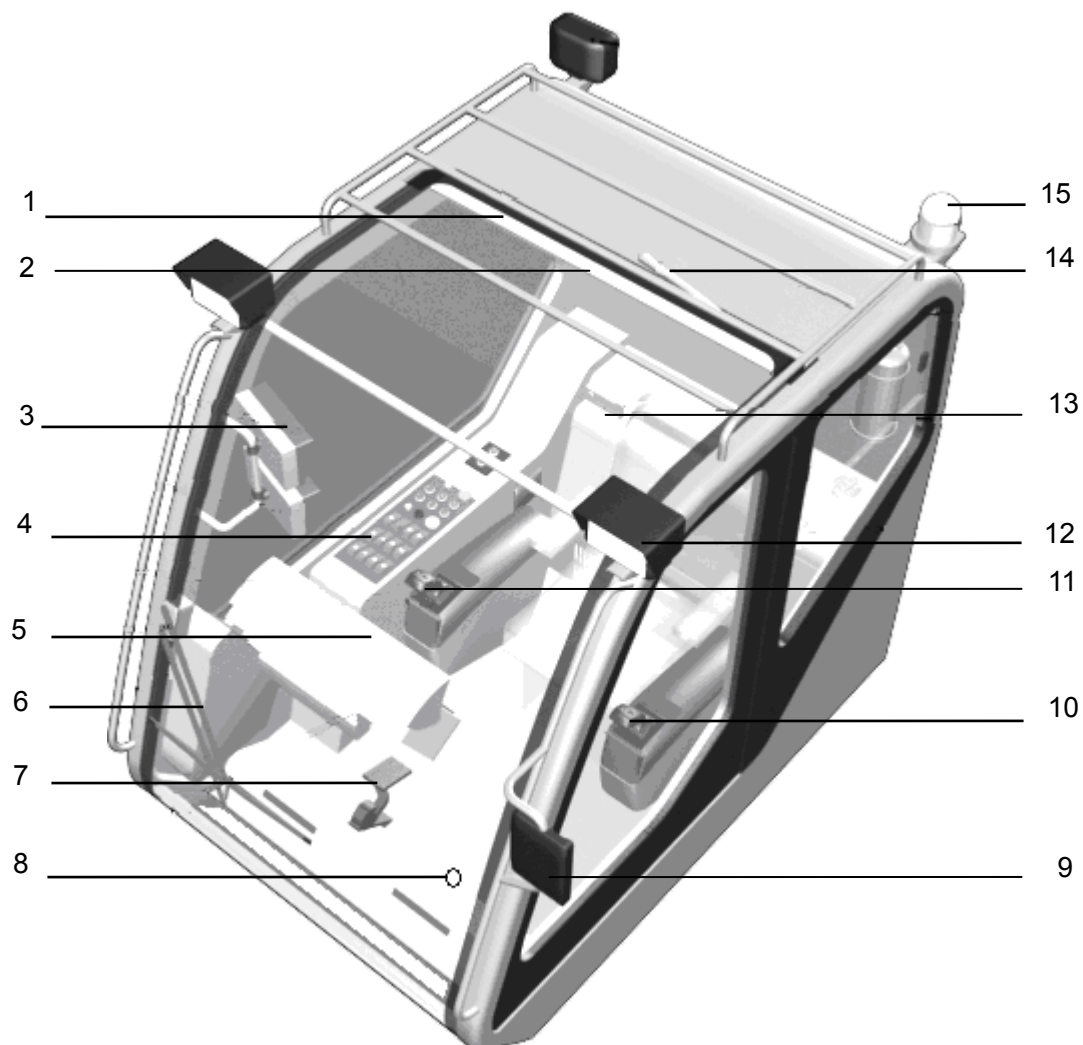
1. We recommend using the hand signals illustrated above. However, users can decide on their own hand signals depending on actual condition, as different countries and regions may differ in the expression of hand signals.
2. Hand signals must first be discussed and mutually agreed upon and clearly executed. Misunderstand of hand signals may lead to serious accidents.
3. In any case, national traffic regulations must always be observed when abroad.



ZOOMLION

4.1 Operating and control instruments

4.1.1 Overview of crane operator's cab

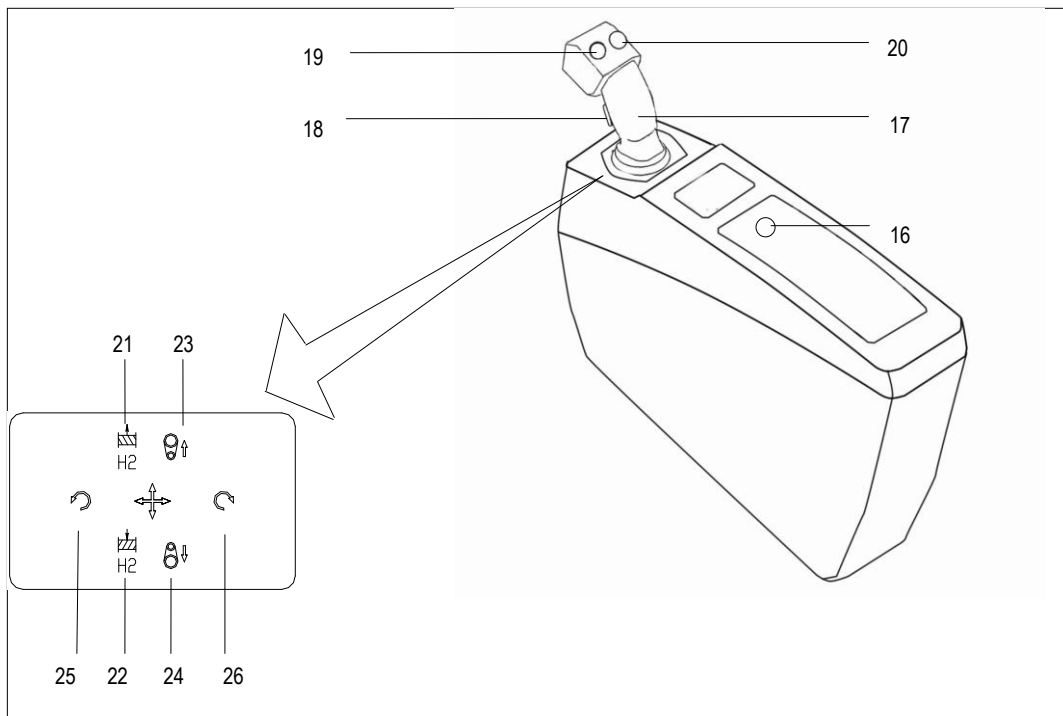


Overview of crane operator's cab

Components in crane operator's cab

No.	Description	Position and function
1	Fan	At the rear right side of operator's cab
2	Interior light	On the top of operator's cab
3	Monitor	Display the images from the video camera near the slewing table
4	Right control panel	The rocker switches, rotary switches and ignition starter switch are fitted on the control panel. (For details, see Section 4.1.4 and 4.5)
5	Digital display system	Consists of display of load moment limiter and display of control system (For details, see Section 4.2)
6	Front windshield wiper	At the bottom of front windshield
7	Accelerator pedal	Control the engine speed
8	Foot-operated switch	Actuate the horn
9	Rearview mirror	At front left side of operator's cab
10	Control box, left	Control the motions of hoisting winch 2, slewing mechanism and left crawler. (For details, see Section 4.1.2 and 4.5)
11	Control box, right	Control the motions of hoisting winch 1, derricking mechanism, right crawler and self-assembly & dismantling mechanism. (For details, see Section 4.1.3 and 4.5)
12	Working floodlights	Two working floodlights, front; One working floodlight, rear
13	CD player	
14	Roof windshield wiper	At the roof of operator's cab
15	Warning light	At the rear left side of operator's cab

4.1.2 Left control box



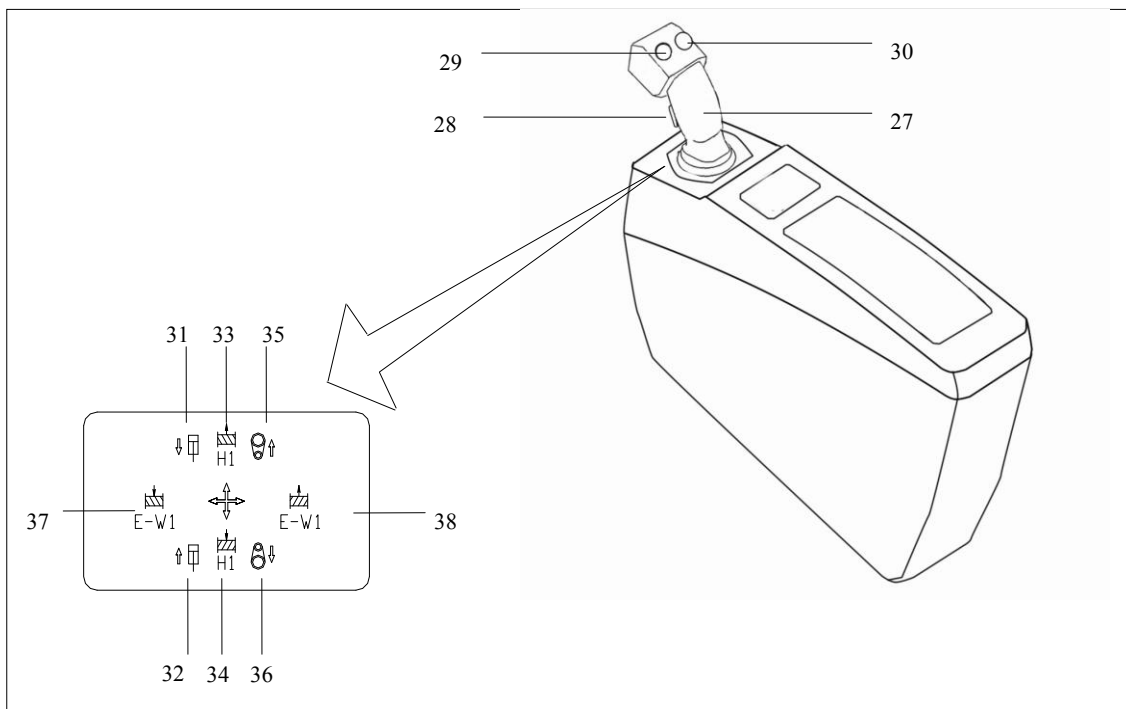
Components of left control box

No.	Names of the components	Remarks
16	Emergency stop button	For details, please refer to section 4.4.1
17	Left control lever	
18	Deadman's button	
19	High-speed switch	Control the high speed of slewing movement. For details, please refer to section 4.5.4.
20	"Swing free running" switch	For details, please refer to section 4.5.4.3
21	Symbol "reel off H2"	H2 refers to hoisting winch 2
22	Symbol "spool up H2"	H2 refers to hoisting winch 2
23	Symbol "left crawler forwards"	
24	Symbol "left crawler backwards"	
25	Symbol "slew to the left"	
26	Symbol "slew to the right"	



- (1) The crane movements can be carried out only when deadman's button is pressed.
- (2) The crane movements can still be carried out before the control lever is returned to neutral position with deadman's button released. However, to perform the next crane movement after returning the control lever to neutral position, the operator must press deadman's button first and then move the control lever. Otherwise, the operation of control lever is invalid.
- (3) In normal condition, stop the crane movements by returning the control lever to neutral position.
- (4) Make sure that the emergency stop button is triggered when needing to connect the power or start up the engine again.

4.1.3 Right control box



Components of right control box

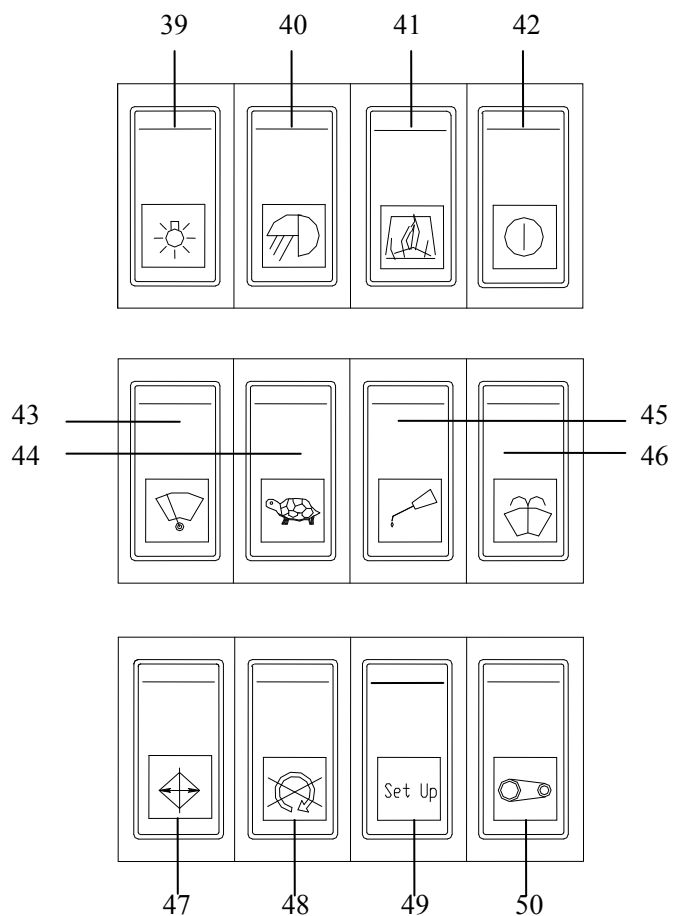
No.	Names of the components	Remarks
27	Right control lever	
28	Deadman's button	
29	Switch	Not assigned
30	High-speed switch	Control the high speed of hoisting winch1, hoisting winch 2, luffing jib derricking winch and travel gear. For details, please refer to section 4.5.
31	Symbol "extend mounting cylinder on A-frame"	Reserved
32	Symbol "retract mounting cylinder on A-frame"	Reserved
33	Symbol "reel off H1"	H1 refers to hoisting winch 1
34	Symbol "spool up H1"	H1 refers to hoisting winch 1
35	Symbol "right crawler forwards"	
36	Symbol "right crawler backwards"	

37	Symbol "spool up E/W1"	E refers to derricking winch, and W1 refers to luffing jib derricking winch (spare)
38	Symbol "reel off E/W1"	E refers to derricking winch, and W1 refers to luffing jib derricking winch(spare)

 CAUTION

- (1) The crane movements can be carried out only when deadman's button is pressed.
- (2) The crane movements can still be carried out before the control lever is returned to neutral position with deadman's button released. However, to perform the next crane movement after returning the control lever to neutral position, the operator must press deadman's button first and then move the control lever. Otherwise, the operation of control lever is invalid.
- (3) In normal condition, stop the crane movements by returning the control lever to neutral position.

4.1.4 Control panel assy.



Rocker switches on the control panel

Description of the rocker switches

No.	Names of the rocker switches	The key	Remarks
39	Master lighting switch		1 st position: The LED on the switches of control panel lights up; 2 nd position: master lighting switch
40	"Working floodlight" switch		Control all the working floodlights on the crane
41	"Cold-start on/off" switch		Control the cold-start of the engine
42	Controller power supply switch		Control the power supply of PLC controller and LCD screen

No.	Names of the rocker switches	The key	Remarks
43	“Front windshield wiper” switch		Control the front windshield wiper
44	“Low-speed” switch		For details, please refer to section 4.5
45	“Automatic lubrication system” switch		Lubricate the superstructure lubricating points automatically.
46	“Front windshield washer” switch		Control the front windshield washer
47	“Oil cooling fan” switch		Pressing this switch can cool the hydraulic oil
48	“Engine shutdown” switch		Pressing this switch can shut down the engine Press the “engine shutdown” switch and hold it for more than 30 seconds, the working hours of the engine can be saved. In normal situation, using the ignition key switch to stop the engine is prohibited. Ensure that this switch is not pressed down before engine startup. Otherwise, the crane cannot be started.
49	“SETUP” switch		For details, please refer to section 4.4
50	“Travel” switch		To carry out traveling movements, the operator must first press the traveling switch and then operate control lever! Do not press this switch when crane winch is operated.

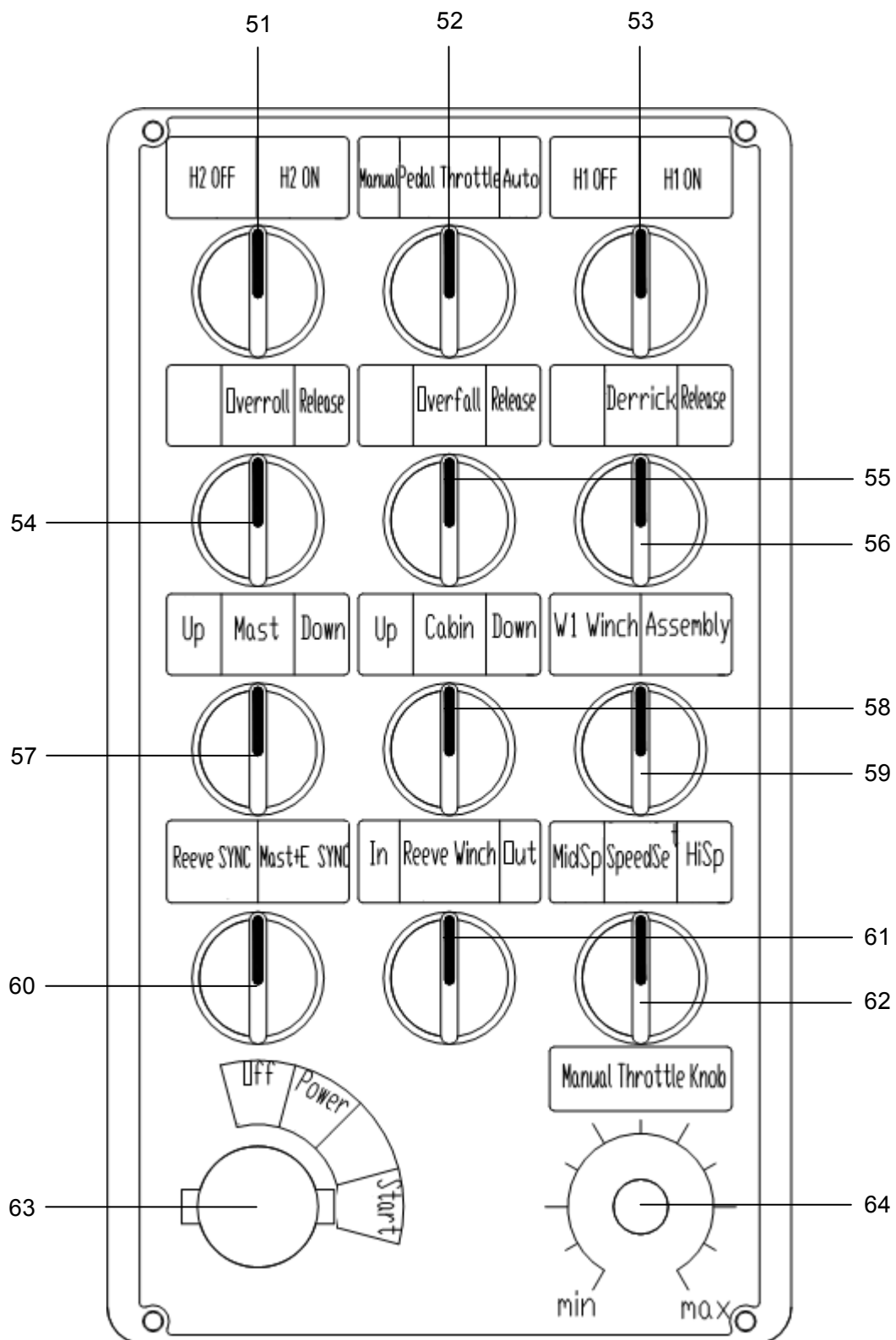


(1) Put the master lighting switch  on the 2nd position before switching on the

working floodlight switch .



- (2) After putting the master lighting switch on the 2nd position, the LED on the rocker switches of control panel is still on.**
- (3) Press the “engine shutdown” switch and hold it for more than 30 seconds, the working hours of the engine can be saved. In normal situation, using the ignition key switch to stop the engine is prohibited.**



Right control panel

Components on right control panel

No.	Names of the components	Remarks
51	"H2 Control" Switch	Turn the switch to left, hoisting winch 2 (H2) will not work; Turn the switch to right, hoisting winch 2(H2) can work.
52	"Manual/automatic accelerator" switch	When the switch is set in neutral position, the engine speed is controlled by accelerator pedal. When the switch is set in "manual" position, the engine speed is controlled by Manual ACCEL adjuster. When the switch is set in "automatic" position, the current Manual ACCEL adjuster value is the maximum adjustable speed of engine.
53	"H1Control" Switch	Turn the switch to left, hoisting winch 1(H1) will not work; Turn the switch to right, hoisting winch 1(H1) can work.
54	"Hoisting bypass" switch	For details, please refer to section 4.4.
55	"Lowering bypass" switch	For details, please refer to section 4.4.
56	"Derricking bypass" switch	For details, please refer to section 4.4.
57	"A-frame erecting/lowering" switch	Turn the switch to left, A-frame will be erected; Turn the switch to right, A-frame will be lowered.
58	"Tilt cab forwards/backwards" switch	Turn the switch to left, the cab will tilt forwards; Turn the switch to right, the cab will tilt backwards.
59	"W1 winch/Assembly" switch	When the switch is turned to "W1" position, move right control lever to left and right to control the luffing jib derricking winch (W1). This is only available for W1 winch. (For details, see section 4.5.2.2.3.3.) When the switch is turned to "Assembly" position, push right control lever forwards and backwards to control the mounting cylinder on A-frame. This is only used during assembly and dismantling operation. (For details, see section 4.5.9.)
60	"Synchronization" switch	"Synchronization" switch includes "Reeve sync" position and "Mast +E sync" position. "Reeve sync" For detailed description of "Mast +E sync", For details, please refer to section 4.5.3.
61	"Reeving winch" switch	Turn the switch to left, the reeving winch will be spooled up; Turn the switch to right, the reeving winch will be reeled off.

No.	Names of the components	Remarks
		start. 1. When the switch is placed in “off” position, the power supply of the crane is turned off. 2. When the switch is placed in “power” position, the power supply of the crane is turned on, including the control system, auxiliary control system and engine electrical control system. 3. When the switch is placed in “start” position, the starting motor of the engine is turned on, thus starting the engine. Releasing the switch after the crane starts up, the switch will return to “power” position automatically.
64	“Manual ACCEL adjuster” switch	1. In “manual accelerator mode”, the adjuster is used to control the engine speed. Turn it clockwise to the required speed. 2. In “auto accelerator mode”, the current value is the maximum adjustable speed of engine.

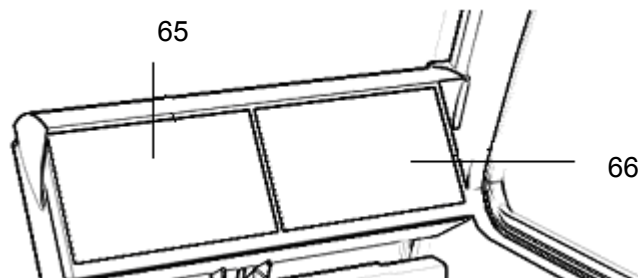
 CAUTION

- (1) In cold weather, the engine will be preheated automatically after startup. Therefore, the delay of engine startup in cold weather is a normal phenomenon.
- (2) **“Assembly” position of “W1 winch / Assembly” selective switch is only used for assembling and dismantling.**
- (3) **Only when the crane is fitted with luffing jib derricking winch (W1), can the operator can turn the “W1 winch / Assembly” selective switch to “W1 winch” position. Otherwise, there is a risk of danger!**
- (4) When the “Manual/automatic accelerator” switch is set in “manual” position before starting the engine, turn “Manual ACCEL adjuster” to “MIN” position or place “Manual/automatic accelerator” switch to the neutral position.

 DANGER

It's dangerous to use “hoisting bypass” and “lowering bypass” switches, which can't be used in normal situation. Under special circumstances, and the user knows the possible consequences, then he can operate it very carefully.

4.2 Instruction for digital display system



Digital display system

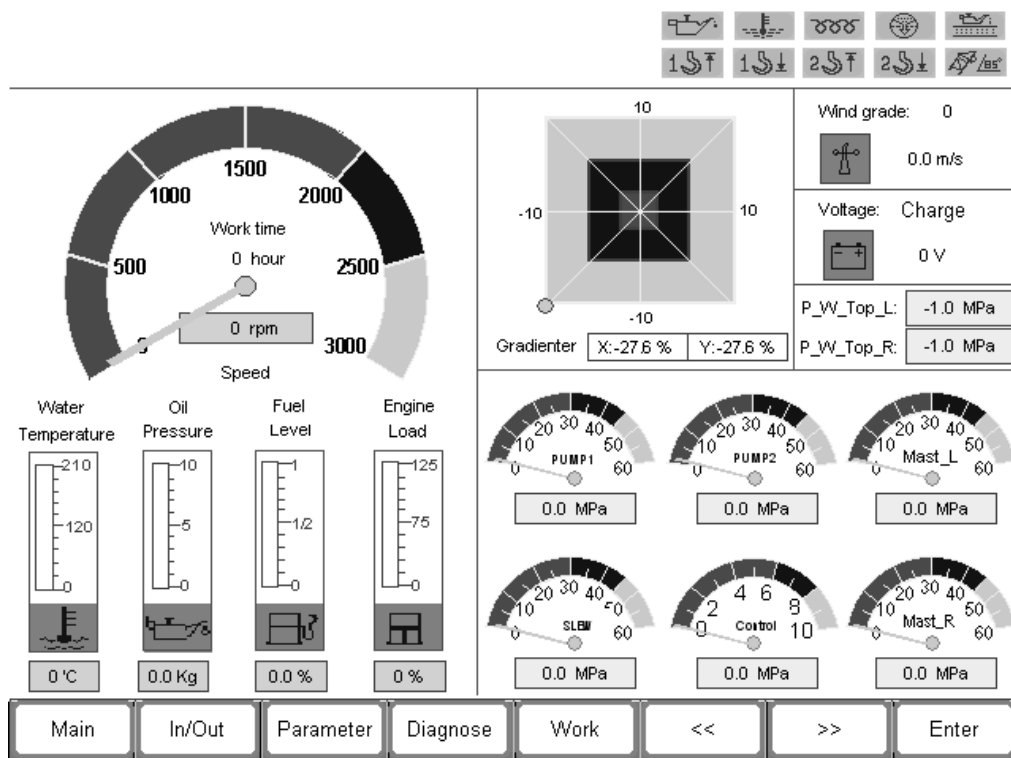
No.	Description	Function
65	Display of load moment limiter	Display the current working condition of crane
66	Display of control system	Display the information about crane control system

4.2.1 Load moment limiter

As to detailed operation, refer to ***Load Moment Limiter Operating Manual***.

4.2.2 Display of control system

It can display the working state of crawler crane in real time. When abnormal conditions occur, the warning light will flash or a prompt will appear on the screen. The display can show the working mode, engine speed, wind speed, voltage, water temperature, oil level, load and pressure of pumps etc.



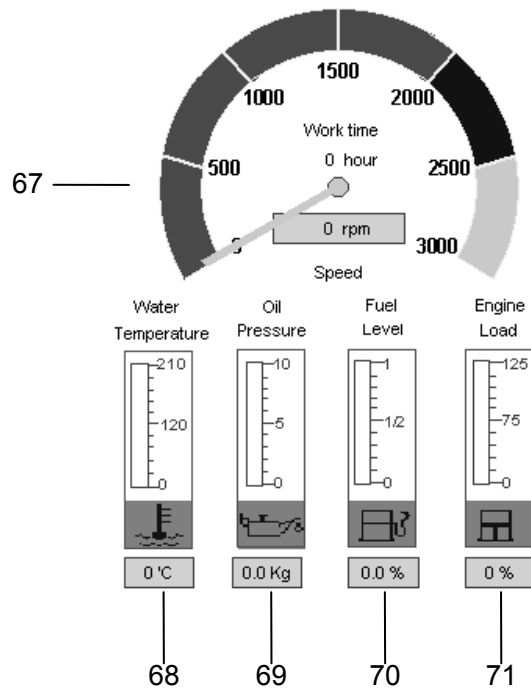
Main screen of display

The main screen is subdivided into **five** main areas.

- Engine information
- Alarm functions
- Monitored additional functions
- Pressure of crane control pumps
- Function key line

Note: In view of legibility, Figures of display of control system given here are amplified. However, when crane is working, the screen shown on the display is not as large as the figure.

4.2.2.1 Engine information



Display of engine information

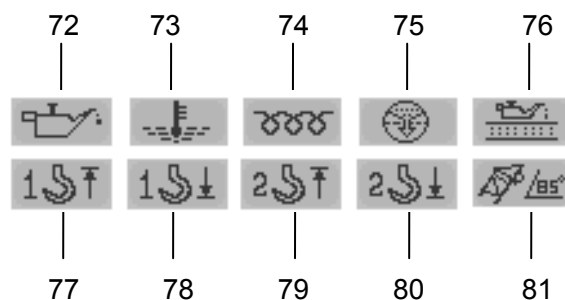
No.	Description
67	Engine speed and working time
68	Water temperature
69	Engine oil pressure
70	Fuel level
71	Engine load



Note:

The fuel level and engine load are shown in percentage.

4.2.2.2 Alarm functions

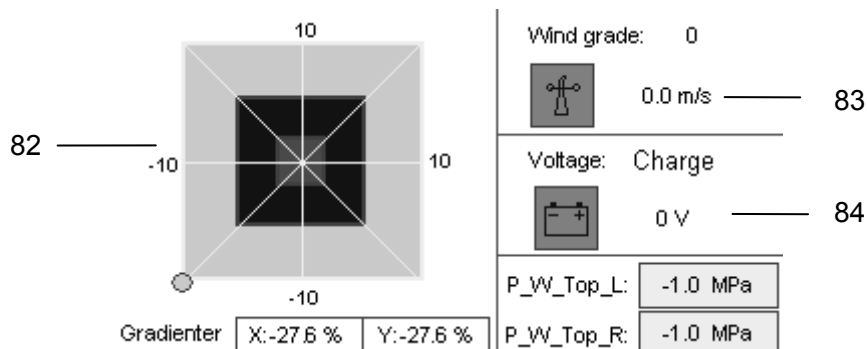


Display of alarm function

The limit ranges of the working state of crane are monitored. The following icons will flash when the limits are reached.

No.	Description	Function
72	Icon "Engine oil pressure"	When engine oil pressure is too high, the icon  will flash.
73	Icon "Water temperature"	When water temperature reaches the specified value, the icon  will flash.
74	Icon "Preheating"	When engine is being preheated, the icon  will flash.
75	Icon "Air filter clog"	When air filter is clogged, the icon  will flash.
76	Icon "Oil inlet /return pipe clog"	When oil inlet pipe or oil return pipe is clogged, the icon  will flash.
77	Icon "Upper limit switch on H1"	When load hook 1 comes into contact with the hoisting limit switch weight during its upward movement, the icon  will flash.
78	Icon "Lower limit switch on H1"	When there are only three windings of wire rope left on H1, the icon  will flash.
79	Icon "Upper limit switch on H2"	When load hook 2 comes into contact with the hoisting limit switch weight during its upward movement, the icon  will flash.
80	Icon "Lower limit switch on H2"	When there are only three windings of wire rope left on H2, the icon  will flash.
81	Icon "main boom, 85°"	When main boom angle reaches 85°, the icon  will flash.

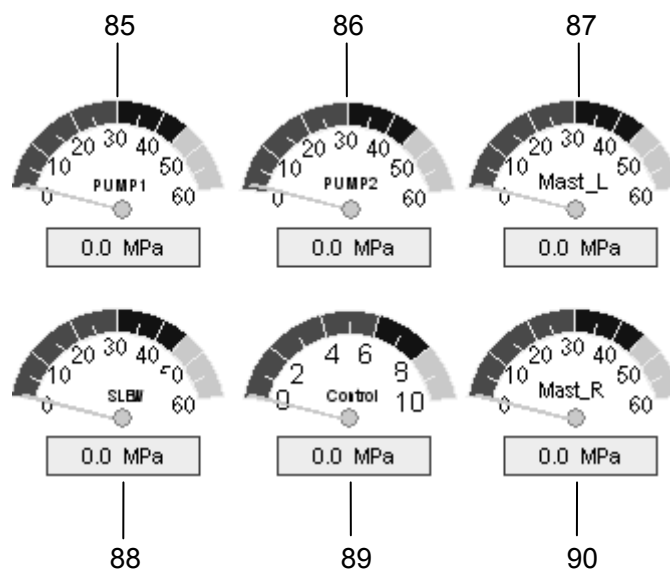
4.2.2.3 Monitored additional functions



Display of monitored additional functions

No.	Description	Function
82	Crane inclination	Display the inclination of crane to the horizontal in longitudinal and lateral direction Note: The traveling direction of crane is taken as positive direction.
83	Wind speed	Display the current wind speed at boom head detected by anemometer
84	Voltage of machine	Display the voltage of machine battery

4.2.2.4 Pressure of crane control pumps



Display of pressure of crane pumps

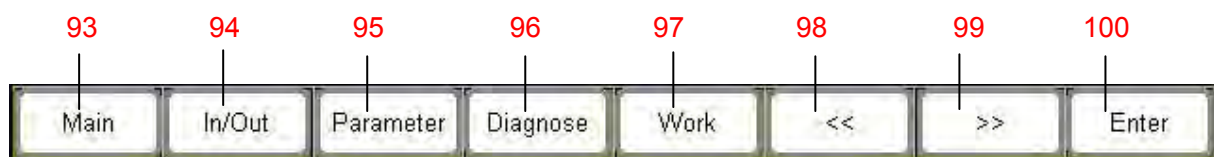
No.	Description
85	Pressure in main pump I circuit
86	Pressure in main pump II circuit
87	Pressure of A-frame erection cylinder (left)
88	Pressure in slewing pump circuit
89	Pressure in control pump circuit
90	Pressure of A-frame erection cylinder (right)

P_W_Top_L: -1.0 MPa — 91
P_W_Top_R: -1.0 MPa — 92

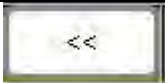
Display of pressure of tilting-back support cylinder for WA-frame 1

No.	Description
91	Pressure of tilting-back support cylinder for WA-frame 1 (left)
92	Pressure of tilting-back support cylinder for WA-frame 1 (right)

4.2.2.5 Function key line



Function key line

No.	Description	Operation and function
93	Key "main screen"	Pressing this key in any other screen can switch to "main screen" directly. The main screen is shown in Section 4.2.2.
94	Key "IO"	Press this key to enter into "I/O screen". In this screen, all the input/output points of PLC can be checked for correction.
95	Key "Parameter adjustment"	Adjust relevant parameters of main motions
96	Key "Fault diagnosis"	At present, this function is not set in the control system of crane.
97	Key "working conditions"	Pressing this key can switch to "Working conditions screen". Under this screen, the working conditions for main crane movements can be checked.
98		Page up
99		Page down
100	Key "Enter"	Confirm the previous operation or save the modified parameters.

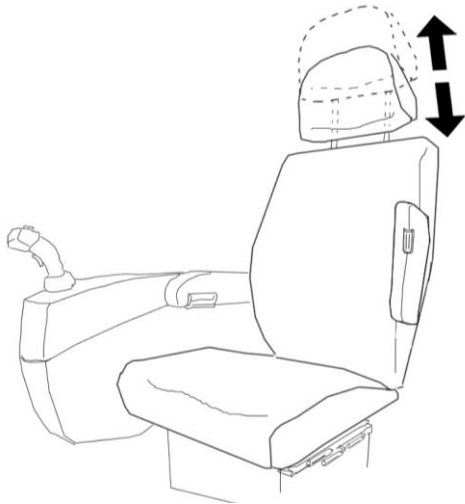
**Caution:**

Never adjust the parameters without the permission of our technicians.

4.3 Startup of crane

4.3.1 Adjustment of crane operator's seat

a) Vertical adjustment of headrest



The height of headrest is adjusted manually.

b) Adjustment of armrest



The height of armrest can be adjusted by adjusting knobs.

c) Horizontal adjustment of seat



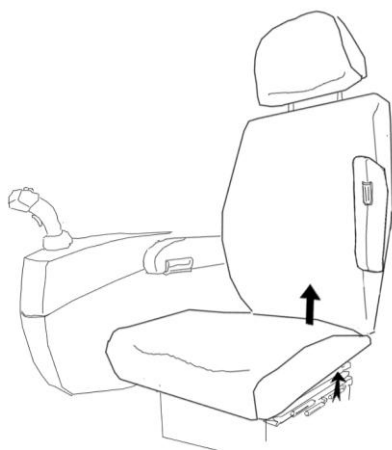
- Pull the lever upwards;
- Move the seat to required position;
- Release the lever.

d) Adjustment of the height of seat

There are two levers to adjust the height of the seat. The front lever adjusts the height of the front of the seat, and the rear lever adjusts the height of the rear of the seat.

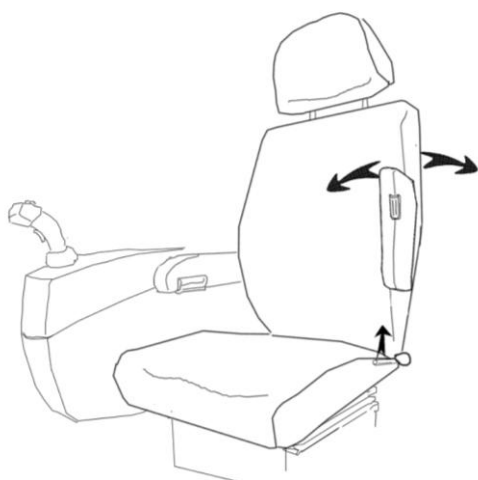


-- Pull the lever upwards, the front of the seat is raised up.



-- Pull the lever upwards, the rear of the seat is raised up.

e) Adjustment of backrest



- Press your back gently against the backrest;
- Pull the lever upwards;
- The backrest tilts backwards.
- pull the lever downwards.
- The backrest automatically tilts forwards.

4.3.2 Checks before startup

Following checks should be performed before startup of engine.

- a) Check oil filter and oil level
 - 1) Engine oil level;
 - 2) Oil level of hydraulic oil tank;
 - 3) Oil filter on hydraulic oil tank.
- b) Check coolant level

Add coolant to the rim of oil filler.



Danger:

Never check the coolant level before the engine is cooled down. Otherwise, you may get scalded.

- c) Check the general conditions of crane

Before starting up the crane, the operator must ensure that the following conditions are fulfilled:

- 1) The crane is horizontally aligned;
- 2) The toothed gear of slewing ring must be clean and greased;
- 3) The air inlet of oil cooler is not blocked;
- 4) All cowlings and covers on the sides must be closed and locked;
- 5) No person or object is within the slewing radius of crane;
- 6) No ice or snow is on the wire rope, winding drum and limit switches;
- 7) There are no loose parts on the slewing table or on the boom;
- 8) The shutoff valve on the hydraulic oil tank should be opened;
- 9) The fixing pin for slewing table is pulled out.

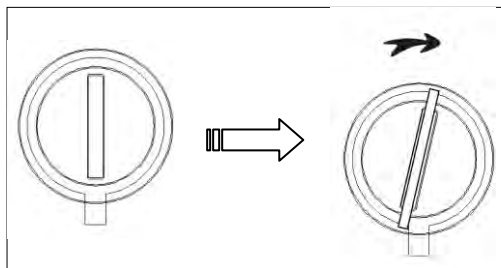


Danger:

Before carrying out any boom movements, make sure that there are no loose parts on the boom such as pin, retaining spring or ice. Otherwise, the falling parts may hit the persons or other objects.

4.3.3 Turn on power supply

Insert ignition key into ignition lock and turn it clockwise to the 1st position, then the power supply is turned on.



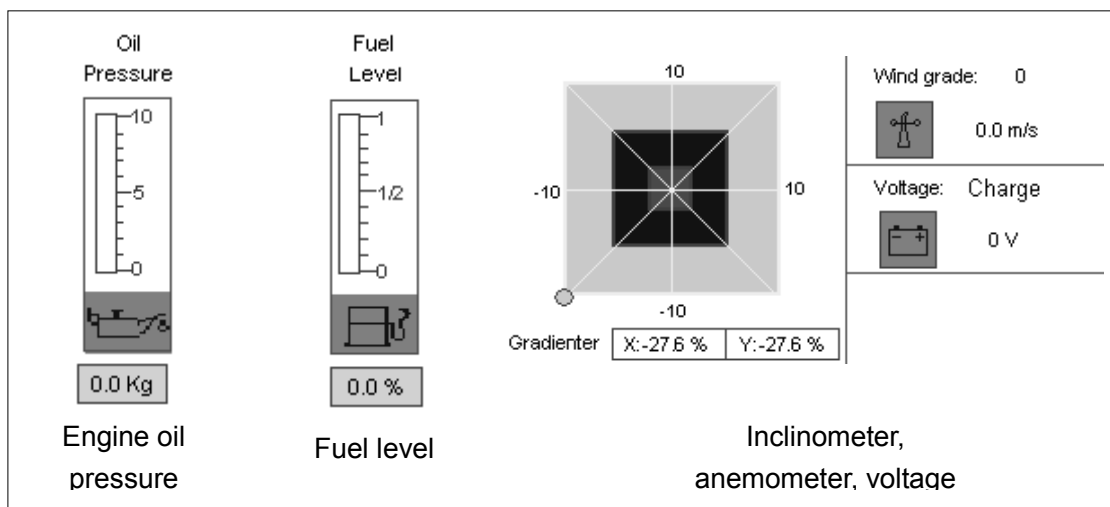
Turn on power supply

a) Digital display system



After the power supply is turned on, press the controller power supply switch on the right control panel, the LCD screen of load moment limiter and LCD screen of control system are started.

Check the following indicators and warning icons:



- 1) Icon "Engine oil pressure";
- 2) Icon "Fuel level";
- 3) Icon "Air filter clog" ();
- 4) Inclinometer;
- 5) Anemometer;
- 6) Voltage;

⚠ CAUTION

- (1) **Correctly set current work mode on load moment limiter, otherwise, operation is not permitted to be carried out.**
- (2) **Low engine oil pressure will impair the working efficiency of engine.**
- (3) **Add diesel oil in time if the oil level is too low.**
- (4) **If air filter is clogged, the icon “air filter clog”  will flash. At this moment, clean or change air filter.**
- (5) **The inclination range for the superstructure: the inclination should be less than 1% in both lateral direction and longitudinal direction. If this range is exceeded, the crane operator must adjust the crane to horizontal position firstly.**
- (6) **The maximum in-service wind speed should not exceed 9.8m/s.**
- (7) **The maximum out-of-service wind speed should not exceed 21m/s when the crane is only fitted with main boom;**
The maximum out-of-service wind speed should not exceed 15m/s when the crane is fitted with main boom and fixed jib.
If wind speed reaches or exceeds these values, the entire boom should be lowered down.
- (8) **The battery master switch must be switched on to electrify the machine.**
- (9) **To protect the battery, switch off the battery master switch if the crane will not work for a long time.**

b) Right control panel

1) Illumination

Press the “interior light” switch, the interior light in the cab will light up.



Turn the master lighting switch to the 1st position or the 2nd position, the LED on the switches of the control panel will light up;

2) Windshield wiper and washer

Turn on front windshield wiper and roof windshield wiper by pressing the front



windshield wiper switch and roof windshield wiper switch respectively.

When front windshield needs to be washed, please press the “front windshield

washer” switch .

3) Fan

There is a fan fitted on the rear right side of the operator’s cab. Turn on the switch on it, the fan will run.

4) Horn

Check if the horn is working properly with foot-operated switch before work.



(1) Before switching on the working floodlight switch , put the master lighting switch  on the 2nd position.

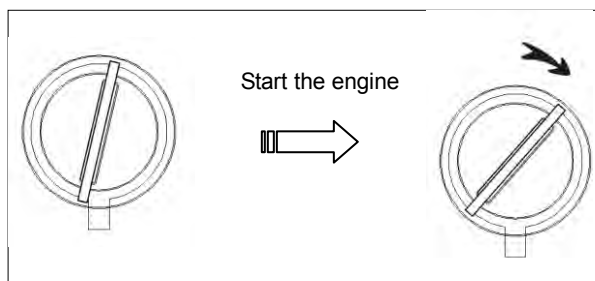
(2) Warning light on boom head is a kind of solar light. The warning light is charged during the day and will flash at night.

(3) The horn must be actuated before starting the engine to warn the person in the vicinity of the crane.

(4) The horn can only be actuated before starting the engine and in emergencies.

4.3.4 Start engine

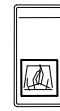
Insert the ignition key into the ignition lock and turn it clockwise to the 2nd position, then the engine is started.



Start the engine

⚠ CAUTION

- (1) When ambient temperature is higher than or equal to -10°C , the engine will be preheated automatically before startup. Therefore, the delay of engine startup in cold climate is a normal phenomenon.
- (2) When the engine is being preheated, the icon  will flash. After the engine is preheated, it will go out.
- (3) When ambient temperature is lower than -10°C , the operator must actuate engine cold-start device first and then start the engine. When engine cold-start device is actuated, put the controller power (if there is) in (stop) position, the ignition key



switch in (power) position, the cold-start rocker switch in the 2nd position. After running the cold-start device for about ten minutes, start the engine.

What's more, if the water temperature of the engine in cold climate is too low, start the cold-start device to improve the water temperature, ensuring that the water temperature of the engine is in normal range.

- (4) The engine can not work with full load until the running temperature is reached.

4.4 Safety devices

The crane operator must check all safety devices for functional work before every crane operation.

⚠ DANGER

Operating crane with faulty safety devices is prohibited!

4.4.1 Emergency stop button

As soon as this emergency stop button is pressed,

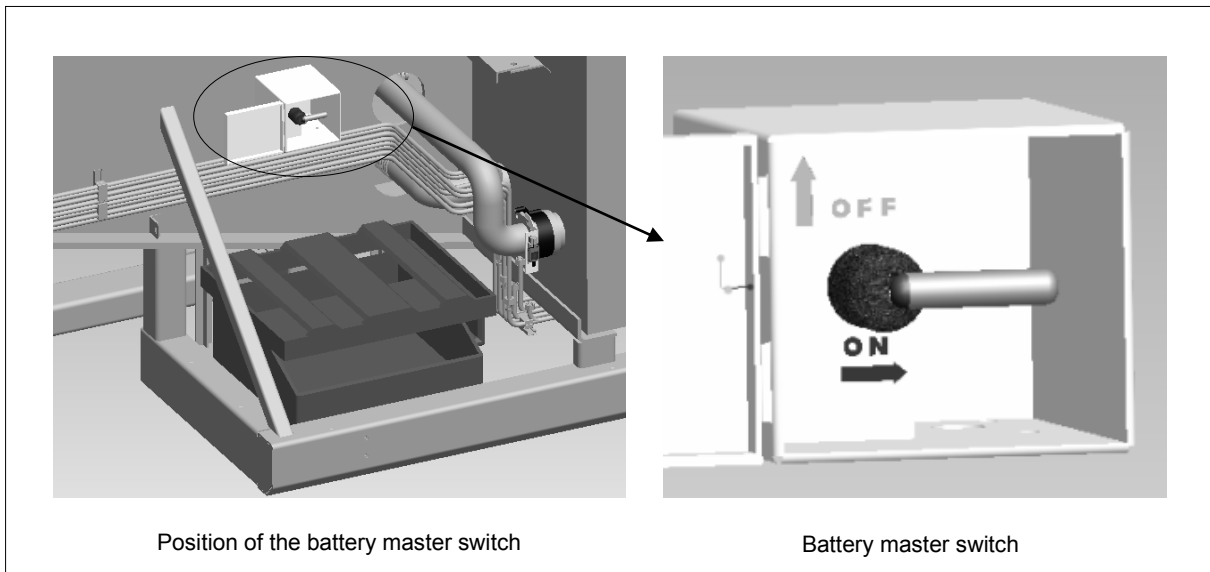
- the electrical control system is switched off and the diesel engine shuts down;
- All crane movements stop immediately.

⚠ DANGER

The emergency shut-down button must only be used in case of emergency and not as a normal procedure for shutting down the diesel engine!

If an emergency stop is triggered while a load is being lifted, there may be a risk of accident owing to swinging of load.

4.4.2 Battery master switch



The battery master switch is put in the rear right side of the slewing table, near the battery, which is described above. When the crane doesn't work at night or for a long time, the battery master switch should be put in "OFF" position to prevent the battery from discharging.

4.4.3 Load moment limiter

The load moment limiter switches off all crane movements that increase the load moment if the permissible load moment is exceeded. Only crane movements that reduce load moment can be carried out. Although the crane is equipped with load moment limiter, the operator can't escape the responsibility of unsafe operation. Before lifting a load, he must know the approximate weight of the load and decide if the crane is in a position to carry out this job with the help of load capacity chart.



Before operating the crane, the load moment limiter must be adjusted to the current setup condition according to the lifting capacity chart. Only this way can it be able to fulfill its protective task. If the crane operator does not observe this safety regulation, there is a great danger of toppling or destroying the crane, despite the load moment limiter is working normally. The load moment limiter can not monitor and control all possible operating conditions; this is still primarily the responsibility of the operator.

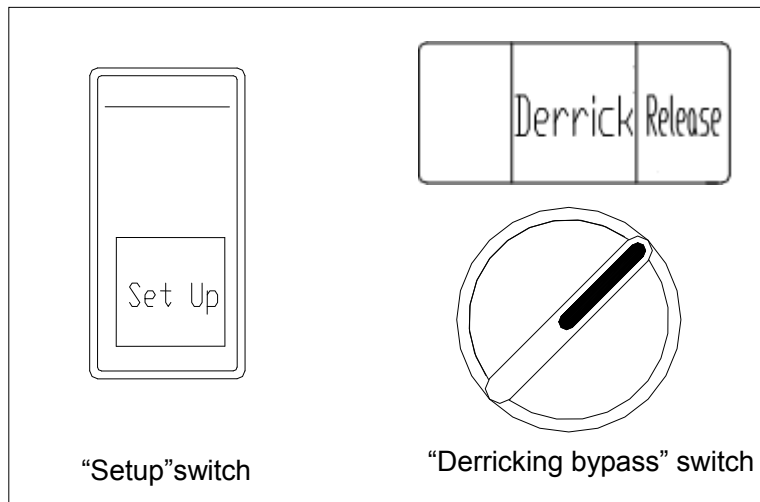
4.4.3.1 The moment percentage between 100%-110%

If the moment percentage is between 100%-110%, it means that the crane overloads by 100%-110%, the crane movements "spool up hoisting winch 1 or 2", "spool up derricking winch" and "reel off derricking winch" are limited. The tricolor light sends out yellow

early-warning and red warning continuously. The buzzer sounds continuously. The icon  will be shown on the display.



The following operation can bypass the limited crane movements temporarily.



1. When the control lever is in neutral position, if press “Setup” switch and then release it, the cut-off movements “spool up hoisting winch 1 or 2” and “reel off derricking winch” will be bypassed. The movements will be slower, the tricolor light will send out yellow warning continuously, and the buzzer will sound, meanwhile the icon  will be shown on the **display**.
2. When the control lever is in neutral position, if press “Setup” switch and then release it, and turn the “derricking bypass” switch to the right as shown in the above figure, the cut-off movements “spool up hoisting winch 1 or 2”, “spool up derricking winch” and “reel off derricking winch” will be bypassed. The movements will be slower, the tricolor light will send out yellow and red warning continuously, and the buzzer sounds, meanwhile the icon  is shown on the **display**.

4.4.3.2 The moment percentage more than 110%

If the moment percentage is more than 110%, it means that the crane overloads by 110%, the crane movements “spool up hoisting winch 1 or 2”, “spool up derricking winch” and “reel off derricking winch” are limited. The tricolor light sends out yellow early-warning and red warning continuously. The buzzer sounds continuously. The icon  will be shown on the display.

4.4.3.3 Unspecified rated load

If the load moment limiter enters the unspecified rated load work range, the crane movements “spool up hoisting winch 1 and 2” and “reel off derricking winch” are limited. The tricolor light will send out yellow early warning and red warning continuously. The buzzer will sound.

 CAUTION

The following operation can bypass the limited crane movements temporarily.

When the control lever is in neutral position, if press “Setup” switch and then release it, the cut-off movements “spool up hoisting winch 1 or 2” and “reel off derricking winch” will be bypassed. The movement will be carried out at normal speed, the tricolor light will send out yellow warning, and the buzzer will sound, meanwhile the icons  and



are shown on the **display**.

 CAUTION

- (1) “Bypass” means when overload appears and the movement is restricted, the operator get the permission to operate in the direction of danger temporarily through switch, but it doesn’t mean that it excludes overload.
- (2) Only when the control lever is in neutral position, can the “Setup” switch be operated, otherwise, it will be invalid.
- (3) Pressing “Setup” switch for the first time works, press it again, the control lever returns to neutral position for more than 10 seconds or the engine stops, the lever will be invalid.

 DANGER

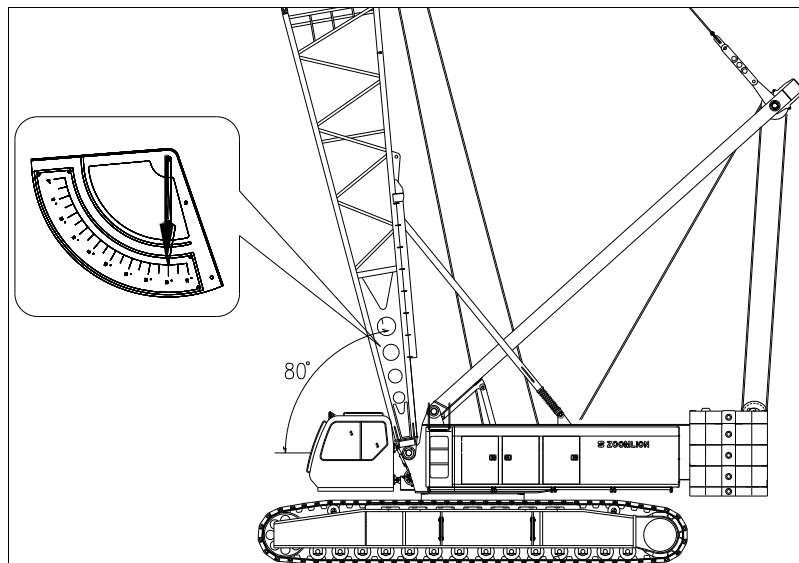
- (1) When the control lever is in neutral position and the engine is still on, turning “safety bypass” switch right can bypass the overload safety device. Only operate when professional supervisor is present and with special care.
- (2) If bypassing the overload safety device, there will be no protective device to prevent overloading, which will increase the chance of accident!
- (3) “Safety bypass” works if turn it for the first time. Turn it again, the engine stops or the working time is more than 30 minutes, it will be invalid.
- (4) The movement will be slower after the “safety bypass” releases the safety restriction.
- (5) The icon  shows on the **display** when the “safety bypass” switch works.
- (6) The “safety bypass” switch is placed in electrical control box for slewing table.
- (7) The “safety bypass” switch can only be used by professionals and can’t be used as device for normal operation.



It's very dangerous to use "safety bypass" switch, which is not allowed to use in normal circumstances. Only in special condition and the operator knows the possible consequences, the operation is allowed and with special care.

4.4.4 Boom angle indicator

Boom angle indicator is fitted on the lower rear end of main boom pivot section (i.e. on the right side of the crane operator's cab). In this way, the operator, even in crane operator's cab, can clearly read boom angle shown on the indicator.



Boom angle indicator

4.4.5 Derrick limiter

It is used to detect main boom angle and in real time according to the data collected by angle sensors. Once detected angle exceeds safe angle range, an alarm will be sent out and dangerous movements will be switched off so as to ensure safe crane operation.

a) Crane operation with main boom

When the main boom angle is 80° , the derricking speed will be slower and the buzzer will give an alarm.

When the main boom angle is 83° , the crane movement "raise main boom" will be cut off automatically and the buzzer will give an alarm.

b) Crane operation with main boom and fixed jib

The requirements for main boom angle under this boom configuration are the same as that under "Main boom" configuration. The fixed jib can be fitted in the angle of either 10° or 30° to main boom.

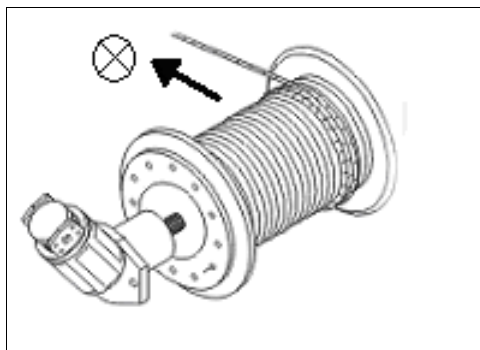
c) For SW boom configuration

- 1) When the main boom is raised to 80° position, the main boom derricking speed will be slower.
- 2) When the main boom is raised to 85° position, the system will cut off hoisting movements automatically and gives an alarm.
- 3) When the main boom is lowered to 65° position, the system will cut off lowering movements and gives an alarm. After switching to “assembly mode” or press “Setup” switch, the main boom will be lowered down.
- 4) When the angle between the main boom and luffing boom is less than 85°, main boom derrick winch will be spooled up, and luffing jib lowering will be stopped automatically in “assembly mode” and “working mode”.
- 5) When the upper angle between main boom and luffing jib is more than 10° and less than 15°, the luffing jib will move slowly.
- 6) When the upper angle between main boom and luffing jib is 10°, the system will cut off luffing jib raising movements and give an alarm.
- 7) When the luffing jib angle is less than 15°, the luffing jib lowering movements will be stopped automatically. After switching to “assembly mode” or press “Setup” switch, the luffing jib can still be lowered down.



Under this boom configuration with S-boom angle of 85°: when W-luffing jib angle exceeds 60°, the luffing jib with a load should not be raised/lowered at high speed. And the load should be the min. lifting capacity under this boom configuration; otherwise the luffing jib is liable to overturning. Before the load is detached from the load hook, lower the luffing jib to a position(less than 60°). In other words, lower the luffing fly jib to 60° by the pulling force of load.

4.4.6 Lowering limiter

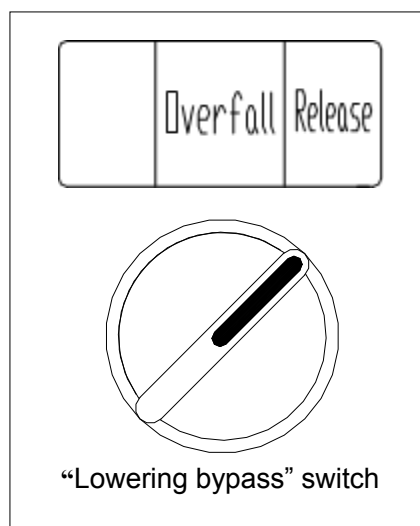


Lowering limiter

In order to prevent wire rope from being wound in the opposite direction after it is unwound completely, the lowering limit switches fitted on winch 1 and 2 are triggered when there are only 3 windings of wire rope left on the drums. Under this condition, the buzzer on the control panel will sound, the tricolor light will send out yellow early warning and red warning continuously, and the icons  or  on the main screen of display will flash. The icon  will be shown on the display. At this time, the movement of “reel off winch” is switched off, and only the movement of ‘spool up winch’ can be carried out.



The following operation can bypass the limited crane movements temporarily.



Turn the “lowering bypass” switch to the right as described above, the cut-off movement “reel of hoisting winch 1 or 2” will be bypassed, the tricolor light will send out yellow early warning, the buzzer will sound continuously, and the icon  is shown on the display at the same time.

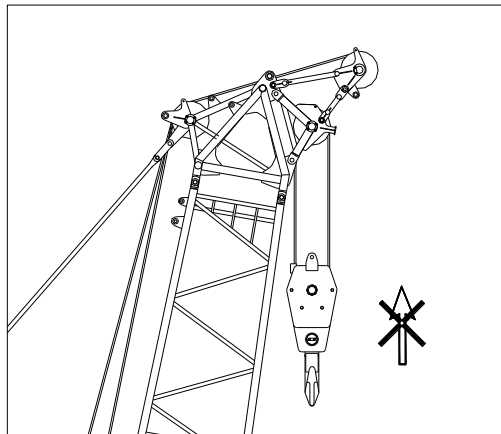
⚠ CAUTION

- (1) “Bypass” means when lowering appears and the movement is restricted, the operator get the permission to operate in the direction of danger temporarily through switch, but it doesn’t mean that it excludes lowering.
- (2) The bypass of lowering limiter must be guided by a professional. He must contact with the crane operator directly and monitor the residual length of the wire rope all the time. Great care is needed to operate the crane.

⚠ DANGER

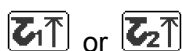
If the lowering limiter is bypassed, there will have no protective device to prevent wire over-lowering, which will increase the chance of accident!

4.4.7 Hoisting limiter



Hoisting limiter

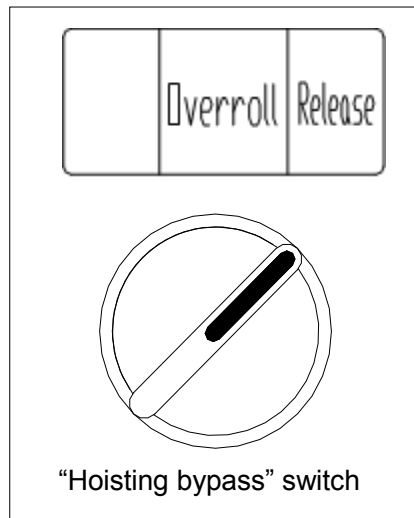
If the load hook comes into contact with the hoisting limit switch weight during its upward movement, the hoisting limit switch is triggered, the buzzer on the control panel sounds, and the crane movement “Spool up hoisting winch 1 and 2” “reel off derricking winch” are switched off. The tricolor light sends out yellow early warning and red warning continuously. The icon



or on the display starts to flash. The icon  will be shown on the display.

⚠ CAUTION

The following operation can bypass the limited crane movements temporarily.



Turn the “hoisting bypass” switch right, as described above, which will bypass the cut-off movement “spool up hoisting winch H1 or H2”. The tricolor light sends out yellow warning, and the buzzer sounds, meanwhile showing the icon .

⚠ CAUTION

- 1) “Bypass” means when hoisting appears and the movement is restricted, the operator get the permission to operate in the direction of danger temporarily through switch, but it doesn’t mean that it excludes hoisting.
- 2) The bypass of hoisting limiter must be guided by a professional. He must contact with the crane operator directly and monitor the distance between the load hook and boom end all the time. Great care is needed to operate the crane.

⚠ DANGER

If the hoisting limiter is bypassed, there will be no protective device to prevent wire hoisting, which will increase the chance of accident!

4.4.8 Support cylinder locking device

When the high pressure oil pipe, which is connected to support cylinder, is damaged, the bidirectional hydraulic lock fitted in oil circuit can prevent pressure oil in the two chambers of support cylinder from flowing outside so as to avoid cylinder retracting or extending, and thus guaranteeing the safety of assembly and dismantling of the crawler crane.

4.4.9 Overflow valve

The overflow valve in hydraulic system can restrain the pressure in the circuit from rising irregularly, thus protecting such hydraulic elements as hydraulic oil pump and hydraulic motor against damage and preventing the hydraulic system from being overloaded.

4.4.10 Anemometer

The anemometer fitted on the boom or jib head can detect the wind speed in real time.

When the in-service wind speed exceeds 9.8m/s, the crane operation should be stopped immediately.

When the out-of-service wind speed for “Main boom” configuration exceeds 21m/s, the entire boom should be placed on the ground.

When the out-of-service wind speed for “Main boom with fixed jib” configuration exceeds 15m/s, the entire boom should be placed on the ground.

The operator should constantly observe the wind speed displayed on the screen.

4.5 Crane operation

a) Prerequisites for crane operation

- 1) The counterweight is fitted and secured according to load capacity charts;
- 2) The crane is horizontally aligned with enough bearing capacity of the ground ;
- 3) The diesel engine is running;
- 4) The hook block is properly reeved in accordance with the reeving chart;
- 5) All safety devices are set in accordance with the load capacity charts;
- 6) No person and object are within danger zone.



- 1) **Always operate the control lever slowly and carefully. This can not only ensure longer service life of crane, but also help to avoid accidents.**
- 2) **During all crane movements, make sure there are neither obstacles nor persons in the danger zone.**
- 3) **Before every crane operation, at least an acoustic signal should be given.**

b) Checks during crane operation

If the crane has been worked for a long time, switch on “Oil cooling fan” switch  to cool down hydraulic oil automatically.

When the engine is running, the following icons on the display must not flash.

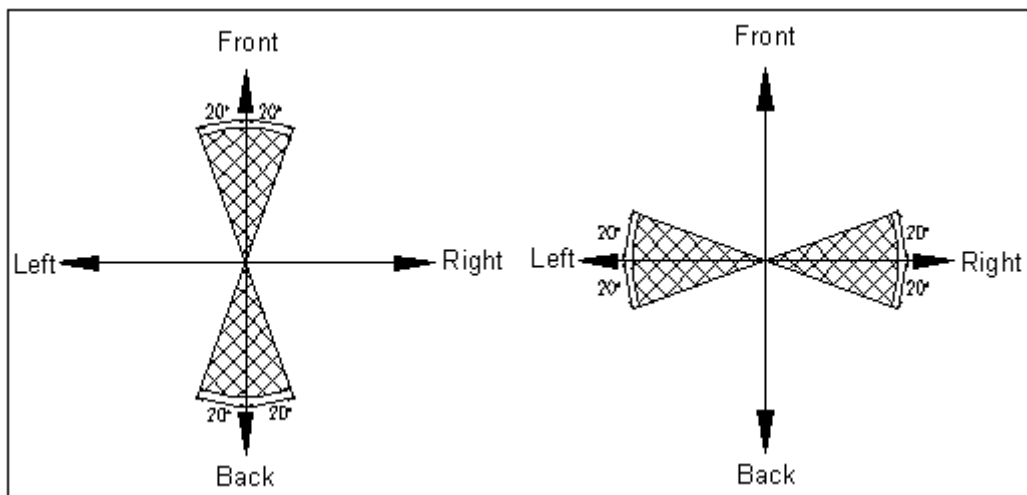
- 1) Icon “Engine oil pressure” 
- 2) Icon “Water temperature” 
- 3) Icon “Air filter clog” 
- 4) Icon “Oil inlet/return pipe clog” 
- 5) Icon “Upper limit switch on H1” 
- 6) Icon “Lower limit switch on H1” 

- 7) Icon "Upper limit switch on H2" 
- 8) Icon "Lower limit switch on H2" 
- 9) Icon "Main boom, 85°" 

! WARNING

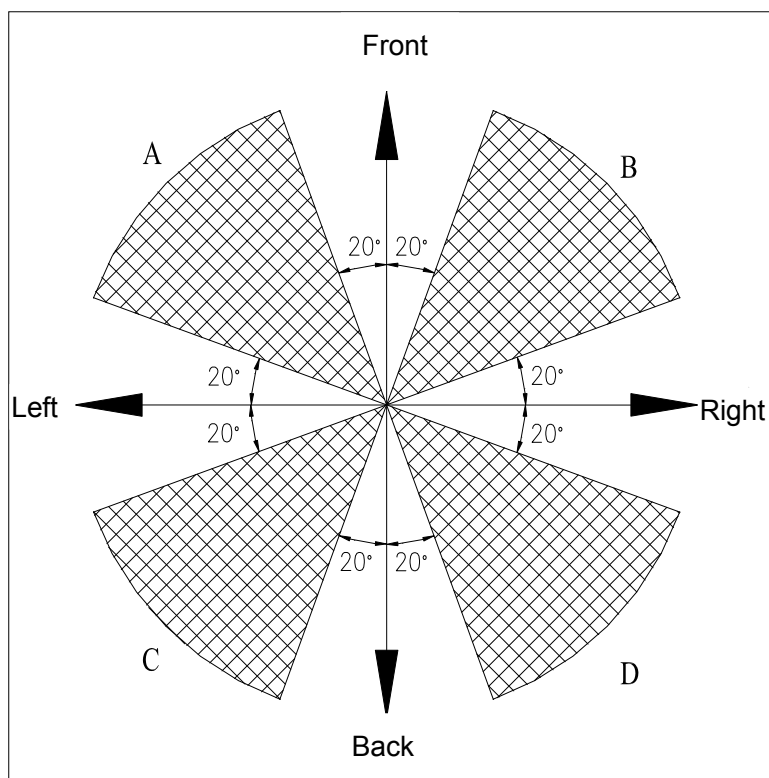
- (1) If one of the above icons flashes during crane operation, stop the operation immediately and shut down the engine at once. Check the corresponding device and eliminate the fault.
- (2) If the icon "Engine oil pressure"  does not go out after engine starts or during crane operation, the engine should be shut down at once. If this operation is not done, the engine will be damaged caused by insufficient oil pressure.
- (3) In order to see the positions of press-keys on the right control panel and the position of boom clearly when the crane works at night, the crane operator must turn on the LED on the keys of control panel, the working light on the slewing table by placing master lighting switch  to the 2nd position, and then pressing "Working light on/off" switch .
- (4) During operation, always check the indicators on the display of load moment limiter. When carrying out crane movement, the operator must see the changing load condition and changing forces. The overloading condition should be recognized early, and the crane movement should be slowed down accordingly.

c) The valid area for control lever movement



Valid area for single control lever movement

When operating single movement by control lever, the valid area in front and rear direction of the control lever is $-20^{\circ} - 20^{\circ}$, the valid area in left and right direction is $-20^{\circ} - 20^{\circ}$, which is described as above in the grid.



Valid area for single control lever compound movement

When do a compound movement using a single control lever, the valid area for control lever movement is $20^{\circ} - 70^{\circ}$, which is described in the above grid. The valid movement range for A,B,C,D areas is 50° .

d) Setting configuration

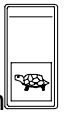
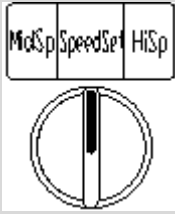
For the specific methods to set configuration, please refer to load moment limiter instructions.



Set the corresponding configuration in the load moment limiter according to actual situation. Since the configuration will affect the control system on winch. The configuration must be set properly to avoid danger and accident.

e) "Speed setting" and the use of micro-move switch

Speed switch can be divided into four shifts: slow, normal, middle and high. For details, please refer to section 4.5.1~4.5.4.

The switch setting speed	Speed set	Function
Rocker switch 	Slow speed	when need to load in fixed position and position exactly, press the key, the system will design proper speed to work no matter how big the opening of the control lever, loading in fixed position and positioning exactly. The work range: hoisting winch 1, hoisting winch 2 and luffing jib derricking winch and main boom derricking winch.
Rotating switch 	Normal speed	The middle position of the switch means the automatic working speed of the system
	Middle speed	When the hoisting winch needs a speed higher than "slow speed" shift, use middle speed.
	High speed	The hoisting movement, luffing jib derricking movement and traveling movement will be performed in high speed.
Left control lever "high speed"	High speed	Slew in high speed
Right control lever "high speed" switch	High speed	Raise the hoisting winch and travel in high speed

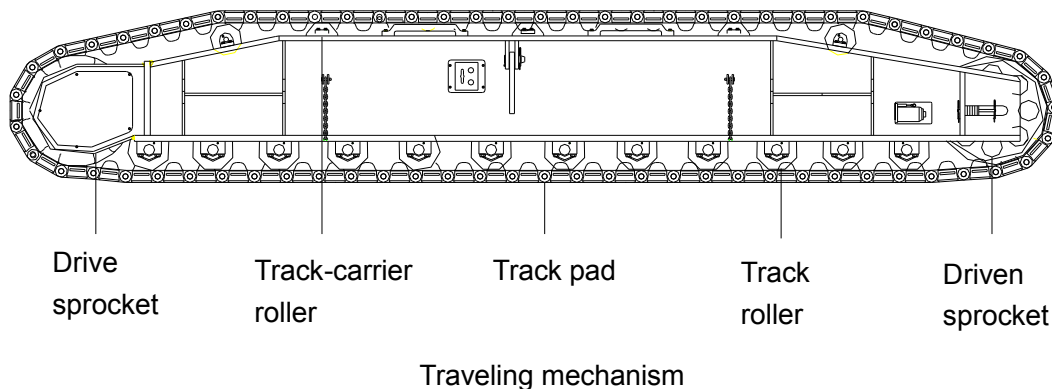


- 1) The automatic working speed for slewing mechanism is low speed. After pressing left control lever "high speed" switch, the slewing mechanism will work in full speed.
- 2) The high-speed switch is only used when the crane is working without load or with light load and the hoisting winch is operated alone.

4.5.1 Operation of traveling mechanism

4.5.1.1 Component parts of traveling mechanism

The traveling mechanism comprises drive sprocket, driven sprocket, track-carrier roller, track roller and track pad, crawler carrier as well as traveling reducer. Both right crawler carrier and left crawler carrier are fitted with an independent traveling reducer. The hydraulic oil in traveling motor is supplied by superstructure main pump through main valve and centre revolving joint.



4.5.1.2 Operation of traveling mechanism

The traveling movements are controlled by left and right control levers. The movements "left crawler forwards" and "left crawler backwards" are controlled by left control lever, and the movements "right crawler forwards" and "right crawler backwards" are controlled by right control lever. In this way, crane can carry out such movements as traveling straight ahead/backwards, steering during traveling and turning on spot.

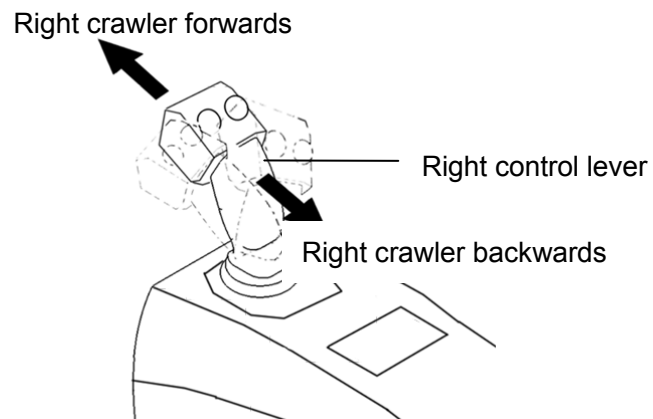
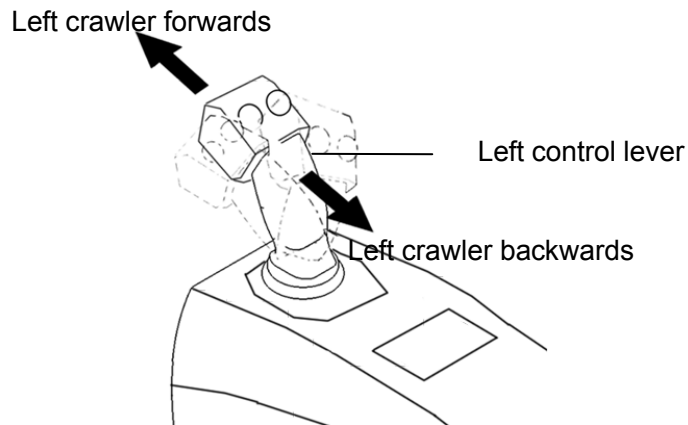


Note:

Before carrying out the traveling movement, the operator must first press the



traveling switch, and then operate the control lever.



Operation of left and right crawler traveling

Instructions for traveling movements

Description	Operation	Movement
Left control lever	Push forwards	Left crawler forwards
	Push backwards	Left crawler backwards
	Return to neutral position	Left crawler stops moving
Right control lever	Push forwards	Right crawler forwards
	Push backwards	Right crawler backwards
	Return to neutral position	Right crawler stops moving

⚠ CAUTION

- 1) Before carrying out traveling movement, the operator must first press



traveling switch, and then operate the control lever.

- 2) When operate the control lever, first press the deadman's button, then press the control lever. Otherwise, the operation is invalid.
- 3) The crane movements can still be carried out before the control lever is returned to neutral position with deadman's button released. However, to perform the next crane movement after returning the control lever to neutral position, the operator must press deadman's button first and then move the control lever. Otherwise, the operation of control lever is invalid.
- 4) In normal operation, stop the crane movements by returning the control lever to neutral position.

a) Traveling on level road

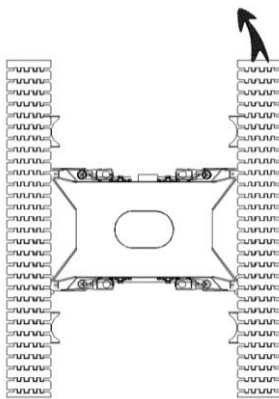
Traveling straight ahead: Push both control levers forwards at the same time

Traveling straight backwards: Push both control levers backwards at the same time

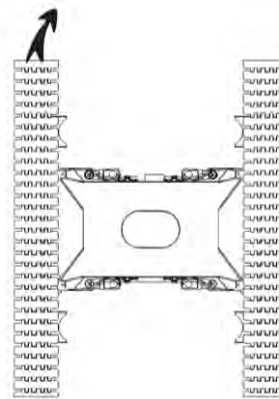
Turning with a crawler

Turning to left: Push right control lever forwards

Turning to right: Push left control lever forwards



Turning to left with a crawler



Turning to right with a crawler



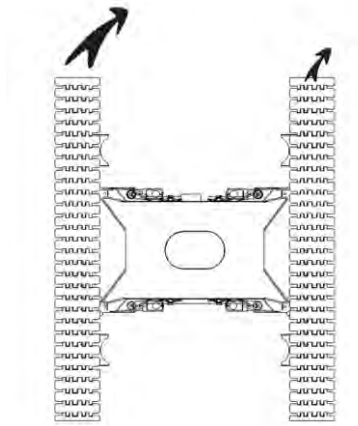
Note:

When crane is traveling with a crawler, the operator had better change into low-speed shift.

Differential steering:

Steering to right: Push left control lever heavily and push right control lever slightly to make the speed of left crawler higher than that of right crawler

Steering to left: Push right control lever heavily and push left control lever slightly to make the speed of right crawler higher than that of left crawler

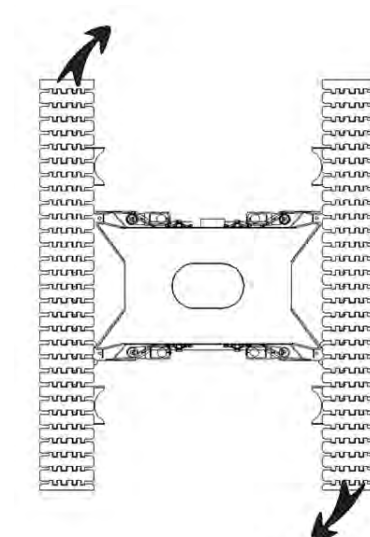


Differential steering

Turning on the spot:

Turning to right: push right control lever backwards heavily, then right crawler will turn to left; push left control lever forwards heavily, then left crawler will turn to right.

Turning to left: Push left control lever backwards heavily, then left crawler will turn to right; push right control lever forwards heavily, then right crawler will turn to left.



Turning on the spot



Note:

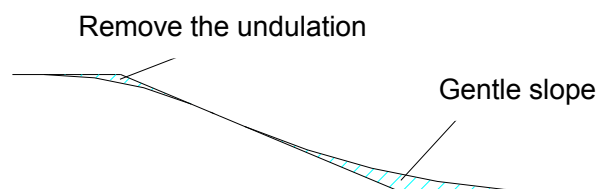
1. The high speed is prohibited when the crane is turning.
2. When there is a need to stop traveling or steering, turn the control lever to neutral (zero) position, the traveling brake will be activated automatically.
3. When crane is traveling with a load, it can only travel forwards with boom located straight ahead.
4. When crawler crane is traveling for a long distance, ensure that the traveling motor is behind the slewing table.

b) Traveling on slope

Make crawler crane travel forwards, and place the slewing control lever in neutral (zero) position. When crawler crane is traveling uphill, the engine speed must be within medium speed range and the boom length must be reduced as possible as you can. When crawler crane is traveling on a slope with maximum permissible gradient, it can only be fitted with basic boom.

Turning on the slope

If crawler crane needs to turn on the slope when it is traveling downhill, some treatments should be taken to the undulations to form a gentle slope curve (see following diagram), which can prevent crane's center of gravity from deviating and load from concentrating on a section of crawler when crawler crane is traveling over



Slope treating diagram



Note:

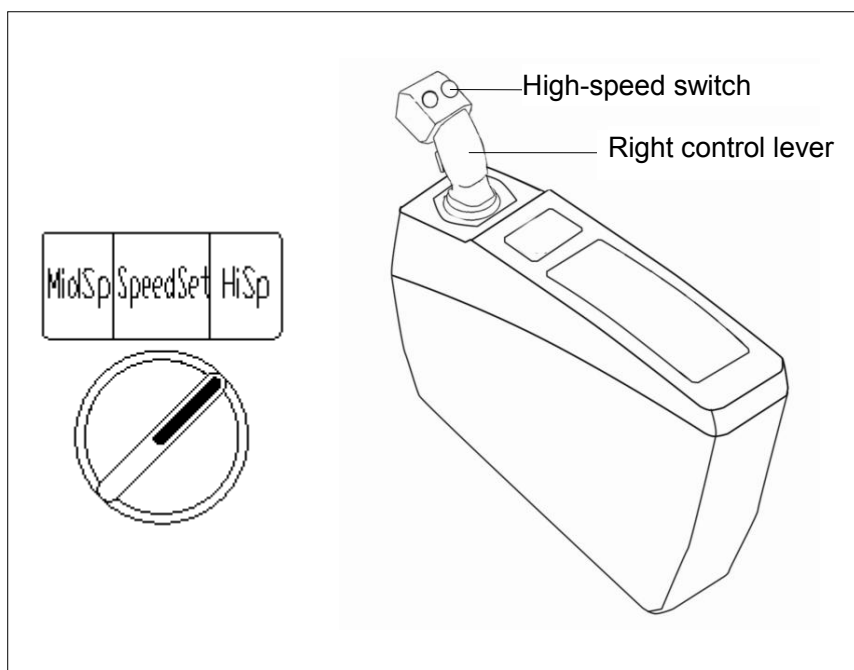
1. When crawler crane is traveling from the horizontal ground to the slope, if its center of gravity deviates forwards, the crane should be stopped to adjust the center of gravity.
2. When crawler crane is traveling on a slope with rated gradient, it is impossible to obtain a special mass parameter according to ground condition. Therefore, in order to assure safety, the counterweight and boom should be dismantled from crane during traveling.

Traveling with suspended load:

The crane can travel with suspended load, providing that the following precautions are taken:

- a) The ground surface must be flat and level (no gradient);
- b) The subsoil must be capable of bearing crane's maximum service weight and the weight of suspended load;
- c) The crane can travel with a load of 70% of the rated load. In this case, the ground should be firm and its gradient should not exceed 5/1000. The boom frame must be located in the driving direction;
- d) Jerky crane movements must be avoided;
- e) The suspended load must be lashed to prevent it from swinging;
- f) Steering of crawler is forbidden.

c) Fast travelling



Turn the Speed Set switch "High Speed" position or press the high-speed switch of right control lever, which is described as above. Then operate left and right control levers to move crane at higher speed.



- 1) Before carrying out traveling movement, the operator must first press

traveling switch , and then operate the control lever.

- 2) Only when deadman's button is pressed, can the operation of control lever is valid.
- 3) The crane movements can still be carried out before the control lever is returned to neutral position with deadman's button released. However, to perform the next crane movement after returning the control lever to neutral position, the operator must press deadman's button first and then move the control lever. Otherwise, the operation of control lever is invalid.
- 4) In normal operation, stop the crane movements by returning the control lever to neutral position.
- 5) The high-speed switch is only used when the crane is traveling straight without a load.

4.5.2 Operation of crane winches



Note:

1. Set correct boom configuration prior to operating crane winches.



2. Switch off traveling switch.

4.5.2.1 Hoisting mechanism

a) Components of hoisting mechanism

Hoisting mechanism consists of hydraulic motor, winch reducer, brake, lowering limiter, hoisting limiter and wire rope as well as load hook 1 and 2. The speed of hoisting movement can be changed by adjusting the inclination angle of control lever. The angle can vary from - 5° to -25° or from 5° to 25°. The bigger the inclination angle is, the quicker the hoisting speed is.

b) Operation of hoisting winch

The crane is fitted with two hoisting winches: hoisting winch 1 and hoisting winch 2. Even though the structure of hoisting winch 1 is the same as that of hoisting winch 2, their positions and functions are different.

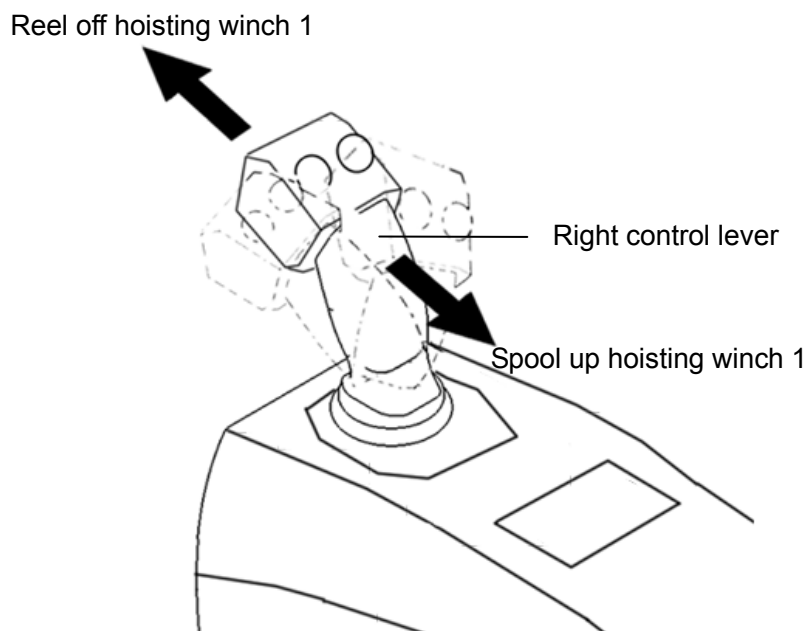
Hoisting winch 1 is required for crane operation with main boom, and hoisting winch 2 is required for crane operation with main boom and fixed jib, crane operation with main boom with luffing jib, or crane operation with tip boom.

The control lever for hoisting winch 1 is fitted at the right side of operator's seat, and the control lever for hoisting winch 2 is at the left side of operator's seat.

Operation of hoisting winch 1:

Push right control lever backwards: spool up hoisting winch 1;

Push right control lever forwards: reel off hoisting winch 1.



Operation of hoisting winch 1

Instructions for the movements of hoisting winch 1

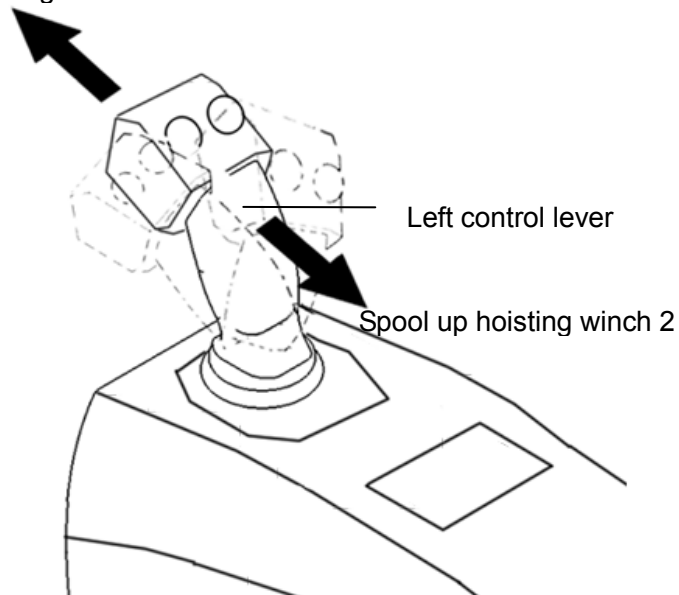
Description	Operation	Movement
Right control lever	Push forwards	Reel off hoisting winch 1 to lower the load hook
	Push backwards	Spool up hoisting winch 1 to lift the load hook
	Return to neutral position	Hoisting winch 1 stops working

Operation of hoisting winch 2:

Push left control lever backwards: spool up hoisting winch 2;

Push left control lever forwards: reel off hoisting winch 2.

Reel off hoisting winch 2



Operation of hoisting winch 2

Instructions for the movements of hoisting winch 2

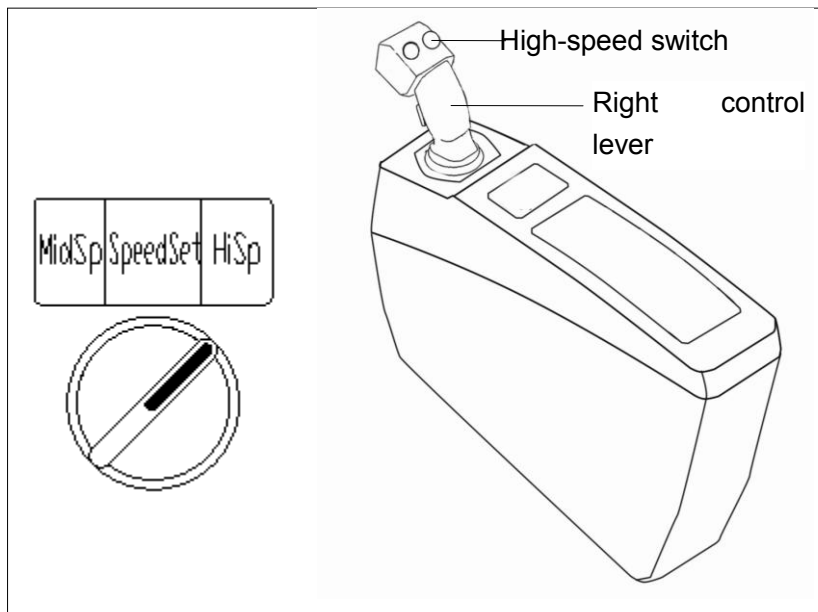
Description	Operation	Movement
Left control lever	Push forwards	Reel off hoisting winch 2 to lower the load hook
	Push backwards	Spool up hoisting winch 2 to lift the load hook
	Return to neutral position	Hoisting winch 2 stops working



Note:

1. Before operating the winch, the operator must first choose correct boom configuration by turning boom configuration switch to required position. As to the functions of winch 1 and 2, they are determined by selected boom configuration.
2. When spooling up or reeling off hoisting rope, keep watching the winch to make sure that there is slack wire rope on the winch.

c) High-speed operation of hoisting winches



High-speed operation of hoisting winches

Turn “SpeedSet” switch to “high-speed” position or press “high-speed switch on right control lever”, which is described above. Then operate right control lever or left control lever to lift and lower load hook at higher speed.

Turn “SpeedSet” switch to “Medium-speed” position, then operate right control lever or left control lever to lift and lower load hook at middle speed.

⚠ CAUTION

- (1) Choose proper rope reeving in accordance with boom length.
- (2) When the load swings due to winding wire rope, the load should be put down and be loaded again after complete unlocking of wire rope.
- (3) Under any conditions, there must be at least three windings of wire rope left on the winding drum.
- (4) When a load is lifted away from the ground, it should first be suspended in the air for a moment. Do not lift the load until the operator confirms that there is no safety hazard. Do not derrick and telescope the boom if the load is still in contact with the ground.
- (5) Do not change the control lever between “lift hook” and “lower hook” jerkily. The operator must return the control lever to neutral position and ensure that the winding drum has stopped before changing control lever from “lift hook” to “lower hook”. Otherwise, the winch components will be damaged.

- (6) If main boom is extended under “Main boom” configuration, the lifting height of crane will increase accordingly, which will therefore make the wire rope not long enough. Such problem can be solved by changing the rope reeving of wire rope. Before changing the rope reeving, fit a hoisting limit switch weight.**

When the crane is overloaded, or wire rope on hoisting winch 1 or 2 is excessively wound /unwound, the dangerous motions will be switched off automatically and an alarm will be given out

- (7) After the system sounds the alarm, only movements towards safe directions are permitted. If some movements towards dangerous directions are required, please refer to instructions in section 4.4.**
- (8) The high-speed switch is only used when the crane is working without load or with light load and the hoisting winch is operated alone.**

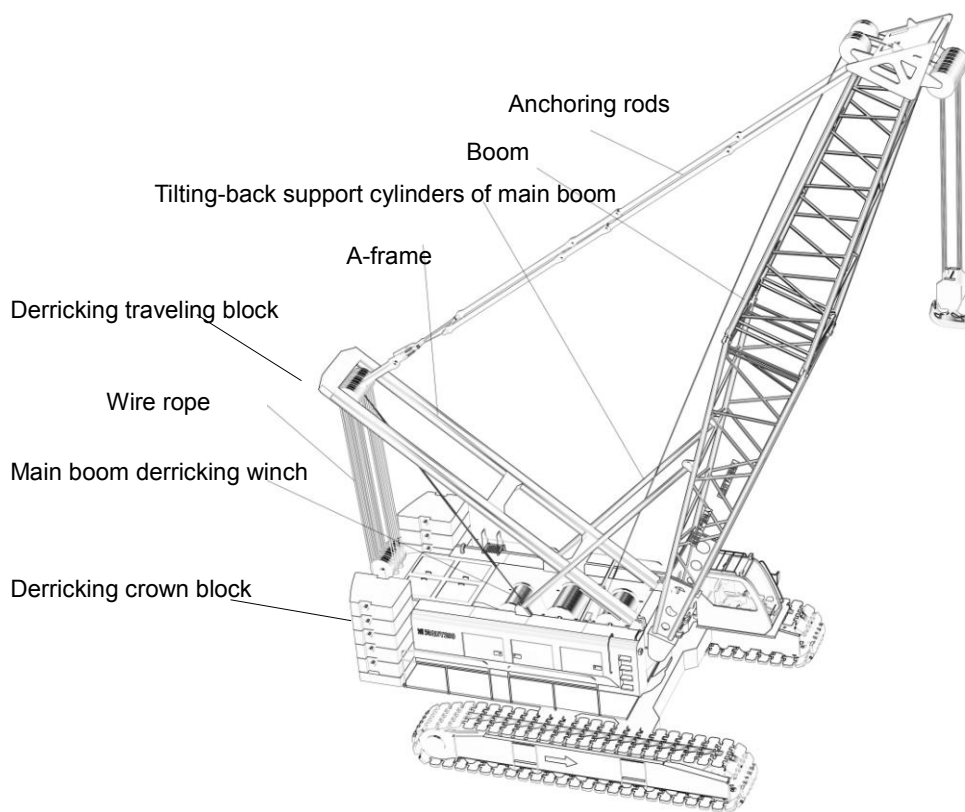
4.5.2.2 Derricking mechanism

4.5.2.2.1 Component parts of derricking mechanism

Through changing the length of wire rope reeved between derricking pulley blocks (including derricking crown block and derricking traveling block), the derricking mechanism, via derricking winch, can adjust boom angle so as to change the working radius. In different boom configurations, different winches are selected.

Crane operation with main boom and crane operation with main boom and fixed jib

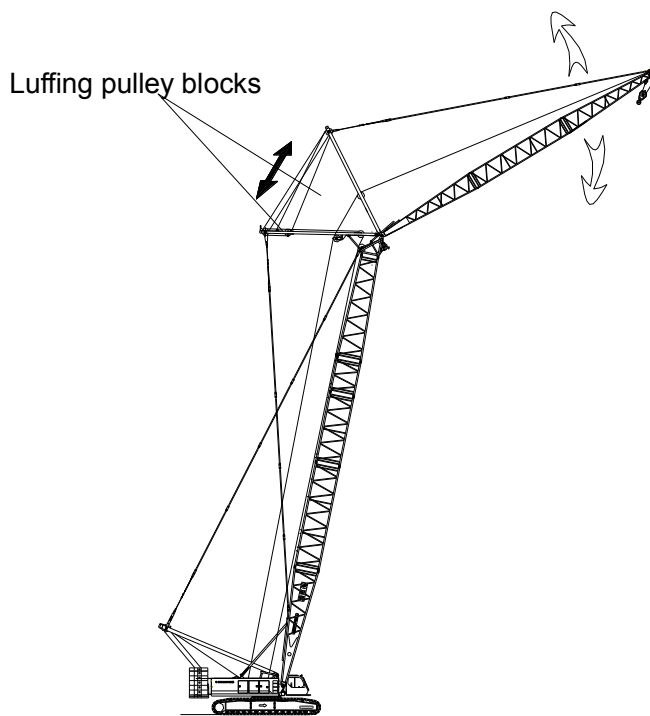
Main boom angle can be adjusted by changing the length of wire rope reeved between derricking pulley blocks, which consist of derricking crown block at the tail end of slewing table and derricking traveling block on the top of A-frame.



Derricking mechanism

Crane operation with main boom with luffing jib

Luffing jib angle can be adjusted by changing the length of wire rope reeved between luffing pulley blocks, which are comprised of pulley blocks respectively located on the top of WA-frames 1 and 2.



Derricking mechanism



Note:

1. Before operating derricking mechanism, the operator must first choose correct boom configuration by turning boom configuration switch to required position. As to the different derricking methods, they are determined by selected boom configuration.

