



SC SERIES CONSTRUCTION HOIST INSTRUCTION MANUAL

SHENXI MACHINERY CO., LTD-CHINA

To Customer

The outstanding features of the hoist produced by our Company are safe, reliable, stable and flexible in use.

Thank you for selecting and using our construction hoist! Please carefully read the Manual before operation and keep it safe for query.

Our Company is dedicated to the updates of the product; no further notification will be given if there are changes. Contact us if you have any questions or concerns.

The design and manufacture basis standards for SC-Series construction hoist are as following:

Builders hoists for persons and materials with vertically guided cages

--**GB 26557-2011** , China

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Technical parameter table of SHENXI SC-Series construction hoist

Classification of Construction Hoist	Capacity kg	Speed m/min	Lifting Height m	Motor Power kW	Safety Device	Inverter Power kW	Cage dimension (L×W×H) m	Mast size m	Module	
General Hoist	SC100	30	150	2×11	SAJ30-1.2	—	3.0×1.3×2.5	0.65×0.65×1.508	8	
	SC150	36	250	2×13	SAJ30-1.2	—	3.0×1.4×2.5	0.65×0.65×1.508	8	
	SC200	36	250	3×11	SAJ40-1.2	—	3.2×1.5×2.5	0.65×0.65×1.508	8	
	SC200E	36	250	2×13	SAJ40-1.2	—	3.2×1.5×2.5	0.65×0.65×1.508	8	
	SC100/100	1000/1000	30	2×2×11	SAJ40-1.2	—	3.0×1.3×2.5	0.65×0.65×1.508	8	
	SC150/150	1500/1500	36	2×2×13	SAJ40-1.2	—	3.0×1.4×2.5	0.65×0.65×1.508	8	
	SC200/200	2000/2000	36	2×3×11	SAJ40-1.2	—	3.2×1.5×2.5	0.65×0.65×1.508	8	
	SC200/200E	2000/2000	36	2×2×13	SAJ40-1.2	—	3.2×1.5×2.5	0.65×0.65×1.508	8	
	SC100Z	1000	0-63	150	2×13	SAJ30-1.6	30	3.0×1.3×2.5	0.65×0.65×1.508	8
	SC150Z	1500	0-63	250	2×15	SAJ30-1.6	37	3.0×1.4×2.5	0.65×0.65×1.508	8
Medium-Speed Frequency Convertible Hoist	SC200Z	2000	250	3×18.5	SAJ40-1.4	55	3.2×1.5×2.5	0.65×0.65×1.508	8	
	SC200EZ	2000	250	2×15	SAJ40-1.4	45	3.2×1.5×2.5	0.65×0.65×1.508	8	
	SC100/100Z	1000/1000	0-63	2×2×13	SAJ30-1.6	2×30	3.0×1.3×2.5	0.65×0.65×1.508	8	
	SC150/150Z	1500/1500	0-63	2×2×15	SAJ30-1.6	2×37	3.0×1.4×2.5	0.65×0.65×1.508	8	
	SC200/200Z	2000/2000	0-63	2×3×18.5	SAJ40-1.4	2×55	3.2×1.5×2.5	0.65×0.65×1.508	8	
	SC200/200EZ	2000/2000	0-63	2×2×15	SAJ40-1.4	2×45	3.2×1.5×2.5	0.65×0.65×1.508	8	
High-Speed Frequency Convertible Hoist	SC200G	2000	250	3×22	SAJ50-2.0	75	3.2×1.5×2.5	0.65×0.65×1.508	8	
	SC200/200G	2000	250	2×3×22	SAJ50-2.0	2×75	3.2×1.5×2.5	0.65×0.65×1.508	8	

Remark : 1.Standard cage dimension (L×W×H) (m) : 3.0×1.3×2.5、3.0×1.4×2.5、3.2×1.5×2.5 and etc , special dimension can be made according to requirement of customer ;

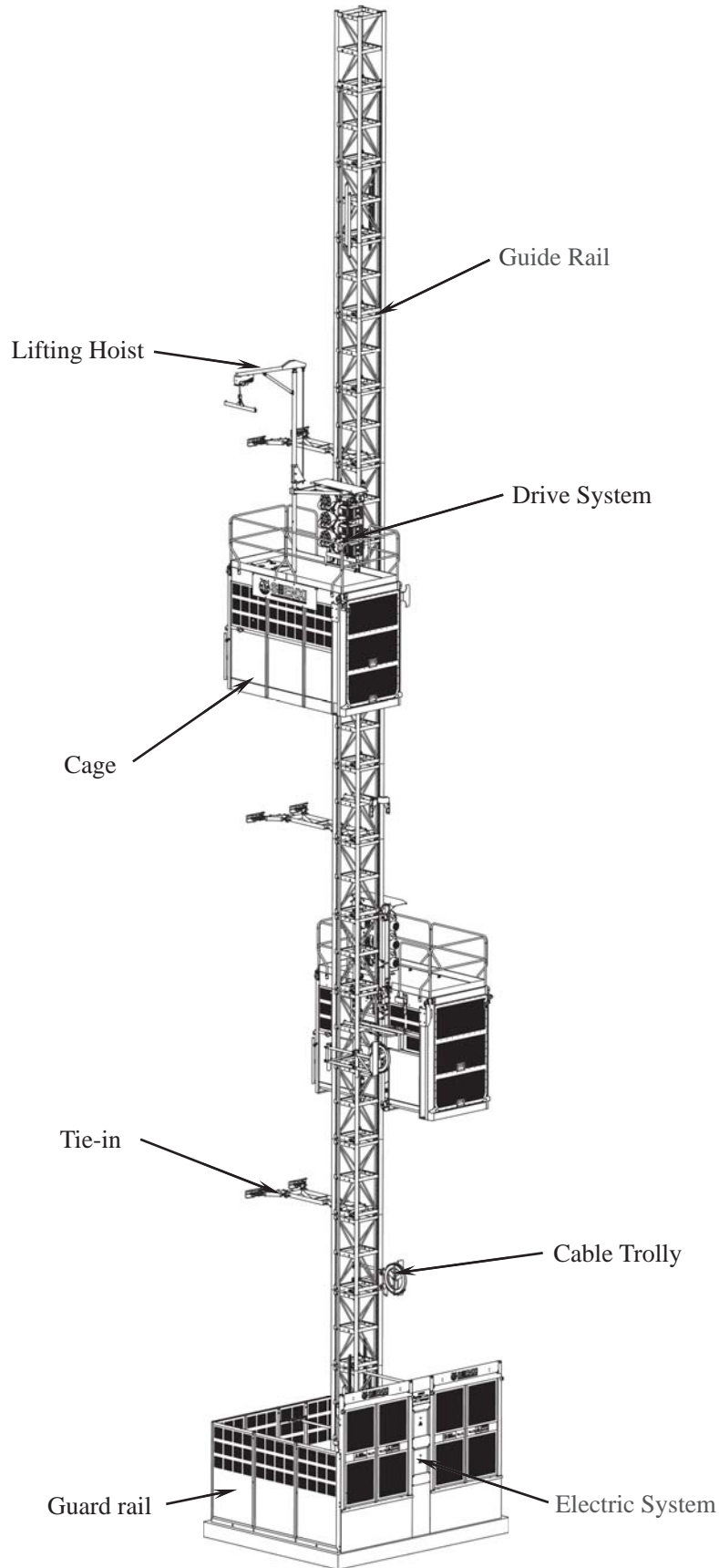
2.Lifting height increased can be design according to the requirement of customer ;

3.Cages and the cage door should be use made by steel mesh grid, galvanized sheet, aluminum plate, checkered plate and so on , also according to the requirement of customer ;

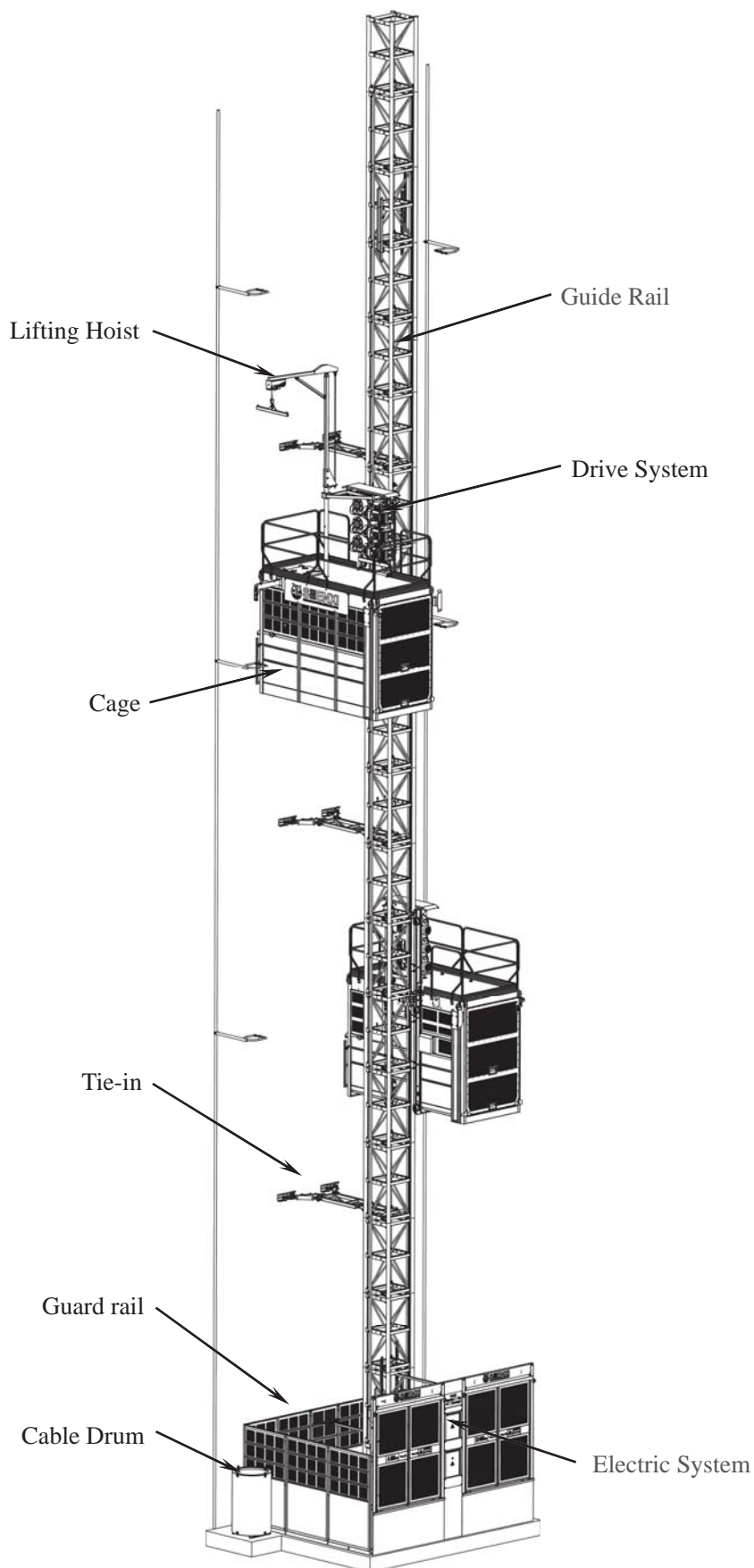
4.Mast and mast tie can be painted or hot galvanizing processing ;

5.Motor/reducer option:SEW or NORD ;

6.No further notification will be given if there are changes.



Cable Trolley Type Construction Hoist Overall View



Cable Drum Type Construction Hoist Overall View

CONTENTS

A	Application Guidelines -----	A0
	A.1 General conditions for using the construction hoist -----	A1
	A.1.1 Climate and geographical conditions -----	A1
	A.1.2 Environmental conditions -----	A3
	A.1.3 Conditions related to the design -----	A3
	A.1.4 Installation conditions -----	A5
	A.1.5 Conditions for auxiliary loading and unloading -----	A6
	A.2 General responsibility provisions -----	A6
	A.2.1 Provisions related to users -----	A6
	A.2.2 Provisions related to using conditions -----	A8
	A.2.3 Provisions related to special risks -----	A9
	A.2.4 Provisions related to all stages of using the construction hoist -----	A10
	A.3 Safety signal -----	A11
	A.3.1 Description -----	A11
	A.3.2 Terms -----	A12
	A.3.3 Warning signal board -----	A12
B	Security Rule -----	B0
	B.1 User safety responsibility -----	B1
	B.2 Safety requirements in installation and disassembly phase -----	B1
	B.2.1 Responsibilities -----	B1
	B.2.2 Safety measures before installation and disassembly -----	B1
	B.2.3 Safety measures during installation and disassembly -----	B2
	B.2.4 Safety measures after installation -----	B3
	B.2.5 Safety measures for acceptance test and inspection -----	B5
	B.3 Periodic inspection and test -----	B5
	B.3.1 Requirements on periodic inspection and test -----	B5
	B.3.2 Daily safety inspection -----	B6
	B.4 Operational safety -----	B7

	B.4.1 Responsibilities -----	B7
	B.4.2 Safety measures for operation -----	B7
	B.5 Maintenance -----	B8
	B.5.1 Responsibilities -----	B8
	B.5.2 Safety measures for repair and maintenance -----	B8
C	Overview and Technical Features -----	C0
	C.1 Overview -----	C1
	C.2 Performance parameter table -----	C2
	C.3 Brief introduction of construction principle -----	C3
D	Foundation Setting -----	D0
	D.1 P Calculation on Bearing Capacity of Foundation -----	D1
	D.2 Model Selection of Concrete Foundation -----	D2
	D.3 Concrete Foundation of Mast Tie -----	D3
	D.4 Notes in making concrete foundation -----	D4
E	Mast and Mast Tie -----	E0
	E.1 Configuration of Mast -----	E1
	E.2 Type and Selection of Mast Tie -----	E3
	E.3 Connection of Mast Tie and Wall -----	E4
	E.4 Maximum Installation Spacing and Maximum Cantilever Height of Mast Tie ---	
	-----	E5
	E.5 Calculation of Acting Force F of Mast Tie Applying to Wall Space -----	E6
F	Installation and Commissioning -----	F0
	F.1 Installation Procedure -----	F1
	F.2 Preparation before Installation -----	F1
	F.3 Installation -----	F3
	F.3.1 Precautions prior to installation -----	F3
	F.3.2 Installation of the base frame, several mast sections below and guard rails of the base frame -----	F3