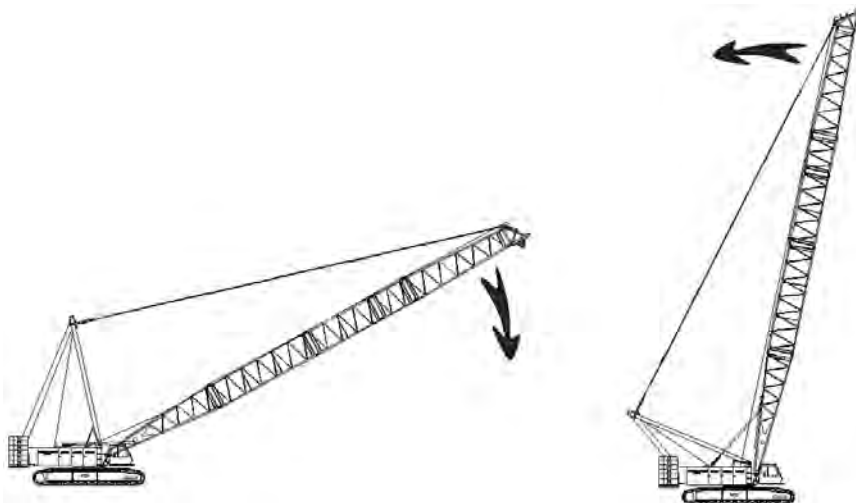


2. Switch off traveling switch prior to operating crane winches.

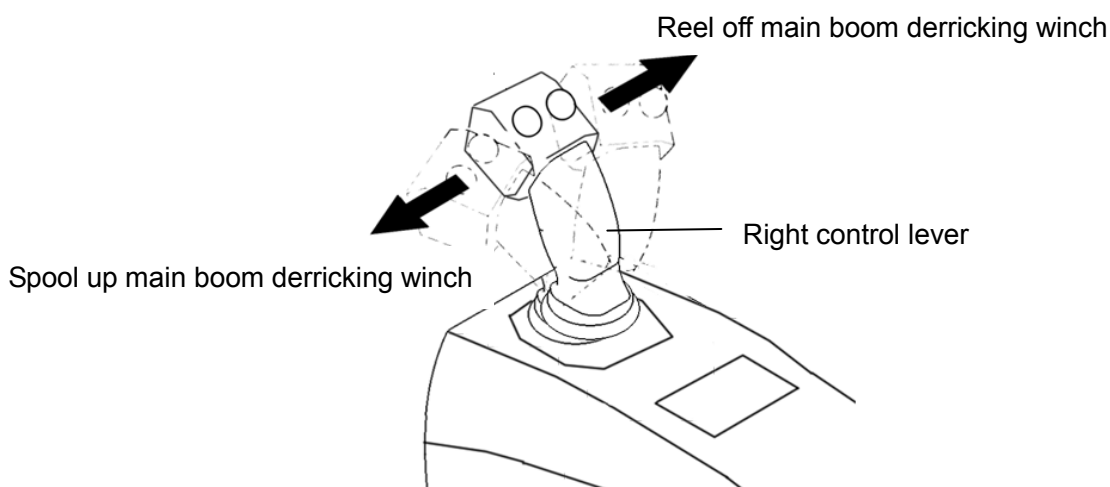
4.5.2.2.2 Operation of derricking mechanism in different boom configurations

4.5.2.2.2.1 Crane operation with main boom

Main boom angle can vary from 0° to 83°, and main boom can be raised and lowered via main boom derricking winch.



Crane operation with main boom



Operation of main boom derricking winch

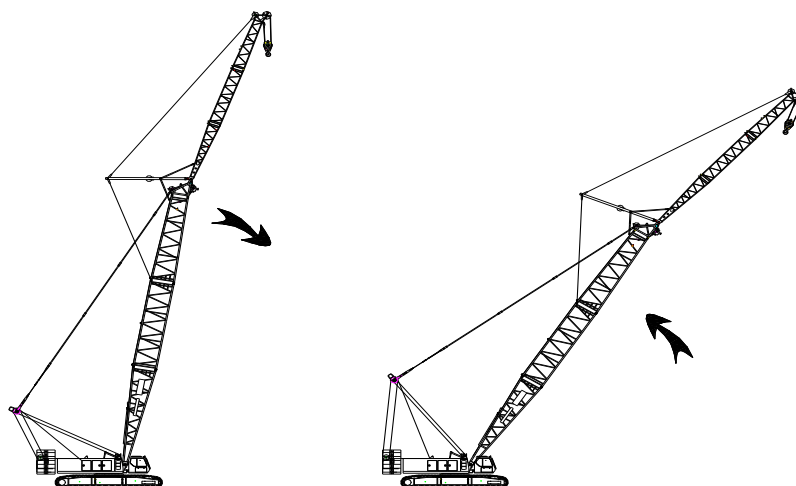
Instructions for the movements of main boom derricking winch

Description	Operation	Movement
Right control lever	Move to left	Spool up main boom derricking winch to raise main boom
	Move to right	Reel off main boom derricking winch to lower main boom
	Return to neutral position	Main boom derricking winch stops working

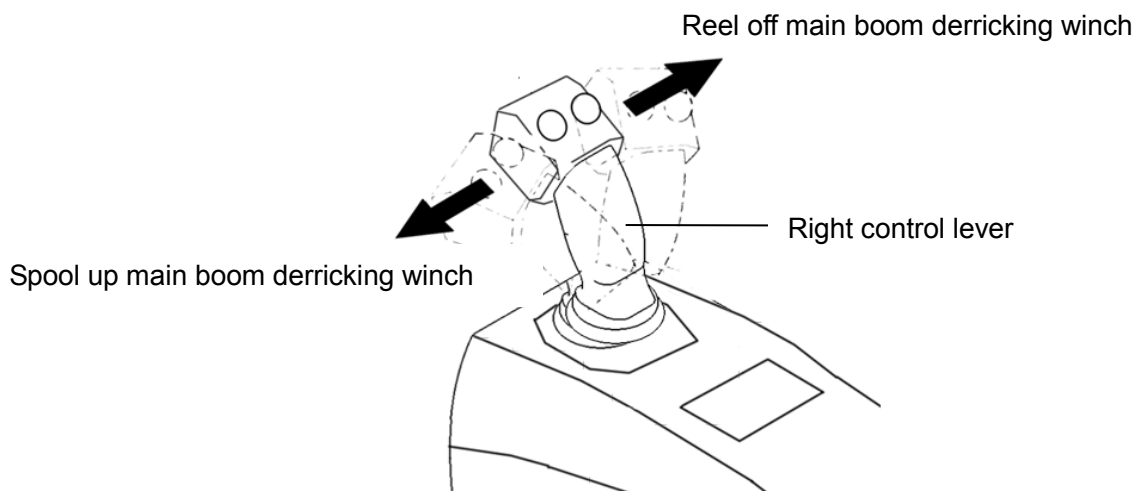
4.5.2.2.2 Crane operation with main boom and fixed jib

The fixed jib can be mounted in the angle of either 10° or 30° to main boom. Once the angle is set, it can not be changed during operation.

The main boom can be raised and lowered via main boom derricking winch.



Crane operation with main boom with fixed jib



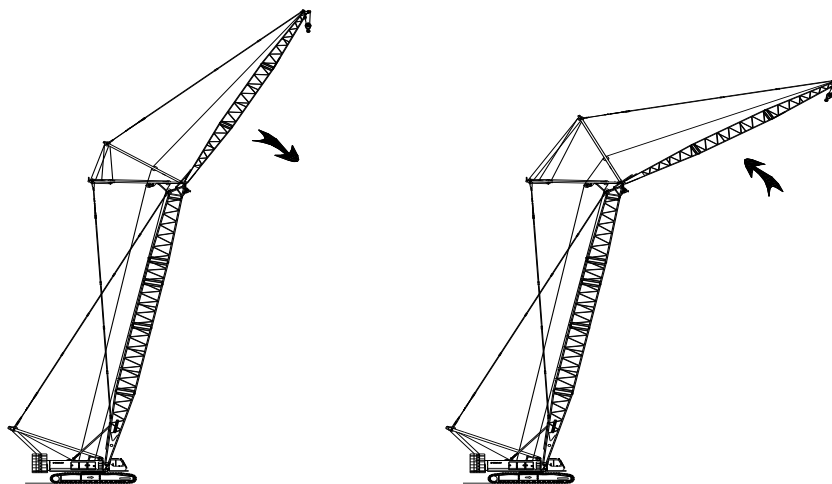
Operation of main boom derricking winch

Instructions for the movements of main boom derricking winch

Description	Operation	Movement
Right control lever	Move to left	Spool up main boom derricking winch to raise main boom
	Move to right	Reel off main boom derricking winch to lower main boom
	Return to neutral position	Main boom derricking winch stops working

4.5.2.2.3.3 Crane operation with main boom with luffing jib

Under this boom configuration, main boom can be fixed at 65°, 75° or 85° position via main boom derricking winch, while luffing jib can be raised or lowered via hoisting winch 1 or luffing jib derricking winch.

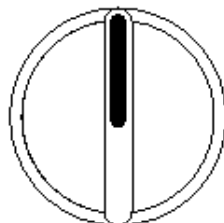
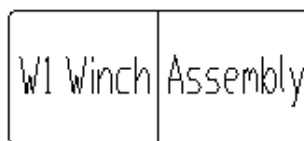


Crane operation with main boom with luffing jib

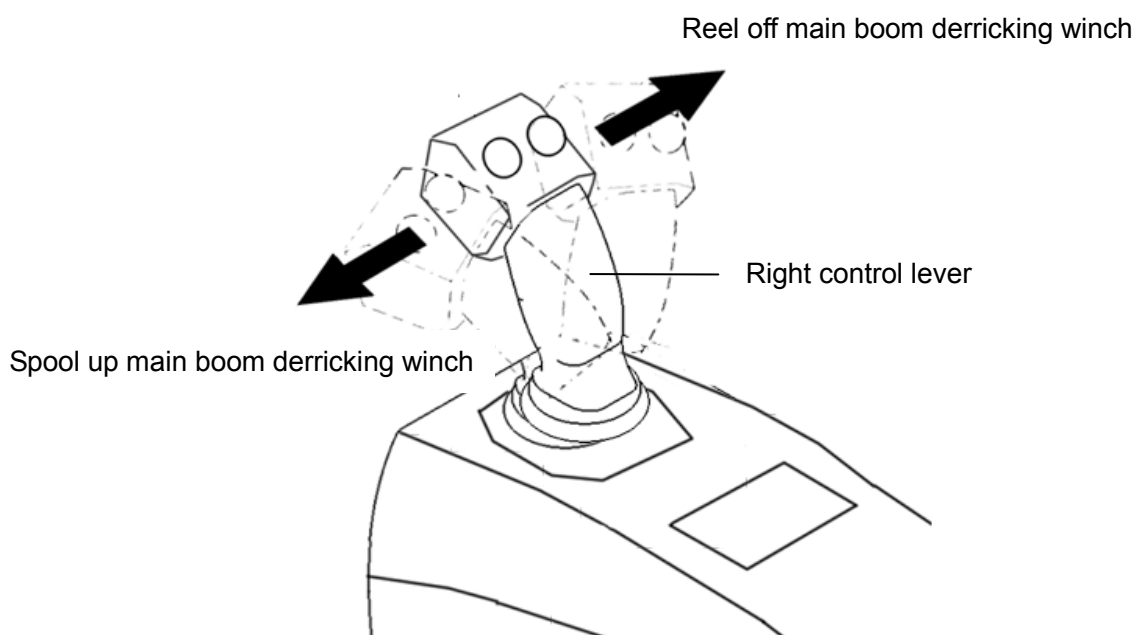


Note:

1. When luffing jib derricking winch is not fitted,
 - raise and lower main boom via main boom derricking winch;
 - raise and lower luffing jib via hoisting winch 1.
2. When luffing jib derricking winch is fitted,
 - raise and lower main boom via main boom derricking winch;
 - raise and lower luffing jib via luffing jib derricking winch.

a) Raise/lower boom

“W1 winch/Assembly” switch



Operation of main boom derricking winch

Place the “W1 winch/Assembly” switch in neutral position, and then move right control lever to left and right to control the main boom derricking winch, see the above figure.

Instructions for the movements of main boom derricking winch

Description	Operation	Movement
Right control lever	Move to left	Spool up main boom derricking winch to raise main boom
	Move to right	Reel off main boom derricking winch to lower main boom
	Return to neutral position	Main boom derricking winch stops working

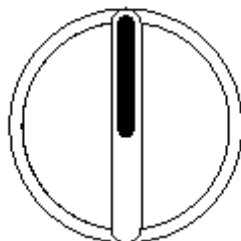
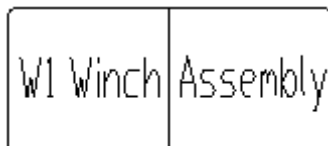


Note:

Under crane operation with main boom with luffing jib, main boom must be fixed at 65°, 75° or 85° position.

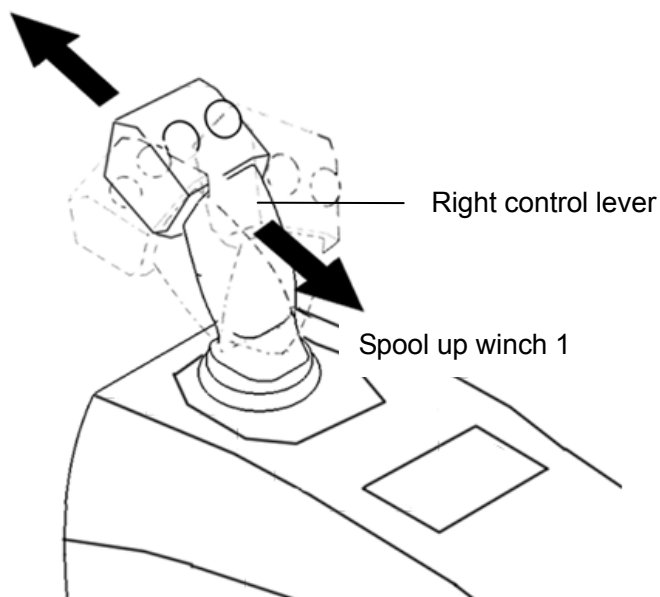
b) Raise/lower luffing jib

1) Use hoisting winch 1 to raise/lower luffing jib



"W1 winch/Assembly" switch

Reel off winch 1

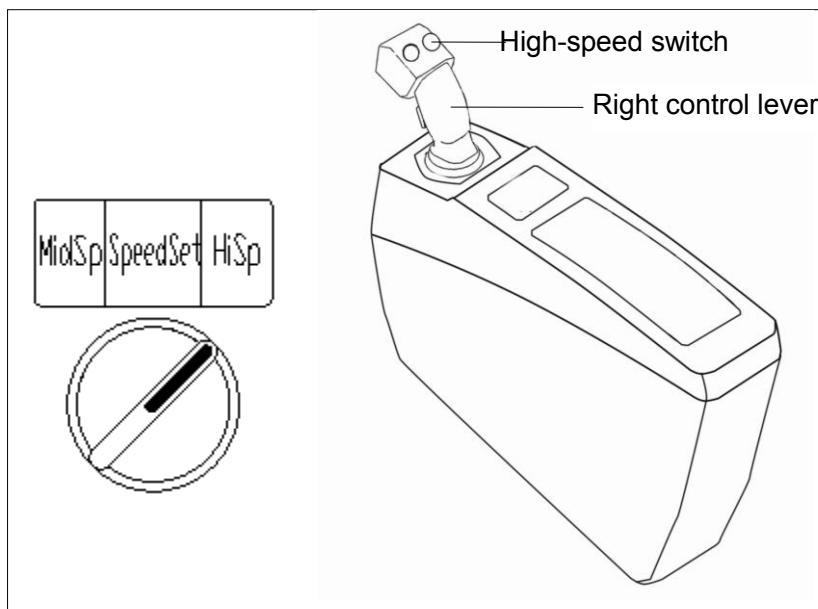


Raise/lower luffing jib via hoisting winch 1

Place the "W1 winch/Assembly" switch in neutral position, and then use hoisting winch 1 (H1) to raise and lower the luffing jib by moving right control lever forwards and backwards. At this time, the overriding signal for H1 is shielded.

Instructions for the movements of hoisting winch 1

Description	Operation	Movement
Right control lever	Push forwards	Reel off hoisting winch 1 to lower luffing jib
	Push backwards	Spool up hoisting winch 1 to raise luffing jib
	Return to neutral position	Hoisting winch 1 stops working



Turn “SpeedSet” switch to “high-speed” position or press “high-speed switch on right control lever”, which is described above. Then push right lever forwards or backwards to control luffing jib derrick at higher speed.



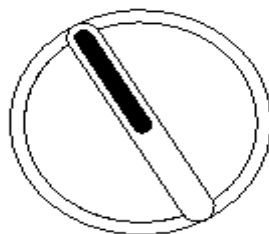
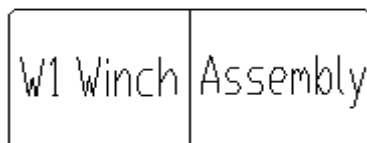
Note:



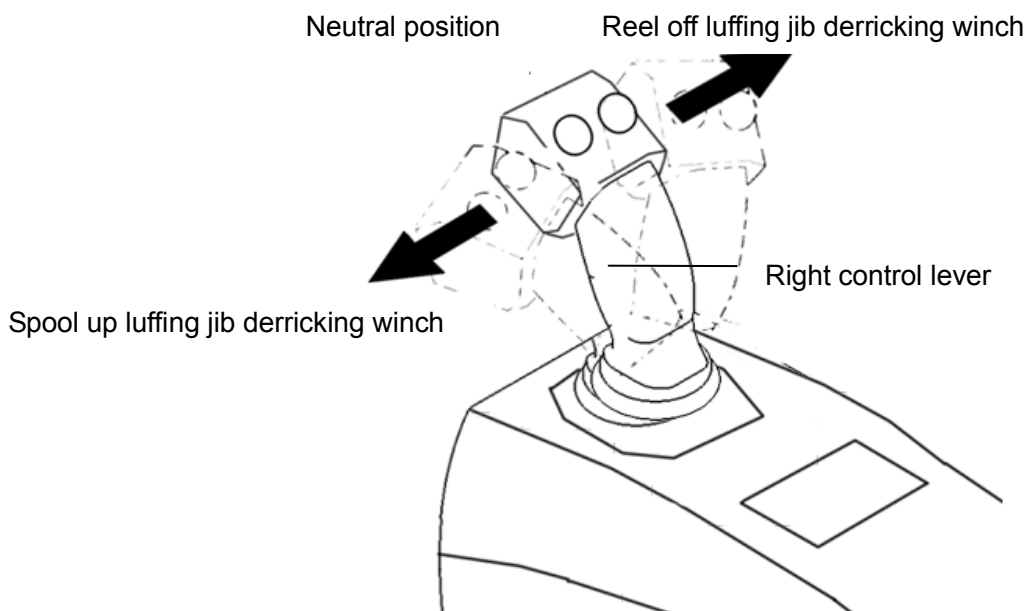
1. Switch off traveling switch prior to operating winches.

2. Only use luffing jib derricking winch high-speed gear when operating the luffing jib alone. Otherwise, it's prohibited to use.

2) Use luffing jib derricking winch to raise/lower luffing jib



“W1 winch/Assembly” switch



Raise/lower luffing jib via luffing jib derricking winch

Turn the “W1 winch / Assembly” switch to “W1 winch” position, and then move right control lever to left and right to control luffing jib derricking winch.

Instructions for the movements of luffing jib derricking winch

Description	Operation	Movement
Right control lever	Move to left	Spool up luffing jib derricking winch to raise luffing jib
	Move to right	Reel off luffing jib derricking winch to lower luffing jib
	Return to neutral position	Luffing jib derricking winch stops working

Turn “SpeedSet” switch to “high-speed” position or press “high-speed switch on right control lever”, Then push right lever to left or right to control luffing jib derrick at higher speed.



Note:

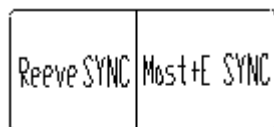
1. The derricking operation must be carried out stably. Otherwise, a great impact will be made on the crane with a load.
2. **Only use luffing jib derricking winch high-speed gear when operating the luffing jib alone. Otherwise, it's prohibited to use.**

4.5.3 Operation of synchronizing A-frame and main boom derricking winch and synchronizing reeving winch and working winch

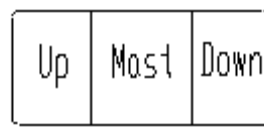


- (1) The functions of synchronizing A-frame and derricking winch only works for erecting the A-frame.
- (2) Reeving winch synchronizing isn't suitable for main boom derricking winch.

4.5.3.1 A-frame and main boom derricking winch synchronization



“Synchronisation” switch



“A-frame retracting and erecting” switch

Procedure for this operation:

- (1) Turn “synchronizing” switch on the right control panel to “Mast (A-frame) + E sync” position, as described above.
- (2) Turn “A-frame erecting/lowering” switch to the left “Erecting” position, as described above.
- (3) Then the A-frame is erected, while the main boom derricking winch is reeled off synchronously and automatically;
- (4) The movements “reel off main boom derricking winch” and “erect A-frame” will be carried out at the matched speed. And the movements can be stopped at any time according to actual conditions.

4.5.3.2 Operation of reeving winch

(1) Prerequisite

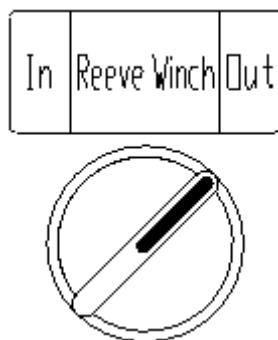
An assistant is present to guide the hoisting rope.

- Complete the assembly operation on a stable area! If it is unavoidable that the rope must be hand-guided over the boom to rope pulleys in boom head, proceed with great caution when walking on the boom.
- The person guiding the rope will slip on the boom if the crane is not operated properly. There is a great danger of a serious accident!

- After the A-frame reaching the required position, turn the synchronisation switch to neutral position.

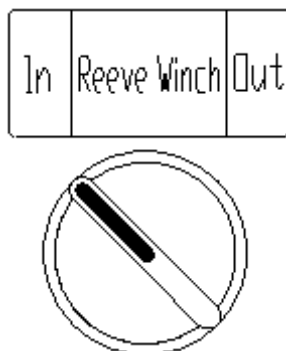
(2) Operation of reeving winch

- 1) Reel off reeving winch. The rope of reeving winch is reeved in accordance with the reeving diagrams, however in reverse direction with hoisting rope between the rope pulleys in the boom head and the hook block.



Turn the reeving winch switch to the right on right control panel– reel off reeving winch.

- 2) Attach the rope end point of reeving winch to hoisting rope for winch 1 (or winch 2) with rope lock.
- 3) The hoisting winch 1 (or 2) is reeled off, while the reeving winch is spooled up at the same time.



Turn the reeving winch switch to left, then the reeving winch is spooled up.



1. Reel off hoisting winch 1 (or 2) when spooling up the reeving winch.
2. The speed of spooling up reeving winch should be higher than the speed of reeling off hoisting winch 1 (or 2).
- 4) Release the hoisting rope from the rope lock after the rope of hoisting winch 1 (or 2) is reeved between the load hook and boom head.



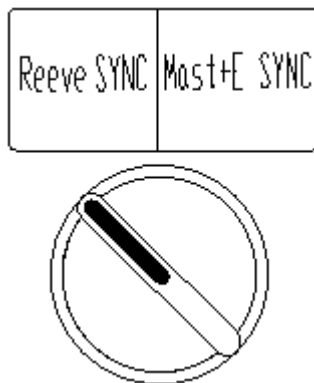
- (1) When the assistant guides the hoisting rope to the rope pulley on the boom head, the crane operator must operate the reeving winch. This procedure must be done in such a manner that the rope does not slacken up on the winding drum.

- (2) Reeving can be done manually or with the help of a reeving winch.

If the reeving winch is used, the rope on it must first be reeved in reverse direction between the hook block and the rope pulleys on boom head and then connected with the hoisting rope of winch 1 (or winch 2).

- (3) Reeving winch and hoisting winch synchronisation

Procedure for this operation: (taking hoisting winch 1 as working winch)



- 1) Turn "synchronization switch" to the left "Reeve SYNC" gear, which is described as above;
- 2) Push right control lever forwards and backwards, the reeving winch and hoisting winch 1 will carry out synchronous movements, namely, reeling off hoisting winch 1 and spooling up reeving winch, or spooling up hoisting winch 1 and reeling off reeving winch. (Push left control lever forwards and backwards, the reeving winch and hoisting winch 2 will carry out synchronous movements. namely reeling off hoisting winch 2 and spooling up reeving winch, or spooling up hoisting winch 2 and reeling off reeving winch)
- 3) After hoisting rope is reeved well, return the "synchronization" switch to neutral position, and remove the rope lock connecting the reeving rope and hoisting rope. Finally wind the reeving rope onto the reeving winch.



- (1) The operation mentioned above must be carried out by at least tow persons.
- (2) After the hositing rope is reeved correctly between rope pulleys, the "synchronization" switch must be returned to neutral position.

4.5.4 Operation of slewing mechanism

4.5.4.1 Component parts of slewing mechanism

The slewing mechanism consists of hydraulic motor, planetary gear reducer, brake, drive gear and slewing ring, etc. The slewing speed can be adjusted by changing the inclination angle of control lever.

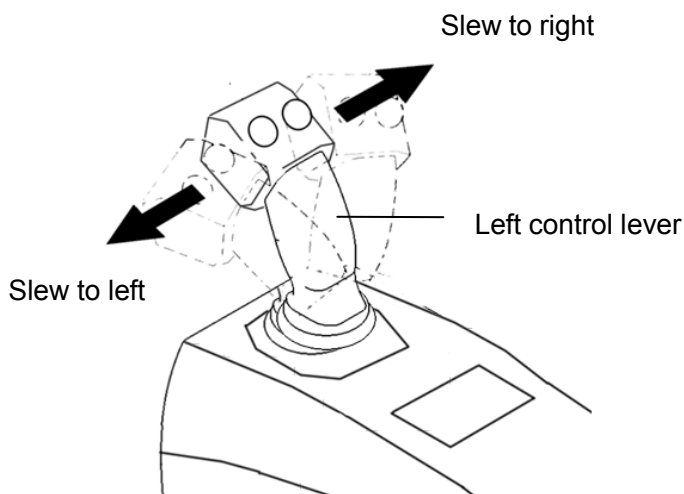
An independent piston variable pump is applied to hydraulic system to supply oil, which can adjust slewing speed accurately.

4.5.4.2 Operation of slewing mechanism



Note:

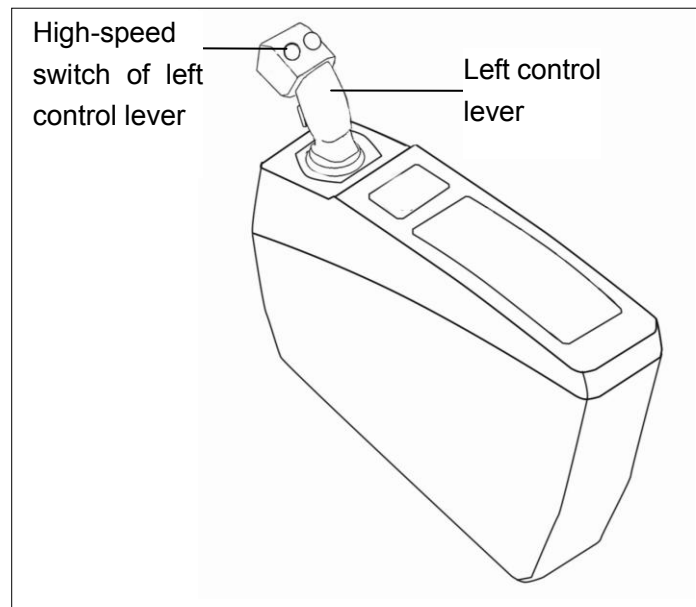
1. The speed range for slewing movement must be set according to the load capacity charts.
2. Operating with high slewing speed will cause an increased risk of accidents! Before initiating any slewing movements, the operator must make sure that there are no persons or obstacles within slewing radius. Otherwise, there is an increased risk of accidents. Before carry out slewing movement, an acoustic signal should be given.



Operation of slewing mechanism

Instructions for the movements of slewing mechanism

Description	Operation	Movement
Left control lever	Move to left	Superstructure slews to left
	Move to right	Superstructure slews to right
	Return to neutral position	Stop slewing

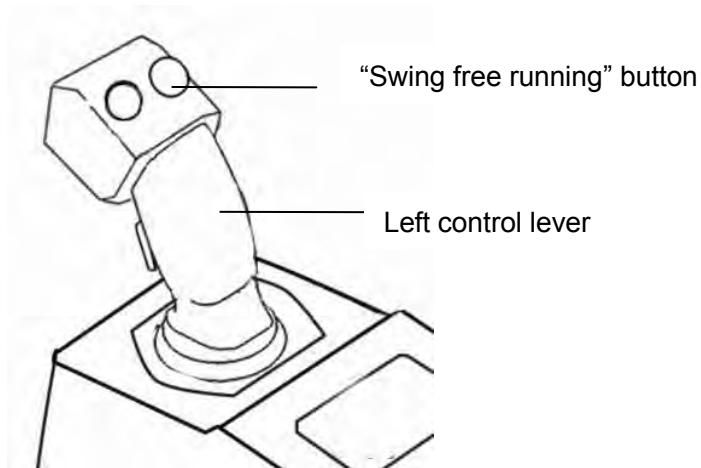


Note:

1. The automatic speed of slewing mechanism is low speed. After pressing the high-speed switch of left control lever, the slewing mechanism can work at full speed.
2. Longer boom - slower slewing speed;
3. Heavier load - slower slewing speed;

4.5.4.3 Swing free running

If the load hook is not positioned vertically over the load's center of gravity before lifting operation, the operator can press the button on the left control lever to activate swing free running mode. At this moment, the side force on the boom can be reduced, and the boom and superstructure, under the effect of external force, are pulled to the position where the load hook is vertical to the load's center of gravity. In this way, pulling the load obliquely can be avoided and the equipment can be protected against damage.



Operation of swing free running

Press the button on the left control lever, the movement "Swing free running" will be carried out.

After hoisting rope is vertical, the movement "Swing free running" stops.



Note:

1. When carrying out the movement "Swing free running", operate the control lever to lift the hook at the same time. In this way, the side force will be produced on the wire rope to make load hook vertical to the boom.
2. Before each swing of the superstructure the crane operator must personally make sure that there are no obstacles in the crane slewing area and no person is in the danger zone. Give a short warning signal (horn) before starting a crane movement.
3. When slewing with a load, initiate the slewing movement very carefully. It is prohibited to stop slewing movement or change slewing direction jerkily.
4. Longer boom - slower slewing speed;
5. Heavier load - slower slewing speed;
6. It is not permitted to slew the superstructure on the trailer.
7. In order to ensure safe operation, the customer should check slewing ring bolts with 1800N.m tightening torque after initial 100 operating hours. Then check and tighten them after 300 operating hours. After that, do the checks every 500 operating hours.
8. When operator has to leave the machine in traveling or transport condition, never rely solely on the slewing brake to lock the slewing mechanism. Even though the slewing brake is applied, the superstructure may still slew, because it

is not a positioning lock.

9. Activating slewing brake switch to lock slewing mechanism abruptly should be avoided, since it may cause damage to the superstructure.

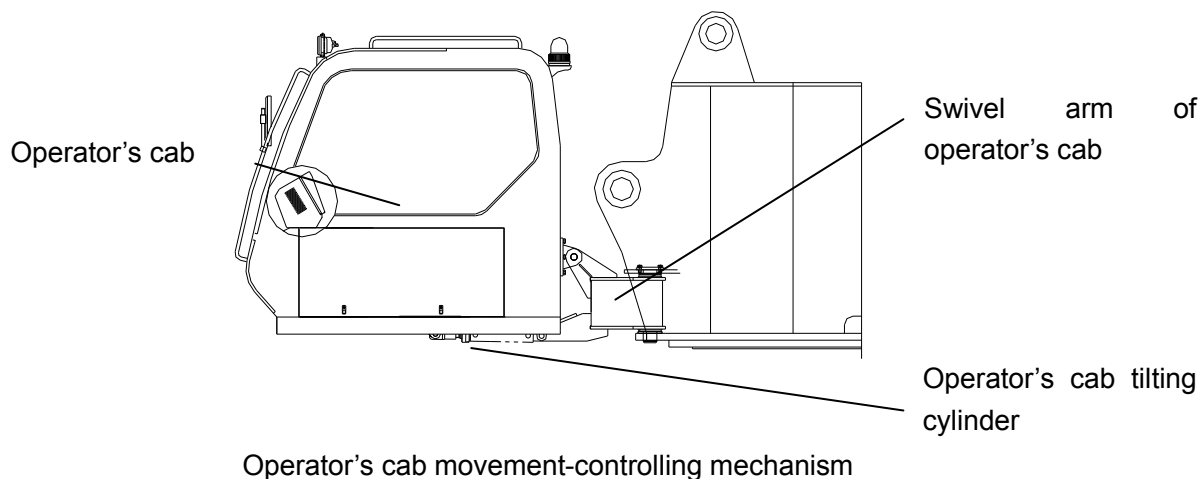
4.5.5 Simultaneous operation

No	Simultaneous operation	Operation
1	Slewing mechanism and Winch 1	Left control lever(left and right)+ right control lever(forwards and backwards)
2	Slewing mechanism and derricking mechanism	Left control lever(left and right)+ right control lever(left and right)
3	Slewing mechanism and winch 2	Operate the left control lever in 20°~70° range
4	Winch 1 and derricking mechanism	Operate the right control lever in 20°~70° range
5	Winch 2 and derricking mechanism	Left control lever(forwards and backwards)+ right control lever(left and right)
6	Winch 2 + winch 1 (luffing jib)	Left control lever(forwards and backwards)+ right control lever(forwards and backwards)
7	Slewing mechanism + winch 1 (luffing jib)	Left control lever(left and right)+ right control lever(forwards and backwards)
8	Winch 1+ luffing jib derricking winch	Operate the right control lever in 20° - 70° range
9	Winch 2+ luffing jib derricking winch	Left control lever(forwards and backwards) + right control lever(left and right)
10	Winch 1+ luffing jib derricking winch	Left control lever(left and right)+ right control lever(left and right)

4.5.6 Operation of movements of crane operator's cab

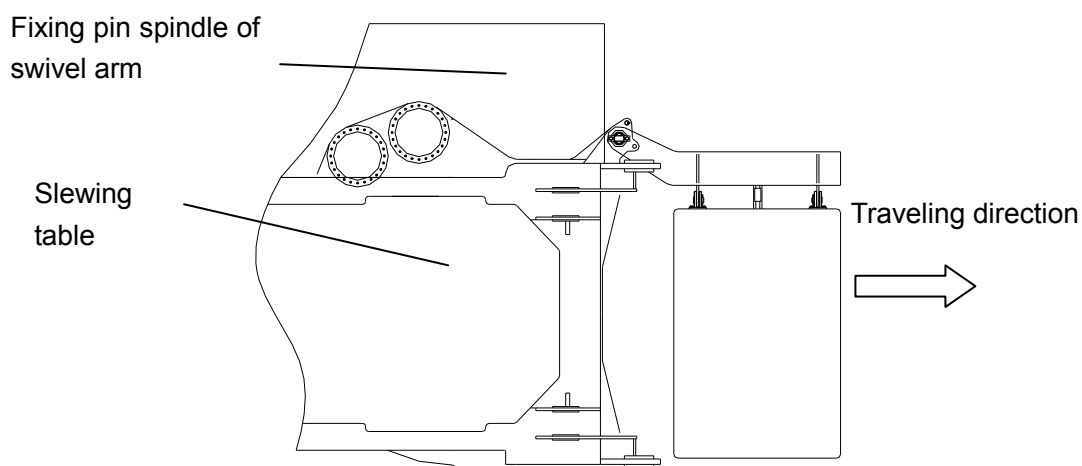
Operator's cab movement-controlling mechanism consists of operator's cab, swivel arm of operator's cab, fixing pin spindle of swivel arm, operator's cab tilting cylinder.

The operator's cab, an independent cabin, can make relative movement to the basic machine. It can not only tilt forwards or backwards, but also swivel sideways. Under working condition, the cab can not be swiveled out, but can be tilted forwards and/or backwards. Only when the crane transfers from transport position to working position, can the cab be swiveled out.



4.5.6.1 Swiveling the operator's cab sideways

To reduce the transport width of the basic machine on the low-loader, the operator's cab must be swiveled out of the side working position to the centre of slewing table.

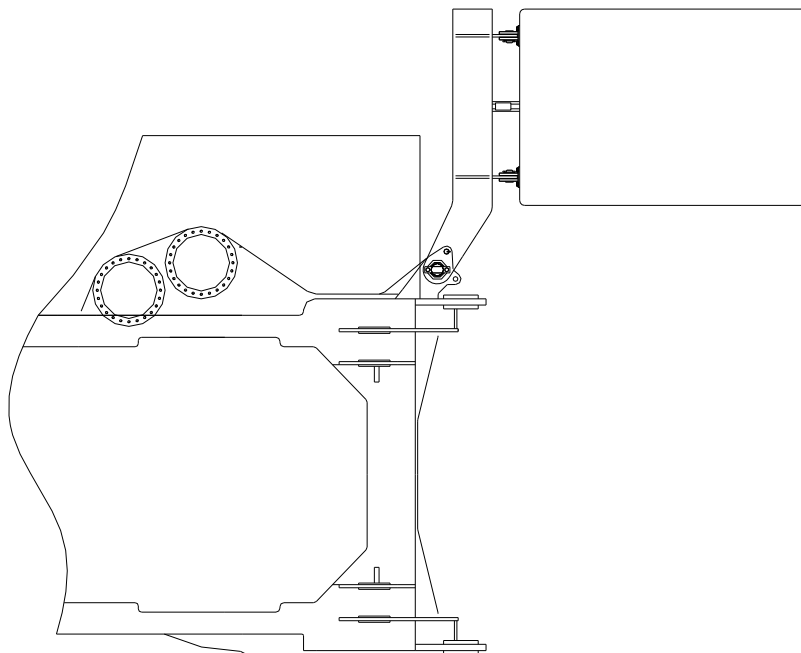


Operator's cab in transport position

Before swiveling the cab from transport position to working position, the operator must swivel the swivel arm of cab 90 ° manually and then secure it with pin spindle.

The procedure for swiveling cab to the working position:

- Pull out the fixing pin spindle of swivel arm.
- Swivel the swivel arm of operator's cab 90 ° manually.
- Insert fixing pin spindle to secure the swivel arm after cab is in the working position.



Operator's cab in working position



Note:

1. Swiveling the operator's cab to the transport condition is carried out in reverse order.
2. Do not operate any other devices when swiveling the operator's cab.
3. Close the door before swiveling the operator's cab.
4. Take off the interior light on the roof of cab before swiveling the operator's cab. The cab should not collide with tilting-back support cylinders of main boom when it is swiveled out.

4.5.6.2 Tilting the operator's cab forwards/backwards

In order to enlarge the view of crane operator, the cab can tilt forwards or backwards using tilting cylinder.

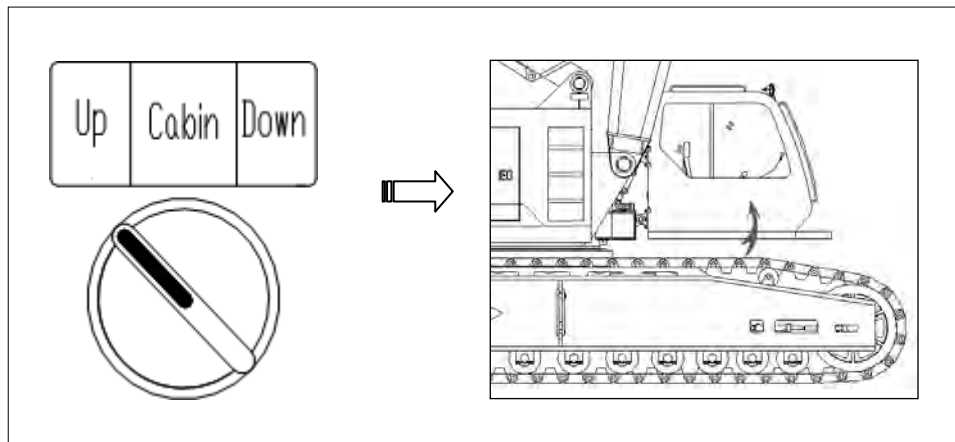
When tilting cylinder is extended completely, the cab is in horizontal position;

When tilting cylinder is retracted, the cab will tilt backwards to a maximum of 20°.

This function can be achieved by operating "Tilt cab forwards/backwards" switch in operator's cab, which can make cab stop and maintain at any position within the range of 0° - 20°.

a) Tilting operator's cab backwards

When cab is horizontal, turn the "tilt cab forwards/backwards" switch to the left, then the cab will tilt backwards. After it tilts to proper position, turn the switch to neutral position.



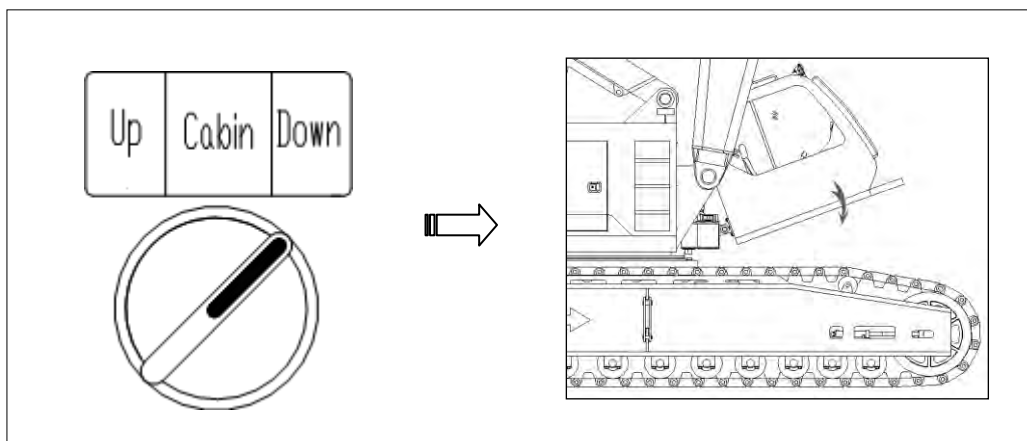
Operation of tilting cab backwards

Turn the "tilt cab forwards/backwards" switch on the right control panel to the left, the cab will tilt backwards;

Turn the "tilt cab forwards/backwards" switch on the right control panel to the neutral position, the cab will stop tilting backwards.

b) Tilting operator's cab forwards

When operator's cab is tilted backwards, turn the "tilt cab forwards/backwards" switch to the right, then the cab will tilt forwards. After it tilts to proper position, turn the switch to neutral position.

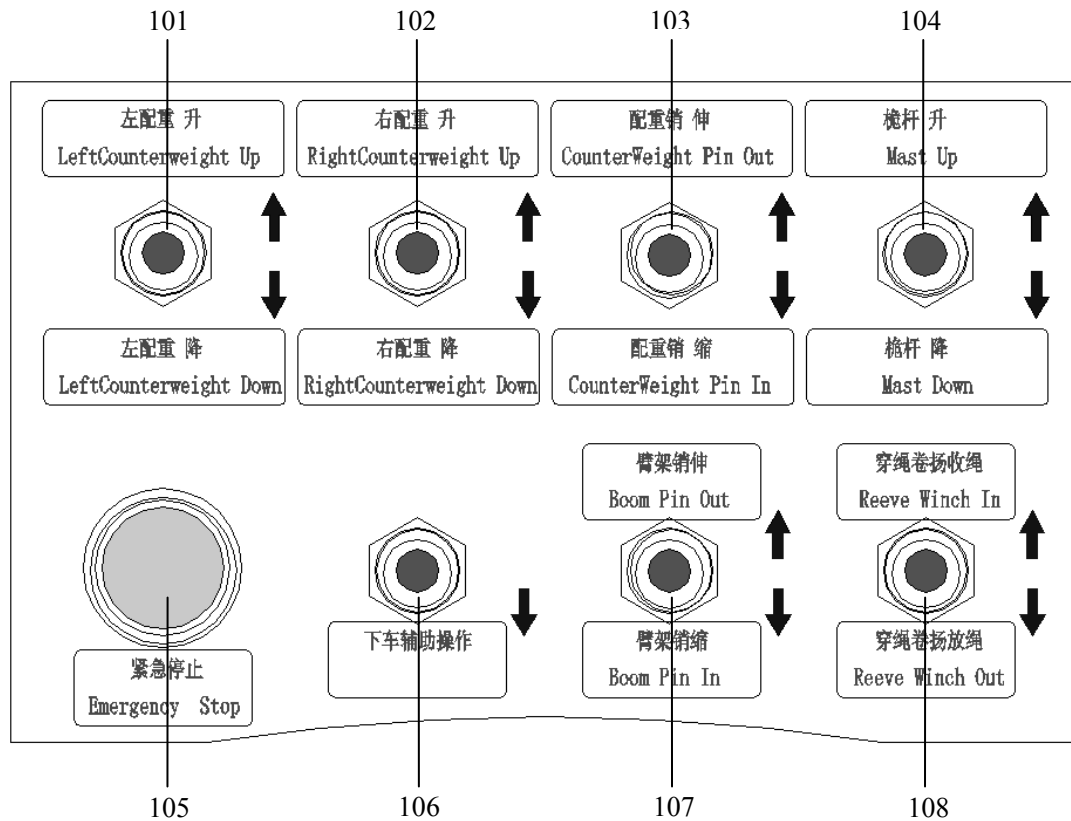


Turn the "tilt cab forwards/backwards" switch on the right control panel to the right, the cab will tilt forwards;

Turn the "tilt cab forwards/backwards" switch on the right control panel to the neutral position, the cab will stop tilting forwards.

4.5.7 Auxiliary remote control box

The auxiliary remote control box, located on the right side of slewing table, is mainly used for self-assembly & dismantling operation. The functions of switches on it are shown in following figure.



Auxiliary remote control box

Instructions for switches on the auxiliary remote control box

NO.	Name of switch	Operation	Function
101	Counterweight left lifting cylinder switch	Push up	Extend left counterweight cylinder
		Push down	Retract left counterweight cylinder
102	Right counterweight control switch	Push up	Right counterweight cylinder extends
		Push down	Right counterweight cylinder retracts
103	Counterweight bolting cylinder switch	Push up	Extend bolting cylinder
		Push down	Retract bolting cylinder
104	A-frame erecting/lowering switch	Push up	Erect A-frame
		Push down	Lower A-frame
105	Emergency stop switch	Its function is the same as that of emergency shut-down button on the right control panel.	

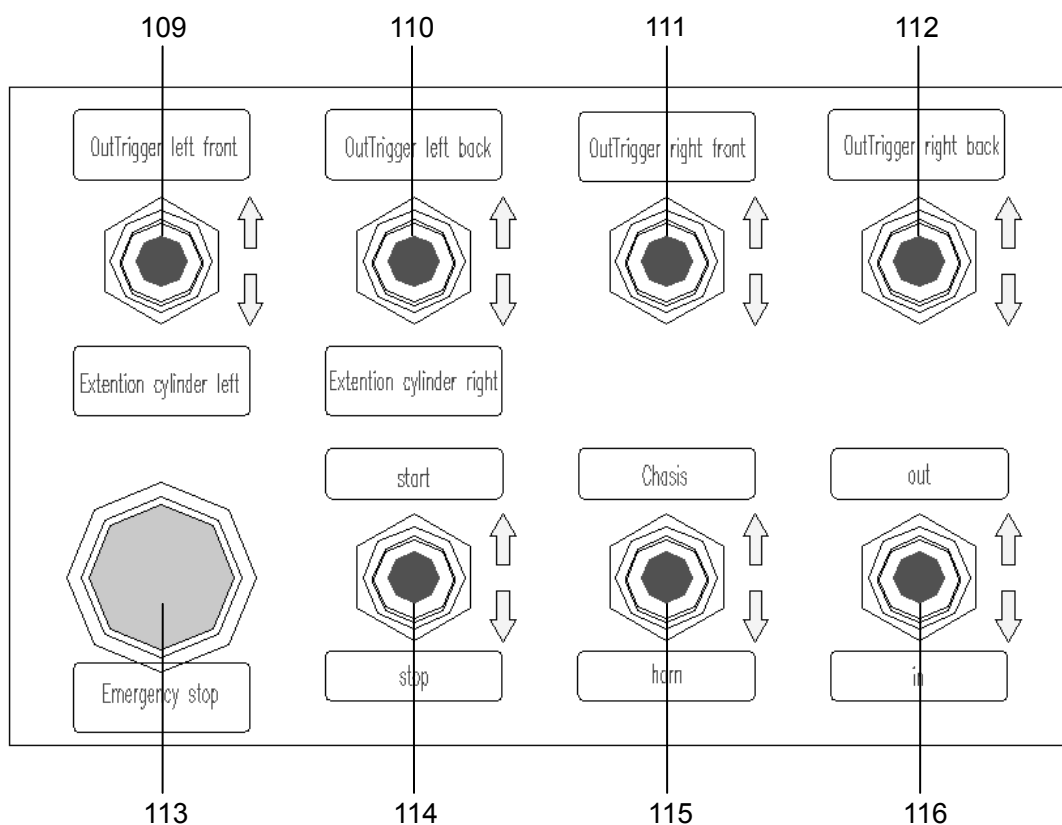
106	Undercarriage control switch	Only when this switch is turned on, can the support cylinder control levers be operated. (For details, see Section 4.5.8)	
107	Pivot section bolting cylinder switch	Push up	Extend pivot section bolting cylinder
		Push down	Retract pivot section bolting cylinder
108	Reeving winch switch	Push up	Spool up reeving winch
		Push down	Reel off reeving winch
		Its function is the same as that of "Reeving winch" rotary switch on the right control panel.	



Note:

As soon as the emergency stop switch is pressed, the power supply of machine is cut off and the engine shuts down!

4.5.8 Undercarriage remote control box



Description of switches on the undercarriage remote control box

No.	Description
109	Changeover switch, FL support cylinder / left crawler carrier extension cylinder
110	Changeover switch, RL support cylinder / right crawler carrier extension cylinder
111	"FR support cylinder" switch
112	"RR support cylinder" switch
113	Emergency stop button
114	"Engine on/off" switch
115	Changeover switch, undercarriage auxiliary device / horn
116	"Cylinder extending/retracting" switch



Note:

1. As soon as the emergency stop button is pressed, the power supply of machine is cut off and the engine shuts down!
2. Before carrying out the following operation, the undercarriage auxiliary device switch should be switched on. Otherwise, no movements are performed.

Operation of support cylinders and crawler carrier bolting cylinders

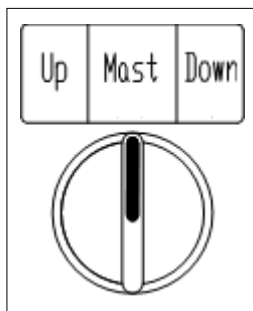
Front left support cylinder	Extend	Place the switch 109 in "FL support cylinder" position, and then push the toggle-switch 116 to "Extend" position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is extended to prescribed position.)
	Retract	Place the switch 109 in "FL support cylinder" position, and then push the toggle-switch 116 to "Retract" position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is extended to prescribed position.)
Rear left support cylinder	Extend	Place the switch 110 in "RL support cylinder" position, and then push the toggle-switch 116 to "Extend" position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is extended to prescribed position.)
	Retract	Place the switch 110 in "RL support cylinder" position, and then push the toggle-switch 116 to "Retract" position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is retracted to prescribed position.)
Front right support	Extend	Place the switch 111 in "FR support cylinder" position, and then push the toggle-switch 116 to "Extend" position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is extended to prescribed position.)

cylinder	Retract	Place the switch 111 in “FR support cylinder” position, and then push the toggle-switch 116 to “Retract” position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is retracted to prescribed position.)
Rear right support cylinder	Extend	Place the switch 112 in “RR support cylinder” position, and then push the toggle-switch 116 to “Extend” position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is extended to prescribed position.)
	Retract	Place the switch 112 in “RR support cylinder” position, and then push the toggle-switch 116 to “Retract” position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is retracted to prescribed position.)
All support cylinders	Extend	Place the switches 109, 110, 111 and 112 in “FL support cylinder”, “RL support cylinder”, “FR support cylinder” and “RR support cylinder” positions, and then push the toggle-switch 116 to “Extend” position to extend four cylinders simultaneously. (Note: the switch 116 is a self-return switch. Release it after the cylinder is retracted to prescribed position.)
	Retract	Place the switches 109, 110, 111 and 112 in “FL support cylinder”, “RL support cylinder”, “FR support cylinder” and “RR support cylinder” positions, and then push the toggle-switch 116 to “Retract” position to retract four cylinders simultaneously. (Note: the switch 116 is a self-return switch. Release it after the cylinder is retracted to prescribed position.)
Left crawler carrier extension cylinder	Extend	Place the switch 109 in “Left crawler carrier extension cylinder” position, and then push the toggle-switch 116 to “Extend” position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is extended to prescribed position.)
	Retract	Place the switch 109 in “Left crawler carrier extension cylinder” position, and then push the toggle-switch 116 to “Retract” position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is retracted to prescribed position.)
Right crawler carrier extension cylinder	Extend	Place the switch 110 in “Right crawler carrier extension cylinder” position, and then push the toggle-switch 116 to “Extend” position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is extended to prescribed position.)
	Retract	Place the switch 110 in “Right crawler carrier extension cylinder” position, and then push the toggle-switch 116 to “Retract” position. (Note: the switch 116 is a self-return switch. Release it after the cylinder is retracted to prescribed position.)

4.5.9 Operation of A-frame erection cylinder and mounting cylinder on A-frame

a) Operation of A-frame erection cylinder

A-frame can be erected by operating the “A-frame erecting/lowering” switch in operator’s cab, or the “A-frame erecting/lowering” switch on auxiliary remote control box. (For details, see Section 4.5.7)

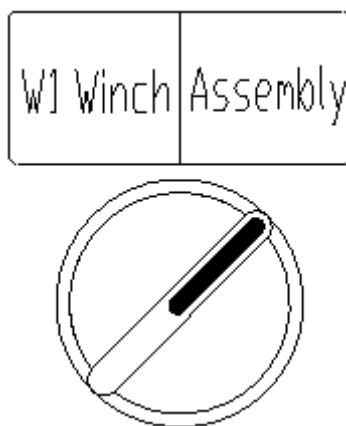


Turn the “A-frame erecting/lowering” switch on right control panel to the left, A-frame erection cylinder will be extended.

Turn the “A-frame erecting/lowering” switch on right control panel to the right, A-frame erection cylinder will be retracted.

The above mainly introduces the operation of A-frame erection cylinder. As to the operation of A-frame during self-assembly & dismantling, refer to section 5.2.2.

b) Operation of mounting cylinder on A-frame

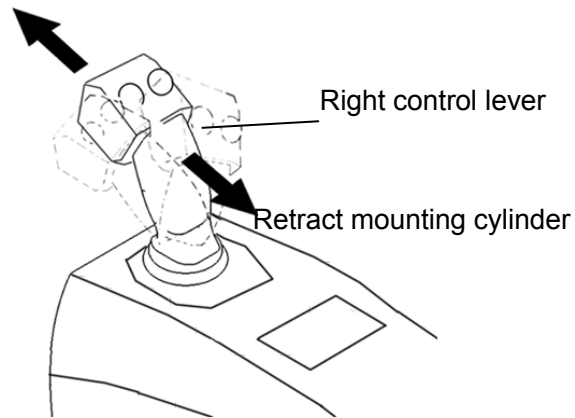


Turn “W1 Winch/Assembly” switch on the right control panel to “Assembly” position, as described above.

Push right control lever forwards, the mounting cylinder will be extended to low the load;

Push right control lever backwards, the mounting cylinder will be retracted to lift the load.

Extend mounting cylinder

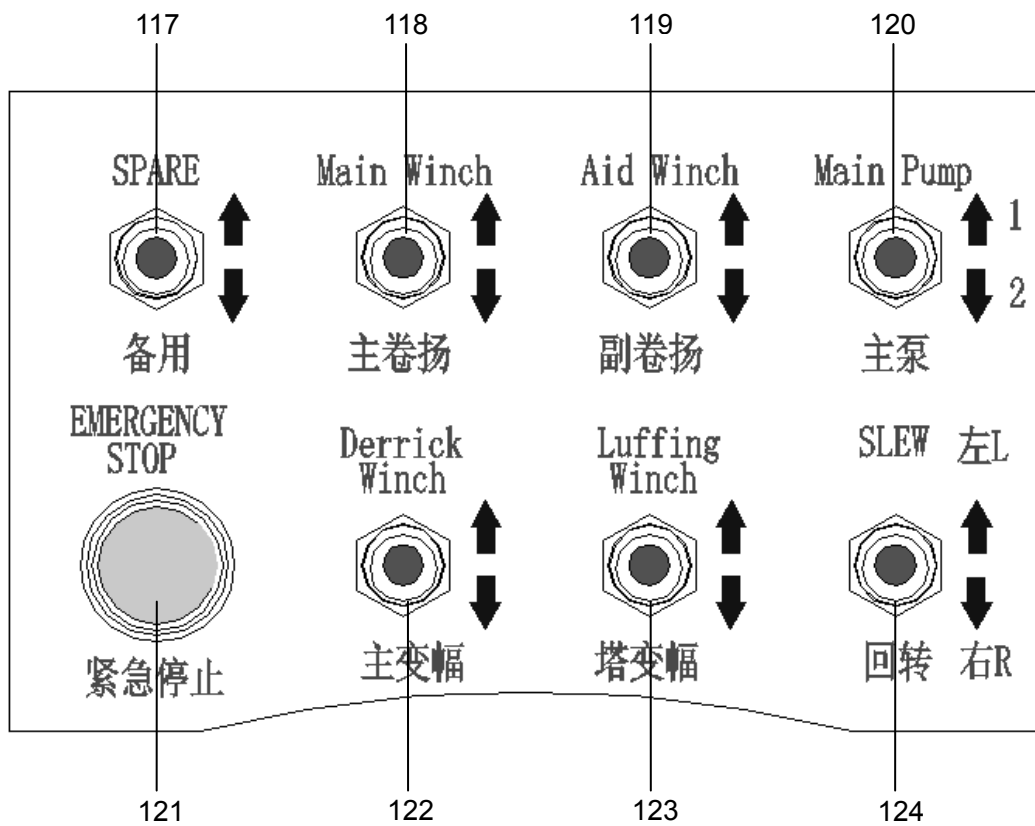


Operation of mounting cylinder



When operating self-assembly & dismantling mechanism, turn the “W1 winch / Assembly” switch to right.

4.5.10 Emergency control box



Description of switches on emergency control box

No.	Names of the switches	Operation
117	Reserved	
118	“Hoisting winch 1 (H1)” switch	Push it upward, spool up H1 to lift main load hook;
		Push it downward, reel off H1 to lower main load hook;
119	“Hoisting winch 2 (H2)” switch	Push it upward, spool up H2 to lift auxiliary load hook;
		Push it downward, reel off H2 to lower auxiliary load hook;
120	“Main pump” switch	Push it upward, main pump 1 is selected;
		Push it downward, main pump 2 is selected.
121	Emergency stop button	Cut off the power of emergency control box
122	“Main boom derricking winch (E)” switch	Push it upward, spool up E to raise main boom (or lower derrick boom when crane is operated with derrick boom and suspended ballast);
		Push it downward, reel off E to lower main boom (or raise derrick boom when crane is operated with derrick boom and suspended ballast);
123	“Luffing jib derricking winch (W1)” switch	Push it upward, spool up W1 to raise luffing jib;
		Push it downward, reel off W1 to lower luffing jib;
124	“Slewing mechanism” switch	Push it upward, slew the superstructure to the left;
		Push it downward, slew the superstructure to the right;

The emergency control box is used only when the control system malfunctions.

Before operating the emergency control box, plug its 24-pin plug into the 24-hole socket (X109) inside the electrical control box, which is near the slewing table.

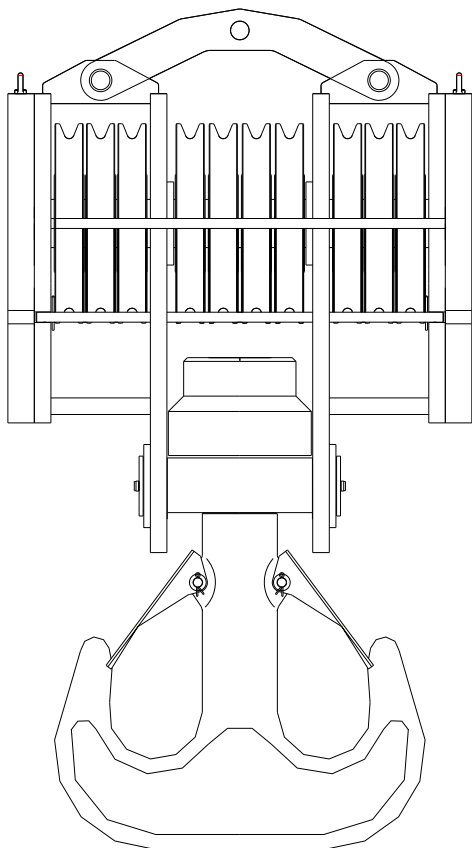


- (1) The emergency control box must only be used in an emergency to make crane do safe motions.
- (2) When control system is working normally, the emergency control box is not used generally. It must be put in the waterproof toolbox, and the electrical connection between emergency control box and electrical control box is disconnected.

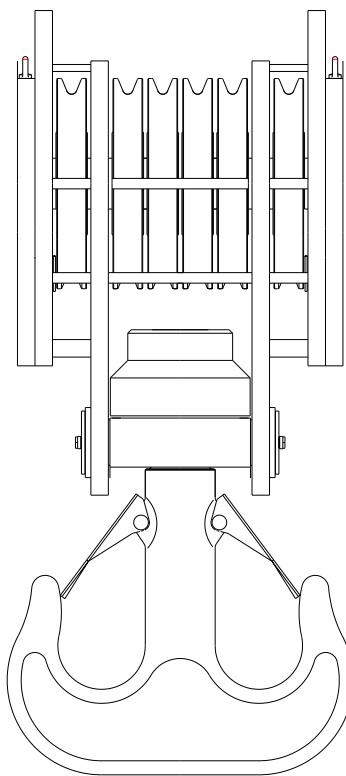
4.6 Rope reeving

Select proper load hook and rope reeving in accordance with operational planning and different boom configurations.

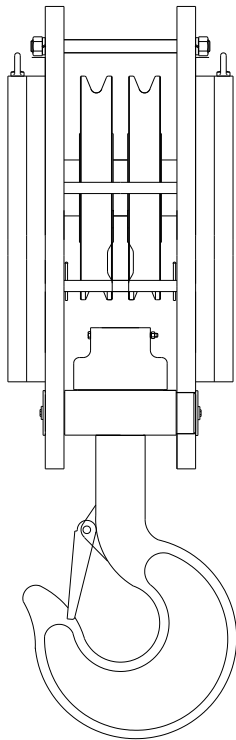
Type of load hook	Maximum rope reeving	Weight of load hook (lb)
573300 lb	20	9300
352800 lb /220500 lb	12/8	6200
110250 lb	4	3900
66150 lb	2	2400
35280 lb	1	2000



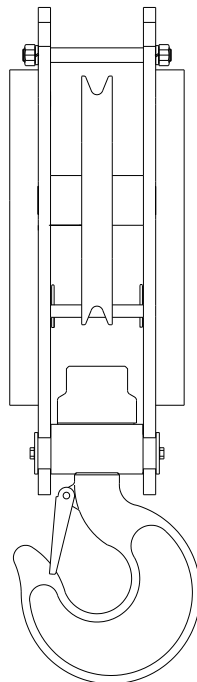
573300 lb load hook



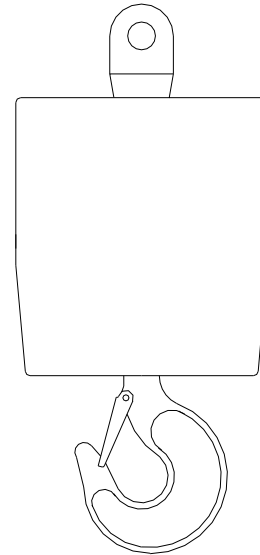
352800 lb /220500 lb load hook



110250 lb load hook



66150 lb load hook

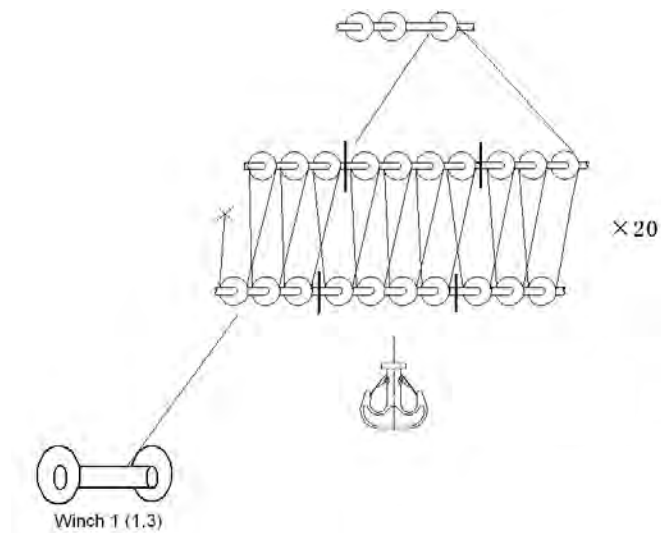


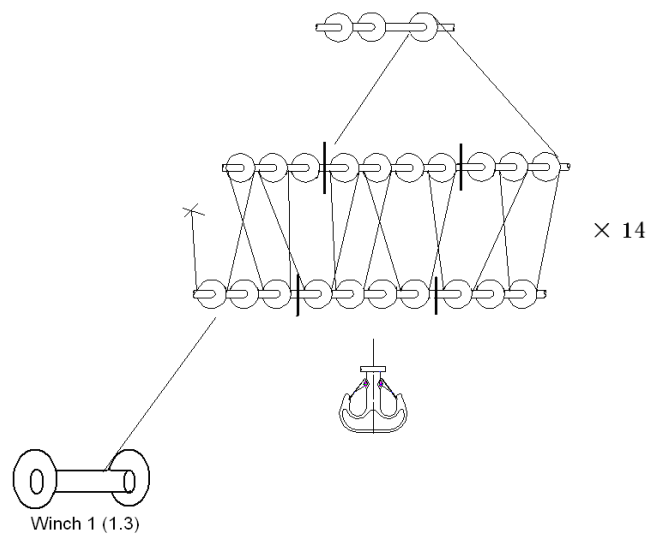
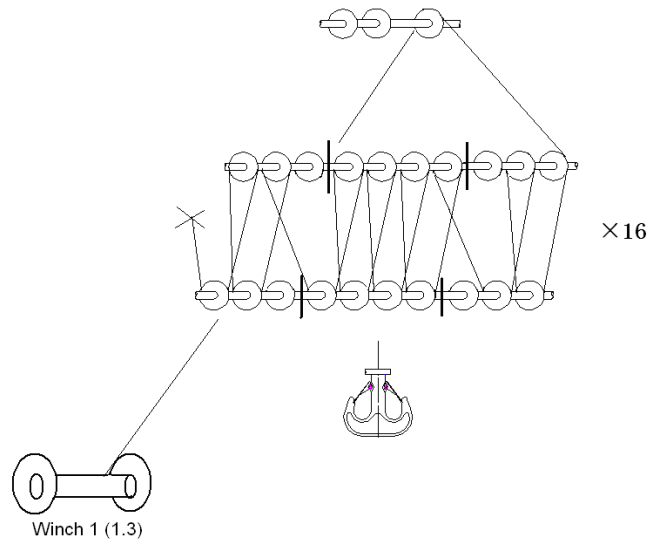
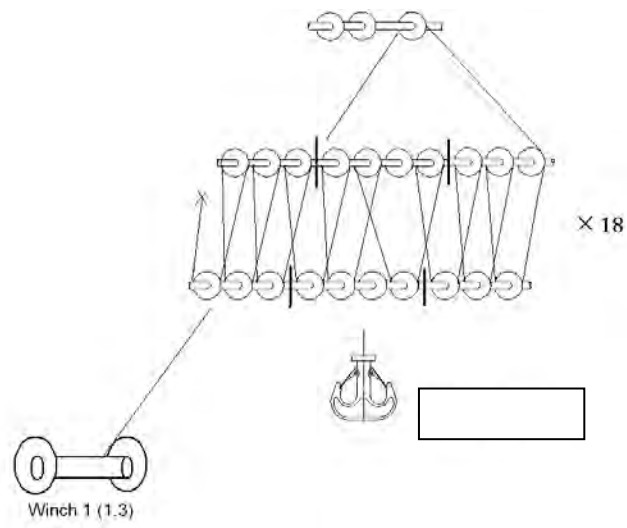
35280 lb load hook

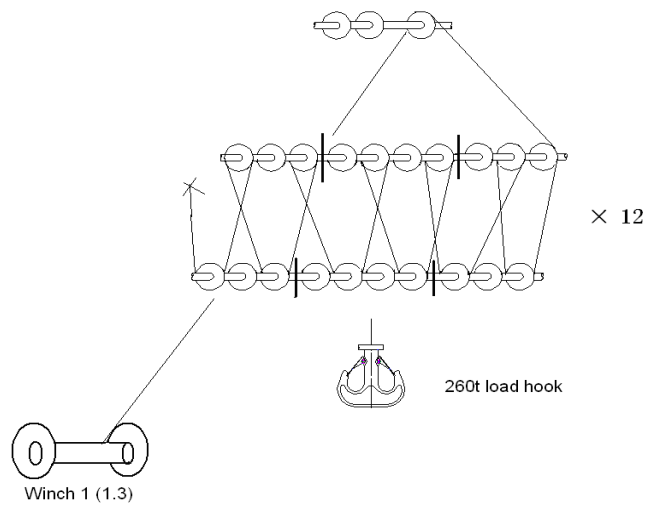
4.6.1 Heavy duty boom (S)

4.6.1.1 Hoisting rope guidance and reeving

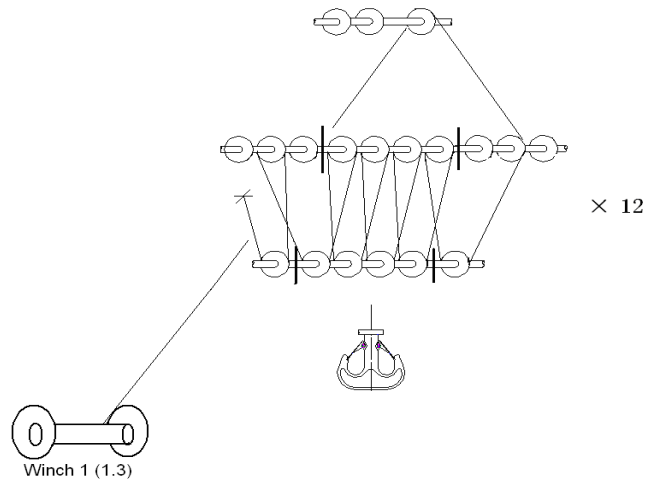
573300 lb load hook

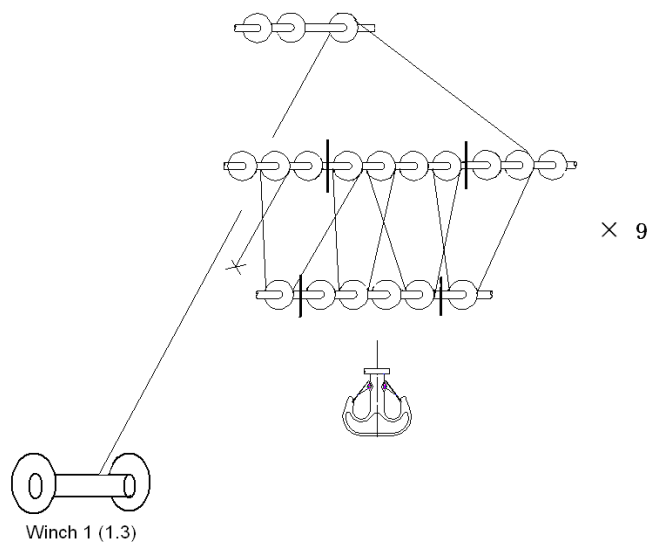
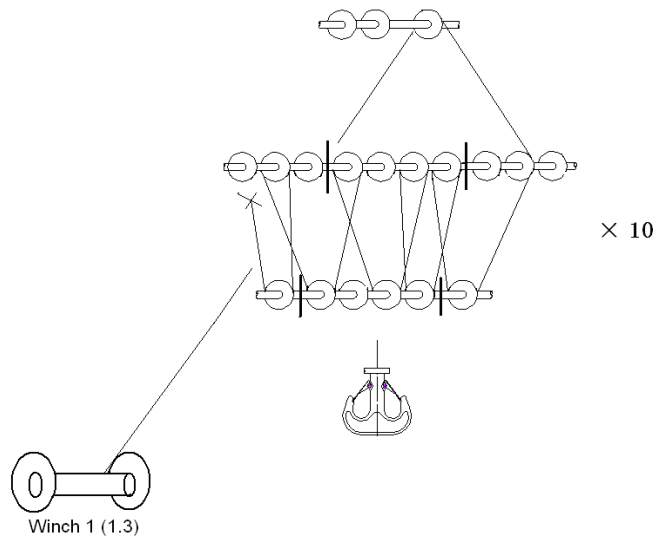
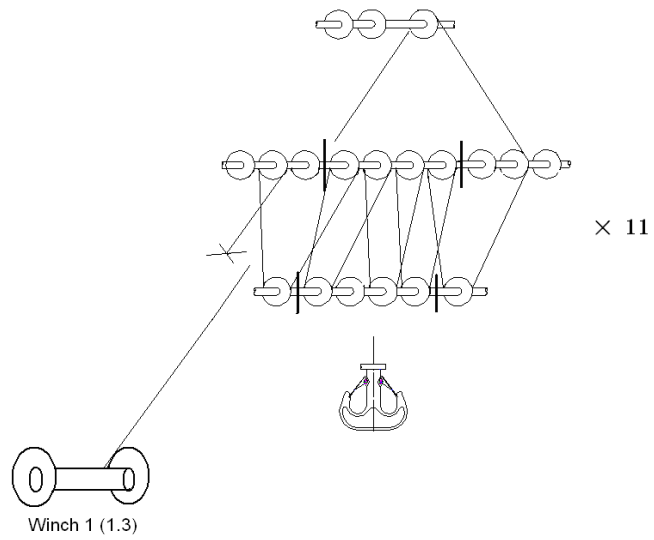


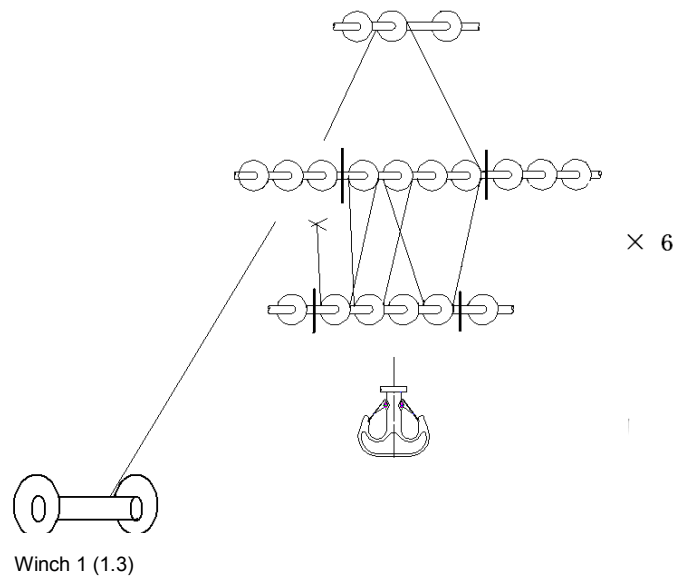
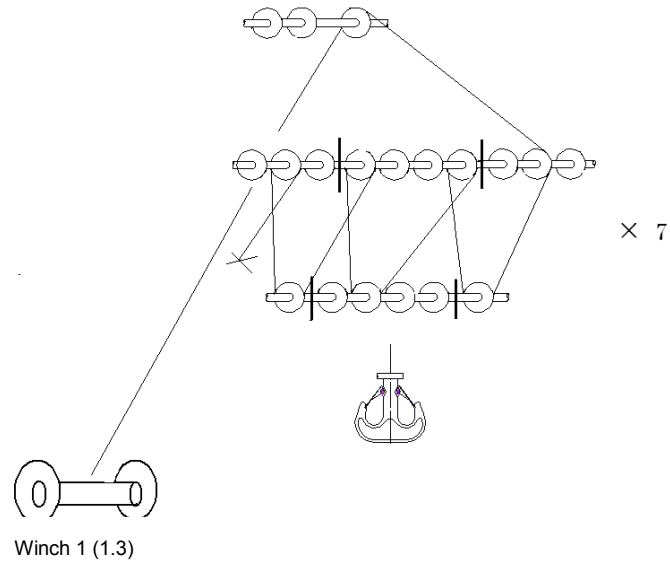
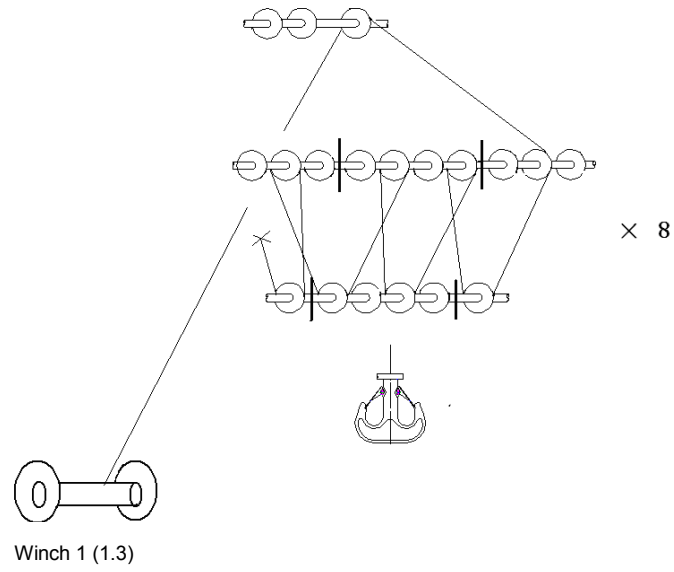


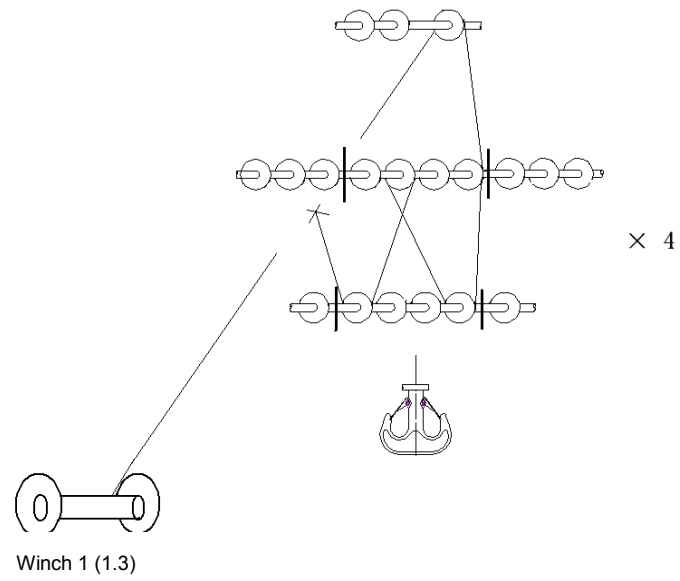
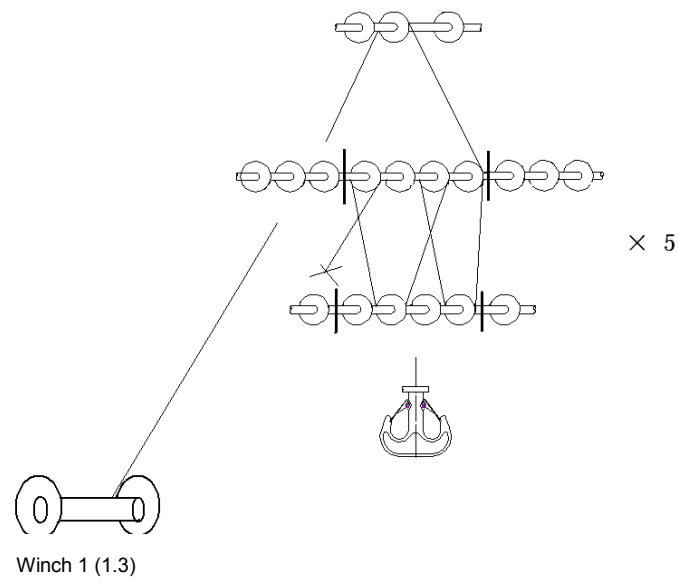


352800 lb /220500 lb load hook

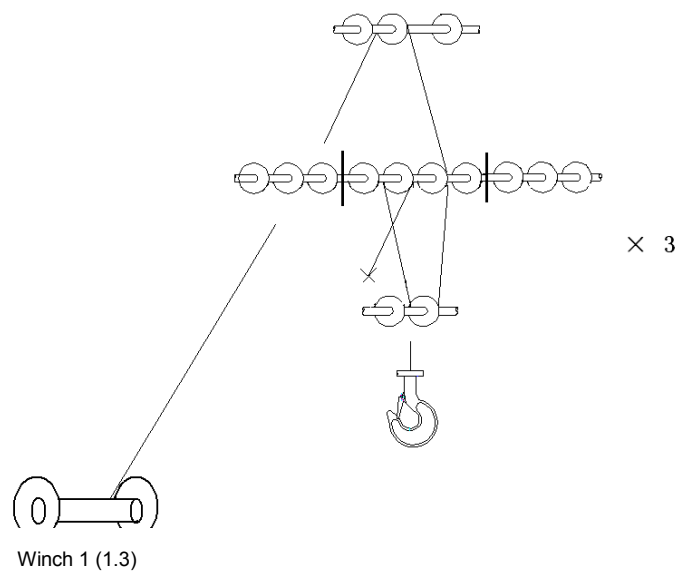
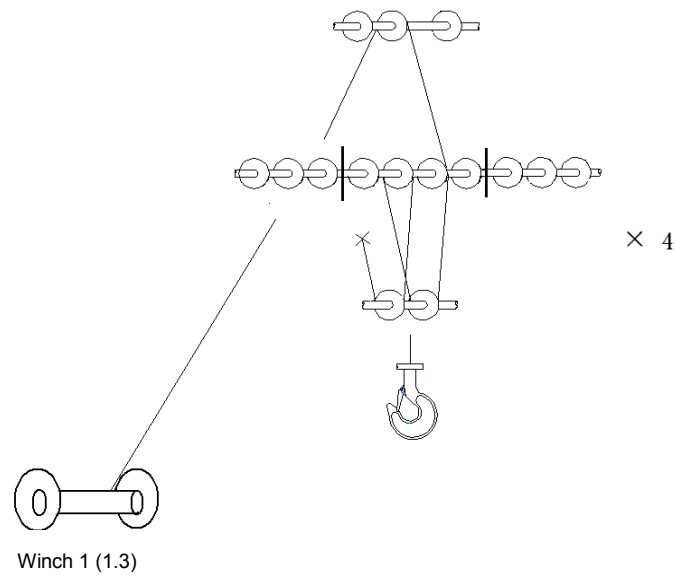
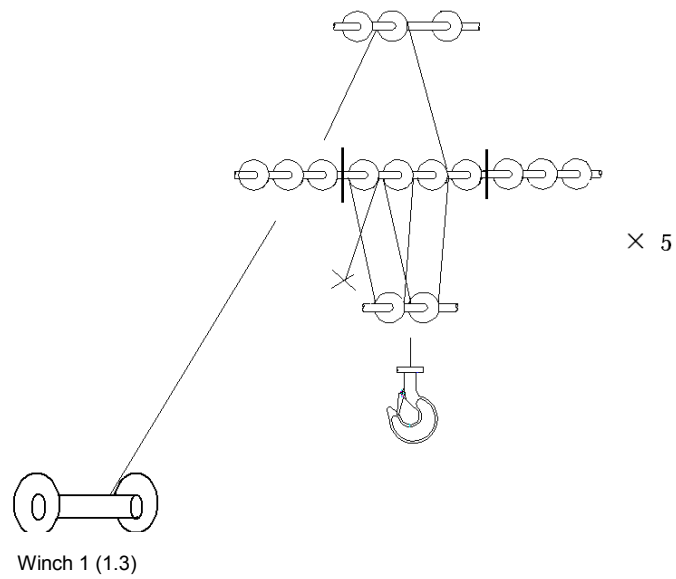




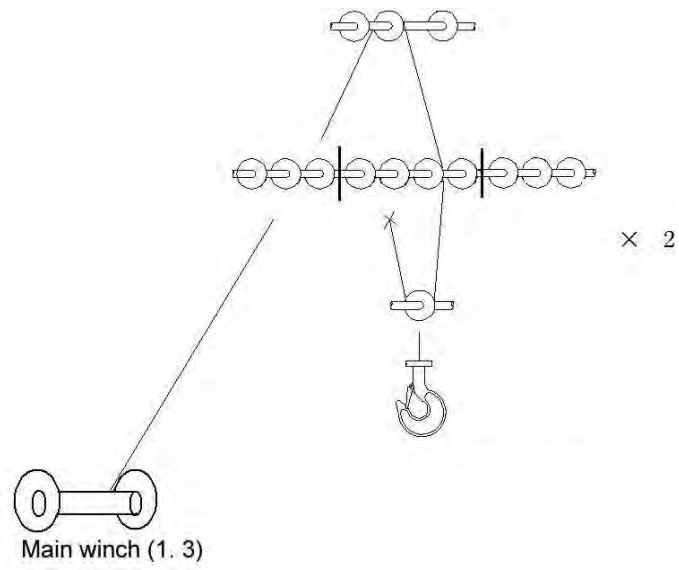




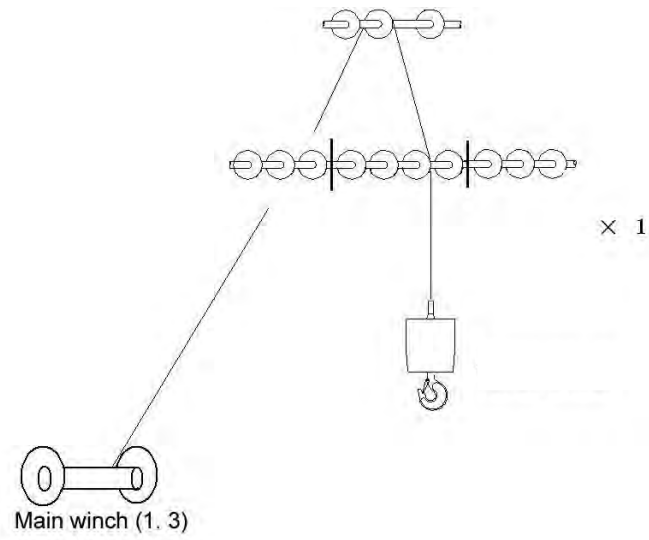
110250 lb load hook



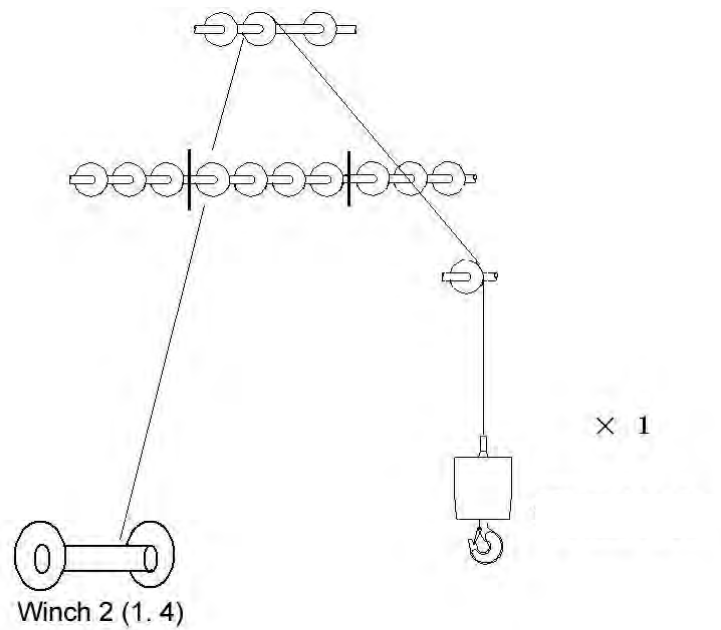
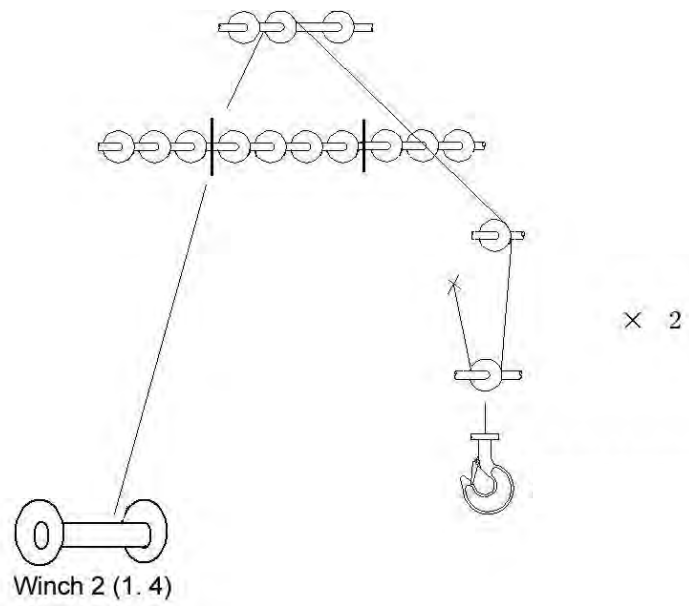
66150 lb load hook



35280 lb load hook

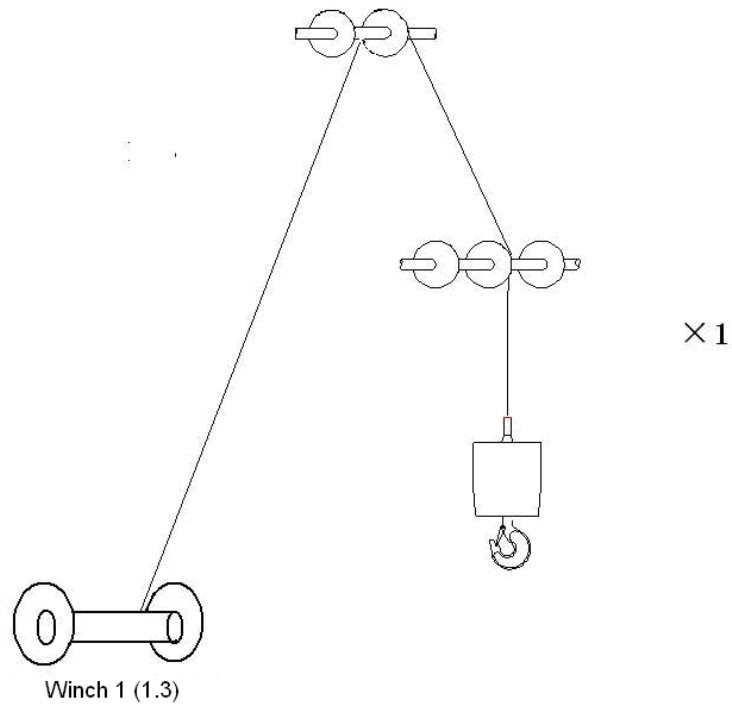
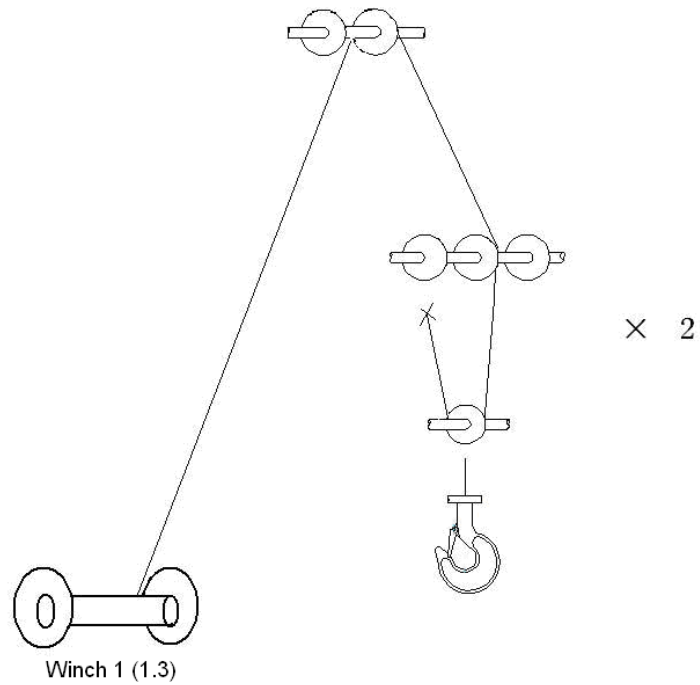


4.6.1.2 Main boom with tip boom

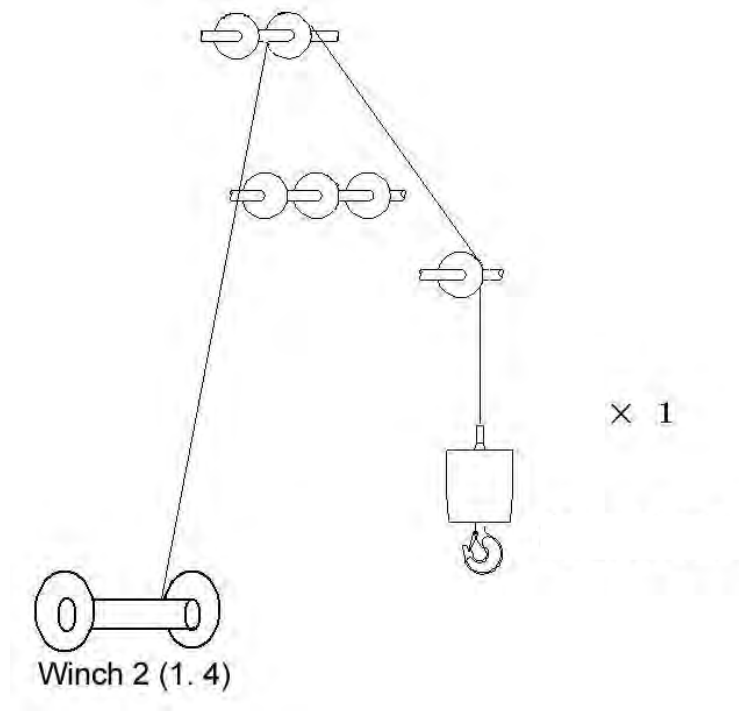


4.6.2 Light duty boom (SL)

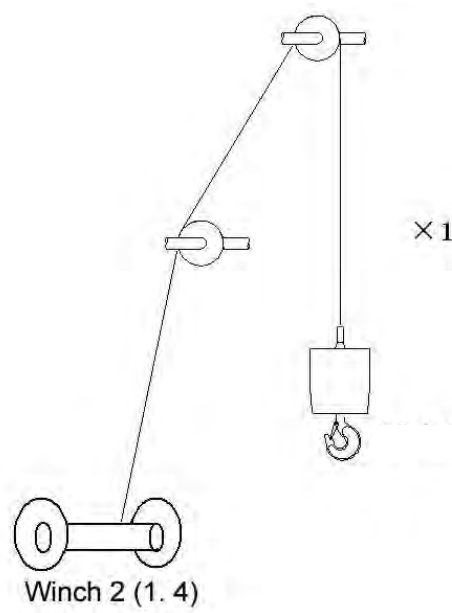
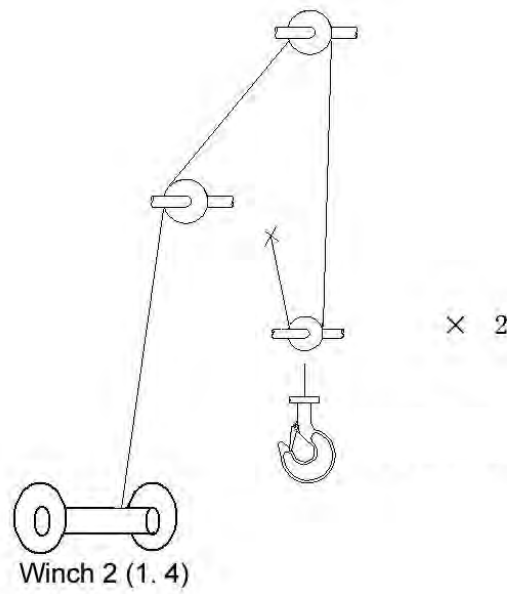
4.6.2.1 Hoisting rope guidance and reeving