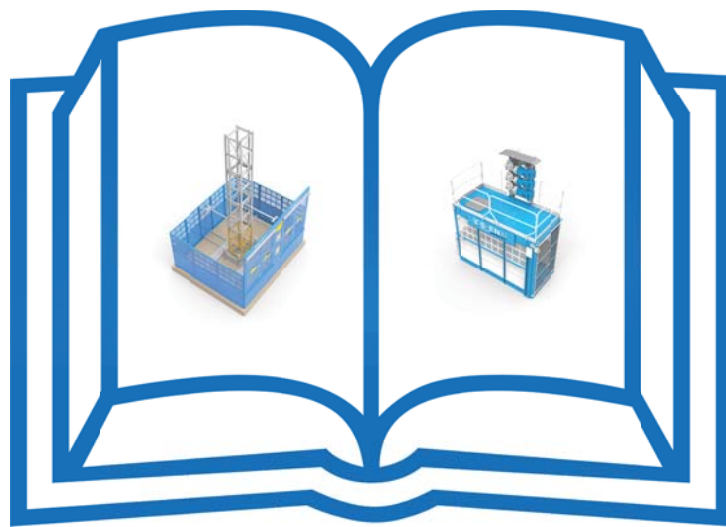
F.3.3 Installation of cage, drive system guard rail on the top of cage and jib	
-----	F5
F.3.4 Heighten the mast to 10.5m, then heighten the mast tie to 15m after attachment of it	
-----	F6
F.4 Installation of Electrical Equipment, Control System and Overload Protector	
-----	F6
F.4.1 Installation of electrical equipment and control system	F6
F.4.2 Installation of overload protection device	F7
F.4.3 Overload protection device quick setup guide	F8
F.5 The Installation of Limit Cam at the Bottom of Mast and Power Driven Lifting Test	
-----	F9
F.6 The Machine Commissioning	F9
F.6.1 Guide roller gap adjustment	F9
F.6.2 Meshing clearance adjustment of rack and pinion	F10
F.6.3 Clearance adjustment of back pinion and rack	F10
F.6.4 Adjustment of cable trolley	F10
F.6.5 Adjustment of upper and lower limiting switch touch iron	F10
F.6.6 All-Round lubrication of hoist	F10
F.7 Drop Test	F10
F.7.1 Operational requirements of anti-falling safety device	F10
F.7.2 Drop test description	F11
F.7.3 Drop test method	F11
F.7.4 Reset of anti-falling safety device	F12
F.8 Heightening of the mast (meanwhile installing the mast tie) and the installation of limit cam block	
-----	F12
F.8.1 Heightening of the mast	F12
F.8.2 Installation of limit cam on the top of mast	F13
F.9 Installation of Mast Tie	F14
F.10 Installation of Cable Guiding Device	F14
F.10.1 Installation of cable collecting basket and cable protecting rack	F14

	F.10.2 Installation of cable trolley type of cable guiding device -----	F16
	F.11 Installation of Floor Call System (Selective Assembly) -----	F18
G	Operation -----	G0
	G.1 Safety Check before Operation -----	G1
	G.2 Operation -----	G2
H	Check and Lubrication -----	H0
	H.1 Safety Cautions -----	H1
	H.2 Daily Check -----	H1
	H.3 Weekly Check -----	H2
	H.4 Monthly Check -----	H2
	H.5 Seasonal Check -----	H2
	H.6 Yearly Check -----	H3
	H.7 Special Inspection -----	H3
	H.8 Lubrication -----	H5
	Maintenance -----	I0
	I.1 Electrical system failure inspection -----	I1
	I.2 Mechanical system fault inspection experience adjustment diagnosis method -----	I3
	I.3 Replacement of wearable parts -----	I5
J	Disassembly -----	J0
	J.1 Disassembly of Safety Setup Procedure -----	J1
	J.2 Preparatory Phase of Disassembly Operation -----	J1
	J.3 Implementation Phase of Disassembly -----	J2
	J.4 Disassembly Operation Procedure -----	J2

Appendix



Application Guidelines



A.1 General conditions for using the construction hoist

General conditions for using the construction hoist has described all conditions stated in such relevant parts of this manual as Chapter C “Overview and technical characteristic”, Chapter D “Basic setup” and Chapter E “Mast tie and tie-in”. Please consult with our company for those conditions that are not stipulated.

Some particularly important situations about operation of construction hoist will be described again by illustration in relevant parts of this manual.

A.1.1 Climate and geographical conditions

A.1.1.1 Wind

The using conditions of the construction hoist, such as standard height, counter-force and pressure under the base mat, are relying on standard wind speed at the location of the construction hoist.

Standard wind speed (GB50009. 2001) is the average wind speed tested in the place that is 10 meters above the flat ground for successive 10 minutes.

A.1.1.2 General conditions

The standard wind speed during the operation of the construction hoist should use the average wind speed diagram of the located country to determine the standard wind speed area.

Please consult with our company for different standard wind speed areas of other nations or areas except China.

A.1.1.3 Special conditions, such as:

- No average wind speed diagram;
- There are special stipulations or some other situations in the located country or area;
- The altitude is higher than that marked in the average wind speed diagram;
- Basin, defile, mountain pass, hills, etc.

Ask users to design in advance to determine the standard average wind speed at the installation location of the construction hoist. Users can also consult with our company and provide relevant data.

A 1.1.4 Operation of construction hoist

The construction hoist can only be operated where the maximum wind speed is less than 72km/h.

A.1.1.5 Installation, dismantling and location changing of the construction hoist

Installation, dismantling and location changing of the construction hoist can only be conducted when the maximum wind speed (gust of wind) is less than 45km/h.

A.1.1.6 The environmental air temperature tested in the shady place

The temperature is one that is tested within a non-hermetic and wind & rain-proof cover that is 2 meters above

the ground and within a radius of 100 meters at the location of construction hoist.

Unless otherwise stipulated in the contract (such as special reasons from the located country), the temperature scope for operating the construction hoist is: working state (non-working): -20°C to +40°C,

When the temperature is not within the scope, please stop the operation of the construction hoist, otherwise, it should have risks of abnormal operation or damaging the electrical components due to abnormal heating.

A.1.1.7 Humidity and precipitation

The humidity for operating the construction hoist (working or non-working state), precipitation: the maximum humidity is 95% non-coagulation (unless otherwise stipulated in the contract).

The maximum humidity of the storage of the construction hoist (after dismantling) is 100% .

A.1.1.8 Frost, ice, snow

Frost, ice and snow can increase the weight of the structural parts and they can accumulate with wind and rain. Frost, ice and snow can damage the parts in the operation and, at worst, can have the risk for persons on duty to fall..

When the construction hoist is covered with frost, ice and snow, the operation of the construction hoist is prohibited.

A.1.1.9 Thunder and lightning

The thunder and lightning can electrify the structural parts of the construction hoist and endanger persons directly or indirectly contacting the construction hoist with electric shock hazard. For example: on the steel structure, tie-in or base frame's guard rail of the construction hoist.

If storm is possibly coming, operation of the construction hoist should be stopped and set it under non-working state. Don't board or leave the construction hoist during the thunderstorm period.



If operators fail to leave the construction hoist in time (thunderstorm happens suddenly), never try to leave the construction hoist during the thunderstorm period. The risk can be much lower if operators stay in the cage, but don't touch the control panel.

A.1.1.10 Sand storm

After the sand storm, sand can be blown into the motor and structural parts and block the gap.

Before restarting, sand-dust in the motor and structural parts should be completely cleared, dismantle movable parts of relevant structures if necessary.

A.1.1.11 Flood, tide

Unless otherwise stipulated in the contract, the design of the construction hoist has considered these factors.

When encountering flood or tide, the stability of the construction hoist decreases, and should stop operating

immediately.

A.1.1.12 Earthquake

Unless otherwise stipulated in the contract, the design of the construction hoist has not considered earthquakes of any magnitude.

A.1.1.13 Special installation

Unless otherwise stipulated in the contract, the design of the construction hoist has not considered installation on the moving foundation, such as RIG, local vessel and floating caisson etc.

A.1.1.14 Mast-tie of the construction hoist

The mast-tie of the construction hoist should be designed to bear the force speculated in the technical parameters of the construction hoist, and it should be strictly produced within the indicated tolerance range.

A.1.2 Environmental conditions

A.1.2.1 Environment with radioactive chemicals

Unless otherwise stipulated in the contract, the allowable maximum concentration where the construction hoist is operated should comply with that in the industrial zone or in the areas with heavy traffic.

A.1.2.2 Environment with explosives

The construction hoist can not be used in the environment with explosives.

A.1.2.3 Electromagnetic field

Unless otherwise stipulated in the contract, the construction hoist can be used in the environment whose electromagnetic field is lower than 10V/m, such as 100kw broadcast or television transmitter within 500 meters away from the construction hoist or portable transmitter within 0.5m from the electrical cabinet or control panel.

As all the metal structural parts, construction hoist can interfere the emission and receiving of the Hertz wave.

A.1.2.4 Radiation

The construction hoist can not be radiated.

A.1.3 Conditions related to the design

A.1.3.1 Users should be responsible for the adaptation of the construction hoist to the construction site.

A.1.3.2 Power supply

The working power supply and fluctuation scope designed for the construction hoist must be strictly obeyed. Failing to comply with the given value can lead to the abnormal operation of the construction hoist.

A.1.3.3 Station of operators

In accordance with the selected category, the operators of the construction hoist can conduct in the cab of the

cage or in the cage.

A.1.3.4 Safety device

The safety device of the construction hoist (all the inhibited devices) is prohibited to be operated beyond the using scope. The adjustment scope of the safety device can not be changed arbitrarily to hinder its operation or make it lose function.

A.1.3.5 Protection mechanism/ protection device is used to prohibit access to dangerous areas. It can not be canceled in any case The construction hoist can not be started before all the protection devices are properly placed (such as safety shield, separating rail, railing and cover plate etc.).

A.1.3.6 General lifetime

The general lifetime of the construction hoist is used to calculate the minimum lifetime of the construction hoist under abrasion state.

Unless otherwise stipulated in the contract, the general lifetime of the construction hoist should comply with the ranking method in the standard GB10054 . This ranking method has separately stipulated the lifetime of the construction hoist and its structural parts.

A.1.3.6.1 Working class of structural parts

The general lifetime of structural parts is represented by the number of the operating cycle (one operating cycle=the whole circulating process of one cage lifting and one cage descending). The grade of the working class of the construction hoist is A6.

A.1.3.6.2 Working class of mechanism

The general lifetime of mechanical parts is represented by the working hours of this mechanism. The grade of the general lifetime of mechanical parts is determined by the category of the construction hoist and its operation. The loading status of the mechanism stipulates the lifetime of the mechanical parts. The grade of the general working class of mechanical parts is M5.

A.1.3.7 Advertisement scutcheon of users

Unless otherwise stipulated in the contract, users could not install advertisement scutcheon at will without the written consent of the manufacturer of the construction hoist.

A.1.3.8 Fire extinguisher

Users are responsible for the provision and installation of fire extinguishers in the cab of the cage or in the cage.

A.1.3.9 Modification or welding of the construction hoist. Without the written consent of manufacturer of the construction hoist, modification of the construction hoist's structure (such as adding or refitting parts, incision,

welding etc.) is prohibited.

A.1.3.10 Changing the adjustment device (such as calibration value, adjustment value, etc.) of the construction hoist by installing accessories is prohibited.

A.1.3.11 Matching of structural parts and replacement and utilization of parts. Users should be responsible for using the exchangeable structural parts/parts that are not provided or suggested by the manufacturer of the construction hoist.

Non-genuine parts or parts without confirmation of the manufacturer of the construction hoist are prohibited for replacement.

A.1.3.12 Custody and check of the construction hoist

Custody of the construction hoist: store in good state and use safely. Check the construction hoist by confirming the check frequency, the check cycle and the check contents in accordance with items stipulated in this manual.

If relevant standards and provisions of the located place of the construction hoist are stricter than those in this manual, then check in accordance with the former ones. Fill in tracking card of the construction hoist as the speculations provided in this manual.

A.1.3.13 Disposal of wastes

Dispose all the wastes in accordance with standards and provisions of the located place, such as: grease, waste oil, etc....

A.1.4 Installation conditions

If the wind velocity is over 12.5m/s or the weather is bad including thunder and snow, the installation and dismantling of the construction hoist can not be conducted.

A.1.4.1 Distance from the fixed barrier

Keep the minimum distance between the mobile protrusion for the lifting or descending of the construction hoist and fixed barrier as stipulated . If not stipulated, this distance from the fixed barrier is at least 0.25 meter.

A.1.4.2 Distance between the construction hoist and the overhead power transmission line

Ensure that the safe distance between parts of the construction hoist and overhead transmission line complies with the stipulation of the located place of the construction hoist. If not stipulated, the vertical distance is 4 meters

when the voltage is lower than or equal to 40kv, . And the horizontal distance is 2 meters. 5 cm will be added to the distance for each 1kv exceeding 40kv.

A.1.4.3 Strength requirement of concrete foundation

The concrete foundation of the construction hoist must meet the technical requirements of its installation and

construction intensity before the equipment is installed.

A.1.4.4 Requirements of power box and cables

The power box must be for the exclusive use of the construction hoist, and can not be shared with other electrical equipment. The voltage and current of the cables connecting to the power box should meet the utilization requirements of the construction hoist, and the cables must have reliable grounding connection.