4.6.2.1 Hoisting rope guidance for tip boom

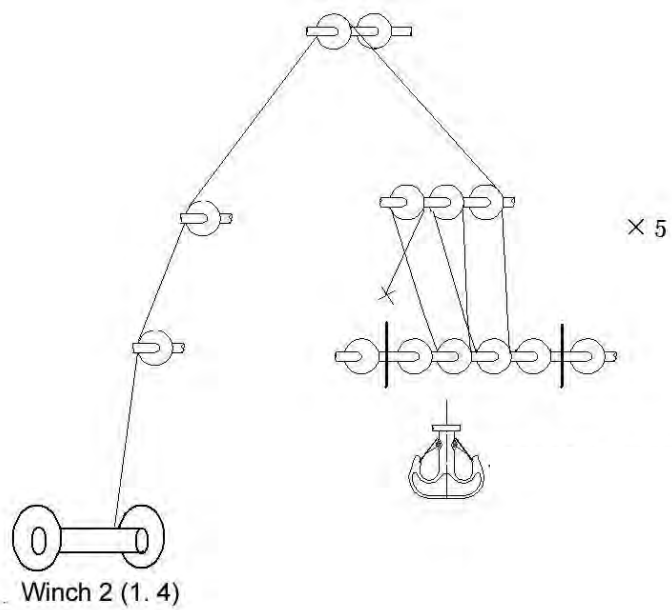
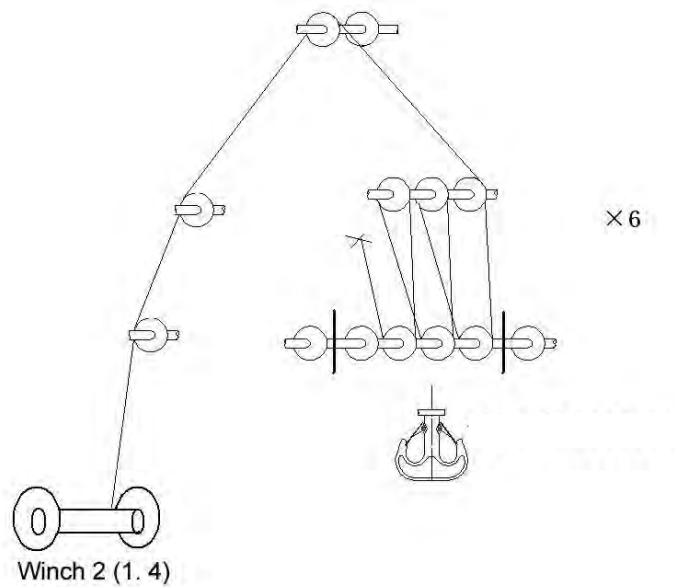


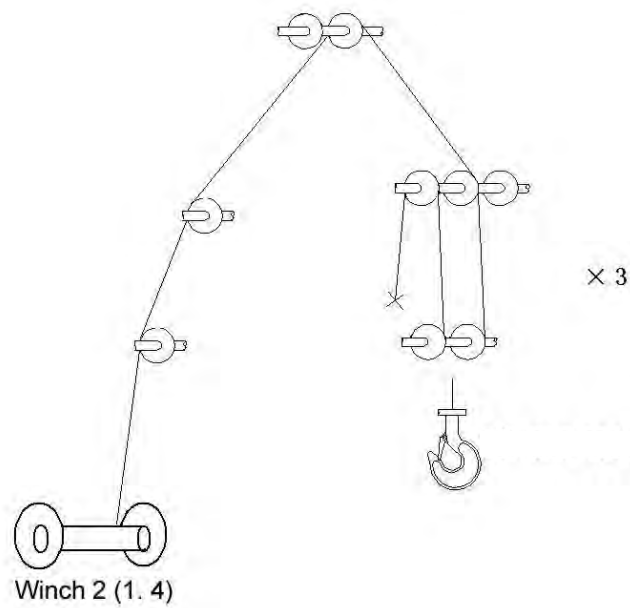
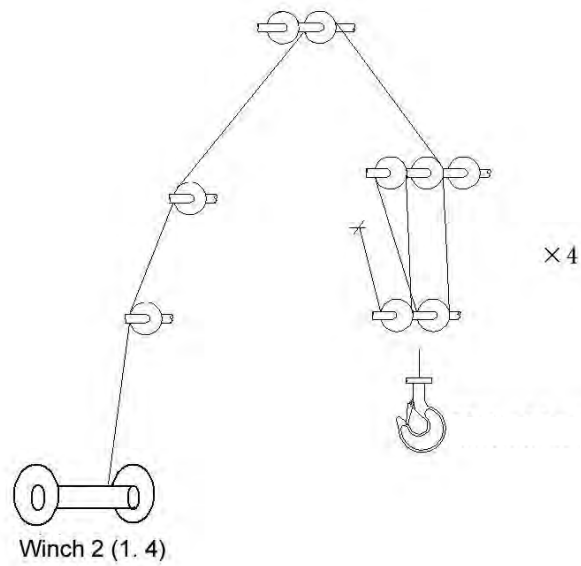
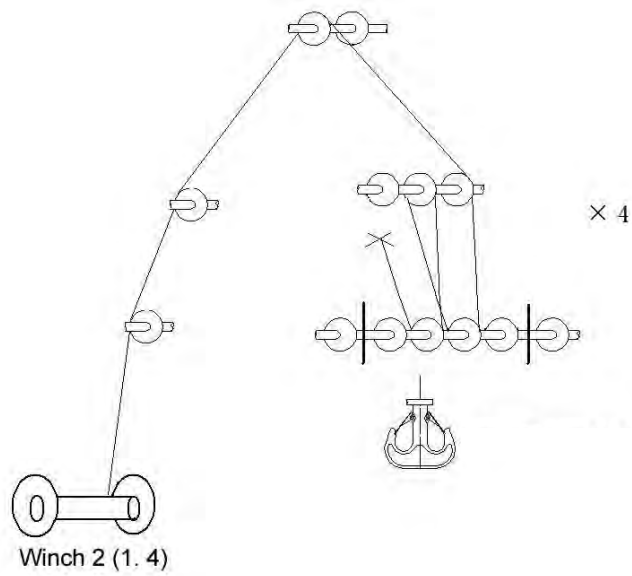
4.6.3 Fixed jib on heavy duty boom (SF)

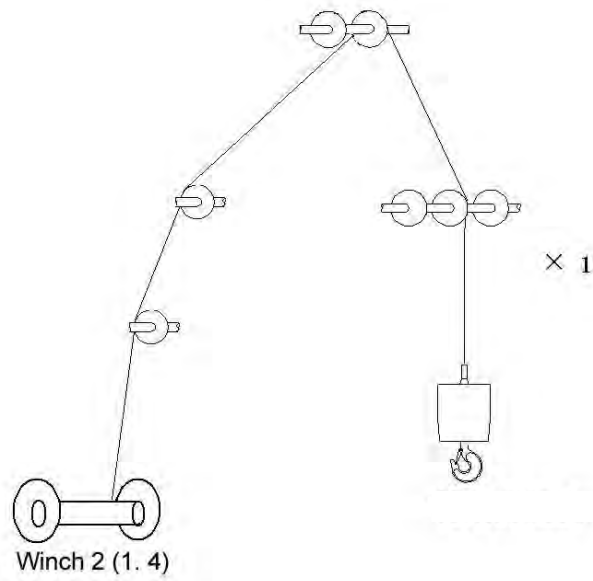
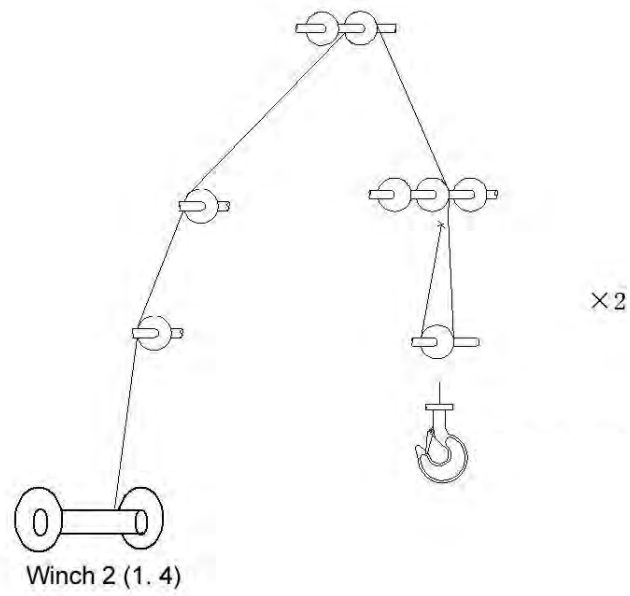


4.6.4 Luffing jib on heavy duty boom

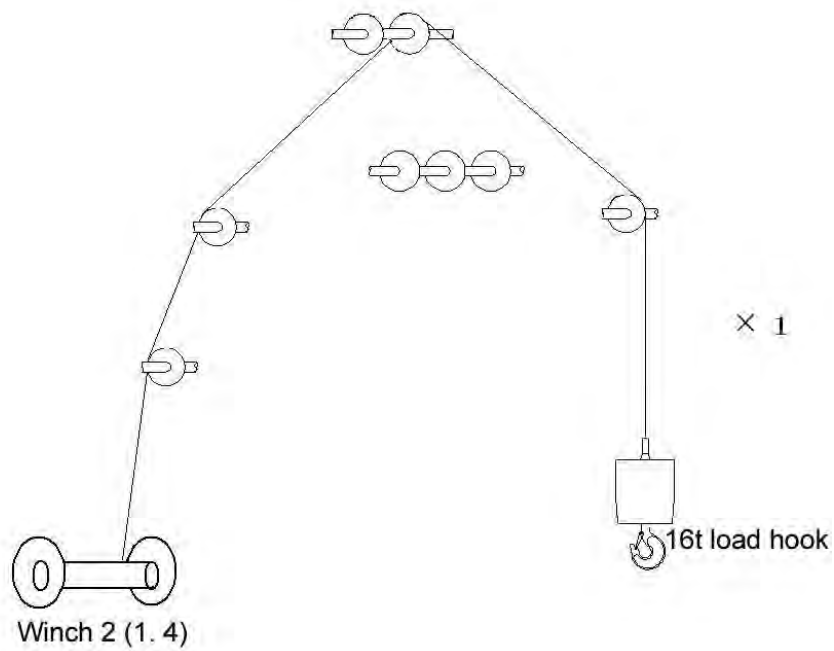
4.6.4.1 Hoisting rope guidance and reeving



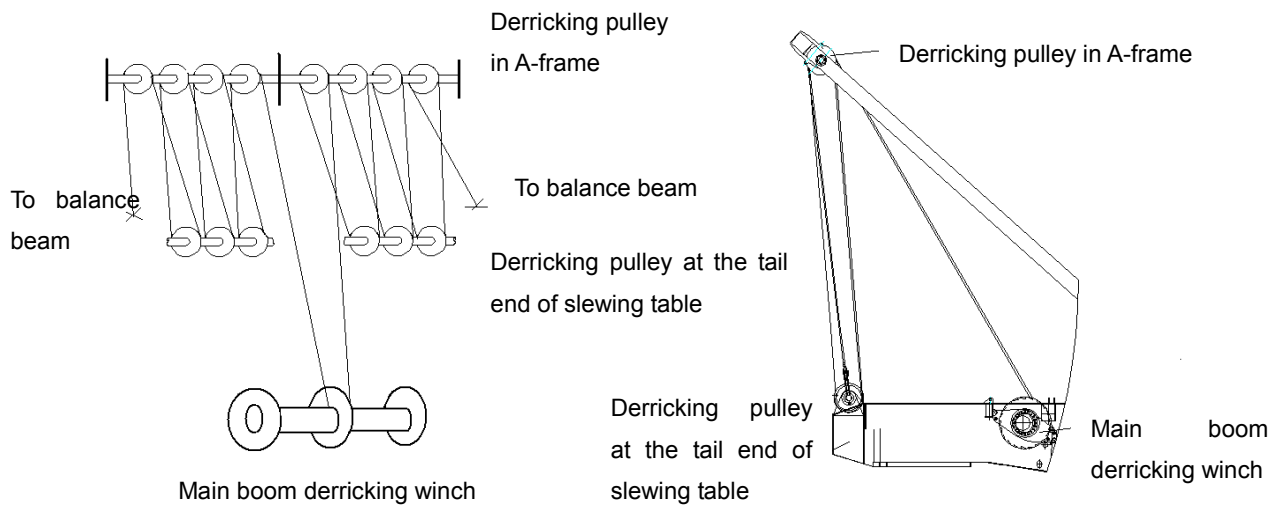




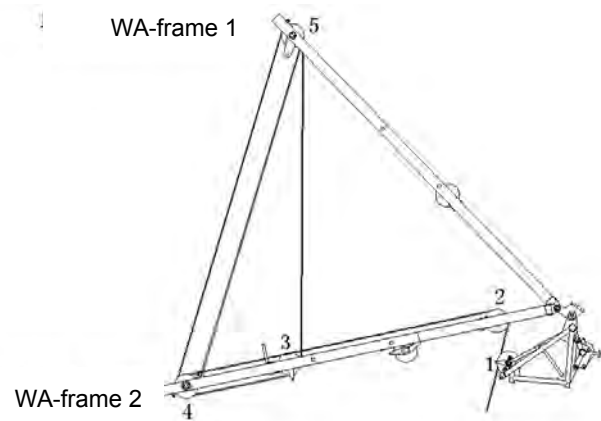
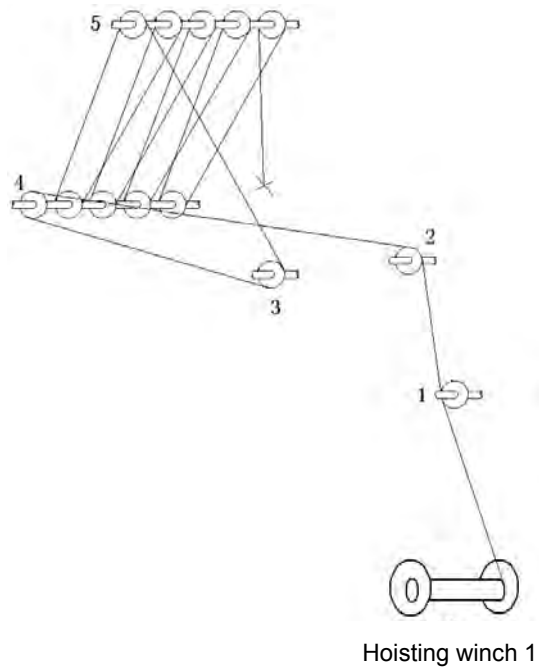
4.6.4.2 Hoisting rope guidance for tip boom on the luffing jib

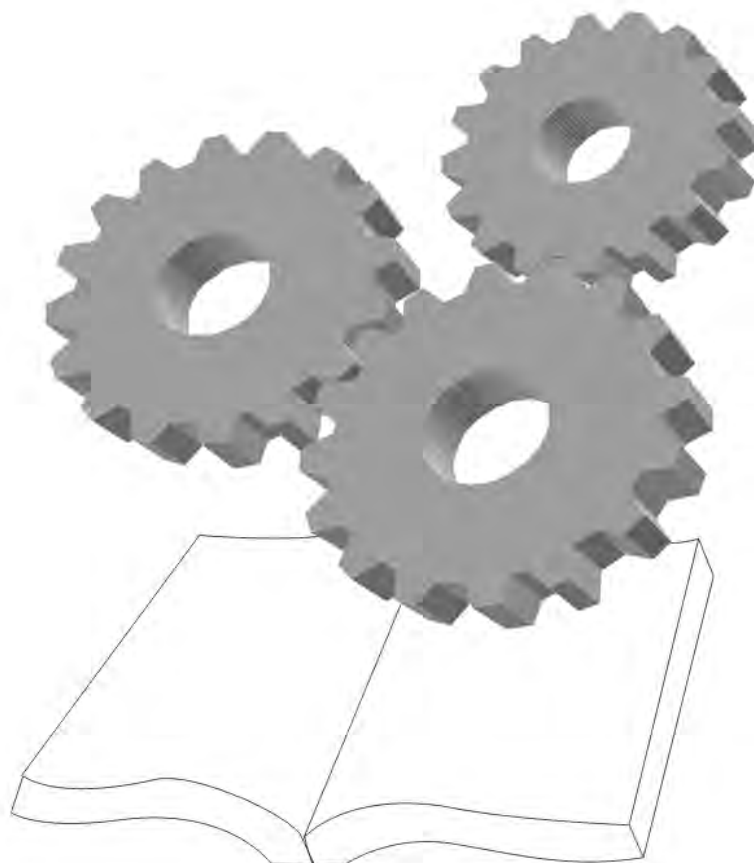
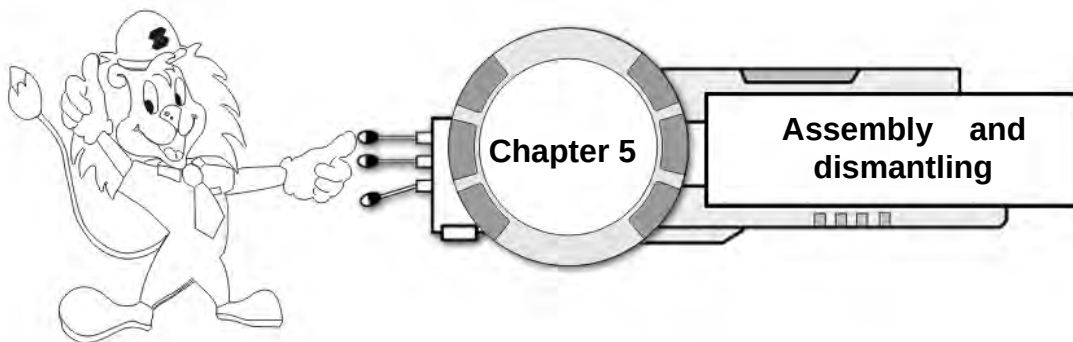


4.6.5 Main boom derricking rope guidance and reeving



4.6.6 luffing jib derricking rope guidance and reeving





ZOOMLION

5.1 Safety-technical notes

5.1.1 Notes on assembly

- a) Make sure that the crane complies with operating requirements. Then check the position of A-frame, anchoring rods, WA-frame 1, WA-frame 2 and sequence of boom intermediate sections one by one according to combination mode of boom length.
- b) The hoisting rope must be reeved between the rope pulley on the main boom head and load hook in accordance with the corresponding hoisting rope reevings specified in Rope Reeving in chapter 4.
- c) Counterweight plates must be fitted according to load capacity chart.
- d) For assembly work on the crane, a safety assembly scaffolding/ working platform should be used. Improvisations are prohibited. Otherwise, there is a danger of falling down.
- e) Remove obstacles away from the ground on the site before assembling and dismantling. In addition, the ground on the site should be cordoned off to prevent access by unauthorized person.
- f) Assembly of the boom must be done over the front or rear of the undercarriage of the machine; attention must be given to choose flat and solid ground to ensure proper support of the crane.;
- g) The fly jib should be assembled in accordance with the maximum permissible boom length, and the wire rope should be installed strictly according to the hoisting rope reevings.
- h) Each dismantled part should not only satisfy the requirement of load-bearing capacity under operating conditions, but also meet the art technology requirement of self-assembling /dismantling operation which must be carried out strictly in accordance with design requirement since the self-assembling /dismantling operation is a complicated lifting process.
- i) Lattice components which are not in contact with the ground during assembly/disassembly must be supported by appropriate and stable objects.
- j) Make sure that no one is standing beneath the lattice boom when the lattice boom is pinned or unpinned.
- k) Following certain disassembly principles and methods, QUY260 crawler crane can be divided into several parts for transportation. Main parts include undercarriage centre section, slewing table, A-frame and luffing pulley blocks, whose gross weight should be controlled within 105840lb. The slewing table and undercarriage centre section should be placed in the same direction, and operator's cab should be swung in 90°. Crawler carrier should be transported as a whole part. Boom system can be dismembered into boom sections and fly jib can be placed in main boom and secured with two chains during transportation. If lattice components are not secured, the inside lattice components will slide out and fall down which may cause severe accident.

l) For SW boom configuration:

Only when the angle of luffing jib to main boom reaches 100° (main boom angle is larger than 65°) and the luffing jib is not attached with a load hook, can it be raised up; to lay down the luffing jib, make sure that the angle between the main boom and luffing jib is equal to or larger than 10° when the tilting-back supports of luffing jib are yet not dismantled.

5.1.2 Checking safety measures

- a) Clearly define the duty and area of responsibility of all personnel concerned.
- b) Check whether the crane is adjusted to be horizontal.
- c) Check whether there is sufficient safety clearance to slopes and trenches.
- d) Check whether there are any live wires within the operating range of the crane and make sure that any parts of the crane are not in contact with the live-wire when crane movement is carried out.
- e) Checks that appropriate operating site has been selected so that the crane movements can be performed within maximum and minimum working radius.
- f) Check whether there are obstacles which will hinder required crane operations.
- g) Check whether the ground provides adequate load-bearing capacity.
- h) Know clearly about the type of crane operation and working mode.
- i) Check the distance between the lifting points and surrounding buildings;
- j) Check influence of communal facilities (including the overhead high/low voltage lines and underground gas pipes;
- k) Check movement restrictions due to surrounding structures (e.g. is there another crane nearby in working);
- l) Check number, weight, dimensions, material of load(s) to be lifted;
- m) Check required lifting height and slewing radius;
- n) Check heights and widths of thoroughfares leading to the site.
- o) Communication means must be agreed upon by both the signaller and crane operator;
- p) Take appropriate measures to keep people unconcerned and equipment away from the working range;



Note:

To master the actual condition of lifting operation accurately and ensure safe operation, the safety measures mentioned above should be checked and a proper operational planning should be carried out.

5.1.3 Inspection of wire rope, load hook, rope pulley and anchoring rods

5.1.3.1 Checking the wire ropes

The ropes must be checked by an expert before assembly and checks must be performed at regular intervals in order to detect possible damage or wear and tear at an early stage.

The ropes must be removed immediately if any of the following damage is detected:

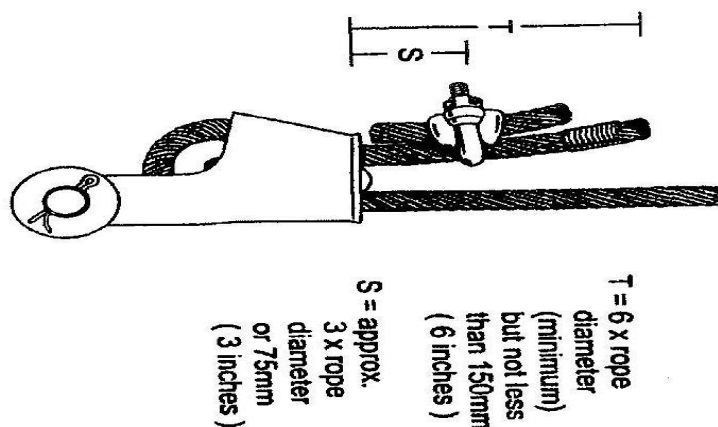
- a) Breakage of a strand;
- b) Wire breaks;
- c) reduction in the rope diameter by more than 10% of the nominal size
- d) Rope deformation.

The replacement rope must comply with the original rope specifications, including length, diameter and strength rating. The cam-type limit switch must be readjusted if a new hoisting rope is used!

Damaged rope pulley should be repaired or changed prior to replacing wire rope; otherwise, new wire rope will be damaged.

The inspection and maintenance of wire rope is detailed in Chapter 7.

5.1.3.1.1 A small piece of rope is cut and clipped to the dead end. This method is good for regular rope and is approved by ASME sTANDARD B30.5. Distance "S" should be approximately 3xrope diameter or 75mm (3in),whichever is less,please see the warning in Clause E5 for its use.



5.1.3.2 Checking load hook

- a) Check the hook for distortions; e.g., at the hook jaw;
- b) Inspect all bolts and screws, and ensure all cotter pins are complete.

- c) Check that the rotary connection of hook can move easily, and the clearance is not too large;
- d) Check the easy rotation of the hook: rotate the hook by hand. If it is stiff, it indicates that the bearing has been damaged;
- e) Check the safety catch for completeness and functional work;
- f) Check the hook for corrosion and wear.

5.1.3.3 Checking rope pulleys

- a) Check rope pulley all around for damage and cracks.
- b) If rope pulleys have been hit during crane operation (for example on buildings) or if they were subjected to other stress factors, they must be then extensively checked for damage or cracks.
- c) Check for wear on the rope groove. Replace the pulley if the bottom of the rope pulley has been worn down more than 1/4 of the rope diameter.
- d) If any damage or cracks are found, then the rope pulley must be replaced immediately. If this is not observed, there is great danger of causing a serious accident!
- e) Check rope pulley for tight fit and shakes; Loose and shaken rope pulley indicates that the bearing and bearing bush is damaged.

5.1.3.4 Checking anchoring rods

- a) The anchoring rods should be secured well on boom frame during transportation;
- b) The anchoring rods, if removed from boom frame for transportation, must be re-assembled according to anchoring rods configuration;
- c) Check the anchoring rods for cracks, wear and corrosion;
- d) The anchoring rods should be checked regularly. For the items to be checked, please refer to the Section 7.6 "Inspection and maintenance of anchoring rods" in Chapter 7.

5.1.4 Connecting or disconnecting the hydraulic lines with quick-release couplings

When hydraulic lines are connected or disconnected using quick-release couplings please ensure that the coupling procedure is being performed correctly.

Requirements for a proper connection:

- a) Depressurize hydraulic system before connecting and disconnecting (switch off the engine and wait for about 5 minutes).
- b) Coupling parts (cathode end and anode end) are plugged into each other and screwed together using the hand-tightened nut.
- c) Turn the hand-tightened nut over the O-ring until a firm and tight fit is attained.
- d) The hydraulic couplings may only be tightened or unscrewed by hand rather than by tools which may cause damage to couplings.



Danger: Improperly connected couplings may lead to a loss of pressure or sudden leaking, thereby causing accidents.

5.1.5 Setting-up and taking-down

Before setting up and taking down the boom system, ensure that the following prerequisites are met:

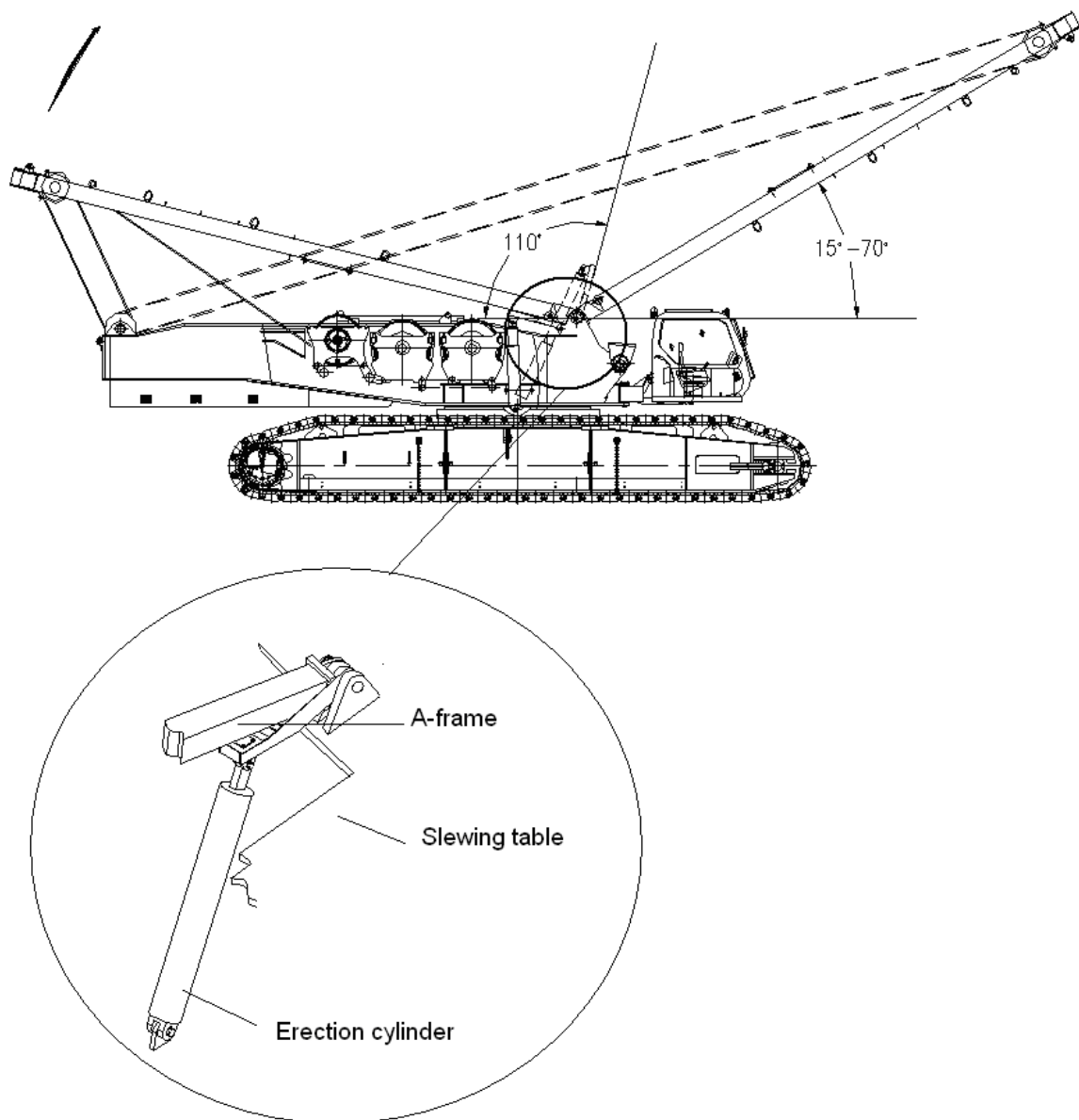
- a) The crane is properly supported and level;
- b) The counterweight plates have been attached in accordance with the load capacity chart.
- c) All limit switches has been correctly fitted and are fully operational;
- d) The main boom and fly jib have been attached in accordance with the boom configurations and operating instructions.
- e) All pinned connections have been secured;
- f) The hoisting rope has been correctly placed in the rope pulleys and prevented from jumping out (from rope groove) using rope retaining pins.
- g) There are no loose parts on main boom or fly jib.
- h) In winter, the main boom, fly jib and associated components (limit switches, rope drums, warming lamp, anemometer etc.) must be kept free of ice and snow.



Danger:

Incorrectly fitted or faulty limit switches and falling parts (pins, retaining pins, ice etc.) can cause injury.

5.2 A-frame



The A-frame erecting mechanism consists of A-frame, erection cylinder and auxiliary hydraulic system, etc. it is mainly used for the assembly, dismantling or conversion of the machine on the site. Erect the A-frame by the erection cylinder to the upper tilt point at approximately 110° (the angle of A-frame to the front horizontal line is 70°). When A-frame tilts forwards under its own weight, the main boom derricking winch is simultaneously operated in a lowering direction until A-frame reaches 165° (the angle of A-frame to the front horizontal line is 15°). Under this condition, the A-frame erecting mechanism can be used to connect anchoring rods and used as a mounting crane.

The function of A-frame erecting mechanism:

a) Serving as a mounting crane

— After the A-frame is tilts forwards to a required position, the boom sections, and

crawler carriers and individual counterweight plate can be lifted by the mounting cylinder on A-frame. in the process of self assembly & dismantling, the A-frame erecting mechanism serves as a mounting crane, whose maximum lifting capacity is **55125lb** in **16' 4"** working range;

b) Serving as a component of derricking mechanism

— The derricking mechanism of the crane is composed of A-frame and the boom frame, the A-frame is therefore an integral part of the derricking mechanism.

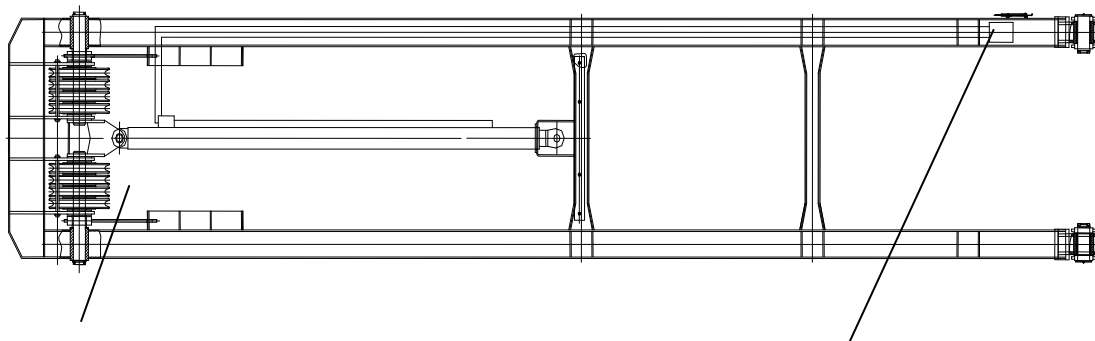
5.2.1 Connecting the hydraulic lines to mounting cylinder on A-frame

The hydraulic lines to mounting cylinder are connected as follows:

- The quick-release coupling is a hydraulic connector consisting of a cathode end (internal thread) and an anode end (external thread).
- To connect the hydraulic lines, the operator just need to plug the anode end of quick-release coupling into the cathode end of it.
- To distinguish between the two quick-release couplings of the same type, on the mounting plate are often installed a cathode end of one coupling and an anode end of the other coupling.

Two quick-release couplings are fitted on the left arm of A-frame(see following diagram)

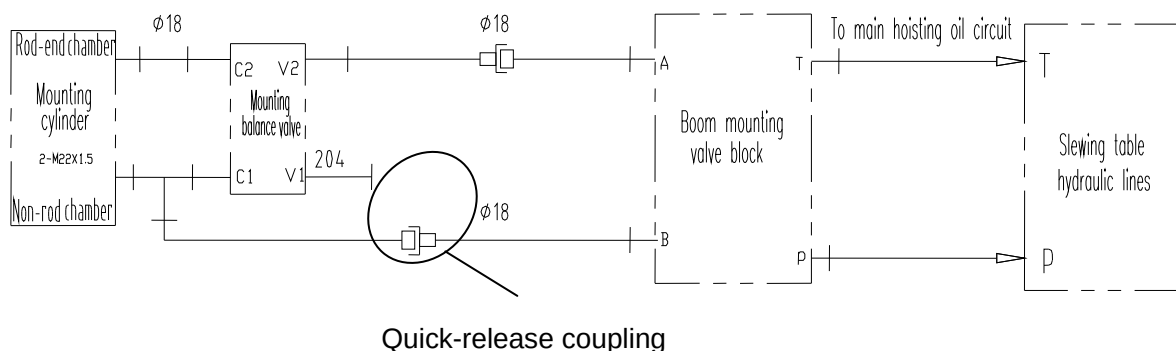
Position of quick-releasing coupling in A-frame:



Mounting balance valve

installation position of quick-release coupling

Hydraulic lines connecting diagram:





Anode end of quick-release coupling



Cathode end of quick-release coupling

Plug the anode end of quick-release coupling to its cathode end.



Caution:

When hydraulic lines are connected and disconnected using quick-release couplings, please ensure that the coupling procedure is being performed correctly.

Requirements for a proper connection:

1. Depressurize hydraulic system before connecting and disconnecting. Turn off engine and wait for 5 minutes.
2. Coupling parts (cathode end and anode end) are plugged into each other and screwed together using the hand-tightened nut.
3. Turn the hand-tightened nut over the O-ring until a firm and tight fit is attained.
4. The couplings may only be tightened by hand rather than by tools which will cause damage to coupling.
5. It is strongly recommended that a quick-release coupling with a diameter larger than 1 inch should be tightened by spanner.

Fit together the protective covers of the hydraulic couplings and hydraulic connectors.



Danger:

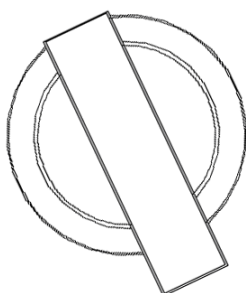
Improperly connected couplings may lead to a loss of pressure or sudden leaking, thereby causing accidents.

5.2.2 Operation of A-frame

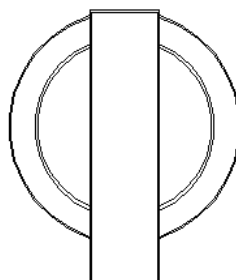
5.2.2.1 A-frame movement control

A-frame can be erected or lowered by operating the “A-frame erecting/lowering” switch (57) in the operator’s cab.

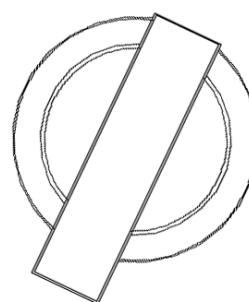
Erect A-frame



Neutral



Lower A-frame

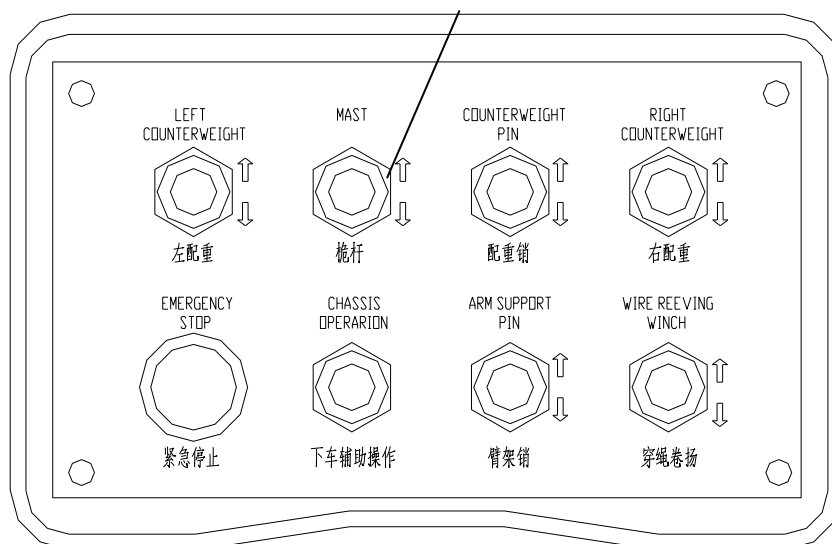


Turn the switch (57) on the right control panel (4) to the left—erect A-frame

Turn the switch (57) on the right control panel (4) to the right—lower A-frame

A-frame movement can also be controlled by operating the “A-frame erecting/lowering” switch on the auxiliary remote control box.

“A-frame (mast) erecting/lowering” switch



Push the “A-frame erecting/lowering” switch up ----erect A-frame

Push the “A-frame erecting/lowering” switch down----lower A-frame



Caution:

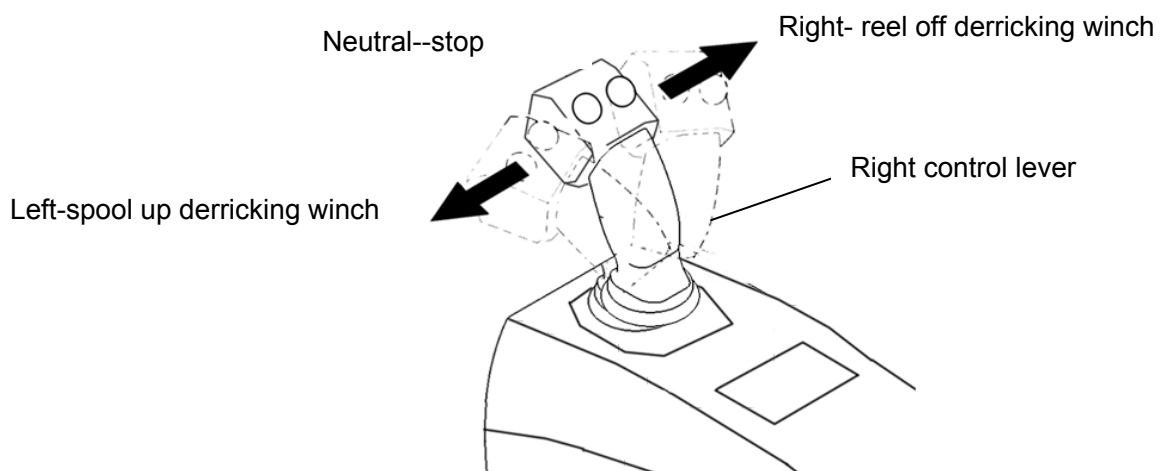
1. The control lever code and control panel code appeared in this chapter are detailed in section 4.1 "Control and operating instruments" of chapter 4 "Crane Operation"
2. The operation mentioned above should be performed by two persons. One worker gives guidance (watch the A-frame, erection cylinder and rope guiding condition on the derricking winch), while another worker operates.

5.2.2.2 Erecting A-frame



Note: before operation, make sure that derricking rope is reeved between derricking pulley block on A-frame and that on slewing table and sit well in the derricking pulley block.

- a) Turn switch (57) in operator's cab to the left or push up "A-frame erecting/lowering" switch on the auxiliary remote control box, the erection cylinder will extend to erect A-frame from 0° position upwards until the derricking rope between the slewing table and the derricking pulley block is tensioned, and then move the right control lever (27) to the right to reel off the derricking winch.
- b) After A-frame is erected to 110° position, return the switch (57) or "A-frame erecting/lowering" switch on the auxiliary remote control box to neutral position, and then the erection cylinder will stop movement. At this time, A-frame tilts forwards under its own weight, and the derricking winch is reeled off simultaneously.



- c) When A-frame tilts forwards under its own weight to 165° limit position, return the right control lever(27) to neutral position to stop the movement of "reel off the derricking winch "



Caution:

1. A-frame movement limit should not be exceeded; otherwise, the crane is likely to topple over.
2. A-frame position can be adjusted within its movement limit depending on different working requirements.
3. No slack must be allowed to develop in derricking rope when A-frame is in motion.

5.2.2.3 Lowering A-frame

- a) Move the right control lever (27) to the left to spool up the derricking winch, and the A-frame will be raised backwards.
- b) After A-frame is raised by the derricking rope to 110° position, turn the switch (54) in operator's cab to the right or push down "A-frame erecting/lowering" switch on the auxiliary remote control box, the erection cylinder will retract, and A-frame will also retract.
- c) When the erection cylinder and A-frame return to original or required position, return the switch (57) in operator's cab or "A-frame erecting/lowering" switch on the auxiliary remote control box to neutral position, and then the erection cylinder will spot motion. At the same time, move the right control lever (27) to neutral position to stop the movement of "spool up the derricking winch".



Caution:

1. No person may stand underneath A-frame as long as A-frame is moving; otherwise there is a risk of injury.
2. No slack must be allowed to develop in derricking rope when A-frame is in motion.

5.3 Attaching the crawler carriers

5.3.1 Unloading of basic machine

5.3.1.1 Checks before operation

a) Jobsite

- 1) The ground on the jobsite must be firm and flat. If necessary, steel plate should be padded.
- 2) It should be large enough for trailer traveling and auxiliary hoist operation.

b) Operating procedure and safety regulations

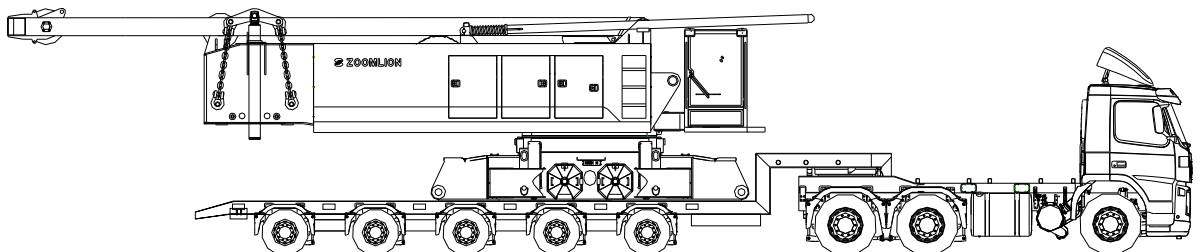
All operators should be familiar with operating procedure and safety regulations and clear about their areas of responsibility before operation.

c) Checks before operation

Check the basic machine before operation.

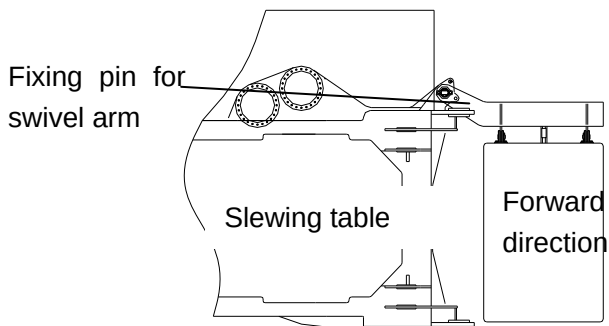
5.3.1.2 Unloading the basic machine

- a) After the basic machine reaches the jobsite, remove related fixing devices and the package.

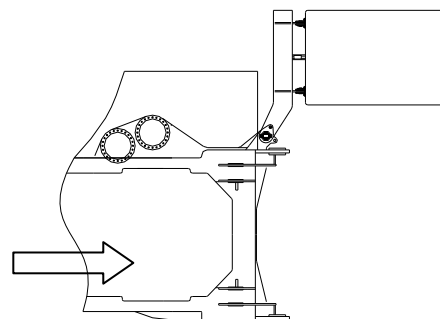


Basic machine in transport position

- b) Swivel the operator's cab from transport position to working position and then secure it with "fixing pin for swivel arms"

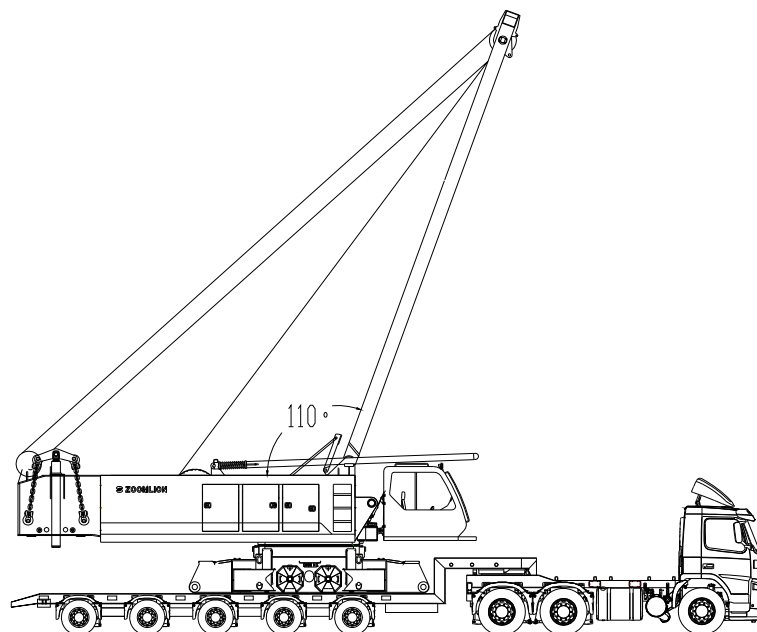


Operator's cab in transport position



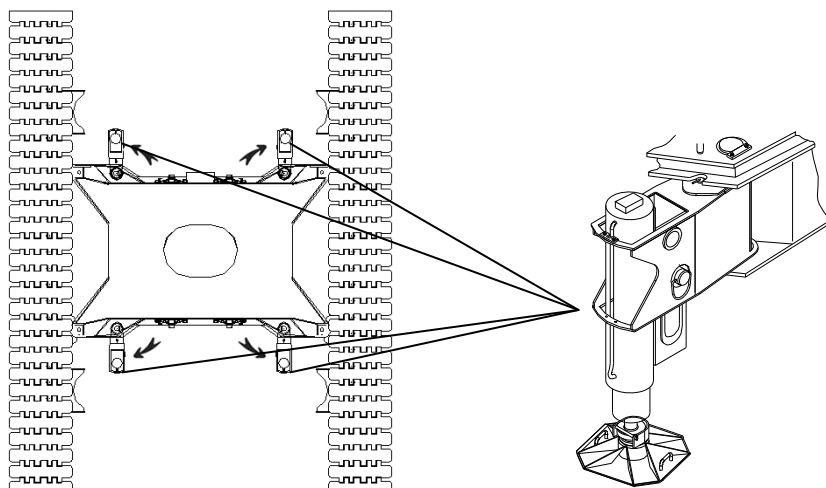
operator's cab in working position

c) Raise the A-frame by erection cylinder to 110° position.



d) To support the basic machine

- swivel the folding brackets out into the support position
- pull out the fixing screw for support plates on the undercarriage centre section
- detach the support plates and assemble it under the support cylinder



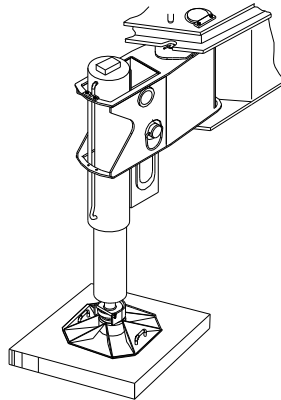
e) Use bonded wooden plates or steel plates to underlay all support plates.

- Before operate the support cylinders and crawler carrier bolting cylinders, turn on “undercarriage auxiliary control switch” in the auxiliary remote control box (see Section 4.5.7), and then operate the undercarriage control levers.
- Each support cylinders and crawler carrier bolting cylinders can not only be controlled

independently but also operated simultaneously.

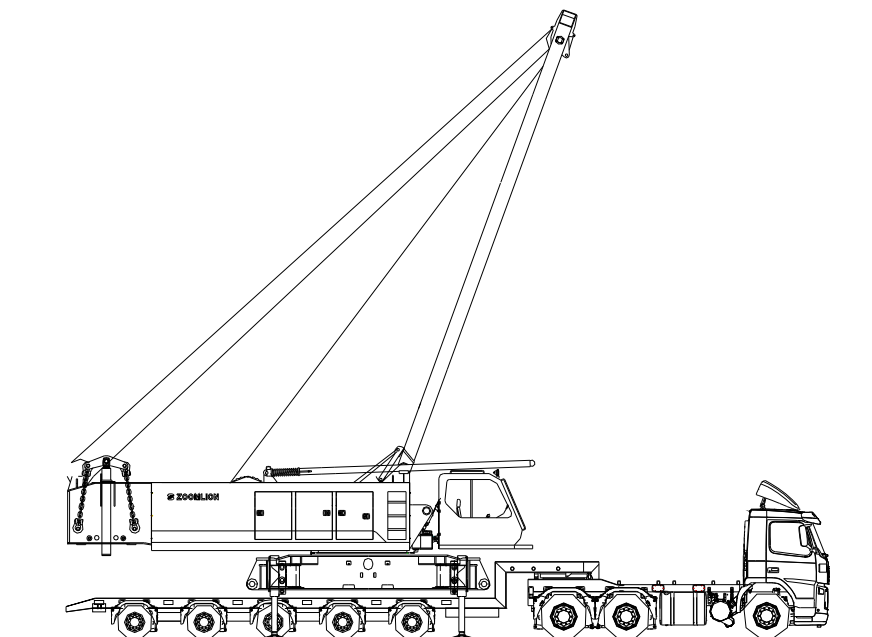
- Select a support cylinder to be operated by the undercarriage selective control lever, and then extend the support cylinder by operating the cylinder telescoping control lever.

Note: in the assembling process, the maximum force support cylinder can bear is **63945 lb.**

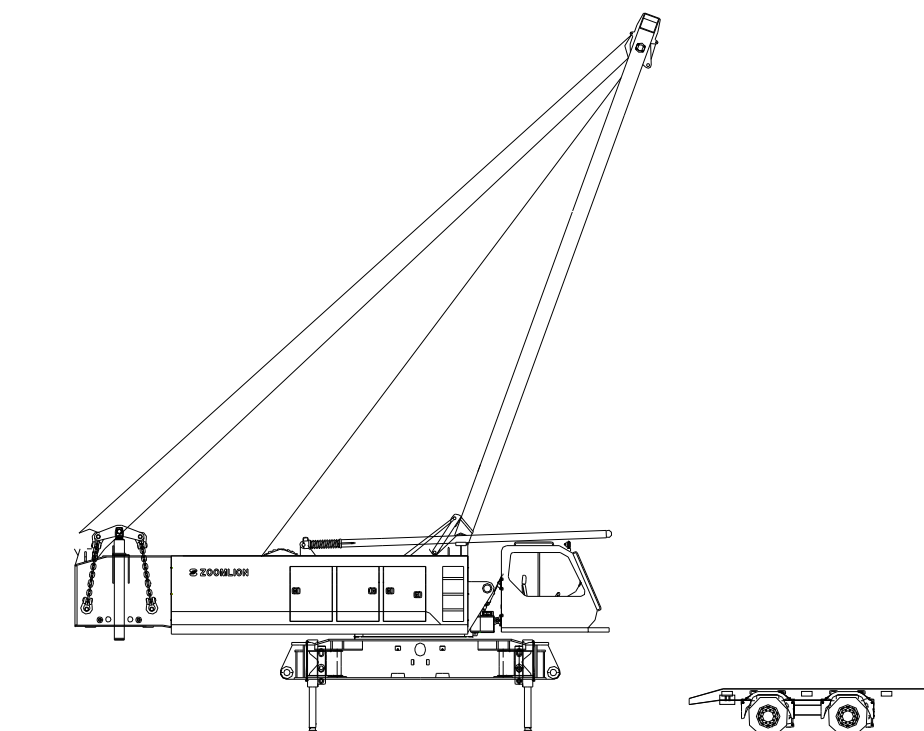


Caution:

1. In no circumstance, can the extending of support cylinders be carried out by one person. At least two assistants are available to support the basic machine. One assistant operates the control levers while another assistant watches the position of support cylinders and see whether the crawler carrier bolting cylinder is extended to specified position.
2. When the support cylinders are operated, the engine should run at low-middle speed (about 1000-1500rpm).
3. The support cylinders should be extended on firm and even ground. During operation, pay attention to the level state of basic machine.



f) Drive the low-loader away.



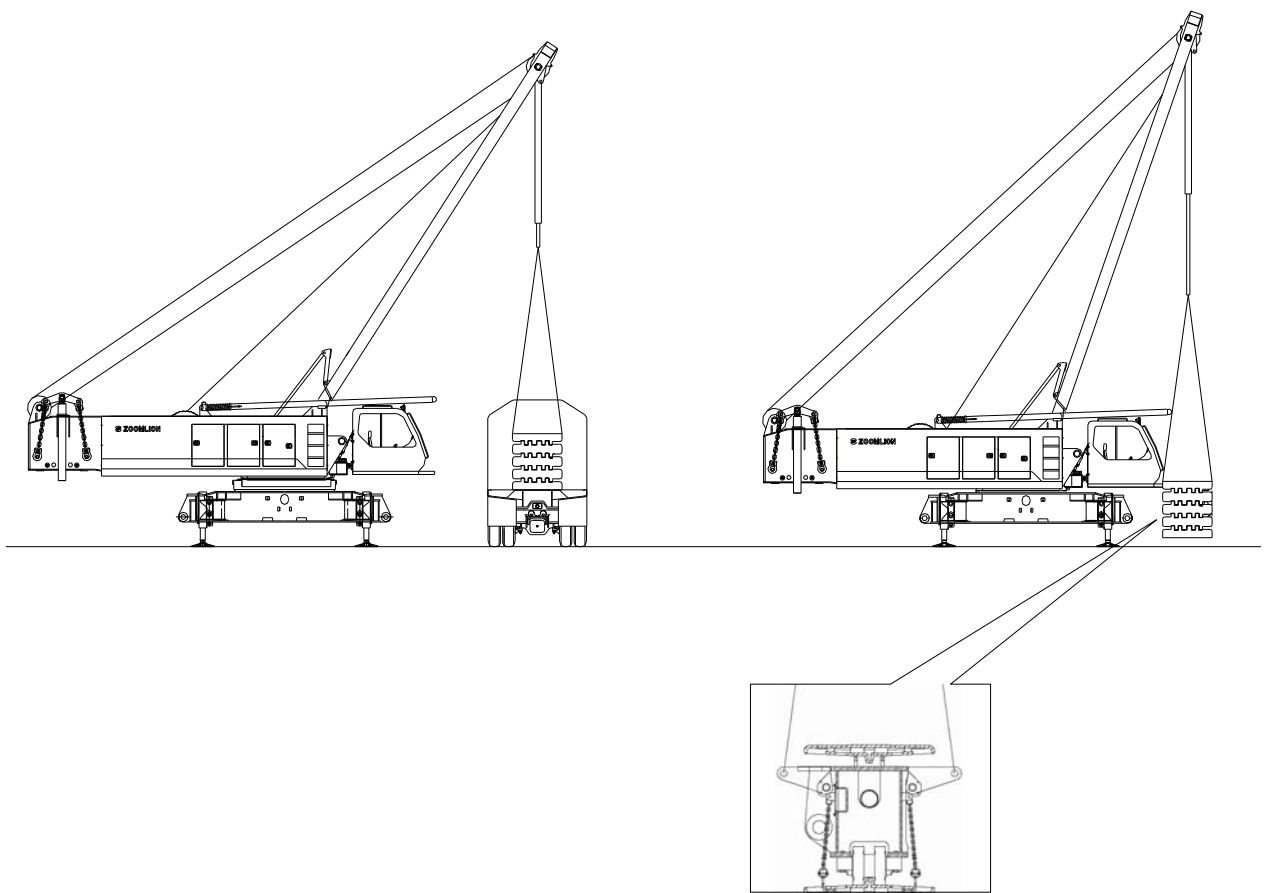
5.3.2 Attaching the first crawler carrier

- a) Tilt the A-frame forwards according to the Section 5.2 “ Operation of A-frame”
- b) Turn “self-assembly& dismantling” switch on the right control panel to right and push the right control lever (27) forwards, and then the mounting cylinder on A-frame will be extended. Connect the mounting cylinder to crawler carrier with assembling chain.



Caution:

Hang the twin hook on the loose end of the attachment in the holes of the floor plate underneath to prevent the crawler carrier from hanging down during mounting of the crawler carrier.

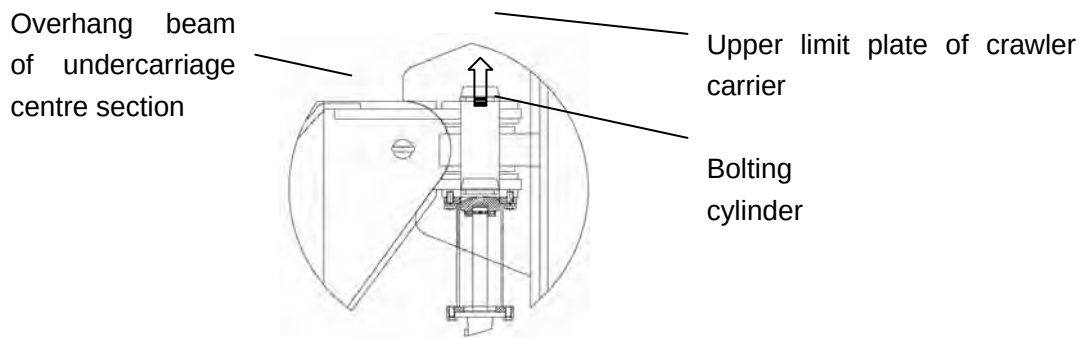


- c) Push the right control lever (27) backwards to retract the mounting cylinder to lift the first crawler carrier from the transport vehicle.

Slowly raise A-frame and adjust the mounting cylinder to align the crawler carrier exactly on the bolting points on the undercarriage centre section. Carefully and sensitively position the crawler carrier by the undercarriage centre section and upper limit plate of crawler carrier.

Turn on “undercarriage auxiliary control” switch on the auxiliary remote control box, and then extend the crawler carrier bolting cylinders with appropriate control lever. In this way, the first crawler carrier is attached on the undercarriage centre section by the bolting cylinders.

Positioned by the upper limit plate of crawler carrier and undercarriage centre section



Caution:

Bring the transport vehicle with the first crawler carrier as close as possible to the basic machine to make sure that the distance between the centre of crawler carrier and the rotation axis of the upper carriage is smaller than or equal to 5m.

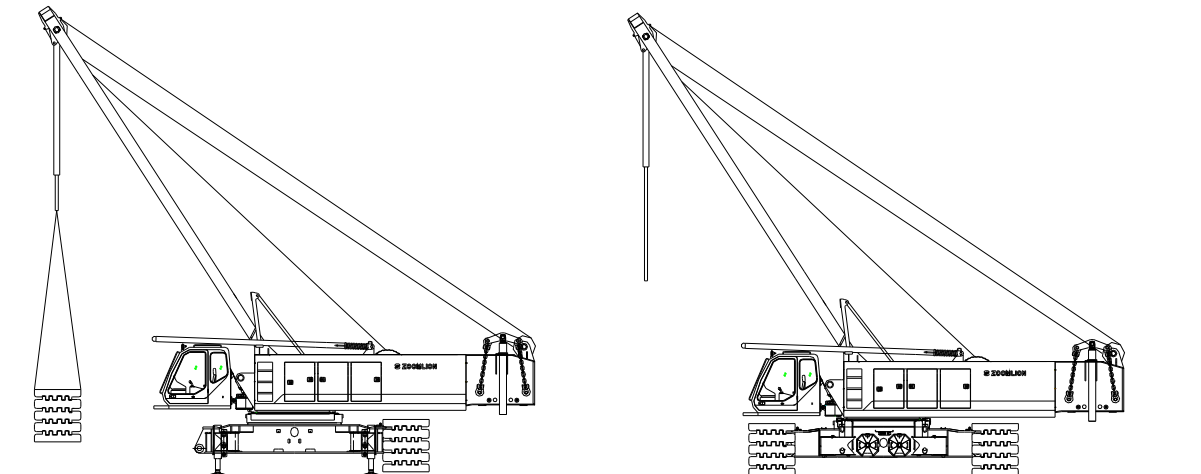
Note: the slewing radius of hook attached to the mounting cylinder on A-frame must be smaller than or equal to 5m.

5.3.3 Attaching the second crawler carrier

- a) Slew the superstructure to a position where the second crawler carrier can be attached.

The assembly sequence for the second crawler carrier is essentially the same as for the first crawler carrier.

- b) After the second crawler carrier is attached, it must be lowered on the ground by retracting the support cylinders.
- c) Detach the support plates from support cylinders and fixed them on undercarriage centre section.
- d) Retract the support cylinders completely. Swivel inwards the folding brackets and secure them with locking pins.
- e) Swivel in the locking plate on folding bracket and secure it with locking pin.
- f) Establish hydraulic connection to both crawler carriers via quick-release couplings.



Caution:

1. The slewing radius of hook attached to mounting cylinder on A-frame must be no more than **16' 4"** ; otherwise the basic machine may turn over.
2. When mounting the crawler carrier, nobody is permitted to stand in the working radius.
3. Crawler carrier bolting cylinders which are used to connect the crawler carriers to undercarriage centre section should be greased.

5.3.4 Connecting the hydraulic lines to the crawler carrier

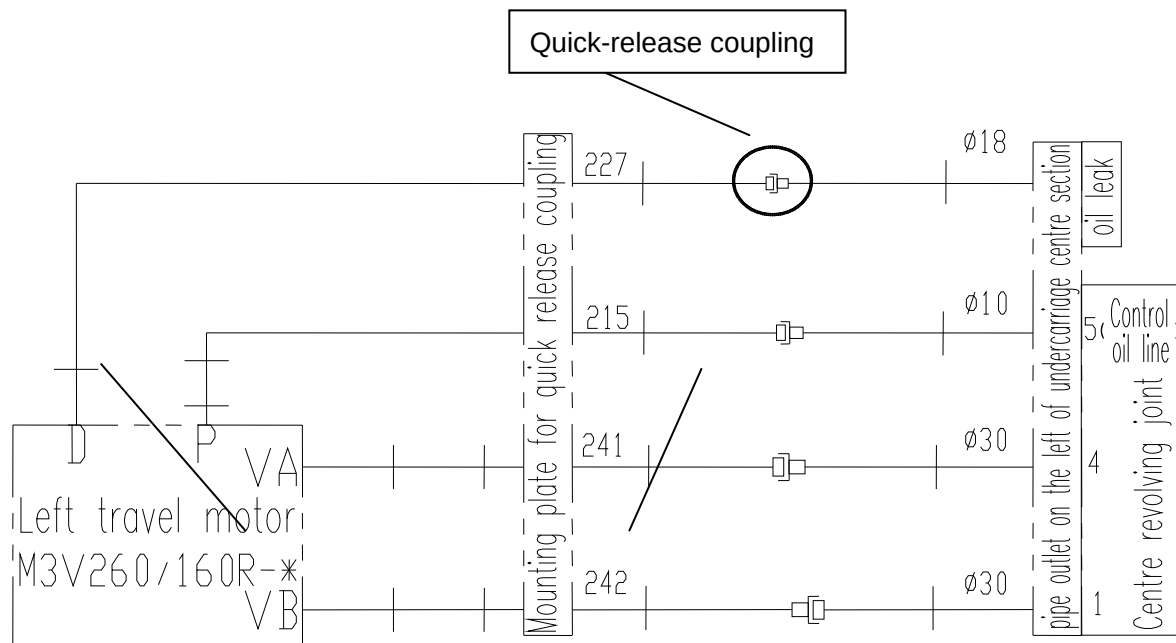
There are 8 hydraulic lines in total led out from the left and right sides of undercarriage centre section, which are respectively connected to the left and right crawler carrier. Take the hydraulic connection to the left crawler carrier for example:

Connect hydraulic lines to two crawler carriers via quick-release couplings:

The quick-release coupling is a hydraulic connector consisting of a cathode end (internal thread) and an anode end (external thread). Plug the anode end of a quick-release coupling to the cathode end of it, the hydraulic connection can then be established.

To distinguish between the two quick-release couplings of the same type, a cathode end of one coupling and an anode end of the other coupling are often installed on the mounting plate.

Hydraulic lines connecting diagram:



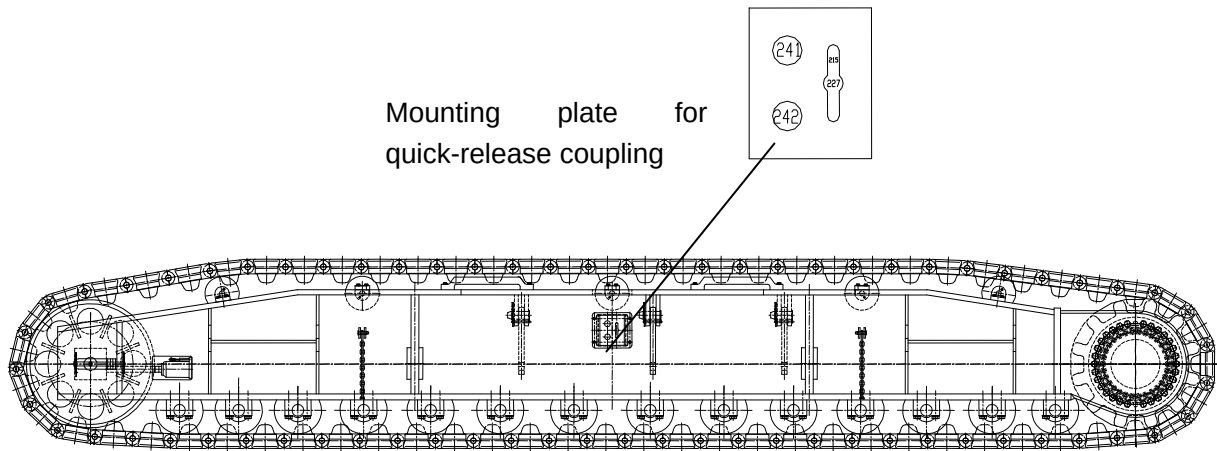
Anode end of quick-release coupling



Cathode end of quick-release coupling

Plug the anode end of quick-release coupling to its cathode end.

Position of mounting plate for quick-release coupling:



Fit together the protective covers of the hydraulic couplings and hydraulic connectors.



Note:

When hydraulic lines are connected and disconnected using quick-release couplings, please ensure that the coupling procedure is being performed correctly.

Requirements for a proper connection:

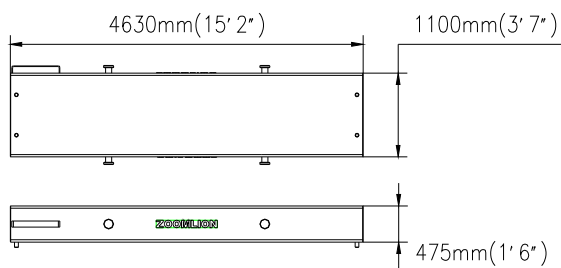
1. Depressurize hydraulic system before connecting and disconnecting. Turn off engine and wait for 5 minutes.
2. Coupling parts (cathode end and anode end) are plugged into each other and screwed together using the hand-tightened nut.
3. Turn the hand-tightened nut over the O-ring until a firm and tight fit is attained.
4. The couplings may only be tightened by hand rather than by tools which will cause damage to coupling.



Danger:

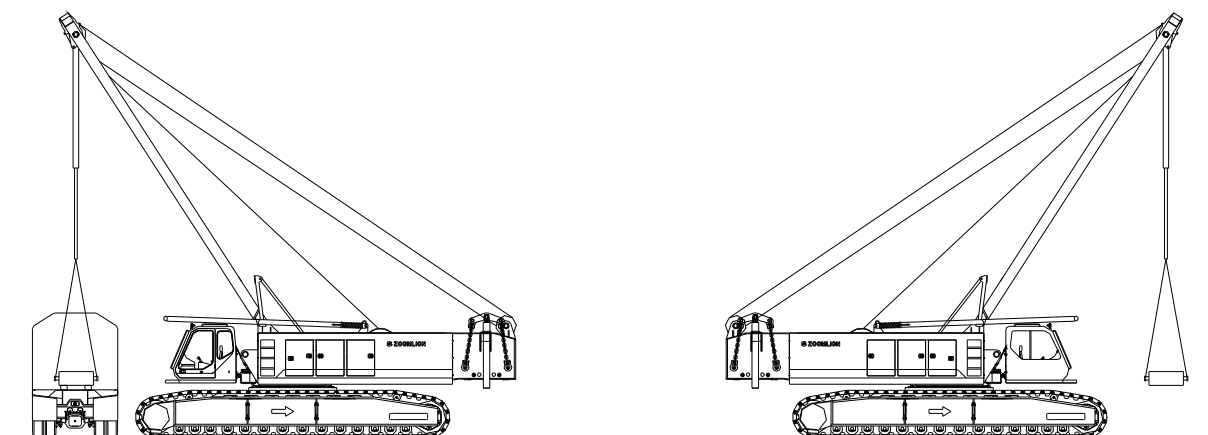
Improperly connected couplings may lead to a loss of pressure or sudden leaking, thereby causing accidents.

5.4 Attaching the central counterweight

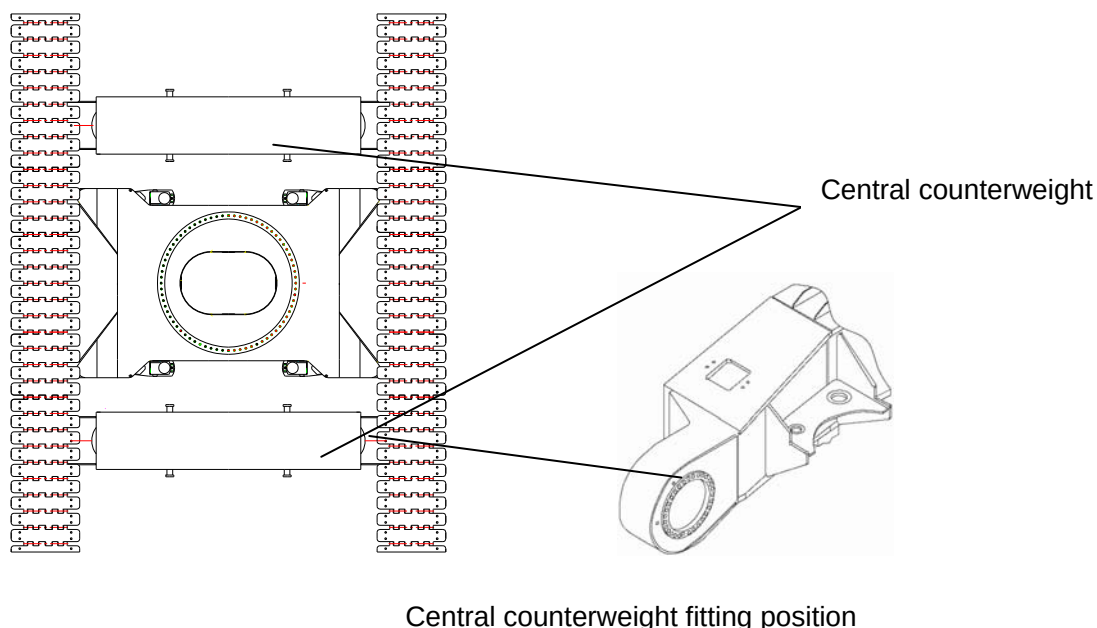


Central counterweight plate (weight: **14600lb** ×2)

The central counterweight consists of two central counterweight plates, which are located at the front and rear of the undercarriage between the crawler carriers. After the basic machine is fitted with the left and right crawler carriers, lift the first counterweight plate from transport vehicle and lay it on the supports on the inside of crawler carriers after rotating the superstructure to the front of crane. The second counterweight plate is installed at the rear end of crane in the same way (for the operation of superstructure, A-frame and mounting cylinder, please refer to Section 5.3 “attaching the crawler carriers”).

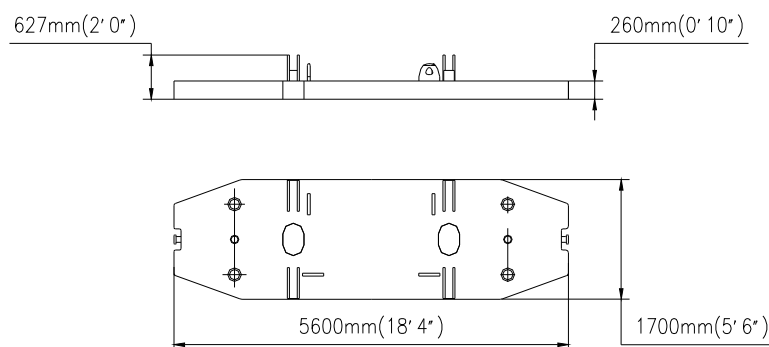


Schematic diagram for fitting Central counterweight plate

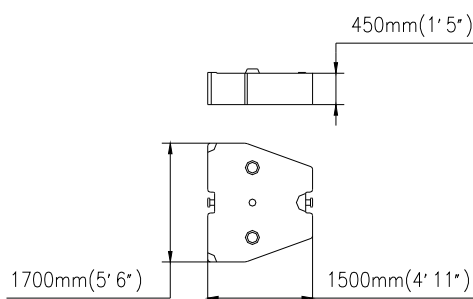


5.5 Assembling the rear counterweight

The rear counterweight, weighing **187400lb** in total, consists of 10 counterweight plates of **14600lb** each and a counterweight base plate of **41900lb**. The stacks of individual counterweight plates must always be stacked up symmetrically on both sides of superstructure tail-end.



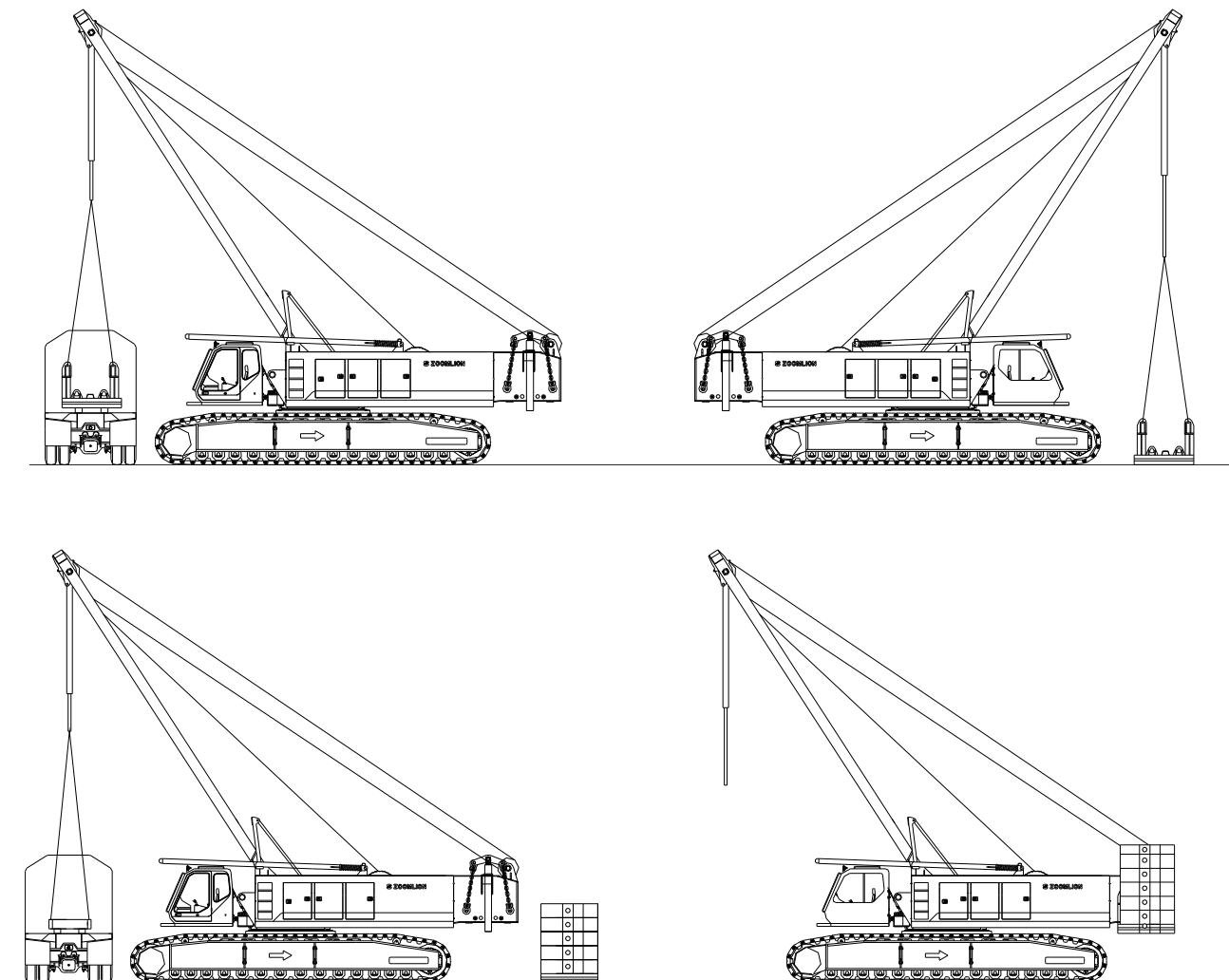
Counterweight base plate (**41900lb**.×1)



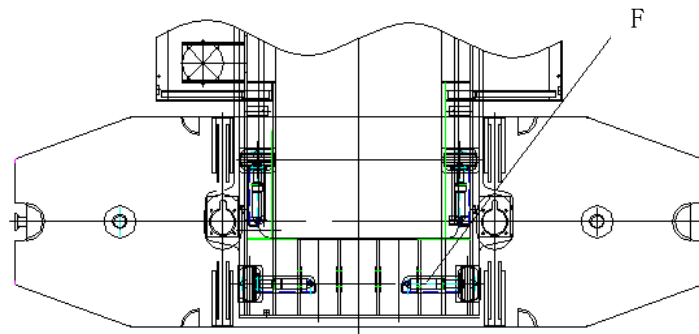
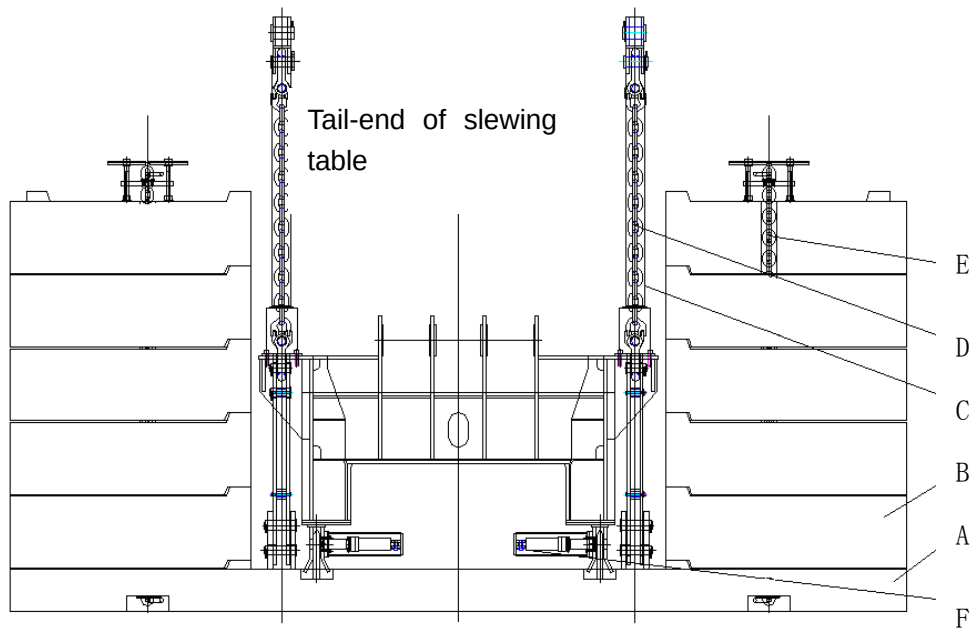
Counterweight plates (**14600lb**×10)

Procedure for mounting the rear counterweight:

Lift the counterweight base plate and lay it on a flat ground, and then lift the individual counterweight plate one by one from the transport vehicle and stack them on the base plate by aligning them over the fixing position (two circular prominences) at the two sides of base plate. Fix the counterweight locking chain and secure it (the locking chain passes through the center of counterweight).

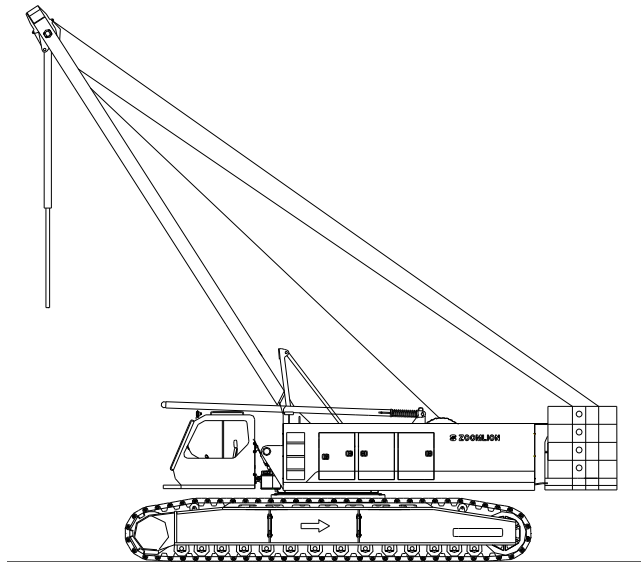


- b) Push up the “left and right counterweight control” switches on the auxiliary remote control box, the left and right counterweight cylinders will extend to lift the counterweight.



- A. Counterweight base plate B. counterweight plate
C. Counterweight lifting cylinder D. Counterweight assembly chain
E. counterweight locking chain (through the center of counterweight)
F. counterweight bolting cylinder

- c) If the counterweight is not level during the lifting process, adjust one counterweight cylinder by the “counterweight left/right lifting cylinder” switch to make the counterweight to be level. And then extend or retract the two counterweight cylinders simultaneously;
- d) Turn on the “counterweight bolting cylinder” switch on the auxiliary remote control box to extend the counterweight bolting cylinder to required position and secure the bolting cylinder with retaining spring. After that, retract the counterweight cylinders.



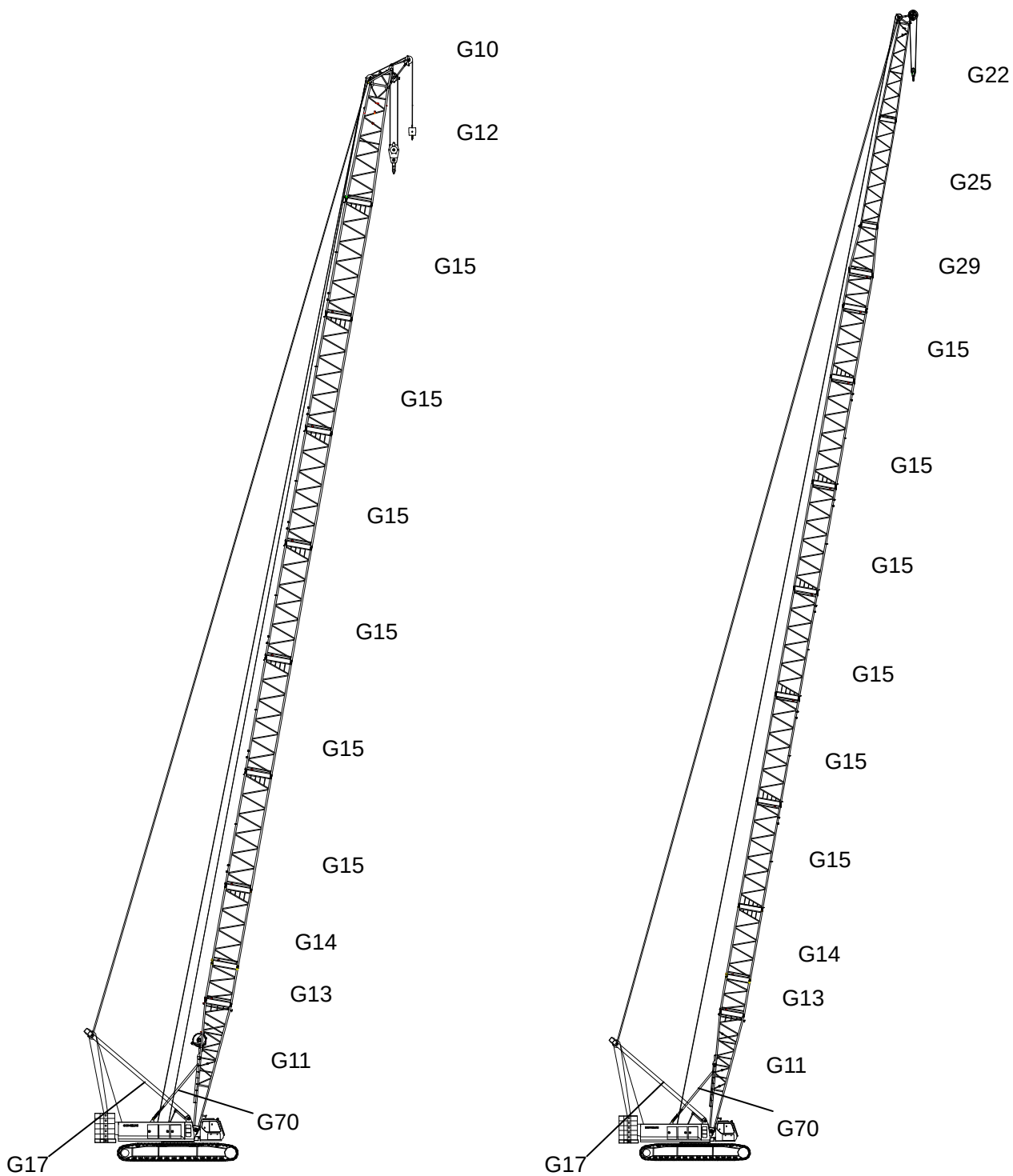
e) The dismantling of counterweight plates is carried out in the reverse order to assembling.



Caution:

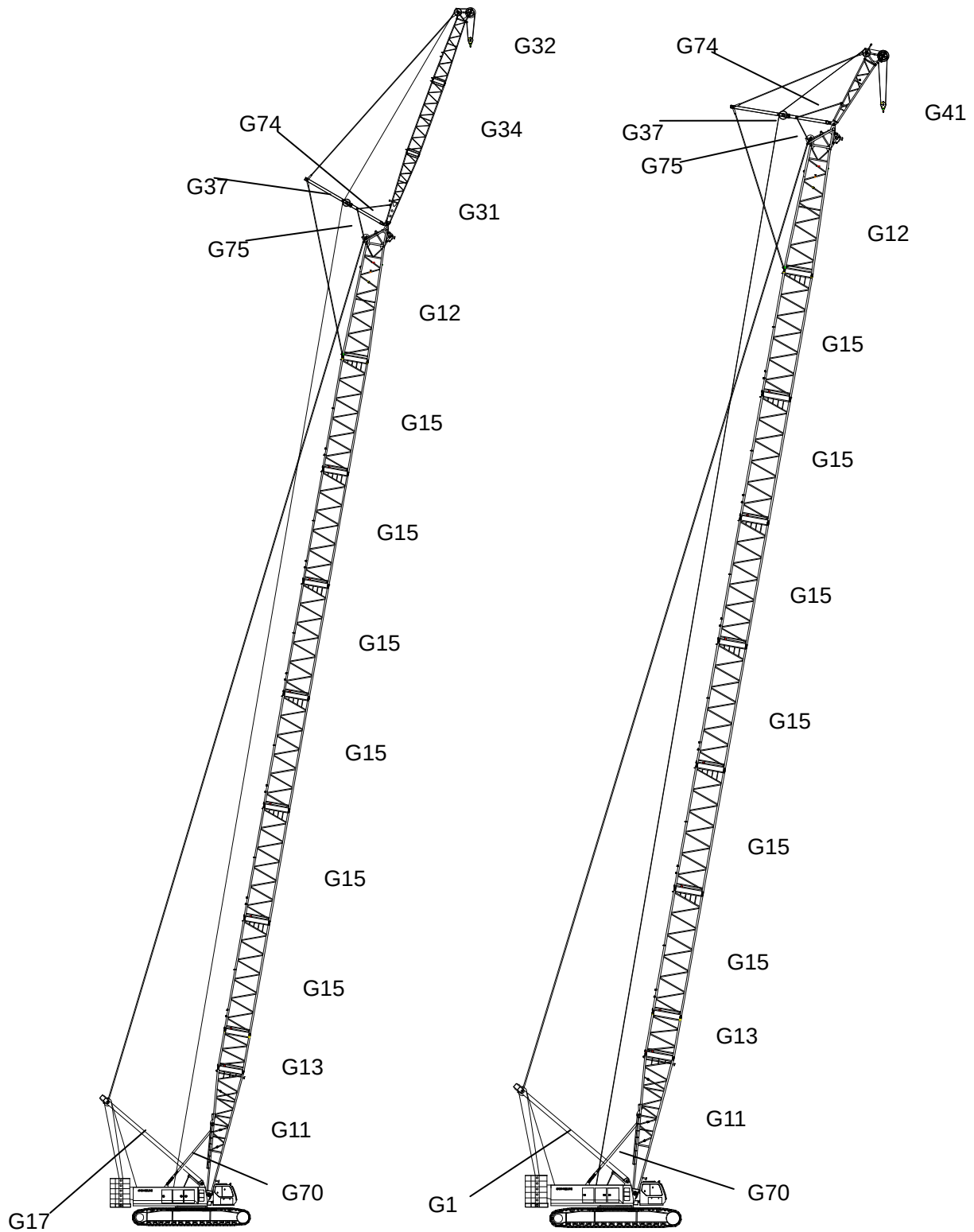
1. When stacking the counterweight plate on top of one another, align the upper counterweight plate over the circular prominences at the two sides of the lower counterweight plate and secure well.
2. In any condition, the assembling and dismantling of counterweight plates should be carried out by more than two persons. A person is not permitted to perform this operation. When extending or retracting the counterweight cylinders, make sure that the counterweight base plate is level and synchronous at any time. When inclination situation occurs, the operator should synchronize them immediately through controlling the movement of one cylinder.
3. In the process of self assembly& dismantling, A-frame can only be used to lift one counterweight plate at a time.

5.6 Available boom configurations for Crawler Crane QUY260



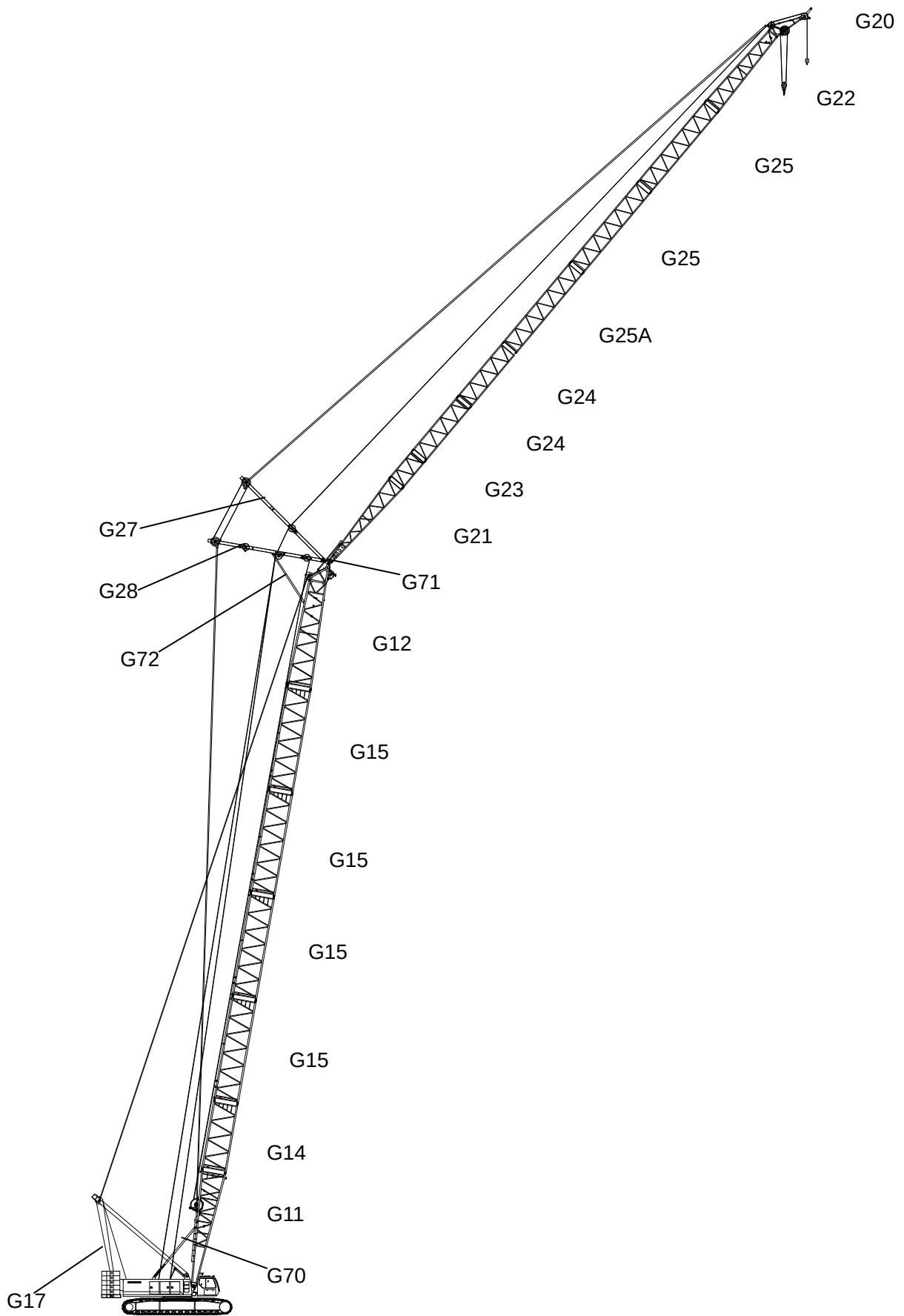
S---Heavy duty boom

SL---light duty boom



SF---Fixed jib on heavy duty boom

SFV---Heavy fixed jib on heavy duty boom



SW---luffing jib on heavy duty boom

Description of part number of boom configuration

Part number	Description	Length (ft)	Weight (lb)
G10	Tip boom on main boom head		441.0
G11	Main boom pivot section	(32'9")	6659.1
G12	Main boom head	(32'9")	7452.9
G13	Main boom intermediate section	(9'10")	1587.6
G14	Main boom intermediate section	(19'8")	2646.0
G15	Main boom intermediate section	(29'6")	3924.9
G17	A-frame		6923.7
G20	Tip boom on luffing jib head		
G21	Luffing jib pivot section	(29'6")	2315.3
G22	Luffing jib head	(29'6")	2425.5
G23	Luffing jib intermediate section	(9'10")	705.6
G24	Luffing jib intermediate section	(19'8")	1323.0
G25A	Luffing jib intermediate section	(29'6")	1764.0
G25	Luffing jib intermediate section	(29'6")	1323.0
G27	WA-frame 1		3351.6
G28	WA-frame 2		3836.7

Part number	Description	Length (ft)	Weight (lb)
G29	Reducing section	(13'1")	1808.1
G31	Fixed jib pivot section	(19'8")	1036.4
G32	Fixed jib head	(19'8")	1367.1
G33	Fixed jib intermediate section		573.3
G37	FA-frame		1653.8
G70	Titling-back support of main boom		573.3
G71	Tilting-back support of luffing jib		176.4
G72	Rear tilting-back support of luffing jib		154.4
G74	Front tilting-back support of fixed jib		132.3
G75	Rear tilting-back support of fixed jib		66.2



Danger:

1. Any other boom configurations and anchoring rods combination that have not been stipulated in the operating manual are prohibited.
2. When attaching boom sections, make sure that the intermediate sections are assembled to their specified positions; otherwise there is a risk of accidents.