A.1.4.5 Installation acceptance

Cooperating with the testing authorities of the located place of the construction hoist, users should conduct inspection and acceptance of the installed construction hoist in accordance with all the contents in “Rules for Inspection and Supervision of the Construction Hoist” (GZJG 121. 2002) (Report of Inspection and Acceptance of Construction Hoist). It can not be used until it is accredited.

A.1.5 Conditions for auxiliary loading and unloading

A.1.5.1 Auxiliary loading and unloading equipment of the construction hoist load or unload the standard knot load with the help of the installation suspender at the top of the cage. Prohibit the use of all machines and tools that will generate dynamic influence for loading and unloading, such as electromagnet, grapnel, bucket, etc

A.1.5.2 Loading and unloading of the standard knot load

- a) Don't crane the standard knot load that is not tied tightly;
- b) Don't slantways crane the standard knot load;
- c) The craned standard knot load should keep a vertical line with the lifting hook;
- d) Don't add weight to the craned standard knot load.
- e) Operators should closely monitor it when the installation suspender is lifting or descending the standard knot load.

A.1.5.3 No man riding

The installation suspender of the construction hoist can not be used for man riding. If man riding is allowed for the construction hoist in the located place or country, users shall be fully responsible for it.

A.2 General responsibility provisions

The responsibility provisions involve all relevant personnel. Especially suitable for administrators and operators of the construction hoist, and relevant personnel should also carefully abide by and execute the provisions.

The use of the construction hoist should strictly abide by Article A.1 “General Conditions for Using the Construction Hoist”.

A.2.1 Provisions related to users

The administrators and operators of the construction hoist should comply with provisions of the located place related to protection and accident precaution for installation, dismantlement and operation of the construction hoist.

A.2.1.1 Provisions for the administrators of the construction hoist

a) Entrust the operation of the construction hoist to qualified operators;

- Age should comply with the provisions of the located country of the construction hoist.

- Physical conditions should comply with the requirements (eyesight, aural hearing, reactive ability, flexibility, fit for working at heights).

- Obtain certificate through training of relevant institutions, and confirm the relevant certificates are qualified and valid, and have sufficient knowledge about the risk of this job (electric risk, working at heights).

- Prohibit personnel who don't comply with the above conditions from operating this construction hoist.

b) Specify responsibilities of all operators of the construction hoist;

- Entrust the commanding rights for installation, dismantlement, testing and maintenance of the construction hoist to qualified technicians;

- Human resource manager arranges and trains those operators during their internship.

- Managers should draw up a preliminary scheme for installation and dismantlement that need special requirements.

c) Ensure that operators of the construction hoist know well the safety stipulations and regularly check the execution of these provisions;

Stipulate that operators of the construction hoist must:

- Wear properly (such as hair tucked, proper clothing etc);

- Wear protection articles: safety helmet and safety shoes; wear gloves when doing hand work;

- Fasten the safety belt when working at heights (more than 3 meters above the ground);

d) Specify and implement special suggestions in the manual.

- Require that operators of the construction hoist not to leave the control panel before cutting off the electricity of the construction hoist;

- When installing, dismantling or maintaining the construction hoist, install access device (escalator, aisle way, platform) that complies with requirements of the located place.

- Equip maintenance personnel of the construction hoist with corresponding measurement and repairing tools.

- Inform operators of the construction hoist to pay attention to dangers related to the work (such as appearance of persons in the operation area of the cage, whistle for going up and down etc).

A.2.1.2 Stipulations for administrators in the construction site:

- Inform the constructors at the location of the construction hoist of all the direct or indirect dangers that may be caused by construction hoist (such as construction site influence, load fluctuation caused by wind, etc).

- Inform the constructors at the location of the construction hoist of the meaning of the acoustical signal for the operation of the construction hoist (refer to the chapter of “Safety Signal”).

- Obtain the cooperation of the constructors in the located place of the construction hoist in proper ways, set up anti-smash insulation protection device for buildings on the guard rail of the base frame and above the cage of the construction hoist.

- Prohibit constructors in the located place of the construction hoist from climbing the standard knot and adhered strut of the construction hoist.

A.2.2 Provisions related to using conditions

A.2.2.1 Provisions related to mechanical equipment for building construction

Abide by relevant provisions for the use of mechanical equipment of building construction of the located place

- (Communications and transportation;
- Arrangement of fire extinguishers;
- Attach importance to environmental protection;
- Control the receiving and emission of wireless radio frequency;
- Periodical inspection.

A.2.2.2 Climate conditions

Under circumstance of special climate, users in the located place of the construction hoist should draw up preliminary scheme that should be abided by (such as decreasing the working height, withdrawing from the construction site).

This scheme can be formulated in accordance with the forecasting system of climate situation set up by the meteorological department of the place.

A.2.2.3 Access to the construction hoist

- The entry to the cab of the construction hoist should be conducted through a stipulated access when the construction hoist stops.

- Keep the access to the cab of the construction hoist clean: dispose all the wastes, grease dirt, spare parts, tools, etc; store tools, articles and components in the stipulated place.

- The weight of the personnel, building materials and tools in the cage of the construction hoist should not

exceed the allowable maximum load.

A.2.2.4 Abnormal operation of construction hoist

When the construction hoist operates abnormally, it should be stopped, and checked by professionals and evaluate its risks; should immediately eliminate abnormal situations that may endanger the safety; record those abnormal situations in the tracking record of the construction hoist.

A.2.2.5 Power safety

For the possibility that the construction hoist may have electricity, users of the construction hoist in the located place should formulate a preliminary scheme that should be obeyed for touching the power supply (direct touch or generating electric arc), for example:

- Don't leave the construction hoist;
- Don't touch the metal structures of the construction hoist;
- Notify non-relevant personnel not to get close to and touch the construction hoist;
- Cut off the power supply, and then leave the construction hoist.

A.2.2.6 Visibility conditions

- Use communication tools that are corresponding with the visibility condition of the construction site of the construction hoist, such as interphone or video system;
- Set up enough lighting when the light is very weak.

A.2.3 Provisions related to special risks

A.2.3.1 Power

- Cut off the power supply of construction hoist when the construction hoist does not need working power supply;
- The power box of the construction hoist should be closed with keys and monitored by special personnel;
- For the power box with frequency conversion structure, wait at least 10 minutes after cutting off the power and then close the power box to operate (condenser discharge within the frequency conversion structure).

A.2.3.2 Hydraulic device

- Release pressure before the construction hoist with hydraulic device begins to work, (attention: after the hydraulic device stops, the pressure can still be maintained). When radioactive oil leakage happens, stop the operation of the construction hoist should immediately;
- Don't use it to check whether there is leakage or not;
- Don't smoke or use inflammable device near the devices with oil or grease (reducer, gear drive system etc);

- Don't fold or knock hydraulic hose.

A.2.3.3 Chemical substances

● The storage and utilization of chemicals (grease, oil, paint, glue, solvent etc) should comply with special safety provisions of this product and descriptions on the container.

A.2.3.4 Falling of the objects

Proper measures should be taken within the operating area of the construction hoist to avoid the falling of tools or non-fixed objects.

A.2.4 Provisions related to all stages of using the construction hoist

A.2.4.1 Transportation

In accordance with the transportation conditions of the construction hoist and situations of automobile lifting of parts of the construction hoist (such as ground intensity, climatic conditions, slope of passageway, site for loading and unloading etc.), determine the passageway of the installation site of the construction site.

Set up the alarming device for the ultrahigh parts including cage when transported on roads.

A.2.4.2 Site preparation

The using site should comply with all the technical performances and installation and utilization conditions of the construction hoist.

A.2.4.2.1 Installation zone of construction hoist

Before installing the construction hoist, analyze relevant restrictions of using site, for example:

● Restrictions related to the air zone above the public buildings, other buildings, road, railway and river in the located place.

● Whether there are other tower cranes, airports, electrical wires, electromagnetic wave launcher etc. nearby.

● Site state, ground intensity, groove hole, slope, underground construction etc.

● Restrictions about the electricity transmission cables, telephone, optical cables etc above the ground of the located place.

Site for storing components and for lifting and transportation equipment when handling the construction hoist.

Determine the best position for construction hoist, ensure the handling and use of the construction hoist.

A.2.4.2.2 Installation, handling

a) Preparation for installation and disassembly;

● The constructors at the located place of the construction hoist should establish corresponding management materials, list risks that may happen when installing, handling and appending the construction hoist and

corresponding protection measures;

- Before installation, handling and appending of the construction hoist, know the weather condition from relevant departments of the located place, the wind velocity should not be larger than allowable maximum wind velocity;

- During the period of installation, handling and appending of the construction hoist, line out some safe area (storage area, working area), use obvious marks to prohibit personnel who are not permitted to enter.

b) Process of installation and handling

- Guarantee that the construction hoist is not used in the lifting area when installing, handling and appending the construction hoist;

- Please consult with our company for information about unconventional installation and handling (for example, restrictions related to the located place of the construction hoist, when installed and handled, the equipment operates abnormally).

A.2.4.3 Repair, maintenance

a) Maintenance

- When the construction hoist operates abnormally or is being maintained, use obvious marks to mark out safe areas, prohibit the entering of personnel who are not allowed.

- During the maintenance period of the construction hoist, stop the operation of the construction hoist, set up appropriate mark at the main power switch, prohibit the starting of the construction hoist.

b) Maintenance

- Don't use construction hoist during the maintenance period of the construction period.

- Please consult with our company for information about unconventional maintenance.

A.3 Safety signal

A.3.1 Description

Safety or health signal provides instructions or stipulations about safety or health in special environment for the operation of the construction hoist.

This signal can be a board, a color, a light or audible signal depending on circumstances.

Safety signals can be divided into several categories and each category is marked by one color.

- Banning (red);
- Warning (yellow or yellow / orange);
- Provisions (blue);




- Help and assistance (green);
- Equipment or devices for preventing fire disaster (red).




A.3.2 Terms

Signal board: it is a signal that provides a special description through geometrical shape, color, symbol or graphs.

- Prohibition signal board: prohibit behaviors that may cause dangers;
- Warning signal board: indicate a certain risk or hazard;
- Stipulation signal board: stipulate a certain behavior;
- Signal board for help or assistance: description related to life-saving channel or methods of help;
- Signal board for preventing fire disaster: give descriptions related to the location of fire-fighting equipment and evacuation route when fire disaster happens;
- Attachment signal board: used with signal board, gives supplementary instructions;
- Symbol or graph: graphical representation for expressing a certain situation or stipulating a certain behavior, use it in a certain signal plate or a certain shining surface;
- Lighting signal: made by transparent materials or translucent materials., Constitute the shining surface itself by internal or rear lighting;
- Audible signal: special audible signal sent by a special device which is not an artificial sound or synthesized sound.

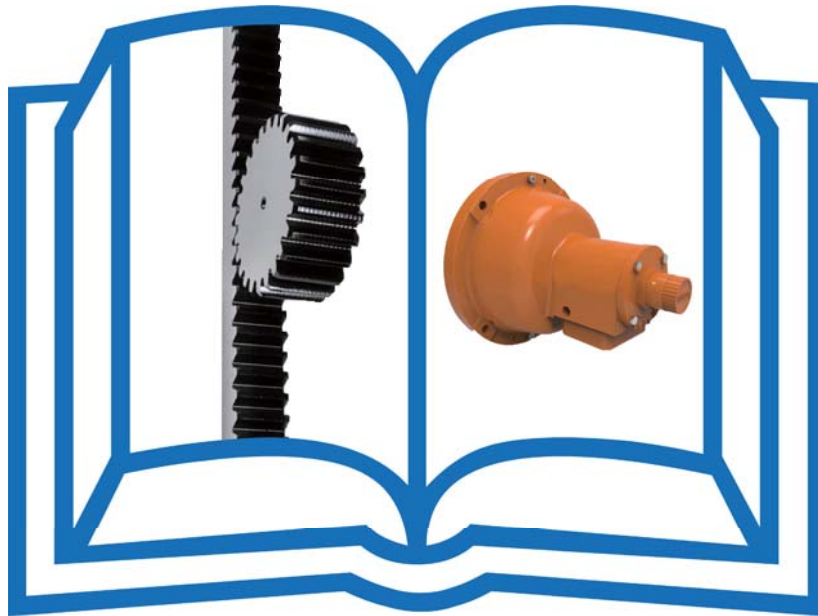
A.3.3 Warning signal board

Signal plate	Meaning	Specification
	Caution! Danger!	Safety warning
	Electrical risk	No power outages, No entry
	Prevent fire	Do not cause a fire No smoking near the inflammables, such as oil, paint, glue etc.

	<p>Falling objects</p>	<p>No objects dropping from the upper air within the construction site</p>
	<p>High-altitude falling</p>	<p>Prevent operators in the construction site from falling down</p>
	<p>Warning! Attention!</p>	<p>Safety warning Note!</p>

B

Security Rule



Before the use of construction hoist, the user shall carry out security supervision on construction hoist during overall use process according to local laws and regulations and safety standard on construction hoist.

B.1 User safety responsibility

User manager and related operating personnel shall carefully read, understand and master all contents in the instruction book, and carefully and responsibly observe and implement the regulations in the handbook for the purpose of safety production before the use of construction hoist.

Requirements on construction hoist user or operating personnel:

- Pass the training of relevant organizations and obtain qualified certificate, and the related certificate is identified to be qualified and valid.
- Able to understand and implement the standard, regulations and safe operation rules.
- Trained, understand, carefully read and master all contents in the construction book.
- With rich operating experience, able to bear high running up and down tension state in the air, and operate safely and correctly.
- Respond to all kinds of possible situations correctly and rapidly to avoid accidents.

B.2 Safety requirements in installation and disassembly phase

B.2.1 Responsibilities

Construction hoist user shall be responsible for safety requirements on installation and disassembly phase, and shall work according to local laws, regulations and safety standards on construction hoist.

The operating personnel shall carefully read, understand and master the contents in instruction book and detailed description in installation and disassembly scheme, shall be familiar with mechanical and electrical properties and principles of construction hoist, especially strictly observe and implement installation safety requirements before construction hoist installation.


B.2.2 Safety measures before installation and disassembly

- Construction hoist installation/disassembly. Construction team shall possess qualified and valid installation/disassembly certification issued by relevant government departments before carrying out construction hoist installation/ disassembly tasks; operating personnel also shall possess qualified and valid post qualification certificates issued by relevant government departments before carrying out construction hoist installation/ disassembly tasks.
- Construction hoist installation/disassembly place shall be clean, and have warning mark to prohibit non-operating personnel.

- Related department shall arrange professional engineering and technical personnel for site safety supervision and management during construction hoist installation//disassembly to supervise the implementation of construction scheme and operating procedures to ensure the implementation of safety measures.

- Make sure hoisting equipment, machines and tools are suitable for hoisting load and in a good condition.
- Make sure the installation foundation for construction hoist can bear specified load and meet local construction technical specification for upper foundation.

B.2.3 Safety measures during installation and disassembly

	<p>Installation and disassembly is not available when wind speed is more than 12.5m/s, or in thunderstorm, rainy or snowy day.</p>
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- Specially assigned person shall be responsible for construction hoist installation/ disassembly, and command uniformly.
- Specially assigned person shall be responsible for the control and custody of electrical control box during installation and disassembly.
- Personnel unrelated to installation /disassembly is prohibited to use construction hoist during installation/disassembly.
- Only when cage roof control box is moved to cage roof instead of inside, the cage can be driven to operate.
- Hanger rod maximum hoisting capacity shall be 300kg, and overload operation is prohibited when installation hanger rod on the top of cage is used for installation. Cage load shall not exceed rated installation load.
- Nobody is allowed to stand under the suspension.
- Don't start the cage when there is any suspension on installation hanger rod.
- Personnel's head, hands and shipment shall not stretch out of the cage guard rail when the cage is running.
- Nobody can act in base frame guard rail, guard rail roof, or lean against the guard rail or in hoist way, or dangerous area enclosed by mast section and mast tie before main power is cut off.
- Don't carry out installation on the cage roof before emergency stop button on the cage roof control box is closed.
- Personnel without electrician certificate can not carry out electrical wiring work. Make sure the power is cut off before carrying out work like this.
- After the installation of mast section for required height of construction hoist, fasten all connecting bolts before starting the cage .
- Electrical grounding protection and lightning arrester for construction hoist shall be installed separately as

required.

- Air obstruction light shall be available when construction hoist installation height is more than 120m and surpasses the building.

B.2.4 Safety measures after installation

Construction hoist can not be put into normal operation before passing acceptance test.

B.2.4.1 Acceptance test and inspection for construction hoist

After installation and before normal operation, acceptance test and inspection shall be available in order to ensure the safe use of newly installed construction hoist and construction hoist with big changes.

Construction hoist user shall be responsible to ensure the test and inspection are in accordance with safety specification requirements stipulated by local laws, regulations and safety standards on construction hoist.

All tests and inspections shall be under surveillance of inspector and related departments.

B.2.4.1.1 General test and inspection on construction hoist

a) The examination of construction hoist mast and mast tie shall meet:

- Use and fix mast section according to required hoisting height;
- The location, dimension and bearing capacity of ground foundation shall meet requirements;
- Mast section and the rack are in good condition;
- Installation condition of mast shall meet requirements;
- Rack fastening shall meet requirements;
- Installation of mast tie shall meet requirements, connecting bolt fastening meets requirements;
- Free end height of mast shall meet requirements;
- The installation of limiting device (collision block) shall meet requirements.

b) The examination of construction hoist base frame guard rail shall meet:

- The inner and outer position of guard rail shall meet requirements;
- Guard rail components shall not have corrosion and damage deformation, and shall meet requirements;
- Electromechanical interlocking device of guard rail door shall act flexibly and reliably, and shall meet requirements;

- Base frame fixed bolt fastening shall meet requirements;
- Installation position of cable in collecting basket shall meet requirements.

c) The examination of cage shall meet:

- Dimension and bearing capacity shall meet requirements;

- No corrosion and damage deformation, and shall meet requirements;
 - Cage door and doorframe dimension, intensity, easy electromechanical interlocking startup shall meet requirements;
 - The installation of guide roller and safety hook shall meet requirements;
 - Cage floor is with no damage and non-skid, which shall meet requirements;
 - Safety guard on the top of cage shall meet requirements;
 - Installation hanger rod is in good condition; installation position and intensity on cage shall meet requirements.
- d) The examination of drive system shall meet:
- The installation of drive system on cage frame shall meet requirements;
 - Transmission gear is in good condition, contact state with rack shall meet requirements;
 - Back gear fastening and clearance of the rack back shall meet requirements;
 - Worm wheel and worm are in good condition, lubricating oil brand and oil level shall meet requirements;
 - The brake has required functions and shall meet requirements.
- e) The examination of cable guiding device shall meet:
- Installation position of cable-protected frame is correct, and interval shall meet requirements;
 - The rubber parts or spring strip fixed on guiding frame are in good condition and shall meet requirements;
 - The fixation of cable arm rest on the cage shall meet requirements;
 - The model, specification, connection and installation of cable shall meet requirements.
- f) Electrical equipment shall meet:
- Supply voltage and frequency shall meet requirements;
 - Ground resistance shall meet requirements;
 - In good safety state and shall meet requirements.
- g) Control system:
- Master control system is in good condition and shall meet requirements;
 - The installation position of all control components shall be suitable; the use is flexible, reliable, safe and shall meet requirements.
- h) Full stroke of cage shall meet:
- The distance of the highest point of the cage full stroke from the top of mast shall meet requirements;
 - The distance of the lowest point of the cage full stroke from the ground shall meet requirements;

- Running process of cage, the action of limit switches shall be flexible, reliable and meet requirements.

B.2.4.1.2 Special test and inspection on safety device

Special test and inspection shall be carried out after general test and inspection on construction hoist have met requirements, to ensure the safe use of construction hoist, inspection contents are as follows:

a) Test and inspection of safety device shall meet:

- The safety device shall meet requirements within required valid calibration (safety device shall be submitted to testing organization for calibration and inspection once every year as required, and new safety device shall be replaced every 5 years according to date of production on the brand);

- The installation of safety device shall meet requirements;
- Boundary drop test under rated load. Cage stop sliding distance during drop test shall meet requirements;
- Reset the safety device after passing drop test;
- Lead seal of safety device shall meet requirements.

b) Designated symbol and instruction manual

- Related warnings and designated symbol of construction hoist shall be complete and meet requirements;
- The driver shall have the copy of instruction book for check at any time;
- The driver shall read, understand and master the meaning of warnings and designated symbol in the instruction book.

c) Final service test

Carry out final service test and inspection for construction hoist according to the instructions, and shall meet requirements.

d) Final report

Submit the final report after acceptance test and inspection for construction hoist. The report should briefly summarize all faults in test and inspection and describes all preparatory work before the construction hoist is put into operation.

B.2.5 Safety measures for acceptance test and inspection

Certain safety measures shall be available during construction hoist acceptance test and inspection to ensure operating and inspecting personnel safety, especially during drop test nobody shall be in the cage or base frame guard rail, and ground control shall be adopted.

B.3 Periodic inspection and test

B.3.1 Requirements on periodic inspection and test

Periodic inspection and test shall be carried out for the construction hoist according to local laws, regulations and safety standards on construction hoist. In addition to these standards (or no such standards), carry out periodic inspection and test according to the following requirements.

B.3.1.1 Responsibility

a) Inspector

Inspection and test shall be carried out by qualified engineering technical personnel.

b) Safety measures during inspection and test

Ensure operating and inspecting personnel safety before function test; during load test and safety device drop test, nobody shall be in the cage or base frame guard rail, and ground control shall be adopted.

c) General inspection and test on construction hoist

- All components shall be regularly inspected. If necessary, test shall be carried out to ensure it is in safe and usable state.

- Inspection and test shall be carried out in accordance with time interval and instructions in “repair and maintenance”.

- Adjust the adjustable wear-out part in time; replace the wear-out parts reaching wear-out limit and other wear-out parts with spare parts or by purchasing our components, and make sure replacement components have passed qualified safety inspection.

- The user shall be responsible for any consequences caused by replacing components of other manufacturers without our written confirmation.

d) Safety device inspection and test, drop test shall be carried out every 3 months according to requirements to ensure its function meets requirements. Cage stop sliding distance during drop test shall meet requirements. Ensure safety during drop test.

- The motor brake function shall be fine before test.
- Hoist the cage to safety height before test to ensure the cage will not collide into buffer spring during test.
- Nobody shall be in the cage and base frame guard rail during test, and ground control shall be adopted.
- Reset safety device correctly in time after test.

B.3.2 Daily safety inspection

B.3.2.1 Responsibility

Construction hoist user shall be responsible for daily safety check of construction hoist.

All work shall be in accordance with local laws, regulations and safety standards on construction hoist.

Before daily safety check of construction hoist, read the detailed contents of “daily safety check” carefully and strictly execute.

B.3.2.2 Safety measures for daily safety check

- After the construction hoist is attacked by rainstorm or severe typhoon, professional personnel shall be assigned to inspect its key parts and take necessary safety measures before daily safety check.
- It is prohibited to operate construction hoist when wind speed is more than 20m/s, or mast and cable freeze.
- It is prohibited to operate construction hoist before “periodic inspection and test” and “maintenance and repair” are completed.
- It is prohibited to operate construction hoist before removing obstructions from construction hoist passageway and ensuring there is no personnel.
- It is prohibited to operate construction hoist during daily safety check for the cage on the ground.
- Be careful when the cage is under operation and daily safety check.

B.4 Operational safety

B.4.1 Responsibilities

Construction hoist user shall be responsible for its operation safety.

All work shall be in accordance with local laws, regulations, and safety standards on construction hoist.

Before construction hoist operation, read the detailed contents of “Operation safety” carefully and strictly execute.

B.4.2 Safety measures for operation

- It is prohibited to operate construction hoist when wind speed is more than 20m/s.
- It is prohibited to operate construction hoist when mast and cable freeze.
- It is prohibited to operate construction hoist before “daily safety check” and “maintenance and repair” are completed.
- Cage load and the number of passenger shall not exceed rated value on the sign.
- Goods shall not be beyond the cage.
- Dismantle installation hanger rod on the top of cage after section adding.
- It is prohibited to operate construction hoist before all protection and safety devices can work normally.
- It is prohibited to operate construction hoist before removing obstructions from construction hoist passageway and ensuring there is no personnel.
- Nobody shall be on the top of the cage when construction hoist is operating in the cage.

- Immediately report to safety supervision in the field when there is any failures or conditions endangering safety. It is prohibited to operate construction hoist before eliminating faults and conditions endangering safety.

B.5 Maintenance

B.5.1 Responsibilities

Construction hoist user shall be responsible for its repair and maintenance.

All work shall be in accordance with local laws, regulations, and safety standards on construction hoist.

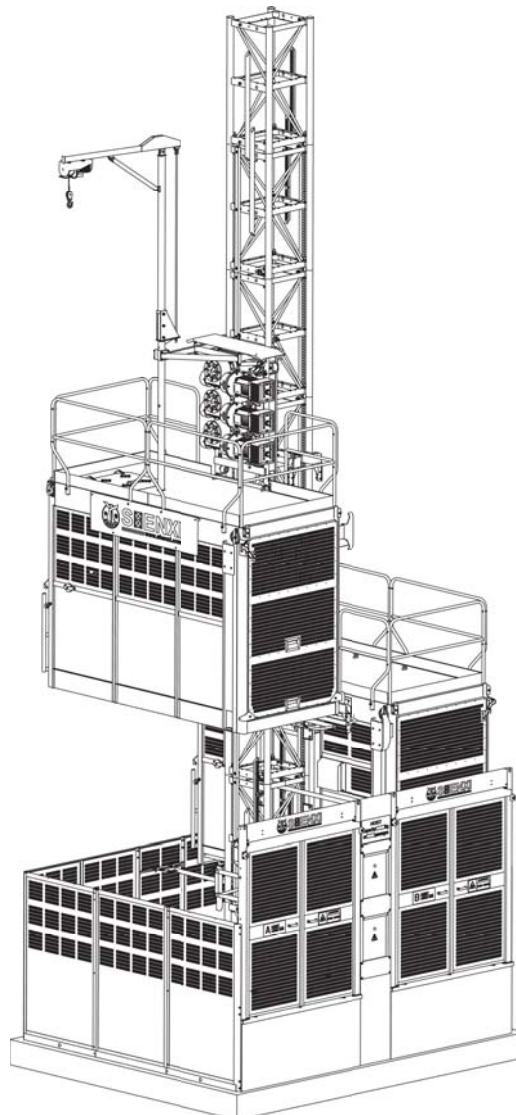
Before construction hoist repair and maintenance, read the detailed contents of “repair and maintenance” carefully and strictly execute.

B.5.2 Safety measures for repair and maintenance

- Cut off the main power when carrying out repair and maintenance on construction hoist equipment, passageway, or surrounding areas.
- Stop the cage stably on buffer spring when repair work is carried out on the cage, drive system or safety device. Lock the cage on the mast if there is counterweight.
- Stop the cage stably on buffer spring and cut off the main power when testing motor brake braking torque.