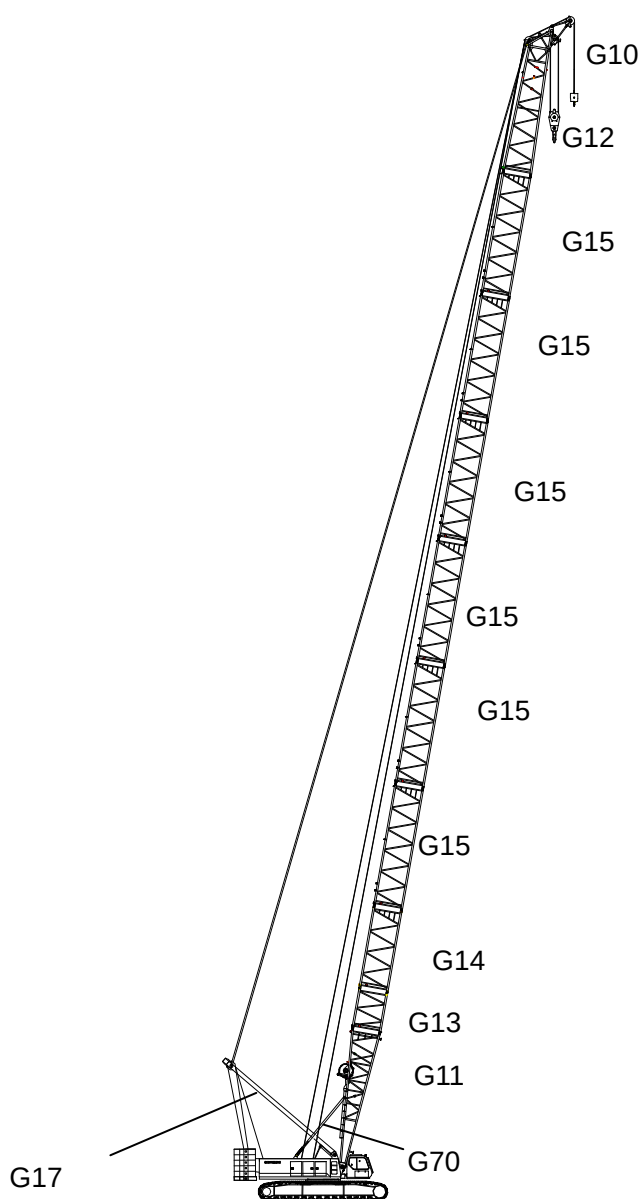
5.7 Boom configuration

5.7.1 Heavy duty boom (S)

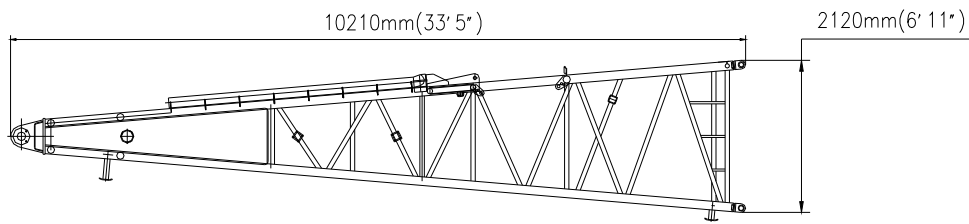
5.7.1.1 Component of heavy duty boom

The heavy duty boom, whose length varies from 65'7"~272'3", comprises basic boom and an optional number of main boom intermediate sections. The basic boom is 65'7" long, including main boom pivot section (G11), main boom head (G12), tip boom (G10). There are three types of main boom intermediate section: 9'10" main boom intermediate section (G13), 19'8" main boom intermediate section (G14) and 29'6" main boom intermediate section (G15).

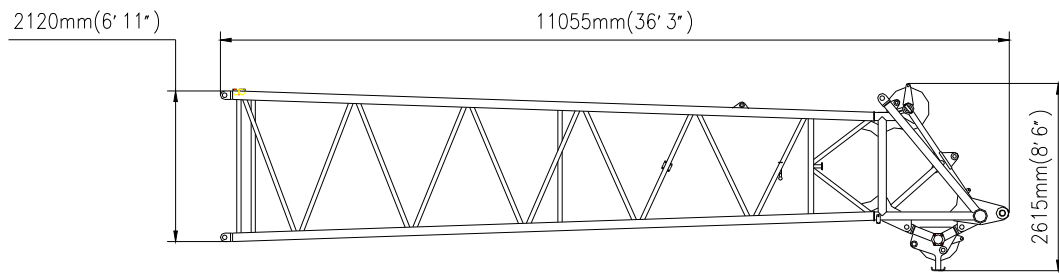
the longest heavy duty boom of 83m, overview:



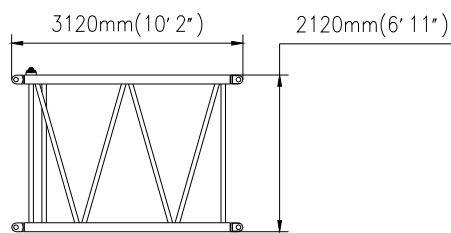
Main boom pivot section—G11



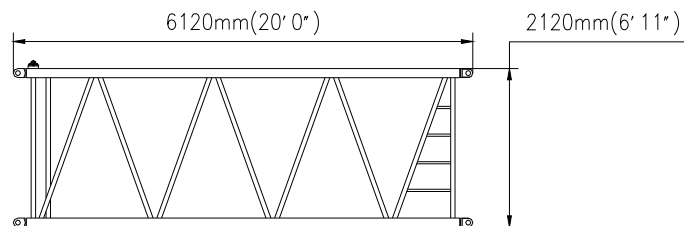
Main boom head—G12



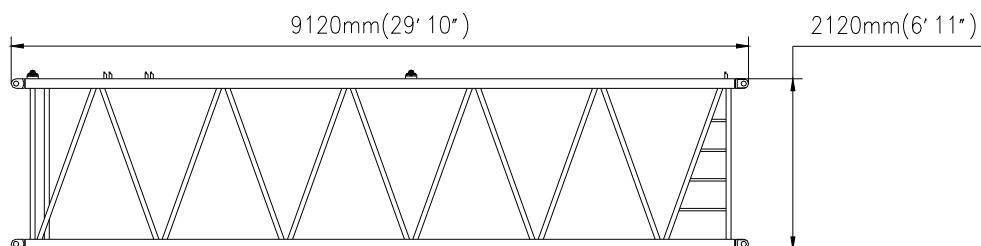
(9' 10") main boom intermediate section—G13



(19' 8") boom main intermediate section—G14



(29' 6") main boom intermediate boom section—G15



When different main boom length is required, crane operator only needs to disconnect main boom pivot section from main boom head, and then install main boom intermediate sections between them. In this way, main boom can be assembled to required length.

Main boom assembly table

Main boom length (ft)	assembly sequence of main boom sections	Main boom length (ft)	assembly sequence of main boom sections
(65'7")	G11+G12	(173'10")	G11+G14+3×G15+ G12
(75'5")	G11+G13+G12	(183'8")	G11+4×G15+ G12
(85'3")	G11+G14+ G12	(193'6")	G11+G13+4×G15+ G12
(95'1")	G11+G15+ G12	(203'4")	G11+G14+4×G15+ G12
(104'11")	G11+ G13+G15+ G12	(213'2")	G11+5×G15+ G12
(114'9")	G11+ G14+G15+ G12	(223'0")	G11+G13+5×G15+ G12
(124'7")	G11+2×G15+ G12	(232'10")	G11+G14+5×G15+ G12
(134'5")	G11+G13+2×G15+ G12	(242'8")	G11+6×G15+ G12
(144'3")	G11+G14+2×G15+ G12	(252'6")	G11+G13+6×G15+ G12
(154'1")	G11+3×G15+ G12	(262'4")	G11+G14+6×G15+ G12
(164'0")	G11+G13+3×G15+ G12	(272'2")	G11+G13+G14+6×G15+ G12

Principle for assembling main boom: when connecting main boom intermediate sections, always bolt the shorter intermediate sections first.

**Danger:**

1. Pin different boom sections strictly in accordance with main boom assembly table.
2. The operator should not stand inside the boom or beneath it when the boom sections are pinned.

5.7.1.2 Connecting the hydraulic lines to luffing winch(if luffing winch is used)

Connect the hydraulic lines to A-frame via quick-release coupling.

Connect the hydraulic lines to luffing winch:

There is a mounting plate for quick-release coupling at the front left side of slewing table. It is used to establish hydraulic connection to luffing winch. The coupling procedure of hydraulic lines is shown in following figure.

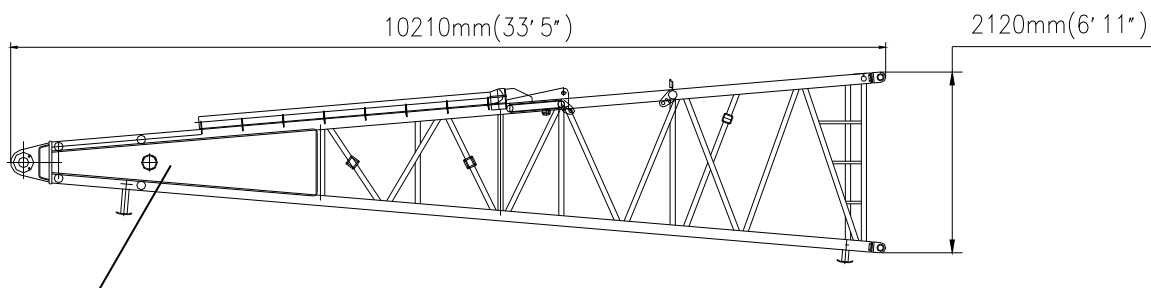
Hydraulic lines connecting diagram:

Quick-release coupling

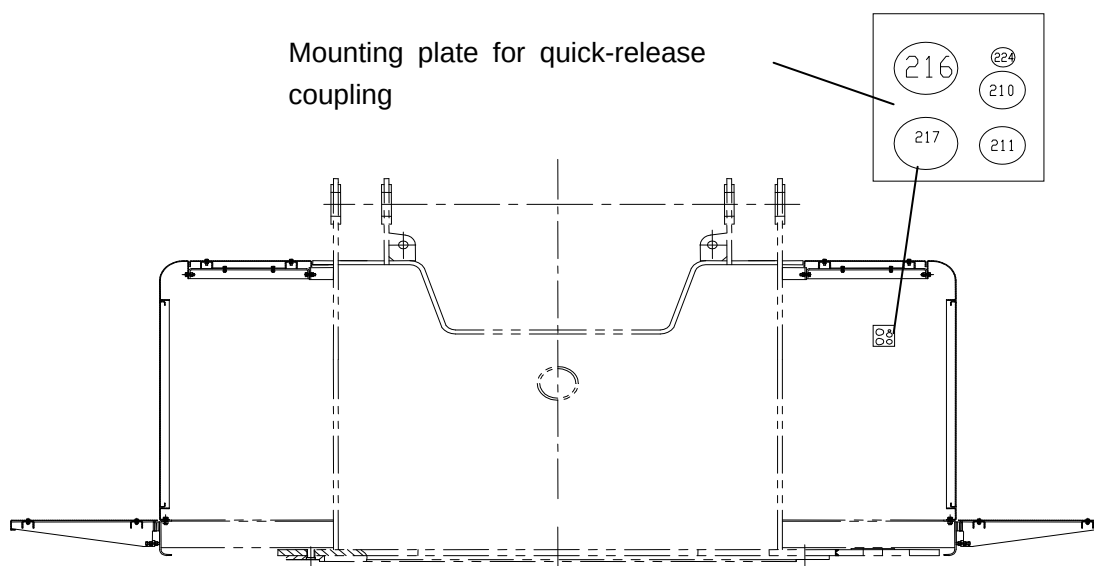


Cathode end of quick-release coupling

The mounting plate for quick-release coupling is installed on the left side of boarding (see following fig.) on the mounting plate are fixed five ends of five quick-release couplings, and the rest five ends are fixed on the left side plate of bottom section of A-frame.



Quick-release coupling



Fit together the protective covers of the hydraulic couplings and hydraulic connectors.



Caution:

When hydraulic lines are connected and disconnected using quick-release couplings, please ensure that the coupling procedure is being performed correctly.

Requirements for a correct connection:

1. Depressurize hydraulic system before connecting and disconnecting. Turn off engine and wait for 5 minutes.
2. Coupling parts (cathode end and anode end) are plugged into each other and screwed together using the hand-tightened nut.
3. Turn the hand-tightened nut over the O-ring until a firm and tight fit is attained.
4. The couplings may only be tightened by hand rather than by tools which will cause damage to coupling.



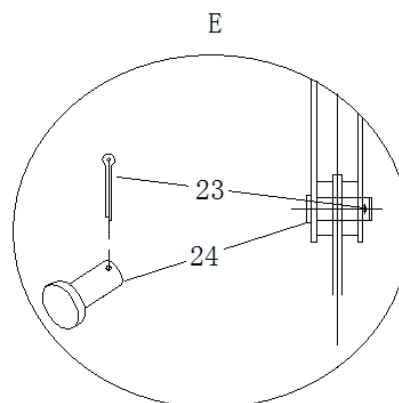
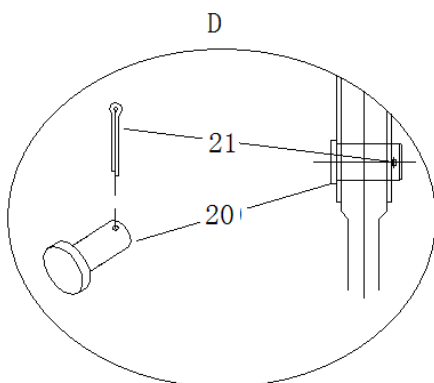
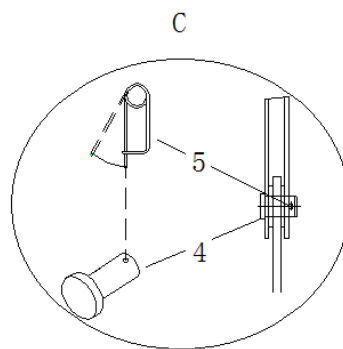
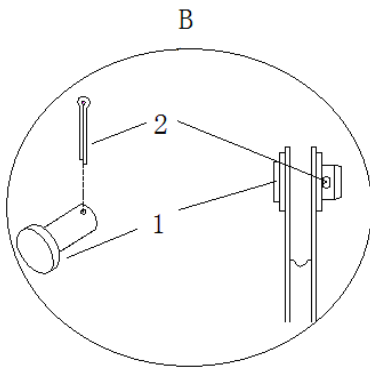
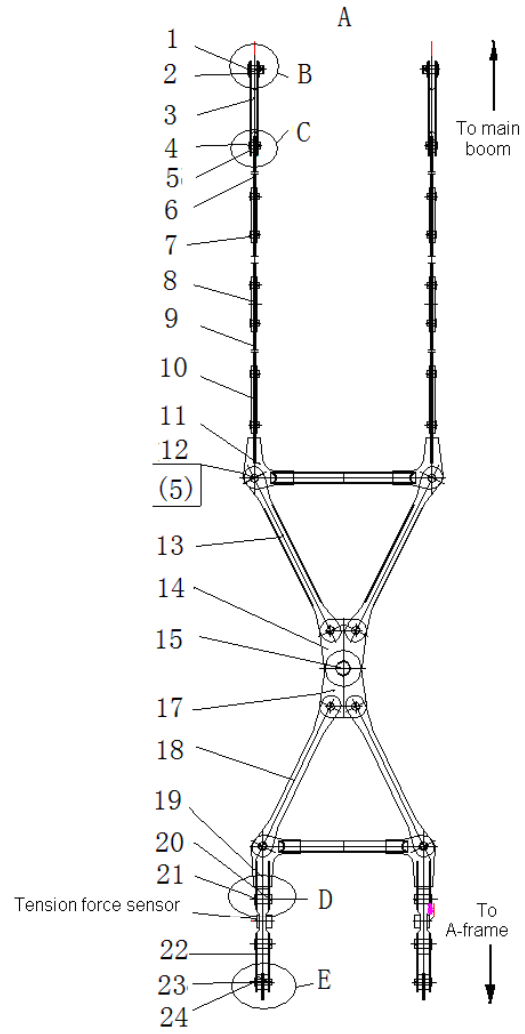
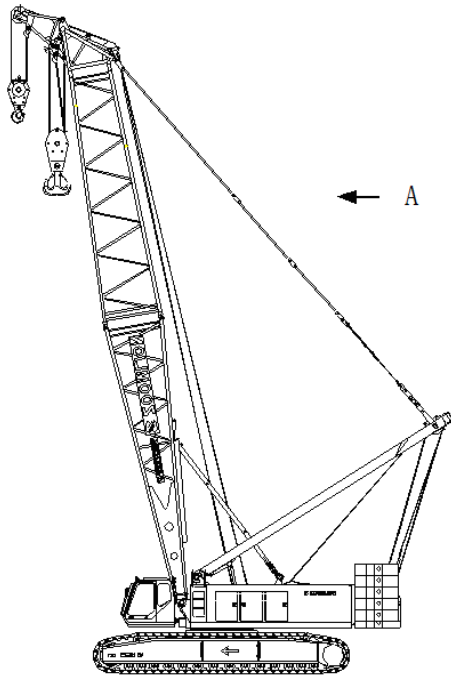
Danger:

Improperly connected couplings may lead to a loss of pressure or sudden leaking, thereby causing accidents.

5.7.1.3 Combination of anchoring rods of heavy duty boom

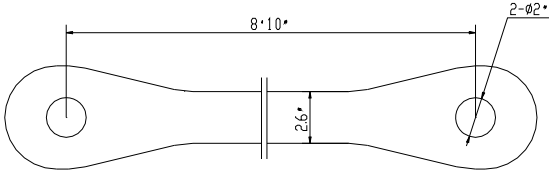
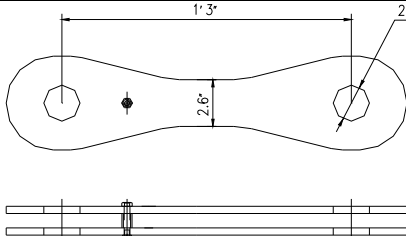
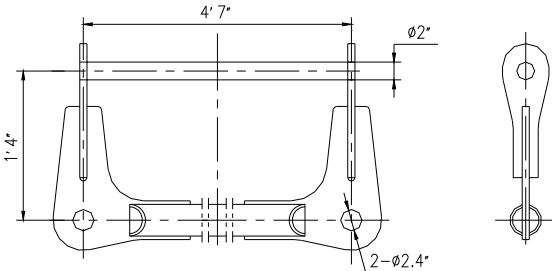
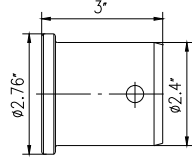
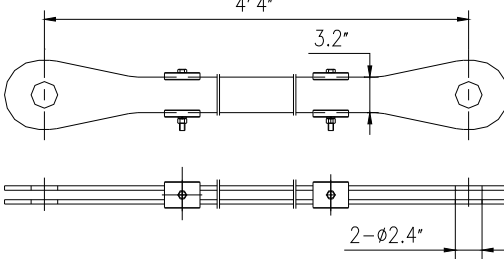
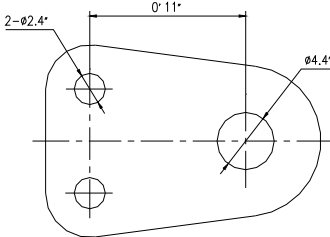
Each kind of boom is assigned to anchoring rods of specific length, and the anchoring rods should be connected strictly in accordance with the given method.

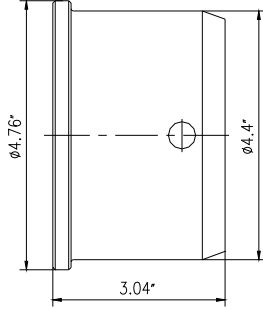
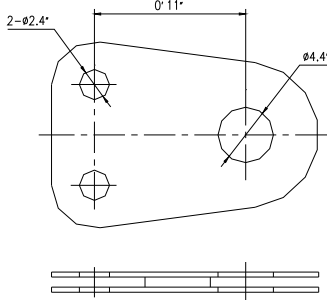
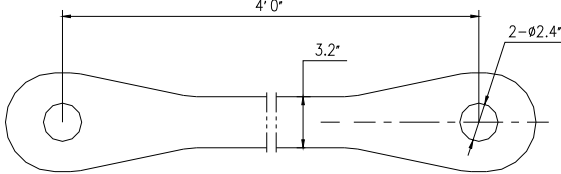
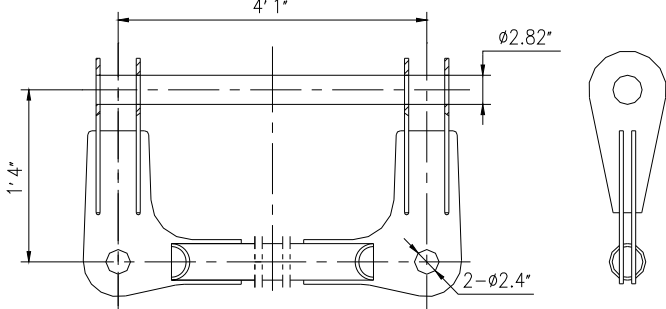
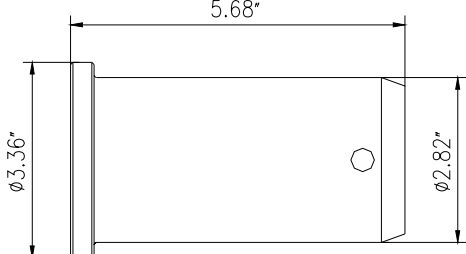
Now, we will illustrate the connection method of anchoring rods of different main boom, for example basic boom of **65'7"**.

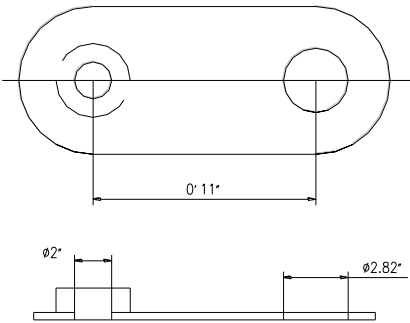
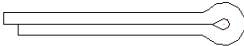
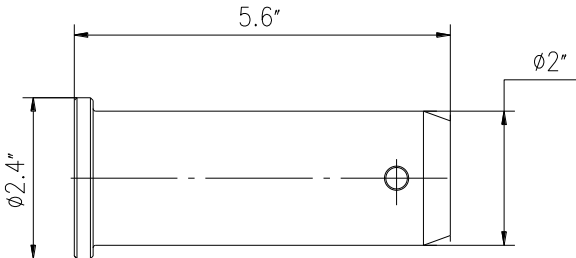


Component parts of main boom anchoring rods

Part No.	Description	Illustration
1	Pin spindle	
2	Cotter pin	 ISO1234-1997 (0.4"×3.8")
3	Anchoring rod connected to main boom	
4	Pin spindle	
5	Retaining pin	
6	Single-anchoring rod	
7	Pin spindle	
8	Double-anchoring rod	

9	Single-anchoring rod	
10	Double-anchoring rod	
11	Coupling link	
12	Pin spindle	
13	Double-anchoring rod	
14	Reducing piece	
15	Cotter Pin	 ISO1234-1997 (0.48"×4.8")

16	Pin spindle	
17	Double reducing piece	
18	Single-anchoring rod	
19	Coupling link	
20	Cotter Pin	 ISO1234-1997 (0.4"×4.8")
21	Pin spindle	

22	anchoring rod connected to A-frame	
23	Cotter Pin	 ISO1234-1997 (0.32"×2.4")
24	Pin spindle	

**Note:**

The part number of main boom anchoring rods given in Section 5.7.1.3 “combination of main boom anchoring rods” is consistent with that in the above table, so the component parts of anchoring rods can be found by referring to the part number.

Principle for determining the length of main boom anchoring rods:

When basic boom is 65'7" long, the length of main boom anchoring rods is 56'1";

When main boom length increases by 9'10", a 0'11"-long double anchoring rod(8) and a 8'10"-long single anchoring rod(9) should be added accordingly.

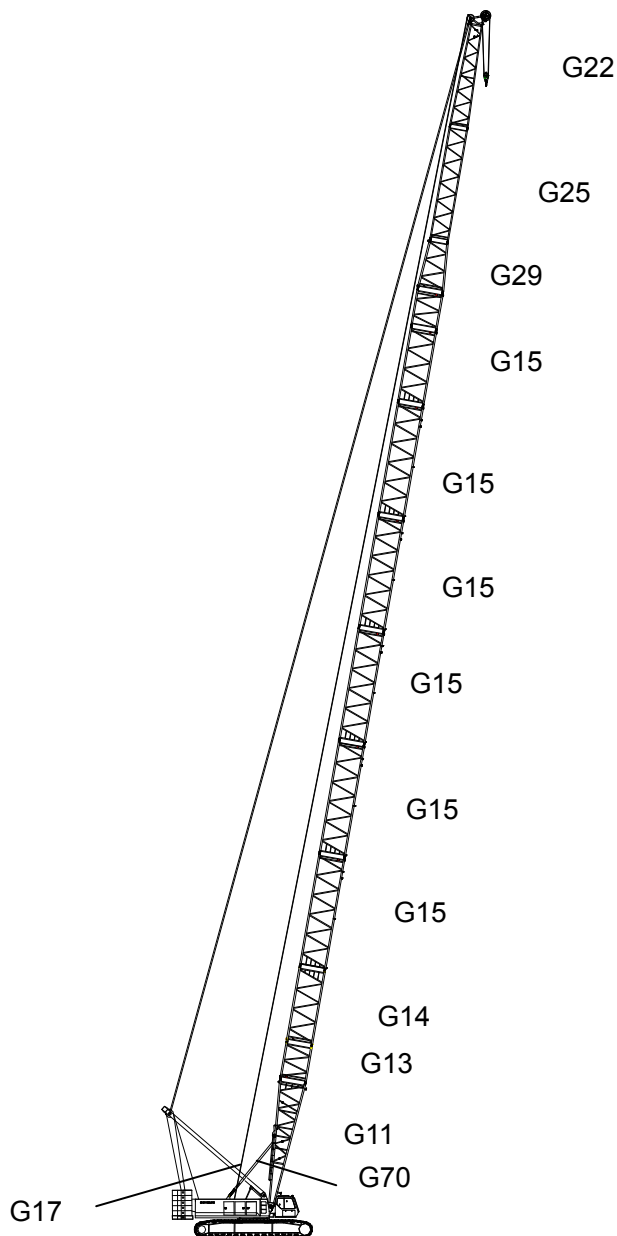
When main boom length increases by 19'8", a 0'11"-long double anchoring(8) rod and a 18'8"-long single anchoring rod(6) should be added accordingly.

When main boom length increases by 29'6", two 0'11"-long double anchoring rods(8) and a 8'10"-long single anchoring rod(9) as well as a 18'8"-long single anchoring rod(6) should be added accordingly.

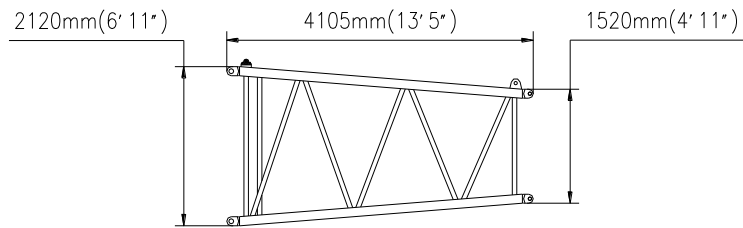
The width of main boom anchoring rods is 2.6", and the diameter of pin spindle is $\phi 2"$.

Combination of main boom anchoring rods is shown in following diagram:

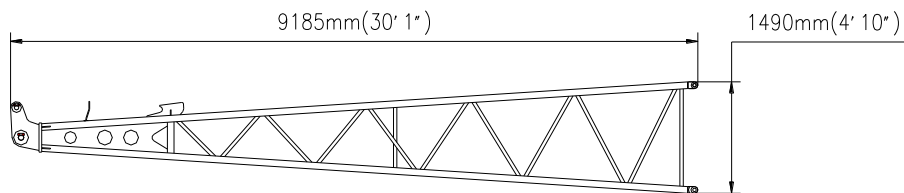
Figure 1 displays a series of 12 horizontal diagrams, each representing a different road section. Each diagram is labeled with a height (83m, 80m, 77m, 74m, 71m, 68m, 65m, 62m, 59m, 56m, 53m, 50m, 47m) and a total length (e.g., 80100, 77100, 74100, 71100, 68100, 65100, 62100, 59100, 56100, 53100, 50100, 47100). The diagrams show a series of rectangular blocks representing traffic volume, with some blocks having triangular shapes indicating a change in volume. The total length decreases as the height decreases.



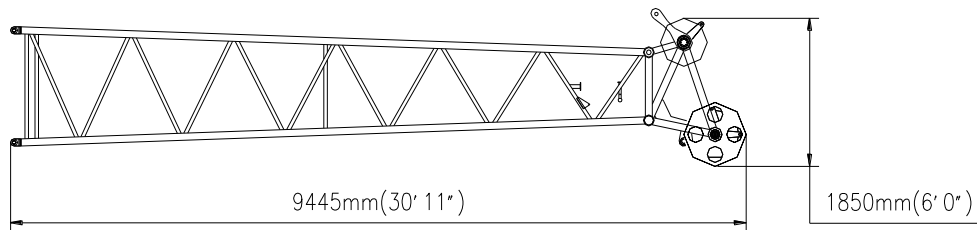
13'1" reducing section (G29)



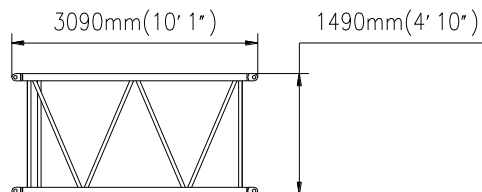
luffing jib pivot section(G21)



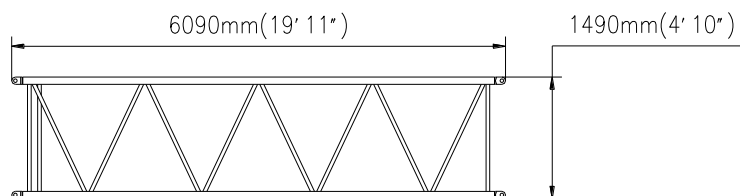
Luffing Jib head (G22)

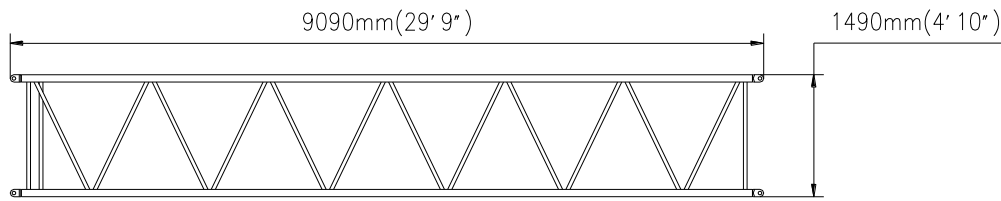


(9'10") luffing jib intermediate section (G23)



(19'8") luffing jib intermediate section (G24)



(29'6") luffing jib intermediate section (G25)

When different main boom length is required, crane operator only needs to disconnect pivot section from main boom head, and then install intermediate sections between them. In this way, the main boom can be assembled to required length.

Assembly table of light duty boom sections

Boom length(ft)	Assembly sequence of boom sections	Boom length (ft)	Assembly sequence of boom sections
(282'0")	G11+ G13+G14+6×G15+G29+G22	(301'9")	G11+ G13+G14+6×G15+G29+G24+G22
(291'11")	G11+ G13+G14+6×G15+G29+G23+G22	(311'7")	G11+ G13+G14+6×G15+G29+G25+G22

Principle for assembling boom sections: when connecting boom intermediate sections, always bolt the shorter intermediate sections first.

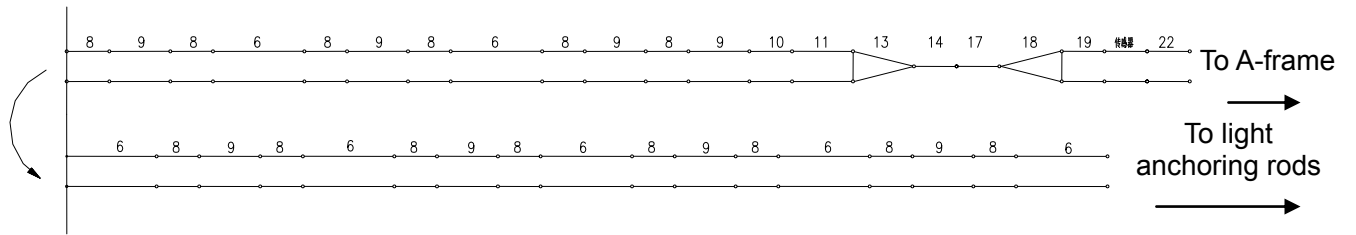
For this boom configurations, the first 239'5" long boom is composed of main boom sections, and the rest boom is either composed of 13'1" reducing section (G29) and luffing jib head (G22), or 13'1" reducing section (G29), luffing jib head (G22) together with a luffing jib intermediate section (i.e. G23, G24 or G25). See the table above.

5.7.2.2 Components of anchoring rods of light duty boom

Anchoring rods of light duty boom consists of anchoring rods of heavy duty boom and light anchoring rods.

Anchoring rods of heavy duty boom

The length of anchoring rods of heavy duty boom used in this boom configuration is always 231'2". Different lengths of anchoring rods of light duty boom can be available by adjusting the length of light anchoring rods according to the length of light duty boom.



Anchoring rods of heavy duty boom (it length is 231'2")

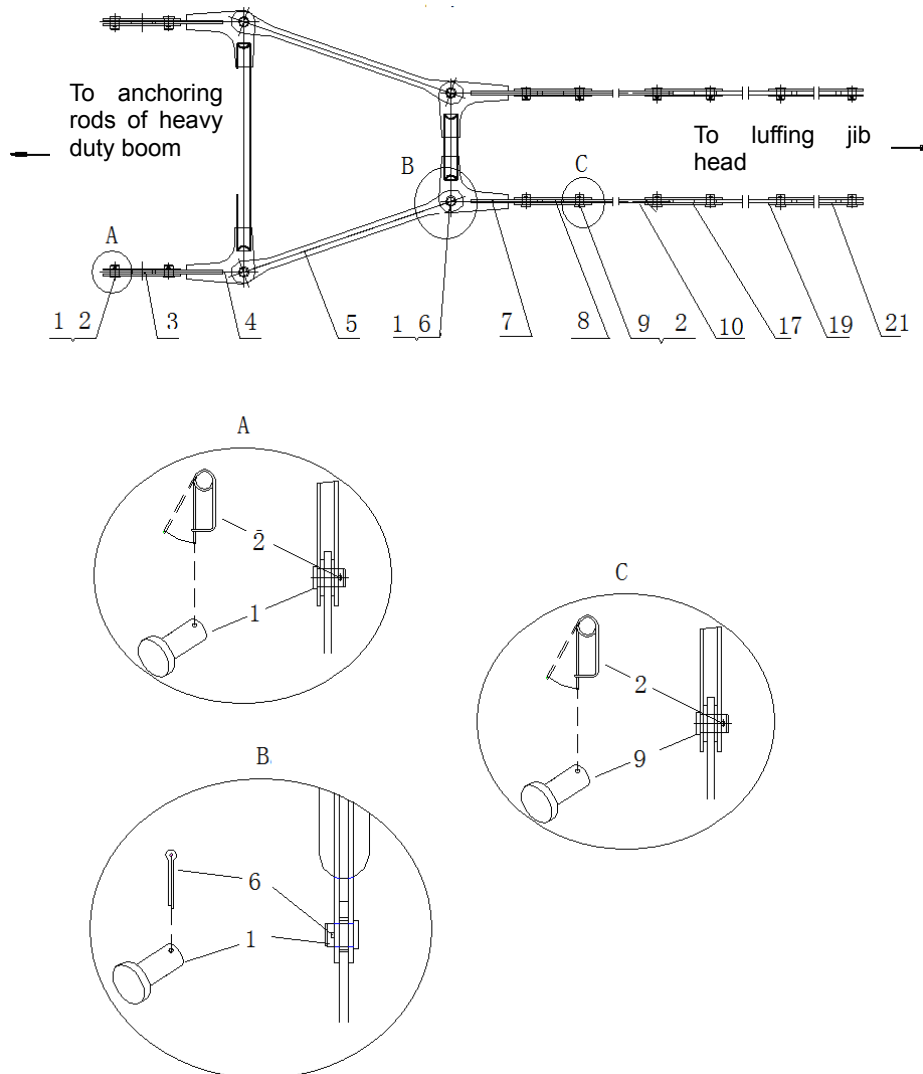


Caution:

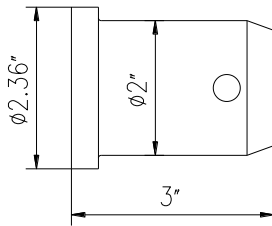
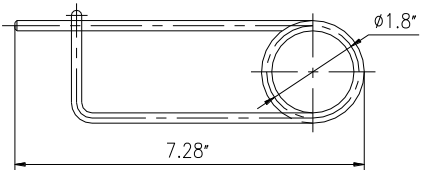
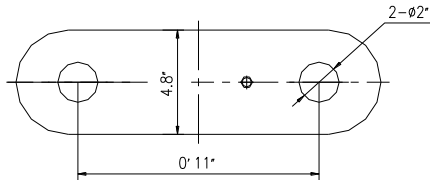
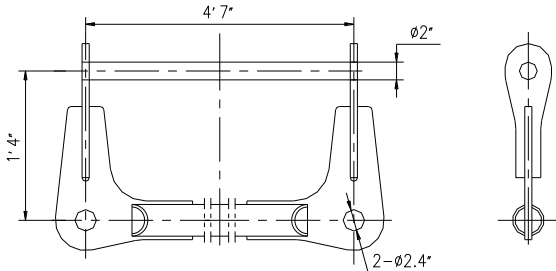
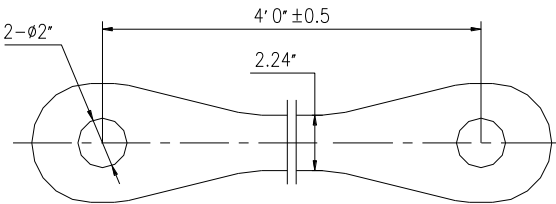
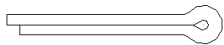
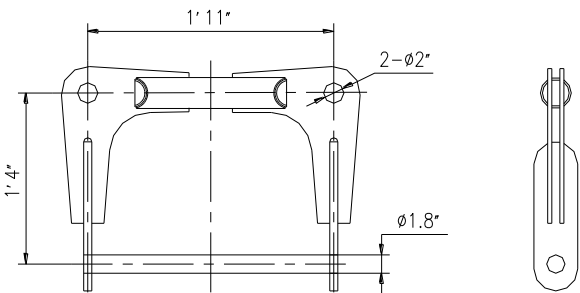
For part number of main boom anchoring rods, please see Section 5.7.1.3 "Combination of anchoring rods of heavy duty boom"

b) light anchoring rods

Another component part of anchoring rods of light duty boom is the light anchoring rods. The anchoring rods shown in the following figure is the light anchoring rods assigned to 282'0" light duty boom



Component parts of light anchoring rods

Part No.	Description	illustration
1	Pin spindle	
2	Retaining pin	
3	Double-anchoring rod	
4	Coupling link	
5	Single-anchoring rod	
6	Cotter pin	 ISO1234-1997 (0.4"×3.8")
7	Coupling link	

8	Double-anchoring rod	
9	Pin spindle	
10	Single-anchoring rod	
17	Double-anchoring rod	
19	Single-anchoring rod	
20	Single-anchoring rod	
21	Double-anchoring rod	



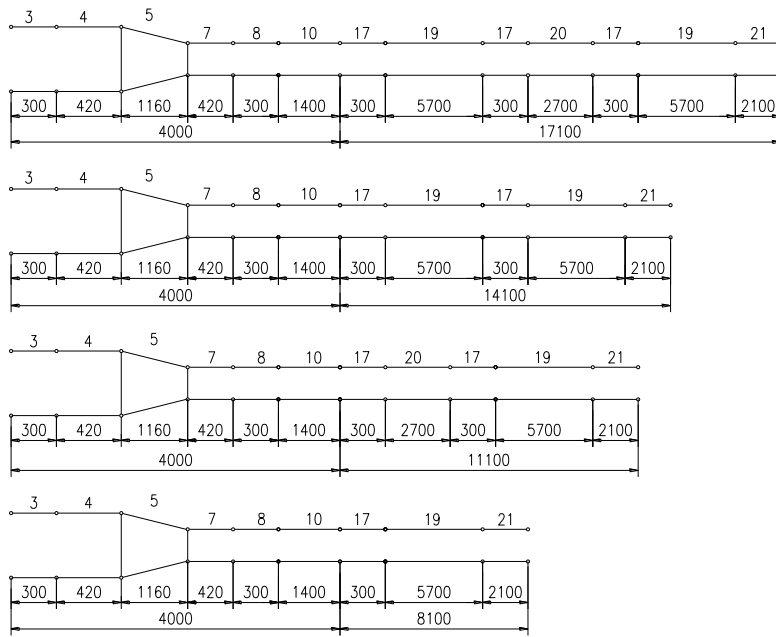
Note:

The part number of anchoring rods given in Section 5.7.2.2—b “light anchoring rods” are consistent with those in the above table, so the component parts of anchoring rod can be found by referring to the part number.

Combination of light anchoring rods:

Combination of light anchoring rods

Length of light duty boom (ft)	Length of light anchoring rods (ft)	Combination of light anchoring rods(between anchoring rods of heavy duty boom and luffing jib head)
(311'7")	(69'2")	LA=3+4+5+7+8+10+17+19+17+20+17+20+21
(301'9")	(59'4")	LB=3+4+5+7+8+10+17+19+17+20+21
(291'11")	(49'6")	LC=3+4+5+7+8+10+17+20+17+19+21
(282'0")	(39'8")	LD=3+4+5+7+8+10+17+19+21



5.7.2.2.3 Total length of anchoring rods of light duty boom

Possible total length of anchoring rods of light duty boom

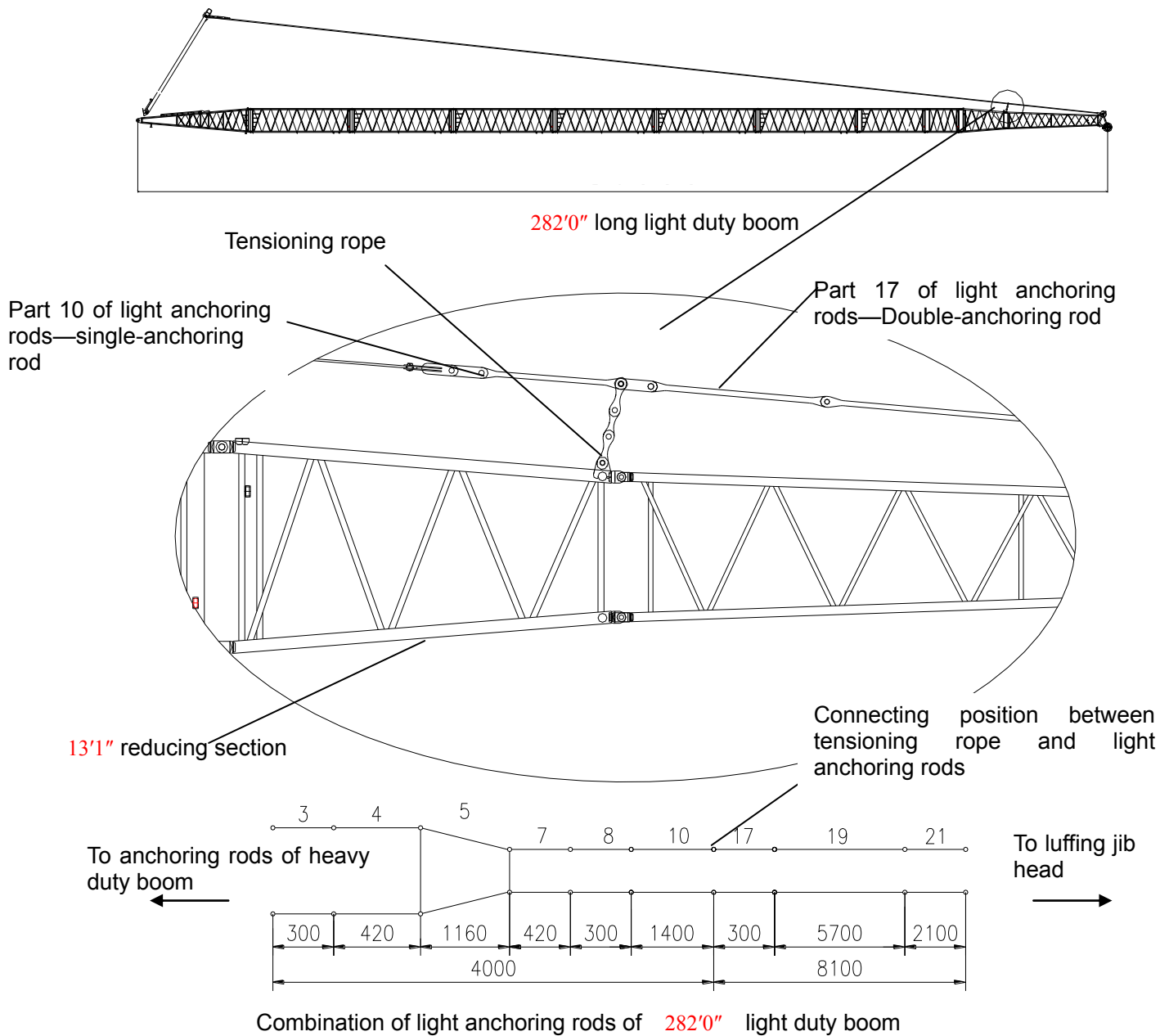
Length of light duty boom (ft)	Total length of anchoring rods of light duty boom (ft)	Length(L) of anchoring rods of heavy duty boom (ft)	Length of light anchoring rods(ft)	Combination of anchoring rods of light duty boom (between A-frame and luffing jib head)
(311'7")	(300'5")	(231'2")	(69'2")	L+LA
(301'9")	(290'7")	(231'2")	(59'4")	L+LB

(291'11")	(280'9")	(231'2")	(49'6")	L+LC
(282'0")	(270'11")	(231'2")	(39'8")	L+LD

5.7.2.3 Intermediate tensioners on the main boom

The fitting of intermediate tensioners is obligatory for SL boom configuration. The installation positions of intermediate tensioners for different main boom length have been shown in the following figures:

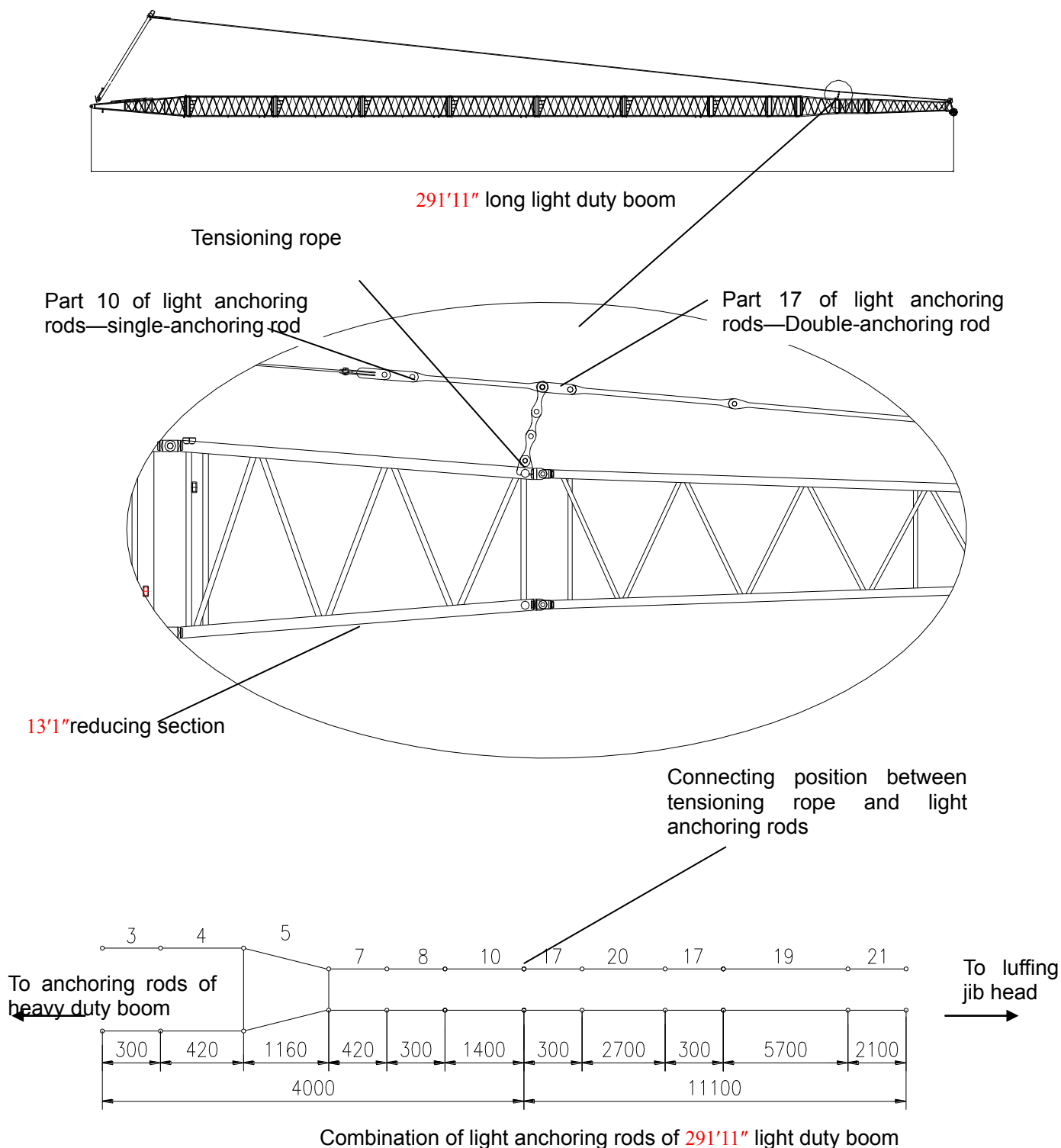
Installation position of intermediate tensioners for 282'0" long light duty boom (SL boom)



Note:

For the parts number of light anchoring rods given in the above table, please refer to Section 5.7.2.2-b "light anchoring rods"

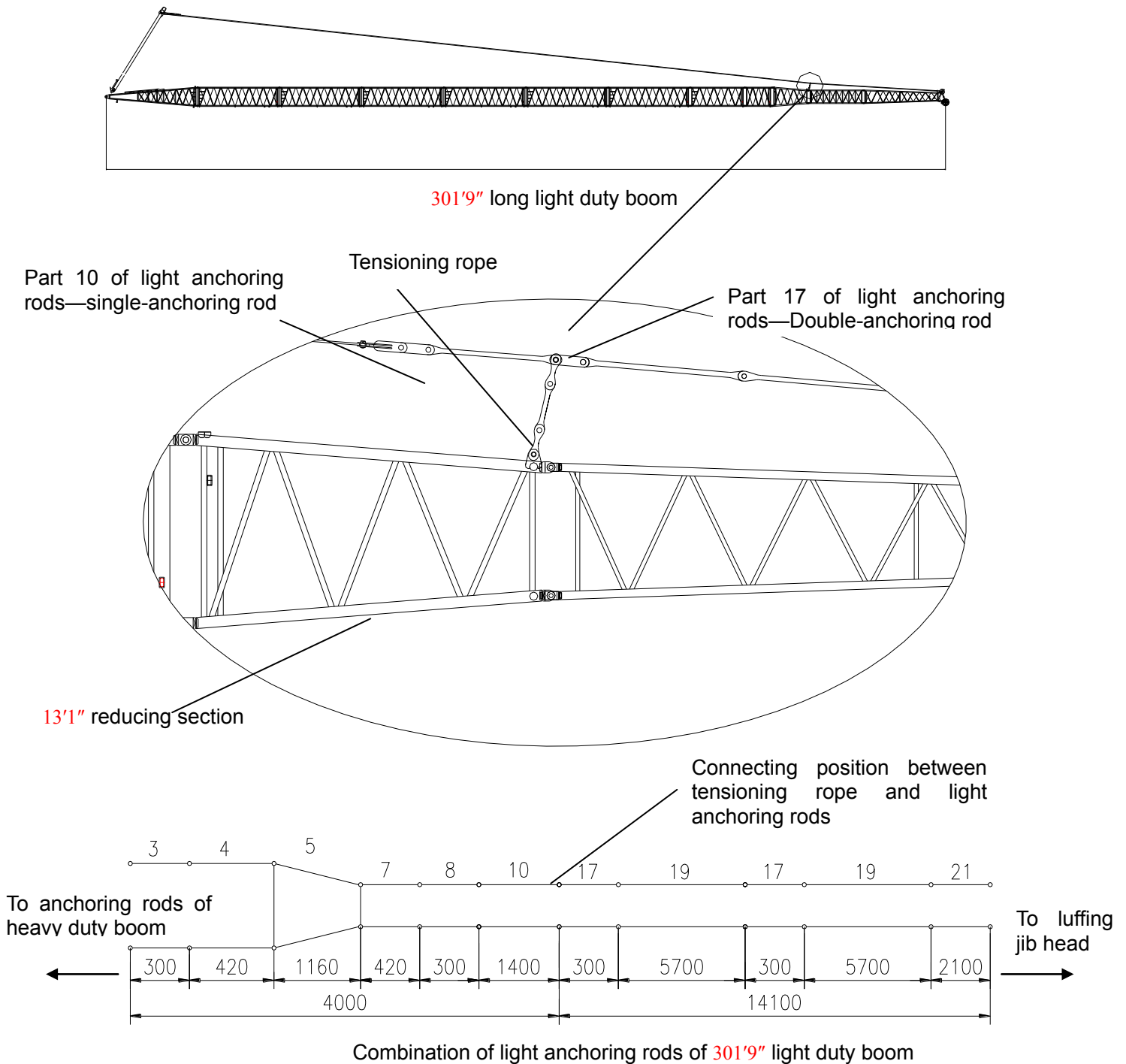
Installation position of intermediate tensioners for 291'11" long light duty boom



Note:

For the parts number of light anchoring rods given in the above table, please refer to Section 5.7.2.2-b "light anchoring rods".

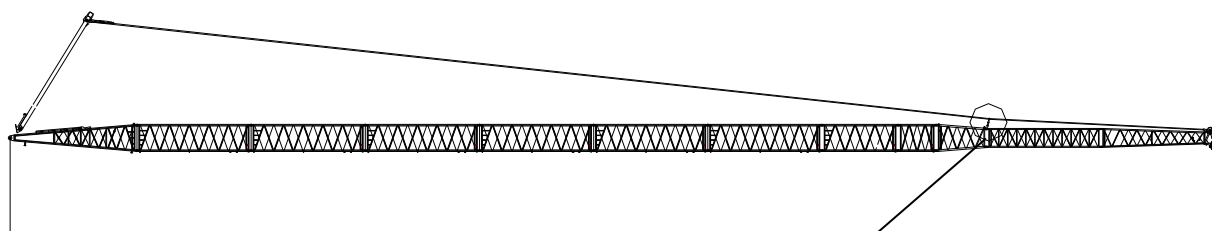
Installation position of intermediate tensioners for 301'9" long light duty boom



Note:

For the parts number of light anchoring rods given in the above table, please refer to Section 5.7.2.2-b "light anchoring rods".

Installation position of intermediate tensioners for 311'7" long light duty boom

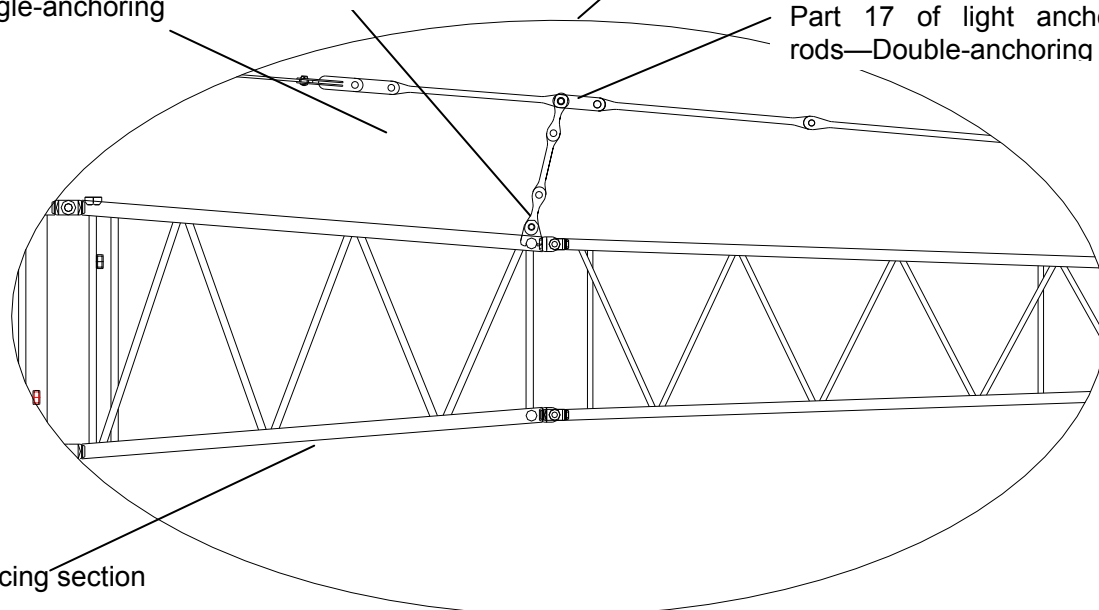


311'7" long light duty boom

Part 10 of light anchoring rods—single-anchoring rod

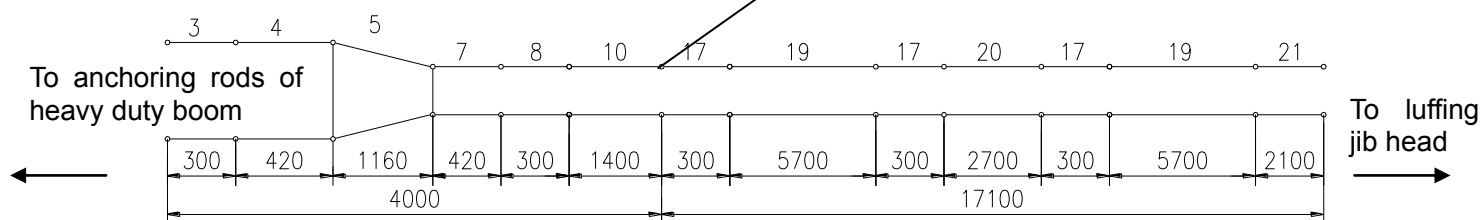
Tensioning rope

Part 17 of light anchoring rods—Double-anchoring rod



13'1" reducing section

Connecting position between tensioning rope and light anchoring rods



Combination of light anchoring rods of 311'7" light duty boom

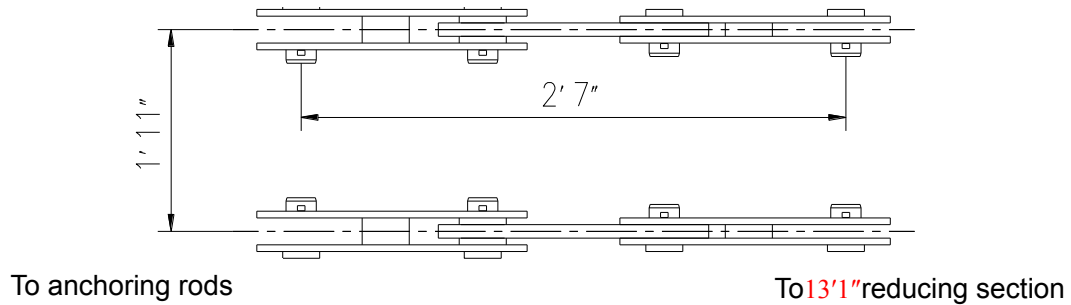


Note:

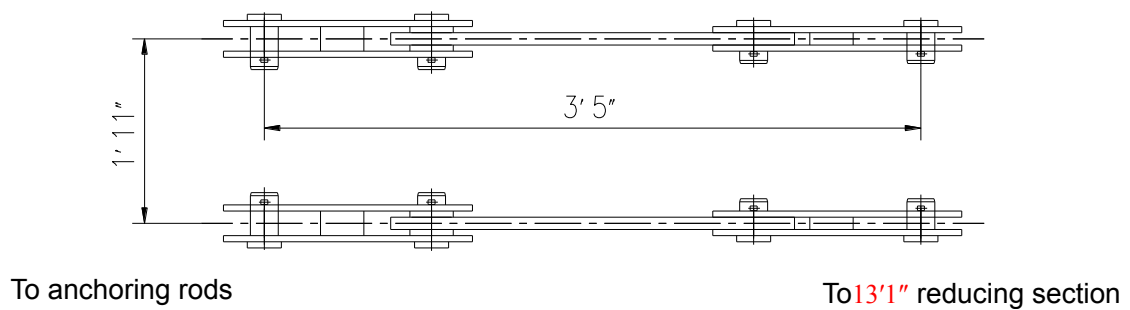
For the parts number of light anchoring rods given in the above table, please refer to Section 5.7.2.2-b "light anchoring rods".

Intermediate tensioners for light duty boom with different length:

Intermediate tensioners for 282'0" and 291'11" long light duty boom



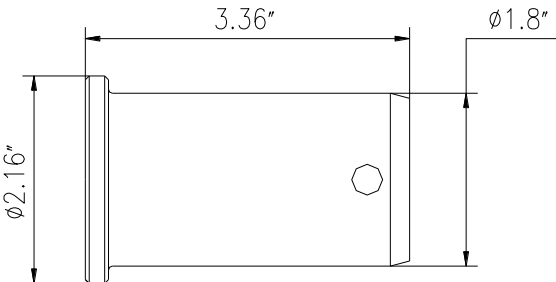
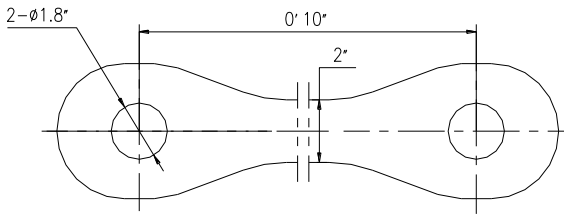
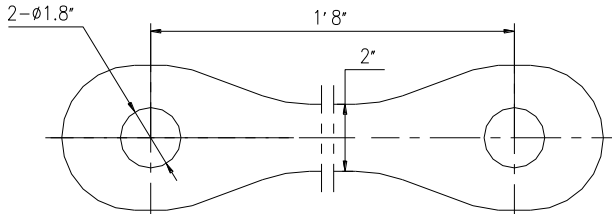
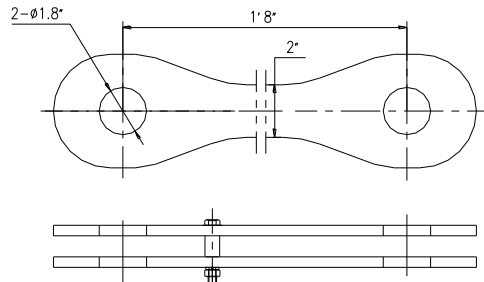
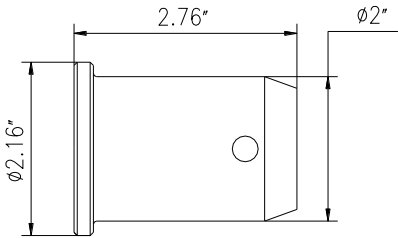
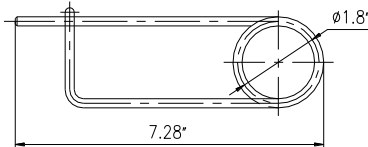
Intermediate tensioners for 301'9" and 311'7" long light duty boom



Component parts of intermediate tensioners

Component parts of intermediate tensioners

Part No.	Description	Illustration
1	Double-anchoring rod	

2	Pin spindle	
3	Single-anchoring rod	
4	Single-anchoring rod	
5	Double-anchoring rod	
6	Pin spindle	
7	Retaining pin	



Note:

Part numbers of intermediate tensioners given in Section 5.7.2.3 "intermediate tensioners on the main boom" are consistent with those in the above table, so the component parts of intermediate tensioners can be found by referring to the part numbers when assembling.

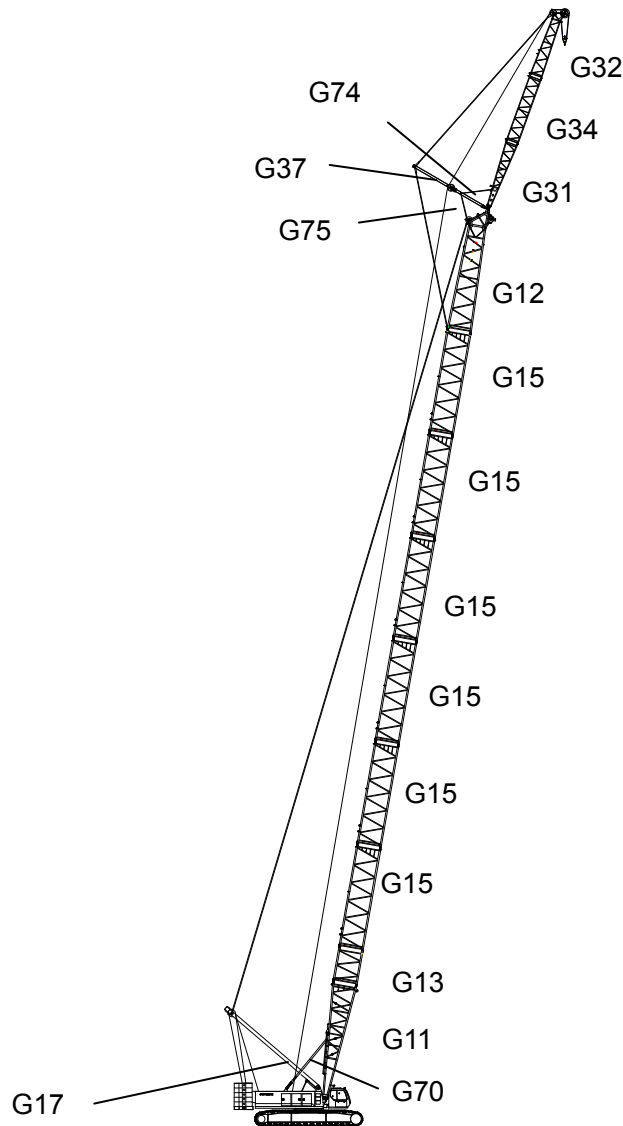
5.7.3 Fixed jib on heavy duty boom (SF)

5.7.3.1 Components of SF boom

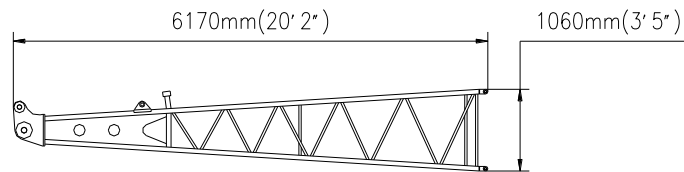
SF boom comprises main boom (S) and fixed jib (F). The main boom length varies from **95'1"~252'6"** and the fixed jib length varies from **34'9"~98'5"**. The fixed jib consists of fixed jib pivot section (**G31**), fixed jib head (**G32**) and an optional number of fixed jib intermediate section 6m in length (**G34**). The fixed jib can be assembled in the angle of 10° or 30° to main boom. When different fixed jib length is required, operator only needs to disconnect fixed jib pivot section from fixed jib head, and then install fixed jib intermediate sections between them. In this way, the fixed jib can be assembled to required length.

Main boom sections in this boom configuration are pinned together in the same way as that in S boom configuration.

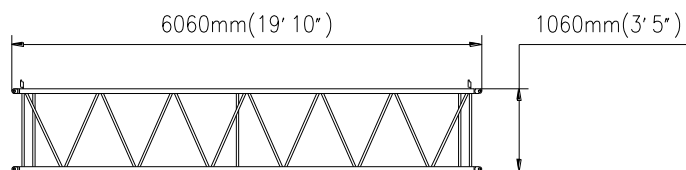
252'6" long main boom with **59'0"** fixed jib, overview:



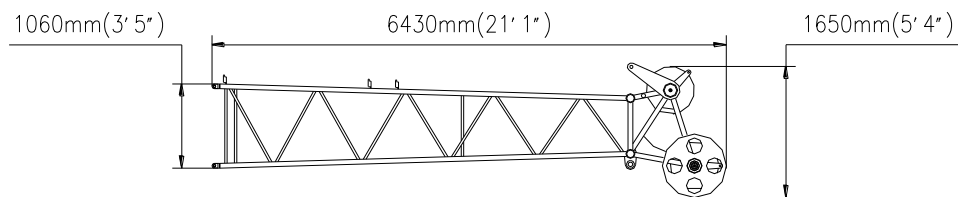
Fixed jib pivot section—G31



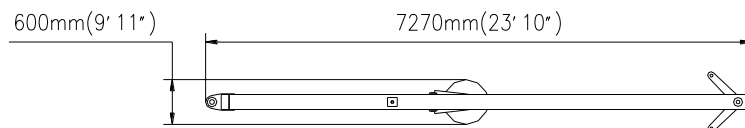
19'8" fixed jib intermediate section—G33



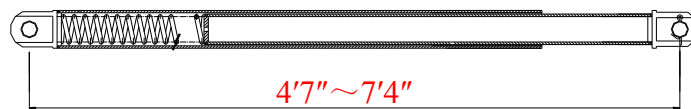
Fixed jib head—G32



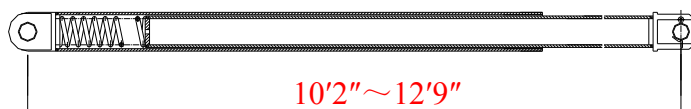
FA-frame —G37



Rear tilting-back support of fixed jib—G75



Front tilting-back support of fixed jib—G74



Combination of fixed jib sections:

Assembly table of fixed jib sections

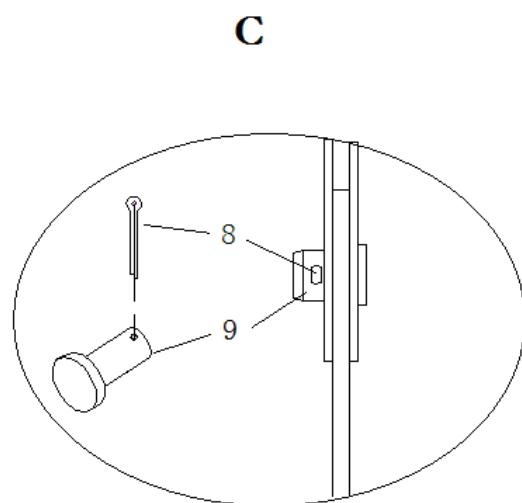
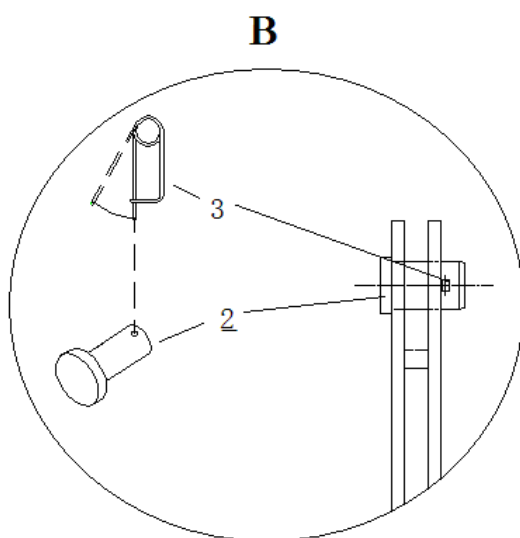
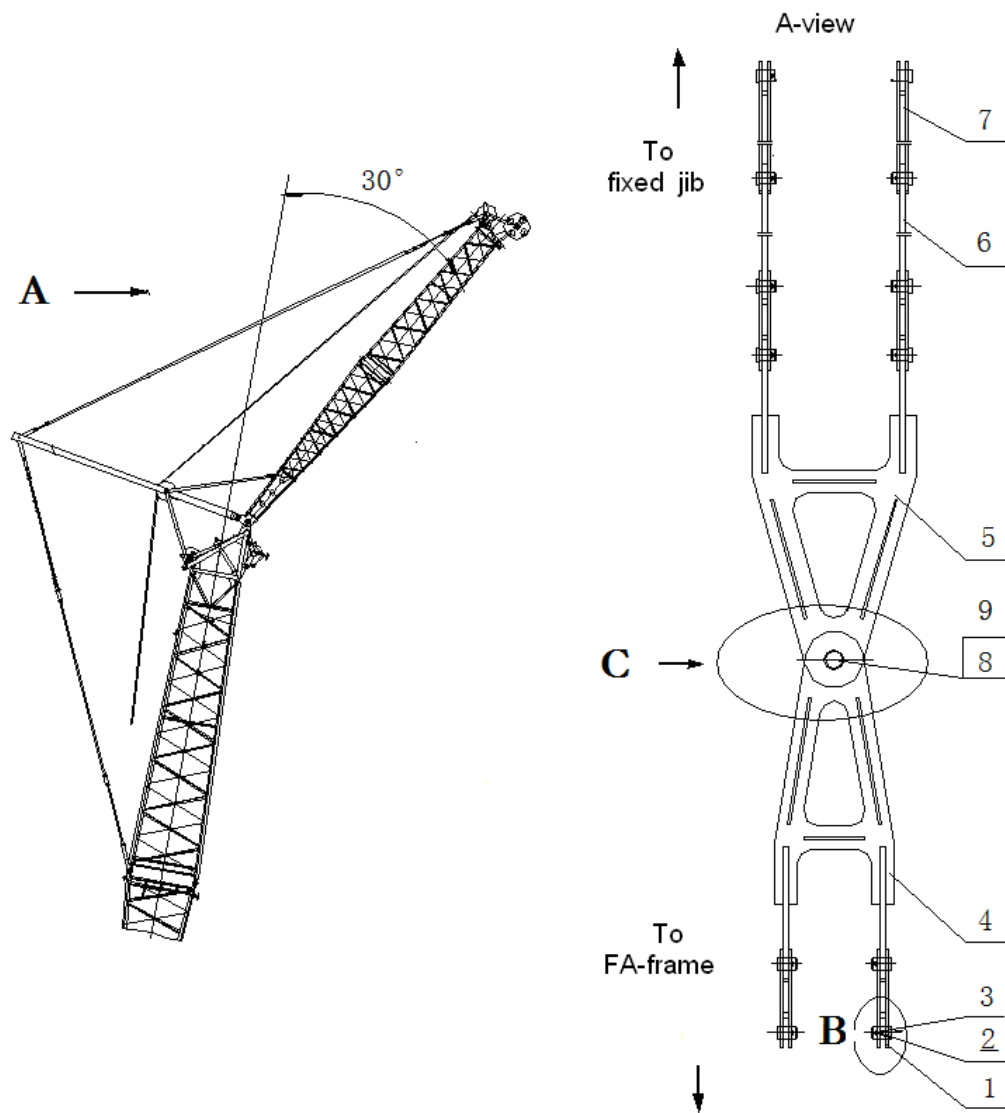
Fixed jib length (ft)	assembly sequence of fixed jib sections	Fixed jib length (ft)	assembly sequence of fixed jib sections
(39'4")	G31+G32	(78'8")	G31+2×G34+G32
(59'0")	G31+G34+G32	(98'4")	G31+3×G34+G32

5.7.3.2 Components of anchoring rods of SF boom

The anchoring rods of SF boom comprises main boom anchoring rods, fixed jib front anchoring rods and fixed jib rear anchoring rods. For the combination of main boom anchoring rods, see Section 5.7.1.3. And the combination of fixed jib anchoring rods has been given as follows.

a Fixed jib front anchoring rods

When the fixed jib length is 39'4", the fixed jib front anchoring rods is composed by the following component parts.



Component parts of fixed jib front anchoring rods

Part No.	Description	illustration
1	Double anchoring rod	
2	Pin spindle	
3	Retaining pin	
4	Reducing double-anchoring rod	
5	Reducing single-anchoring rod	

6	Single anchoring rod	
7	Double anchoring rod	
8	Cotter pin	ISO1234-1997 (0.4"×3.6")
9	Pin spindle	

**Note:**

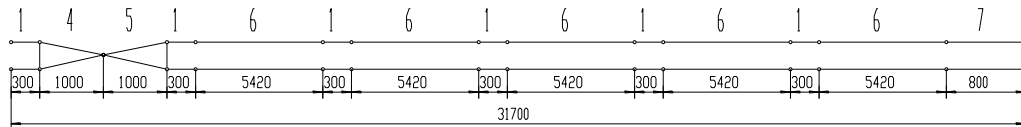
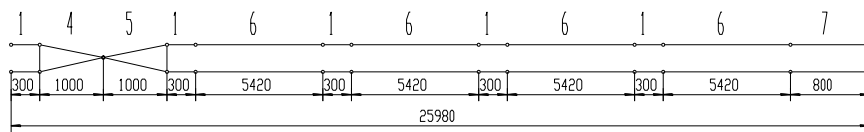
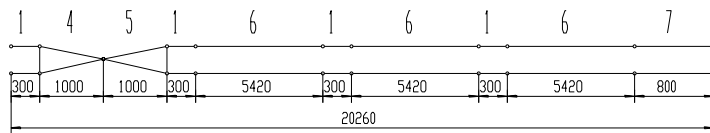
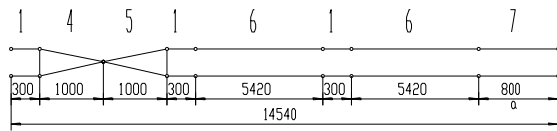
The part numbers of anchoring rods given in Section 5.7.3.2—a “Fixed jib front anchoring rods” are consistent with those in the above table, so the component parts of anchoring rods can be found by referring to the part numbers when assembling.

The width of fixed jib front anchoring rods is 1.8", and the diameter of pin spindle is $\phi 1.6$ ". When fixed jib is 39'4" long, the corresponding front anchoring rods is 49'0" long. When fixed jib length increases by 19'8", a 10.8"-long double anchoring rod (part 1) and a 17'9"-long single anchoring rod (part 6) should be added accordingly.

Combination of fixed jib front anchoring rods is shown in the following table

Combination of front anchoring rods of fixed jib

Fixed jib length (ft)	length of fixed jib front anchoring rods (ft)	Combination of fixed jib front anchoring rods (between FA-frame to fixed jib)
(39'4")	(47'8")	1+4+5+1+(6+1)+6+7
(59'0")	(66'5")	1+4+5+1+2×(6+1)+6+7
(78'8")	(85'2")	1+4+5+1+3×(6+1)+6+7
(98'4")	(103'11")	1+4+5+1+4×(6+1)+6+7

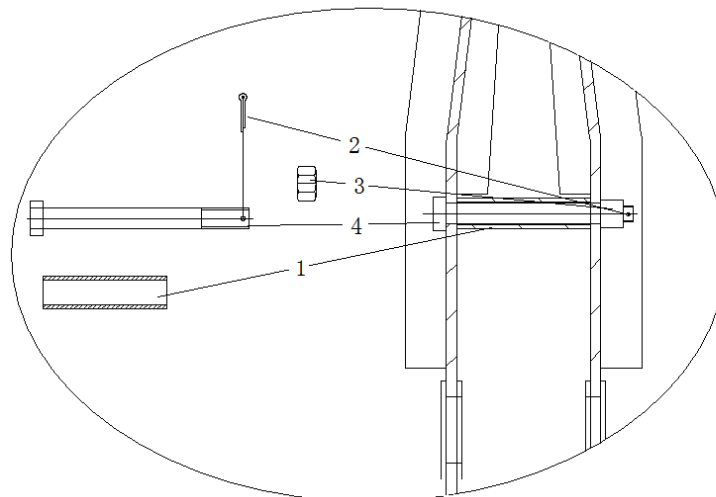
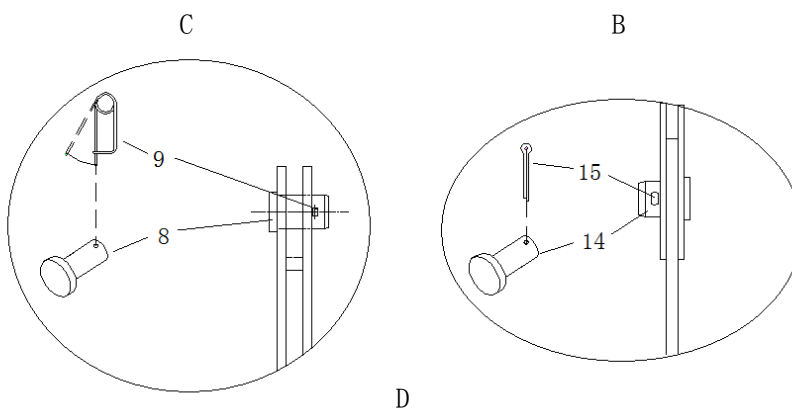
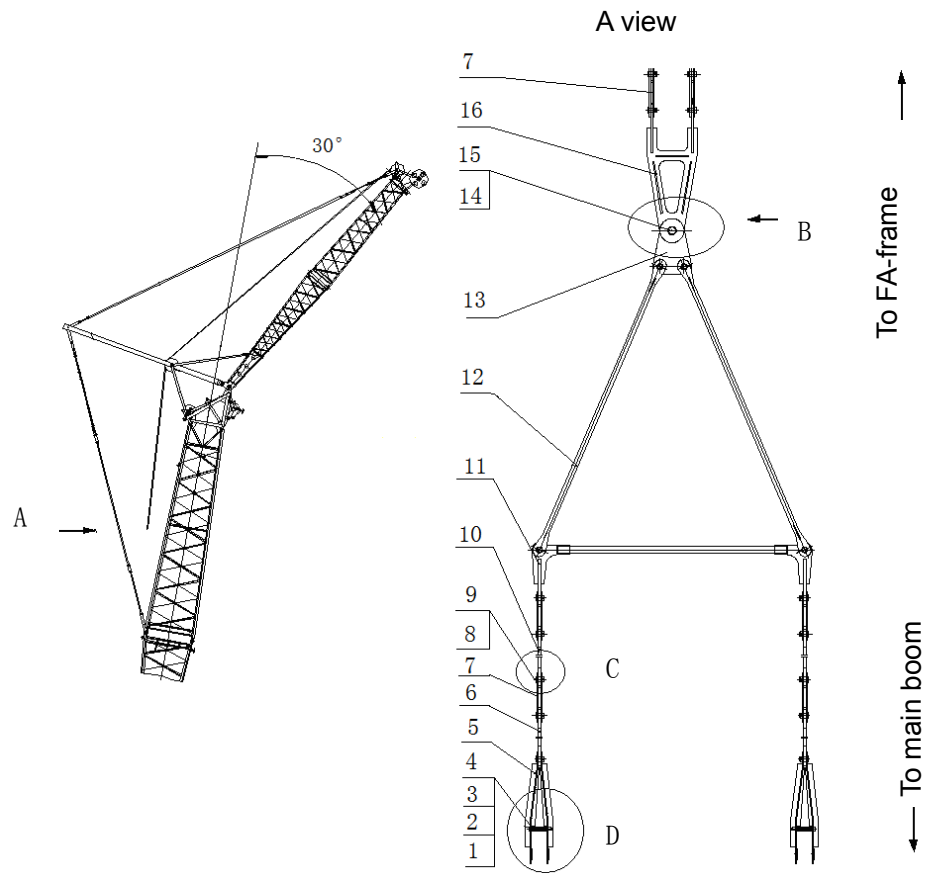


b) Fixed jib rear anchoring rods

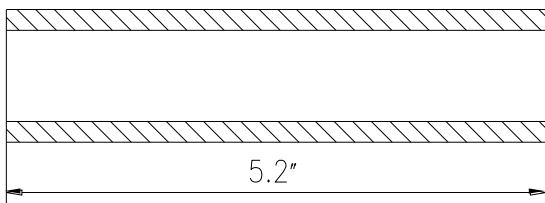
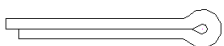
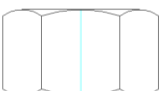
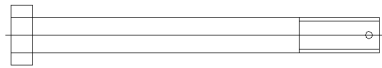
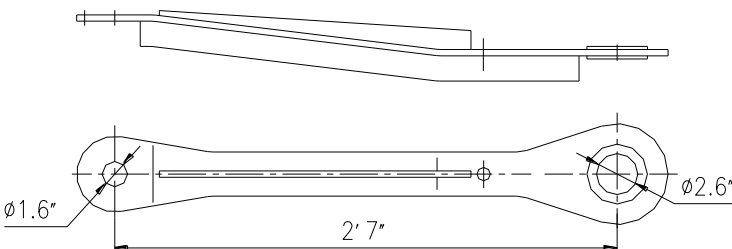
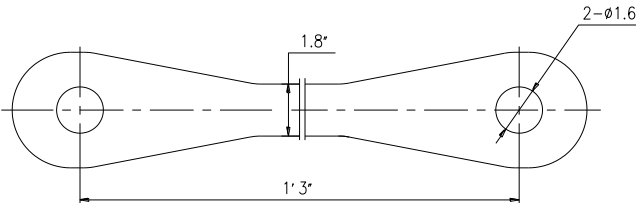
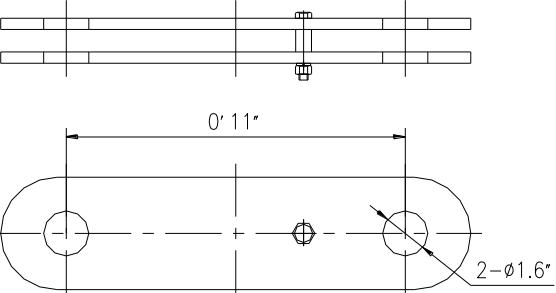
The width of fixed jib rear anchoring rods is 1.8", and the diameter of pin spindle is $\phi 1.6$ ".

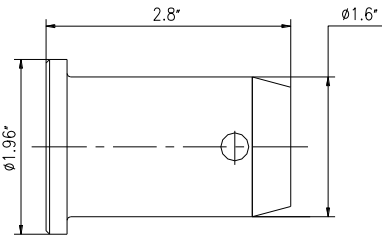
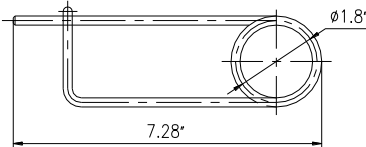
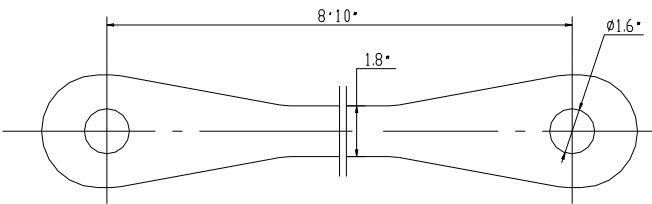
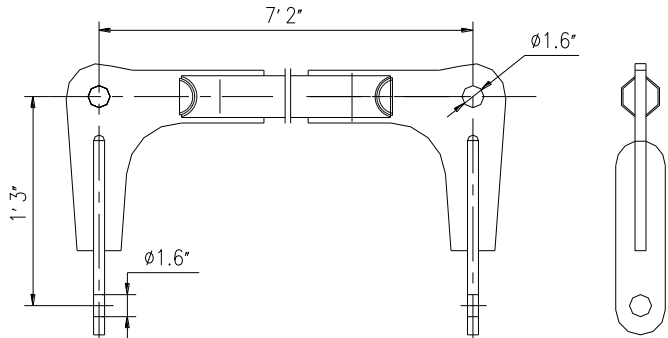
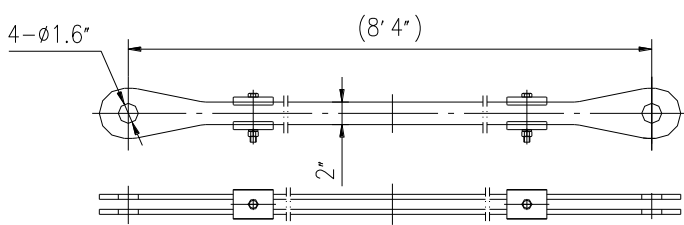
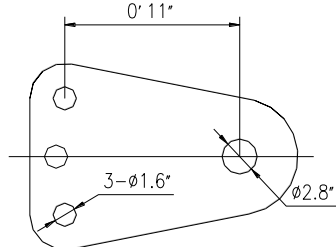
Since the fixed jib can be mounted in the angle of either 10° or 30° to main boom, the fixed jib rear anchoring rods can be combined in two ways.

The following figure shows the combination of rear anchoring rods when fixed jib is mounted in the angle of 30° to main boom.



Component parts of fixed jib rear anchoring rods

Part No.	Description	illustration
1	sleeve	
2	Cotter pin	 ISO1234-1997 (0.16"×1.2")
3	Nut	 ISO4032-1999 (M20-8)
4	Bolt	 ISO4014-1999 (M20×8"-8.8)
5	Anchoring rod	
6	Single-anchoring rod	
7	Double-anchoring rod	

8	Pin spindle	
9	Retaining pin	
10	Single-anchoring rod	
11	Coupling link	
12	Double-anchoring rod	
13	Reducing piece	

14	Pin spindle	
15	Cotter pin	ISO1234-1997 (0.4"×3.6")
16	Reducing double-anchoring rod	
17	Single-anchoring rod	
18	Single-anchoring rod	



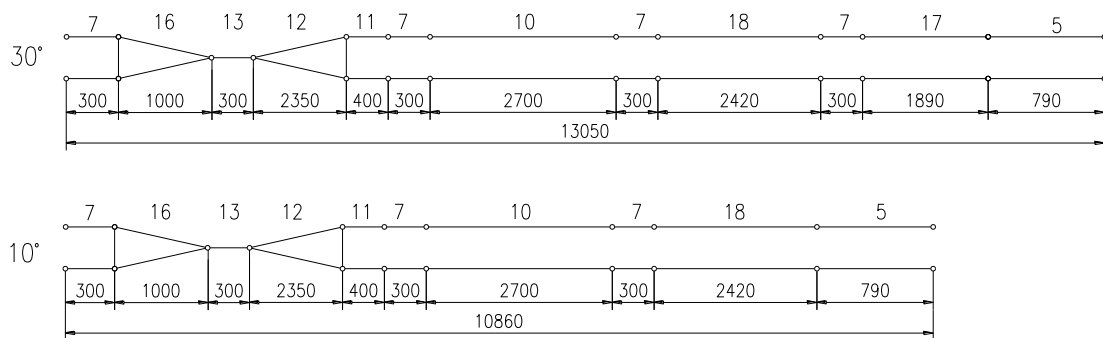
Note:

The part numbers of anchoring rods given in Section 5.7.3.2—b “Fixed jib rear anchoring rods” are consistent with those in the above table, so the component parts of anchoring rods can be found by referring to the part numbers when assembling.

Combination of fixed jib rear anchoring rods is shown in the following table

Combination of fixed jib rear anchoring rods

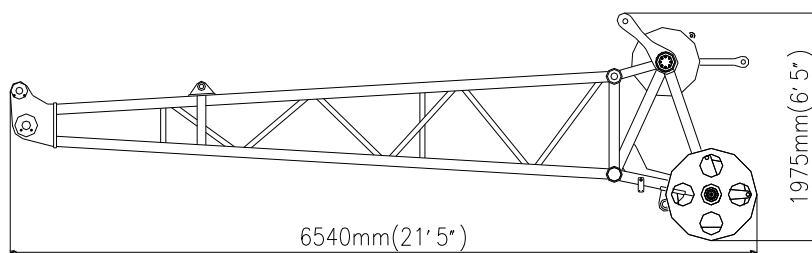
Fixed jib angle to main boom	Length of fixed jib rear anchoring rods(ft)	Combination of fixed jib rear anchoring rods (between main boom to FA-frame)
30°	(42'8")	7+16+13+12+11+7+10+7+18+7+17+5
10°	(35'7")	7+16+13+12+11+7+10+7+18+5



Technical drawing of a crane boom structure, showing various components labeled with 'G' codes:

- G74: Top of the boom structure.
- G37: Joint or connection point near the top.
- G75: Joint or connection point near the top.
- G41: End of the boom structure.
- G12: Joint or connection point on the boom.
- G15: Multiple joints or connection points along the boom.
- G13: Joint or connection point near the base.
- G11: Joint or connection point near the base.
- G70: Base of the boom structure.
- G17: Base of the boom structure.

Heavy fixed jib——G41



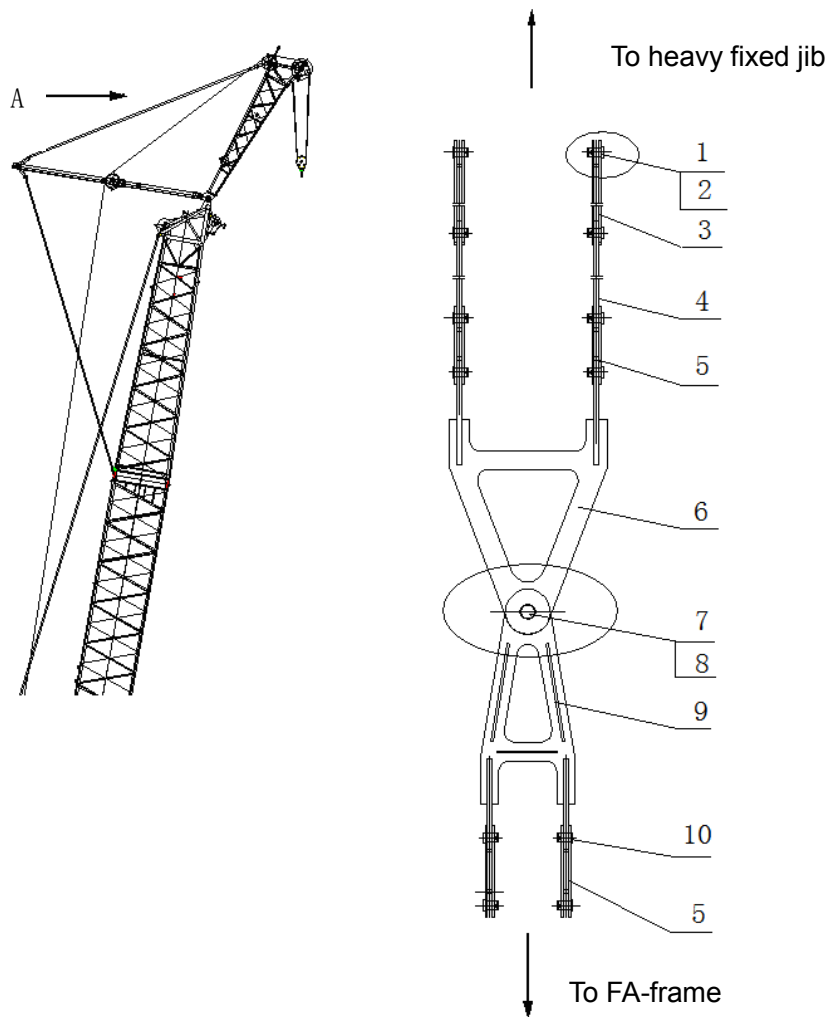
5.7.4.2 Components of anchoring rods of SFV boom

The anchoring rods of SFV boom comprises main boom anchoring rods, heavy fixed jib front anchoring rods and heavy fixed jib rear anchoring rods. For the combination of main boom(heavy) anchoring rods, see Section 5.7.1.3. And the combination of heavy fixed jib anchoring rods has been given as follows.

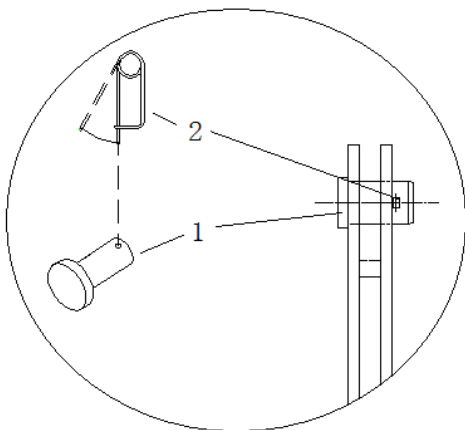
a) Heavy fixed jib front anchoring rods

The heavy fixed jib front anchoring rods is composed by the following component parts, and its length is unvaried.

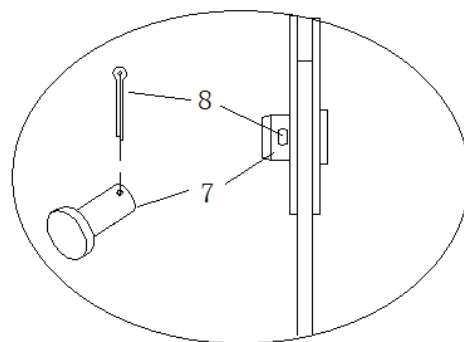
A view



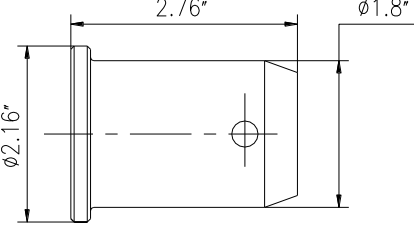
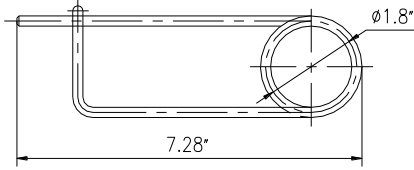
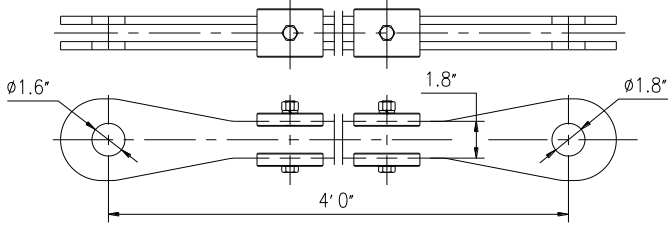
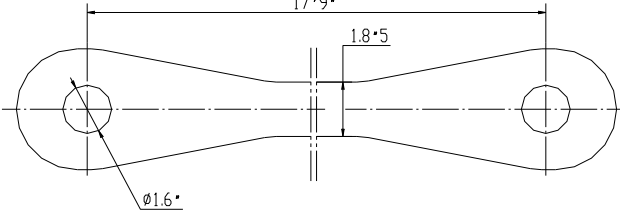
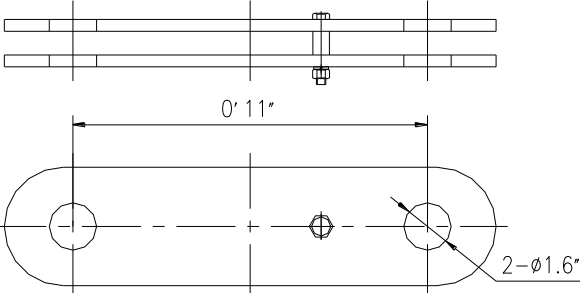
B



C



Component parts of heavy fixed jib front anchoring rods

Part No.	Description	illustration
1	Pin spindle	
2	Retaining pin	
3	Double anchoring rod	
4	Single anchoring rod	
5	Double anchoring rod	

6	Reducing single anchoring rod	
7	Pin spindle	
8	Cotter pin	ISO1234-1997 (0.4"×3.6")
9	Reducing double-anchoring rod	
10	Pin spindle	



Note:

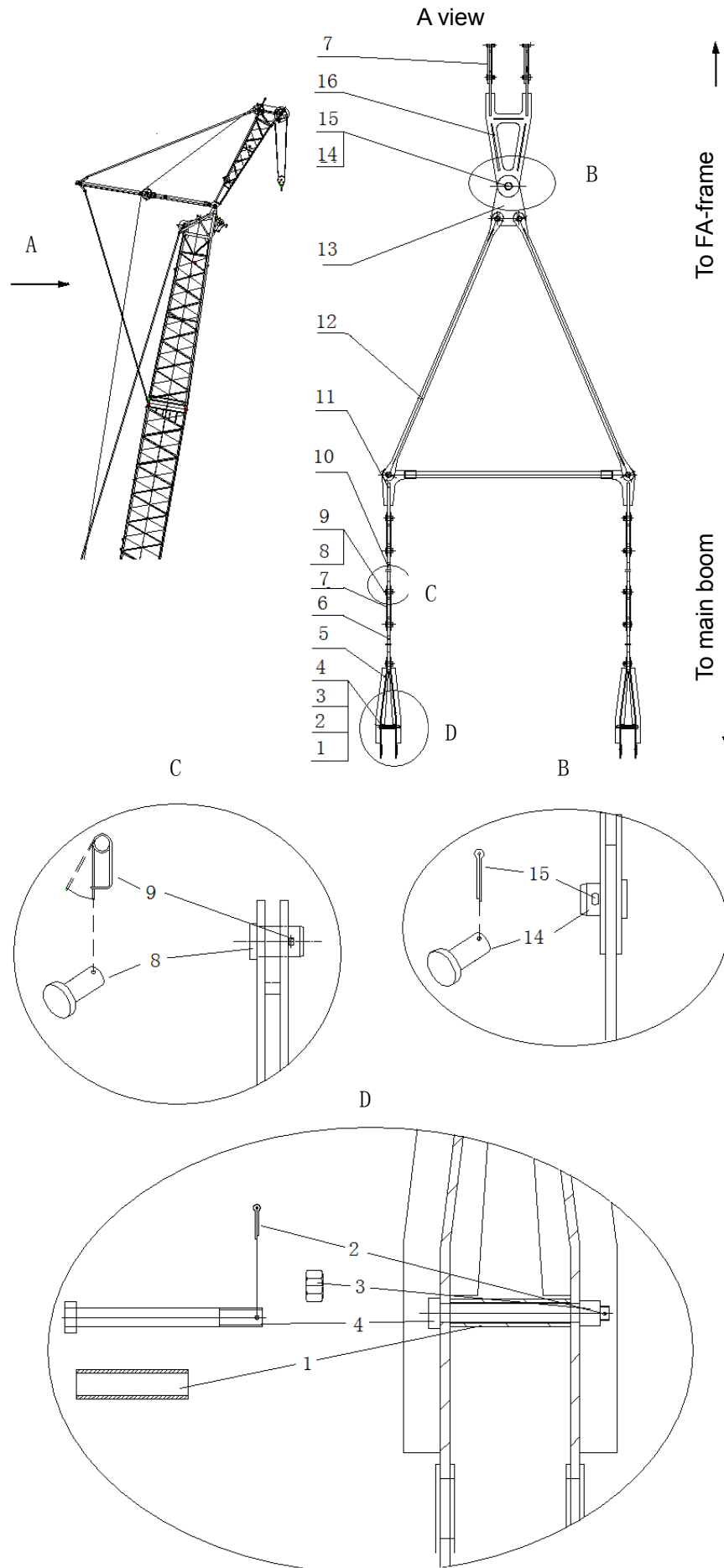
The part numbers of anchoring rods given in Section 5.7.4.2—a “ Heavy fixed jib front anchoring rods” are consistent with those in the above table, so the component parts of anchoring rods can be found by referring to the part numbers when assembling.

b) Heavy fixed jib rear anchoring rods

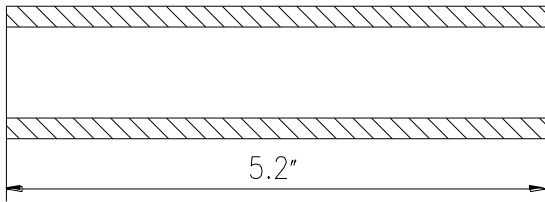
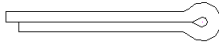
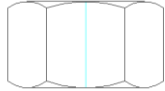
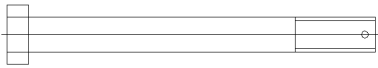
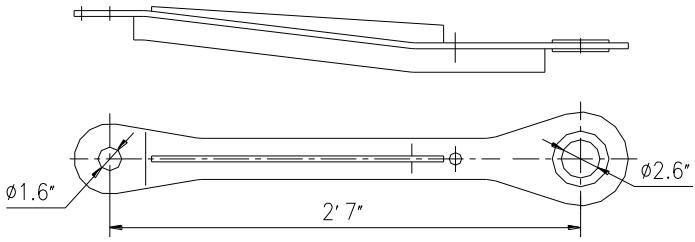
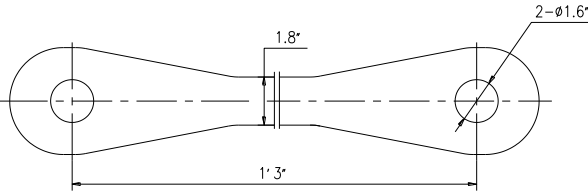
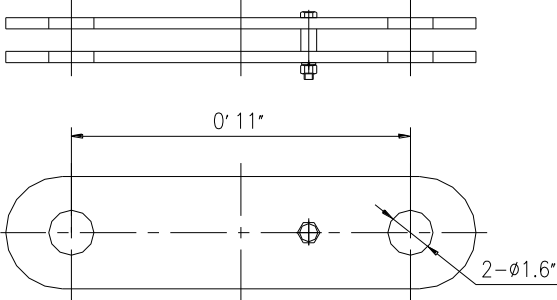
The width of heavy fixed jib rear anchoring rods is 1.8", and the diameter of pin spindle is $\phi 1.6"$..

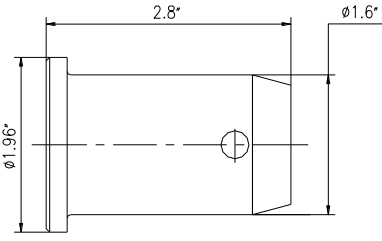
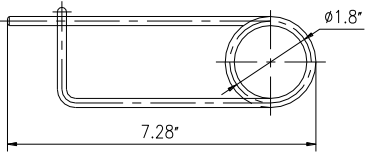
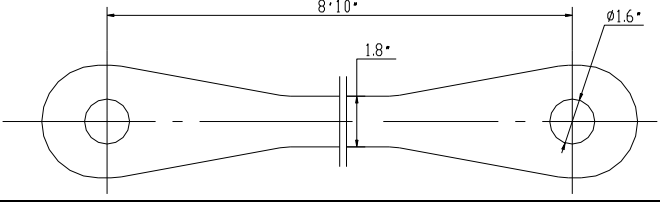
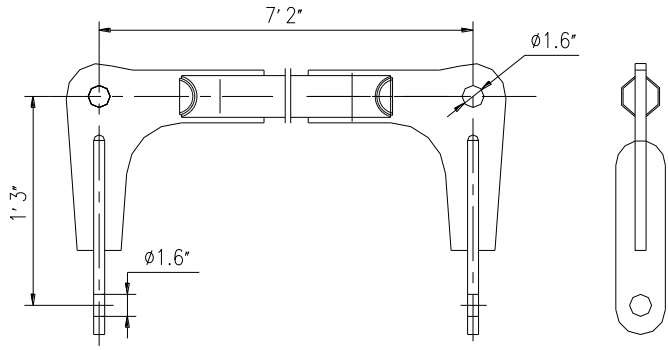
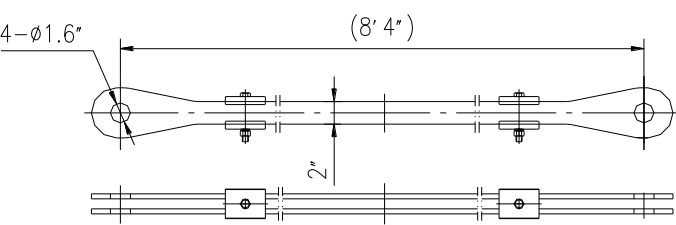
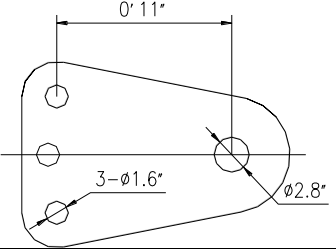
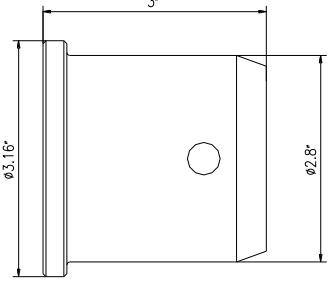
Since the heavy fixed jib can be mounted in the angle of either 14° or 20° to main boom, the heavy fixed jib rear anchoring rods can be combined in two ways.

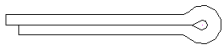
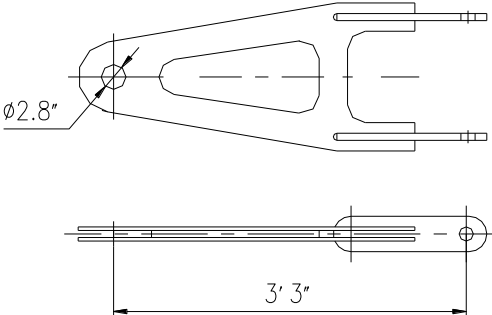
The following figure shows the combination of rear anchoring rods when heavy fixed jib is mounted in the angle of 20° to main boom.



Component parts of heavy fixed jib rear anchoring rods

Part No.	Description	illustration
1	sleeve	
2	Cotter pin	 ISO1234-1997 (0.16"×1.2")
3	Nut	 ISO4032-1999 (M20-8)
4	Bolt	 ISO4014-1999 (M20×8"-8.8)
5	Anchoring rod	
6	Single-anchoring rod	
7	Double-anchoring rod	

8	Pin spindle	
9	Retaining pin	
10	Single-anchoring rod	
11	Coupling link	
12	Double-anchoring rod	
13	Reducing piece	
14	Pin spindle	

15	Cotter pin	 ISO1234-1997 (0.4"×3.6")
16	Reducing double anchoring rod	



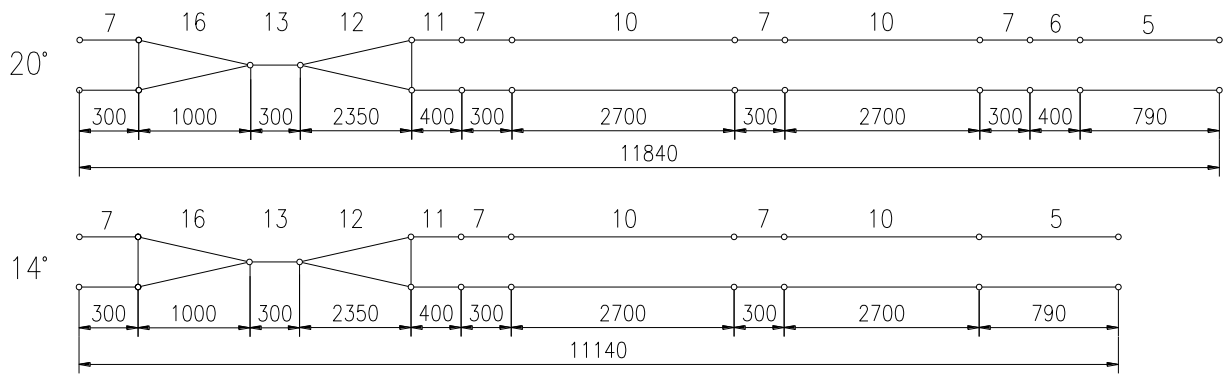
Note:

The part numbers of anchoring rods given in Section 5.7.4.2—b “heavy fixed jib rear anchoring rods” are consistent with those in the above table, so the component parts of anchoring rods can be found by referring to the part numbers when assembling.

Combination of heavy fixed jib rear anchoring rods is shown in the following table

Combination of heavy fixed jib rear anchoring rods

Heavy fixed jib angle to main boom	Length of heavy fixed jib rear anchoring rods (ft)	Combination of heavy fixed jib rear anchoring rods (between main boom to FA-frame)
20°	(42'8")	7+16+13+12+11+7+10+7+10+7+6+5
14°	(35'7")	7+16+13+12+11+7+10+7+10+5

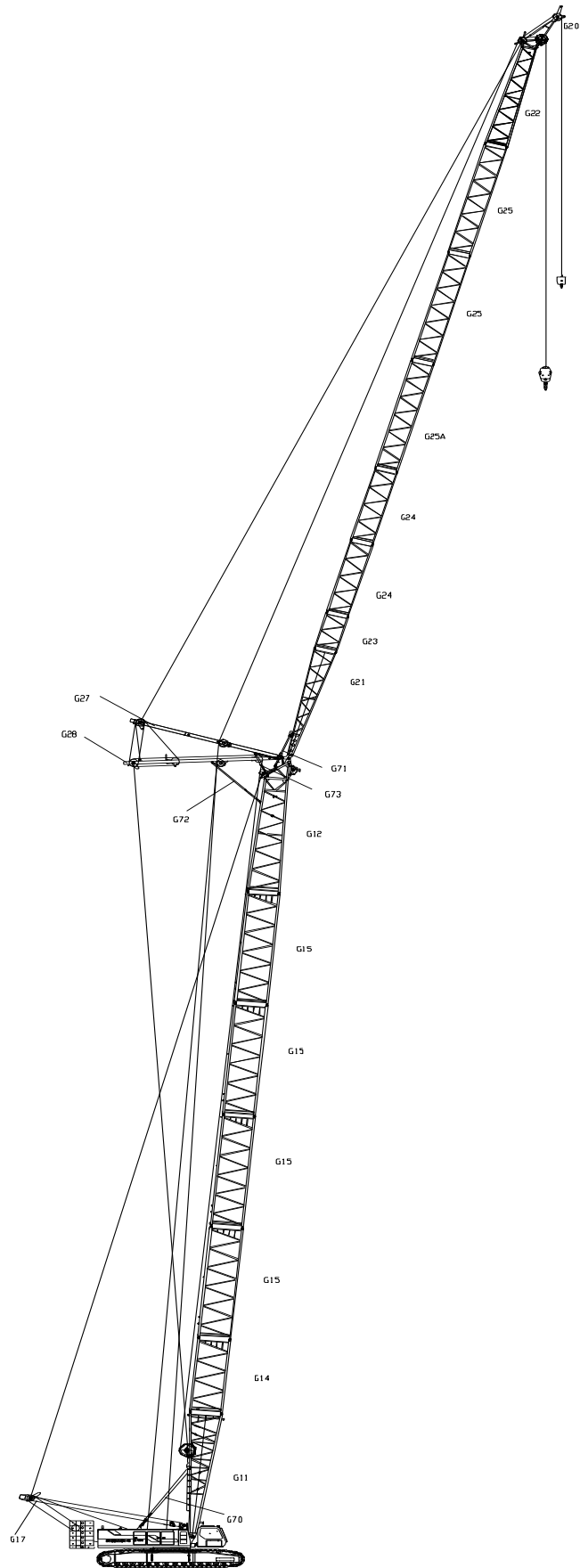


5.7.5 Luffing jib on heavy duty boom (SW)

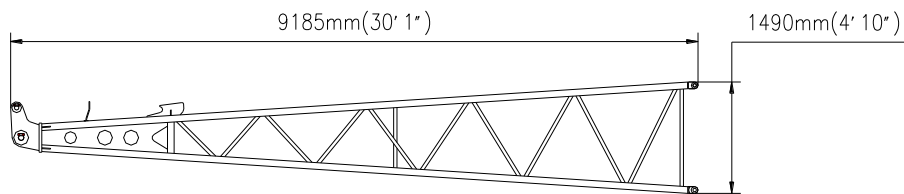
5.7.5.1 Components of luffing jib

The luffing jib, whose length varies from **68'10"~196'10"**, comprises luffing jib pivot section (G21), luffing jib head (G22) and an optional number of luffing jib intermediate sections **9'10"** (G23), **19'8"** (G24) and **29'6"** (G25, G25A) in length.

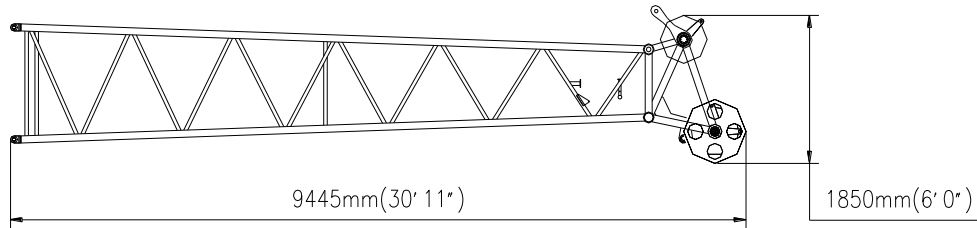
203'4" long main boom with **196'10"** luffing jib, overview:



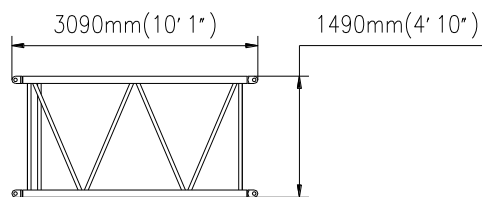
Luffing jib pivot section (G21)



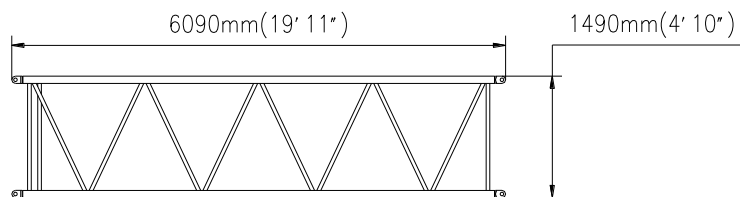
Luffing jib head (G22)



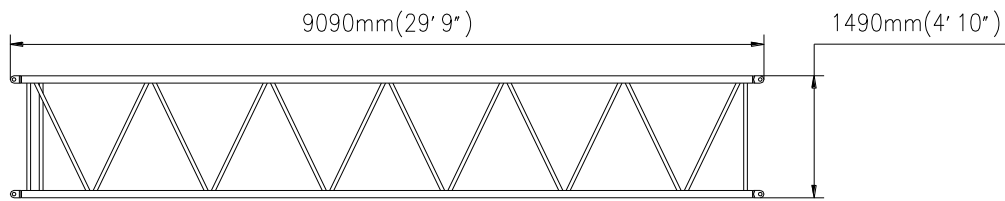
(9' 10") luffing jib intermediate section (G23)



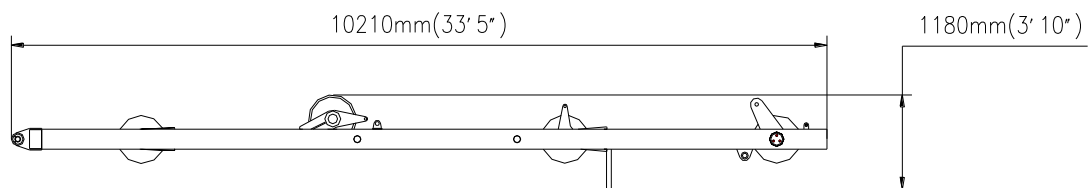
(19' 8") luffing jib intermediate section (G24)



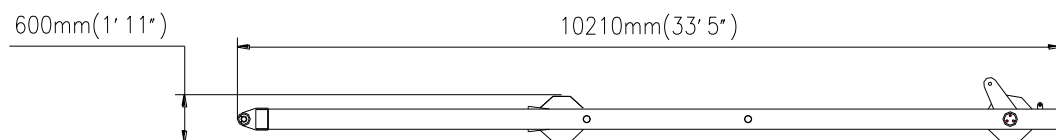
(29' 6") luffing jib intermediate section (G25,G25A)



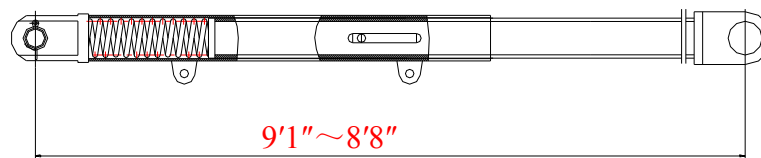
WA-frame 2 (G28)



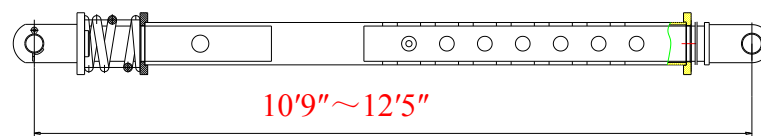
WA-frame 1 (G27)



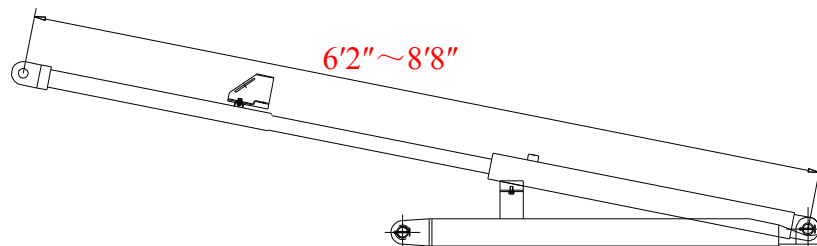
Tilting-back support of luffing jib (G71)



Tilting-back support of WA-frame 2 (G72)



Tilting-back support accumulator cylinder for WA-frame 1 (G73)



When different luffing jib length is required, operator only needs to disconnect luffing jib pivot section from luffing jib head, and then install luffing jib intermediate sections between them. In this way, the luffing jib can be assembled to required length.

Combination of luffing jib sections:

Combination of luffing jib sections

Luffing jib length(ft)	assembly sequence of luffing jib sections	Luffing jib length(ft)	assembly sequence of luffing jib sections
(59'0")	G21+G22	(137'9")	G21+G24+2×G25+G22
(68'10")	G21+G23+G22	(147'7")	G21+3×G25+G22
(78'8")	G21+G24+G22	(157'5")	G21+G23+3×G25+G22
(88'6")	G21+G25+G22	(167'3")	G21+G24+3×G25+G22
(98'5")	G21+G23+G25+G22	(177'1")	G21+G23+G24+3×G25+G22
(108'3")	G21+G24+G25+G22	(187'0")	G21+3×G25+G24+G24+G22
(118'1")	G21+2×G25+G22	(196'10")	G21+G23+G24+G24+3×G25+G22
(127'11")	G21+G23+2×G25+G22		

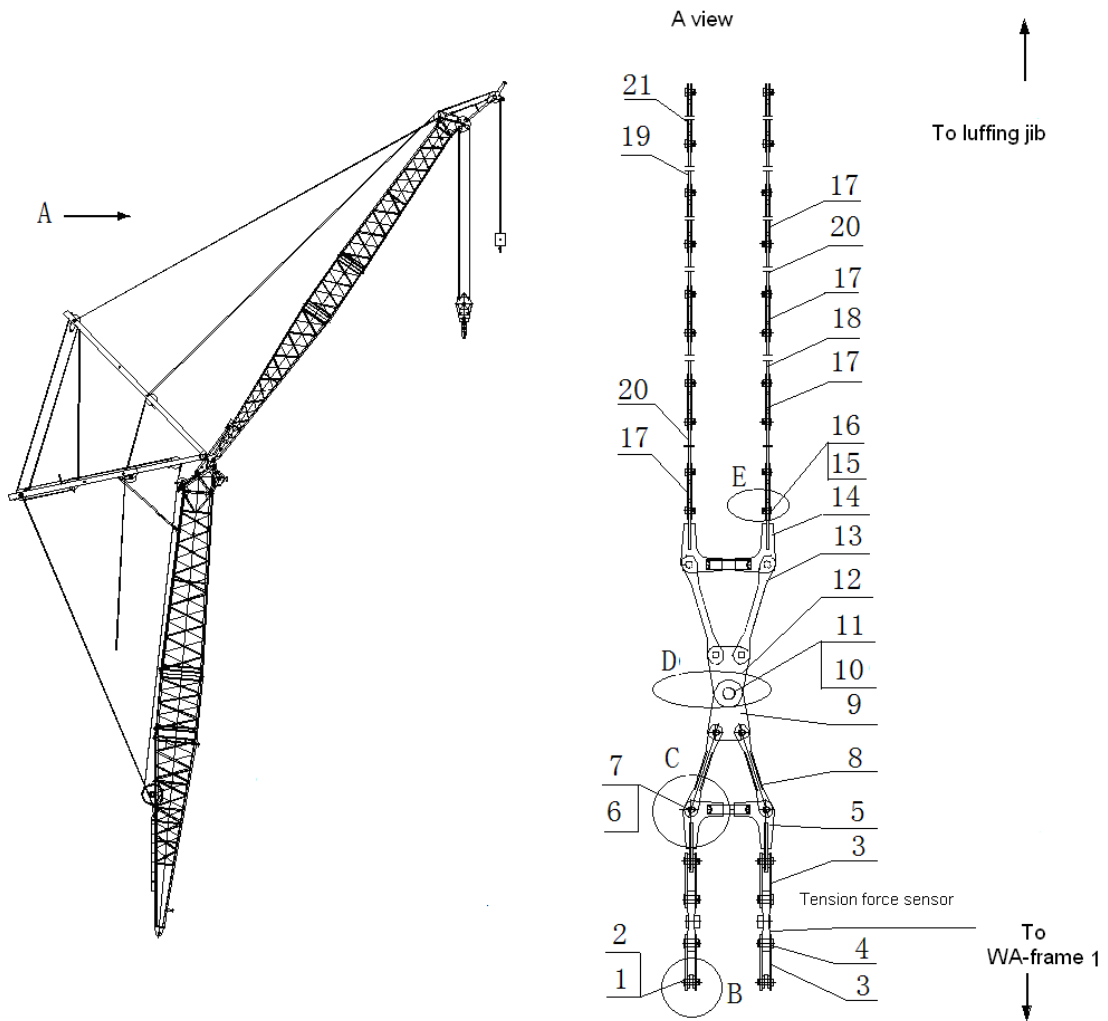
Principle for assembling luffing jib sections: when connecting jib intermediate sections, always bolt the shorter intermediate sections first.

5.7.5.2 Components of luffing jib anchoring rods

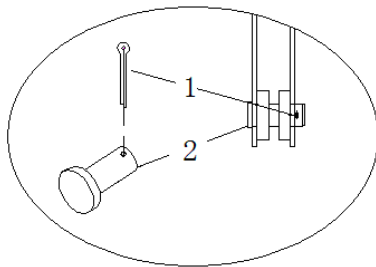
The luffing jib anchoring rods comprises luffing jib front anchoring rods and luffing jib rear anchoring rods. Their lengths are respectively determined by the length of luffing jib and length of main boom. The width of luffing jib front anchoring rods is 2", and the diameter of pin spindle is $\phi 1.8"$.

a) Luffing jib front anchoring rods

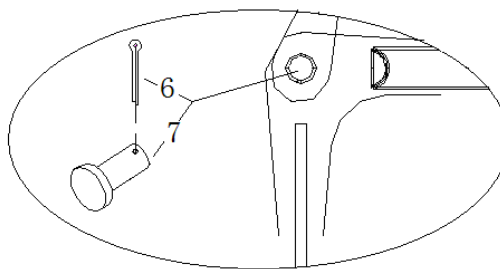
When main boom is 75'5" long, and the luffing jib is 68'10" long, the combination of the luffing jib front anchoring rods is shown in the following figure.



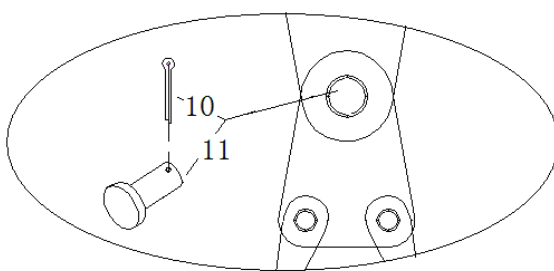
B



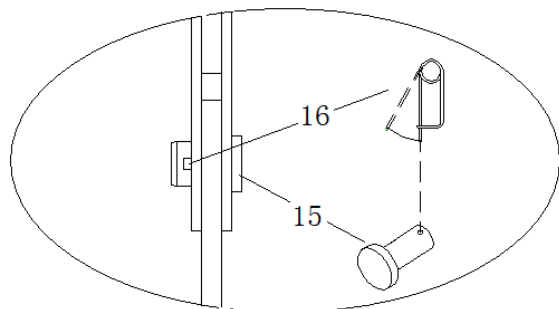
C



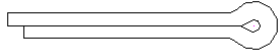
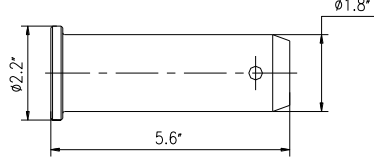
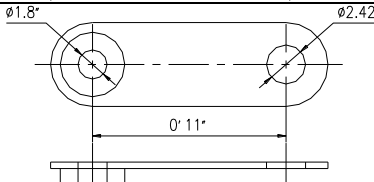
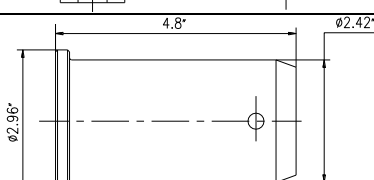
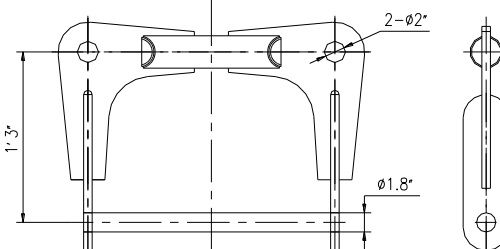
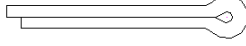
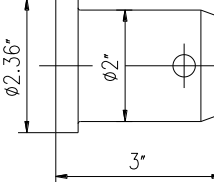
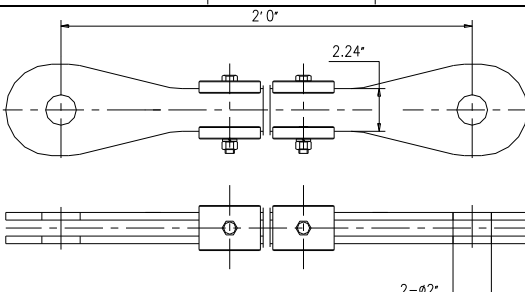
D



E



Component parts of luffing jib front anchoring rods

Part No.	Description	illustration
1	Cotter pin	 ISO1234-1997 (0.24"×3.2")
2	Pin spindle	
3	Anchoring rod	
4	Pin spindle	
5	Coupling link	
6	Cotter pin	 ISO1234-1997 (0.4"×3.6")
7	Pin spindle	
8	Double-anchoring rod	

9	Reducing piece (single)	
10	Cotter pin	 ISO1234-1997 (0.4"×4.8")
11	Pin spindle	
12	Reducing piece (double)	
13	Single anchoring rod	
14	Coupling link	
15	Pin spindle	
16	Retaining pin	

17	Double-anchoring rod	
18	Single anchoring rod	
19	Single anchoring rod	
20	Single anchoring rod	
21	Double-anchoring rod	
22	Single anchoring rod	
23	Double-anchoring rod	

24	Single anchoring rod	
25	Double-anchoring rod	
26	Single anchoring rod	



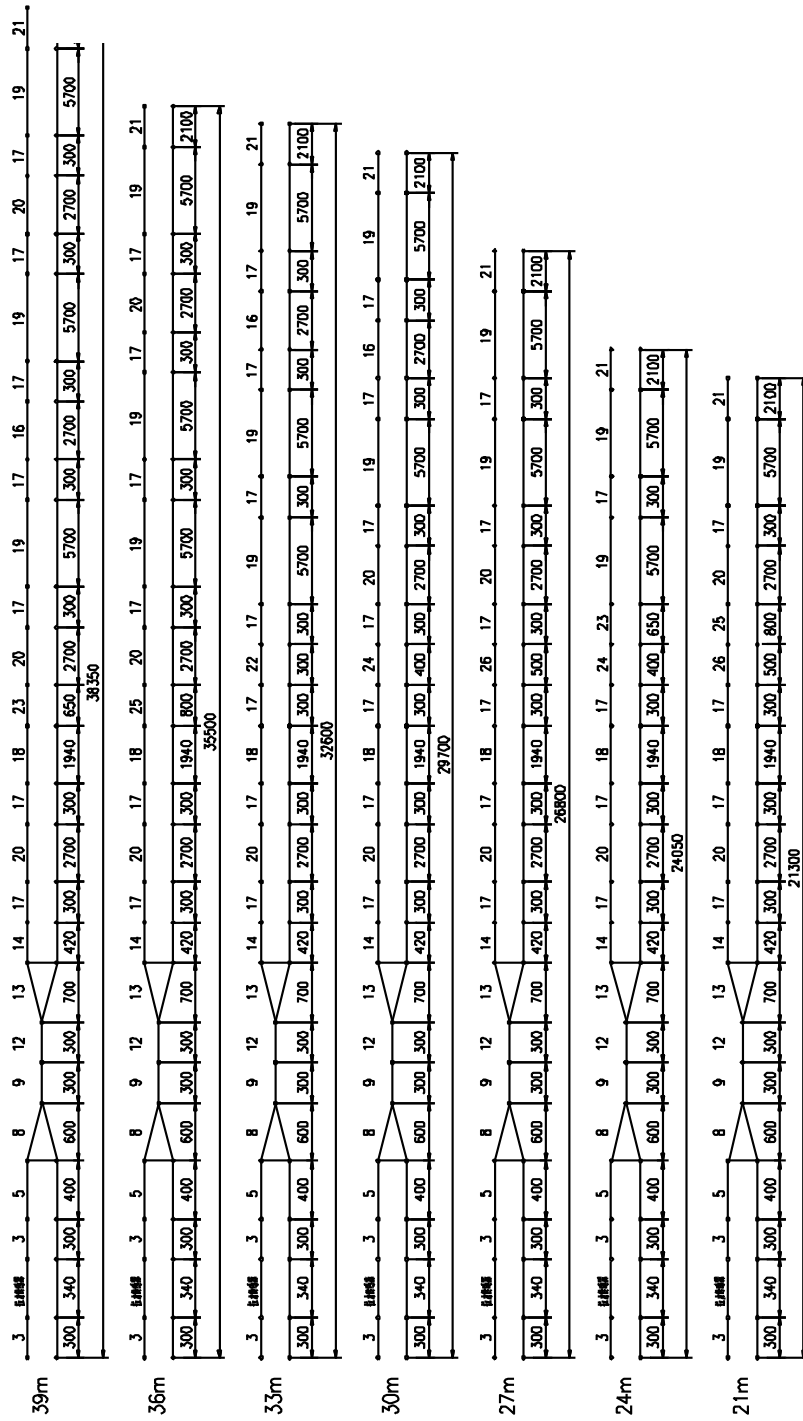
Note:

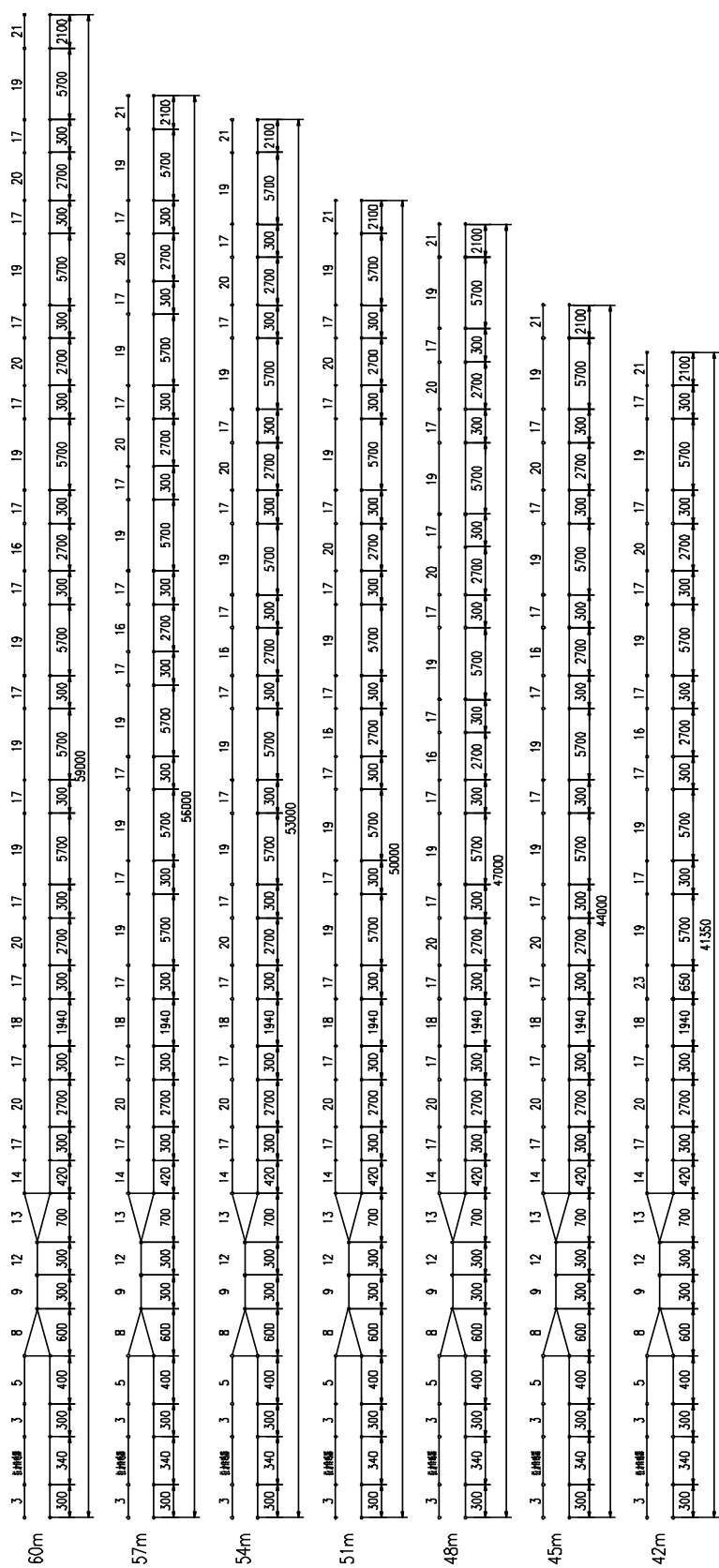
The part numbers of anchoring rods given in Section 5.7.5.2—a “luffing jib front anchoring rods” are consistent with those in the above table, so the component parts of anchoring rods can be found by referring to the part number when assembling.

Combination of luffing jib front anchoring rods:

Connecting diagram of luffing jib front anchoring rods

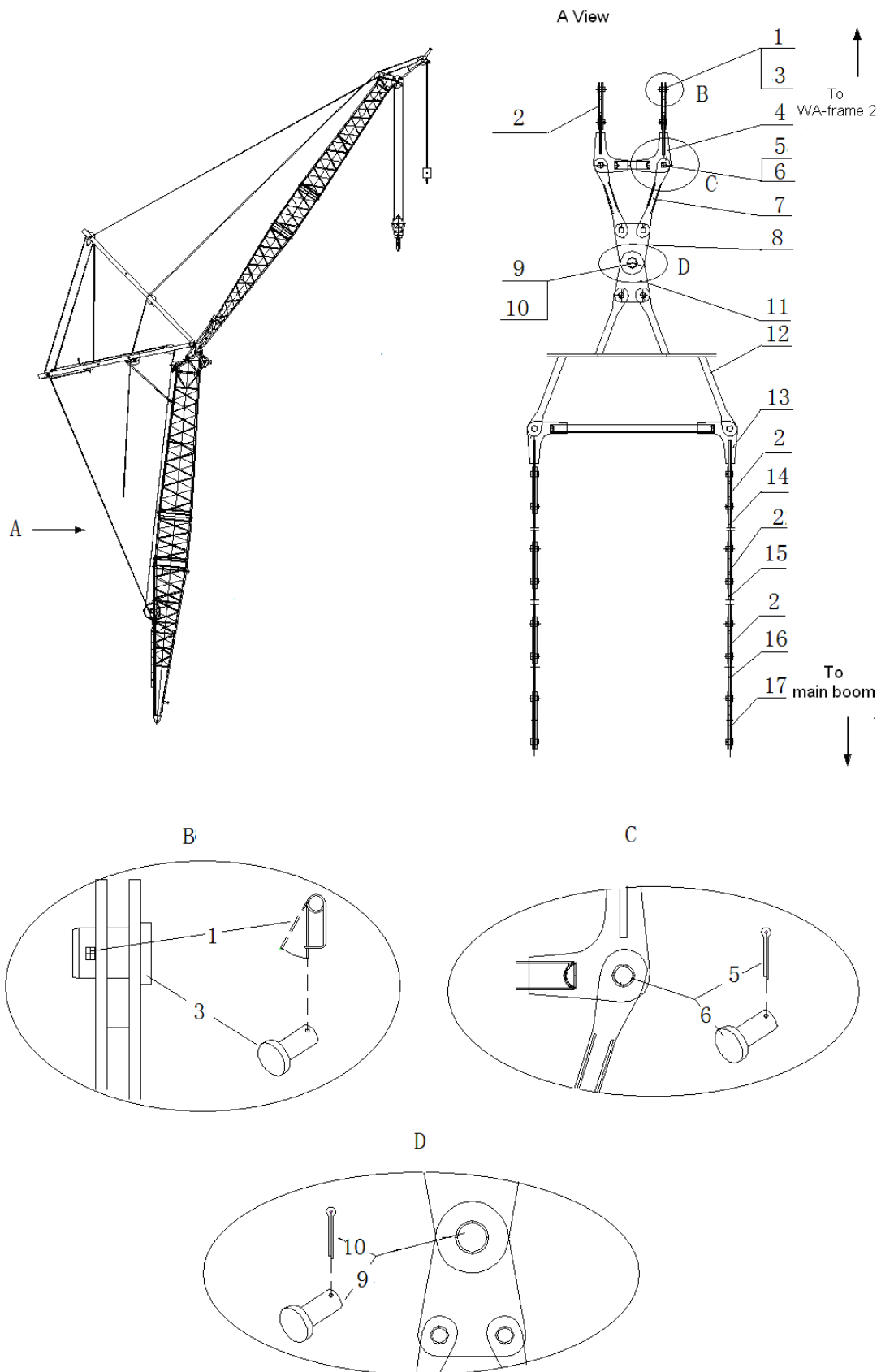
Connecting diagram of luffing jib front anchoring rods



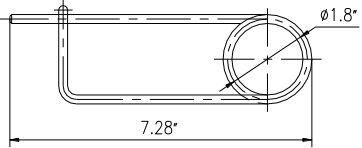
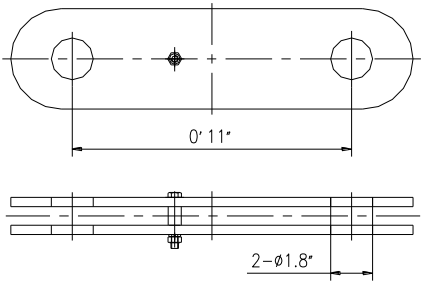
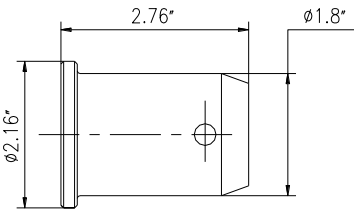
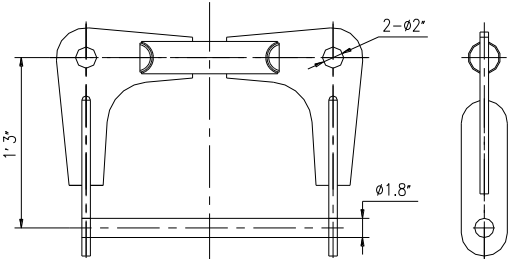
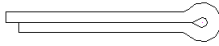
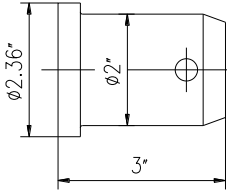


b) Luffing jib rear anchoring rods

When main boom is 75'5" long, and the luffing jib is 68'10" long, the combination of the luffing jib rear anchoring rods is shown in the following figure.



Component parts of luffing jib rear anchoring rods

Part No.	Description	illustration
1	Retaining pin	
2	Double anchoring rod	
3	Pin spindle	
4	Coupling link	
5	Cotter pin	 ISO1234-1997 (0.4"×3.6")
6	Pin spindle	

7	Single anchoring rod	
8	Reducing piece(single)	
9	Pin spindle	
10	Cotter pin	ISO1234-1997 (0.4"×4.8")
11	Reducing piece(double)	
12	Single anchoring rod	

13	Coupling link	
14	Single anchoring rod	
15	Single anchoring rod	
16	Single anchoring rod	
17	Double anchoring rod	



Note:

The part numbers of anchoring rods given in Section 5.7.5.2—b “ luffing jib rear anchoring rods” are consistent with those in the above table, so the component parts of anchoring rods can be found by referring to the part numbers when assembling.

Connecting diagram of luffing jib rear anchoring rods

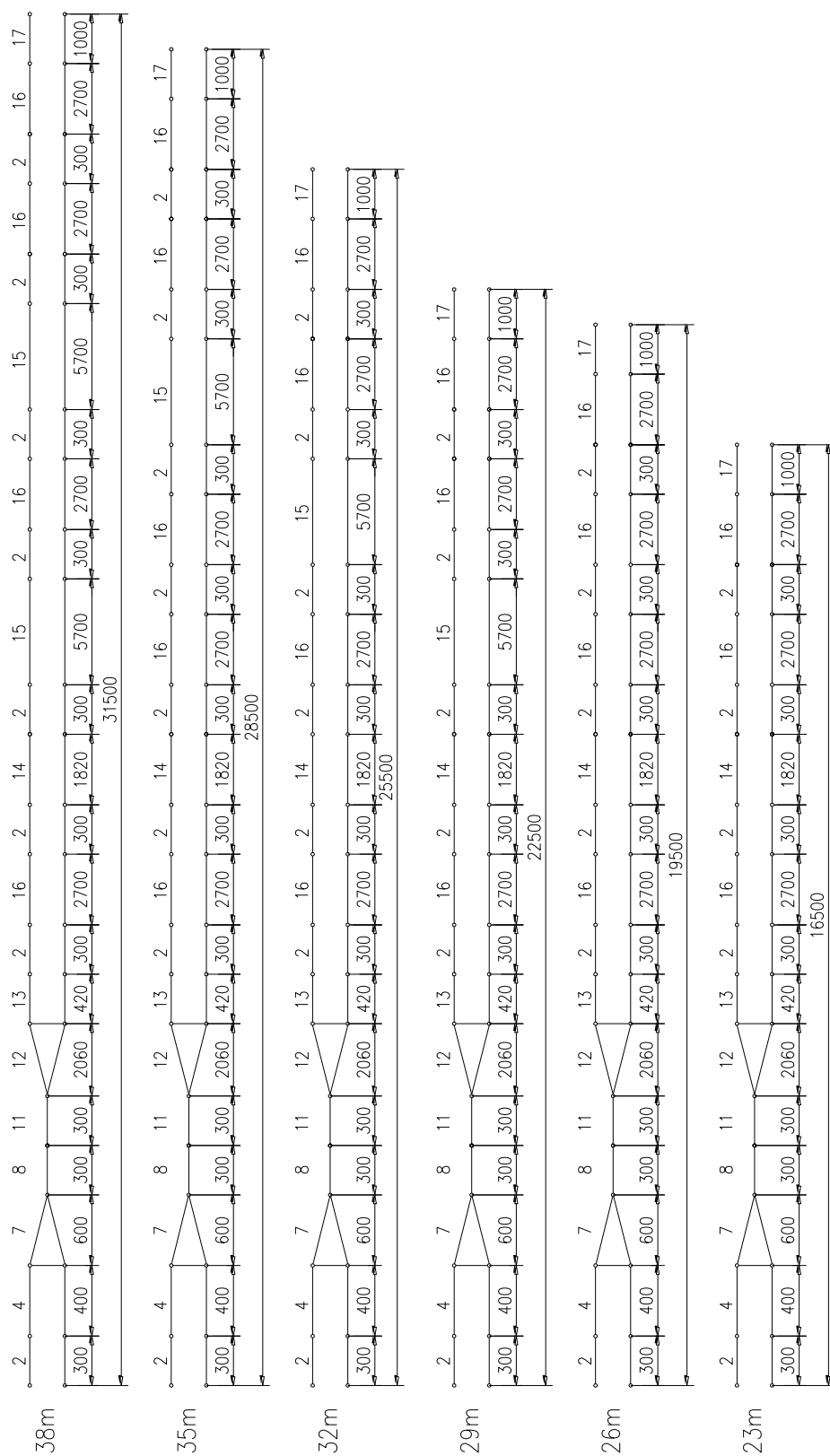


Figure 1 displays schematic diagrams of the bridge deck cross-sections for spans ranging from 62m to 41m. The diagrams illustrate the structural layout, including the main deck, side girders, and various dimensions. Key dimensions and labels include:

- Span Lengths:** 62m, 59m, 56m, 53m, 50m, 47m, 44m, 41m.
- Deck Widths:** 55500, 52500, 49500, 46500, 43500, 40500, 37500, 34500.
- Labels:** 2, 4, 7, 8, 11, 12, 13, 14, 15, 16, 17, 300, 400, 600, 1820, 2060, 2700, 300, 5700, 7000, 1000.

5.8 Assembly and dismantling of heavy duty boom(S)



Note:

Before assembly or dismantling, set the “Boom configuration” switch to “main boom” position.

5.8.1 Preparations for assembly

- a) Choose appropriate boom combination and relevant anchoring rods combination according to operational planning and load capacity chart;
- b) Choose appropriate load hook and rope reeving for load to be lifted;
- c) Assemble required counterweight plates;
- d) Make sure that an auxiliary crane is available and operating personnel get full prepared and qualified for operation;
- e) Change the “operating mode” into “assembly mode”.

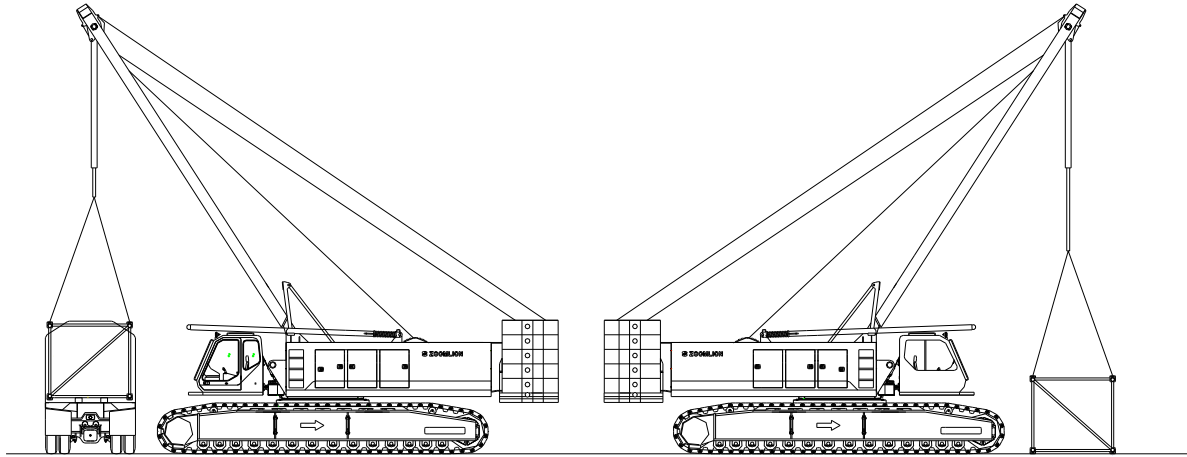


Caution:

1. After the “operating mode” is changed to “assembly mode”, all safety devices built in the crane will be deactivated, the assembly, dismantling of the machine must be therefore carried out with utmost care.
2. For assembly work on the crane, a safety assembly working platform must be used. Improvisations are prohibited. Otherwise, there is a danger of falling down.
3. Any other boom configurations and anchoring rods combination that have not been stipulated in the operating manual are prohibited.
4. Always bolt on the shorter intermediate sections first!
5. If the main boom head is lifted by an auxiliary crane, at least two pieces of lifting chain with a breaking force $\geq 33100\text{lb}$ should be used.
6. Do not stand on the lattice boom when it is assembled.
7. Do not stand beneath the boom when it is being pinned or unpinned !
8. The use of squared timbers or pad block to support the chord in the middle position or web members is prohibited; otherwise the boom sections will be damaged.

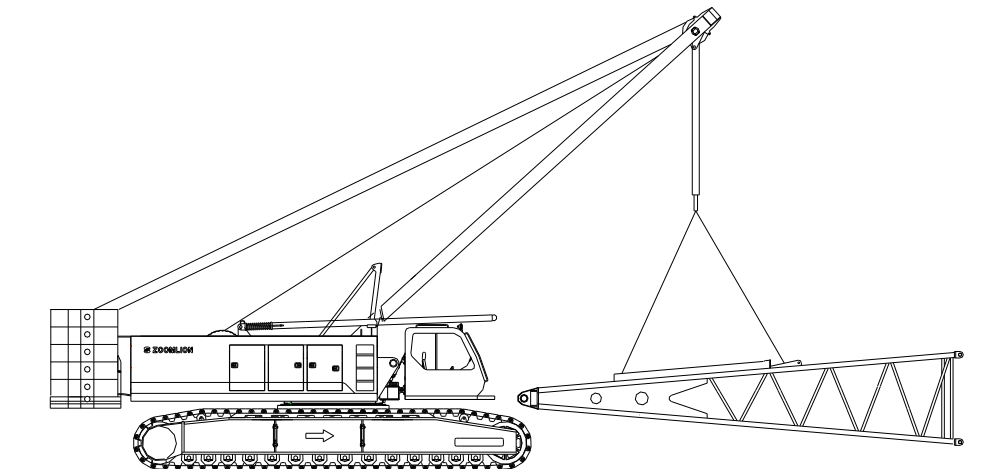
5.8.2 Assembling main boom

After unloading the basic machine, unload each boom section from the transport vehicle via mounting cylinder on A-frame, and then attach such boom components as main boom head, main boom intermediate sections according to actual working requirement.

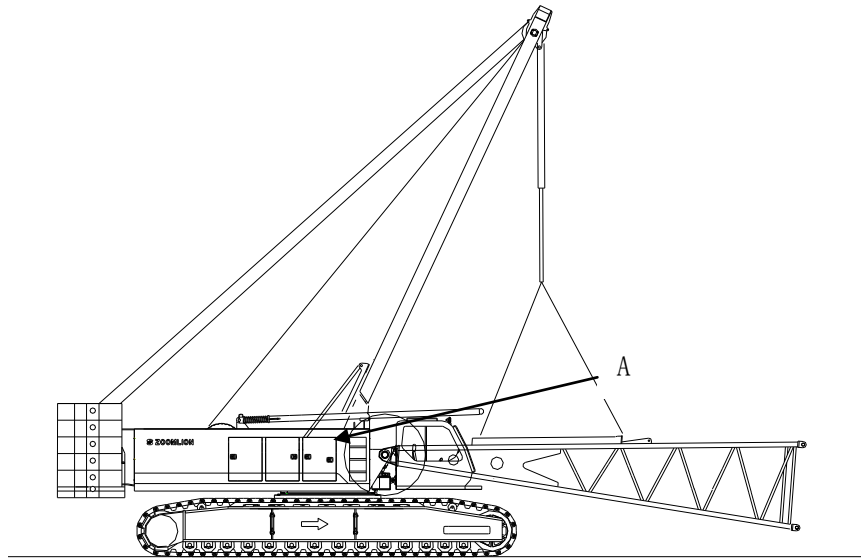


5.8.2.1 Pinning on main boom pivot section

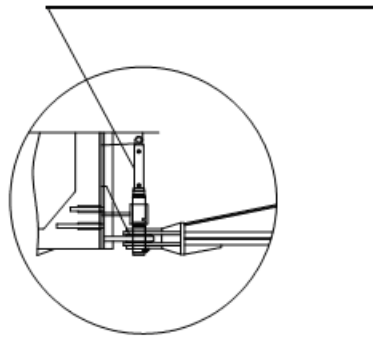
- a) After unloading the main boom pivot section from the transport vehicle, connect it to the mounting cylinder on A-frame with two lifting chains.



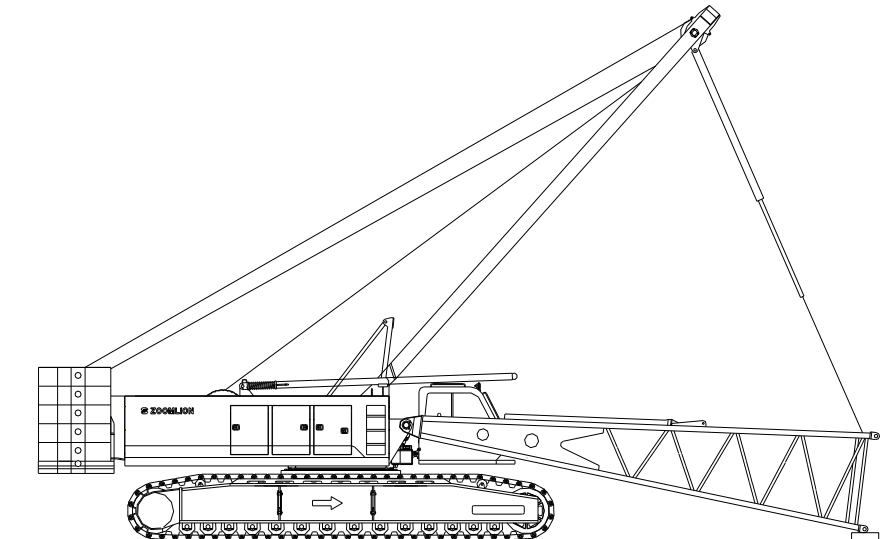
- b) - Derrick the A-frame up or down to proper position by moving the right control lever(27) to left or right
- turn the “self assembly& dismantling” switch (55) on the right control panel to the right
 - adjust the mounting cylinder on A-frame by pushing the right control lever(27) forwards or backwards;
- c) Align the main boom pivot section with connecting points on slewing table.



A pivot section bolting cylinder



- d) Activate the “pivot section bolting cylinder” switch on auxiliary remote control box to extend the pivot section bolting cylinder, and then fit the locking plate. In this way, the main boom pivot section is pinned on.
- e) Remove the lifting chains from the pivot section.



5.8.2.2 Attaching main boom sections

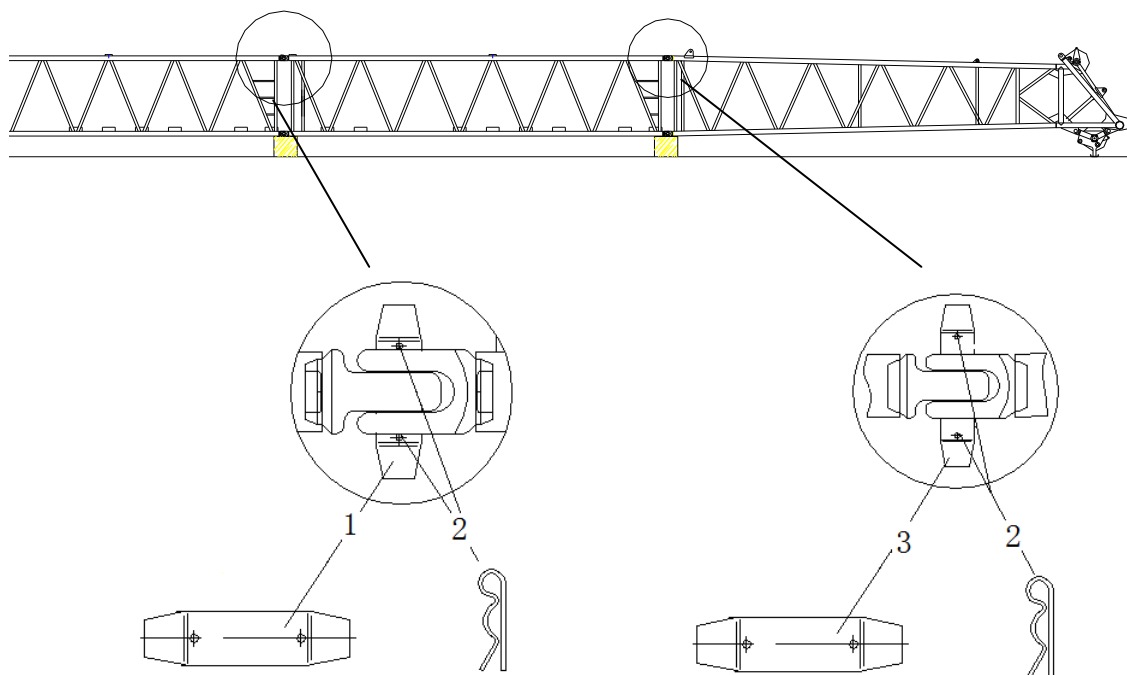
a) Preassemble main boom sections according to Section 5.7.1“heavy duty boom”. For detailed operation, refer to following methods:

— Pin main boom intermediate sections of 3m, 6m or 9m to each other in the following sequence:

1. Position two intermediate sections to be pinned in such a way that the connection holes in one intermediate section are precisely aligned with those in the other intermediate section (see following figure).
2. Join them with double tapered pins (1) and secure on both sides with retaining springs (2).
3. Join the other connecting holes in the same way.

— Pin main boom head to the assembled intermediate sections in the following sequence:

1. Position the assembled intermediate section in such a way that the upper connecting holes in it are aligned with those in the main boom head.
2. Join the upper connecting holes with double tapered pins (3) and secure with retaining springs (2)
3. Join the lower connecting holes in the same way.

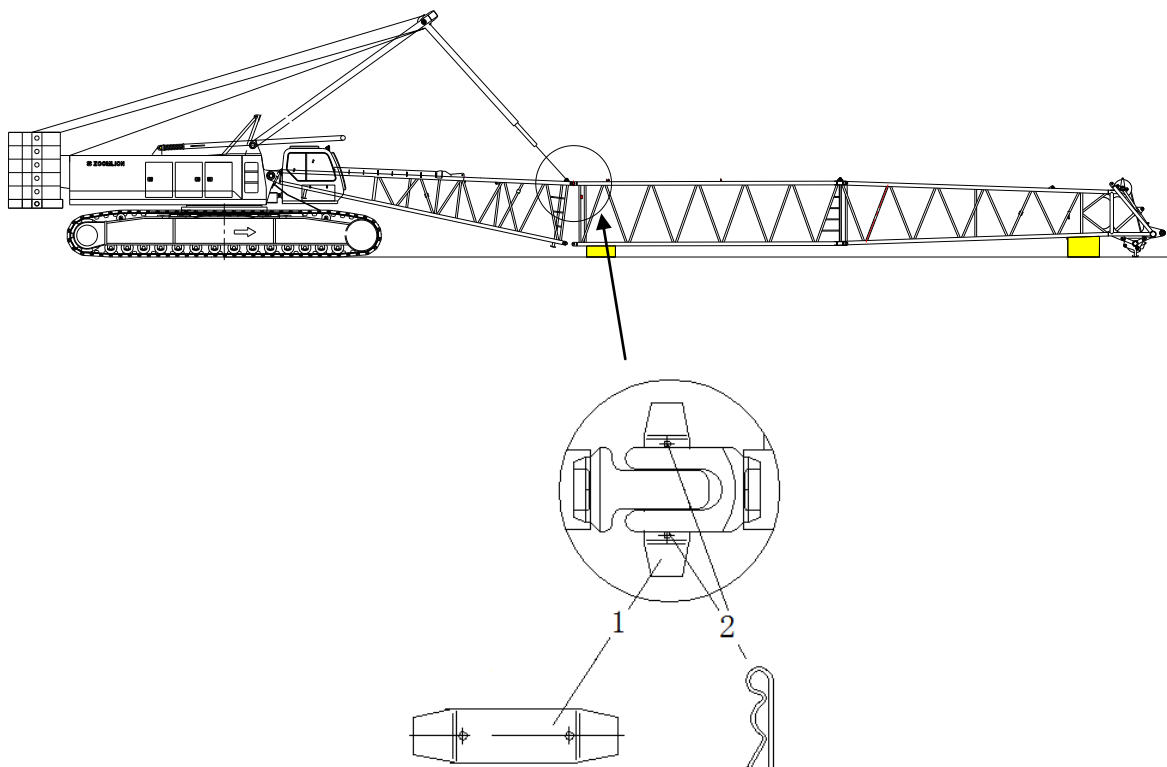


Connecting parts of main boom section

Part No.	Description	illustration
1	Double tapered pin	
2	Retaining spring	
3	Double tapered pin	

b) Attaching the preassembled main boom to main boom pivot section.

1. Slowly drive the basic machine with main boom pivot section attached up to the preassembled main boom.
2. Adjust the A-frame position by moving the right control lever (27) left or right to make the upper connecting holes in adjacent main boom intermediate section are aligned with the connecting holes in pivot section.
3. Join the upper connecting holes with double tapered pins (1) and secure properly on both sides with retaining springs (2).
4. Adjust the mounting cylinder on A-frame until the lower connection holes in pivot section are aligned with those in adjacent main boom intermediate section.
5. Join the lower connecting holes with double tapered pins (1) and secure on both sides with retaining springs (2).
6. Disconnect the main boom pivot section from mounting cylinder on A-frame by removing the lifting chain.



Connecting parts of pivot section

Part No.	Description	illustration
1	Double tapered pin	
2	Retaining spring	



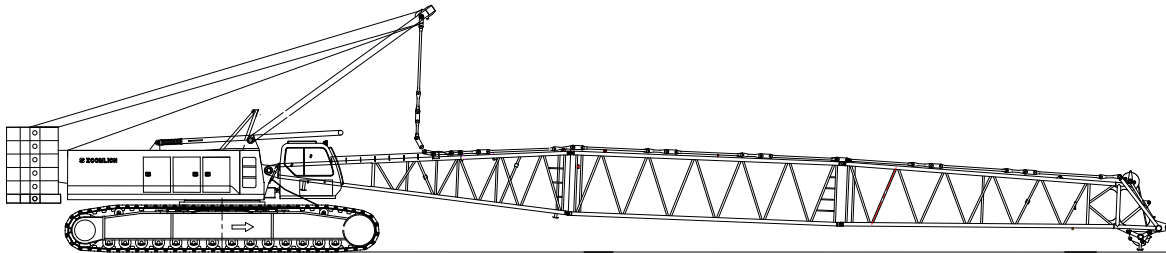
Warning:

1. It is prohibited to put hand or fingers into the connecting hole during installation.
2. While the connecting pin is being removed, no person is allowed to stand beneath or in the boom.
3. It is prohibited to climb up the boom, and stand or walk on the boom.
4. Utilize a ladder or other similar tools to carry out assembly operation.

5.8.2.3 Assembling main boom anchoring rods and reeving in rope

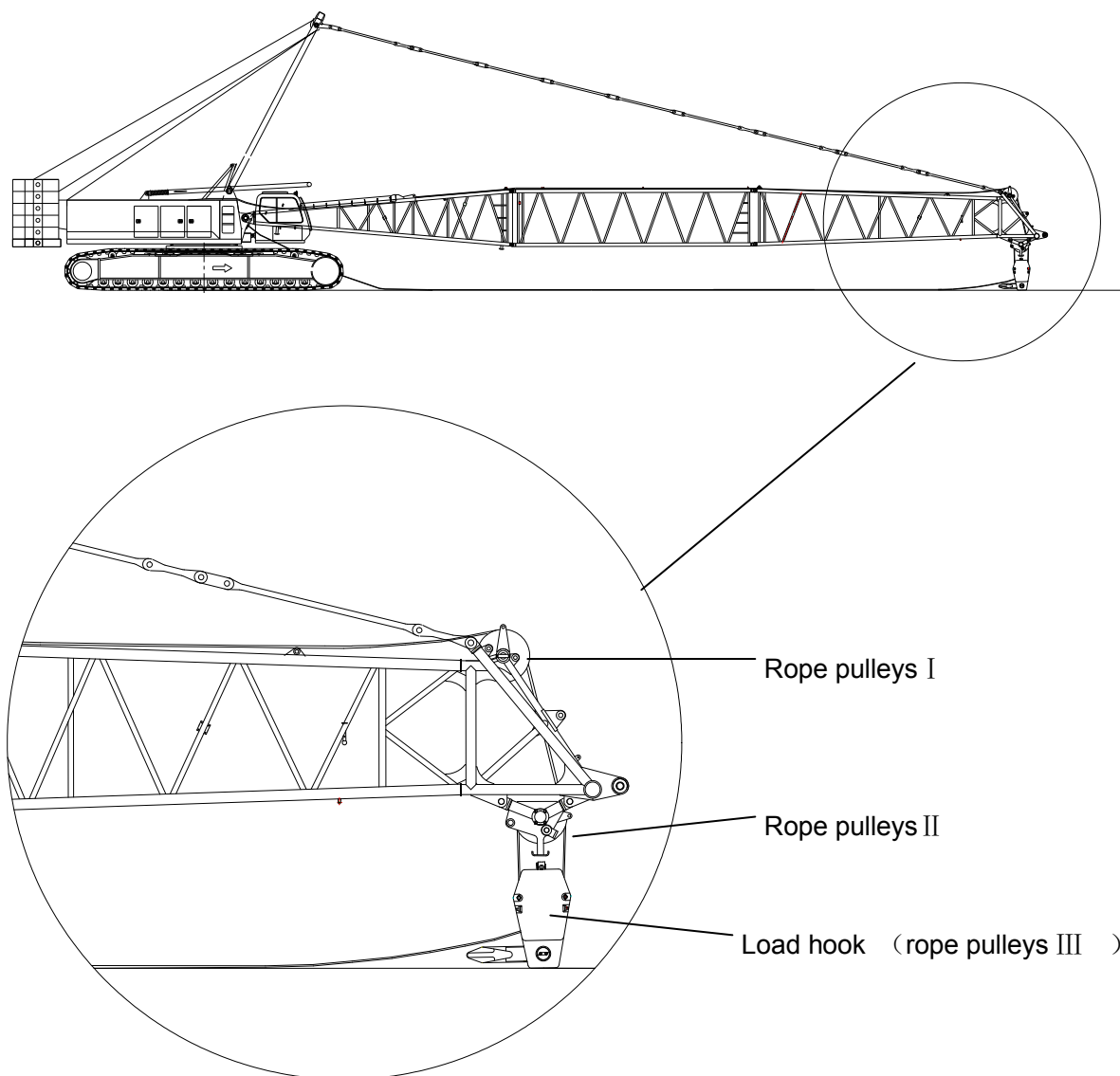
a) Assembling main boom anchoring rods:

Connect the anchoring rods on A-frame and on main boom pivot section together, and then attach anchoring rods of main boom intermediate section and anchoring rods of main boom head to each other by pin spindles and secure them with retaining pins. (The arrangement and combination of main boom anchoring rods are specified in Section 5.7.1.3).



b) Reeving hoisting winch 1 in:

- 1) Move the right control lever(27) to the left to wind the derricking rope until the main boom head is raised to a proper position a littler higher than the load hook, and then position the load hook directly under the main boom head.
- 2) Turn the switch (60) to right or push down the “reeving winch” on the remote control box to unwind the rope of reeving winch until it approach the load hook. Reeve the rope of reeving winch in the reverse direction between the load hook and the rope pulleys on main boom head and then pull it to tail-end of main boom (for the details, please refer to Section 4.5.3.3 “Operation of reeving winch”).
- 3) Push the right control lever (27) forwards to unwind hoisting rope for winch 1 until it reaches the tail-end of main boom. Attach rope end point of reeving winch to hoisting rope for winch 1 with rope lock (see following figure).
- 4) Turn the switch (60) to left or push the “reeving winch” on the remote control box up to wind the rope of reeving winch, simultaneously unwind the hoisting rope for winch 1. Guided by the rope of reeving winch, the hoisting rope for winch 1 will then reeve between the rope pulley and load hook. After that, stop operation on winch 1 and reeving winch, detach the rope lock. Finally, spool up the reeve winch to wind the rope end point onto the reeving winch.

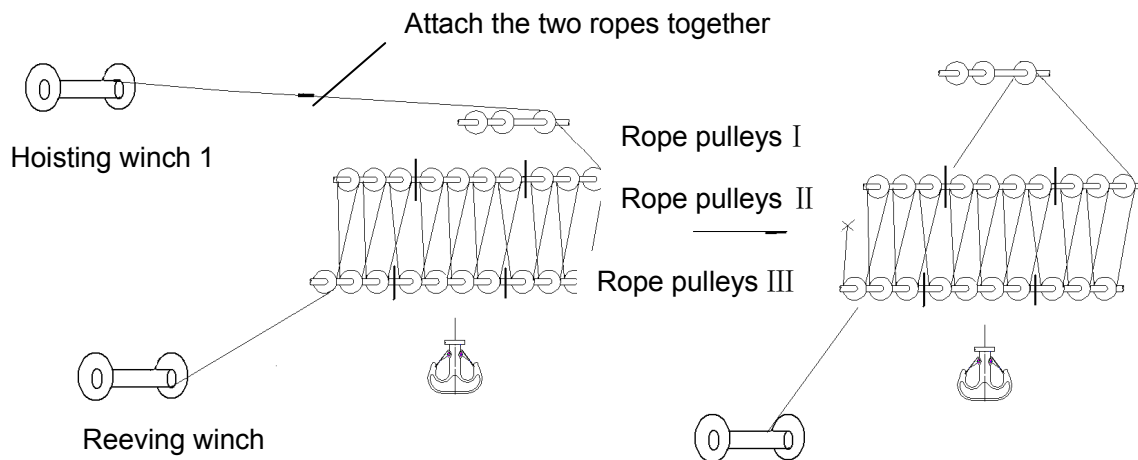


Hoisting rope reeving method for 260t load hook, for example, will be detailed here:

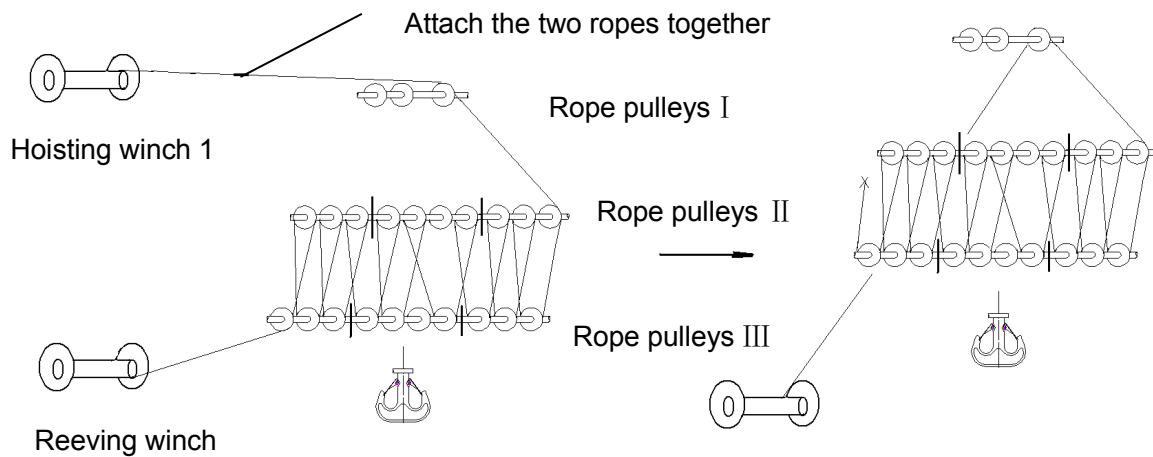
- According to the method stipulated in Section 4.6.1.1 “hoisting rope reeving for winch 1”, reeve the rope of reeving rope in the reverse direction between rope pulleys III and rope pulleys II on main boom head and then through the rope pulleys I.
- Attach rope end point of reeving winch to hoisting rope for winch 1 with rope lock.
- Wind the rope of reeving winch and simultaneously unwind the hoisting rope for winch 1. Guided by the rope of reeving winch, the hoisting rope for winch 1 will then reeve in desired direction between the rope pulleys and load hook (see following figures.).

Rope reeving plans (the hoisting rope is led by rope of reeving winch):

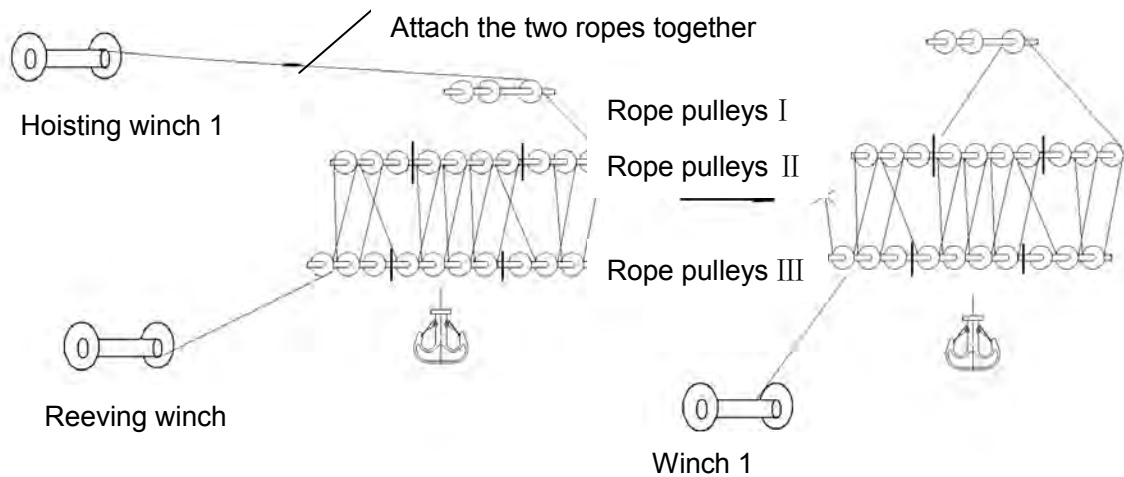
573300 lb load hook (rope reeving: 20)



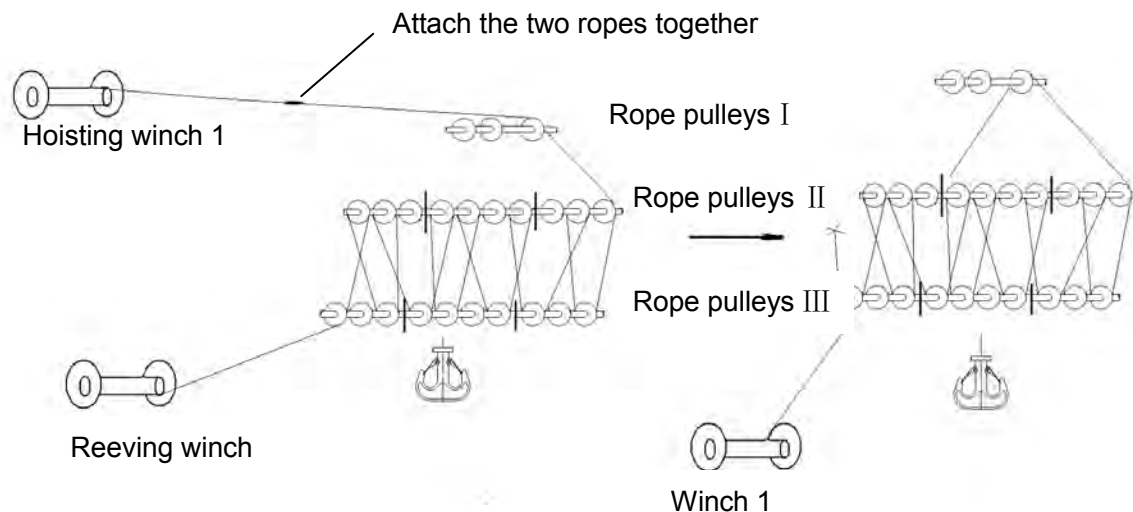
573300 lb load hook (rope reeving: 18)



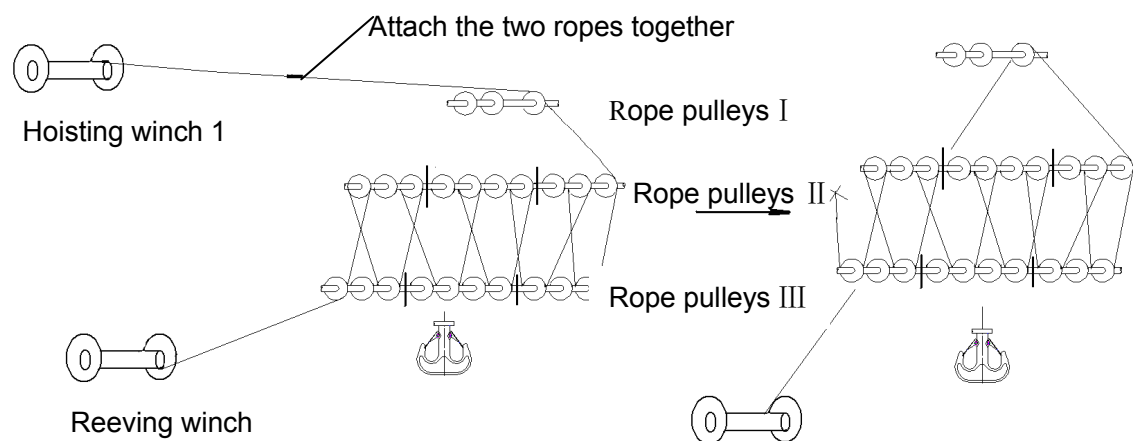
573300 lb load hook (rope reeving: 16)



573300 lb load hook (rope reeving: 14)



573300 lb load hook (rope reeving: 12)



Caution:

1. Working personnel who guides the wire rope should take great care to prevent against falling down when walking on the boom frame; otherwise, serious accident may occur.
2. The rope unwinding speed from winch 1 must be faster than rope-winding speed on reaving winch.

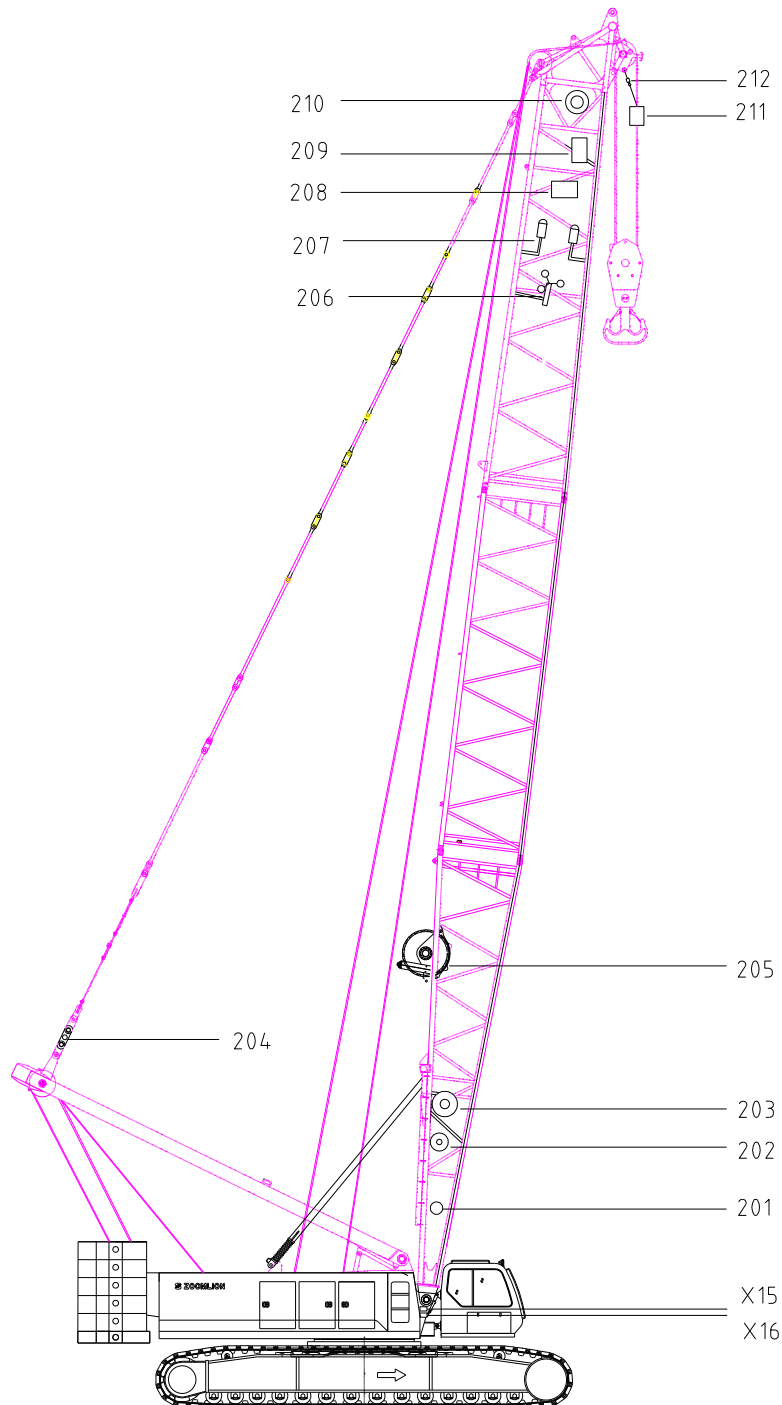
5.8.3 Connect electrics to main boom

5.8.3.1 Electrical line connections



Note:

The following figure shows the connected electrical parts on main boom. Before erecting the boom, make sure that all electrical lines are connected and safety measures are checked.



Layout of electrical parts on main boom

Part No.	Description	Installation position
X15	Socket ,10 hole	At the front of slewing table
X16	Socket ,10 hole	At the front of slewing table
201	Angle sensor	main boom pivot section
202	Cable drum 1	main boom pivot section (if luffing jib is used)
203	Cable drum 2	main boom pivot section
204	Main boom tension force sensor	anchoring rod of A-frame
205	Luffing winch	Main boom pivot section (optional)
206	anemometer	Main boom head
207	Warning lamp(2)	Main boom head
208	Main boom junction box	Main boom head
209	Control box for Load Moment Limit on luffing jib	Main boom head (if luffing jib is used)
210	Cable drum 3	Main boom head (if luffing jib or fixed jib is used)
211	Hoisting limit switch weight	Connected with hoisting rope on main boom head
212	Hoisting limit switch	Boom head, connected with hoisting limit switch weight

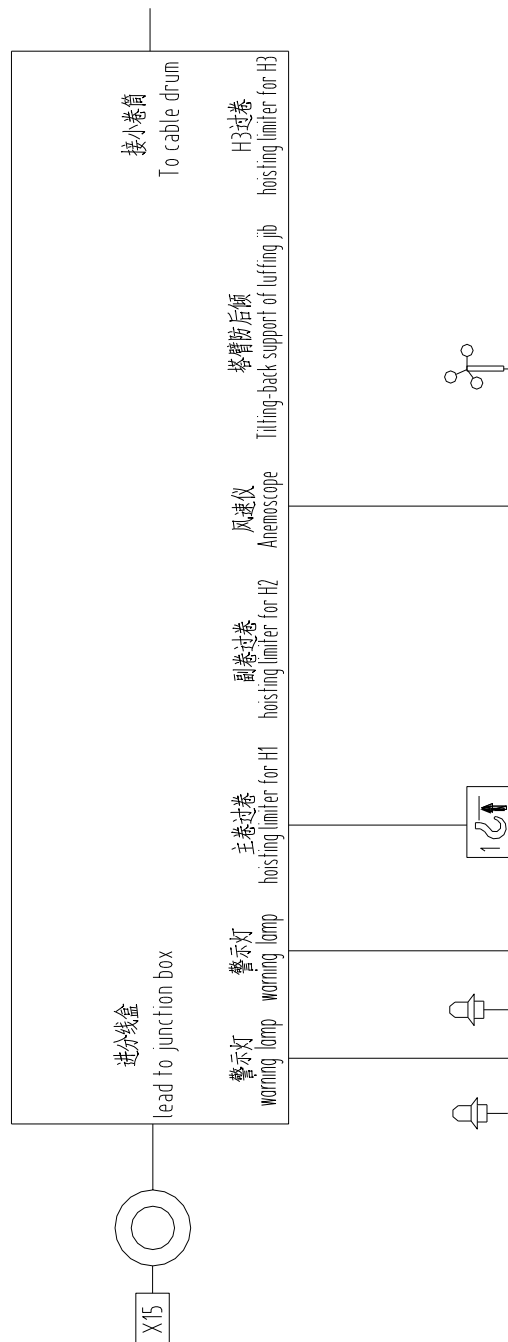
a) Connecting electrics to main boom pivot section

Insert the cable plug of X15 on main boom pivot section into the X15 socket at the front of slewing table. If a luffing winch is fitted on the main boom, insert the cable plug of X16 into the X16 socket at the front of slewing table.

b) Connecting electrics to main boom head

Unplug the cable plug of cable drum 2, pull the cable plug along the main boom and then insert it into the "lead to junction box" socket on main boom junction box. Establish the

electrical connections from the junction box on the main boom head to associated components respectively.



Description of main boom junction box:

The main boom junction box, installed on main boom head, has 9 input and output sockets in total, including:

- “lead to junction box” sockets (12-hole) on the left side, which is used to establish a connection to main boom cable drum 2
- “to cable drum” socket (12-hole) on the right side, not-assigned

Other sockets at the bottom of the junction box, from the left to right, are respectively:

- “Warning lamp” socket (2-hole), which is used to establish a connection to warning lamp on main boom head;
- “Warning lamp” socket (2-hole), which is used to establish a connection to warning lamp on main boom head
- “Hoisting limit switch for H1” socket (3-pin), which is used to establish connection to hoisting limit switch for H 1 connected to main boom head;
- “Hoisting limit switch for H2” socket (5-pin), not-assigned
- “Anemometer” socket (4-pin), used to establish a connection to anemometer on main boom head;
- “Tilting-back support of luffing jib” socket (2-pin), not-assigned
- “Hoisting limit switch for H3” socket (3-pin), not-assigned.

Establish electrical connections:

- Insert the two cable plugs of main boom warning lamps (2) into the two “warning lamp” sockets respectively in the junction box
- insert the cable plug of hoisting limiter for H1 into the “hoisting limit switch for H1” socket in the junction box.
- insert the cable plug of hoisting limiter for H2 into the “hoisting limit switch for H2” socket in the junction box.
- insert the cable plug of anemometer into the “anemometer” socket in the junction box



Caution:

Cable plug which is not used should be protected by seal cover.

c) Electrical connection to Load Moment Limiter

See the *Installation Guide & User's Manual* for Load Moment Limiter.

5.8.3.2 Checks before erecting the boom

a) Check warning lamp on main boom head

Set the Master Lighting Switch 39 (see Section 4.1.4) to the second position, and press “warning lamp on/off” switch 41 at the same time, check that the warning lamp lights up..

b) Check the anemometer

Rotate the vane of anemometer to check whether the wind velocity shown on the display in the operator's cab is normal.

c) Check hoisting limit switch for H 1

Support and hold the hoisting limit switch weight for H1 to ensure that the switch is triggered, and then check that the Icon “upper limit switch on H1” on the screen will flash and the buzzer will sound.

d) Check hoisting limit switch for H2 (when the tip boom is used)

Support and hold the hoisting limit switch weight for H2 to ensure that the switch is triggered, and then check that the Icon “upper limit switch on H2” on the screen will flash and the buzzer will sound.

5.8.4 Erecting main boom

5.8.4.1 Requirements for erecting main boom

- a) The crane is properly supported and level;
- b) The required counterweight plates have been attached;
- c) Select appropriate boom configurations according to the load to be lifted and the load capacity charts; ensure that boom sections have been connected and secured;
- d) All limit switches has been correctly fitted and are fully operational;
- e) All pinned connections have been secured;
- f) The hoisting rope has been correctly placed in the rope pulleys and prevented from jumping out (from rope groove) using rope guard tube;
- g) No person is present in the danger zone;
- h) There are no loose parts on main boom;
- i) In winter, the main boom, fixed jib and associated components (limit switches, rope drums, warning light, anemometer etc.) must be kept free of ice and snow.



Danger:

Incorrectly fitted or faulty limit switches and falling parts (pins, retaining pins, ice etc.) can cause injury.

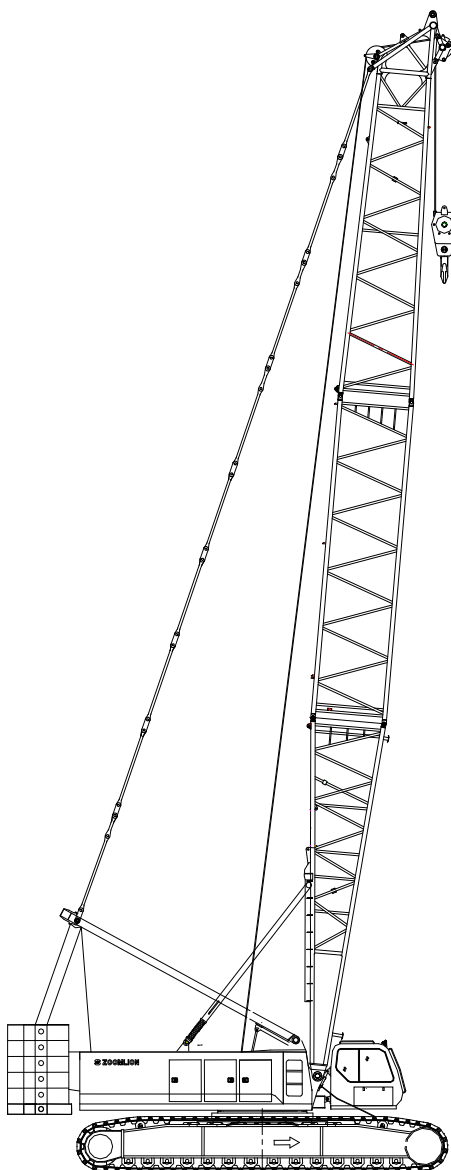
5.8.4.2 Erecting main boom

- a) Move the right control lever (27) to the left to spool derricking winch up, and the main boom anchoring rods will be tensioned gradually.

Note: During the erecting process, to prevent the load hook from being dragged on the ground, while moving the right control lever (27) in 45° direction, press the “simultaneously operation ” button(29)at the same time until main boom reaches 30° position. When the main boom reaches 30° position, the “assembly mode” will automatically be changed into “operating mode”. Then return the right control lever (27) to

neutral position.

- b) Continue to move the right control lever (27) to left until the main boom is erected to required position.



Caution:

1. The main boom angle can be changed between 0° to 85° . When main boom is raised to 80° , acoustic warning will be given out, but main boom can still be derricked up. And when main boom is raised to 83° , the movement of derricking boom up will be switched off automatically along with warning being sent out, but the main boom can still be derricked up by pressing the "bypass key button"(54). However, when main boom is raised to 85° position, the movement of derricking

boom up will be switched off automatically along with warning being sent out. Under this condition, even though “bypass key button” is pressed, the main boom can not be raised any further.

2. Always monitor the wire rope in process of erecting main boom to make sure that the wire rope is kept in the rope groove all the time.
3. The boom-raising movement should be performed slowly and stably. And during the operation, the crane operator must observe the data shown on the display, while other workers must observe the surrounding areas for potential dangers.
4. Standing beneath the boom frame is prohibited.
5. Working radius stipulated in the Load Capacity Charts should be adhered to, even if no load is attached on the load hook! Non-observance of it is likely to cause the crane turnover.

5.8.5 lowering and disassembling the main boom

5.8.5.1 Lowering main boom

- a) Move the right control lever (27) to the right to reel derricking winch off, and then the main boom will be lowered gradually. When the main boom is lowered to 30° position, return the control lever (27) to neutral position.
- b) Push the right control lever(27) forwards to reel off hoisting winch 1 to lower stably the load hook on the ground;
- c) Move the right control lever (27) to the right until the main boom head comes into contact with the ground. Return the right control lever (27) to neutral position.



Caution:

1. In the process of lowering main boom, the hoisting winch 1 must be reeled off to avoid the hook's collision with the pulley head.
2. Standing within danger area of crane during operation is prohibited.
3. The boom-lowering movement should be performed slowly and stably. And during the operation, the crane operator must observe the data shown on the display, while other workers must observe the surrounding areas for potential dangers.
4. To prevent the crane from overturning, the counterweight must be removed prior to the dismantling of main boom pivot section.

5.8.5.2 Dismantling boom sections and anchoring rods

- a) After the anchoring rods are lowered down on the anchoring rod supports on the relevant boom sections, remove the pin spindles from anchoring rods, and then secure them on anchoring rod supports with pin spindles for transportation.
- b) Separate boom sections using self-assembly system or an auxiliary crane.
- c) Lower A-frame down on the slewing table.