Overview and Technical Features



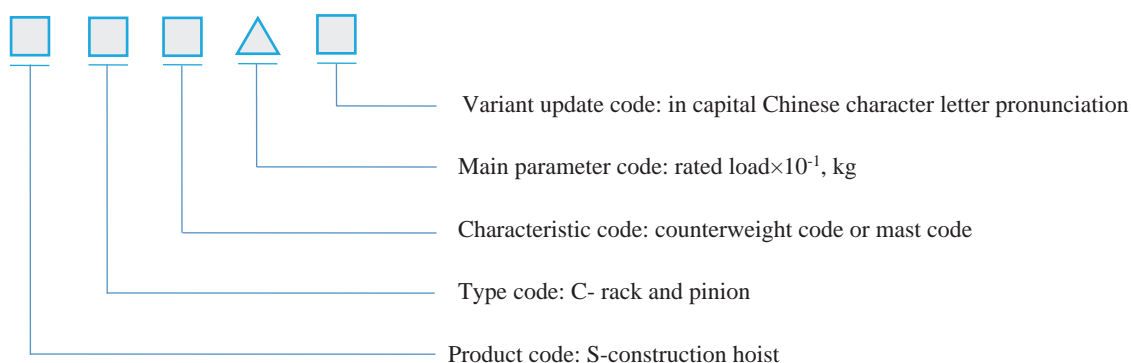
C.1 Overview

SC construction hoist is one kind of construction hoist based on the driving theory of gear wheel and rack, mainly used for person and cargo transport of high-rise building construction, overall working class is A6.

The construction hoist is easy to install and disassemble, and can rise along with the increase of the building. SC construction hoist is safe and efficient vertical transportation equipment for construction for its extremely reliable mechanical and electrical safety system.

The model of construction hoist consists of group, type, features, the main parameters, variant update and other codes.

Items are specified as follows:



Main parameter code: single cage construction hoist only labels one numerical value, double-cage construction hoist labels two numerical values, separate them with symbol “/”, each numerical value divides equally rated load of one cage.

Characteristic code: the code denotes two main characteristics of construction hoist.

a) Counterweight code: D indicates there is counterweight, omit if there is no counterweight;

b) Mast code: Q indicates tilting or curvilinear mast, E indicates mast with two columns; Model designation examples:

SC100 denotes single cage, ordinary construction hoist with rated load of 1000kg;

SC200/200 denotes double-cage, ordinary construction hoist, each cage with rated load of 2000kg;

SC200/200 construction hoist is the latest design of ShenXi Machinery Co., Ltd. It has the characteristics of advanced technology, safe and reliable use, convenient repair and maintenance. And it is the most ideal vertical transportation equipment for modern building construction.

The product is based on computer Creo three-dimensional modeling cad design, compared with traditional construction hoist, it has more advanced and excellent technical performance, more safe and reliable operating mechanism, more strong and compact rigid construction. Meanwhile, it has the characteristics of attractive

appearance, light and handy components, easy disassembly and assembly, good applicability, wide application and etc. The product can be combined into various forms as required by the user, including: standard section and non-standard section; lifting capacity: 1000kg~2000kg; operating speed: 36m/min. It has 0~96m/min stepless speed regulating, automatic floor selecting, leveling and other advantages after installing frequency control function and PLC control program.

Such product possesses the following characteristics:

Safety protection device is complete and reliable, and it is equipped with anti-falling safety device of national patent technique, allowing its operational reliability to rank first among similar products.

Combined design: different combination can form construction hoist specifications of different ground degrees/lifting capacity. Product standard, practicability and generalization degree improve greatly.

Smooth and reliable operation, comfortable seat. The space in the cage becomes large as the product puts drive units on the top of the cage roof, and mechanical vibration becomes smaller, drive is more smooth and steady, and it creates comfortable and spacious working environment for construction personnel.

C.2 Performance parameter table

Table C.1

Serial No.	Project	Unit	Parameters	Remarks
1	Rated load	kg	2×2000	
2	Rated Installation load	kg	2×1000	
3	Rated lifting speed	m/ min	36	Gearbox ratio 1:16
4	Maximum lifting height	m	150	Or design as required by the user
5	Cage space (L×W×H)	m× m× m	3.2×1.5× 2.5	
6	Power voltage	v	380+5% 50Hz or 60Hz	
7	Motor power	kW	2×3×11	JC=25%

8	Rated operational current:	A	2×3×27	
9	Startup total current	A	2×270	
10	Power	kVA	2×3×11	
11	Standard section weight	kg	138.5	650 × 650 (mm)
12	Cage self-weight (including drive system)	kg	2× 2000	
13	Overall self-weight	t	22. 5	H=150m
14	Safety device model	SAJ40-1.2		

C.3 Brief introduction of construction principle

SC200/200 mainly consists of cable collecting basket and cable trolley, the products include: mast, drive system, electrical system, safety device, limiting device, electric control panel, cage, power box, base frame guard rail, cable collecting basket, cable wire-protected frame, mast tie, cable arm rest, hanger rod, cable trolley.

C.3.1 Mast

Mast is the orbit for construction hoist, composed of 1508mm mast section through Grade 8.8 M24×230 high strength bolt connection (pre-tension torque for bolt installation shall not be less than 300N•m). Mast section is made up of welded seamless tube or welded tube, angle steel or cold-formed section steel, steel tube; mast section has rack (1 rack for single-cage mast section, 2 racks for double-cage mast section), 3 inner hexagon screws are used to fasten the rack, and the rack is removable.



Figure C-1 Mast

Spigots are welded on the lower ends of 4 main chords of mast section; there is straight pin on the lower end of rack for accurate positioning when mast section is installed. Mast section main chord center distance dimension is 650×650mm square section. The mast is connected to the building through mast tie.

C.3.2 Drive system

The drive system consists of drive body and drive unit. Drive body is the component that connects transmission gear into integral structure, and passes the driving force from drive unit to the cage to make it run up and down. Grade 8.8 high strength bolts are used to connect drive body and drive unit.

Drive unit is power section for construction hoist operation, the unit is supplied by 3 sets of power source which work at the same time, work together to drive the construction hoist self-weight part and cage load (construction personnel) to run up and down.

Drive unit consists of drive gear, reducer, coupler (quincunx elastic component), motor (with brake).

Reducer is hollow flank worm units, with the characteristics of compact structure, high bearing capacity, high mechanical efficiency, long service life, stable operation and etc.

The coupler is claw type, there are elastic component (polyurethane rubber) between the two couplers to reduce shock and vibration during operation.

The motor is YZEJ 132M-4 lifting disc brake three-phase asynchronous motor, whose brake electromagnet can realize automatic tracking along with the abrasion of brake disc, and braking torque is adjustable.

C.3.3 Electric System

Electrical system is control port for construction hoist operation, and it controls all actions of construction hoist. Electrical system consists of electric control panel, power box, main control cable and various limit switches and etc.

C.3.4 Safety device

SAJ40-1. 2 safety device is the product with national patent technique, adopting flail block engaging-in shock-free, brake band wearing capacity inspection without dismantling the machine and other advanced technologies.

It can make the cage stop stably on the mast when the cage falls down with overspeed by accident, and cut off power supply to ensure personnel and equipment safety.

Safety device excitation speed has been adjusted and sealed before delivery from the factory, the user is strictly prohibited to open the safety device without authorization.

Service life is on the nameplate of safety device, service life is usually not more than one year. Submit the safety device back to manufacturer or testing organization for re-check and calibration after the expiration of service life. Service life of safety device is 5 years.

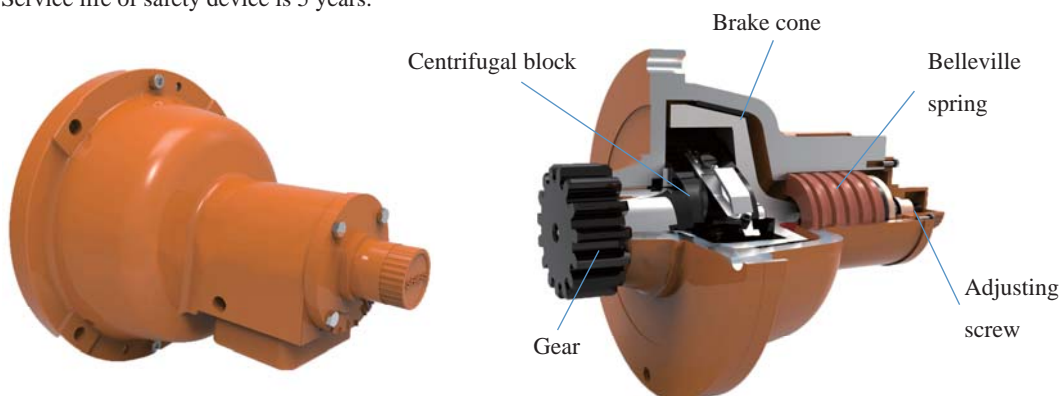


Figure C-2 Safety device

C.3.5 Limiting device

Limiting device includes upper and lower limit switch and proximity limit switch.

Cage upper and lower limit switches ensure that the power will be cut off automatically to make construction hoist stop when the cage runs to the designated upper and lower positions.

Proximity limit switch ensures that main power will be cut off immediately when the cage continues operation after reaching upper and lower limit position as the failure of the limit switch, to stop the cage and ensure the cage moves upward without roof fall, and moves downward without hitting the bottom.

Proximity limit switch is not self-reset type, and it can reset only by manual operation. Frequently check position accuracy between all limiting devices to ensure correct action of the limit and proximity limit switches.

C.3.6 Electric control panel:

Electric control panel is the heart part of construction hoist electrical system, its inner includes upper and lower running contactor, control transformer, overheat protector, phase-failure and phase sequence keep relay and etc. Electric control panel is installed inside the cage.

C.3.7 Cage:

Cage is of steel structure, and operates along the mast under the force of roller, with entrance and exit doors. Cage entrance and exit doors are of vertical drawing doors.

Dodge door is on the top of cage, you can easily climb to the cage top for installation and maintenance through special ladder, and cage top can be served as working platform during installation and disassembly and is surrounded by cage top guard rail.

There is electrical interlocking device on the cage, and the cage will stop running when cage door is open to ensure personnel safety in the cage.

There are 14 guide rollers running along the mast on the cage.

C.3.8 Power box:

Power box is power supply place for construction hoist control part, and is on base frame guard rail.

C.3.9 Base frame guard rail:

Base frame guard rail mainly consists of base frame, guard rail, guard rail door, and electricity box frame four

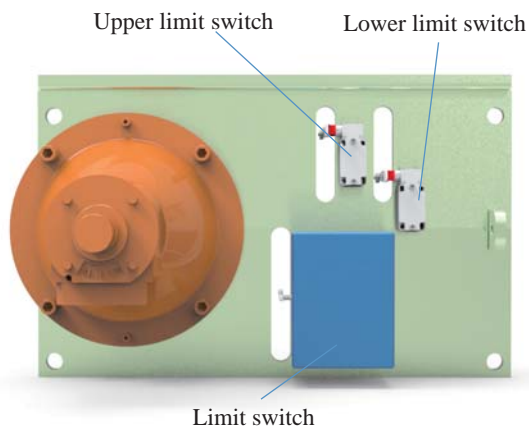


Figure C-3 Limiting device

parts.

The base frame is welded by bending plate and steel plate, and its periphery is connected with ground guard rail, the middle part is mast base. It can bear all loads from construction hoist. The base frame is fastened through bolt foundation frame during installation.

Guard rail: welded by bending plate, punching folded plate and steel plate, enclose the main part of construction hoist to form a closed region to make the personnel unable to enter the region during the operation of construction hoist. Guard rail door is on the entrance of base frame guard rail, and electromechanical interlocking device is available on the gate.

Guard rail door: welded by bending plate, profiles and punched plate. Guard rail door is the safety door for going in and out of the hoist, and door locking device is available. Threshold heights of cable collecting basket and cable trolley hoist are 480mm and 850mm.

Electricity box frame: welded by bending plate and steel plate; fit the power cabinet and support guard rail door.