Note:

1. Dismantling is carried out in the reverse order to assembly.
2. Warnings and safety precautions for assembly should be followed during assembly operation.

5.9 Assembly and dismantling of main boom with luffing jib(SW)



Caution:

1. Before operation, turn the “Boom configuration” switch to “luffing jib” position.
2. The luffing jib can be derricked up or down by hoisting winch 1 or luffing winch.:

By hoisting winch 1: push the right control lever (27) forwards or backwards- derrick the jib down or up.

By luffing winch: move the right control lever(27) to left or right- derricking the jib up or down.

Only when the “Boom configuration” switch is turned to “main boom” position, can the main boom be derricked up or down by pushing the right control lever (27) forwards or backwards. In other words, if the crane operator wants to derrick main boom or luffing jib up/down, he should first turn the “Boom configuration” switch to “main boom” or “luffing jib” position.

5.9.1 Preparations for assembling luffing jib

- a) Choose appropriate boom combination and relevant anchoring rods combination according to operational planning and boom configuration.
- b) Choose the correct load hook and rope reevings for the load to be lifted;
- c) The main boom is installed;
- d) The required counterweight plates have been assembled;
- e) The safe load indicator system of Load Moment Limiter is set according to the data given

in the load capacity charts;

- f) Make sure that an auxiliary crane is available and operating personnel get full prepared and qualified for operation;
- g) Change the “operating mode” to “assembly mode”.

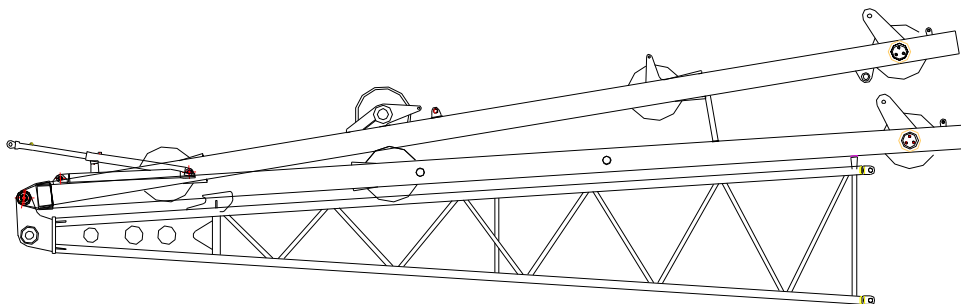


Caution:

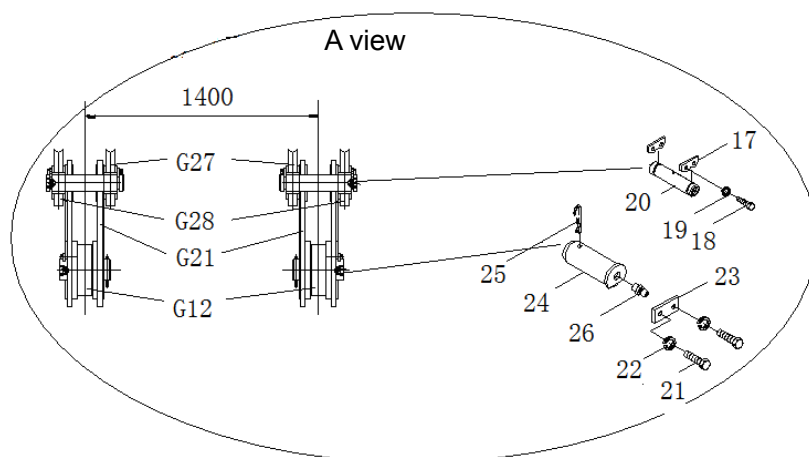
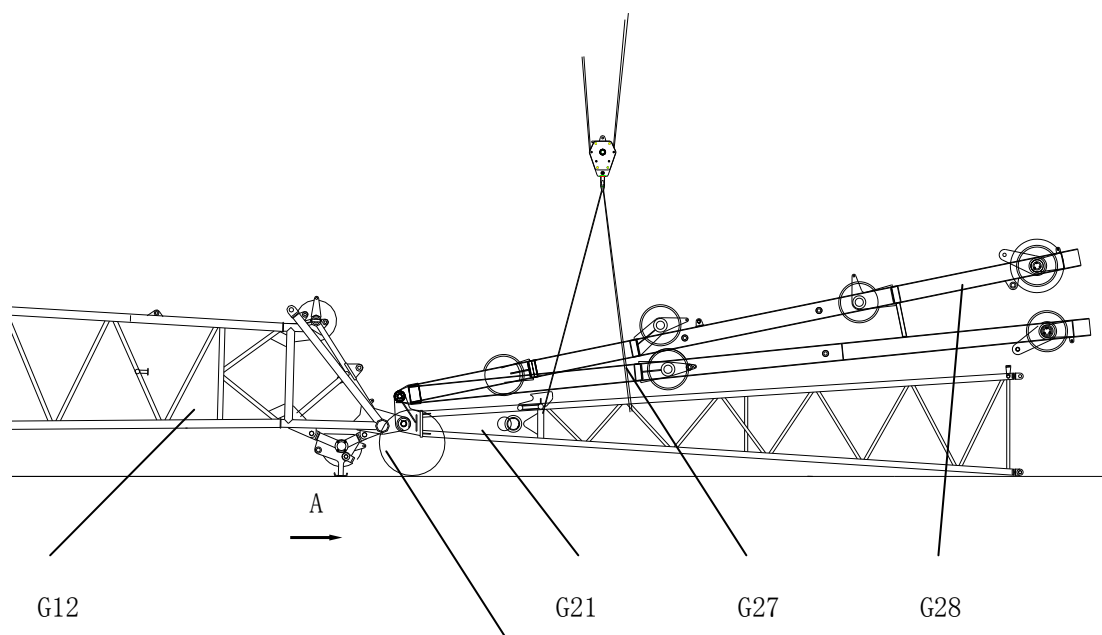
1. After the “operating mode” is changed to “assembly mode”, all safety device built in the crane will be deactivated, the assembly, dismantling of the machine should therefore be carried out with utmost care.
2. For assembly work on the crane, a safety assembly working platform should be used. Improvisations are prohibited. Otherwise, there is a danger of falling down.
3. Any other boom configurations and anchoring rod combination that have not been stipulated in the operating manual are prohibited.
4. Always bolt on the shorter intermediate sections first!
5. If the main boom head is lifted by an auxiliary crane, at least two pieces of lifting chain with a breaking force $\geq 15t$ should be used.
6. Do not stand on the lattice boom when it is assembled.
7. The use of squared timbers or pad block to support the chord in the middle position or web members is prohibited; otherwise the boom sections will be damage.
8. Do not stand beneath the boom when it is being pinned or unpinned !

5.9.2 Assembling main boom with luffing jib

During transportation, the luffing jib pivot section (G21), WA-frame 1 (G27) and WA-frame 2 (G28) as well as tilting-back support accumulator cylinder (G73) of WA-frame 1 are assembled together. See following diagram.

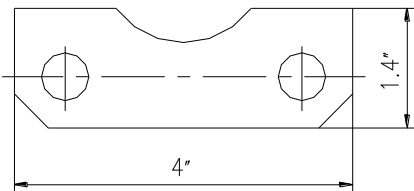
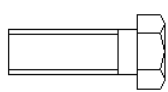
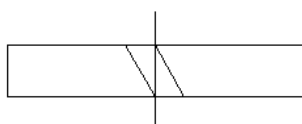
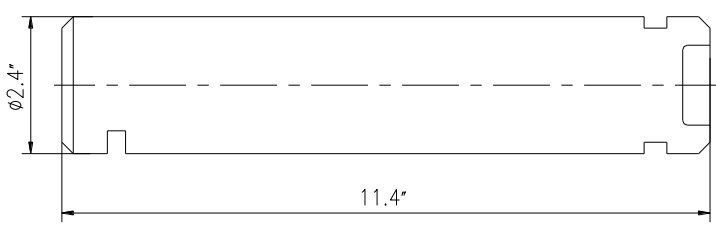
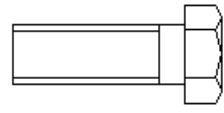
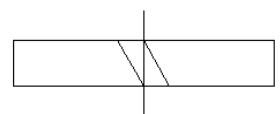


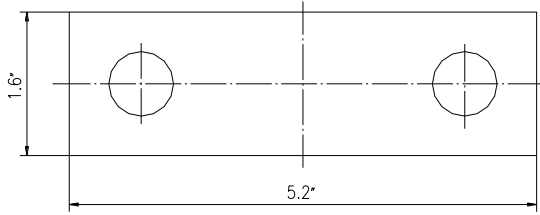
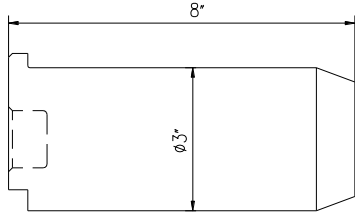
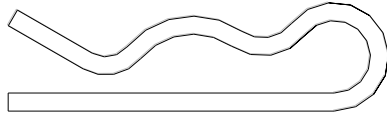
- a) Assemble required main boom sections in accordance with Section 5.7.1;
- b) - Lift the luffing jib pivot section (together with WA-frames 1 and 2) with an auxiliary crane and swing to main boom head.
 - Attach the luffing jib pivot section to the main boom head from above.
 - Continue lowering the luffing jib pivot piece until it can be pinned to main boom head.
 - Pin the luffing jib pivot piece to main boom head with pin spindles (24) and secure with bolts (21), locking plates (23), retaining springs (25) and washer (26). (See following figure.)



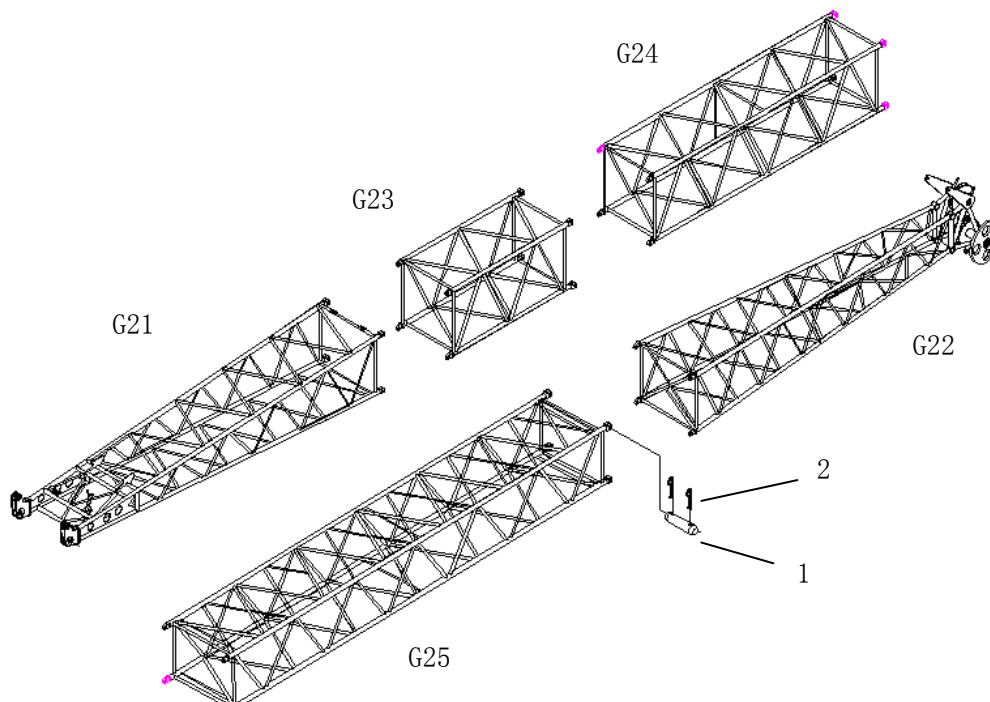
G12—main boom head G21—luffing jib pivot section
 G27—WA-frame 1 G28—WA-frame 2

Connecting parts of luffing jib pivot section to main boom head

Part No.	Description	Illustrations
17	Locking plate	
18	Bolt	 ISO4017-1999 (M12×1.4"-8.8)
19	Washer	 (0.48")
20	Pin spindle	
21	Bolt	 ISO4017-1999 (M16×2.2"-8.8)
22	Washer	 (0.64")

23	Locking plate	
24	Pin spindle	
25	Retaining spring	

- c) According to actual condition, choose appropriate numbers of luffing jib intermediate sections 3m (G23), 6m (G24) and 9m (G25) in length, and then pin them together. All jib intermediate sections are connected with double tapered pins (1), secured on both sides with retaining springs (2) (see following fig.).



G21—luffing jib pivot section

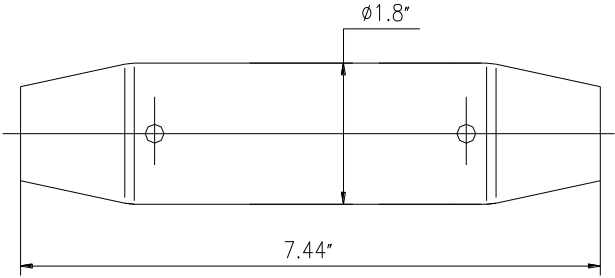
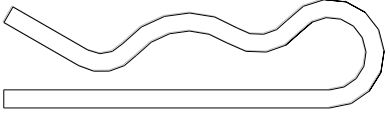
G23—3m luffing jib intermediate section

G24— 6m luffing jib intermediate section G25—9m luffing jib intermediate section

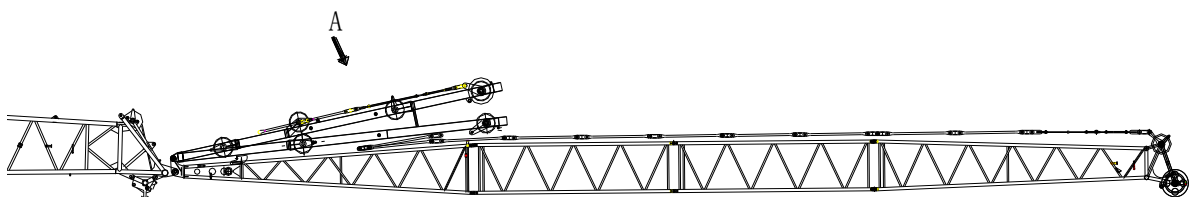
G22—luffing jib head

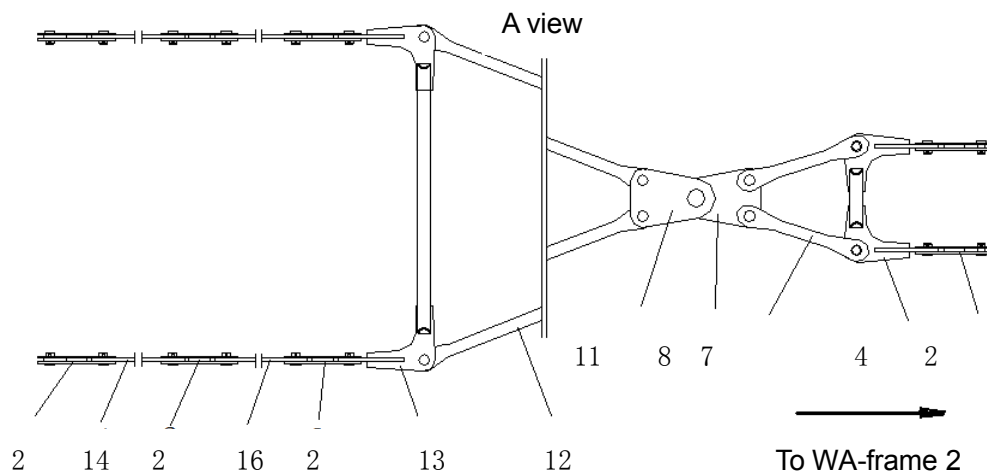
Connecting parts of luffing jib section have been shown in the following table:

Connecting parts of luffing jib section

Part No.	Description	Illustration
1	Double tapered pin	
2	Retaining spring	

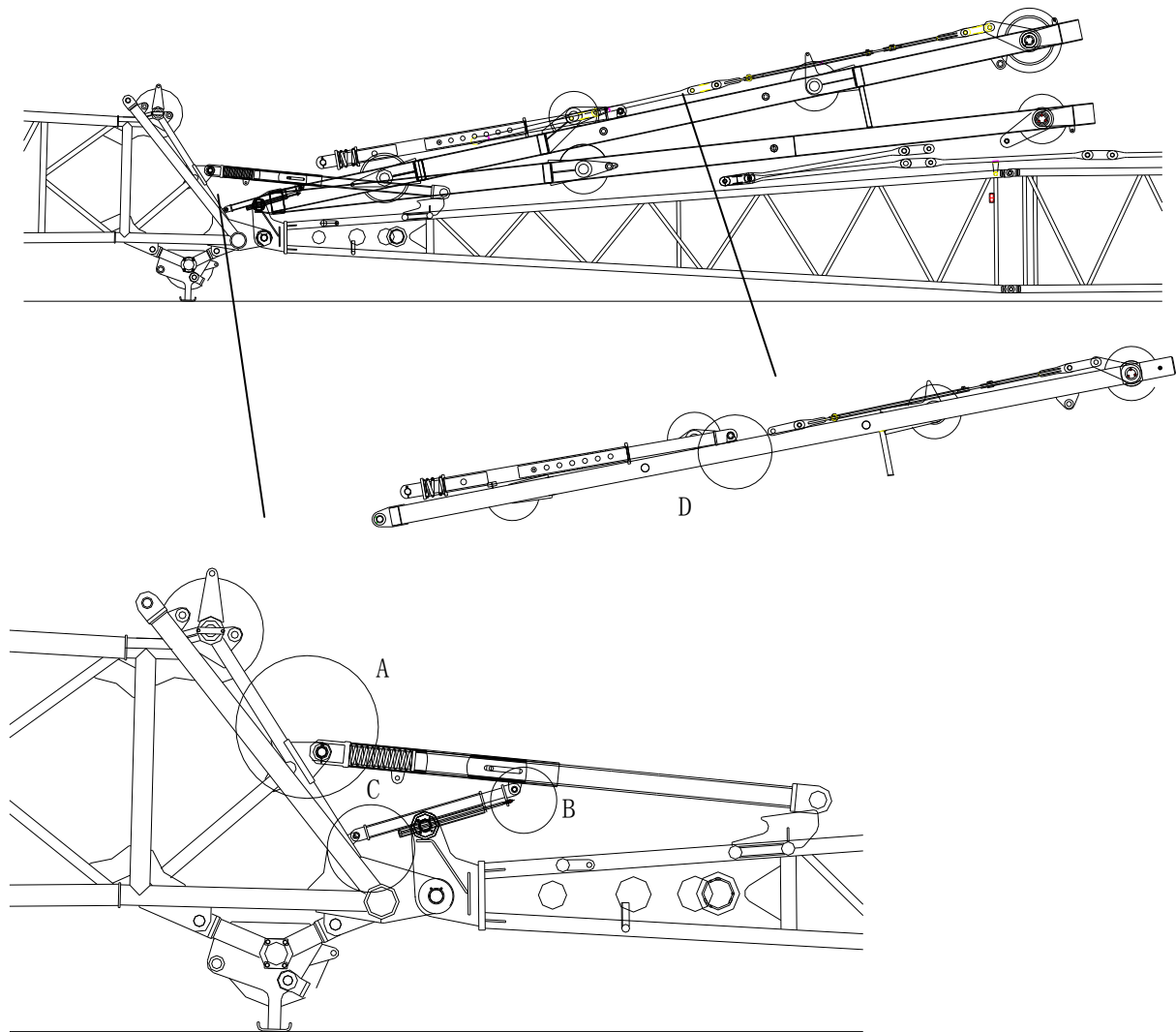
After the attachment of luffing jib is completed, preassemble partial anchoring rods to WA-frame 2(for the part number appear in the following figure, please refer to Section 5.7.5.2-b “luffing jib rear anchoring rods”) and pin adjacent anchoring rods on the jib intermediate sections to one another.

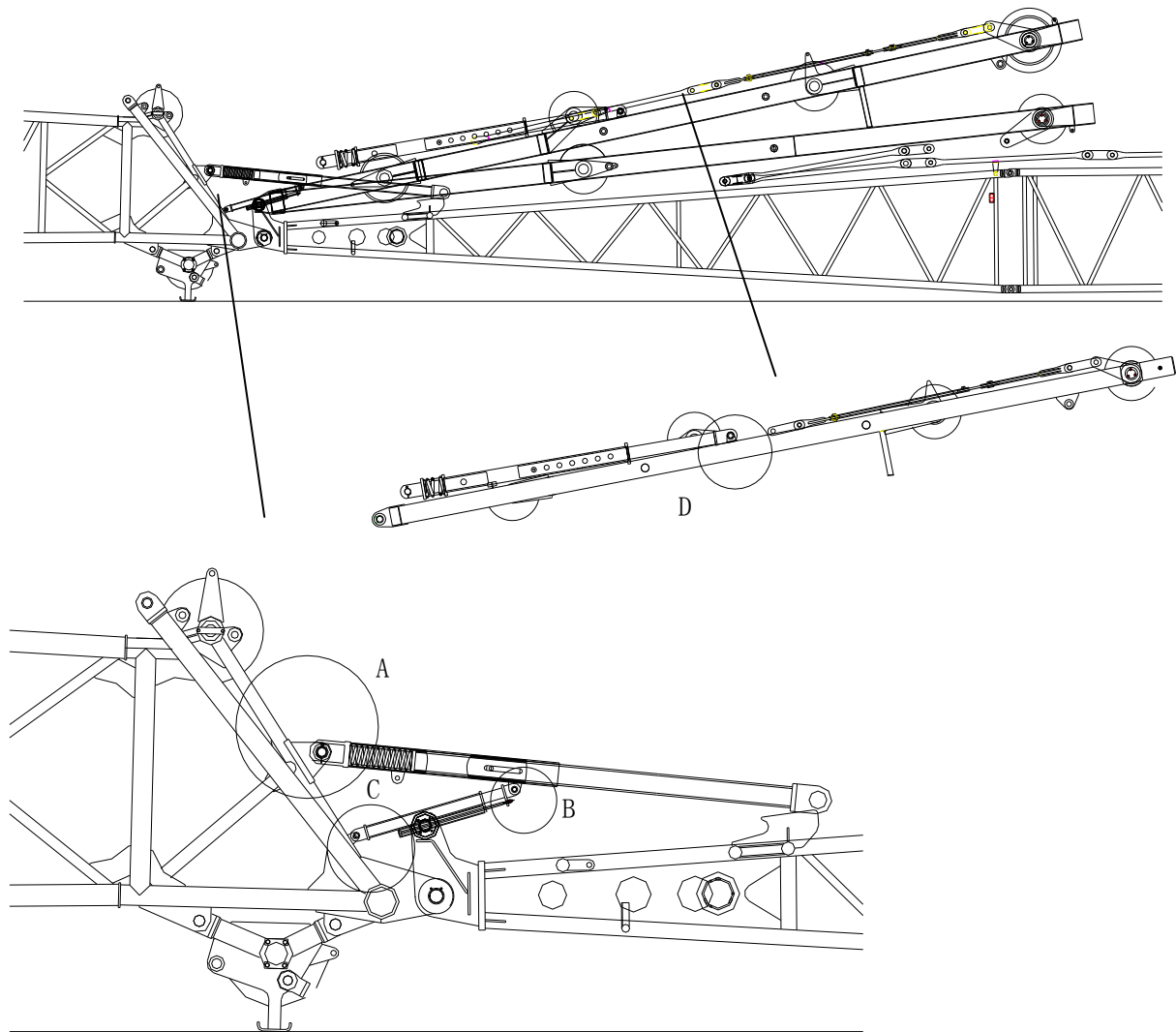


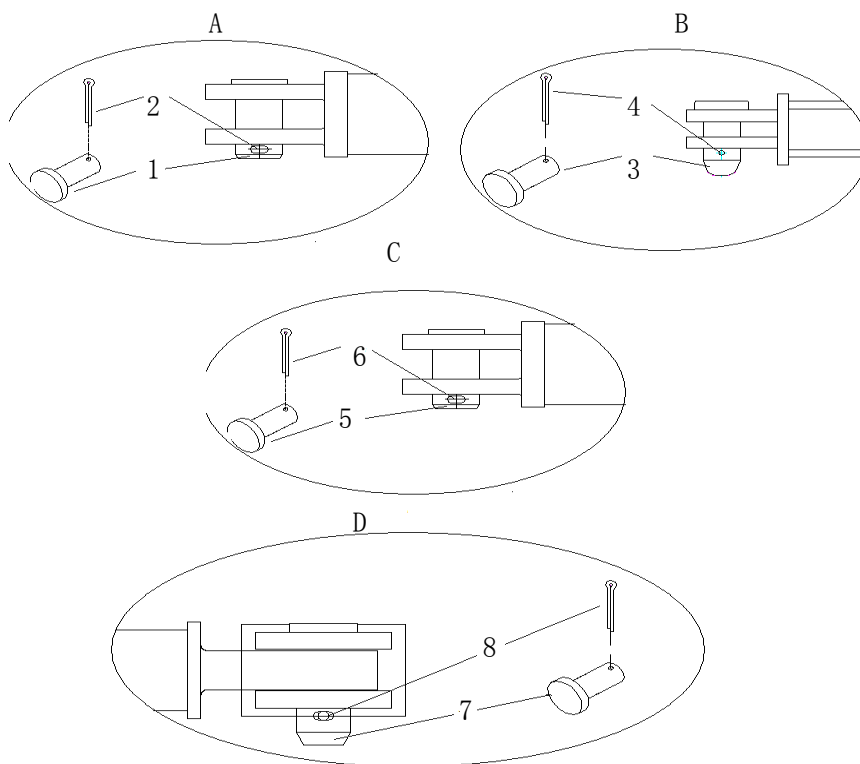


d) Assemble the tilting-back support of luffing and tilting-back support of WA-frame 2.

Firstly ,connect the tilting-back support of luffing jib to main boom head with a pin spindle (1) and secure it with a cotter pin (2). And then connect the two ends of strut rod respectively to tilting-back support of luffing jib and main boom head with pin spindles (3) and (5), and secure with cotters (4) and (6). Finally, pin one end of the tilting-back support of WA-frame 2 to WA-frame 2 with a pin spindle (7) and secure with a cotter pin(8).

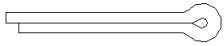
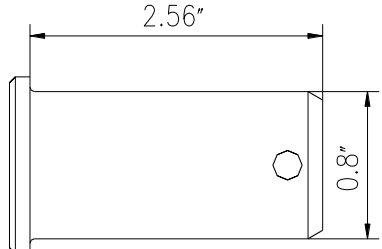
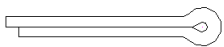
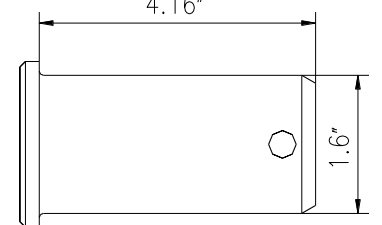






Connecting parts of luffing jib tilting back support

Part No.	Description	Illustration
1	Pin spindle	
2	Cotter pin	
3	Pin spindle	

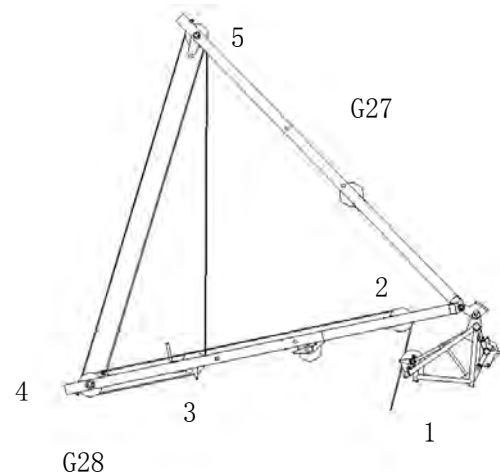
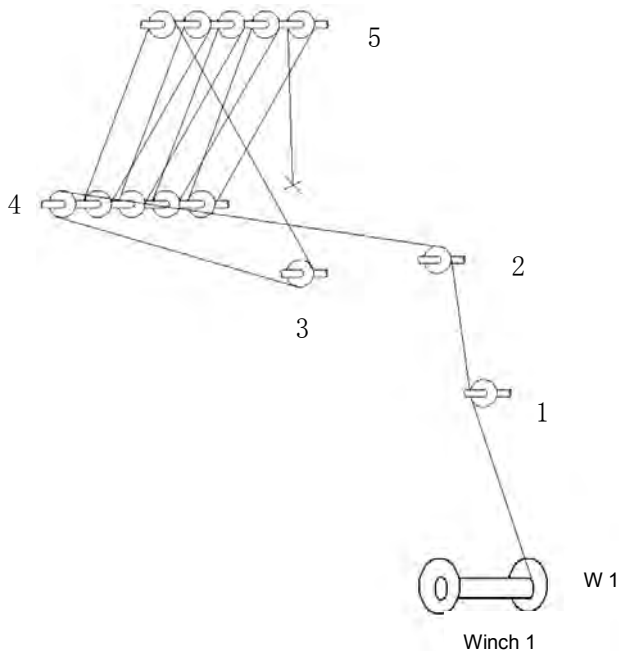
4	Cotter pin	
5	Pin spindle	
6	Cotter pin	
7	Pin spindle	
8	Cotter pin	

e) Reeving luffing rope in

- 1) Turn the switch (60) to right or push down the “reeving winch” on the remote control box to unwind the rope of reeving winch;
- 2) Reeve the rope of reeving winch in the reverse direction between the load hook and the rope pulley on luffing jib head and then pull it to the tail-end of main boom pivot section. Attach rope end point of reeving winch to rope for hoisting winch 1(or luffing rope) with rope lock.
- 3) Turn the switch (60) to left or push the “reeving winch” on the remote control box up to wind the rope of reeving winch, while simultaneously moving the right control lever (27) forwards to unwind the rope for hoisting winch 1(if luffing winch is used to raise or lower the luffing jib, move the right control lever (27) to right to unwind the luffing rope).

**Caution:**

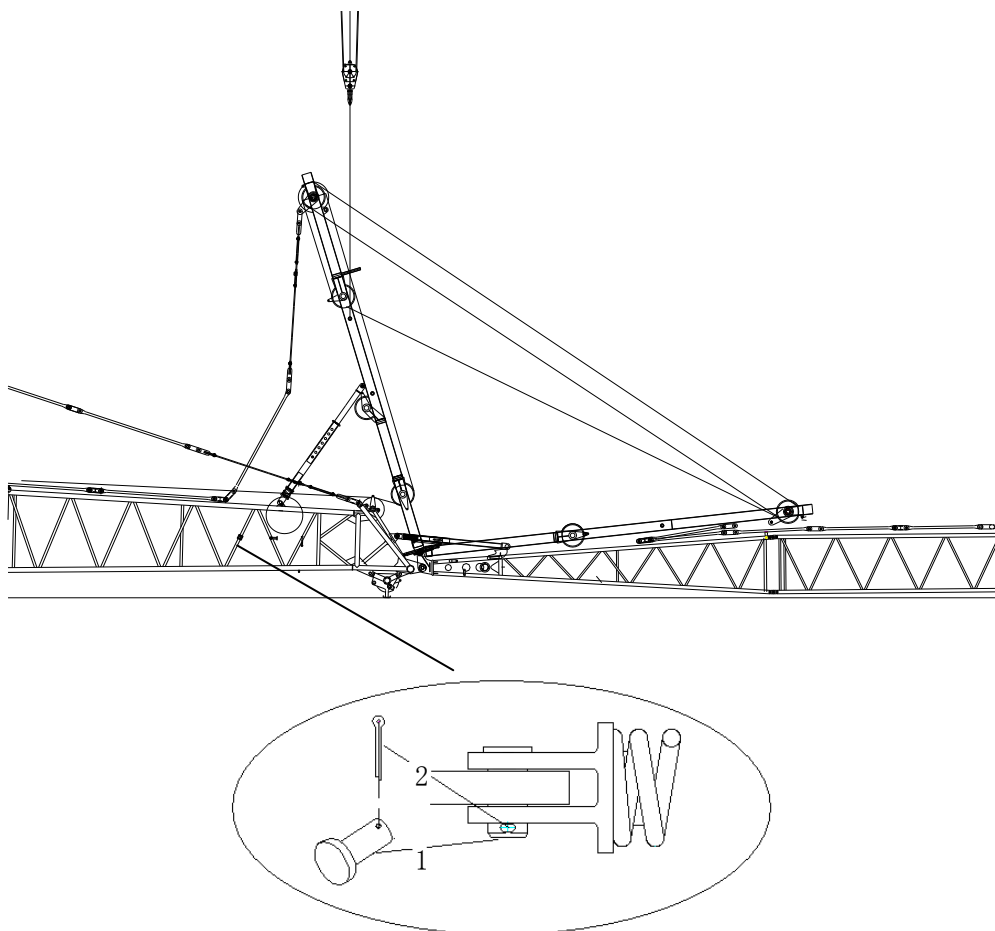
1. Before operation, the operator must choose the correct boom configuration by turning “boom configuration” switch to required position.
2. Working personnel who guides the wire rope should take great care to prevent against falling down when walking on the boom frame; otherwise, serious accident may occur.
3. The rope unwinding speed from winch 1 must be faster than rope winding speed on reeving winch.
- 4) Guided by the rope of reeving winch, the rope for hoisting winch 1(or luffing rope) will then reach luffing jib head. When the rope for hosting winch 1(or luffing rope) is unwound long enough, reeve it between the rope pulley on luffing jib head and load hook according to the method given in Section 4.6.6 “luffing rope reeving”.



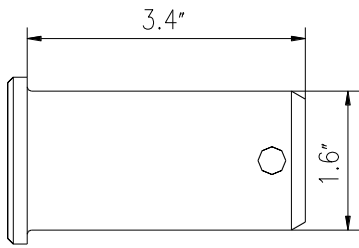
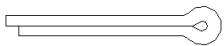
G27—WA-frame 1 G28—WA-frame 2

- f) - Connect required main boom anchoring rods according to assembled main boom length (See the arrangement and combination of anchoring rods in Section 5.7.1.3);
- Tie the WA-frame 1 to luffing jib with an attachment chain.
- lift the WA-frame 2 and swing it 90° by an auxiliary crane, and push the right control lever(27) forwards at the same time to unwind the rope from winch 1(if luffing winch is used to raise or lower the luffing jib, move the right control lever(27) to right to unwind luffing rope from luffing winch).
- Attach the luffing jib rear anchoring rods (see Section 5.7.5.2-b “luffing jib rear anchoring rods”).

- Connect the other end of tilting-back support of WA-frame 2 to main boom head with a pin spindle(1) and secure it with a cotter pin (2), then remove the pins on WA-frame 2.

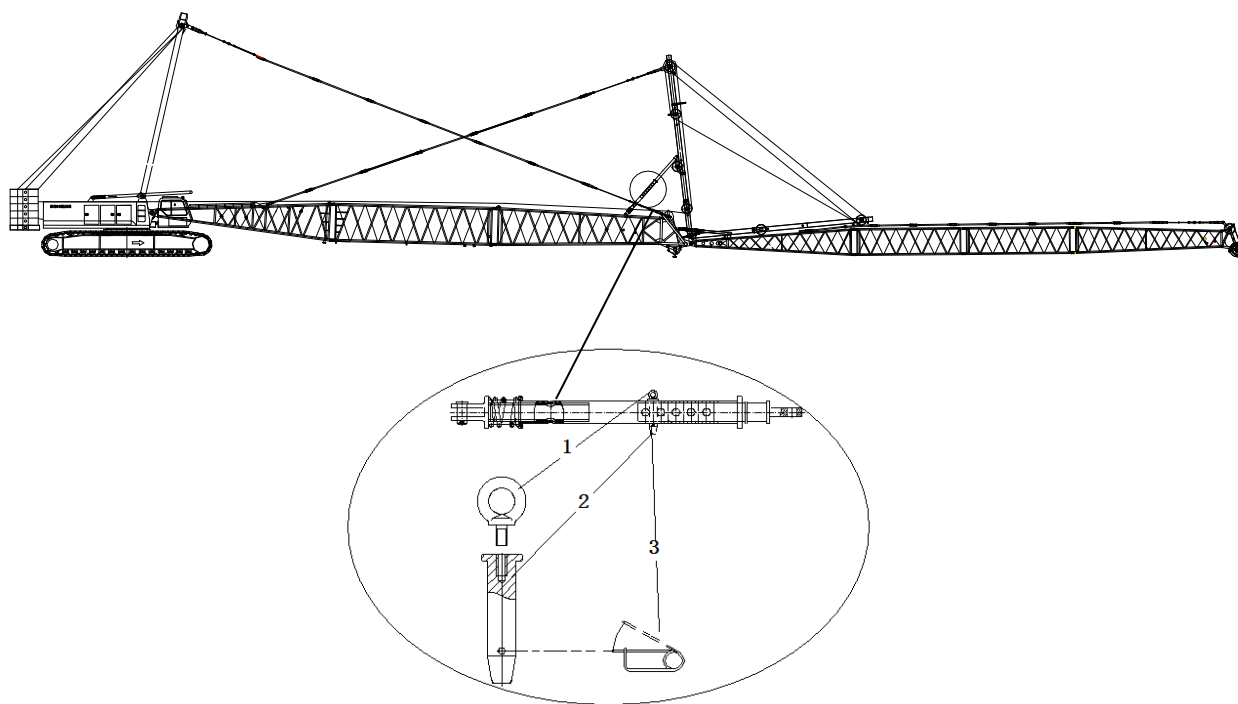


Connecting parts

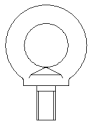
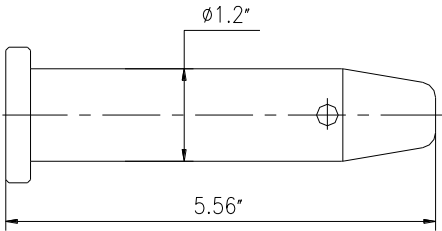
Part No.	Description	Illustration
1	Pin spindle	
2	Cotter pin	

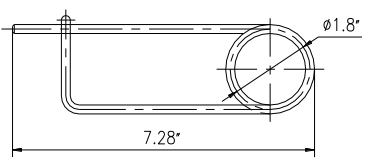
g) - Remove the auxiliary crane

- push the right control lever(27) backwards to wind the rope onto winch 1(if luffing winch is used to raise or lower the luffing jib, move the right control lever(27) to left to wind luffing rope onto luffing winch) until the luffing jib rear anchoring rod is tensioned slightly.
- insert the pin spindle(2) in corresponding hole in the tilting-back support of WA-frame 2 and secure it with locking bolt(1) and retaining pin(3)



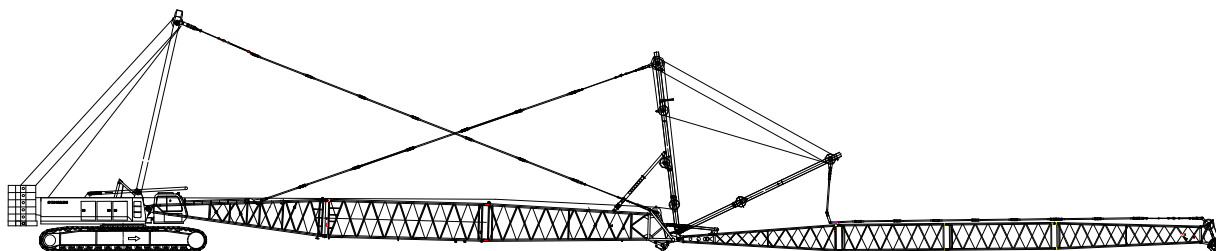
Connecting parts

Part No.	Description	Illustration
1	Locking bolt	 (M12)
2	Pin spindle	 $\phi 1.2"$ 5.56"

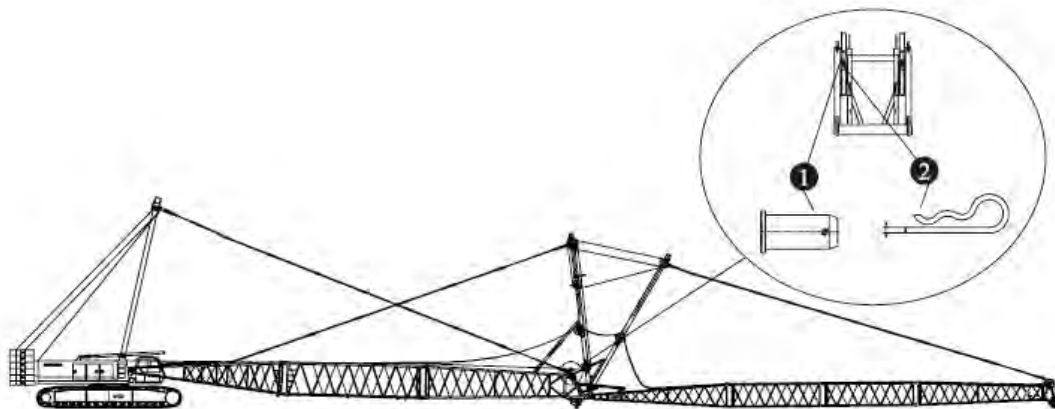
3	Retaining pin	
---	---------------	--

h) - Remove the attachment chain that ties the WA-frame 1 to luffing jib.

- push the right control lever(27) backwards to wind the rope onto winch 1(if luffing winch is used to raise or lower the luffing jib, move the right control lever(27) to left to wind luffing rope onto luffing winch) so as to raise the WA-frame 1 to proper position.
- select appropriate length of front anchoring rods according to luffing jib length and then connect the front anchoring rods with WA-frame 1 (see Section 5.7.5.2-a “luffing jib front anchoring rods”).

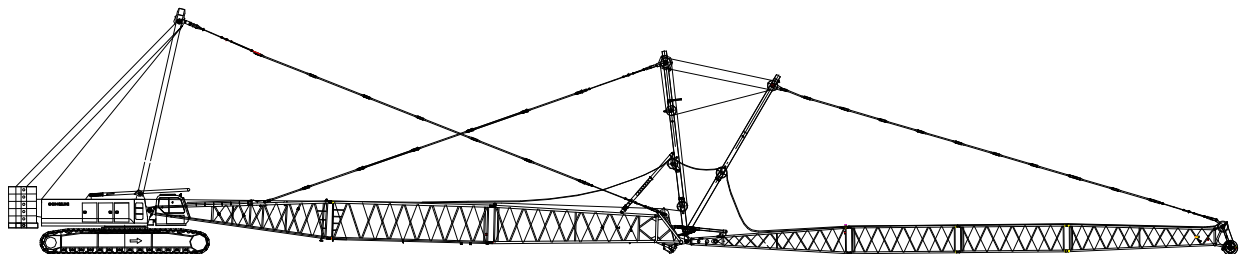


- i. Connect the tilting-back support accumulator cylinder of WA-frame 1 to main boom head as shown in following figure.



1	Pin spindle	2	Retaining spring
---	-------------	---	------------------

- j) - Turn the switch (60) on right control panel (4) to right or push down the “reeving winch” on the remote control box to unwind the rope of reeving winch.
- Reeve the rope of reeving winch through the rope pulley on luffing jib head and then pull it back to the tail-end of main boom pivot section.
 - Return the switch (60) or the “reeving winch” on the remote control box to neutral position to stop unwinding rope.
 - push the left control lever(17) forwards to unwind the hoisting rope of winch 2 to tail-end of main boom pivot section, and then attach the rope of reeving winch to hoisting rope of winch 2 with rope lock.
 - Turn the switch (60) to left or push the “reeving winch” on the remote control box up to wind the rope of reeving winch, while simultaneously unwinding the hoisting rope for winch 2. Guided by the rope of reeving winch, the hoisting rope for winch 2 will then reach luffing jib head.



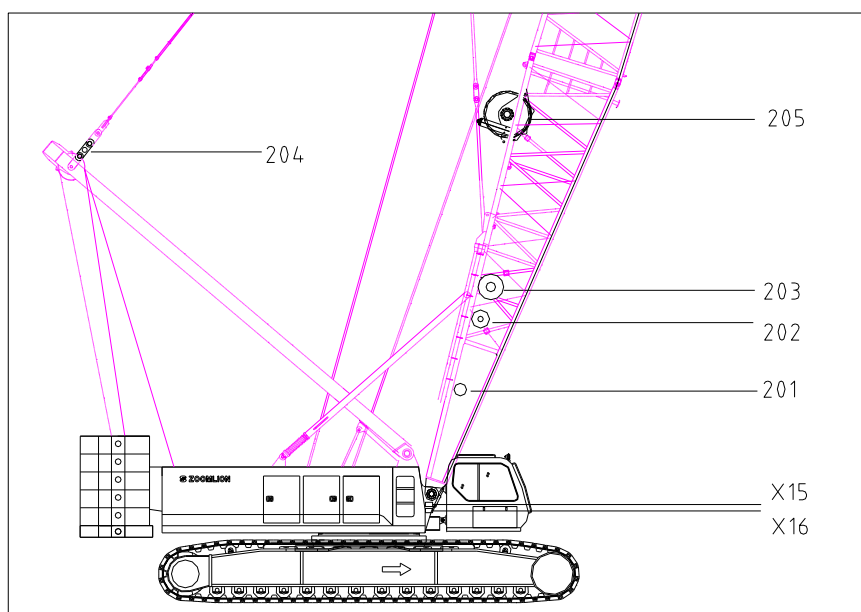
5.9.3 Connect electrics to luffing jib

5.9.3.1 Electrical lines connection



Note:

The following figure shows the connected electrical parts on main boom pivot section. Before erecting the boom, make sure that all electrical lines are connected and safety measures are checked.

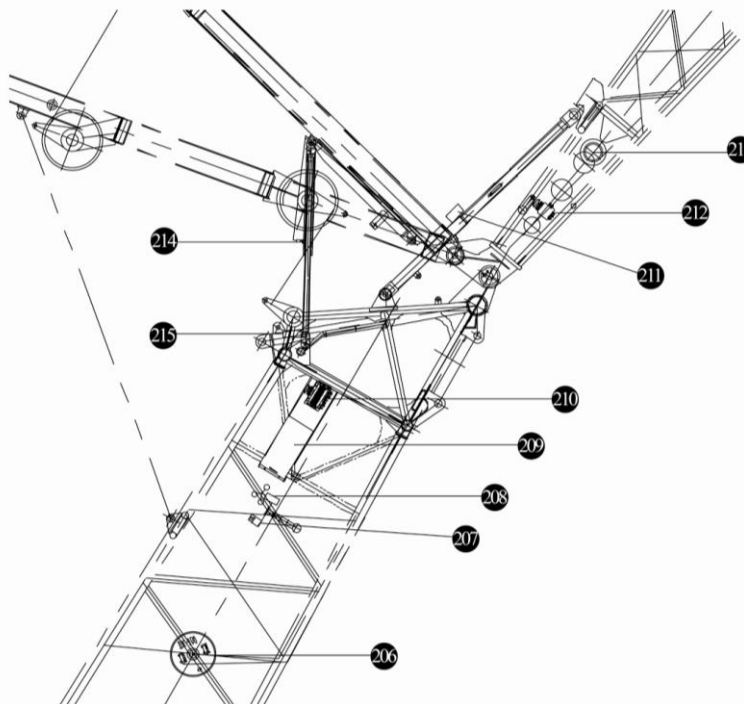


Layout of electrical parts on main boom pivot section

Description of electrical parts on main boom pivot section

Part No.	Description	Installation position
X15	Socket ,10 hole	At the front of slewing table
201	Angle sensor	main boom pivot section
202	Cable drum 1	main boom pivot section
203	Cable drum 2	main boom pivot section

204	Main boom tension force sensor	anchoring rod of A-frame1
205	Luffing winch	main boom pivot section (optional)

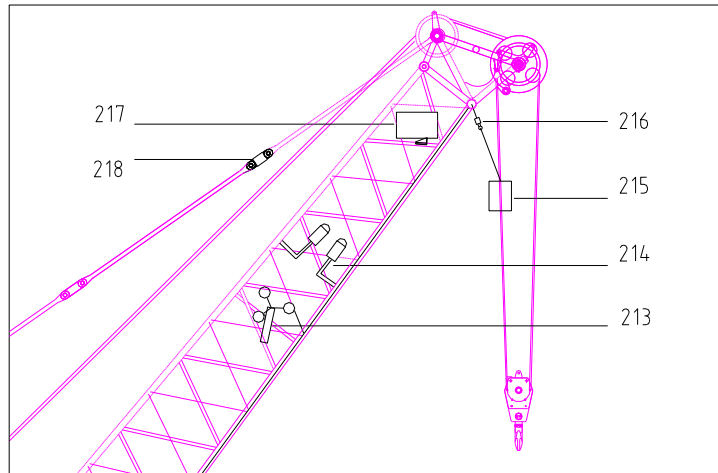


Layout of electrical parts between main boom head and luffing jib pivot section

Description of electrical parts between main boom head and luffing jib pivot section

Part No.	Description	Installation position
206	anemometer	Main boom head
207	Warning lamp(2)	Main boom head
208	Main boom junction box	Main boom head
209	Control box for Load Moment Limit on luffing jib	Main boom head
210	Cable drum 3	Main boom head
211	Luffing jib angle sensor	luffing jib pivot section

212	Tilting-back support switch(2)	On tilting-back support of luffing jib
214	Proximity switch	on tilting-back support accumulator cylinder
215	Pressure sensor	on tilting-back support accumulator cylinder



Layout of electrical parts on luffing jib head

Description of electrical parts on luffing jib head

Part No.	Description	Installation position
213	anemometer	Luffing jib head
214	Warning lamp(2)	Luffing jib head
215	Hoisting limit switch weight	Connected with hoisting rope on luffing jib head
216	Hoisting limit switch	Luffing jib head, connected with hoisting limit switch weight
217	Luffing jib junction box	Luffing jib head
218	Luffing jib tension force sensor	Luffing jib anchoring rod

a) Connecting electrics to main boom:

Connect all electrical parts on main boom according to electrics connecting requirement; Establish electrical connection from the “tilting-back support of luffing jib” socket on the main boom junction box to the “Tilting-back support” switch on tilting-back support of luffing jib.

- 1) insert the one-end cable plug of cable drum 3 into “to cable drum ” socket on main boom junction box, meanwhile, pull the other-end cable plug of cable drum 3 to luffing jib head and insert it into “lead to junction box” socket on luffing jib junction box.

The diagram illustrates the electrical control system for the cable drum of a tower crane. It features a main control box labeled "进分线盒 lead to junction box" which is connected to a terminal block "X15". The main control box contains several components: two "警示灯 warning lamp" (warning lamps), a "风速仪 Anemometer" (anemometer), a "风速仪 Anemometer" (anemometer), a "塔臂防后倾 Tilting-back support of luffing jib", a "主卷过卷 hoisting limiter for H1" (hoisting limiter for H1), a "副卷过卷 hoisting limiter for H2" (hoisting limiter for H2), and a "H3过卷 hoisting limiter for H3". The system is connected to a "接小卷筒 To cable drum". The diagram also shows a "进分线盒 lead to junction box" connected to a "风速仪 Anemometer" and a "主卷过卷 hoisting limiter for H1". The system is connected to a "警示灯 warning lamp" and a "风速仪 Anemometer". The diagram also shows a "进分线盒 lead to junction box" connected to a "风速仪 Anemometer" and a "主卷过卷 hoisting limiter for H1". The system is connected to a "警示灯 warning lamp" and a "风速仪 Anemometer".

The luffing jib junction box, installed on luffing jib head, has 5 input and output sockets in total,

including:

- “Lead to junction box” socket (12-hole) on the left side, used to establish connection to cable drum 3 on main boom head.
- “Anemometer” socket (4-pin) on the right side, used to establish connection to anemometer on luffing jib head.

Other sockets at the bottom of the junction box, from the left to right, are respectively:

- “Warning lamp” socket (2-hole), used to establish connection to warning lamp on luffing jib head
- “Warning lamp” socket (2-hole), used to establish connection to warning lamp on luffing jib head
- “Hoisting limit switch for H1” socket (3-pin), used to establish connection to hoisting limit switch for H 1 connected to luffing jib head.

Insert the cable plug of cable drum on main boom pivot section into the “lead to junction box” socket on main boom junction box.

Insert the two cable plugs of luffing jib warning lamps respectively into the two “warning lamp” sockets on the luffing jib junction box.

Inset the cable plug of hoisting limiter for H2 into the “hoisting limit switch for H1” socket on luffing jib junction box.

Insert the cable plug of anemometer on luffing jib head into the “anemometer” socket on luffing jib junction box.

Insert the cable plug of titling-back support switch into the “tilting-back support of luffing jib” socket on main boom junction box.



Caution:

Cable plug which is not used should be protected by seal cover.

c) Electrical connection to Load Moment Limiter

See the *Installation Guide& User's Manual* for Load Moment Limiter.

5.9.3.2 Checks before erecting the boom

a) Check warning lamp on main boom head

Set the Master Lighting Switch 39 (see Section 4.1.4) to the second position, and press “warning lamp on/off” Switch 41 the same time to check that the warning lamp lights up.

b) Check the anemometer

Rotate the vane of anemometer to check whether the wind velocity shown on the display in

the operator's cab is normal.

c) Check hoisting limit switch for H2

Support and hold the hoisting limit switch weight for H2 to ensure that the switch is triggered, and then check that the icon "upper limit switch on H2" on the screen will flash and the buzzer will sound.

5.9.4 Erecting and lowering main boom with luffing jib

5.9.5.1 Requirements

- a) All electrical connections have been established.
- b) The limit switch control lever has been checked for smooth movement.
- c) Check the warning lamp.
- d) Check the anemometer.
- e) Check the anemometer for smooth rotation and functional working.
- f) Check the hoisting limiter switch.
- g) Operate the hoisting winch, and adjust the hoisting limit switch on luffing jib head manually. Requirement for this operation: the hoisting movement of hoisting winch should be stopped when the upper limit has been exceeded, and icon "upper limit switch" on the screen will flash.

5.9.5.2 Requirements for erecting main boom with luffing jib

- a) The crane is properly supported and level;
- b) Select appropriate boom configurations according to the load to be lifted and the load capacity chart; ensure that boom sections have been connected and secured;
- c) All limit switches has been correctly fitted and are fully operational;
- d) All pinned connections have been secured.
- e) The hoisting rope has been correctly placed in the rope pulleys and prevented from jumping out (from rope groove) using rope guard tube;
- f) No person is present in the danger zone;
- g) There are no loose parts on main boom;
- h) In winter, the main boom, fixed jib and associated components (limit switches, rope drums, warning light, anemometer etc.) must be kept free of ice and snow.



Danger:

1. Incorrectly fitted or faulty limit switches and falling parts (pins, retaining pins, ice etc.) can cause

injury.

2. Before erecting the boom, check that the tilting-back support for luffing jib is installed correctly. And ensure the spherical ends of tilting-back support move smoothly in the two guides on luffing jib pivot section when luffing jib is raised to the limit position. Otherwise, the luffing jib is liable to tilt backwards if the tilting-back support is not fixed properly.

5.9.3.3 Erecting main boom with luffing jib

- a) Set the “luffing jib” operating mode in Load moment limiter in accordance with boom configurations.



Caution:

Performing slewing motion while the boom is erected from the ground is prohibited.

- b) When luffing jib is erected by winch 1,
 - turn “boom configuration” switch to “Main boom” position;
 - slowly raise the main boom to a proper position by moving right control lever (27) to the left;
 - unwound wipe rope off winch 1 by pushing right control lever (27) forwards

When luffing jib is erected by luffing winch,

- turn “boom configuration” switch to “Main boom” position;
- Slowly raise main boom by moving the right control lever (27) to the left;
- after main boom is raised to a proper position, turn “boom configuration” switch to “Luffing jib” position;
- unwind luffing rope off luffing winch properly through moving right control lever (27) to the right.

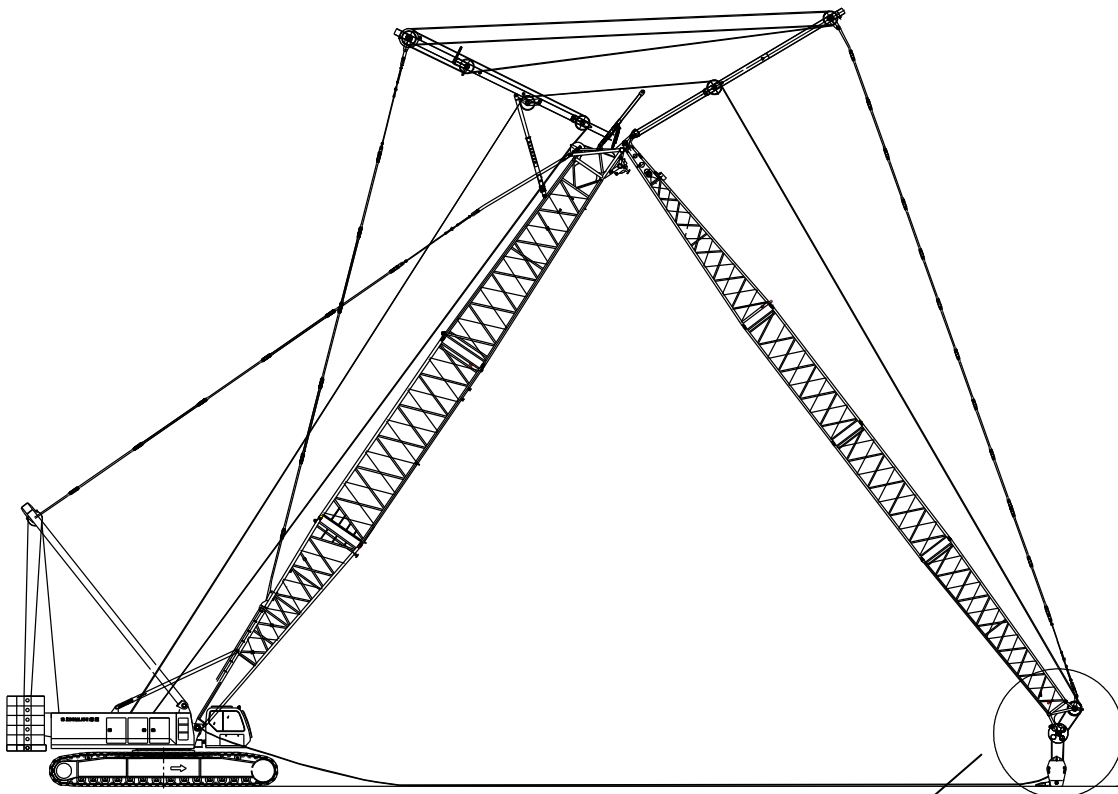
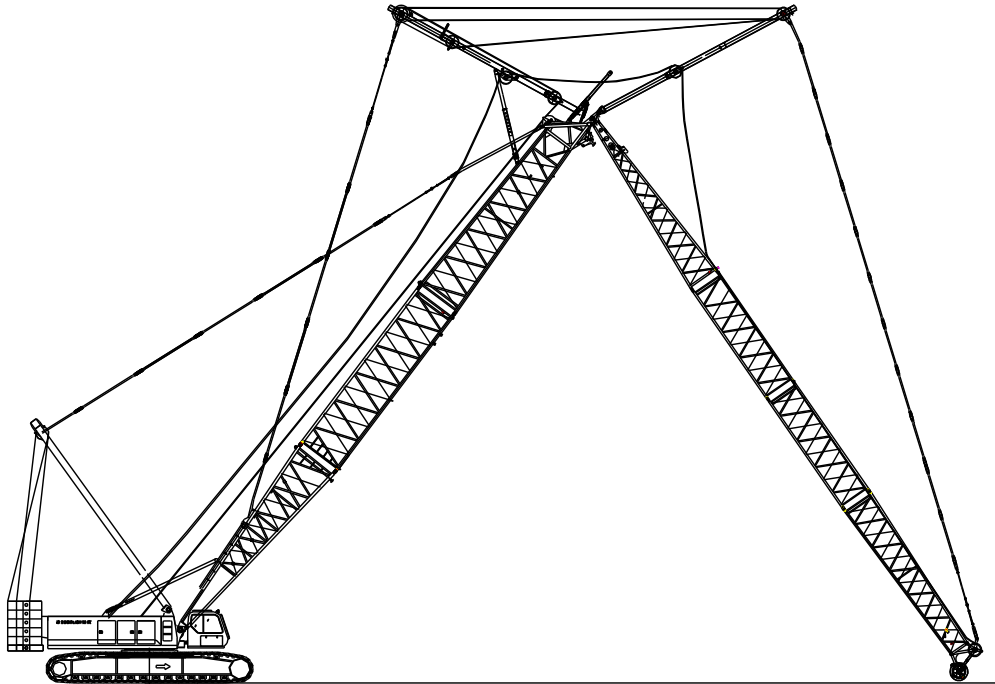
Carry out the movements “Raise main boom” and “unwind luffing rope” repeatedly and ensure that the luffing jib head is running with the running wheels on the ground. when the angle between main boom and luffing jib reaches 90°, move right control lever (27) to neutral position to stop erecting.

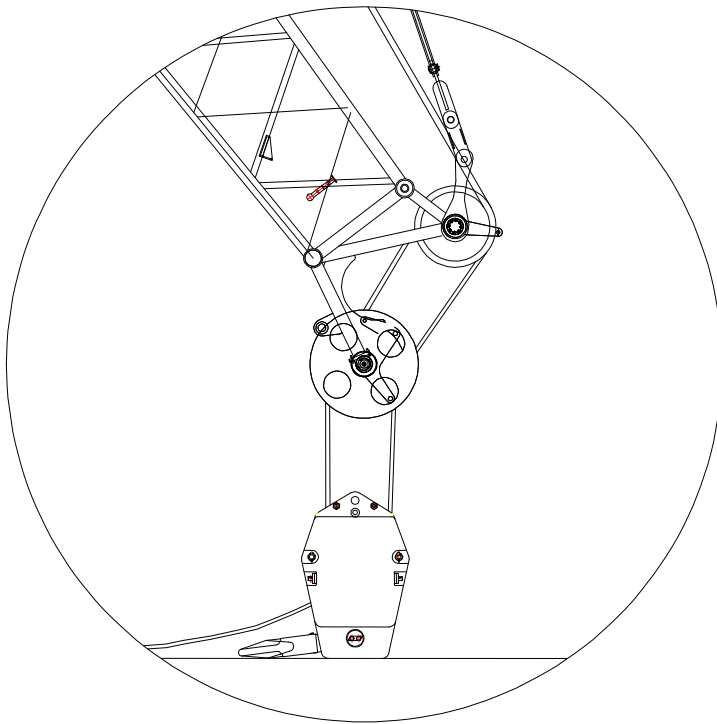


Note:

1. The total weight of luffing jib should be loaded on the running wheel.
2. Check whether the wire rope on luffing winch is slack.
3. In no circumstances can the angle between the main boom and luffing jib be smaller than 90°. Otherwise, the luffing jib head and luffing jib may be damaged.
4. Wire rope should be checked and guided by an appointed person to prevent it

from being damaged due to crush.





- c) - Turn the “boom configuration” switch to “main boom” position, and then move right control lever (27) to the left to raise the boom. When luffing jib head is lifted to a proper position, place the selected load hook under the luffing jib head.
- At this time, turn the “reeving winch” rotary switch (60) on the right control panel (4) to the right, or push the “reeving winch control” switch on auxiliary remote control box downwards, to unwind the rope of reeving winch and reeve it in the reverse direction between rope pulleys on luffing jib head and load hook, finally attach it to hoisting rope with rope lock.
- After that, turn the switch (60) to the left, or push “reeving winch” switch down, to spool up reeving winch. At this moment, the hoisting rope, under the guidance of rope of reeving winch, will be reeved between the rope pulleys on luffing jib head and load hook, and the rope end point is fixed on the luffing jib head or load hook.
- d) Turn the “boom configuration” switch to “main boom” position, and then move right control lever (27) to the left to raise main boom, at the same time push the left control lever (17) forwards to unwind the wire rope off the winch 2 to make sure that the load hook will not be dragged on the ground. After main boom is raised to the required position, return the left and right control levers (17, 27) to neutral position to make main boom and load hook stop moving.

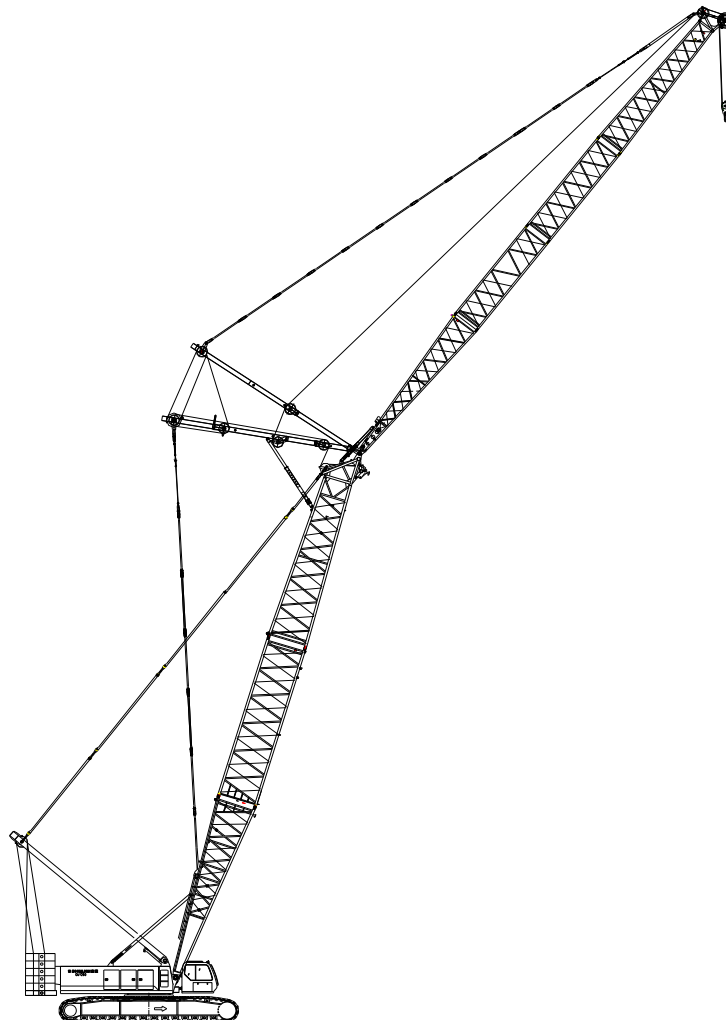


Danger:

1. In the erecting process, when main boom is raised to 65° position, the

“assembly mode” must be changed to the “operating mode”.

2. To prevent the luffing jib front anchoring rods from swinging to and fro, the luffing jib should be erected at constant speed slowly.
- e) Turn the “Boom configuration” switch to “luffing jib” position, and then push right control lever (27) backwards to spool up winch 1 so as to raise the luffing jib. (if luffing jib is raised/lowered by luffing winch, move right control lever (27) to the left to spool up luffing winch to raise luffing jib.) Meanwhile, push the left control lever (17) forwards to unwind the wire rope off the winch 2 to prevent the hook block from being dragged on the ground. After luffing jib is erected to the working position, return the left and right control levers (17, 27) to neutral position to make luffing jib and load hook stop moving.
- f) Push left control lever (17) backwards to spool up winch 2 until the load hook is lifted.





Caution:

1. When main boom angle is 85°, the luffing jib angle can be adjusted from 15° to 75°.
2. When main boom angle is 75°, the luffing jib angle can be adjusted from 15° to 65°.
3. When main boom angle is 65°, the luffing jib angle can be adjusted from 15° to 55°.
4. When boom angle varies from 65° to 75° or 75° to 85°, we should determine the corresponding smaller value in the chart as the rated lifting capacity. In order to give full play to the crane's performance, please operate the crane under the operating conditions with three prescribed boom angles.
5. **Under crane operation with main boom and luffing jib** (with main boom angle of 85°): when luffing jib angle exceeds 60°, the luffing jib with a load should not be raised/lowered at high speed. And the load should be the min. lifting capacity under this boom configuration; otherwise the luffing jib is liable to overturning. Before the load is detached from the hook, lower the luffing jib to a position less than 60° by the pulling force of load.

5.9.3.4 Lowering main boom with luffing jib

- a) Push left control lever (17) forwards to reel off hoisting winch 2 so as to lower the load hook. After the load hook is lowered on the ground, it must be moved away from the position where the boom will be lowered;
- b) Push right control lever (27) forwards to operate winch 1 in the lowering direction to lower luffing jib (or move right control lever (27) to the right to lower luffing jib. If luffing jib is lowered with luffing winch.) when the angle between luffing jib and main boom reaches 90°, return right control lever (27) to neutral position to make luffing jib stop moving.
- c) Turn the "boom configuration" switch to "main boom" position, and then move right control lever (27) to the right to lower main boom until the luffing jib head touches the ground with the running wheels.



Caution:

1. In the lowering process, when main boom is lowered to 65° position, the "operating mode" must be changed to "assembly mode".
2. In the process of lowering main boom, the winch 1 must be reeled off to avoid the hook's collision with the pulley head.
3. Standing within danger area of crane during operation is prohibited!
4. The boom-lowering movement should be performed slowly and stably. And during the operation, the crane operator must observe the data shown on the display, while other workers must observe the surrounding areas for potential dangers.

- d) If winch 1 is used to raise/lower luffing jib, turn the “boom configuration” switch to “main boom” position, and then push the right control lever (27) backwards to spool up winch 1. And then move the right control lever (27) to the right to lower main boom. Carry out the movements “Spool up winch 1” and “Lower main boom” repeatedly to ensure that the luffing jib head is running with the running wheels.

(if luffing winch is used to raise/lower luffing jib, turn the “boom configuration” switch to “luffing jib” position, and then move right control lever(27) to the right to lower luffing jib. After that, turn the “boom configuration” switch to “main boom” position, and then push left control lever(17) backwards to spool up winch 2. when main boom and luffing jib are lowered on the ground, return right control lever (27) to neutral position.



Caution:

1. Standing within danger area of crane during operation is prohibited !
2. The boom-lowering movement should be performed slowly and stably. And during the operation, the crane operator must observe the data shown on the display, while other workers must observe the surrounding areas for potential dangers.
3. To prevent the wire rope from being damaged due to crush, it should be guided by a person.
4. In the process of lowering the boom, make anchoring rods of luffing jib hang down a little.
5. The winding of wire rope should be supervised by a person appointed, and no person is standing within danger zone during operation.

5.9.3.5 Disamantling of main boom with luffing jib

- a) Push left control lever (17) backwards to spool up winch 2;



Note:

The winding of wire rope should be supervised by a person appointed, and no person must stand within danger zone during operation.

- b) Push right control lever (27) forwards to reel off winch 1 (or move right control lever to the right to reel off luffing winch when luffing jib is lowered with luffing winch). After WA-frame 1 is lowered forwards to proper position, return right control lever(27) to neutral position. At this moment, separate the anchoring rods of WA-frame 1 from those of luffing jib. And then lower the WA-frame 1 on the luffing jib and secure them with slings.

- c) push right control lever (27) backwards slightly to spool up winch 1 (or move right control lever to the left to spool up luffing winch when luffing jib is controlled by luffing winch) until the luffing jib rear anchoring rods is tensioned. At this moment, remove the positioning pin for tilting-back support of WA-frame 2. After that, push right control lever (27) forwards to reel off winch 1 (or move right control lever to the right to reel off luffing winch). Lower WA-frame 2 backwards until the tilting-back support are retracted completely, and then insert the positioning pin.



Caution:

1. In order to avoid breaking mounting sling, the force should not be too large when wind luffing rope to tighten the luffing jib rear anchoring rods. Otherwise, accident will occur.
2. The end of tilting-back support should slide in guiding rails provided for that purpose.

- d) Dismantle the tilting-back support of WA-frame 2 with the help of auxiliary crane ,and then disconnect luffing jib rear anchoring rods from WA-frame 2;



Note:

When wind luffing wire rope, the mounting sling should not bear any load to prevent it from being broken.

- e) Push right control lever (27) forwards to reel off winch 1 (or move right control lever (27) to the right to reel off luffing winch when it is controlled by luffing winch), slowly put WA-frame 2 on the WA-frame 1 with the help of auxiliary crane.



Danger:

1. At this time, WA-frame 2 is lowered down with the help of auxiliary crane, not the hoisting wire rope.
2. After WA-frame 2 is lowered to 45° position in the front, it should be lowered down by auxiliary crane and mounting wire rope. Do not make wire rope of winch 1 bear force; otherwise, they will be damaged.

- f) Retract the rope of winch 1. push right control lever (27) backwards to wind the rope on the winch 1 (or move right control lever to the left to spool up luffing winch when luffing jib is raised or lowered by luffing winch) and fixed it on the winch.
- g) Spilt luffing jib sections one by one, leaving the luffing jib pivot section assembled.
- h) Detach the luffing jib pivot section (together with WA-frames 1 and 2) from the main boom

head.

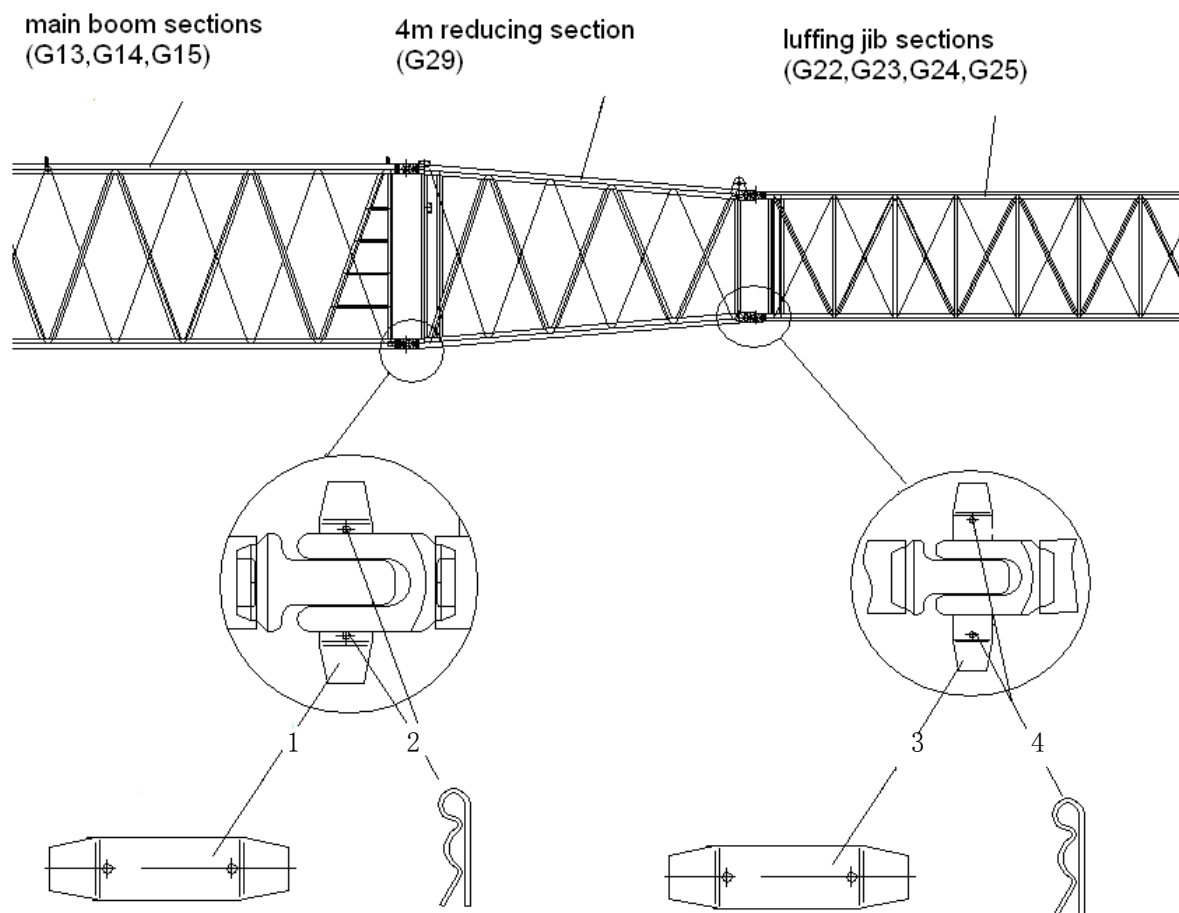


Caution:

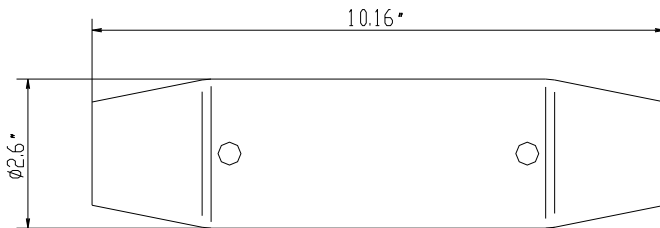
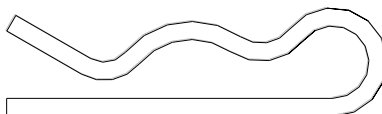
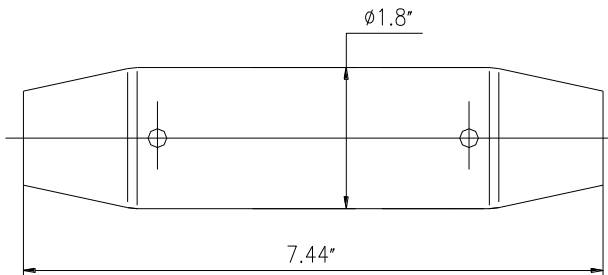
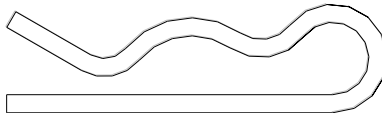
All crane movements should be carried out smoothly, and all safety precautions should be followed, otherwise accident may occur.

5.10 Assembly and dismantling of light duty boom (SL)

The SL boom comprises main boom sections and luffing jib sections. Its first 73 long boom is composed of main boom sections, and the second part of it is composed of luffing jib sections. The first part of it is connected to the second part by 4 reducing section (G29). The assembly sequence of boom sections for both parts of it and the arrangement and combination of anchoring rods as well as safety precautions have detailed in Section 5.7.2 “Light duty boom”. The connection of 4m reducing section to main boom section and to luffing jib section has been shown in the following figure.



Connecting parts

Part No.	Description	illustration
1	Double tapered pin	
2	Retaining spring	
3	Double tapered pin	
4	Retaining spring	

Connecting electrics

Insert the cable plug of X15 on main boom pivot section into the X15 socket at the front of slewing table.

Insert the cable plug of cable drum 2 into “lead to junction box” socket on luffing jib junction box.

For electrical connections to other parts, please see the “Connecting electrics to luffing jib” in Section 5.9.3.1.

**Note:**

For erection and lowering of light duty boom as well as safety precautions, please refer to Section 5.8.4 “Erecting main boom” and Section 5.8.5.1 “Setting down main boom”

5.11 Assembly and dismantling of main boom with fixed jib (SF)

5.11.1 Preparations

- a) The crane is properly supported and level.
- b) The main boom is installed;
- c) The required counterweight plates have been assembled;
- d) An auxiliary crane and working platform are available.;
- e) The safe load indicator system of Load Moment Limiter is set according to the data given in the load capacity charts;
- f) Choose appropriate boom combination and relevant anchoring rods combination according to operational planning and boom configuration.
- g) Choose the correct load hook and rope reeving for the load to be lifted.
- h) Change the “operating mode” to “assembly mode”.



Danger:

1. After the “operating mode” is changed to “assembly mode”, all safety device built in the crane will be deactivated, the assembly, dismantling of the machine should therefore be carried out with utmost care.
2. Any assembly work on crane should be carried out on safety working ground; otherwise there is a risk of accident.
3. Do not stand beneath the boom when it is being pinned or unpinned !

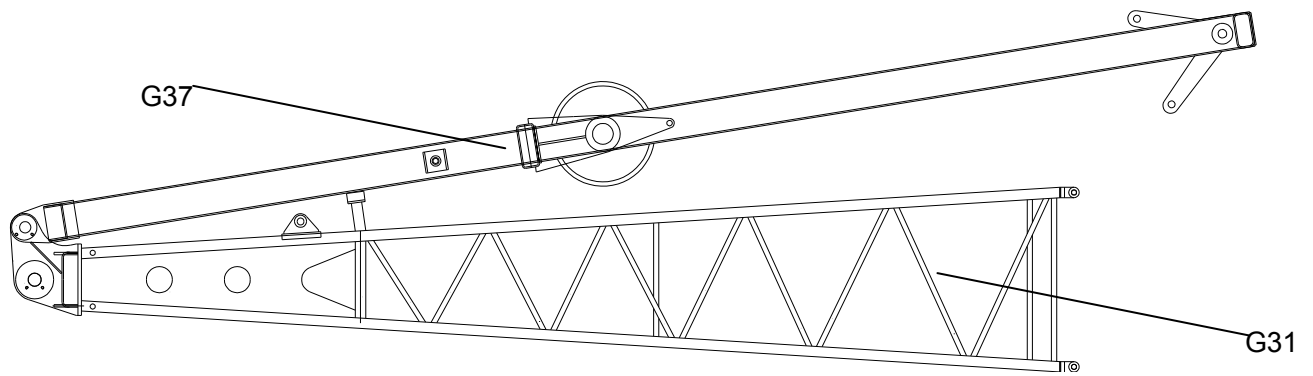
5.11.2 Assembling main boom with fixed jib



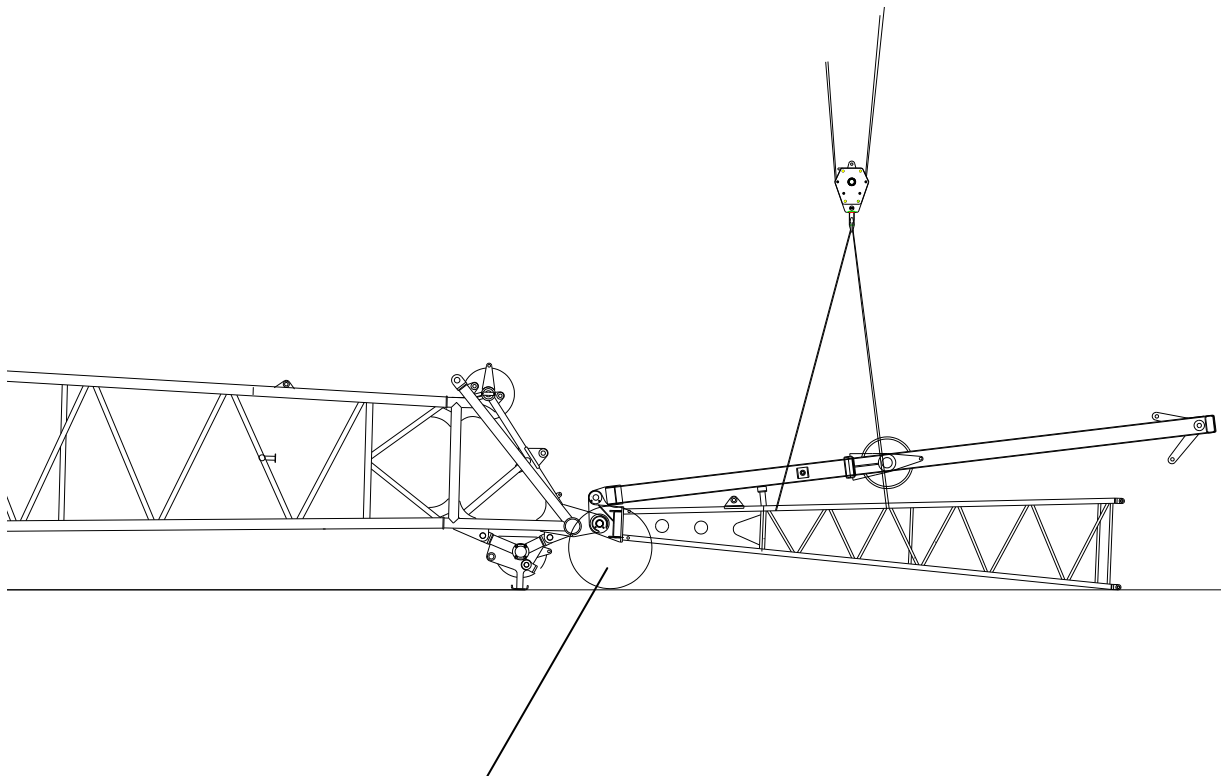
Caution:

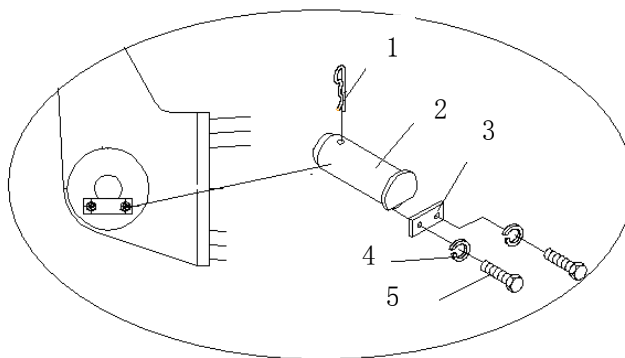
Before operating the crane, set the “Boom configuration” switch to “fixed jib” position.

During transportation, the fixed jib pivot section (G31) and FA-frame (G37) are assembled together. See following diagram.



- a) Assemble required main boom sections in accordance with Section 5.7.1 “heavy duty boom”;
- b) - Raise the fixed jib pivot section (together with FA-frame) with an auxiliary crane and swing to main boom head.
 - Attach the fixed jib pivot section to the main boom head from above
 - Continue lowering the fixed jib pivot piece until it can be pinned to main boom head.
 - Pin the fixed jib pivot piece to main boom head with pin spindles (2) and secure with bolts (5), locking plates (3), retaining springs (1) and washer (4). (See following figure.)

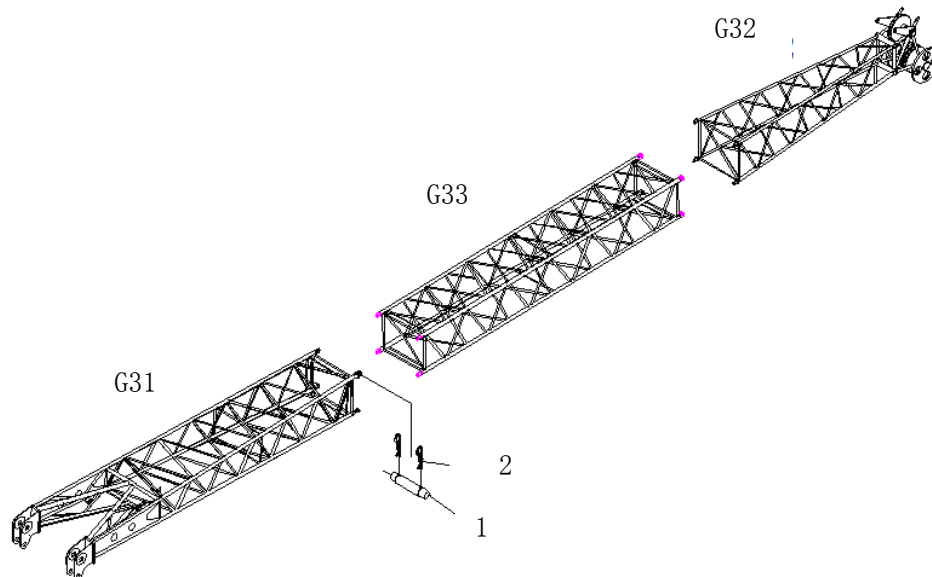




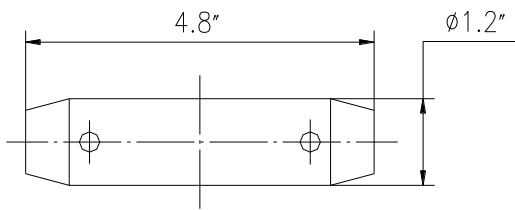
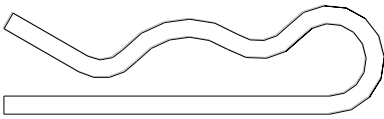
Connecting parts connect fixed jib pivot section to main boom head

Part No.	Description	Illustration
1	Retaining spring	
2	Pin spindle	
3	Locking plate	
4	Washer	
5	Bolt	 ISO4017-1999 (M16×2.2"-8.8)

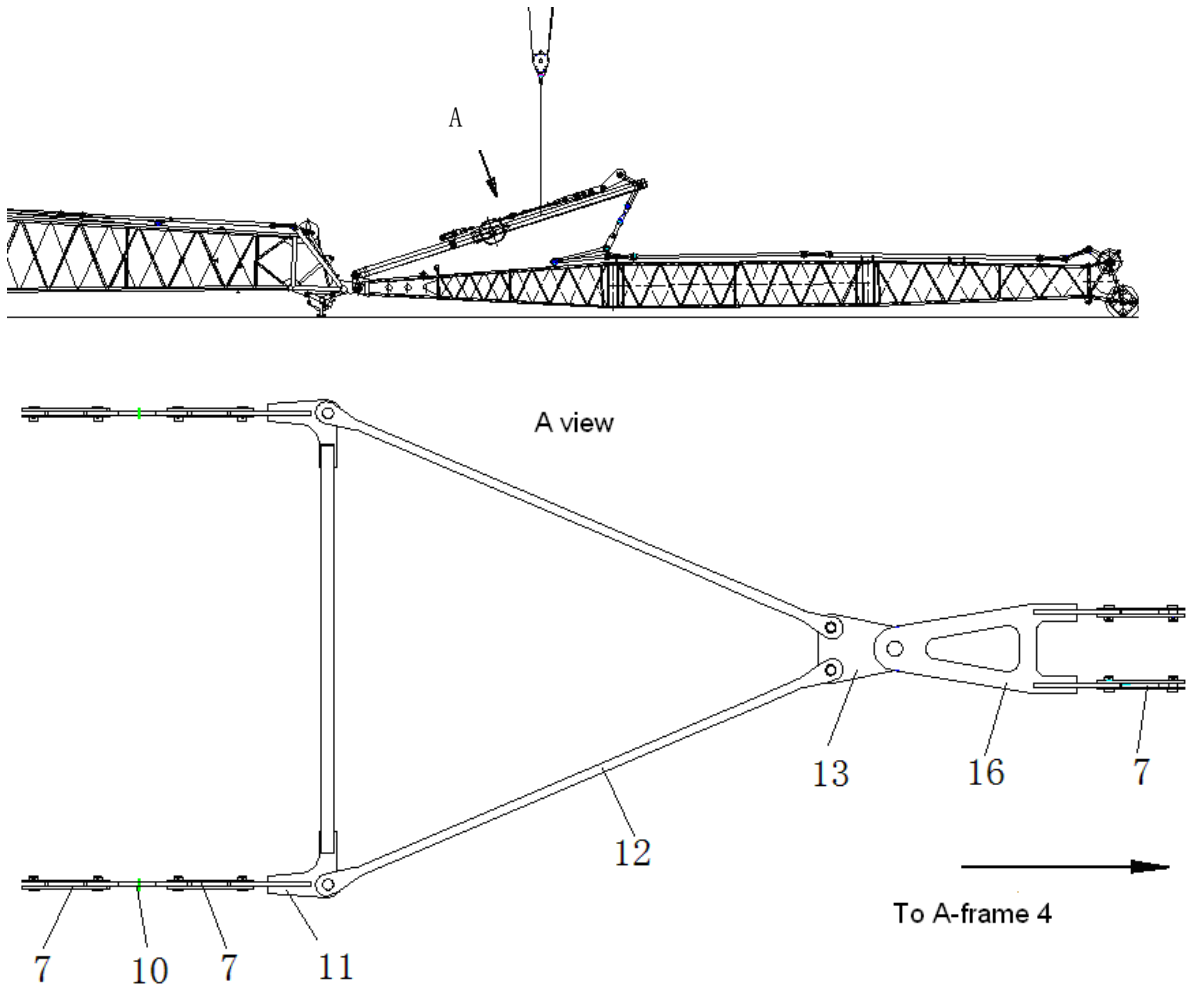
- c) According to actual condition, choose appropriate numbers of fixed jib intermediate sections 6m (G33) in length, and then pin them together. All jib intermediate sections are connected with double tapered pins (1), secured on both sides with retaining springs (2) (following fig.).



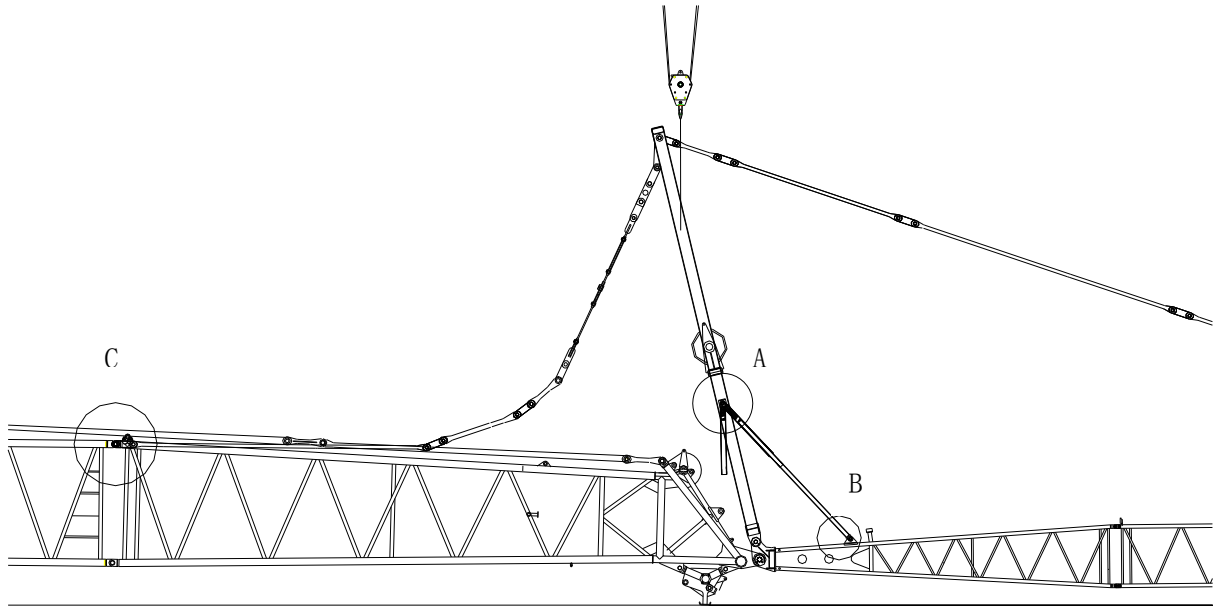
Connecting parts of connect fixed jib section

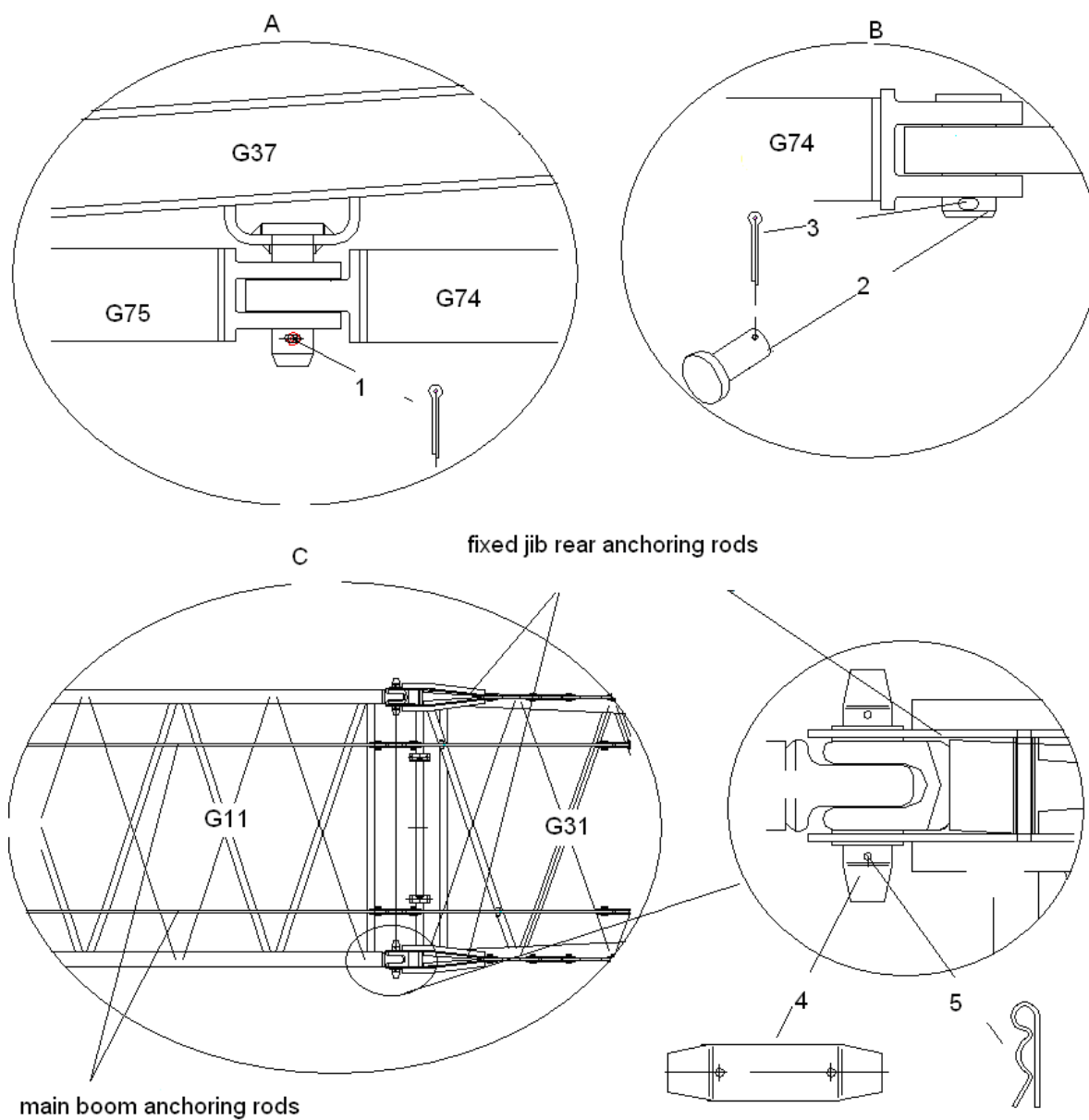
Part No.	Description	Illustration
1	Double tapered pin	
2	Retaining spring	

- d) - Connect required main boom anchoring rods according to assembled main boom length (See Section 5.7.1.3 "combination of main boom anchoring rods").
- Preassemble partial fixed jib rear anchoring rods to FA-frame (see following A-view, for the part number appear in the following figure, please refer to Section 5.7.3.2-b "fixed jib rear anchoring rods")
 - Connect required front anchoring rods according to fixed jib length (for the arrangement and combination of front anchoring rods, please refer to section 5.7.3.2—a "fixed jib front anchoring rod").