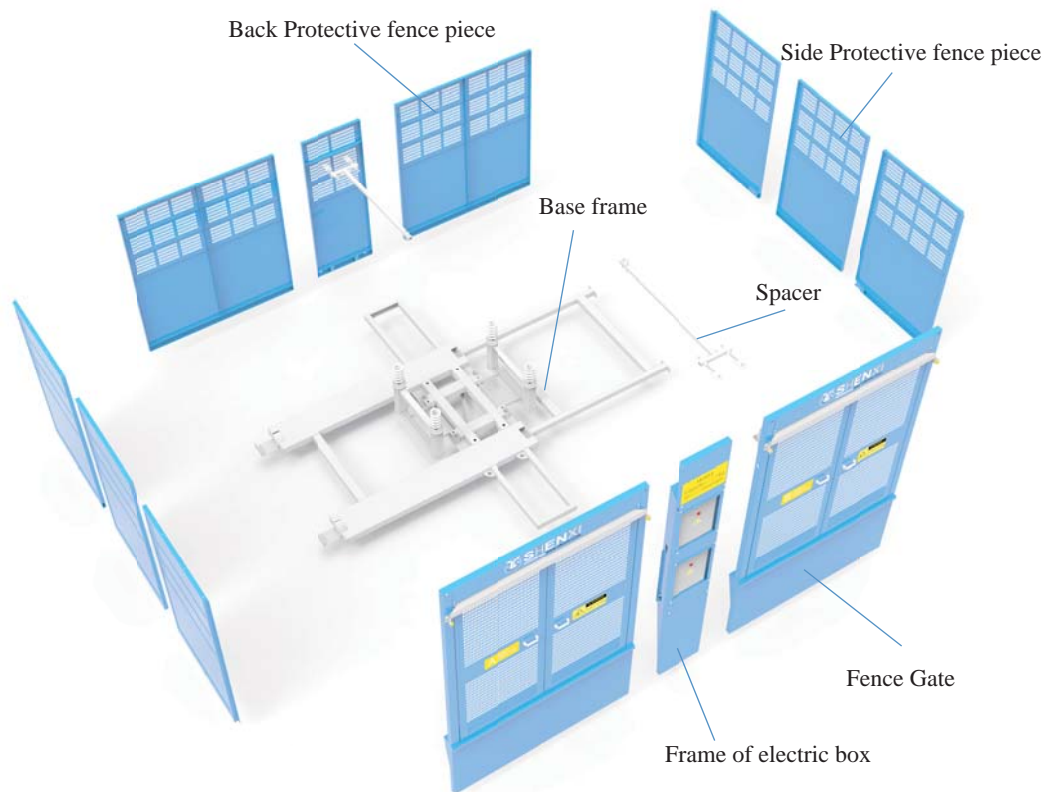


Figure C-4 Base frame guard rail

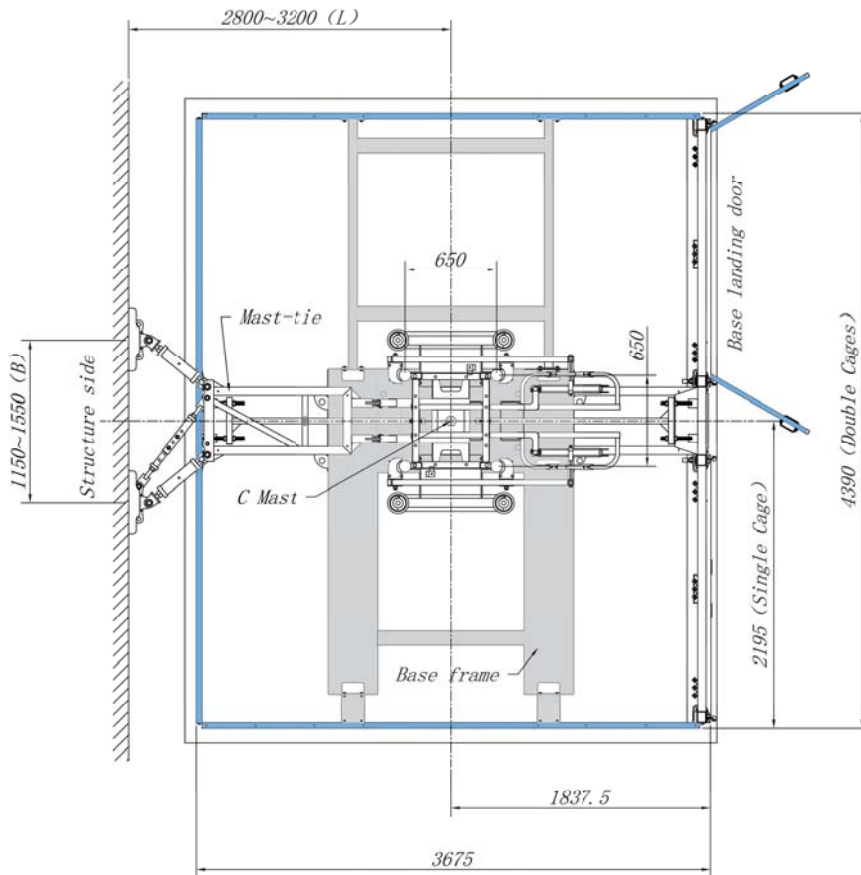


Figure C-5 Top view of base frame guard rail (unit: mm)

C.3.10 Cable collecting basket:

Cable collecting basket is the part used to collect and release cable. As greatly influenced by wind force, it is usually installed in the area with a height less than 100m or with small wind force.

The cage drives the main cable in cable collecting basket to move upward when the cage runs upward. The main cable will be gradually collected into cable collecting basket when the cage runs downward to prevent it scattering on the ground and causing danger.

C.3.11 Cable-protected frame:

Cable-protected frame is used to ensure the safe operation of cable, and ensure the cable is in the retainer of cable-protected frame during elevator operation to prevent the cable intertwining with other equipments around and causing danger during the cage operation.

Make sure cable arm rest and cable can succeed in passing through the retainer of cable-protected frame during cable-protected frame installation.

C.3.12 Mast tie:

Mast tie is the part used to connect mast and building to maintain stability of construction hoist mast and the whole structure.


C.3.13 Cable arm rest:

Cable arm rest is the device used to drag main cable to run downward and upward; main cable is dragged by cable arm rest to pass through the cable retainer safely and to prevent the cable being scratched and causing accident. Cable collecting basket type cable arm rest can pick the main cable out of base frame guard rail to make main cable be collected into cable collecting basket safely.

C.3.14 Hanger rod:

Hanger rod is indispensable part for construction hoist self-help section adding and self-help disassembly.

After the completion of construction hoist fundamental part installation, the mast section on the top of cage can be lifted by hanger rod to the top of mast installed to carry out section adding operation. The mast section can be removed from top to bottom by hanger rod during disassembly.

	<ol style="list-style-type: none">1. Hanger rod rated load is 300kg, overloading operation is prohibited;2. It is forbidden to hang heavy things on hanger rod during hoist operation.3. Take down hanger rod from the top of cage after the completion of hoist installation and disassembly.
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C.3.15 Cable trolley:

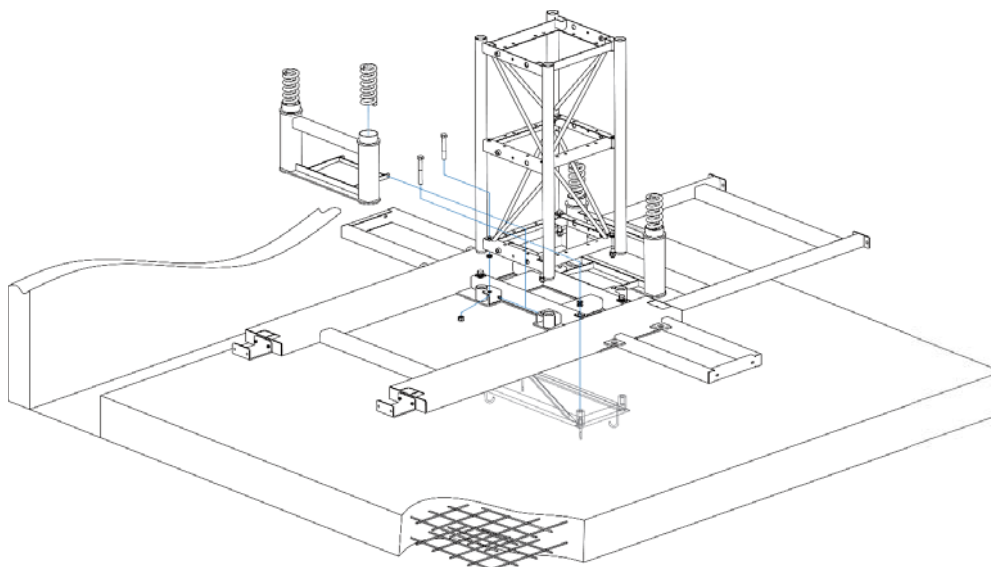
Cable trolley can be used when installation height of construction hoist is a little higher, and is greatly influenced by supply voltage, wind force and its own gravity. Cable trolley can be installed on the lower part of cage, structure is simple and installation is easy. Construction hoist mast is not only the orbit of cage but also the orbit of cable trolley. As wind force has small impact on it, it can be widely used in different occasions. The existing cable trolley is of combined type, and its right and left cages are interchangeable.



Figure C-6 Cable trolley



Foundation Setting



Before using construction hoist, users shall conduct the load calculation and basic setting for the foundation of construction hoist in accordance with the regulation that “foundation of construction hoist shall carry all loads under the most unfavorable working conditions” in 5.1.10 of *Construction Hoist (GB/T10054 —2005)*.

D.1 P Calculation on Bearing Capacity of Foundation

$$P=n \cdot G$$

Where, P: foundation bearing capacity (N)

n: safety factor n=2 after considering the influence from dynamic load, wind load and dead weight error upon the foundation.

G = dead weight of cage (including driving system) + rated load of cage + dead weight of base frame guard rail + dead weight of mast + weight of attachment + weight of mast tie + dead weight of counter weight (kg)

Converted into gravity: $9.8 \cdot G$ (N), namely,

$$P=0.02 \cdot G \text{ (kN)}$$

Calculation example:

For example, erection height of SC200/200 construction hoist, IIS mast tie;

Dead weight of cage (including driving system)

Rated load of cage:

Dead weight of base frame guard rail:

Dead weight of mast:

Weight of attachment including power cable, cable guiding device and fasteners is 2000 kg.


Weight of IIS mast tie is about $108 \times 16 = 1728 \text{kg}$

Dead weight of counter weight: 0 kg (none)

So:

Conclusion: The maximum load of concrete foundation is 538kN;

If area set according to Figure D-1 is 17.48 m², maximum load of concrete foundation is $537.56 / 17.48 \approx 0.031$ MPa.

	Foundation of hoist and ground under the foundation must meet:
	When height of mast is $\leq 100\text{m}$, bearing capacity is $\geq 0.10\text{MPa}$;
	When height of mast is $> 100\text{m}$ but $\leq 300\text{m}$, bearing capacity is $\geq 0.15\text{MPa}$;
	When height of mast is $> 300\text{m}$ but $\leq 450\text{m}$ bearing capacity is $\geq 0.2\text{MPa}$;

D.2 Model Selection of Concrete Foundation

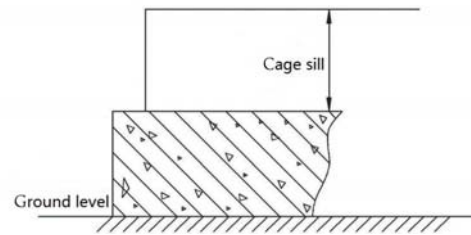
Setting of concrete foundation has the following choices:

Plan 1:

Concrete foundation is set on the ground.

Advantage: No drainage

Disadvantage: Higher door sill



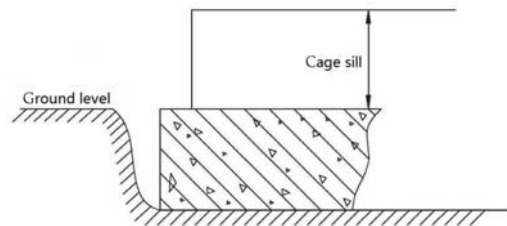
Plan 1

Plan 2:

Concrete foundation is level with the ground.

Advantage: Simple drainage

Disadvantage: With door sill, but only need a plank to build a simple ramp.



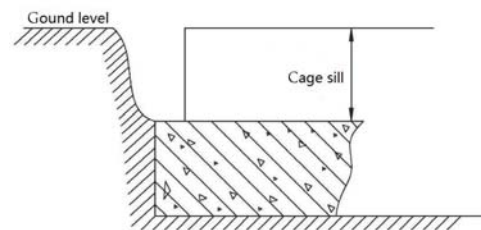
Plan 2

Plan 3:

Concrete is under the ground.

Advantage: Ground and cage have no door sill.


Disadvantage: It is easily to store water, so it is necessary to



Plan 3

take strict drainage measures to prevent corroding the foundation.

When selecting setting scheme of foundation, users can make comprehensive decision according to the actual situation of construction site.

	<p>1. Height of door sill shall change with the cable guiding device, with height of cable collecting basket of 480mm and cable trolley of 850mm.</p>
	<p>2. The foundation is made by users themselves, and shall be completed one week before installation of hoist.</p>

D.3 Concrete Foundation of Mast Tie

In order to facilitate convey and loading and unloading, concrete foundation as shown in the figure shall be set (apply to IIS mast tie, without driving cab).

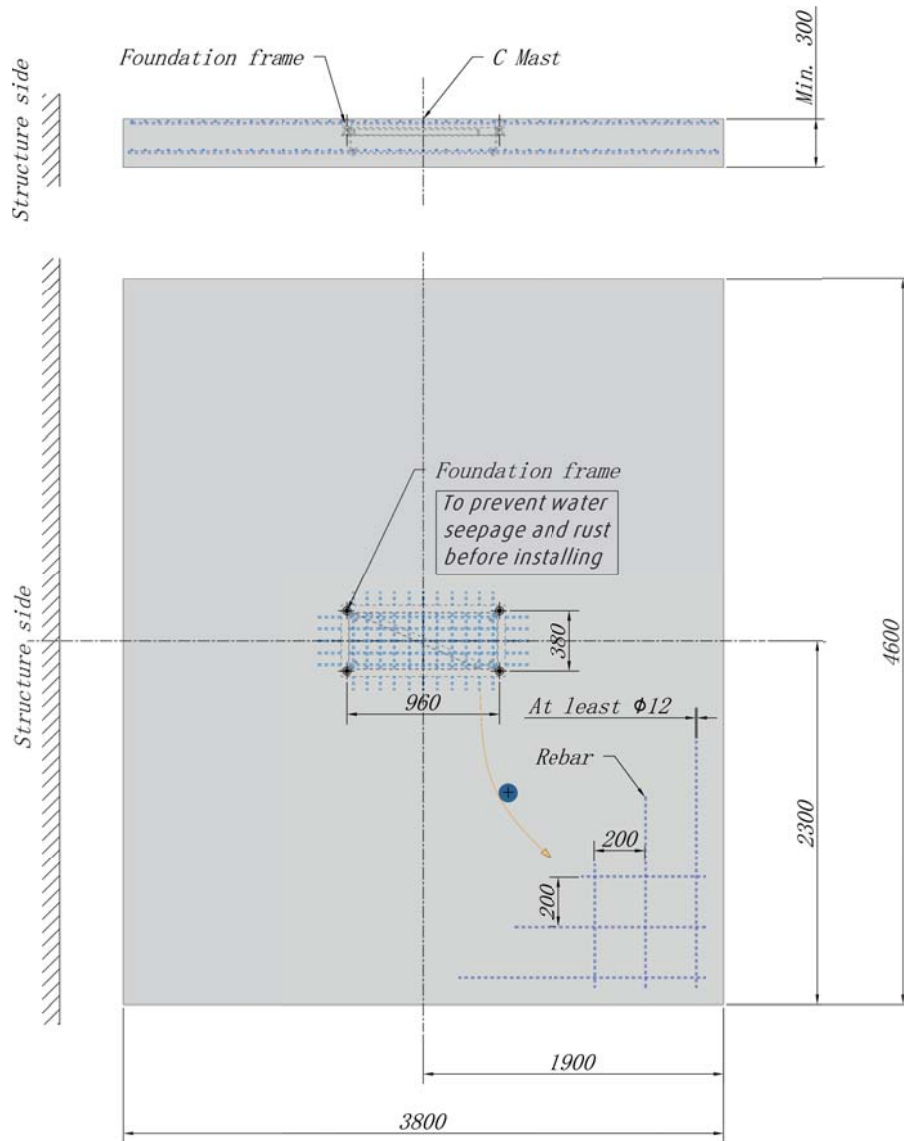


Figure D-1 Diagram of reinforced concrete foundation

Model	Specification of cage	Distance of foundation from wall L (mm)
SC200	3.2×1.5m	IIs mast tie: 2800-3200
SC200/200		

D.4 Notes in making concrete foundation

a) Soil bearing capacity of concrete foundation shall meet:

When height of mast is $\leq 100\text{m}$, bearing capacity is $\geq 0.10\text{MPa}$;

When height of mast is $> 100\text{m}$ but $\leq 300\text{m}$, bearing capacity is $\geq 0.15\text{MPa}$;

If failing to meet such requirements, foundation shall be reinforced.

b) Drainage ditch shall be set nearby the concrete foundation according to the condition of construction site.

c) Embedded base (base bolt hook) of concrete foundation shall be connected with steel mesh sheet.

d) When placing concrete, bolt hole of embedded frame shall be covered with plank or protected by inserting plastic plug or other fillers to prevent concrete from entering the bolt hole, and its end face is 1mm higher than concrete surface.

e) Making of concrete foundation is implemented in accordance with Construction and Acceptance Specification of Reinforced Concrete Works (GBJ204).

- Rebar inside the concrete foundation shall not be less than 12mm, and gridding 200mm, Texture of material:

HPB235 or HRB335

- Grade of concrete to be placed shall be more than C30.

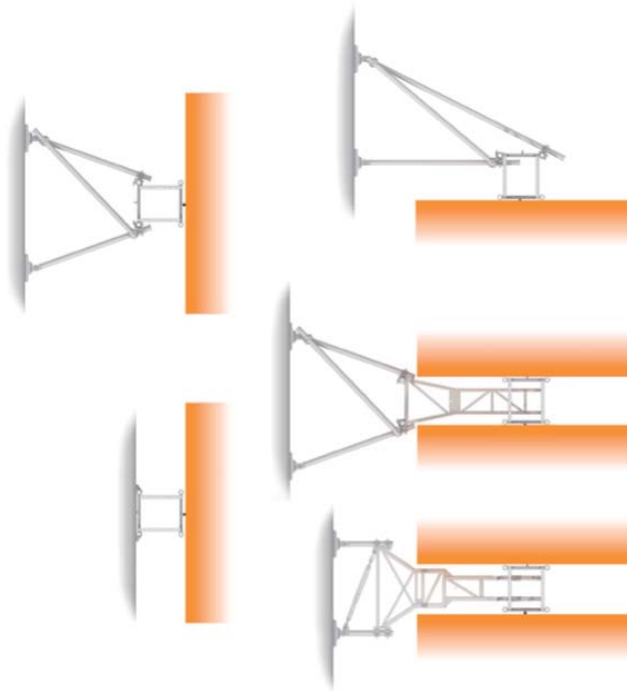
- Construction technology strength of concrete foundation shall comply with *Construction and Acceptance*

Specification of Reinforced Concrete Works (GBJ204) and installation requirements of construction hoist.

f) User's making of above concrete foundation is not completely applied, so it shall see the relevant specifications and standards of the country and region where users live.



Mast and Mast Tie



E.1 Configuration of Mast

Installation height of hoist is different, and configuration of mast section is also different. Thickness of steel tube of mast section changes with the increase of installation height, so it is necessary to install conversion section between mast sections with different thickness of steel tube.

Example of selecting specification of mast section:

When installation height of mast is 380m, see “configuration diagram of thickness of steel tube of E-1 mast section”:

$\Phi 76 \times 6.3$, installation height is 120m, namely, 80 sections (including 1 conversion section)



If installation height of mast is more than 380m, configuration of thickness of steel tube of mast section shall be subject to the installation scheme provided by our company.

Configuration diagram of thickness of steel tube of mast section

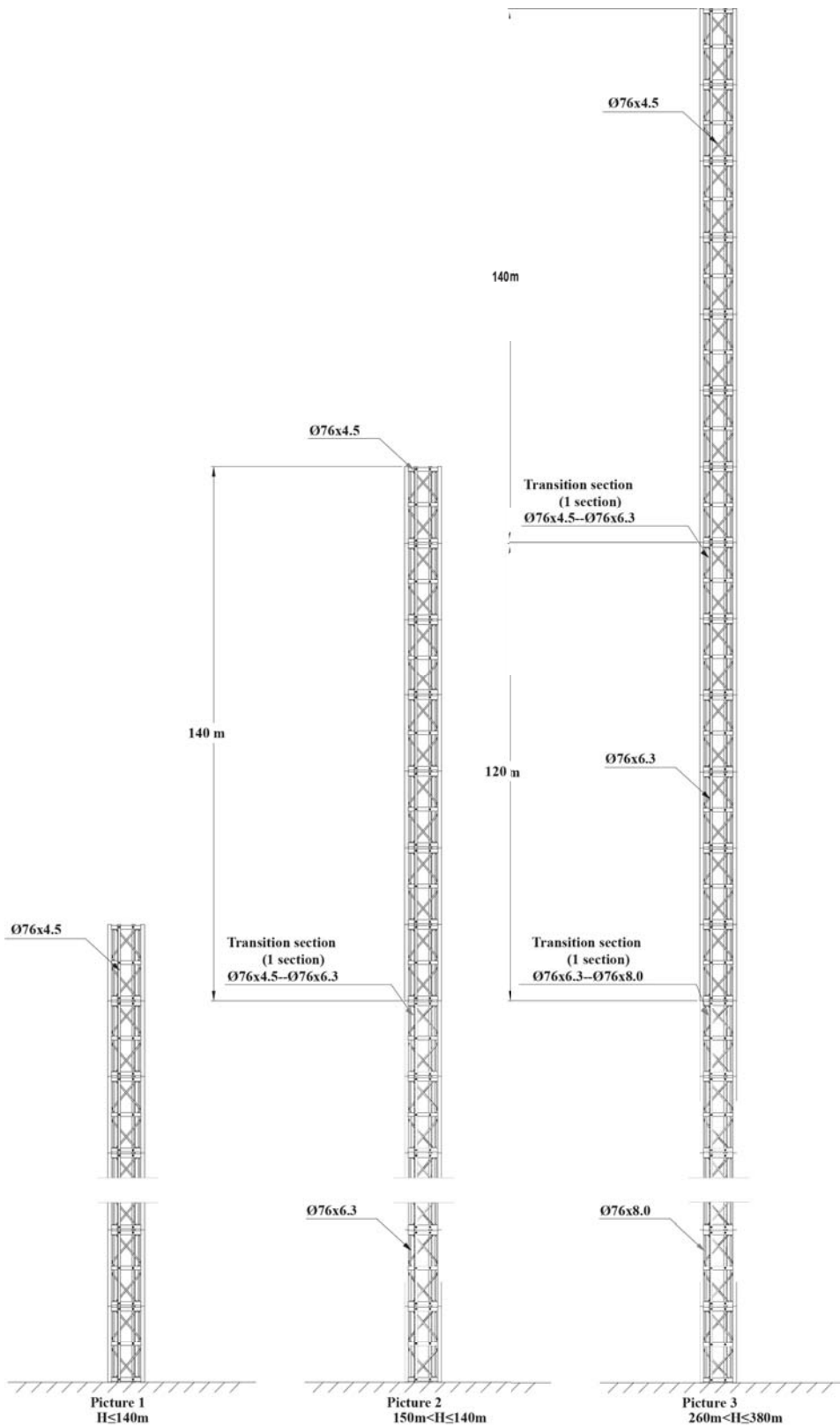


Figure E-1 Configuration diagram of thickness of steel tube of mast section

Notes: H is installation height of mast

E.2 Type and Selection of Mast Tie

In order to meet the actual demand of users for site operation of construction hoist, our company's construction hoist provides its mast tie. If there is special structure, please consult our company.

Its mast tie: it can be used for the construction hoist with or without counter weight, with or without driving cab, with single cage or double cages.

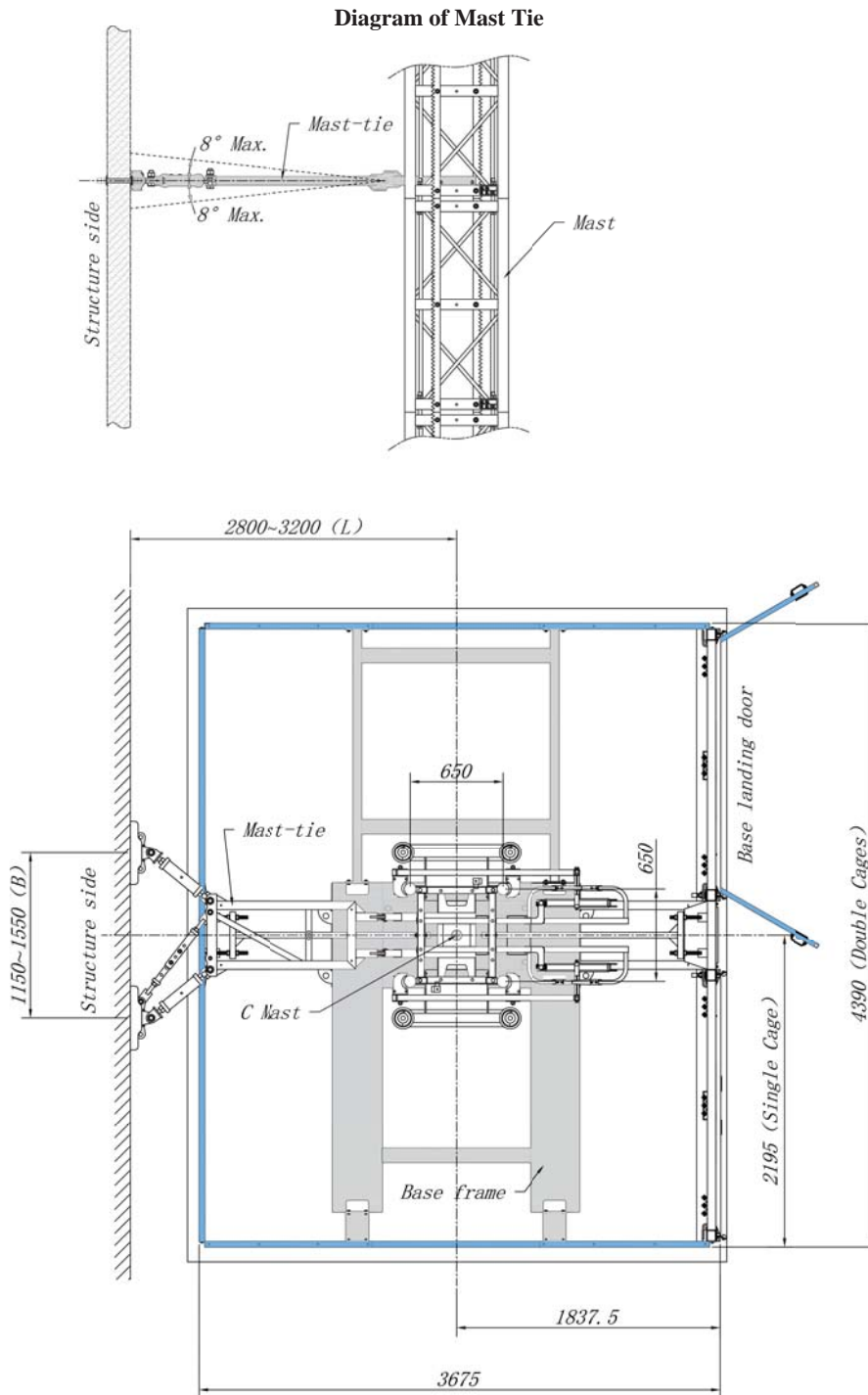
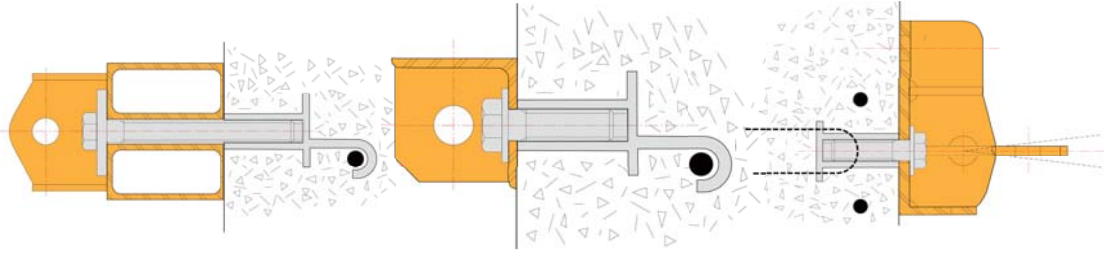