- e) - Assemble the outer pipe of one end of front tilting-back support (G74) and rear tilting-back support (G75) to FA-frame (G37), and secure them with cotter pin (1).
- lift FA-frame (G37) with an auxiliary crane until the fixed jib front anchoring rods is tensioned slightly.
- attach the inner pipe of the other end of front tilting-back support (G74) to fixed jib pivot section with pin spindle (2) and secure with cotter pin (3).
- attach required fixed jib rear anchoring rods (see Section 5.7.3.2-b “fixed jib rear anchoring rods”).





G11—main boom pivot section

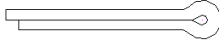
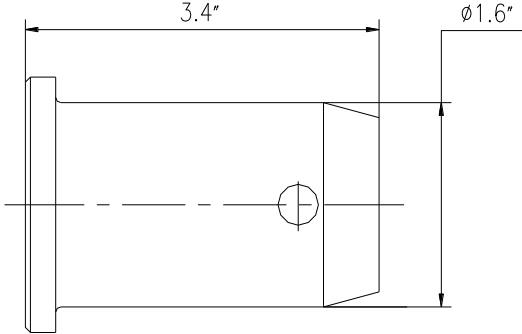
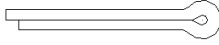
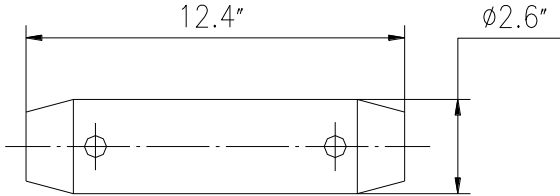
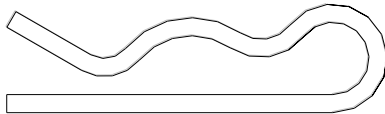
G31—fixed jib pivot section

G37— FA-frame

G74— front tilting-back support of fixed jib

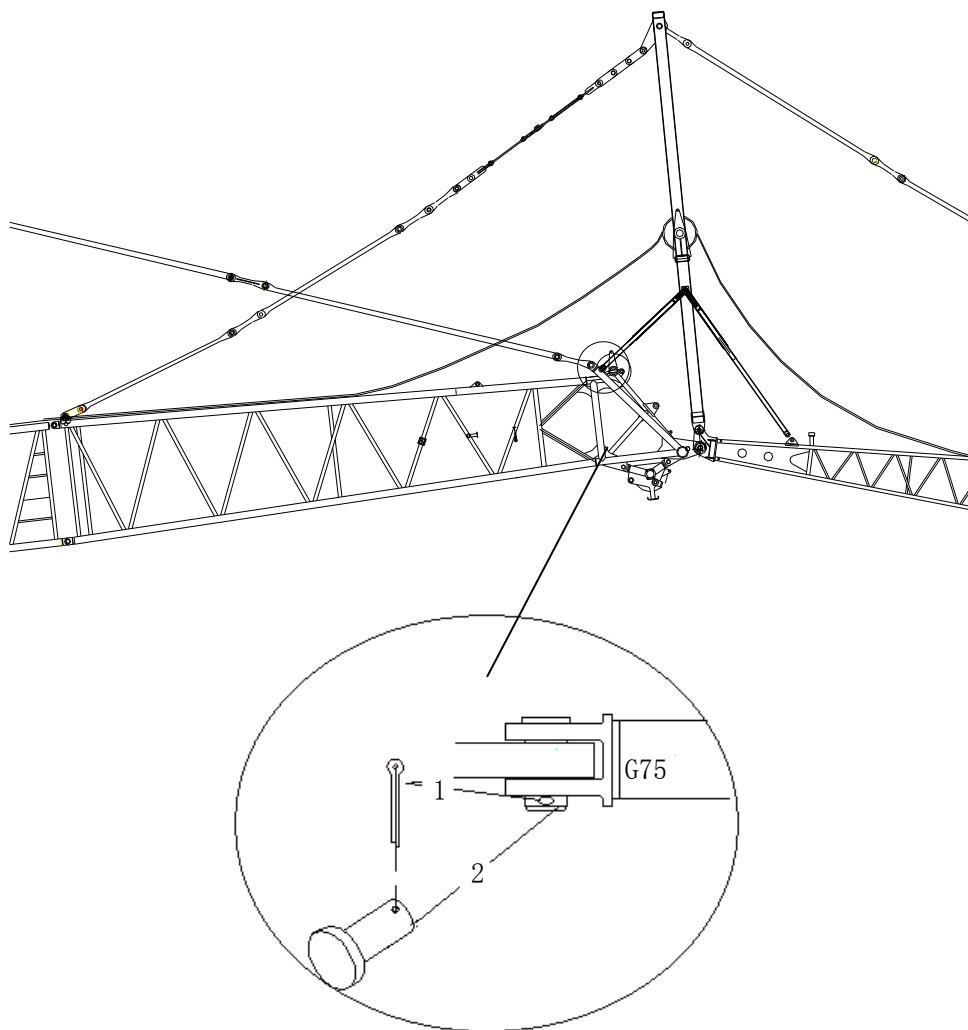
G75—rear tilting-back support of fixed jib

Connecting parts

Part No.	Description	Illustration
1	Cotter pin	 ISO1234-1997 (0.32"×2.4")
2	Pin spindle	
3	Cotter pin	 ISO1234-1997 (0.32"×2.4")
4	Double tapered pin	
5	Retaining spring	

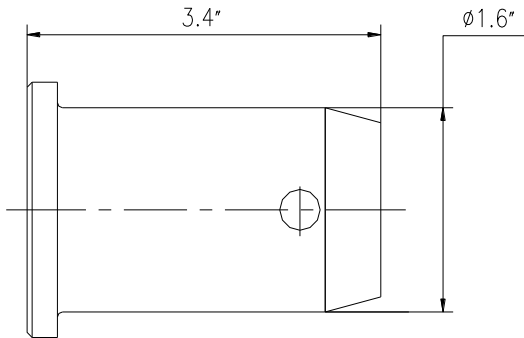
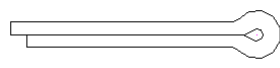
- f) - Turn the switch (60) on right control panel (4) to right or push down the “reeving winch” on the remote control box to unwind the rope of reeving winch.
- Reeve the rope of reeving winch through the rope pulley on fixed jib head and then pull it back to the tail-end of main boom pivot section.
 - Return the switch (60) or the “reeving winch” on the remote control box to neutral position to stop unwinding rope.
 - push the left control lever(17) forwards to unwind the hoisting rope of winch 2 to tail-end of main boom, and then attach the rope of reeving winch to hoisting rope of winch 2 with rope lock.

- Turn the switch (60) to left or push the “reeving winch” on the remote control box up to wind the rope of reeving winch, simultaneously unwind the hoisting rope for winch 2. Guided by the rope of reeving winch, the hoisting rope for winch 2 will then reach fixed jib head.
- g) Move the right control lever (27) to left to wind derricking rope onto derricking winch. When main boom is raised to a proper position, lift the rear tilting-back support of fixed jib (G75) with an auxiliary crane, and then connect it with main boom head with pin spindle (2) and secure with cotter pin(1).



G75— rear tilting-back support of fixed jib

Connecting parts

Part No.	Description	Illustration
2	Pin spindle	
3	Cotter pin	 ISO1234-1997 (0.32"×2.4")

**Caution:**

1. Make sure that hoisting rope on fixed jib head is not exposed to crushing force.
2. Ensure that the fixed jib head is rolling forwards on the running wheel all the time.
3. The attachment of rear tilting-back support to main boom head should be carried out with utmost care.

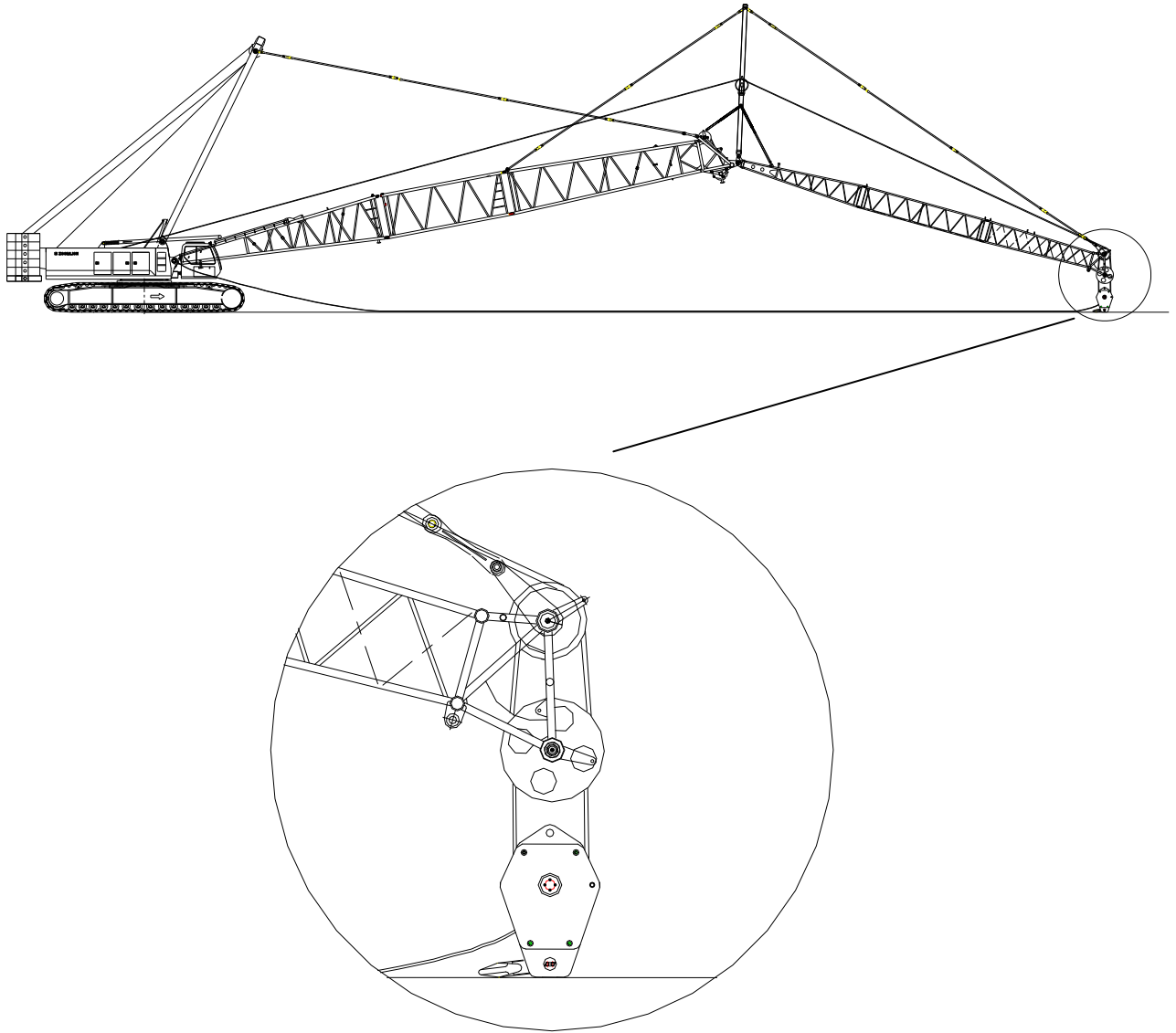
h) -- Move the right control lever (27) to left to wind derricking rope onto derricking winch.

-- When main boom and fixed jib are raised to a proper position a littler higher than the height of a load hook, position the selected load hook under the fixed jib head.

-- reeve the rope of reeving winch in reverse direction between rope pulley on fixed jib head and load hook.

-- attach the rope end point of reeving winch to hoisting rope of winch 2 with rope lock.

-- Turn switch (60) on right control panel (4) to left or push the "reeving winch" switch on the remote control box up to wind the rope of reeving winch. Guided by the rope of reeving winch, the hoisting rope for winch 2 will be reeved in desired direction between the rope pulley on fixed jib head and load hook.



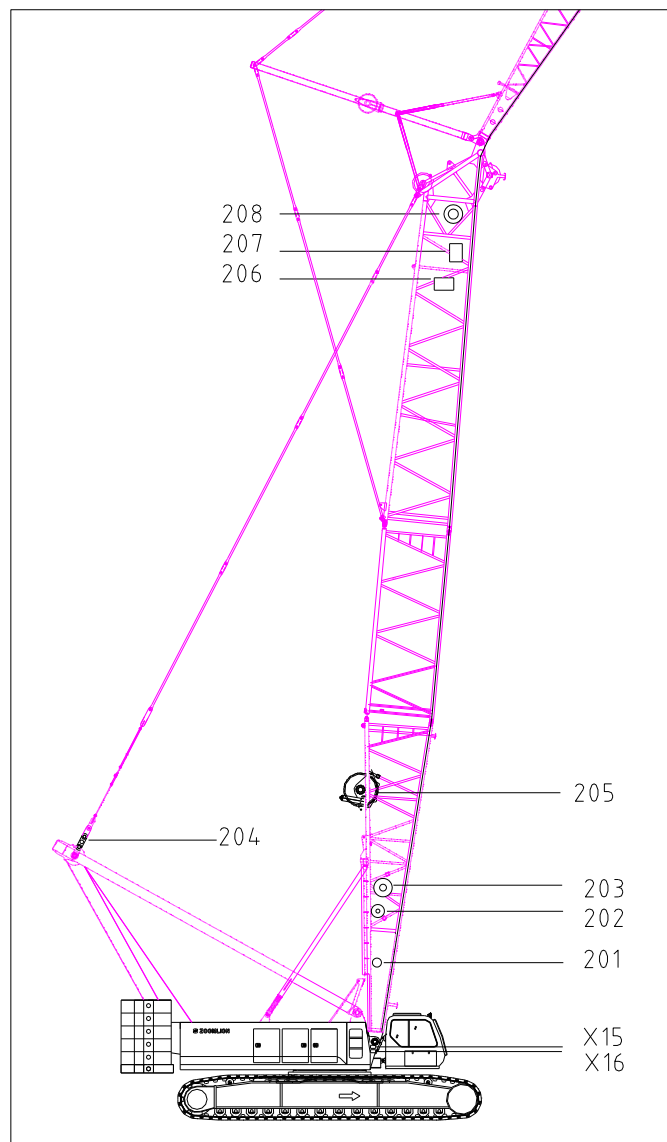
5.11.3 Connect electrics to fixed jib

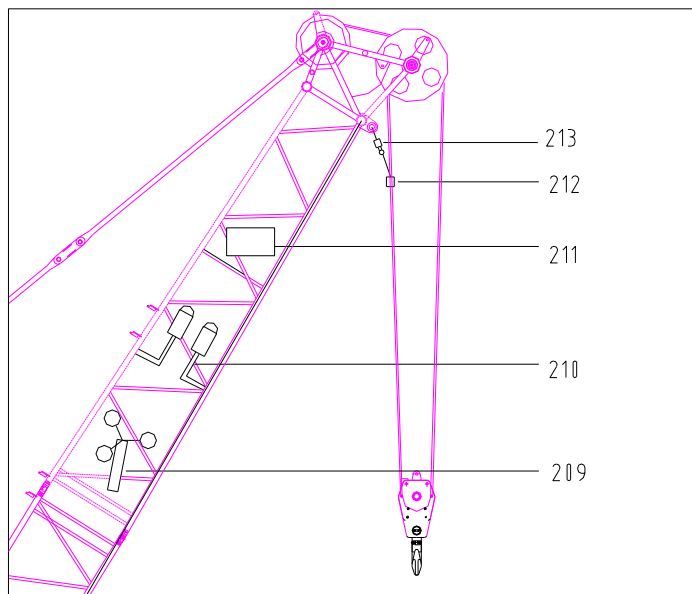
5.11.3.1 Electrical lines connection



Note:

The following figure shows the connected electrical parts on main boom with fixed jib. Before erecting the boom, make sure that all electrical lines are connected and safety measures are checked.





Description of electrical parts attached on main boom with fixed jib

Part No.	Description	Installation position
X15	Socket ,10 hole	At the front of slewing table
X16	Socket ,10 hole	At the front of slewing table
201	Angle sensor	main boom pivot section
202	Cable drum 1	main boom pivot section
203	Cable drum 2	main boom pivot section
204	Main boom tension force sensor	anchoring rods of A-frame
205	Luffing jib derricking winch	main boom pivot section (optional)
206	Main boom junction box	Main boom head
207	Control box for Load Moment Limit on luffing jib	Main boom head
208	Cable drum 3	Main boom head
209	Anemometer	Fixed jib head

210	Warning lamp	Fixed jib head
211	Fixed jib junction box	Fixed jib head
212	Hoisting limit switch weight	Connected to hoisting rope on fixed jib head
213	Hoisting limit switch	Fixed jib head, connected to hoisting limit switch weight

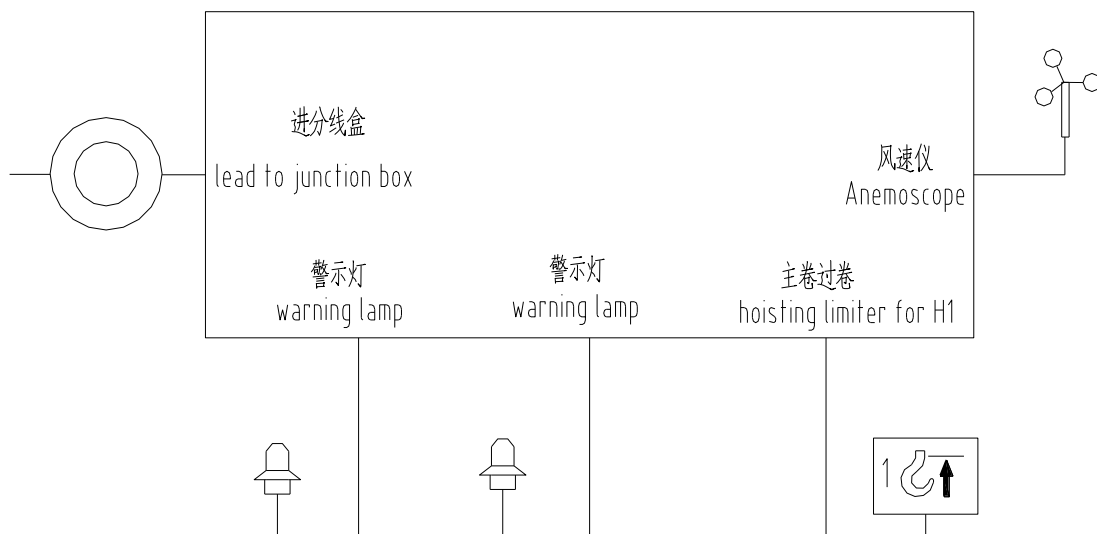
a) Connecting electrics to main boom:

Connect all electrical parts (except anemometer and warning lamp) on main boom according to electrics connecting requirement

b) Connecting electrics to fixed jib:

- 1) insert the one-end cable plug of cable drum 3 into “to cable drum ” socket on main boom junction box, meanwhile, pull the other-end cable plug of cable drum 3 to fixed jib head and insert it into “lead to junction box” socket on fixed jib junction box.

2) Connecting electrics to fixed jib head



Description of fixed jib junction box:

The fixed jib junction box, installed on fixed jib head, has 5 input and output sockets in total, including:

- “Lead to junction box” socket (12-hole) on the left side, used to establish connection to cable drum 3 on main boom head.
- “Anemometer” socket (4-pin) on the right side, used to establish connection to anemometer on fixed jib head.

Other sockets at the bottom of the junction box, from the left to right, are respectively:

- “Warning lamp” socket (2-hole), used to establish connection to warning lamp on fixed jib head
- “Warning lamp” socket (2-hole), used to establish connection to warning lamp on fixed jib head
- “Hoisting limit switch for H1” socket (3-pin), used to establish connection to hoisting limit switch for H 1 connected to fixed jib head.

Insert the cable plug of cable drum on main boom pivot section into the “lead to junction box” socket on main boom junction box.

Insert the cable plug of fixed jib warning lamp respectively into “warning lamp” sockets on the fixed jib junction box.

Inset the cable plug of hoisting limiter for H2 into the “hoisting limit switch for H1” socket on fixed jib junction box.

Insert the cable plug of anemometer on fixed jib head in the “anemometer” socket on fixed jib junction box.



Caution:

Cable plug which is not used should be protected by seal cover.

- c) Electrical connection to Load Moment Limiter

See the *Installation Guide& User’s Manual* for Load Moment Limiter.

5.11.3.1 Checks before erecting main boom with fixed jib

- a) Check warning lamp

Set the Master Lighting Switch 39 (see Section 4.1.4) to the second position, and press “warning lamp on/off” Switch 41 at the same time to check that the warning lamp lights up.

- b) Check the anemometer

Rotate the vane of anemometer to check whether the wind velocity shown on the display in the operator’s cab is normal.

- c) Check hoisting limit switch for H2

Support and hold the hoisting limit switch weight for H2 to ensure that the switch is triggered, and then check that the icon “upper limit switch on H2” on the screen will flash and the buzzer will sound.

5.11.4 Erecting and lowering main boom with fixed jib

5.11.5.1 Requirements

- a) All electrical connections have been established.

- b) The limit switch control lever has been checked for smooth movement.
- c) Check the warning lamp on the boom head.
- d) Check the anemometer.
- e) Check the anemometer for smooth rotation and functional working.
- f) Check the hoisting limiter switch.
- g) Operate the hoisting winch, and adjust the hoisting limit switch on fixed jib head manually. Requirement for this operation: the hoisting movement of hoisting winch should be stopped when the upper limit has been exceeded, and icon "upper limit switch" on the screen will flash.

5.11.5.2 Requirements for erecting main boom with fixed jib

- a) The crane is properly supported and level;
- b) The counterweight plates have been attached in accordance with the lifting capacity charts
- c) Select appropriate boom configurations according to the load to be lifted and the load capacity chart; ensure that boom sections have been connected and secured;
- d) All limit switches has been correctly fitted and are fully operational;
- e) All pinned connections have been secured.
- f) The hoisting rope has been correctly placed in the rope pulleys and prevented from jumping out (from rope groove) using rope guard tube;
- g) No person is present in the danger zone;
- h) There are no loose parts on main boom or jib;
- i) In winter, the main boom, fixed jib and associated components (limit switches, rope drums, warning light, anemometer etc.) must be kept free of ice and snow.



Danger:

Incorrectly fitted or faulty limit switches and falling parts (pins, retaining pins, ice etc.) can cause injury.

5.11.5.3 Erecting main boom with fixed jib

- a) Select the “fixed jib” operating mode in the Load Moment Limiter in accordance with boom configurations.



Caution:

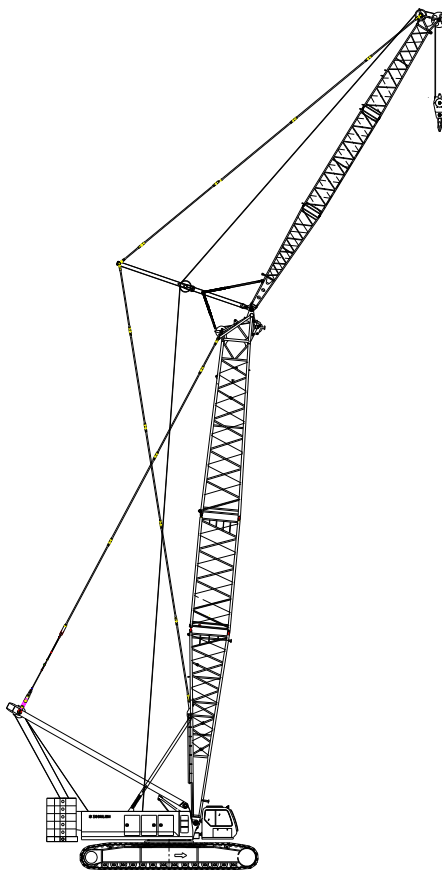
Performing slewing motion while the fixed jib is being erected off the ground is prohibited.

- b) - Move the right control lever (27) to the left to raise the boom, and push the left control lever(17) forwards at the same time to reel off hoisting winch 2 so that the load hook will not be dragged on the ground.
- when main boom is raised to 30° position, the “assembly mode” will change to “operating mode” automatically.
 - move the left control lever(17) and right control lever (27) to neutral position.
- c) Move the right control lever(27) to the left to erect the boom . When the main boom with fixed jib is raised to required working position, move the right control lever (27) to neutral position.



Caution:

1. when main boom is raised to 83°, the movement of derricking boom up will be switched off automatically along with warning being sent out, but the main boom can still be derricked up by pressing the “bypass key button”(54). However, when main boom is raised to 86° position, the movement of derricking boom up will be switched off automatically along with warning being sent out. Under this condition, even though “bypass key button” is pressed, the main boom can not be raised any more.
2. The boom should be erected or set down stably at even speed.



5.11.5.4 Lowering and dismantling main boom with fixed jib

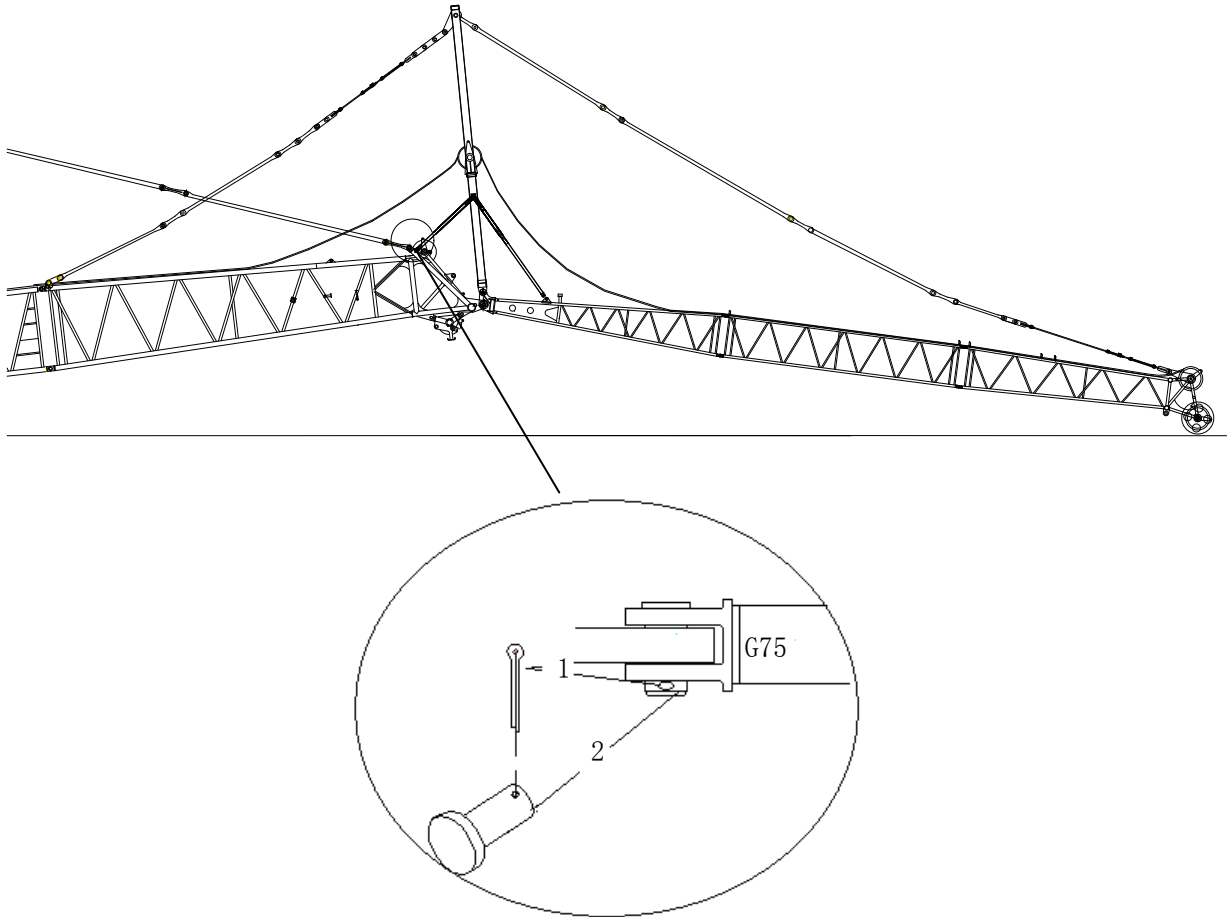
- a) Move the right control lever (27) to the right to lower the boom. When the main boom is lowered to 30° position, return the right control lever (27) to neutral position.
- b) Push the left control lever (17) forwards to lower the hook on the ground.



Note:

To avoid load hook's colliding with the pulley head, the load hook must not be lifted too high in the process of lowering main boom with fixed jib.

- c) Move the right control lever (27) to the right to reel off the derricking winch so as to make the fixed jib head come into contact with the ground, then disconnect the inner pipe of rear tilting-back support of fixed jib (G75) from the main boom head(See following figure).



G75—rear tilting-back support of fixed jib

Connecting parts

Part No.	Description	illustration
2	Pin spindle	Technical drawing of a pin spindle. The drawing shows a cylindrical part with a central hole. The length of the part is dimensioned as 3.4 inches. The diameter of the central hole is dimensioned as 1.6 inches.
3	Cotter pin	Technical drawing of a cotter pin, showing its characteristic shape with a loop at one end and a pointed end at the other. ISO1234-1997 (0.32"×2.4")

d) -Keep on moving the right control lever (27) rightwards to reel off the derricking winch so as to make the fixed jib head rolls forwards on the running wheel until the entire boom gets into contact with the ground.

- Move the right control lever (27) to neutral position to stop the movement.



Caution:

1. The boom-lowering movement should be performed slowly and stably. And during the operation, the crane operator must observe the data shown on the display, while other workers must observe the surrounding areas for potential dangers.
2. Standing within an area where the crane movement is carried out is prohibited.
3. To prevent the wire rope from being damaged due to crush, it should be guided by a person.

e) Push right control lever (27) backwards to wind the hoisting rope onto the winch 2 and secure it.



Caution:

The winding of wire rope should be supervised by a person appointed, and no person is standing within danger zone during operation.

f) - Lift FA-frame by an auxiliary crane, and then dismantle the front and rear tilting-back support of fixed jib.

- with the help of the auxiliary crane, tilt the FA-frame forwards to an appropriate position, and then disassemble the fixed jib front and rear anchoring rods;

g) Spilt the fixed jib sections one by one, leaving the fixed jib pivot section assembled.

h) Detach the fixed jib pivot section (together with FA-frame) from the main boom head.



Caution:

All crane movements should be carried out smoothly, and all safety precautions should be followed, otherwise there is a risk of accident.

5.12 Assembly and dismantling of main boom with heavy fixed jib (SFV)

For the assembly, dismantling and erecting as well as lowering of main boom with heavy fixed jib, please refer to section 5.11 “Assembly and dismantling of main boom with fixed jib”.

Connecting electrics to main boom with heavy fixed jib:

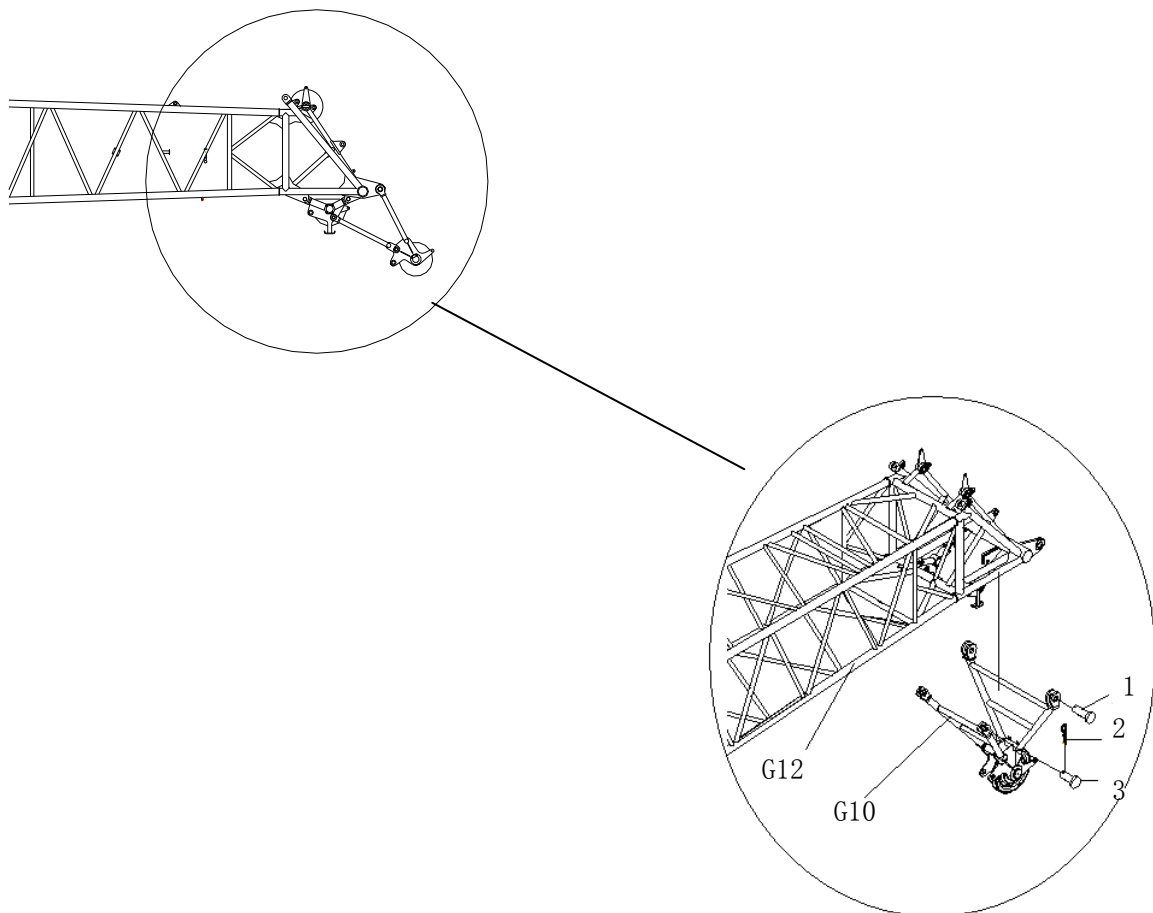
For electrical connections to main boom, please refer to section 5.8.3 “Connect electrics”;

In this boom configuration, the hoisting limit switch is mounted on heavy fixed jib, it should be connected to “hoisting limit switch for H1” on junction box.

5.13 Assembly and dismantling of tip boom

Crawler crane QUY260 has two tip booms, i.e., tip boom on main boom head, and tip boom on luffing jib head.

Assembly of tip boom on main boom head:

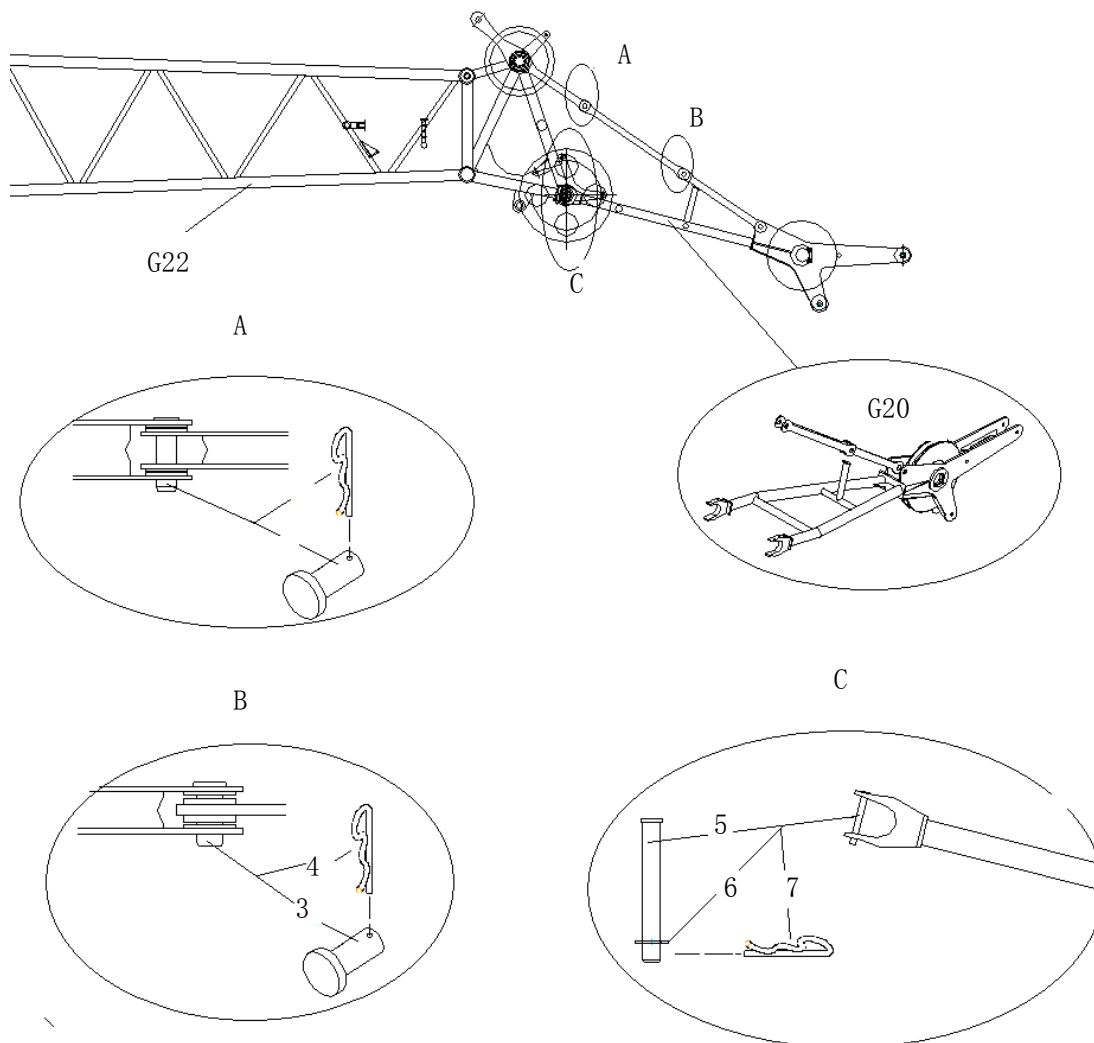


G10—tip boom on main boom head G12—main boom head

Connecting parts of tip boom on main boom head

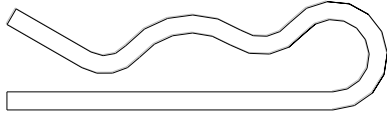
Part No.	Description	illustration
1	Pin spindle	
2	Retaining spring	
3	Pin spindle	

Assembly of tip boom on luffing jib head:



Connecting parts of tip boom on luffing jib head

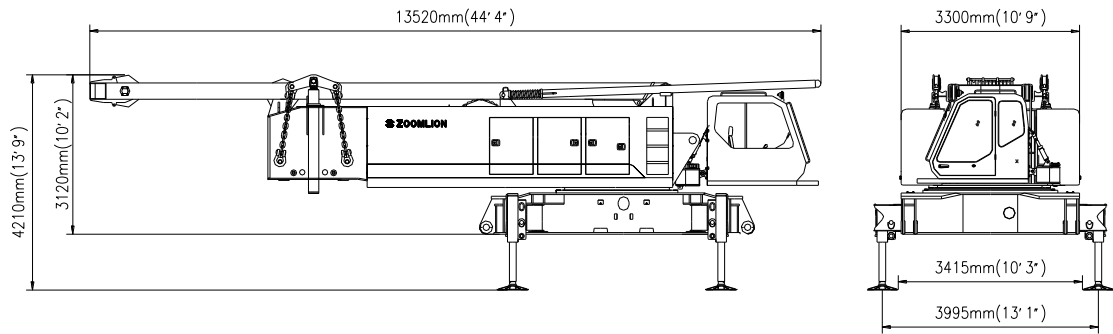
Part No.	Description	illustration
1	Pin spindle	
2	Retaining spring	
3	Pin spindle	
4	Retaining spring	
5	Pin spindle	
6	washer	(0.64'')

7	Retaining spring	
---	------------------	--

5.14 Transport dimensions and weights of main components

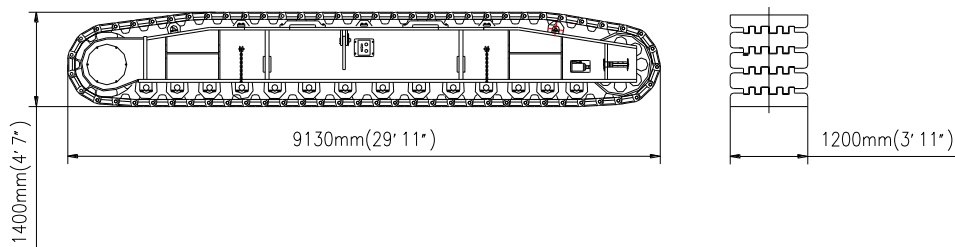
All Length values are given in mm.

Basic machine— (105800Ib)

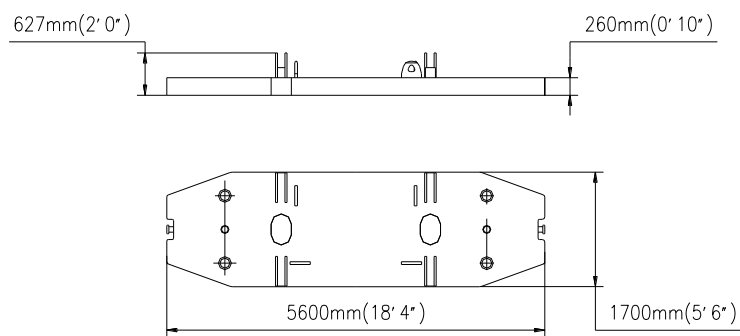


Crawl

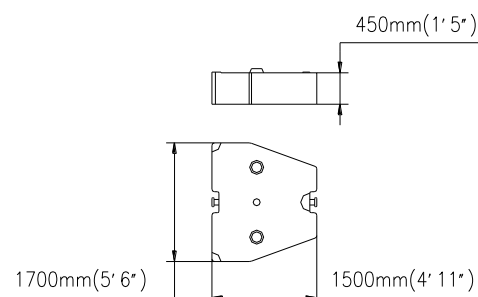
er carrier—54000Ib×2



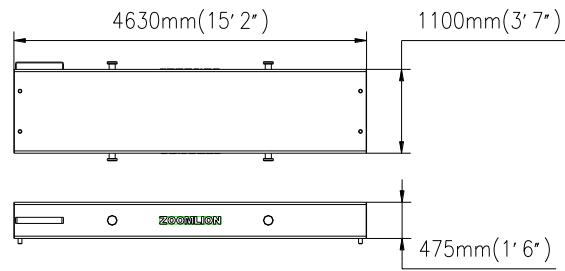
Counterweight base plate—41900Ib×1



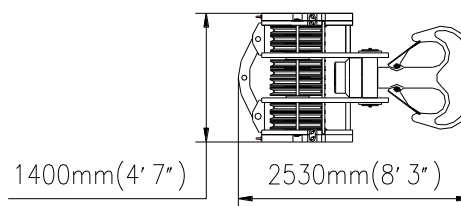
Rear counterweight plate----14600Ib×10



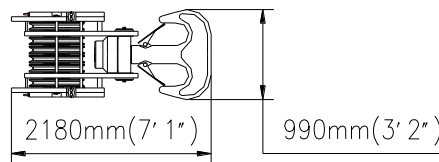
Central counterweight plate----35300Ib t×2



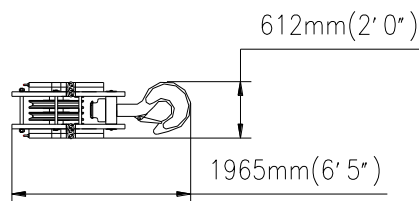
260t (573300Ib) Load hook---- 9261Ib ×1



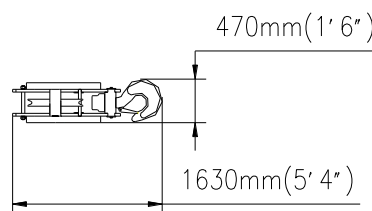
160t/100t (352800Ib /220550Ib) Load hook----6174Ib×1



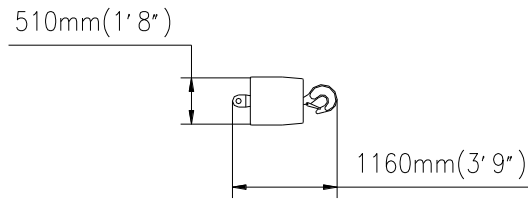
50t (110250Ib) load hook----3748Ib×1



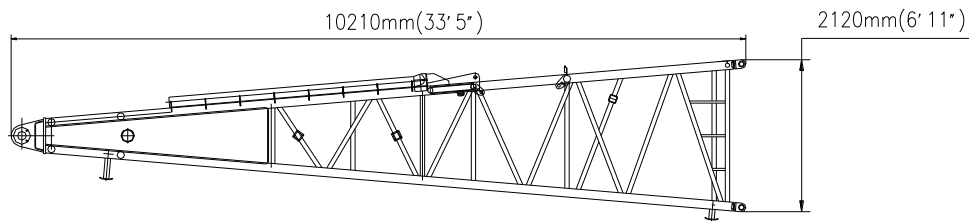
30t (66150Ib) Load hook----2360Ib t×1



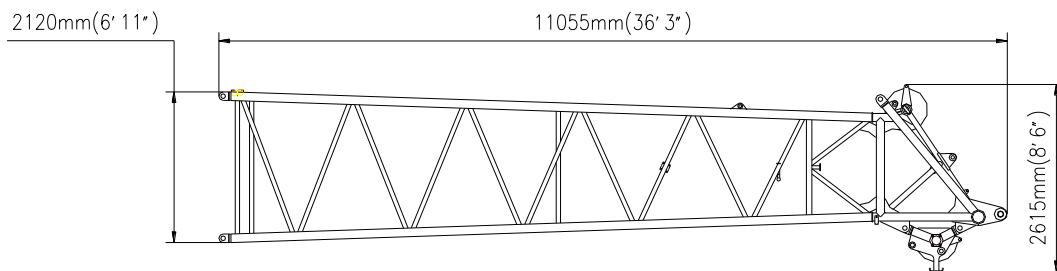
16t (35280Ib) load hook----1764Ib×1



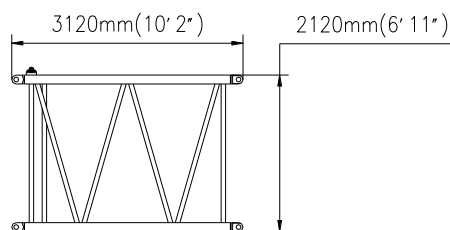
Main boom pivot section (Width: 7' 7")—6659Ib×1



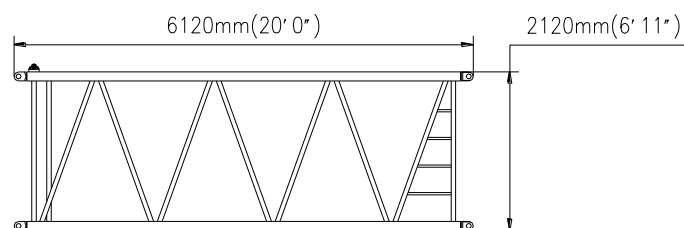
Main boom head (width: 7' 7")—7453Ib×1



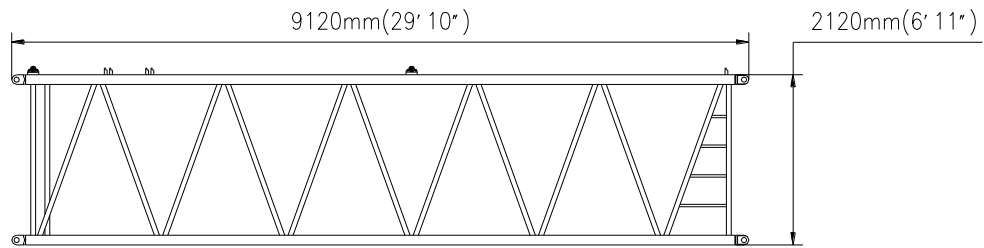
(9'10") main boom intermediate section (width: 7' 7")—1588Ib×1



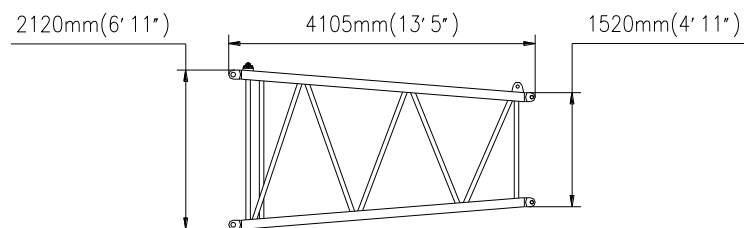
(19'8") main boom intermediate section (width: 7' 7")—2646Ib×1



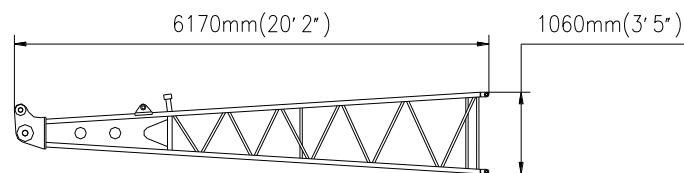
(29'6") main boom intermediate section (width: 7' 7")—3925Ib×6



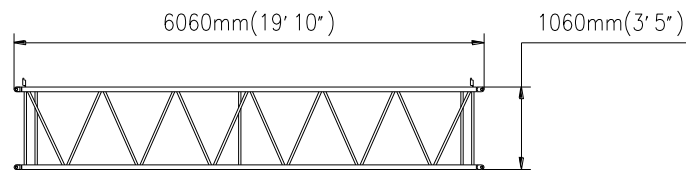
(13'1") reducing section (width: 7' 7")—1808Ib×1



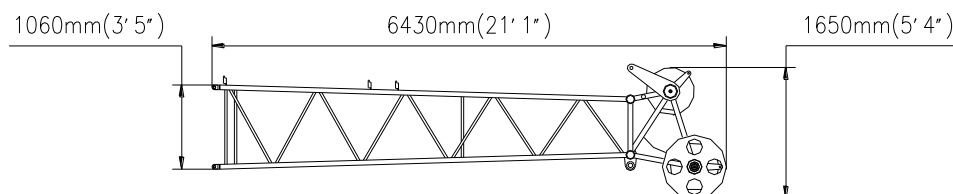
Fixed jib pivot section (width: 5' 0")—1036Ib×1



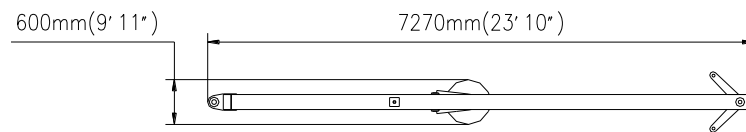
(19'8") fixed jib intermediate section (width: 4' 1")—617Ib×3



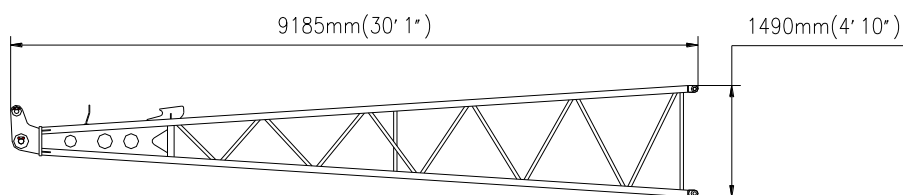
Fixed jib head (width: 4' 1")—1411Ib×1



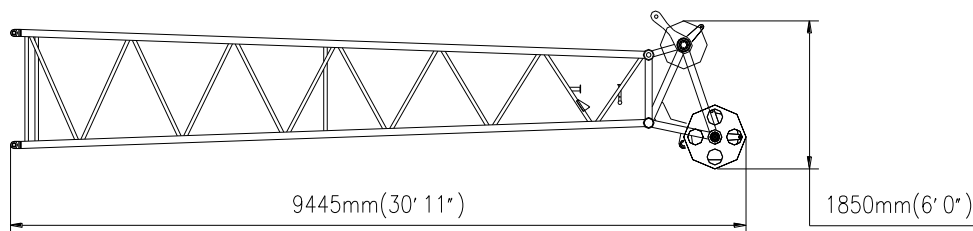
FA-frame (width: 4' 11")—1654Ib×1



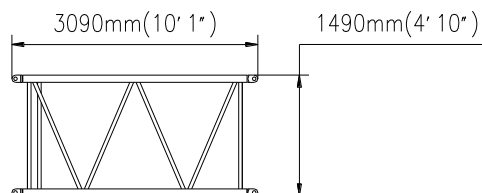
Luffing jib pivot section (width: 5' 6")—2007Ib×1



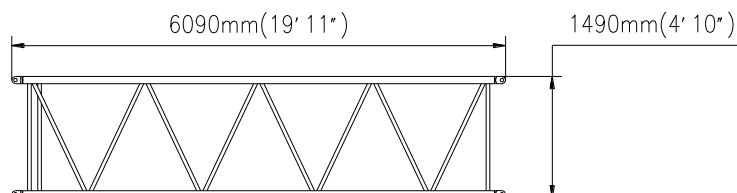
Luffing jib head (width: 5' 6")—2426Ib×1



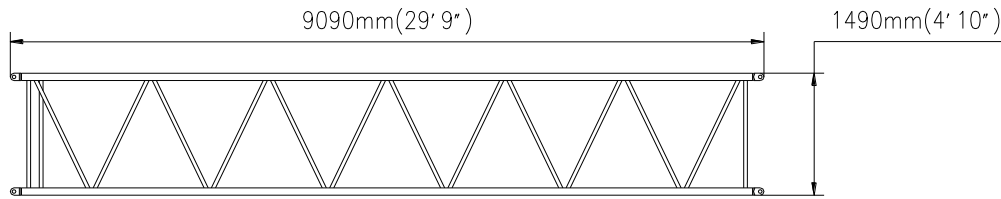
(9' 10") luffing jib intermediate section (width: 5' 6")—617Ib×1



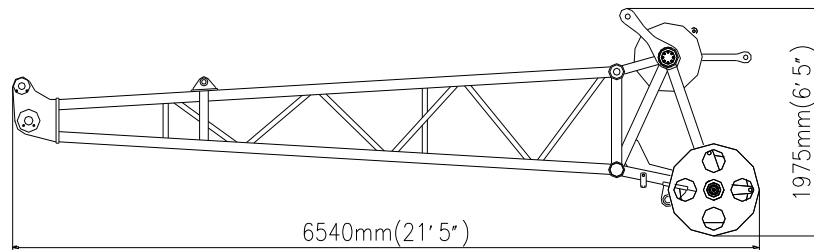
(19' 8") luffing jib intermediate section (width: 5' 6")—1103Ib×2



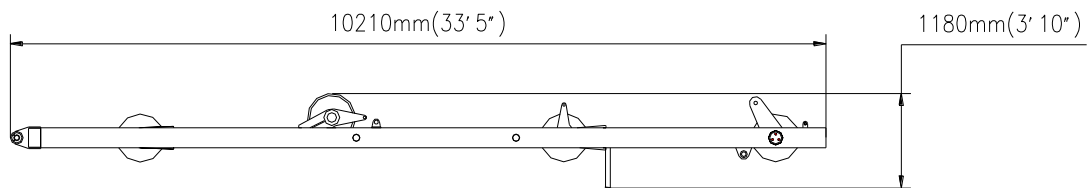
(29' 6") luffing jib intermediate section (width: 5' 6")—1500Ib×3



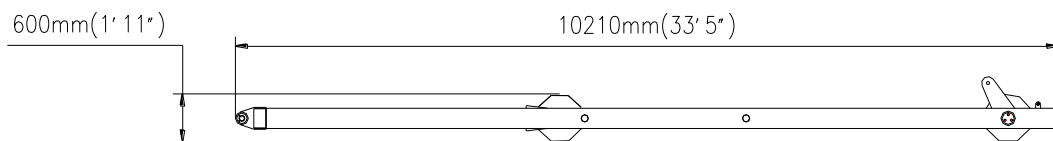
Heavy fixed jib (width: 5' 1")—2205Ib×1



WA-frame 2 (width: 5' 8")—3837Ib×1



WA-frame 1 (width: 4' 6")—3352Ib×1



5.15 Requirement for crane transport

Transport means and safety precautions for transport

- a) After being dismembered, the crawler crane can be transported by a low-loader, train or by other transport equipment for a long distance. During transportation, the crane is fixed by rope, with its doors and windows locked up. If necessary, take preventive measures against rain. The crawler crane should be dismembered and transported in accordance with the permissible load carrying capacity of transport vehicle and the weight, dimensions of dismantled parts which are shown in the previous figures. The transport vehicle is forbidden to be overloaded.
- b) During transportation, all component parts should be fixed to prevent them from jostling and sliding.
- c) To understand the detailed transport means, please consult our company.

If the crane is permanently inactive for more than 6 months, take the following protective measures.

- a) Wipe off the dust and oil dirt to keep the crane clean;
- b) Retract all the piston rods of the cylinders completely;
- c) Put the battery in a dry and ventilating place and charge it periodically;
- d) Bared surfaces of all components should be greased to prevent them from corroding;
- e) Clean the wire ropes and grease them again with ZG-3 graphite calcium base grease;
- f) The crane should be stored in a garage. If it is placed in the open air, it must be covered up with water-proof cloth to prevent it from corroding, and in winter antifreeze measure should be taken;
- g) Starting the machine once a month and running all mechanisms with no load to check whether they are in good condition;
- h) Assign a person responsible for completeness of the crane so that it can be put into operation at any time.

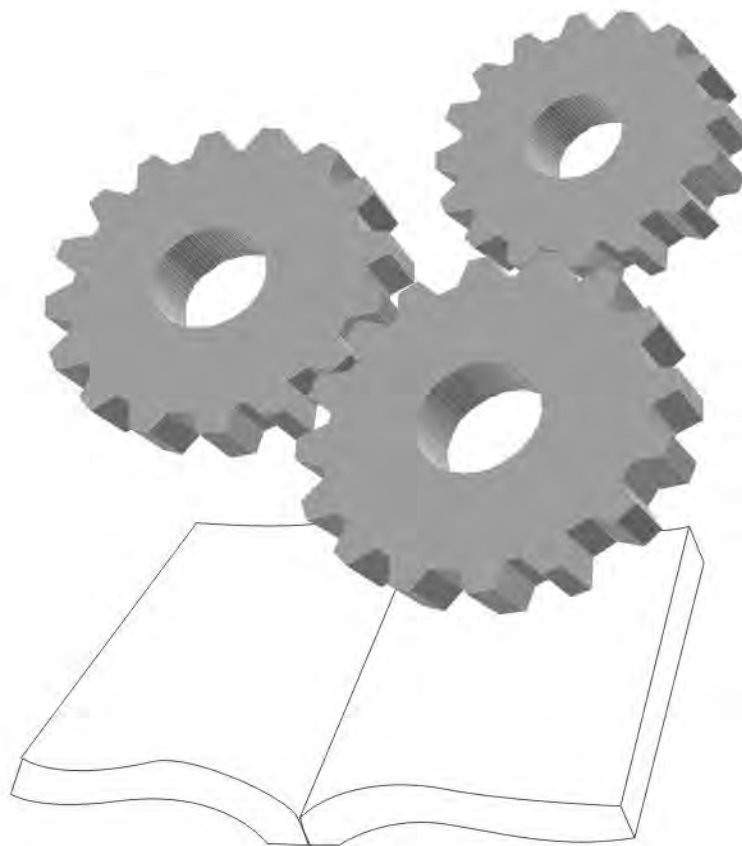
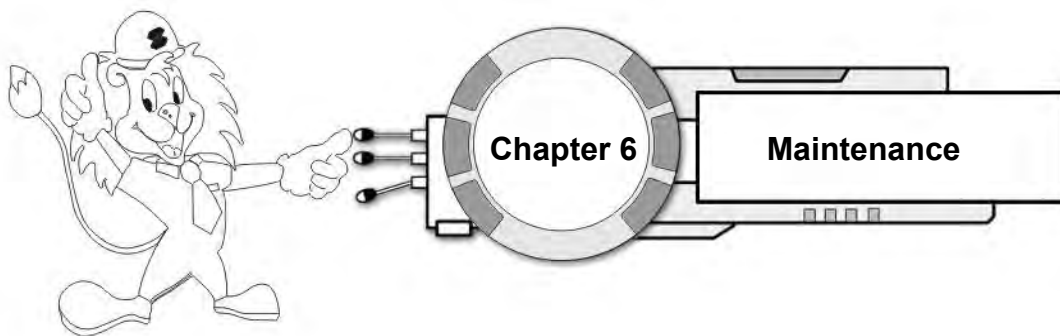
5.15 Requirement for crane transport

Transport means and safety precautions for transport

- a) After being dismembered, the crawler crane can be transported by a low-loader, train or by other transport equipment for a long distance. During transportation, the crane is fixed by rope, with its doors and windows locked up. If necessary, take preventive measures against rain. The crawler crane should be dismembered and transported in accordance with the permissible load carrying capacity of transport vehicle and the weight, dimensions of dismantled parts which are shown in the previous figures. The transport vehicle is forbidden to be overloaded.
- b) During transportation, all component parts should be fixed to prevent them from jostling and sliding.
- c) To understand the detailed transport means, please consult our company.

If the crane is permanently inactive for more than 6 months, take the following protective measures.

- a) Wipe off the dust and oil dirt to keep the crane clean;
- b) Retract all the piston rods of the cylinders completely;
- c) Put the battery in a dry and ventilating place and charge it periodically;
- d) Bared surfaces of all components should be greased to prevent them from corroding;
- e) Clean the wire ropes and grease them again with ZG-3 graphite calcium base grease;
- f) The crane should be stored in a garage. If it is placed in the open air, it must be covered up with water-proof cloth to prevent it from corroding, and in winter antifreeze measure should be taken;
- g) Starting the machine once a month and running all mechanisms with no load to check whether they are in good condition;
- h) Assign a person responsible for completeness of the crane so that it can be put into operation at any time.



ZOOMLION

6.1 General

maintenance of the crane shall conform to ANSI B30.5:2007 section 5-2.3

In order to ensure a good and safe condition of the crane all the time, the maintenance worker must service and maintain the crane periodically.

6.1.1 Crane maintenance

Before inspecting and maintaining the crane, following prerequisites must be fulfilled:

- The boom is laid down on the ground;
- The engine is switched off;
- All the safety devices are locked;
- The key is taken out from the ignition starter switch to prevent the engine from being switched on by an unauthorized person.



Caution:

Failing to observe this regulation may result in death or serious injury.

6.1.1.1 Basic requirements for crane maintenance

- a) The maintenance worker should wear specified clothes during maintenance;
- b) The crane should be set up on level and firm ground, where a warning board marked “Inspection” is placed around the crane;
- c) Use ladder and safety belt when working in high position 2m above the ground;
- d) When there is a need to move the crane for maintenance, the operator must operate the crane according to the signals;
- e) When inspecting or maintaining the hydraulic system, dust and impurities are not allowed to enter into the system;
- f) If several parts need to be repaired and adjusted, please repair and adjust them immediately;
- g) If the crane needs to be repaired, the customer must contact a local service station of Mobile Crane Branch Company of Zoomlion;
- h) In order to ensure the performance of the crane, please use the accessories and lubricating grease specified by Zoomlion;
- i) The expendable parts such as filter cartridge must be changed in time to avoid the malfunction;
- j) If uncertain failure is found during inspection or maintenance, please contact a local service station of Mobile Crane Branch Company of Zoomlion.

- k) Place crane where it will cause the least interference with other equipment or operations in the area.
- l) Set all controls in the off position and ensure all operating features are secured from inadvertent motion by brakes, pawls, or other means.
- m) Lower the boom to the ground, if possible, or otherwise secure against dropping.
- n) Relieve hydraulic oil pressure from all hydraulic circuits before loosening or removing hydraulic components.

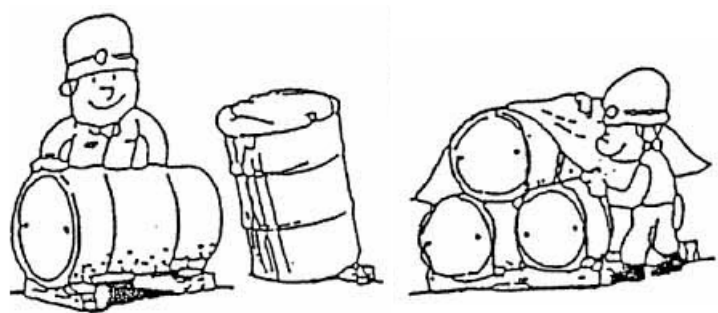
6.1.1.2 Notes on crane maintenance and service

- a) Set up the warning board during maintenance

Before carrying out the inspection and maintenance, put a warning board marked "Never start engine during inspection and maintenance." on the ignition starter switch.

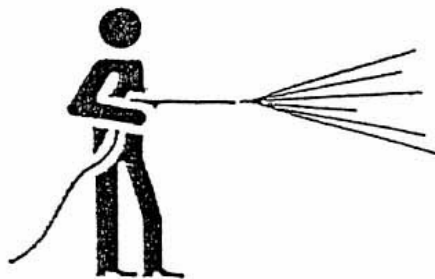
- b) Use clean lubricating grease

The room for storing lubricating grease must be kept clean. Never allow dust and water to enter into container. Ensure that the used lubricating grease is not mixed with water.



- c) Keep machine clean

Clean the machine to make operator easy to check whether some abnormal phenomena occur such as oil leakage, crack and loosening of connector. Especially keep the grease nipple, air vent and oil dipstick clean.





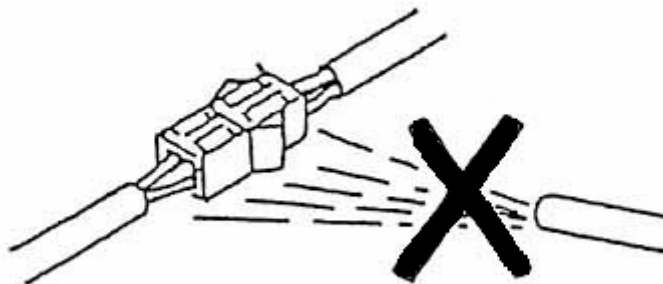
Note:

1. After cleaning the machine, lubricate the propeller shafts and rotary parts.
2. The steering wheel, operating desk, control panel and floor inside the operator's cab must only be washed by warm water with cleaning agent.
3. Never use a corrosive cleaning agent.

d) Oil clean up

When adding or changing fuel, hydraulic oil and lubricating grease, or when replacing the filter cartridge, the oil will be spouted out. At this moment, wipe off oil to prevent a fire.

- e) Never spray water on the electric elements and the fittings when washing the machine.



f) Prevent a fire

The rubbish attached with oil stain or other flammable substances must be placed in a safe place. Know about the position of fire extinguisher and master its use methods.



g) Pay attention to the rotary parts

When checking the fan belt or the water pump, the operator could be hurt. Therefore, he should first switch off engine, and then check the belt or the water pump.



h) Pay attention to the water temperature and the oil temperature

It is very dangerous to drain water, oil or replace filter cartridge immediately after the engine stops. This operation must be done only when the temperature of engine has fallen down. If the oil temperature is too low, heat oil to make its temperature reach 20~50°C, and then drain the oil.



i) Check waste oil and old filter cartridge

Check if there has metallic bits or impurities when changing the oil or filter cartridge.

j) Prevent dust from entering

The dismantled hydraulic pipes and hydraulic elements must be protected by plugs or sealing covers to avoid dust entering into these pipes and elements.



k) Clean joint face

After dismantling O ring or other washer, clean the sealing surface and replace the sealing elements with new ones. During assembly, apply oil on the sealing elements.

l) Pay attention to pressure inside

As there is pressure produced in the hydraulic system, air compressing system and fuel system, the operator must release pressure first before dismantling their pipelines, fittings and other components.



m) Notes when carrying out welding operation

Cut off power supply; disconnect power lead of battery; never constantly apply the voltage more than 200v; set up the grounding device away from the welding point 1m. Never install the sealing device or bearing between the welding point and the grounding point. Before carrying out welding operation in the vicinity of load moment limiter or controller, demount them first to prevent them against damage.

n) Deal with waste oil

First drain waste oil into a container, and then deal with it according to the requirements for industry discharge substances.

o) Unauthorized personnel are prohibited to maintain the crane and replace the parts.

6.1.2 Requirements for crane inspection

In order to know about the working conditions of crawler crane and its components, please carry out inspection in accordance with the following requirements. Inspect them before the crane is working for the first time, after the crane has not been used for a long time, or before the crane is working for the first time after maintenance. The inspection result list refers to attached table.

- a) Check the daily record of work to ensure that all regular inspections, maintenance and repair work is performed.
- b) Check lowering limiter, boom angle indicator, tilting-back supports and other safety devices for functional work.
- c) Check the load-bearing parts carefully, such as wire rope (hoisting rope, derricking rope and sling etc.), boom frame, support cylinders and load hook.
- d) Check if there are some bolts, nuts and pins lost, and the components are cracked or damaged.
- e) Ensure that no modification has been made to the crane without permission, e.g., increase or decrease in counterweight plates, and improper repair of boom frame.
- f) Check the fuel lines and the hydraulic oil lines for leakage.
- g) Check if the values shown on instruments are correct after starting up the engine.
- h) Check if control mechanisms are working normally.
- i) Check brake and clutch. Test the braking performance by lifting a load away from the ground and holding it in the air for a moment.
- j) Under working condition, the brakes for hoisting and derricking system will bear a limit torque which is 33% larger than the torque transmitted from winding drum to brakes.
- k) Mechanisms with dynamic brake systems (e.g. hydraulic brake valve, electrical braking) shall have a secondary holding brake system which is independent of the dynamic brakes restraining the same torque as for the primary holding brake.
- l) In order to avoid free fall of winch, the holding brake shall perform the function of an emergency brake in the event of failure of dynamic brake system. The holding brake will work automatically when energy supply is switched off.
- m) The deceleration in an emergency case should not lead to damage to the structure, wire rope and winding drum as well as mechanisms.

6.1.3 Attached tools for maintenance

Attached tools for maintenance

Serial No.	Code	Designation	Quantity	Serial No.
1	CSH G1/4"/WD	Test joint	1	1
2	CSH/M12*1.5/WD	Pressure testing joint	1	2
3	CSH/M14*1.5-1500A	Test hose	2	3
4	CSH/M14*1.5/WD2103-01-14.00	Pressure testing joint	1	4
5	CSHS10-L	Test joint	1	5
6	CSHS15-L	Test joint	2	6
7	VDDKO10-L	Joint	1	7
8	VDDKO15-L	Joint	1	8
9	A15-ML/WD	Joint	2	9
10	HM63-400-R-M14*1.5	Pressure gauge	2	10
11	HM63-60-R	Pressure gauge	1	11
12	GJX160-91-0	Toolbox assembly	1	12
13	SJ26-0	Load handling device	4	13
14	ST159	Arch buckle	1	14
15	ST009 5T-10000	Flexible belt with two ends fastening	2	15

6.2 Superstructure maintenance and inspection plan

Maintenance interval	Serial No.	Component	Item	Inspection method
6.2.1 Every day or every 5 hours	1	Fuel pipe or hydraulic pipe	Damage	Visual inspection
	2	A-frame	Deformation and crack	Visual inspection
	3	Engine	Start-up, leakage or noise	Start-up and audiovisual inspection
	4	Slewing brake	Functional work	Operation
	5	Slewing lock	Functional work	Operation
	6	Horn, lamps and wiper	Functional work	Operation and visual inspection
	7	Air filter	Blockage	Visual inspection
	8	Pin, anchoring rod and cotter pin	Damage and tight fit	Visual inspection
	9	Bolt and nut	Tight fit	Visual inspection
	10	Hoisting limiter	Functional work	Operation
	11	Derricking limit switch	Functional work	Operation
	12	Glass, ladder, handrail and guardrail	Damage, crack and tight fit	Visual inspection
	13	Operational aids for malfunction: daily, when used		Operation
	14	All hydraulic hoses, particularly those that flex in normal operation of crane functions, should be visually inspected once every working day, when used.		Visual inspection
	15	Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation		Operation
	16	Hydraulic system for proper oil level: daily, when used		Visual inspection

Maintenance interval	Serial No.	Component	Item	Inspection method
6.2.2 Every month or every 100 hours	17	Fan belt	Damage and tight fit	Operation and visual inspection
	18	Radiator and oil cooler	Leakage and damage	Visual inspection
	19	Foundation bolt and damping rubber cushion of engine	Damage and tight fit	Operation and visual inspection
	20	Hydraulic motor and reducer	Leakage and abnormal sound	Audiovisual inspection
	21	Valves	Leakage	Visual inspection
	22	Hydraulic pump	Leakage and abnormal sound	Visual inspection
	23	Erection cylinder	Leakage and damage	Audiovisual inspection
	24	Refueling pump and hose	Functional work and damage	Operation and visual inspection
	25	Transfer case	Leakage and abnormal sound	Audiovisual inspection
	26	Operator's cab tilting mechanism	Functional work	Operation
6.2.3 Every 3 months or every 250 hours	27	Engine oil		Change
	28	Engine oil filter		Change
	29	Engine oil separator filter		Change
	30	Filter cartridge of fuel fine filter		Change
	31	Filter cartridge of coolant filter		Change
6.2.4 Every 6 months or every 600 hours	32	Slewing table	Damage and crack	Visual inspection
	33	Engine air filter		Change

Note: The serial number in above table should be consistent with that in following context.

6.2.1 Maintain and inspect superstructure every day or every 5 hours

1) Fuel pipe or hydraulic pipe

Check fuel pipe or hydraulic pipe for leaks and damage.



Note:

1. If pipeline leaks oil, wipe it clean at once and repair the leaking point completely.
2. If maintenance work will be carried out near the engine, the person must not step onto the fuel pipe.

2) A-frame

Check A-frame for damage.



Note:

If A-frame is damaged, please contact a local service station of Mobile Crane Branch Company of Zoomlion.

3) Engine

Start the engine and check it for starting condition and abnormal noise.

4) Slewing brake

Check slewing brake for functional work. (Turn slewing brake switch in “ON” position to operate the slewing movement. If the slewing brake is valid, the slewing movement will not be carried out.)

5) Slewing lock

Check that slewing lock pins can be inserted smoothly, and check the lock pins and connecting rods for deformation.

6) Horn, lamps and wiper

Switch on the switches to check that the horn, lamps and wiper work properly.

7) Air filter

When air filter is clogged, the indicator will display red color.

8) Pin, anchoring rod and cotter pin

Check connecting pins, anchoring rods and cotter pins for damage or tight fit.

9) Bolt and nut

Check bolts and nuts for tight fit.

10) Hoisting limiter

Check hoisting limiter for functional work.

11) Derricking limit switch

Check derricking limit switch for functional work.

12) Glass, ladder, handrail and guardrail

Often wipe the glass, ladder, handrail and guardrail with a clean cloth, especially when they are polluted by grease.

13) Operational aids for malfunction: daily, when used

14) All hydraulic hoses, particularly those that flex in normal operation of crane functions, should be visually inspected once every working day, when used.

15) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.

16) Hydraulic system for proper oil level: daily, when used.

6.2.2 Maintain and inspect superstructure every month or every 100 hours

13) Fan belt

Check the tension of fan belt. Press its middle position; if deflection is between 10mm and 15mm, it is normal.



Caution:

Switch off engine before checking the fan belt; otherwise serious injury may occur.

14) Radiator and oil cooler

Clean the radiator core and check the radiator and the oil cooler for deformation and abnormal condition.

15) Foundation bolt and damping rubber cushion of engine

Check the foundation bolt for tight fit and damping rubber cushion for damage.

16) Hydraulic motor and reducer

Check following mechanisms for leakage and abnormal sound:

Hydraulic motor and reducer of slewing gear

Hydraulic motor and reducer of winch 1 and 2

Hydraulic motor and reducer of derricking winch

17) Valves

Check valves for leaks.

18) Hydraulic pump

Check hydraulic pump for leaks and abnormal sound.

19) Erection cylinder

Check erection cylinder for leaks and damage.

20) Refueling pump and hose

Check refueling pump for functional work.

Check hose for damage.

21) Transfer case

Check transfer case for leaks and abnormal sound.

22) Operator's cab tilting mechanism

Check operator's cab tilting mechanism for functional work.

6.2.3 Maintain and inspect superstructure every 3 months or every 250 hours

23) Engine oil

24) Engine oil filter

25) Engine oil separator filter

26) Filter cartridge of fuel fine filter

27) Filter cartridge of coolant filter

Please change these five devices in accordance with the requirements after 250 operating hours.



Note:

On no conditions should diesel oil be attached on the engine house, otherwise, the fire will arise. Keep the engine house clean to the utmost, especially when changing the filter and releasing the air. If diesel oil is spilled on the engine house, wipe it off at once. Before replacing the filter, the operator had better put a cloth on the house to absorb the fuel.

6.2.4 Maintain and inspect superstructure every 6 months or every 600 hours

28) Slewing table

Check slewing table for crack and deformation.

29) Engine air filter

If the icon  at upper right-side of control panel flashes, it means that the engine air filter is clogged. At this time, the engine air filter must be changed.

6.3 Undercarriage maintenance and inspection plan

Maintenance interval	Serial No.	Component	Item	Inspection method
6.3.1 Every day or every 5 hours	1	Pipeline and pipe fitting	Leakage	Visual inspection
	2	Pin, anchoring rod and cotter pin	Damage and tight fit	Visual inspection
	3	Bolt and nut	Tight fit	Visual inspection
6.3.2 Every month or every 100 hours	4	Hydraulic motor and reducer	Leakage and abnormal sound	Audiovisual Inspection
	5	Valves	Leakage	Visual inspection
	6	Support cylinder for basic machine and pin pulling device	Leakage and damage	Visual inspection
	7	Centre revolving joint	Leakage	Visual inspection
	8	Slewing ring	Abnormal sound	Listening and monitoring
	9	Crawler	Tension, wear and damage	Visual inspection
6.3.3 Every 3 months or every 250 hours	10	Drive sprocket, driven sprocket, track roller and track-carrier roller	Leakage and damage	Visual inspection
	11	Mounting bolt for slewing bearing	Tight fit	Visual inspection
6.3.4 Every 6 months or every 600 hours	12	Undercarriage centre section	Damage and crack	Operation

Note: The serial number in above table should be consistent with that in following context.

6.3.1 Maintain and inspect undercarriage every day or every 5 hours

1) Pipeline and pipe fitting

Check pipeline and pipe fitting for damage and leaks.

2) Pin, anchoring rod and cotter pin

Check connecting pins, anchoring rods and cotter pins for damage and tight fit.

3) Bolt and nut

Check bolts and nuts for tight fit.

6.3.2 Maintain and inspect undercarriage every month or every 100 hours

4) Hydraulic motor and reducer

Check hydraulic motor and reducer for leaks and abnormal sound.

5) Valves

Check valves for leaks.

6) Support cylinder for basic machine and pin pulling device

Check them for leaks and damage.

7) Centre revolving joint

Check centre revolving joint for leaks.

8) Slewing ring

Check slewing ring for abnormal sound.

Maintenance for slewing ring:

a) When slewing ring leaves from the factory, a little No.2 extreme pressure lithium base grease (GB7323-1994) is applied on the inside of roller. The user can supply new lubricating grease according to different working conditions.

b) Generally speaking, lubricate ball-type slewing ring every 100 hours, and roller-type slewing ring every 50 hours. However, when slewing ring is running continuously under adverse circumstances (e.g., high moisture, full of dust, considerable change in temperature), it must be lubricated every week.

Supply enough lubricating grease before or after the machine stops working for a long time.

Supply lubricating grease to the inside the roller of slewing ring until the grease flows out from the sealing positions. When supplying lubricating grease, run the slewing ring slowly to apply the lubricating grease evenly.

c) Clean the surface of slewing ring teeth and apply lubricating grease every 10 days.

Table of selecting lubricating grease

Support structure	Working condition		Lubricating point		
				Name	Quality indicator
Plastic separate block Rubber sealing ring	Low-temperature, normal temperature, moisture: -20℃ +60℃		Roller bed	Extreme pressure lithium base grease	No.1 /2
			Gear	Graphite base grease	ZG-S
Metal separate block Labyrinth seal	High temperature, moisture	-40℃ ~ 120℃	Roller bed	Extreme pressure lithium base grease	No.1 /2
				M0S2 compound calcium base grease	No.2
		80℃ ~ 180℃	Gear	No.4 high-temperature grease	No.4
			Roller bed	M0S2 compound calcium base grease	No.2
			Gear	No.4 high-temperature grease	No.4
	Normal temperature, corrosion resistance ~50℃		Roller bed	No.2 compound aluminium base grease	No.2
			Gear	No.4 aluminium base grease	No.4

Since the working conditions of slewing ring are complicated, the user can adopt the optimum lubricating grease according to actual conditions.

- d) Check the pre-tightening force of fixing bolts after the slewing ring is operated for 100 hours. And check them again after 500 operating hours to ensure sufficient pre-tightening force. Generally speaking, change the bolts after 14000 operating hours or 7 service years.
- e) Pay attention to the running condition of slewing ring during operation. If noise becomes loud, impact force and power increase suddenly, check the vehicle immediately and eliminate the failures. If necessary, dismantling of the vehicle is also needed.
- f) The slewing ring in use should not be exposed to strong sunlight. Never wash the slewing ring directly using water in order to prevent the water from entering the roll path. Precautions are taken against hard objects from approaching to or entering the meshing area.
- g) Check sealing strip regularly. The sealing strip, if damaged, should be changed, and

if falls off, should be retuned to original position.

9) Crawler

Check crawler for tension and wear.



Caution:

1. If track shoes are connected with each other tightly, they will be worn out quickly so as to make connecting elements broken. On the other hand, if they are connected loosely, the crawler will fall off from drive sprocket and driven sprocket.
2. It is normal that the crawler tension length varies from 10mm to 20mm. As long as crawler travels the same distance forward as its length, the upper crawler will appear a certain degree of relaxation.

6.3.3 Maintain and inspect undercarriage every 3 months or every 250 hours

10) Drive sprocket, driven sprocket, track roller, track-carrier roller

Check them for leaks and damage.

11) Mounting bolt for slewing bearing

Check mounting bolt for tight fit.



Note:

If the bolt looses, demount it for check. If it is damaged, replace it. If the demounted bolt is not damaged, wipe it clean, grease NO. 242 LOCTITE glue (or similar glue) on it and then screw it down with 2.8KN.m (2060ft-lbs) tightening torque.

6.3.4 Maintain and inspect undercarriage every 6 months or every 600 hours

12) Undercarriage centre section

Check undercarriage centre section and crawler carrier for crack and damage.



Note:

If uncertain failures are found during inspection or maintenance, please contact local service station of Mobile Crane Branch Company of Zoomlion.

6.4 Boom frame maintenance and inspection plan

Maintain and inspect following components of boom frame system every day or every 5 hours.

Maintenance interval	Serial No.	Component	Item	Inspection method
Every day or every 5 hours	1	Upper & lower pulley block	Deformation and crack	Visual inspection
	2	Load hook and safety catch	Damage and tight fit	Visual inspection
	3	Rope support	Deformation, damage and wear	Visual inspection
	4	Rope pulley	Deformation, damage and wear	Visual inspection
	5	Main boom and jib	Deformation and damage	Visual inspection
	6	Connecting pin, anchoring rod and lock pin	Damage and tight fit	Visual inspection
	7	Bolt and nut	Tight fit	Visual inspection
	8	Tilting-back support	Deformation and damage	Visual inspection
	9	A-frames	Deformation and damage	Visual inspection
	10	Wire rope	Deformation, damage and wear	Visual inspection
	11	Load hook 1 and 2	The deficiencies that may impair safety	Visual inspection

Note: The serial number in above table should be consistent with that in the following context.

1) Upper & lower pulley block

Check upper & lower pulley block for deformation and crack.



Note:

1. It is prohibited to touch wire rope with bare hands. Otherwise, the operator will be injured by rope's convex section.
2. Keep yourself away from rotary drum and running wire rope.
3. Failure to observe this regulation may result in death or serious injury.
4. Keep ladder, platform and guardrail clean and dry. When climbing the crane, tighten the safety belt. Otherwise, the operator may fall down from crane.

2) Load hook and safety catch

Check pulley, bearing of load hook and safety catch for damage.

Check bolts and nuts for tight fit.

3) Rope support

Check rope support in boom intermediate sections and boom head for deformation, damage and wear.

4) Rope pulley

Rope pulley on main boom head

Deflection pulley

Rope pulley for load hook 2

Rope pulley on jib head

Rope pulley on A-frames

Check above rope pulleys for deformation, damage and wear.

5) Main boom and jib

Check main boom and jib for deformation and damage.

Do not use deformed and (or) damaged main boom and jib.

Replace or repair deformed or damaged main boom and jib.



Note:

Since main boom and jib are made of high-tensile steel, if they need special art technology for maintenance, please contact a local service station of Mobile Crane Branch Company of Zoomlion.

6) Connecting pin, anchoring rod and lock pin

Check them for damage and tight fit.

7) Bolt and nut

Check bolts and nuts for tight fit.

8) Tilting-back supports

Check tilting-back support of main boom and tilting-back support of jib for damage and deformation.



Note:

If they need special art technology for maintenance, please contact a local service station of Mobile Crane Branch Company of Zoomlion.

9) A-frames

Check A-frames for damage and deformation.



Note:

If they need special art technology for maintenance, please a contact local service station of Mobile Crane Branch Company of Zoomlion.

10) Wire rope

a、 Check wire rope for damage and deformation. Never use wire rope with wire breaks and knot. If wire rope is broken during operational period, serious accident will occur. Therefore, wire rope must be inspected periodically. It is forbidden to use the corroded, abraded wire rope or wire rope with wire breaks. As to the determinant of safety degree and discard standard for wire rope, please refer to the 《Practical Criterion for Inspection and Scrap Wire Rope of Crane ISO 4309; 1990》 or local relevant regulations for machine use. The methods for common situations are listed in following table.

Serial No.	Conditions of wire rope	Measures
1	There is 10% wire breaks in a strand (not including filling thread). It is very difficult to check the inner wire breaks. Bend wire rope forcibly to expose wire breaks in groove. If there is wire breaks in groove, which means there is wire breaks inside the rope. Therefore, wire rope reaches its fatigue limit.	Change wire rope at once
2	The diameter of wire rope is narrowed by 7% than nominal size due to corrosion.	
3	The evidence of knot	
4	Excessive deformation and wear	
5	Excessive extension because of overloading or jumping out of the rope pulley	Change wire rope as soon as possible
6	Having been used as lead of short circuit	
7	Burned wire rope due to short-circuiting, gas-cutting or wire rope exposed to high temperature	

b、 Heavy wear and/or broken wires may occur in sections in contact with equalizer sheaves or other sheaves where rope travel is limited, or with saddles. Particular care shall be taken to inspect ropes at these locations.

- c、 All rope which has been idle for a period of a month or more due to shutdown or storage of a crane on which it is installed shall be given a thorough inspection before it is used. This inspection shall be for all types of deterioration and shall be performed by an appointed or authorized person whose approval shall be required for further use of the rope.
- d、 Rotation-resistant rope shall be given special care during installation as it is easily damaged.
- e、 Socketing shall be done in the manner specified by the manufacturer of the wire rope or fitting.
- f、 maintenance of the rope shall conform to ANSI B30.5:2007 section 5-2.4

11) Maintenance of load hook 1 and 2

Since load hook 1 and 2 are used in different operating conditions, they should be inspected every day (begin with alternate operation). Carefully observe any deficiencies that may impair safety in operational period. Do not use load hook 1 and 2 until the deficiencies are overcome.

Daily check and maintenance include following contents:

- a. Wipe load hook 1 and 2 clean;
- b. Lubricate rope pulley (when equipped with grease nipple), rotary part and other parts which are mentioned in "Lubrication Guide", and equipped with grease nipple;
- c. Check all bolts and screws, and ensure all cotter pins are complete;
- d. Check whether the groove and flange of rope pulley are abraded evenly, and inspect whether rope pulley is fitted tightly; if not, it means bearing or bearing bush are damaged;
- e. Check that the rotary connection of load hook can move easily, and the clearance is not too large. If hook rotates stiffly, it means the bearing and bearing bush are damaged or lubricated insufficiently;
- f. Check load hook for easy rotation: rotate the hook by hand. If it is stiff, it indicates that the bearing has been damaged;
- g. Check the load hook 1 is damaged due to overloading: side plate and diameter of bore are extended, and bolt is bended, extended or cracked;
- h. Check the rope fixation for wear and wire breaks. Check the rope lock for crack and tighten the bolt on the rope clamp;
- i. Check safety catch is in perfect condition;
- j. Check load hooks and snap rings.

Check load hook and snap ring at least once a year by using coloring, magnetic particle methods, ultrasonic wave methods or X radiographic methods.



Note:

1. The load hook and snap ring should not be repaired by welding, furthermore, the load handling devices are not allowed to be welded without the permission of manufacturer and they should be welded with proper methods if necessary.
2. The safety catch must keep loosening sling and other load handling devices on the hook, however, it can not be loaded. The sling and other load handling devices must be placed on the hook, and not on safety catch.

6.5 Maintenance and inspection for engine

This chapter only briefly introduces some notes on maintaining engine. As to how to maintain and service engine, please read ***Engine Maintenance Manual*** carefully.

Maintenance must be carried out conscientiously within the specified intervals. Apply the maintenance interval that comes first.

- a) Daily check or adding oil
 - 1) Air intake pipe ---- check
 - 2) Cooling fan ---- check
 - 3) Pipe of crankcase breather ---- check
 - 4) Engine coolant ---- check
 - 5) Water separator ----drain
 - 6) Engine oil level ---- check
- b) Every 250 hours or every 3 months
 - 1) Air resistance indicator for air filter --- check
 - 2) Air-to-air intercooler pipe ----check
 - 3) Air-to-air intercooler ---- check
 - 4) Mounting element of fuel injection pump ---- check
 - 5) Mounting element of air compressor ---- check
- c) Every 500 hours or every 5 months
 - 1) Fuel filter ---- change
 - 2) Cooling system ---- check
 - 3) Coolant filter ---- check
 - 4) Engine oil filter and engine oil ---- change

- 5) Battery ---- change
- 6) Battery cable and terminal ---- check
- d) Every 1000 hours or every one year
 - 1) Drive belt ---- check
 - 2) Belt driven fan hub ---- check
 - 3) Cooling fan belt tensioning device ---- check
- e) Every 2000 hours or every two years
 - 1) Cooling system ---- discharge air/ wash/ add coolant
 - 2) Rubber damper---- check
 - 3) Engine ---- wash with steam
 - 4) Exhaust pipe of air compressor ---- clean
 - 5) Engine suspension
- f) Every 5000 hours or every four years
 - Valve clearance ---- adjust



Note:

1. It is not allowed to repair or maintain engine or its parts especially those relevant to safety of engine. However, the parts listed in our operating manual and engine maintenance manual should be repaired or serviced periodically.
2. Before carrying out welding operation on the machine, the operator must disconnect cables from positive pole and negative pole of battery. When connecting electric welding machine to its earthing cable, make sure that this cable is not farther than **0.61m** from the welded part. Do not connect the earthing cable with ECM or cooling plate of ECM. Never perform welding operation on engine or the parts of engine.
3. When cleaning the parts with solvent, acid cleaning agent or alkaline cleaning agent, the operator must wear goggles and put on protective clothing to protect him from damage. And he must adhere to methods recommended by engine manufacturer to clean parts.
4. When cleaning the parts with steam, the operator must wear goggles and put on protective clothing.

Following parts can not be cleaned with steam:

- a) Electrical parts;

- b) Conducting wire;
 - c) Fuel injector;
 - d) Belt and hose;
 - e) Bearing (ball-type or conical roller-type);
 - f) ECM;
 - g) ECM connector
5. When ambient temperature is less than -18°C or more than 38°C , or when crane works in dust conditions or engine is shut down frequently, the maintenance interval of engine should be shortened accordingly.
 6. Take particular precautions regarding cleanliness when replacing diesel and oil filters. Any fuel or diesel oil that has leaked shall be completely cleaned up. Check oil pipeline and hydraulic system for leaks.
 7. All electrical lines and wires must be arranged and fastened properly. They should be kept away from exhaust pipes. Examine all wiring insulation or casings for signs of chafing or brittleness as a result of operational activities. Any wiring that is not in perfect condition shall be immediately and professionally replaced.
 8. Over the years, fuel and oil lines can become brittle or porous due to aging. Any lines that appear to be excessively porous should be replaced immediately.
 9. It is especially important to note that under no circumstances may pipelines and hoses installed in the engine room be stepped upon during repairs and service work. This is particularly important for fuel injection pipelines. Protect the engine with a board or similar support plate if stepping on the hoses is unavoidable during assembly.
 10. To prevent pollution, engine oil, gear oil, hydraulic oil, lubricating grease and fuel as well as coolant should not be spilled onto the ground and they also should not flow into ground water, sewage or wastewater system. Comply with the regulations specified by local authorities before disposing of any of these items or substances.
 11. As to detailed engine maintenance and service, please observe Engine Maintenance Manual.
 12. Relief valve settings shall be specified and any change in relief valve settings without the consent of the manufacturer shall be the responsibility of the user.

6.5.1 Maintenance guidelines for damageable parts

When replacing drive components such as diesel engine, gear, axles and so on, you must observe the following:

- Before putting these components into service, ensure to add specified oil to the max. marking; for the type of oil, check data tag and lubrication chart.
- Conduct initial maintenance according to Chapter “Periodic maintenance”; thereafter, maintain in accordance with the specified periodic maintenance intervals.

Category I operational aids and alternative measures.

Operational aids listed in this paragraph that are not working properly must be repaired no later than 7 calendar days after the deficiency occurs. Exception: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, the repair must be completed within 7 calendar days of receipt of the parts. See § 1926.1417(j) for additional requirements.

Category II operational aids and alternative measures.

Operational aids listed in this paragraph that are not working properly **must** be repaired no later than 30 calendar days after the deficiency occurs.

Exception: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 calendar days, the repair must be completed within 7 calendar days of receipt of the parts. See § 1926.1417(j) for additional requirements.

6.6 Instructions for lubrication and oil change

6.6.1 Hydraulic oil

When crane is delivered to you from the factory ready for operation, it is supplied with hydraulic oil GB 11118.1-94(The hydraulic oil used in the crane now corresponds with ESSO NUTO H32 hydraulic oil.) or low condensed hydraulic oil L-HV32. The volume is of 800 liter.



Note:

The product is full hydraulic driven. The quality, viscosity and cleanliness of hydraulic oil are the most important factors to crane's functional working. The customer's ignoring replacing hydraulic oil in time will bring on various kinds of malfunctions and reduce its service life greatly. Our company will not take the responsibility for all the consequences caused by customers failing to comply with the requirement stipulated in this manual to replace and filter hydraulic oil.

6.6.1.1 Oil checks and oil change interval

The normal oil change interval is 2000 operating hours. If hydraulic oil is obviously polluted, it must be changed in time without considering operating hour. The inspected item and oil change interval are shown in following table.

Serial No.	Inspected Item		Oil checks and oil change interval (in hour)			Remarks
			5	500	2000	
1	Check oil level	Main oil Tank	○			
2	Clean oil tank			○		
3	Change hydraulic oil				○	800litre

6.6.1.2 Oil sample checking and oil change criteria

Take a sample of hydraulic oil for inspection periodically. For crane working under normal condition, its hydraulic oil should be checked every 3 months; for crane working frequently or working in adverse environment, its hydraulic oil should be checked every month. The inspected item and limitation value should comply with the requirements in following table. For hydraulic oil which does not reach limitation value, change it at once.

Inspected item	Hydraulic Oil Physical & Chemical Character Variation Limitation Value		
	L-HS	NUTO H46, L-HV	L-HM
Kinematic viscosity (40 °C) mm ² /s	±10%	±10%	±10%—15%
Acid value addition mgKOH/g	0.3	0.3	0.3
Moisture %	0.1	0.1	0.1
Flash point °C	-60	-60	-60
Solid grain pollution grade	20/16	20/16	20/16

6.6.1.3 Recommended brand of hydraulic oil used in different ambient temperature

Ambient temperature	The lowest temperature of cold start (without load)	The lowest temperature of cold start (with load)	The lowest working temperature with load	The highest temperature of hydraulic oil	Hydraulic oil brand
below -30°C	-40°C	-35°C	-15°C	50°C	SH 0358-95 10 aviation hydraulic oil
	-35°C	-22°C	-5°C	60°C	
above -30°C	-28°C	-15°C	0°C	70°C	☆ESSO NUTO H32

between -20°C and 40°C	-20°C	-10°C	5°C	80-85°C(*)	☆ESSO NUTO H46
above 40°C	-5°C	-3°C	20°C	100°C (**)	ESSO NUTO H68



Caution:

1. If crane starts in cold area, it should first run without load for a while. After the lowest working temperature is reached, the load can be added gradually and the system can work.
2. The oil property should be identical with that of the original brand when changing oil. The original oil should be washed away thoroughly. The hydraulic oil of different types and different brands can not be mixed together!
3. The domestic brand of hydraulic oil mainly includes Kunlun, the Great Wall, Tongyi, Haibrand, Daqing, Hengyun, Guta, Jiali, Jiarun, Haili, etc. and foreign brand such as ESSO, Mobil, etc. are also available in china.
4. If you find any special operating conditions which are not listed in the above table, please consult the related departments of our company.
5. Check and measure oil temperature of system at any time!
6. The suitable oil temperature for hydraulic system in working condition is 20°C to 80°C. The 85°C may occur for a short time or in some position.
7. When the oil temperature is too high (nearly 100°), pay attention to the cooling of system. The working load should not be too heavy and the working frequency should not be too high.

6.6.1.4 Procedure for changing oil

First change hydraulic oil in the tank. Drain hydraulic oil from the tank, and then dismember the master oil return pipe. Clean the tank and the oil filter carefully. First clean them by using the chemical cleaning agent of solid particle pollution grade less than 18/15. After airing, wash them with the clean hydraulic oil of solid particle pollution grade less than 18/15 and then add new hydraulic oil after draining off oil.

Actuate engine and run it at low speed to let the oil pump start to control mechanisms.

Use new hydraulic oil to drain used oil out of every circuit in the system until the new oil flows out of the master oil return pipe. The used oil is not allowed to return to the hydraulic oil tank. At this time, the oil pump stops running. While the used oil in each return line is changed, the new oil should be added into hydraulic oil tank continuously to prevent the oil pump from inhaling air.

Connect master oil return pipe with oil tank, make each component to initial state and add hydraulic oil to oil tank until the oil level reaches prescribed position.



Note:

1. Filter or change hydraulic oil in time whenever it is polluted seriously.
2. Select proper hydraulic oil according to ambient temperature.
3. Hydraulic oil of different brands can not be mixed.
4. Service life of hydraulic oil can not exceed 24 months. The hydraulic oil can not be used even though it is filtered, if it has been used for 24 months.

6.6.1.5 Temperature of hydraulic oil

Observe the temperature of hydraulic oil from the scale on the liquid temperature meter, and the highest temperature of hydraulic oil is 80°C.

6.6.1.6 Volume of hydraulic oil

When crane is in traveling condition, inspect oil level. Observe the temperature and the level of hydraulic oil from the scale on the liquid temperature meter. The scale of 0°C is the lowest oil level. So when oil level is below this line, top crane up with oil.

6.6.1.7、Air exhaust of hydraulic system

Prior to the initial starting of engine or after the oil changing of hydraulic system, remove the upward oil drain plug on the motor and main hydraulic pump, and add oil with an oiler, then tighten the oil drain plug, finally restart engine.

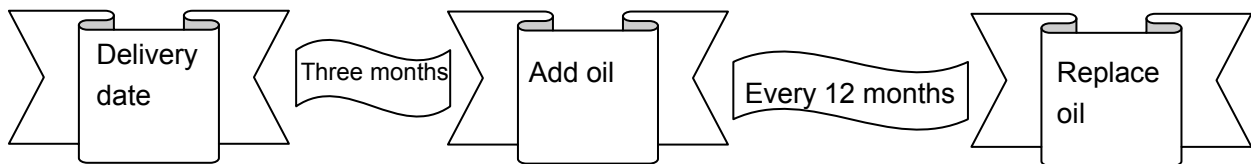
If the engine has not worked for more than a day, the hydraulic system must be deaerated after engine starts. To exhaust the air in hydraulic system, you should first run the engine at low speed of less than 1000rpm for 10 minutes and keep the motor in low-load(or no- load) condition and then operate the mechanisms of crane in proper order for 3-4 times.

6.6.2 Gear oil

Use gear oil recommended in this manual. Before crane leaves the factory, such devices as hoisting winch reducer, derricking winch reducer, slewing reducer and reeving winch have

already been filled with **L-CKD220** industrial closed gear oil. The power divider of drive gear has been filled with **GL-5 85W/90** heavy-duty vehicle gear oil.

6.6.2.1 Table of gear oil change interval



Caution:

1. If gear oil is polluted seriously, replace it at once even though it has not reached the oil change interval.
2. Often check oil level. If necessary, add oil.
3. The gear oil of different brands can not be mixed!
4. Use proper gear oil according to ambient temperature, since unqualified gear oil or gear oil with improper viscosity will damage reducer mechanism.

6.6.2.2 Replaced Gear Oil Volume for Each Mechanism

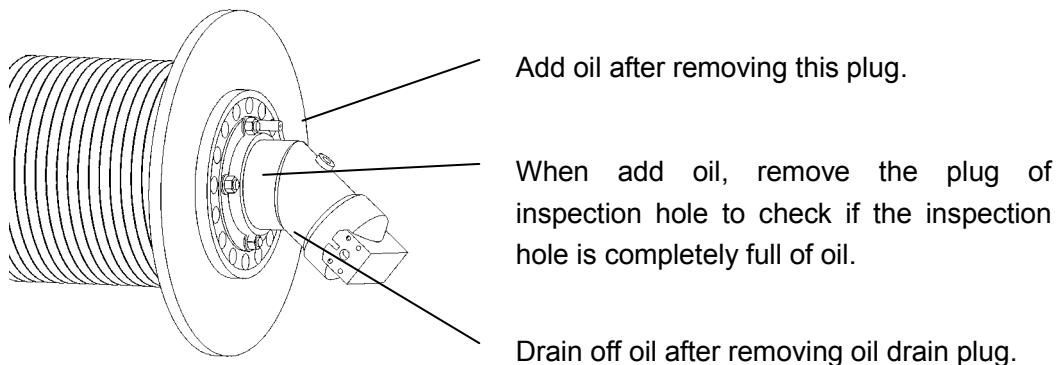
Description	Brand of gear oil	Volume (liter)
Hoisting winch reducer	L-CKD220 industrial closed gear oil	9
Derricking winch reducer	L-CKD220 industrial closed gear oil	8.5
Slewing reducer	L-CKD220 industrial closed gear oil	12
Traveling reducer	L-CKD220 industrial closed gear oil	90
Reeving winch reducer	L-CKD220 industrial closed gear oil	1
Drive gear of transfer case	GL-5 85W/90	6

6.6.2.3 Change gear oil

a) Change gear oil of hoisting winch reducer and derricking winch reducer

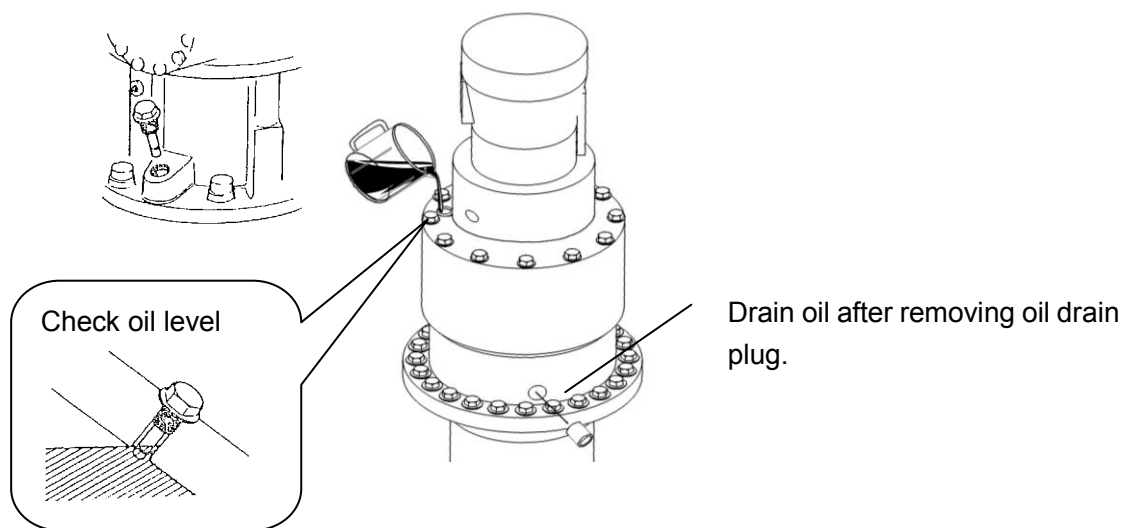
- 1) Unscrew and remove oil drain plug and oil filler plug on the winch reducer, and drain original gear oil;
- 2) Screw down oil drain plug;
- 3) Put funnel head into oil filler to add specified gear oil to inspection hole until the oil is visible in the middle of inspection hole;

- 4) Screw down oil filler plug.



b) Change gear oil of slewing reducer

- 1) Unscrew and remove oil drain plug and oil filler plug on slewing reducer, and drain original gear oil;
- 2) Screw down oil drain plug;
- 3) Put funnel head into oil filler to add specified gear oil to inspection hole until the inspection hole is completely full of oil;
- 4) Screw down oil filler plug.



Note: The gear oil volume is about 6.6 L.

c) Change gear oil of transfer case

1) Volume of lubricating oil:

There is volume of lubricating oil on name plate of transfer case for reference. However, the oil level must be subject to the mark left on oil dipstick. Therefore, the inspector should check oil level with oil dipstick according to the specified requirements. After adding oil to transfer case for the first time, the inspector should check oil level when power is started for 15mins to 30mins. If oil is going down, add oil to specified position.

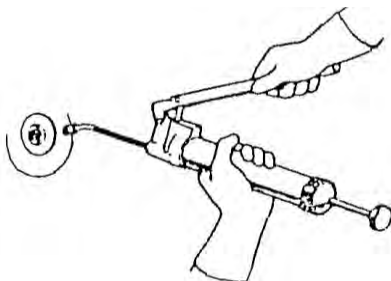
2) Changing lubricating oil:

Generally speaking, change lubricating oil after first 200 operating hours. After that, change lubricating oil after 2000 operating hours or 12 months at least.

6.6.3 Lubricating grease

Use the lubricating grease recommended in this manual and this crane uses ZL-2 and ZG-3 lubricating grease.

Injecting method: grease or inject with gun.



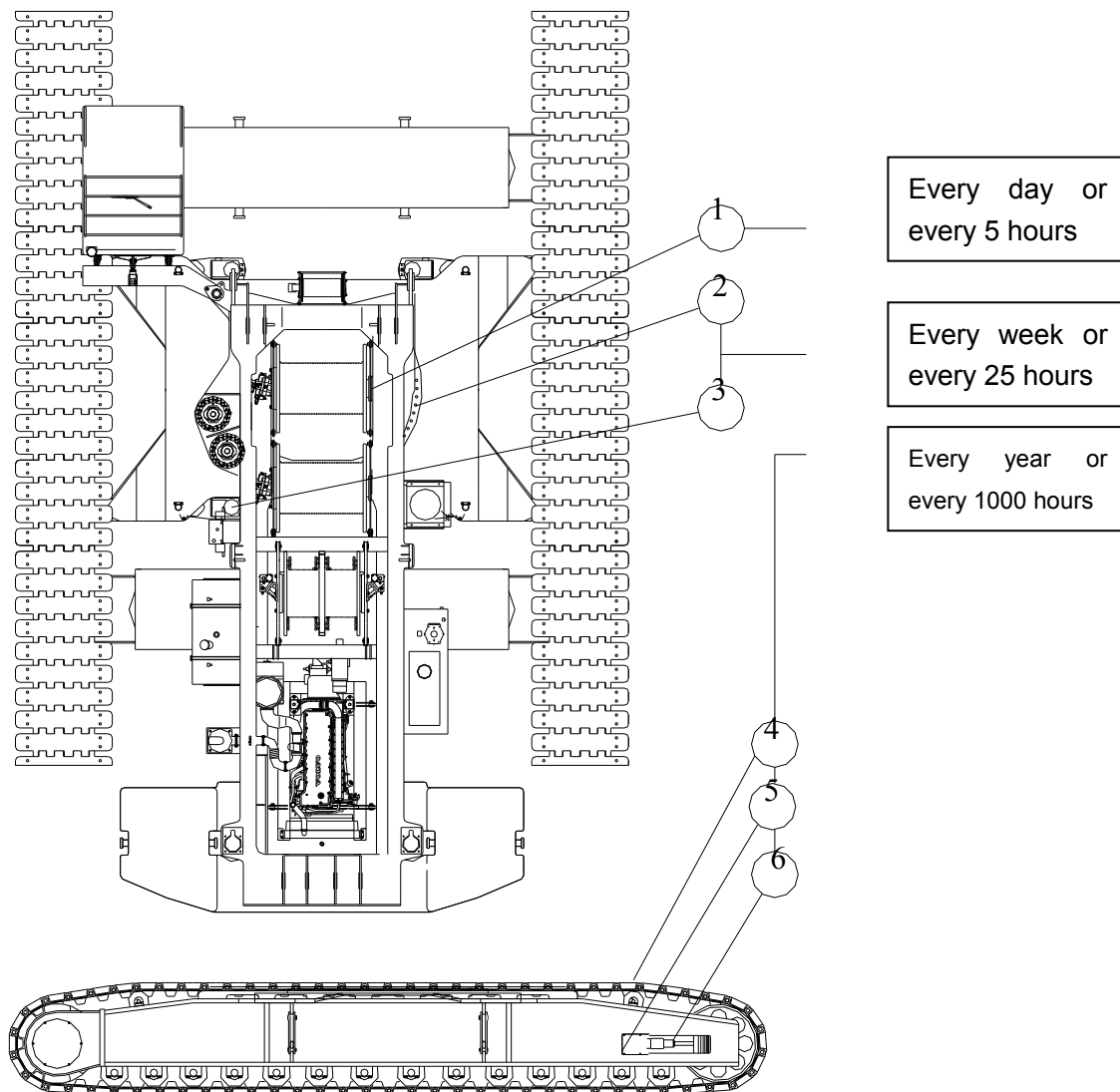
Parameter Type	Appearance	Drop point (°C)	Work wimble degree (1/10mm)	Moisture (%) no more than
ZL-2lubricating grease	Smooth inunctum with the color from pale yellow to brown	175	265~295	—
ZG-3 lubricating grease	Equal inunctum with the color from pale yellow to brown	90	220~250	2.5

In order to keep crane in good working condition, all machinery parts that need lubrication

should be supplied with specified grease periodically. All of them, except for those purchased components, are marked in following diagram.

6.6.3.1 Add lubricating grease to superstructure and undercarriage

a) Diagram of superstructure and undercarriage lubricating points

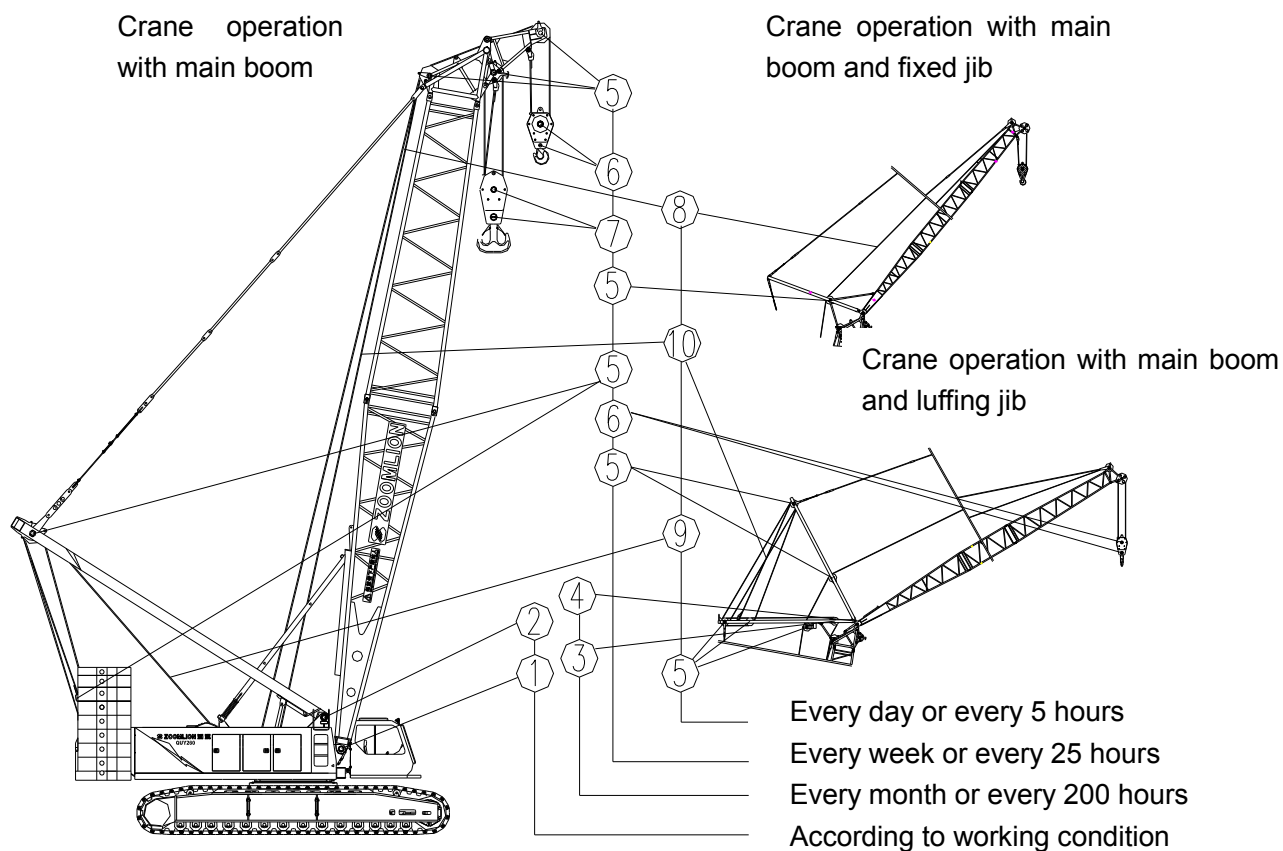


b) Table of superstructure and undercarriage lubricating points

Serial No.	Lubricating points	Lubricating interval	Lubricating Method	lubricating Grease Type
1	Ratchet mechanism	Every day	Grease	ZL-2 lithium base grease
2	Slewing ring	Every week	Grease and inject with gun	ZL-2 lithium base grease
3	Connecting rod and pin spindle	Every week	Grease and inject with gun	
4	Track roller	Every year	Grease and inject with gun	GL-5 85W/90
5	Track-carrier roller	Every year	Grease and inject with gun	GL-5 85W/90
6	Driven sprocket	Every year	Grease and inject with gun	GL-5 85W/90

6.6.3.2 Add lubricating grease to boom frame system

a) Diagram of boom frame system lubricating points



b) Table of boom frame system lubricating points

Serial No.	Lubricating point	Lubricating interval	Lubricating method	Lubricating grease type
1	Pivot section bolting cylinder	Every day	Grease and inject with gun	ZL-2 lithium base grease
2	Pin spindle of A-frame	Every day	Grease and inject with gun	ZL-2 lithium base grease
3	Luffing jib main shaft	Every week	Inject with gun	ZL-2 lithium base grease
4	WA-frame shaft	Every week	Inject with gun	ZL-2 lithium base grease
5	Upper & lower pulley block spindle	Every month	Inject with gun	ZL-2 lithium base grease
6	Auxiliary hook swivel, spindle	Every month	Inject with gun	ZL-2 lithium base grease
7	Main hook swivel, spindle	Every month	Inject with gun	ZL-2 lithium base grease
8	Derricking rope	according to working conditions	Grease	ZL-2 lithium base grease
9	Hoisting rope for winch 1	according to working conditions	Grease	ZL-2 lithium base grease
10	Hoisting rope for winch 2	according to working conditions	Grease	ZL-2 lithium base grease

**Note:**

1. The oil cup and the surface to be oiled should be wiped clean before adding oil.
2. The sliding surfaces which are not listed in above table must be greased periodically.
3. The lubricating grease of different brands can not be mixed.
4. Add grease to bush, shaft and bearing until the used grease is squashed out.
5. Switch off engine before lubrication.
6. Keep ladder, platform and guardrail clean and dry. When climb the crane, tighten safety belt. Otherwise, the operator may fall down from crane.
7. Failure to observe such regulation may result in death or serious injury.

- 8、Set all controls in the off position and ensure all operating features are secured from inadvertent motion by brakes, pawls, or other means。
- 9、Lower the boom to the ground, if possible, or otherwise secure against dropping

6.6.4 Engine oil

6.6.4.1 Check engine oil level

Checking oil level refers to *Operation Manual for Engine*.

The engine applies 15W/40CH-4 diesel oil with 35liter.

Check engine oil level before operation. Take out the dipstick, wipe it with a clean cloth and re-insert it as far as possible. If oil level is between the MIN and MAX markings on the dipstick, it is normal.



Caution:

The crane must be level when checking engine oil level. Otherwise, the oil level will be measured inaccurately.

6.6.4.2 Change engine oil

- a) Unscrew and remove oil drain plug at the bottom of oil pan, and drain original engine oil.
- b) Screw down oil drain plug.
- c) Put the funnel head into oil filler to add specified engine oil until oil level is within the MAX and MIN markings on the dipstick.
- d) Screw down the cover of oil filler.



Caution:

1. When replace engine oil, the filter cartridge should be replaced together.
2. Don not remove oil drain plug when engine oil is still hot. Otherwise, you may get scalded.
3. Failure to observe this regulation may result in death or serious injury.

6.6.5 Fuel

Check and change fuel.

Serial No.	Inspected item	Fuel checks and fuel change interval (in hour)		Volume
		5	1000	
1	Clean fuel tank		○	
2	Change engine fuel	※		700 liter

Note: The sign “※” means the fuel needs to be changed.

1) Clean fuel tank

Remove the oil drain plug to drain water and sediments.

2) In order to reduce sediments, top up fuel tank after work everyday.

If there is no refueling pump, add fuel through oil filler.



Caution:

1. Firing around fuel is forbidden.
2. Never run refueling pump with fuel.
3. Smoking is forbidden when add fuel. Otherwise, fire hazard will arise, which will lead to property loss and personnel injuries.

All fuels **shall** be transported, stored, and handled to meet the rules of Subpart F of 1926.550. When fuel is transported by vehicles on public highways, Department of Transportation rules contained in 49 CFR Parts 177 and 393 concerning such vehicular transportation are considered applicable

6.6.6 Coolant

Check and change coolant.

Serial No.	Inspected item	Coolant checks and coolant change interval (in hour)					Volume
		5	100	250	500	1000	
1	Check coolant level	○					
2	Change coolant					○	43 liter



Note:

The above change interval is applicable to normal conditions. For other kinds of coolant, change it every 6 months.

6.6.6.1 Check coolant level

- a) Remove radiator cover to check coolant level, and check fluid level of auxiliary water tank.
- b) When coolant is insufficient, add softened water to water injection hole, and top up auxiliary water tank.



Caution:

1. Do not open the radiator cover when crane is warm up. Remove cover with thick cloth or gloves after coolant does not bolt. When engine is in working temperature, the coolant has high temperature and pressure.
2. Failing to observe this regulation may result in death or serious injury.

6.6.6.2 Change coolant

- a) Remove the plug at the bottom of radiator to drain coolant.
- b) Mix softened water with durable coolant, and then add the mixed fluid to radiator until it is visible at the bottom of water injection hole. In order to avoid air entering into the radiator, the water should be added slowly. When the fluid level no longer falls down, screw down the lid.
- c) Start engine and run it for one minute, then stop to check the fluid level. If the fluid level is not enough, add water again.



Caution:

1. Do not drain coolant when crane is warm up, since hot coolant may burn the skin. Only when coolant has been cooled down, can it be drained out.
2. Failing to observe this regulation may result in death or serious injury.

6.6.7 Lubrication and maintenance of crane in irregular conditions

6.6.7.1 Lubrication and maintenance in dust circumstance

Item	Measures
Air filter	Clean or replace in time
Radiator, oil cooler	Clean in time to prevent them from being blocked.
Filter, filter cartridge	Replace them in time
Engine oil	Replace oil in time
Slewing gear ring	Lubricate it in time

Wire rope	Clean and lubricate in time
-----------	-----------------------------

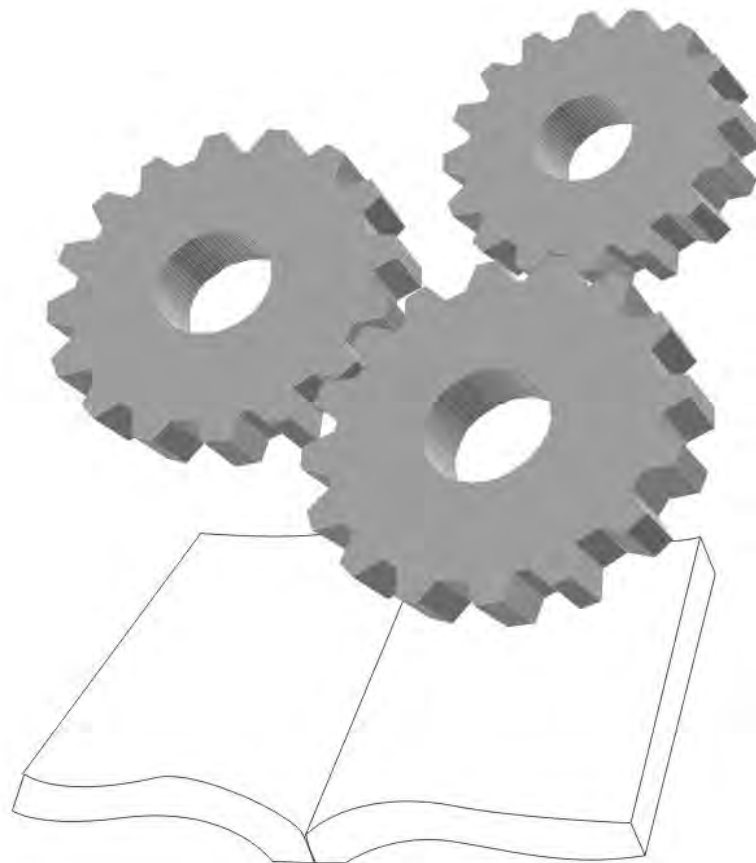
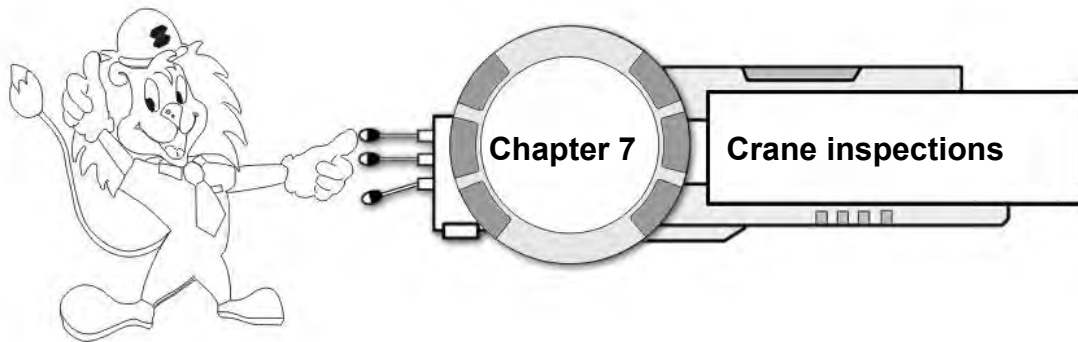
6.6.7.2 Lubrication and maintenance under coast circumstances

Item	Measures
Lubrication	Lubricate all lubricating points and joints which have not been fitted with grease nipple completely and carefully.
Basic machine	Clean crane body, radiator and oil cooler in time to get rid of salt.

6.6.7.3 Lubrication and maintenance in cold area

Item	Measures				Points for attention
Engine oil	Use engine oil suitable for this temperature(see <i>Operating Manual for Engine</i>) CH-4,CG-4 of API classification				When add the oil, the oil of different brands or different quality grades can not be mixed. The volume of all replaced oil is 35 liter.
	The ambient temperature when engine starts	-25 ⁰ C~ -20 ⁰ C	-10C~ 20 ⁰ C	-15 ⁰ C~ 40 ⁰ C	
	Viscosity of engine oil	SAE10W/30	SAE20W/30	SAE15W/40	
Fuel	Use fuel suitable for following temperature				
	Ambient temperature		Type		
	Above -5 ⁰ C		JIS#2 light diesel oil		
	Between -5 ⁰ C and -15 ⁰ C		JIS#3 light diesel oil		
	Below -15 ⁰ C		JIS special #3 light diesel oil		
Drain water before working and top up oil tank after working.					

Coolant	Make proper proportion of antifreeze fluid to water in accordance with ambient temperature. (volume of coolant: 43 liter)			Sometimes, proportion is different according to difference brands of antifreeze fluid. It is recommended to use final antifreeze fluid that has already been matched according to difference temperature.
	Ambient temperature	Water	Antifreeze fluid (condensing)	
	-4 ⁰ C	39 liter	4 liter	
	-7 ⁰ C	37 liter	6 liter	
	-13 ⁰ C	32 liter	11 liter	
	-17 ⁰ C	30 liter	13 liter	
	-21 ⁰ C	28 liter	15 liter	
	-25 ⁰ C	26 liter	17 liter	
	-31 ⁰ C	24 liter	19 liter	
	-40 ⁰ C	22 liter	21 liter	
Battery	Fully charge (The proportion of electrolyte is more than 1.22) The electrolyte of fully-charged battery is more anti-freezing than that of that of under-charged battery in low temperature.			After adding distilled water, run engine to mix it with electrolyte.



ZOOMLION

7.1 General

Initial Inspection. Prior to initial use, all new and altered cranes shall be inspected by a qualified person to verify compliance according to local rules.

The crane has been tested by manufacturer's facilities prior to shipment

The safety level achieved during initial commissioning may not be attainable during operation. Examples of the root cause of such deviation include; e.g., wear and tear, corrosion, effects of forced operations, changes in the environment and changes to the mode of operation. The operator is responsible for taking the necessary steps to ensure that the maximum level of safety is maintained. For that reason, the crane must be inspected by a competent inspector, depending on application situations and the operating condition, at least once a year, counting from the day of initial service.

The crane must be inspected by a competent inspector, depending on the application situations and the operating conditions, at least once a year, counting from the day of initial service.

Before operating the crane, a visual inspection must be performed to prevent accidents by detecting deficiencies in a timely fashion.

Any deficiencies determined by the inspector must be documented, corrected, and subsequently re-inspected.

Note:

1. When significant changes are made to the crane or repairs are made to the load bearing parts, the operator must have the crane inspected by a competent inspector before putting it into service.
2. National and local regulations must be observed.
3. A competent inspector is someone who has a thorough understanding of crane based on technical training and experience and is knowledgeable about the relevant regulations, e.g. labor laws, OSHA regulations, accident prevention regulations and generally accepted engineer principles and is able to assess that the crane is safe to operate(they are specially trained personnel).
4. A competent engineer is someone who engages in the designing, manufacturing and servicing crane and is knowledgeable about all the relevant regulations and standards, and is a position to judge whether the crane functions normally through inspection so as to ensure long-term safe operation.

A number of important examples of items that are particularly important during crane re-inspections are listed in the following. Adhere to the following inspection guidelines and intervals; otherwise, serious accident may occur.

7.2 Inspection of steel bearing structures

Steel bearing components such as boom must be carefully inspected at least once a year. Even though weld joints are not normally situated at maximum load locations, it is nevertheless important that they should be inspected with particular care during the periodic inspections.

If the crane was subjected to excessive operating loads, for example an unusual shock or impact, the load bearing components must be inspected immediately.

If damage (e.g., cracks) is found in any part of the steel structure, the total extend of the damage must be determined by qualified specialists using appropriate material test methods, such as magnetic crack detection, ultrasound or X-ray. The specialists should then advise whether or not the damaged area can be repaired by welding or other means.

The welds or steel structural zones that require inspection may be present more than once and in various forms. The joints or zones must be inspected all around at the locations identified by arrows.

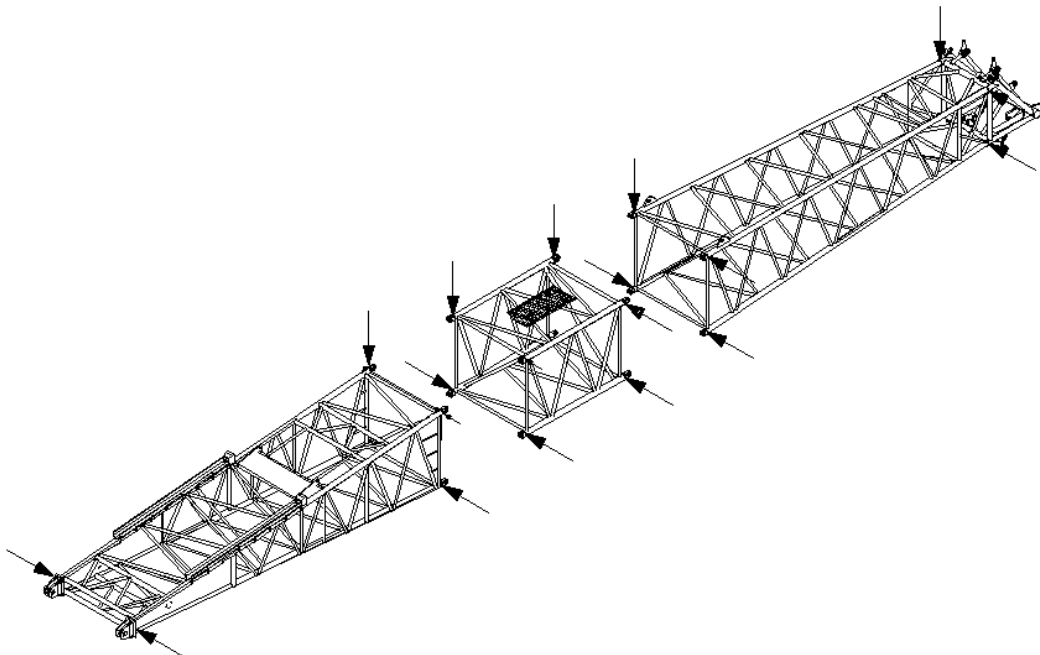


Note:

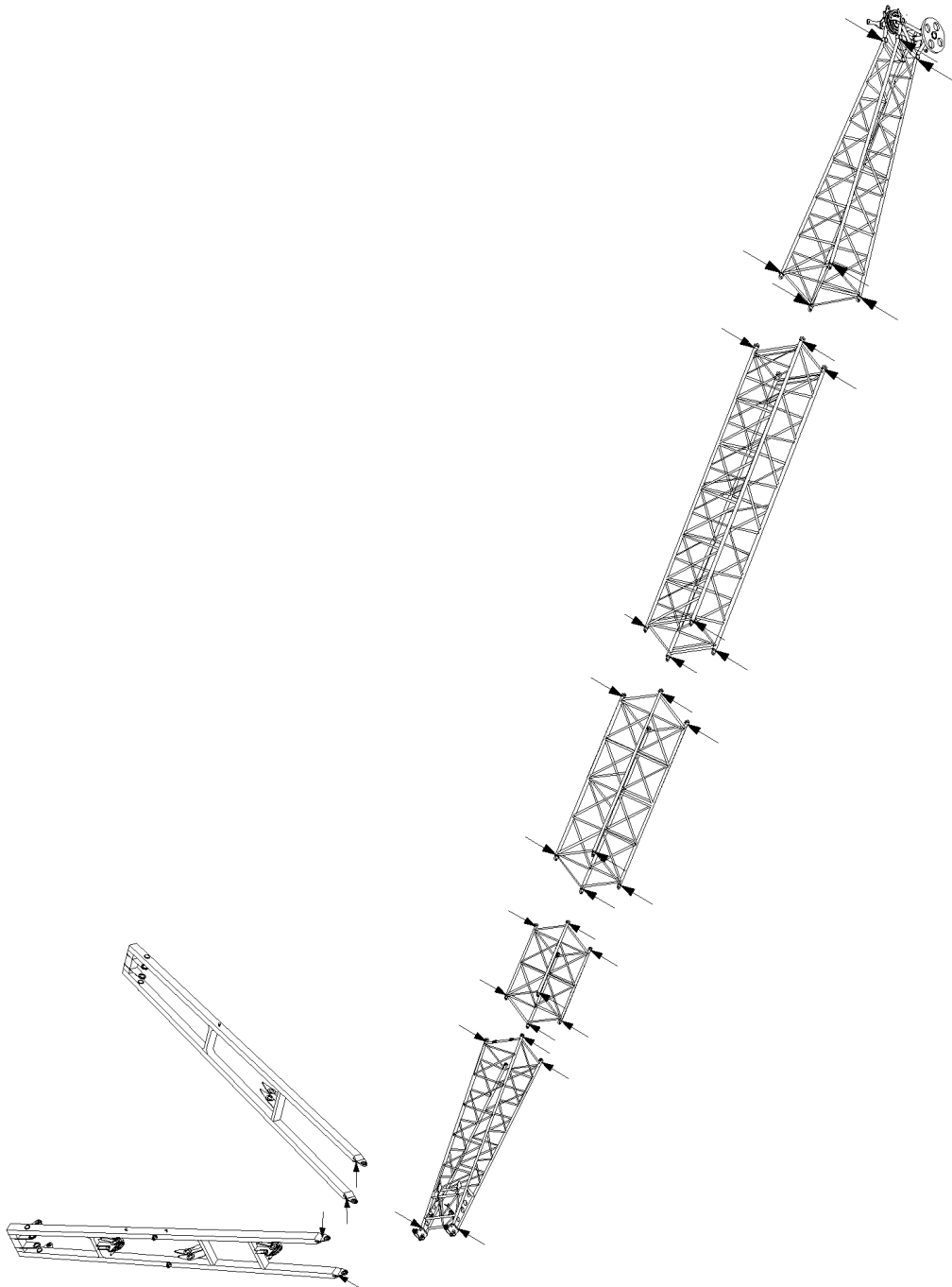
The scope and extent of all inspections remain the sole responsibility of the inspectors.

The following diagrams are provided to assist the inspector. The diagrams are only examples and are not necessarily 100% complete!

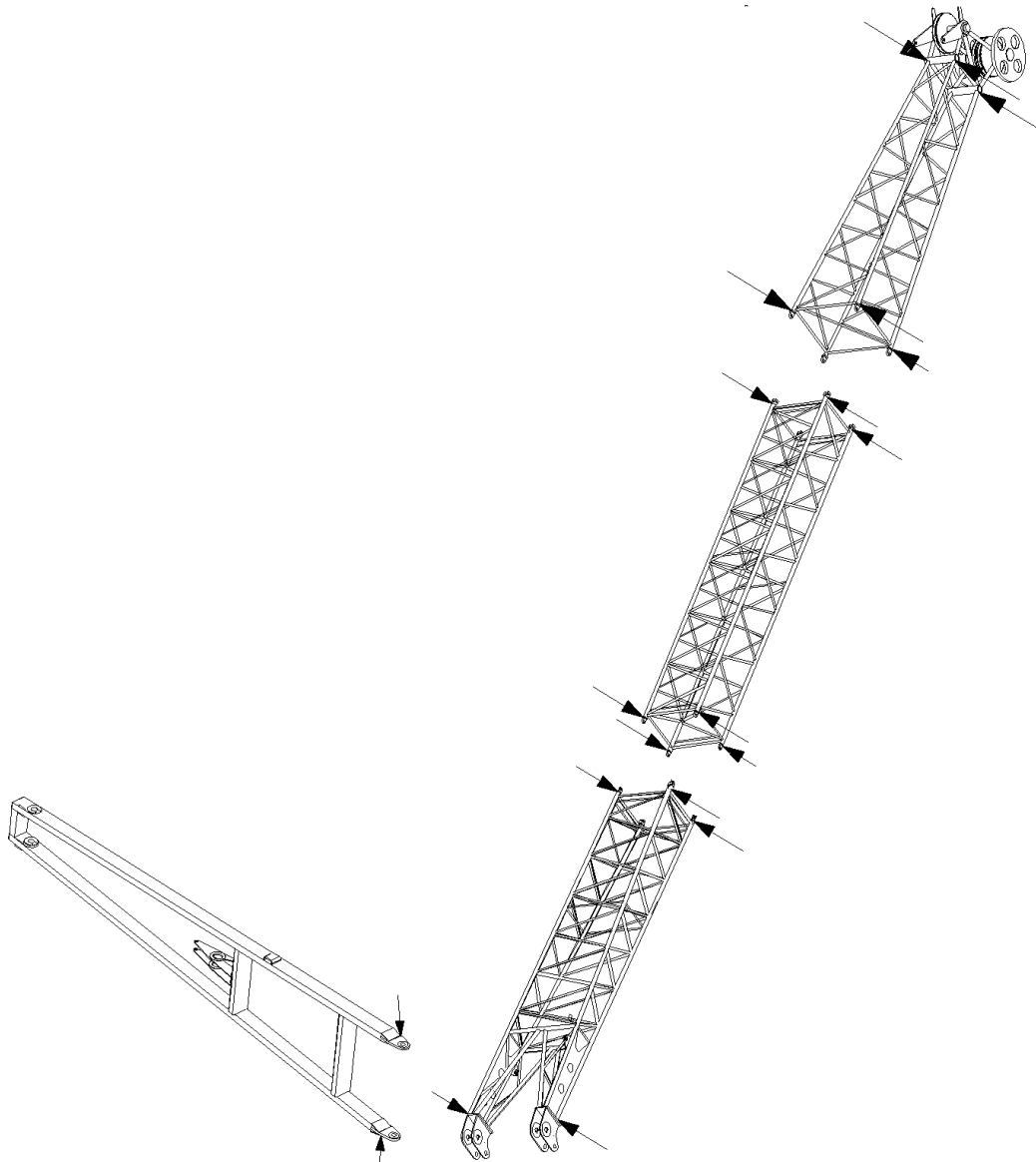
Welding joints on main boom



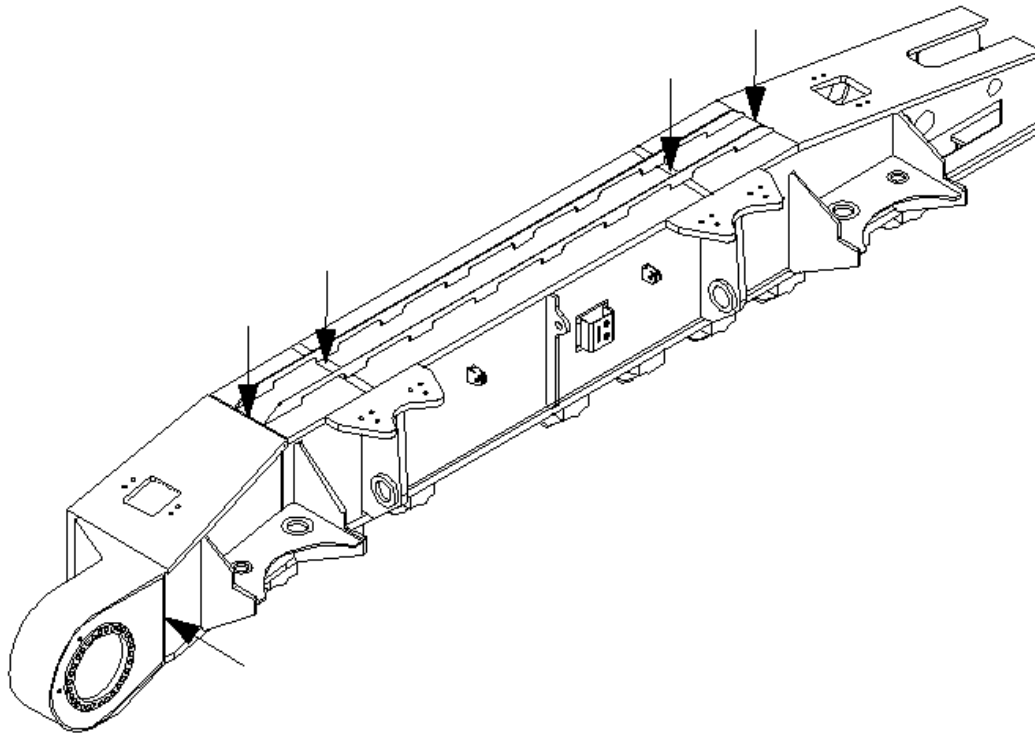
Welding joints on luffing jib



Welding joints on fixed jib



Crawler carrier (left)



7.3 Inspection of hosting and luffing winches

The hoisting and luffing winches and slewing reducer are designed using integrated planetary gears. The gears are designed for long service life and the drive shaft and drive gear are rated for endurance. Even though these gears are designed for long service life, an external visual inspection is not adequate, since their life can be significantly affected by bad maintenance (insufficient oil), defective seals, improper operation or overuse. The inspection must therefore be carried out by a competent inspector in accordance with the following guidelines.

7.3.1 Inspections

a) Inspection intervals

Every 1000 operating hours, at least once a year(annually)

b) Inspecting oil level

Check oil level. For hoisting and luffing winches, we recommend that the oil be drained and the amount compared to the specified oil quantity.

c) Checking oil color

Assume that the oil has been overheated if it is black and/or a burnt oil smell is detected. In this case, the oil must be changed.

d) Checking for foreign substances

This inspection should be carried out in a qualified laboratory. The used oil shall be dribbled onto the specified filter medium. The oil sample is visually checked under a microscope for foreign particles. If any particles are detected, the oil must then be sent to a qualified laboratory and analyzed to determine the makeup of the particles.

e) Evaluation of foreign substances found in the oil

- 1) The maximum permissible quantity of foreign material measured by weight is 0.15% of total oil weight.
- 2) maximum permissible foreign particle size from fine abrasion is 0.229mm.
- 3) If above values are exceeded, the gearbox must be dismantled to determine the root cause of increased contamination and then the gearbox should be refilled with fresh oil.



Caution:

These repairs may only be carried out by specialists with appropriate equipment knowledge.

f) Visual inspection

The drive devices shall be checked for leakage, since any loss of oil, in addition to polluting the environment, can lead to gearbox failure.

g) Inspection the drive device breaks.

Check the brakes at the same check the drive devices.

If the brakes cannot hold the specified test load of 33% rope tension increase on a single rope strand and fully spooled drum, they shall be dismantled to determine the cause. Whenever a planetary gearbox is dismantled because of increased contamination, the brakes shall also be inspected.



Caution:

Only qualified personnel with specialized knowledge can inspect the gearboxes and brakes.

h) Documenting the completed inspection

The results of the annual inspections and maintenance work, including all completed tasks, shall be documented by the competent inspector, if necessary, and signed off by inspection station or specialty shop.

7.3.2 Requirements for monitoring the winches

a) Theoretical service life

Crane winches are classified according to FEM98 as follows:

Drive group:	M2
Load collective:	L1
Load collective factor:	0.125
Theoretical service life D:	1600 hours



Caution: the “theoretical service life” is not equal to the real (true) life of a winch.

The actual life of a winch is affected by many additional outside factors, for example:

- 1) Overloads: because the crane was not used as intended.
- 2) Inadequate maintenance: oil is not changed at the proper intervals
- 3) Improper operation: excessive acceleration or deceleration of load; load falling onto the cables;
- 4) Improper maintenance:
 - Using the wrong type of oil
 - Too much or too little oil
 - Contamination during oil change
- 5) Assembly errors during repair and maintenance
- 6) Undetected oil leakage
- 7) Improperly set safety devices
- 8) Hidden damage from accidents
- 9) Extreme environmental conditions:
 - extremely low or high temperatures

- corrosive atmosphere
- dust and dirt

b) Used portion of theoretical service life

The crane operator is obligated to have the crane inspected at least once a year.

The used portion of theoretical service life must also be determined. If necessary, the crane operator can subcontract this work to an authorized inspector.

The actual operating conditions (load collective) and the winch operating hours at each inspection interval are required to determine the proportion of the theoretical service life that has actually been used. The operator is responsible to have it documented in the crane inspection log.

c) Determining the operating condition (load collective)

The load collective of the crane is classified into groups, please refer to FEM9.5.11.



Note: For mobile cranes in assembly operation, we normally use the load collective L1(Q1), with the load collective factor $k_m = 0.125$

Load collective classification	Definition	Operating time components	Load collective factor	Graph
Light Q1 L1	Drive device or parts thereof are subjected to maximum loading in exceptional cases, but normally only operate at very light load.	10% of the running time at maximum load (dead load and 1/1 working load) 40% of the running time with dead load and 1/3 working load 50% of the running time only with dead load	$K_m = 0.125$	Load % Running time%

Medium Q2 L2	Drive device or parts thereof are subjected to maximum loading relatively often, but normally only operate at light load.	1/6 of the running time at maximum load(dead load and 1/1 working load) 1/6 of the running time with dead load and 2/3 working load 1/6of the running time with dead load and 1/3 working load 50% of the running time only with dead load	Km=0.25	Load % Running time %
Heavy Q3 L3	Drive device or parts thereof are frequently subjected to maximum loading and normally operate at medium load	50% of the running time at maximum load(dead load and 1/1 working load) 50% of the running time only with dead load.	Km=0.5	Load % Running time %
Very heavy Q4 L4	Drive device or parts thereof are regularly subjected to near maximum load	90% of the running time at maximum load(dead load and 1/1 working load) 10% of the running time only with dead load	Km=1	Load % Running time %

d) Determining the effective operating hours T_i

The control system of the crane can record the operating hours of engine which can be read directly from the display. For mobile cranes used in assembly operations, the

operating time for the superstructure can be estimated at 60% of the total operating hours of the crane. If the hoist winch proportions is estimated at 20% of the superstructure operating hours, the resulting hours as a percent of the total crane operating hours is: 12%.



Note:

The percentage staged above normally applies to main hoist winches. For auxiliary hoist winches or luffing winches, the proportion of the total operating hours can be significantly less and should therefore be estimated by the operator.

e) Determining the actual used portion of the theoretical service life

The actually used proportion S_i of the theoretical service life is given by the following formula:

$$S_i = \frac{k_{mi}}{k_m} \times T_i$$

Where,

k_m = Load collective factor that was used to select the winch ratings. This factor is given in the operating manual.

k_{mi} = load collective factor for inspection interval i

T_i = effective operating hours for inspection interval i

The actually used hour proportion is subtracted from the remaining theoretical service life D_i after each inspection interval (see example).

If the remaining theoretical service life is not long enough to cover the next operating period, a general overhaul of the winch is required.

If the theoretical service life D has been reached, the winch may only be operated after conducting a general overhaul.



Note:

1. A general overhaul of the winch is required not later than 10 years after putting the crane into service
2. The general overhaul shall be arranged by operator and carried out by the manufacturer or the manufacturer's authorized representatives and must be documented in the inspection log.

Example

According to the manufacturer's operating manual, a mobile crane with a separate elapsed time meter for the crane engine and the crane drive is classified as follows:

Drive gear group: M2

Load collective: light L1, $k_m = 0.125$

theoretical service life: $D = 1600$ h

Actual used proportion S of the theoretical service life is calculated using the individual inspection intervals as follows:

First inspection (year 1)

The crane was used for assembly work during the past year:

Load collective L1, which means $km_1 = 0.125$.

The hour meter for crane engine indicates 1800 hours. The winch operated about 12% of the time, i.e. $T_1=216$.

The actual used proportion S of the theoretical service life at the time of the first inspection is therefore:

$$S_1 = \frac{0.125}{0.125} \times 216 \text{ h} = 216 \text{ h.}$$

Remaining theoretical service life:

$$D_1 = 1600 \text{ h} - 216 \text{ h} = 1384 \text{ h}$$

Second inspection (year 2)

Load collective L2, which means $km_2 = 0.25$.

The hour meter for crane engine indicates 3400 hours, i.e. during this period:

$$3400 - 1800 \text{ h} = 1600 \text{ h} \text{ (1800h were used during the first year of operation)}$$

The winch operated about 12% of the time, i.e., $T_2 = 192 \text{ h}$.

The actual usage proportion S_2 of the theoretical service life at the time of the second inspection is therefore:

$$S_2 = \frac{0.25}{0.125} \times 192 \text{ h} = 384 \text{ h}$$

Remaining theoretical service life:

$$D_2 = 1384 - 384 = 1000 \text{ h}$$

Do the same for the rest calculation.

7.4 Inspection of load hook

The load hook must be inspected annually by a competent inspector.

These inspections are made to prevent accidents through early detection of deficiencies.

Any deficiencies determined by the inspector must be documented, corrected, and subsequently re-inspected.

- a) Check the hook for distortions; e.g., at the hook jaw.
- b) Inspect all bolts and screws, and ensure all cotter pins are complete and opening is stretched.
- c) Check that the rotary connection of hook can move easily, and the clearance is not too large;
- d) Check the easy rotation of the hook: rotate the hook by hand. If it is stiff, it indicates that the bearing has been damaged.
- e) Check the safety catch for integrity and functional work.
- f) Check the hook for corrosion and wear



Note:

In case corrosion and wear is found on the threads, the load hook may no longer be used. In such a case, contact the mobile crane branch company of Zoomlion.

7.5 Inspection of rope pulleys

- a) Check the rope pulley all around for damage and cracks
- b) If rope pulleys have been hit during crane operation (for example on buildings) or if they were subjected to other stress factors, they must be then extensively checked for damage or cracks.
- c) Check for wear on the rope groove. Replace the pulley if the bottom of the rope groove has been worn down more than 1/4 of the rope diameter.
- d) If any damage or cracks are found, then the rope pulley must be replaced immediately. If this is not observed, there is great danger of causing a serious accident!
- e) Check rope pulley for tight fit and shakes; loose and shaken rope pulley means that the bearing and bearing bush is damaged.



Caution:

If any damage or cracks are found, then the rope pulley must be replaced immediately. If this is not observed, there is great danger of causing a serious accident!

7.6 Inspection and maintenance of anchoring rods

All anchoring rods fitted or used must be checked at least once a year by a specialist, and subjected to additional checks depending on working ground and actual operating conditions. Increase use of the machine shortens the inspection interval. A comprehensive inspection should be carried out on anchoring rod during assembly, including concealed surface and inside holes.

The anchoring rods should be checked for the following defects:

a) Cracks and notches

The anchoring rod must be checked at least once a year using magnetic powder test to make sure that there are no cracks or notches. If any cracks or notches are detected, the rods must be replaced immediately; rod repairing is prohibited.

b) Elongation

The elongation of the rods must be inspected by measurement. Maximum permissible elongation is 0.2%; for example, over a length of 7000mm=14mm

c) Wear and abrasion

The inside holes and pins must be inspected for signs of wear and abrasion, including the spring keepers and cotter pins used for securing the pins.

d) Enamel coating

The anchoring rod coating must be inspected regularly for signs of corrosion. Eroded spots must be repainted. The anchoring rod must not be stored in aggressive agents, such as sea water.

e) Deformation

The anchoring rod, once being distorted, should be replaced immediately.



Note:

If any of the damaged listed above is detected, the anchoring rod must be replaced immediately; damaged and faulty anchoring rods may lead to serious accident!

7.7 Inspection and maintenance of wire rope

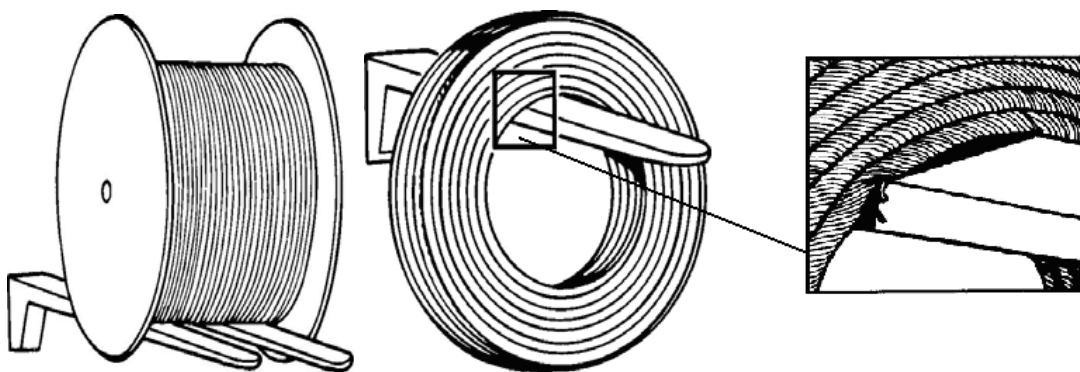
Being a crucial component for crane lifting, the wire rope will directly affect the assembling work and safety on the construction site. Therefore, much emphasis should be put on the use, maintenance and regular inspection of wire rope.

7.7.1 Handling and transport of wire rope

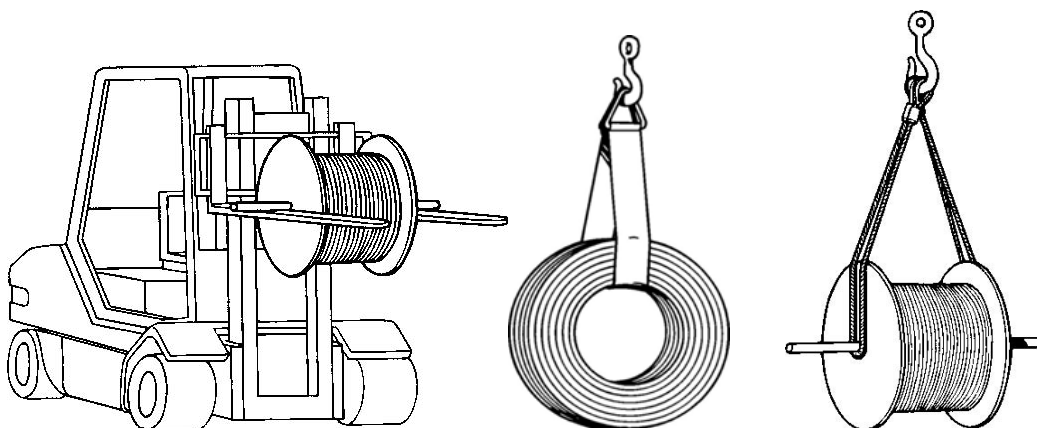
The wire rope should be handled and transported with utmost care. When loading a wire rope down, never push it down directly from a higher position in order to avoid causing any damage to the rope or to the reel.

A proper means of transport is to make use of a steel bar through the middle hole or axle of the reel. The reel can then be lifted with a forklift or directly with a sling attached to a crane. When the reel or coil is rolling on the ground, the illustrated bar can only be placed underneath both flanges of the reel, without getting in contact with the rope. The ground should be even, and the rope is not allowed to contact the sharp objects or the fork of the forklift, even if the outer lay of the rope is protected.

Improper methods:



Proper methods:



7.7.2 Inspection of wire rope

Any torsional stresses and sudden acceleration of load caused by impact loaded on wire rope and load hook will cause serious damage to wire rope, a comprehensive check should be therefore performed on the wire rope. While checking, pay attention to the following points:

- a) whether the rope end connections are in proper order;
- b) notches on pulley groove;
- c) corrosion, wear and tear and rope deformation;
- d) Type and number of wire breaks, and location and consequence of wire break;
- e) Narrowing of the rope diameter during the operational period

Caution:

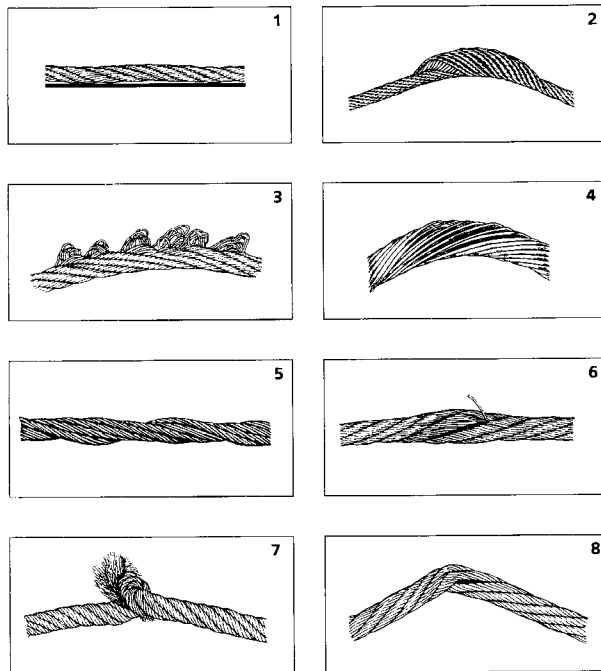
For crane that has been idle for a period of over 6 months shall be give a complete inspection by a qualified person conforming with the requirement of this clause before being placed in services.

7.7.3 Discard of wire rope

Wire rope must be discarded immediately if any one of the following defects is found:

- a) Broken strand or formation of broken wire clusters (In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay)
- b) Wear of one-third the original diameter of outside individual wires. Kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure (Figure 1).
- c) Basket formation(Figure 2);
- d) sharp protruding strands or strand clusters(figure 3)/loop formation;
- e) Reductions from nominal diameter of more than one-sixty-fourth inch for diameters up to and including five-sixteenths inch, one-thirty-second inch for diameters three-eighths inch to and including one-half inch, three-sixty-fourths inch for diameters nine-sixteenths inch to and including three-fourths inch, one-sixteenth inch for diameters seven-eighths inch to 1 1/8 inches inclusive, three-thirty-seconds inch for diameters 1 1/4 to 1 1/2 inches inclusive;
- f) 10% corrosion or wear (figure 4);
- g) loosening of the rope structure(figure 4);
- h) contractions(figure 5);
- i) flattening and sharp bends(figure 6+8);

- j) kinking section of snapped strands (figure 7).
- k) In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection (figure 6).



Caution:

1. If there is any doubt about the operational safety of any ropes, please consult with crane specialist.
2. Should any of the above damages are discovered or any other damages occur, the cause must be established before attaching or mounting a new rope.
3. wire rope safety factors shall be in accordance with American National Standards Institute B30.5-1968 or SAE J959-1966

Wire ropes are sensitive and they should be kept clean and dry, and be prevented from coming in contact with the ground; Wire rope transporting and replacing must be carried out according to actual requirements; When replacing ropes, the new ropes must be of the same strength rating and diameter as the old ones. Should another type of wire rope be used, permission must first be obtained from the crane manufacturer.

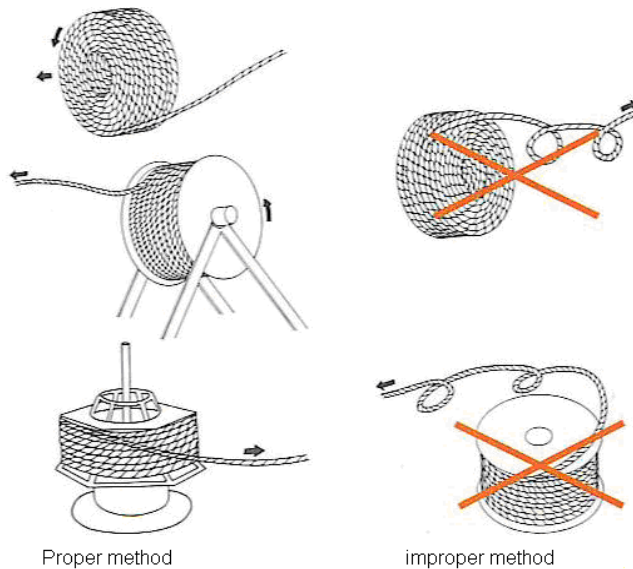
Procedure for changing wire ropes and Notes

a) Preparation

- 1) The rope is usually replaced with a rope that is of the same type as the original. If the spare rope is of another type, the user must ensure that the rope characteristics are at least as good as those of the rope that was taken down;
- 2) When cutting a certain length of wire rope out of a longer one, the area where the cut will take place should be treated properly beforehand, or appropriate technical means should be taken to prevent the rope from coming loose at the cutting point;

- 3) Before installing a new wire rope, the grooves of the rope drums and pulleys must be checked in order to ensure that they can accommodate the spare rope correctly;
- 4) Before starting to use the rope on an equipment the user must ensure that all components that are associated with the rope have been set up in such a way that they will operate correctly.

b) Unwinding of wire rope



The wire rope can be unwound from a reel or uncoiled on the floor. If the later method is applied, the floor should be clean and even; otherwise, foreign substances such as sand grains stuck to lubricating grease will damage the wire rope when it passes through the rope pulley.

In no circumstances shall the rope be pulled from a reel or a coil which is laying on its side, otherwise a twisting force will be inevitably generated on each rope layer. Every twisting force will change the twist pitch of rope strand; alter the proportion of each component part in every section of rope length; and at last change load-bearing location of wire rope. Since the unwound wire rope from the reel will resist the previous twisting force, the rope will form loops and be kinked permanently.

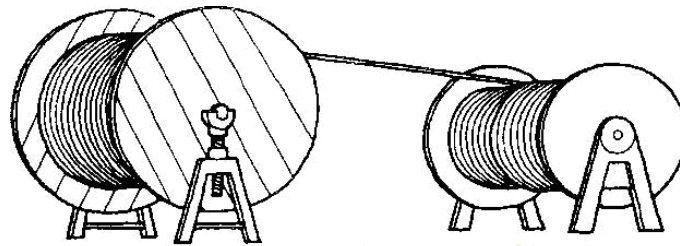
Kinked wire rope can no longer be used and must be discarded.

c) Installation of wire rope

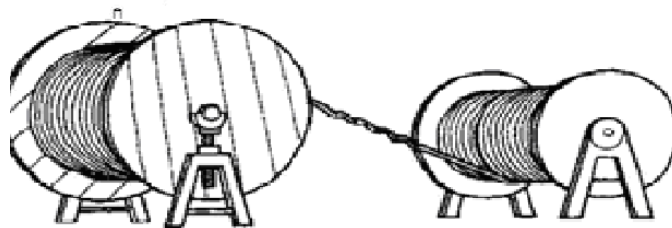
The optimal installation of wire rope can be achieved depending on different type of crane. The installation of a rope must be carried out very carefully to ensure that the rope can be unwound from a reel or uncoiled from a coil without generating torque and causing any outer damages. This point also applies when reeving the rope in the rope pulley. If the rope is not installed under a load, any contact area between the wire rope and the equipment should be protected properly.

It is recommended that the old rope should be removed prior to fitting a new rope. If the old rope is used as a lead rope to pull the new one through the reeving system, do not connect them together by directly welding or binding their rope ends; instead, they should be connected with a Chinese finger. There is still another way to change a rope: use a thinner rope as a lead rope to pull the new one through the reeving system. This way is usually applied to the installation of a rope on new equipment.

1) Unwinding the rope from the reel onto the drum



Proper method



Improper method

In the manufacturing process, when a rope is wound onto a reel, the rope suffers bending with a special direction. After the rope is delivered to customer, it is also bended towards the same direction. Therefore, when the rope is unwound from a reel onto drum, it is advantageous to maintain the direction of bending as it leaves the reel (see the above figure).

If the above mentioned method is not observed, the wire rope will be kinked between the reel and the drum or resume its original bending direction when used, which will result in changes in the structure of rope.

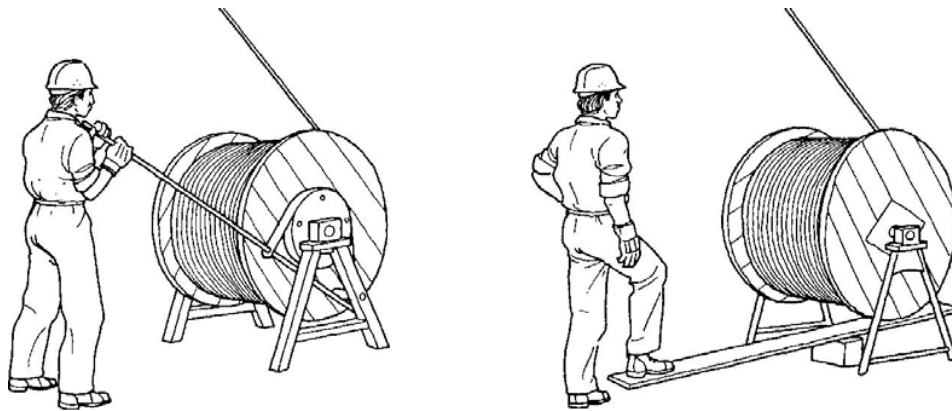
2) Installing the rope under load

To achieve the best spooling condition of rope on a multiple-layer coiling system (especially wound onto a cable drum of crane), it is very important to install the rope under a tensioning load.

If the first rope layer is not tensioned on the rope drum, the outer rope layer will cutting into the lower rope layer under loading, which would result in serious damage to wire rope. And the unwound rope can even get stuck, which will result in the reverse rotation of the rope drum during the unwinding of rope, and thus causing the sudden increase in tension

force and the drum winding downwards.

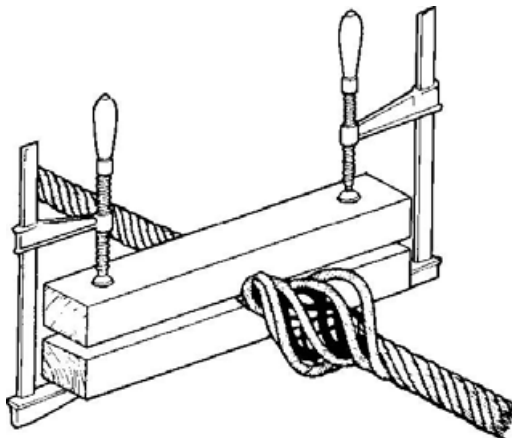
The tensioning load should be 1-2% of the minimum breaking force. In many cases, the rope should be unwound or wound properly with the help of an external force.



Enough tensioning load can be generated on the reel by depressing the wooden board underneath one flanges of the reel or holding the braking bar that is connected with the reel axles (see the figure above).



Note: we should on no account produce the tensioning force by means of compressing the wire rope, such as putting the wooden board directly underneath the wire rope, because the changes incurred in rope structure will make the rope deformation irremediable.



3) Installing a new rope with the help of the old rope or a lead rope

For the spooling operation itself, the new rope is attached to the old rope or to a lead rope. They can be connected by means of a rope hose or welded ring. However, please make sure that the new rope is not twisted by the old or lead rope.

4) Testing of wire rope

After the installation of wire rope and before starting to use it on the crane system, the rope should experience normal "trial running" with a low load several times. After

undergoing “trial-running”, all components of the rope can be adjusted to real operating condition.

The crane should be used for lifting at approximately 10% of the normal load in order to stabilize the rope.

During the trial-running, crossing, kinking, twisting, and excessive bending as well as scratch of wire rope should be avoided.

7.7.4 Maintenance and care of wire rope

The wire rope should be protected against exposure to such dangerous medium as heat source, acid and alkali. And it should be free of sands and dirty adhered, and be greased. Regular maintenance and care of the ropes enhances the safety of crane operation and substantially increases the rope's service life.

- a) Wire ropes must be greased or oiled at regular intervals, especially around the drums and pulleys, areas where they are turned and flexed the most. The grease or oil must be compatible with that already on the ropes. Well lubricated wire ropes demonstrate 4 times as much flex-play as unduplicated ones.
- b) Dirty wire ropes must be cleaned regularly; the best results may be achieved by brushing.
- c) If the lower layers on the drum are hardly used or not used at all, they are loose and must be unwound and then rewound under a preliminary tension.
- d) A rope works most economically when its entire length is used. Therefore, an appropriately adapted rope length should be used for crane operation of long durations. If partial sections of a rope are subject to different and varying loads, the rope, after a certain time, can be turned around. In doing so, the previously free end of the rope is attached onto the drum so that the part of the rope which has been subjected to the most wear and hard use is now in the “quiet” zone, and vice-versa. The service life of a rope can be noticeably increased.
- e) If wear results mainly from the multi-layer winding of the drum, the service life of the rope can be increased by shortening it by a length equivalent to 1/3 of the drum circumference.
- f) Extension torsion in torsion free hoisting rope and its elimination
 - 1) A torsion compensation is not only required after a new rope has been placed, but also if extension torsion has been established after a long working period, resulting from stretching and settling of the rope structure.
 - 2) Torsion compensation can be noticed when the hook block turns in multi reeve operation and when the load is set down and / or the outer strand seem to loosen up. In extreme cases, the rope shows an arch formation.
 - 3) If a crane is operated for a long period of time with the same reeving, without unreeving or changing the hoisting rope reeving, then we recommend installation of a rope twist catcher on the fixed point of the hoisting rope.



Caution: if this is not observed, the rope can be damaged!

g) Measures to eliminate torsion compensation

1) Set down the load hook

Lower the load hook as much as possible, so that the greatest rope length between pulley block and load hook is exposed to compensation (twist, point 4).

2) Determine the rope lay direction\turning direction of rope

First determine in which direction the load hook is twisted.

The turning directions are shown in the illustration with a continuously lined arrow. When the hoisting height is large, it is very difficult to check the turning direction of rope by the turning direction of the dashed arrow. The “braid” must be dissolved.

3) Loosen the rope on the fixed point

When the direction of rotation has been determined, release the rope on the fixed point on the load hook.

It is advantageous for torsion compensation if the load hook has been reeved in an uneven number of that such a member will be reeved.

In this case, the fixed point of the rope is easily accessible on the load hook and it can easily be released.

4) Turn the end of the rope by 180° to 360° carefully to compensate for the turn of the load hook. To compensate for the turn, turn the separately shown end of the rope as marked by the solid line arrow.



Note: it is important that the correct reference point is taken and that the crane operator should hold the cable in from of him.

The rope(Z) with right-hand lay direction, as shown in figure 1 and the rope(S) with left-hand lay direction as shown in figure 4 are turned in for compensation, while the rope(Z) with right-hand lay direction as shown in figure 2 and the rope(S) with left-hand lay direction as shown in figure 3 should be turned out for compensation.

The rule for torsion compensation is that the end of the rope must be turned against the rope lay direction, which causes the release of the ‘braid’ in the above test.

The rope section should be as long as possible for the turn. Through a hoisting movement without a load, this turn should be distributed over the complete length of the cable.

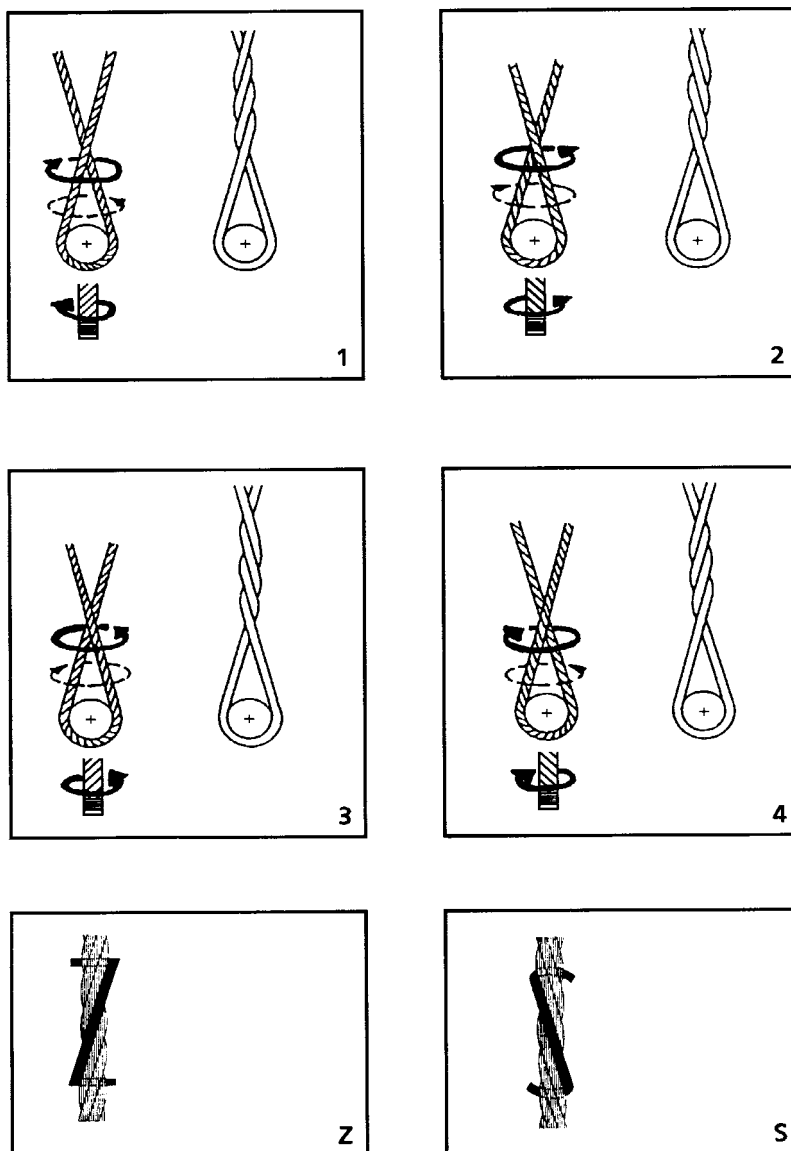
Under no circumstances turn the cable by force over a short section, because this would destroy the cable structure permanently.

5) Reattach the rope on the fixed point

The end of the rope must be reattached and secured on the fixed point after the turn.

6) Carefully lift the load hook and raise it without a load repeatedly, if necessary

Since a non-stretch rope construction is relatively safe from torsion and it can only be stretched a little (actually, the torsion will not make the rope deviate from the groove of rope pulley), the hoisting movements without a load must be repeated several times. after getting the compensating turn to the end of the rope, reattach the rope end again



to the fixed point and repeat the hoisting movements without a load one or several times so that the torsion compensation can be distributed over the complete length of the rope past the rope pulley.

Note: if necessary, in case the stretch was especially severe (multiple twisting of the lower pulley block and /or slackening of the outer strands over a long stretch, or at several points) then repeat this procedure several times, depending on hoist rope length.

7.7.5 Wire rope **shall** be taken out of service when any of the following conditions exist:

- a) Evidence of any heat damage from any cause;

7.8 Inspection of oil and fuel tanks

Oil and fuel tanks shall be inspected at least once a year and checked all around for leakage in the subsequent inspections every four years.

Repairs shall only be carried out by trained and knowledgeable specialists.

Improper repairs such as welding, brazing or soldering are not permitted without consulting our company.

7.9 Inspection of load bearing components

Check the mounting bolts of slewing ring and winch.

Overloading or load impact may cause impact on bolting joints, resulting in damage to bolts.

Check the bolts carefully for elongation, cracks or deformation. If such defects are found on the bolts, they should be changed immediately; otherwise accidents may happen.

The slewing ring is an important load bearing component, so much attention should be given to the following points:

- a) Check the pre-tightening force of fixing bolts of slewing ring after the slewing ring is operated for 100 hours. And check them again every after 500 operating hours to ensure sufficient pre-tightening force. Generally speaking, the bolts should be changed after 14000 operating hours or 7 service years.

Mounting bolts of slewing ring for QUY260

Bolts Specification(ISO7412)	Diameter of Mounting hole (mm)		
M33	36	Strength grade(ISO898-1)	10.9
		Limit of strength $\sigma_{\min}$ (N/mm ²)	900
		Pre-tightening moment(10 ³ N)	412

- b) Pay attention to the running condition of slewing ring during operation. If noise becomes large, impact force and power increase suddenly, check vehicle immediately and eliminate the failures. If necessary, dismantling of the vehicle is also needed.
- c) The slewing ring in use should not be exposed to strong sunlight. Never wash the slewing ring directly using water in order to prevent the water from entering the roll path. Precautions are taken against hard objects from approaching to or entering the meshing area.
- d) Check sealing strip regularly. The sealing strip, if damaged, should be changed, and if falls off, should be returned to original position.

7.10 Inspection of engine

- a) The engine must be inspected prior to every operation; i.e., daily check that all oil and fuel lines are leak-free and dry. The fuel filter, oil filter and injection pumps shall also be inspected for leakage.
- b) Every day, check that the hydraulic components, fan drive hydraulic motors and their supply lines are properly sealed and do no leak.
- c) Check the exhaust system, especially the exhaust flanges and the exhaust flap brakes, and make sure that they seal and move properly. The return springs that open the exhaust flaps must function properly, because seized (therefore closed) exhaust flaps during operation will cause increases in temperature and considerable overheating.
- d) Check if electrical lines are functioning and mounted properly, and ensure that there is sufficient clearance to hot exhaust pipes. Ensure that they are not damaged and still properly insulated.
- e) To reduce noise emission, noise reducing mats are installed in the engine area (engine covering) for certain types of cranes. The fiberglass mats, after being cleaned, are flame-resistant and fireproof.
- f) If engine compartments are not cleaned regularly, oil and fuel may splash on the mats while conducting maintenance and repair work. Oil and fuel soaked on noise reducing mats must be removed, as they are flammable. The same is true for insulating mats in the exhaust system area.
- g) Clean the engine compartment only with nonflammable cleaning fluid. In addition, the fluid may not be corrosive or chemically damaging to hoses and cables.

7.11 Cranes Not in Regular Use

- a) A crane that has been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection by a qualified person conforming with the requirements of paras. Chapter 6 6.2 before being placed in services.
- b) A crane that has been idle for a period of over 6 months shall be give a complete inspection by a qualified person conforming with the requirement of paras. Chapter 6 6.2、 6.3 before being placed in services.
- c) Standby cranes shall be inspected by a qualified person at least semiannually in accordance with the requirements of paras. Chapter 6 6.2、 6.3 Cranes that are exposed to adverse environmental conditions should be inspected more frequently.

7.12 Inspection classification

7.12.1 "Initial inspection." Prior to initial use all new and altered cranes **shall** be inspected to insure compliance with provisions of this section.

7.12.2 "Regular inspection." Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general

classifications are herein designated as "frequent" and "periodic", with respective intervals between inspections as defined below:

- a) Periodic inspection: 1- to 12- month intervals, or as specifically recommended by the manufacturer.

7.12.3 "Frequent inspection." Items such as the following **shall** be inspected for defects at intervals as defined in paragraph (d)(2)(i) of 1910.180 or as specifically indicated including observation during operation for any defects which might appear between regular inspections. Any deficiencies such as listed **shall** be carefully examined and determination made as to whether they constitute a safety hazard

- a) All control mechanisms for maladjustment interfering with proper operation: Daily.
- b) All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.
- c) All safety devices for malfunction
- d) Deterioration or leakage in air or hydraulic systems: Daily.
- e) Crane hooks with deformations or cracks. For hooks with cracks or having more than 15 % in excess of normal throat opening or more than 10 deg. twist from the plane of the unbent hook.
- f) Rope reeving for noncompliance with manufacturer's recommendations.
- g) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.

7.12.4 "Periodic inspection." Complete inspections of the crane **shall** be performed at intervals as generally defined in paragraph (d)(2)(ii) of 1910.180 depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections **shall** include the requirements of paragraph (d)(3) of 1910.180 and in addition, items such as the following. Any deficiencies such as listed **shall** be carefully examined and determination made as to whether they constitute a safety hazard:

- a) Deformed, cracked, or corroded members in the crane structure and boom.
- b) Loose bolts or rivets.
- c) Cracked or worn sheaves and drums.
- d) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers and locking devices.
- e) Excessive wear on brake and clutch system parts, linings, pawls, and ratchets.
- f) Load, boom angle, and other indicators over their full range, for any significant inaccuracies.
- g) Gasoline, diesel, electric, or other power plants for improper performance or noncompliance with safety requirements.
- h) Excessive wear of chain-drive sprockets and excessive chain stretch.
- i) Travel steering, braking, and locking devices, for malfunction.

j) Excessively worn or damaged tires

7.12.5 "Cranes not in regular use."

- a) A crane which has been idle for a period of one month or more, but less than 6 months, **shall** be given an inspection conforming with requirements of paragraph (d)(3) of 1910.180 and paragraph (g)(2)(ii) of 1910.180 before placing in service.
- b) A crane which has been idle for a period of six months **shall** be given a complete inspection conforming with requirements of paragraphs (d) (3) and (4) of 1910.180 and paragraph (g)(2)(ii) of 1910.180 before placing in service
- c) Standby cranes **shall** be inspected at least semiannually in accordance with requirements of paragraph (d)(3) of 1910.180 and paragraph (g)(2)(ii) of 1910.180. Such cranes which are exposed to adverse environment should be inspected more frequently.

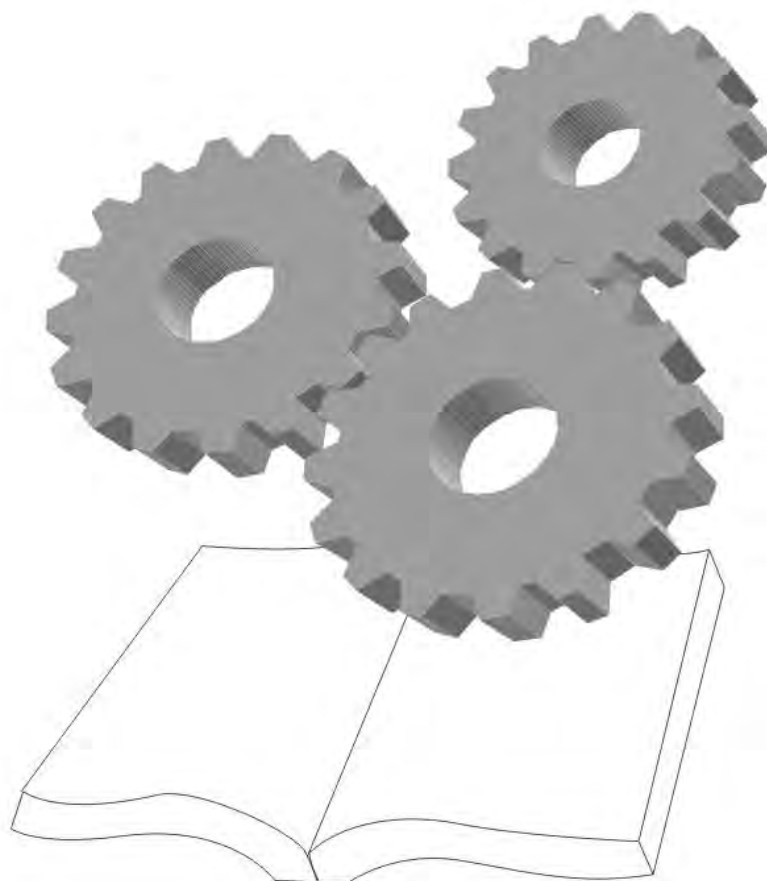
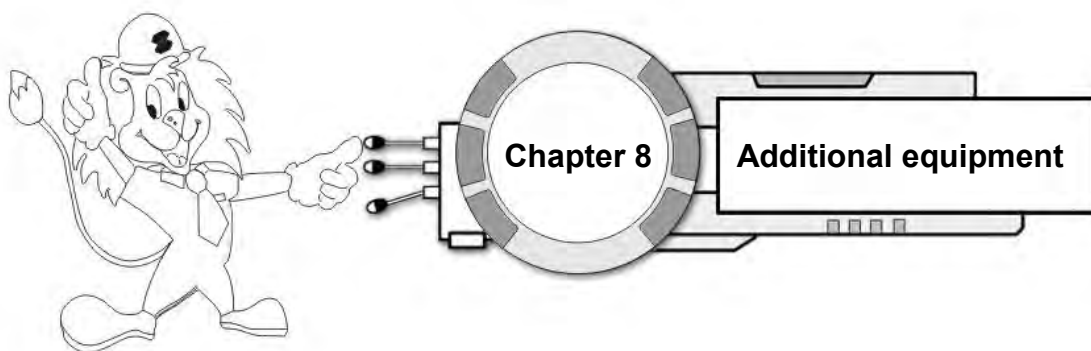
7.12.6 "Inspection records." Certification records which include the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the crane which was inspected **shall** be made monthly on critical items in use such as brakes, crane hooks, and ropes. This certification record **shall** be kept readily available.

7.13 The employer **shall** comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks. Where manufacturer's specifications are not available, the limitations assigned to the equipment **shall** be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded. Attachments used with cranes **shall** not exceed the capacity, rating, or scope recommended by the manufacturer.

7.14 Hand signals to crane and derrick operators **shall** be those prescribed by the applicable ANSI standard for the type of crane in use. An illustration of the signals **shall** be posted at the job site.

7.15 The employer **shall** designate a competent person who **shall** inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition. Any deficiencies **shall** be repaired, or defective parts replaced, before continued use.

7.16 A thorough, annual inspection of the hoisting machinery **shall** be made by a competent person, or by a government or private agency recognized by the U.S. Department of Labor. The employer **shall** maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment.



ZOOMLION

8.1 Air conditioning

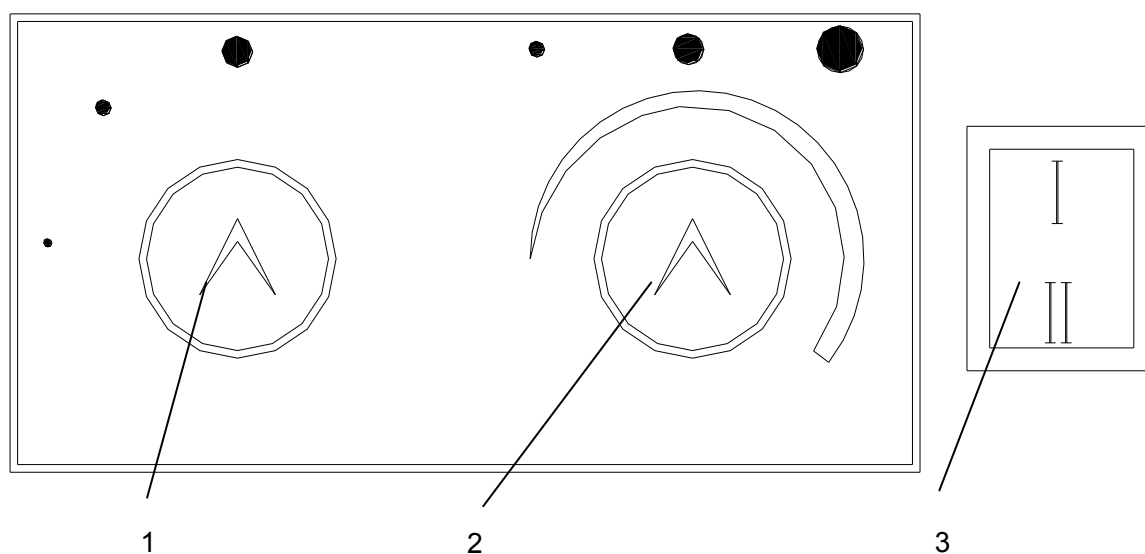
8.1.1 Control panel for air conditioning

The air conditioning system mainly consists of compressor, condenser (including liquid reservoir), evaporator etc.

When cooling performance is activated, its power is supplied by the compressor which is driven by the engine.

And the heating is achieved by utilizing the heat of engine circular water supplied by the evaporator fan.

The air conditioning in the cab is a heating & cooling air conditioning. Its control panel is on the air conditioning cover behind the seats.



- | | |
|----------|---|
| 1 Switch | Control the fan speed to obtain proper air volume. |
| 2 Switch | Adjust the temperature of cab when cool mode functions. |
| 3 Switch | Switching between cooling mode and heating mode |
| | I — cooling mode; II — heating mode |

8.1.2 Methods for operating air conditioning

When air conditioning is used for the first time, turn the switch (1) to high gear position and hold it for 5 minutes after engine starts, then turn the switch (2) to “COOL” position. At this time, the temperature in the cab starts to fall down.

When the required temperature is obtained, turn the switch (2) anticlockwise slowly until the indicator light goes out and the compressor stops working. At this moment, set this temperature to the rated value.

When the temperature in the cab is higher than this value, the indicator light lights up, the compressor starts automatically and the cooling system begins to work.

When the temperature in the cab is lower than this value, the indicator light goes out, and the compressor and cooling system stop working.

Adjust the angle of air outlet to change the direction and angle of cold wind;

Adjust the switch (1), one of three fan speeds can be set for the heating or air conditioning.

Note: Do not turn switch (2) to “COOL” position and rotate switch (1) to low gear position when using air conditioning. Otherwise, evaporator may get frost and cooling performance may be influence.



Note:

1. During “three guarantee” period, it is forbidden to dismantle air conditioning system without manufacturer’s permission.
2. Check the tension of compressor straps periodically and adjusts it in time.
3. Wash off the dirt on the surface of condenser radiating rib. In this way, the cooling performance can be protected.
4. When changing the components of air conditioning system, add freezing oil according to the requirements. As there’s difference between compressors in system, the brand and type of new freezing oil should be the same as that of freezing oil used in the compressor. Different freezing oil, which is not given explanation of being capable of mixing with the freezing oil in the system, is never permitted to fill into the system.
5. When add or change refrigerant, its brand and type should be the same as that of refrigerant used by original system.
6. Lower the temperature in the cab with the evaporator at high gear position, and keep the temperature in cab at middle gear position or low gear position.
7. When the components in the system break down, they should be replaced with the spare parts supplied or designated by manufacturer. Otherwise, the system

may be damaged.

8. Under the condition of low temperature & high humidity, the evaporator should not work at low speed. Otherwise, it may be frozen.
9. If air conditioning is not used in winter, switch air conditioning on once a month and let it run for about 10mins. This minimum running is required to keep the whole system adequately lubricated.

8.1.3 Maintenance of air conditioning system

Component	Maintenance content	Maintenance interval
Condensing fan and motor	Check and repair	Once a quarter
Evaporating fan and motor	Check and repair	Once a quarter
Condenser	Check condenser for blockage. If necessary, clean it.	Once a month or increase maintenance times according to its working condition
Evaporator	Check evaporator for functional work and abnormal sound. Clean the air inlet.	Once a month or increase maintenance times according to its working condition
Electromagnetic clutch	Check that it works properly. If necessary, clean it	Once a quarter
Connector	Check that the wire connector is fitted tightly.	Once a month

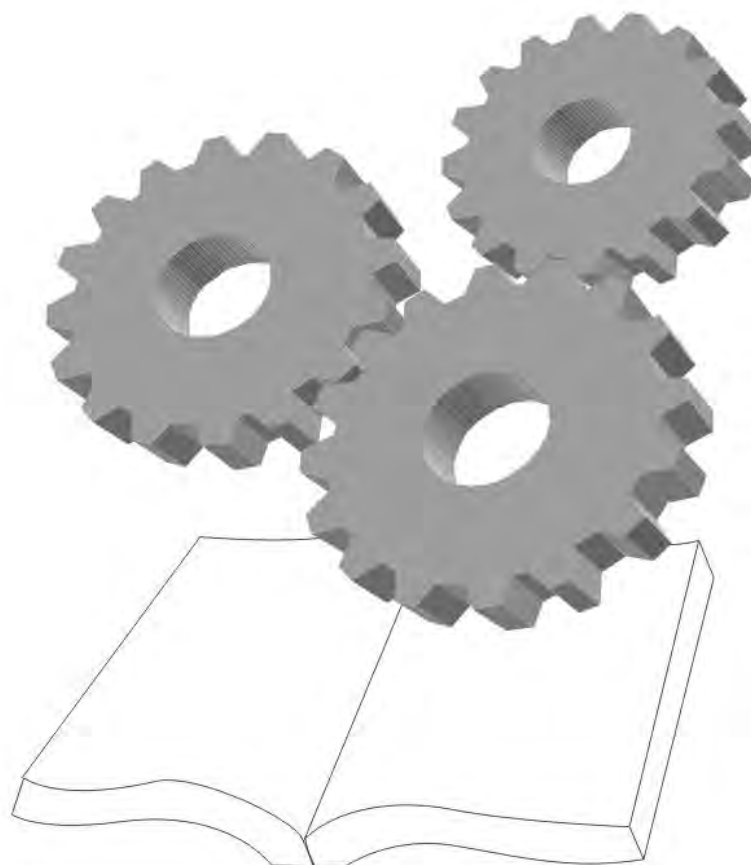
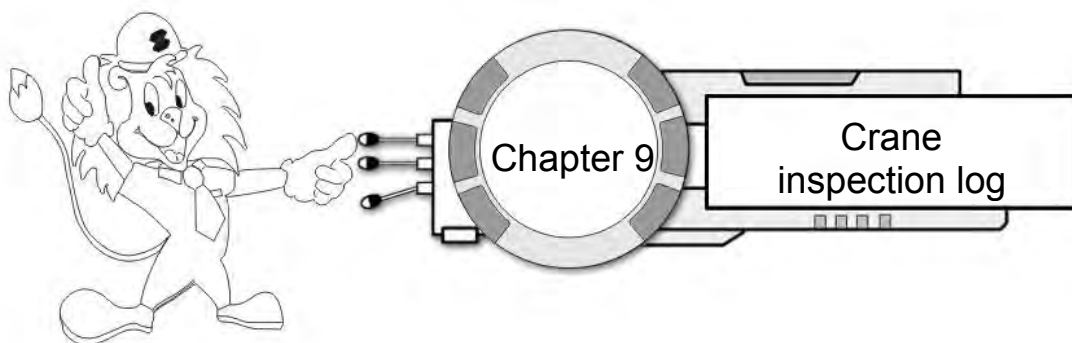
8.2 Media Player

QUY260 crawler crane can be equipped with radio or CD, DVD player according to customer's demands.



Note:

Radio or CD, DVD player are not the basic allocations of crane. Customers can select to assemble according to their different demands.



ZOOMLION

9.1 Crane inspection log (8 pages in total)

Table (1)

No.	Actions (inspection, testing, maintenance, repair)	Component inspected	Date

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]