Figure E-2 Installation diagram of mast section

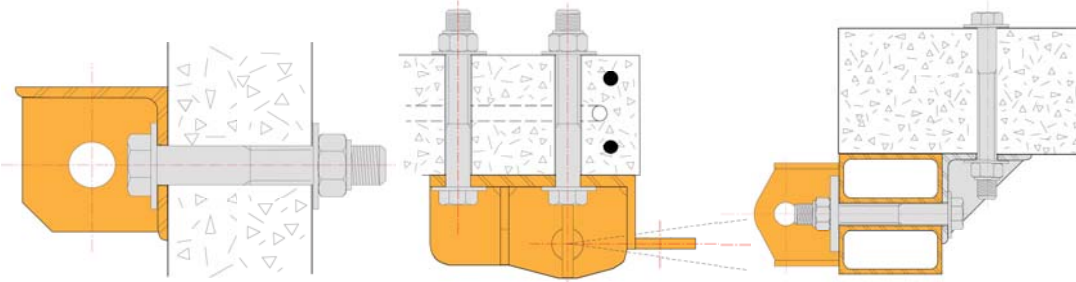
E.3 Connection of Mast Tie and Wall

a) Connection with built-in fitting on the wall



E-3

b) Connection with through-wall bolt



E-4



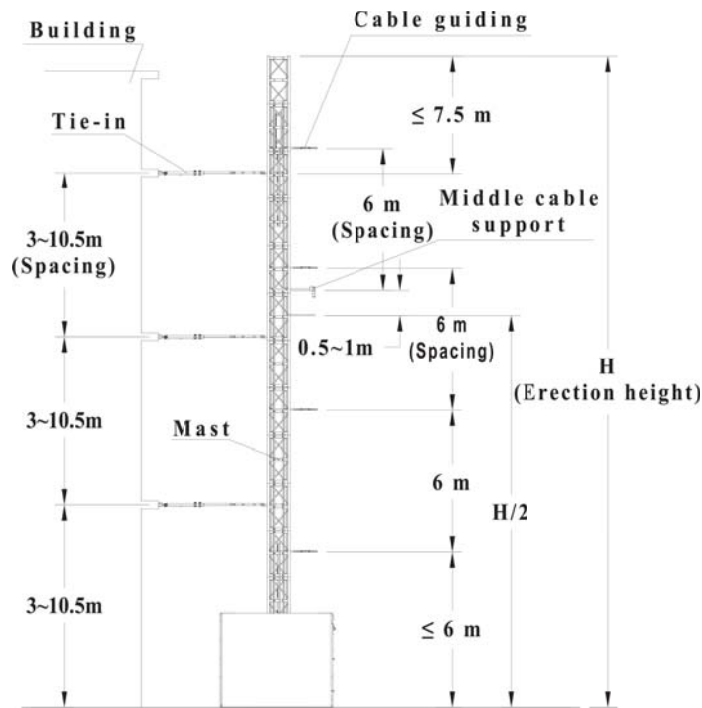
1. Users select the connection mode of mast tie and wall according to the demand.

The strength of their self-provided connecting bolt and parts can carry the force F calculated by the formula in E.5 (select M24 bolt with strength grade of 8.8);

2. It is not allowed to use expansion bolt when connecting mast tie and wall;


3. If the field installation has special situation, please contact our company.

E.4 Maximum Installation Spacing and Maximum Cantilever Height of Mast Tie



E-5 Erection diagram of mast tie

1. Maximum distance of 1# mast tie is 10.5m
2. When installation height of mast tie is more than 150 m, it is inappropriate to use III mast tie.
3. Installation spacing of cable collecting basket type of mast tie is same with that of cable trolley type of mast tie.

	1. Maximum distance of mast tie is 9 m.
	2. When installation height of mast tie is more than 150 m, IIs mast tie shall be strengthened;
	3. Installation spacing of cable collecting basket type of mast tie is same with that of cable trolley type of mast tie.

E.5 Calculation of Acting Force F of Mast Tie Applying to Wall Space

When conducting the setting of construction hoist according to the maximum adhesion spacing L1 of mast tie, maximum cantilever height of mast, L and B value of various mast tie, determine the acting force of mast tie applying to built-in fitting and bolt in order to install built-in fitting and bolt (select M24 bolt with strength grade of 8.8). Conduct force application test of wall or beam, pillar of the adhesion point of the building to make sure that their adhesion is safe and reliable.

Acting fore F can be calculating according to the following formula:

$$F=L \times 60 / B \times 2.05(\text{KN})$$

E.g.:

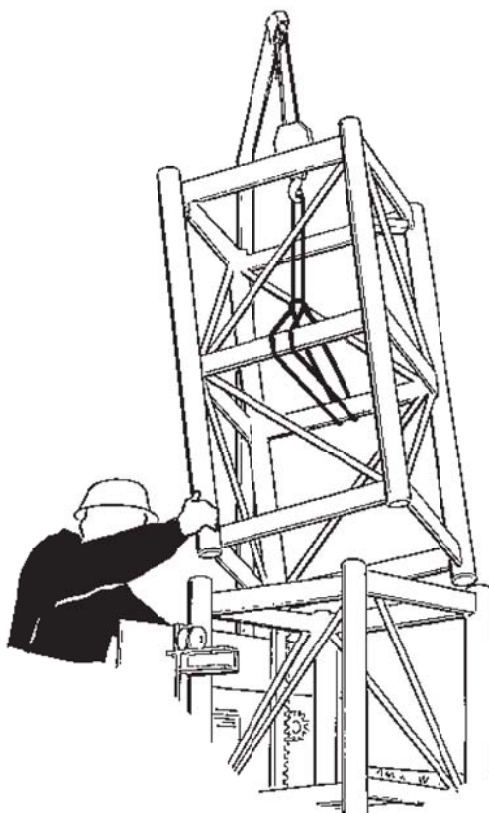
Its mast tie

Mast tie spacing B=1500, mast tie distance L=3200,

$$F=3200 \times 60 / 1500 \times 2.05 = 62.44 \text{KN}$$



Installation and Commissioning



Prior to installation, you should learn more about the related content in the operation manual of this machine, installation personnel must be trained and have the relevant operating license of installation.

F.1 Installation Procedure

- a) Fabrication of foundation (see the Foundation Setting of Chapter D for the specific method);
- b) Preparation before installation;
- c) Safety training prior to installation;
- d) Installation of the base frame, buffer spring and 4 mast sections below;
- e) Installation of guard rails of base frame;
- f) Installation of the cage, drive system, guard rails on top of the cage and the jib;
- g) Increasing the height of the mast to 15m (install a set of mast tie at the same time);
- h) Installation of the electrical control system and the overload protector;
- i) Installation of the limit cam at the bottom of the mast and commissioning of power-driven hoist;
- j) The machine commissioning;
- k) Drop test;
- l) Increasing the height of the mast (install the mast tie at the same time) and installation of the limit cam on the top of the mast;
- m) Installation of crinoline;
- n) Installation of the floor calling system.

F.2 Preparation before Installation

To ensure rapid and safe operation in the whole process of hoist installation, users must make the following preparations before installing:

- a) Ensure that the construction and installation location for the selected hoist meets relevant safety standards and requirements provided in specifications, and has been tested by relevant organizations and obtained test qualified license;
- b) Ensure that the construction and installation site for the hoist can be equipped with power supply, lighting, lifting equipment and other necessary tools; roads and venues have a range required for transportation, circulation, park of each component of the construction hoist;
- c) Users should adopt the foundation frame of mast ties and related standard parts provided by the company;
- d) Before installation, users should check that there are no defects caused by damages such as collisions and deformations occurred in storage and transport; otherwise, they shall be completed, repaired or replaced;
- e) A protective earthing device shall be set in accordance with relevant regulations and requirements, and the earth resistance is $\leq 4\Omega$;
- f) The distance between the on-site power supply box and the power supply box on the guard rail of the base frame of the construction hoist shall be as short as possible, which generally should not exceed 20m, each cage is equipped with a copper cable (length ≥ 25 sectional area=mm²) for connection, if the distance is too long, the sectional area of the cable shall be increased so as to ensure quality of power supply;



The voltage of power supply shall be controlled within the range of 380V \pm 5% when using the construction hoist.

- g) For the construction hoist which has been used repeatedly, according to relevant provisions in Chapter I Maintenance, it shall be transferred to another place for maintenance prior to using again so as to ensure good performance components will be installed. Namely: perform a comprehensive inspection for all structural parts for deformation and damages etc.: parts and components needing repair and replacement shall be repaired and replaced.
- h) 2~3 sets of ties and crinoline shall be prepared prior to installation. Various connectors and standards parts used

for ties shall be prepared completely;

i) The installation personnel can pre-assemble 4-6 masts(mast sections) with M24×230 special bolts on the ground when the site is equipped with other lifting devices (such as tower crane, truck crane, etc.) to assist the installation, and clear dirt and other debris on pipe ports and both ends of the rack and apply grease on the pipe ports;

j) Necessary auxiliary equipments: a 5t and above truck crane (available on-site tower crane), a theodolite;

k) Parts and components supplied by users themselves:

- Hoist foundation fabricated in accordance with requirements and some 2 ~ 12mm thick steel pads used to pad into the base frame to adjust the perpendicularity of the mast;

- A dedicated power box equipped as required and a cable used to connect the power box and the power box on the guard rail of the base frame of the hoist, specific requirements for the cable are as described in f);

- In addition to randomly supplied special tools, users need to prepare a set of installation tools.

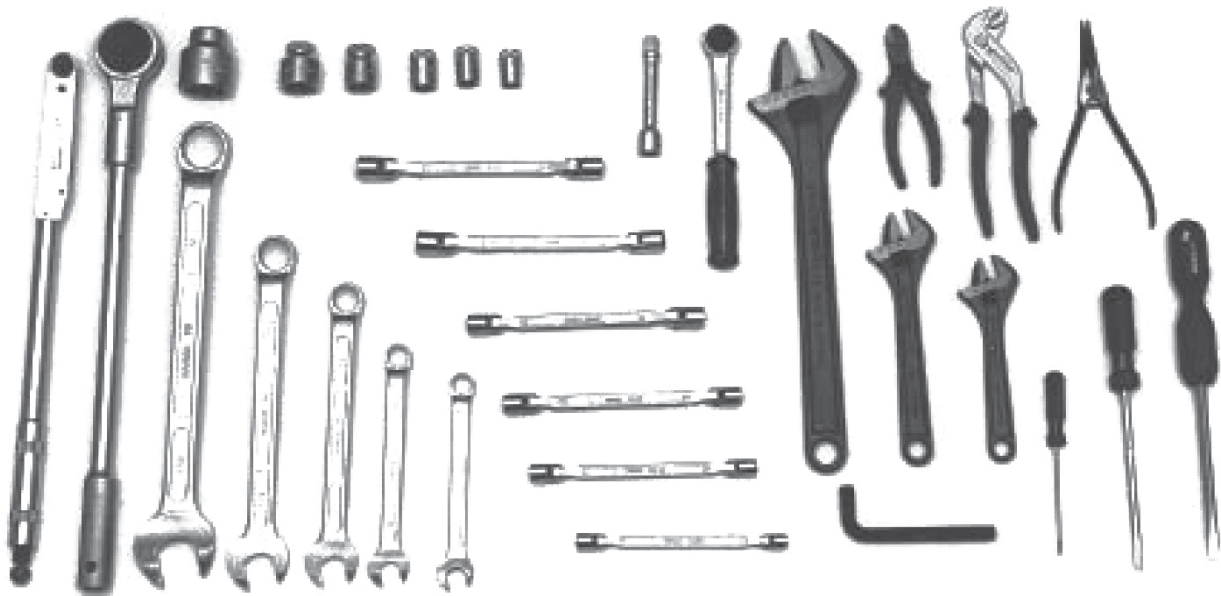


Figure F-1

Note: the tools are prepared by users themselves.

F.3 Installation

F.3.1 Precautions prior to installation

- a) People entering the site must comply with the Ten Safety Production Disciplines;
- b) The construction site shall be set with a safety warning area, and send special assigned person to supervise;
- c) The installation and operation personnel are not allowed to wear hard-soled shoes and high heels shoes; tight fitting, flexible and convenient clothes are preferred: safety belts shall be worn;

d) Personnel performing high-altitude operations including installation and disassembly of masts (mast sections) and other vacant jobs, they must, in their respective job positions, look for safe and proper positions to fasten their safety belts and hang their safety hooks properly;

e) Defective bolts, axle pins, cotter pins and other fasteners are strictly prohibited during the installation process of the construction hoist; scrapped ropes, riggings, lifting gears shall not be used;

f) Prior to installation, entire contents in Chapter B.2 “Safety Requirements for Installation and Disassembly”. Comprehensive understanding of the mechanical and electrical properties of each part and component of the construction hoist;

g) Without permission, the hoist electrical circuit shall not be replaced;

h) Before installation, rusts and burrs on the ports, pin holes, screw holes and other joints of mast sections and mast ties etc. to be installed must be removed, and apply appropriate grease on these positions and racks. To ensure adequate lubrication and flexible rotation of rolling parts;

i) Installation and disassembly of construction hoist must not be performed in severe weathers of wind speed exceeding 12.5m /s or thunderstorm and snow;

j) It is strictly prohibited to install at night or after drinking;

k) Heads and hands of personnel are strictly prohibited to put out the guard rails at the top of the cage, the installation personnel and goods are prohibited to rely on the guard rails during operation of the hoist;

l) It is prohibited to start the hoist when someone is working at the mast or the mast tie;

m) When installing the hoist, you must bring the control box to the top of the cage, and operation inside the cage is prohibited;

n) The hoist must be loaded according to the rated erection load and operation with overload is not permitted during erection operation;

o) It is not permitted to overload when using the jib to install. The jib can only be used to install and remove parts and components of the hoist, but not for other purposes. Weights are strictly prohibited to hang on the jib when the hoist is running;

p) Do not forget to tighten the coupling bolts for the mast sections and mast ties;

q) The concrete foundation must go through the specified strengthening solidification period.

F.3.2 Installation of the base frame, several mast sections below and guard rails of the base frame

a) Clean the foundation surface;

b) Transport the chassis to the installation location, determine the installation location and direction and level chassis plane (use a horizontal rule for leveling), connect the chassis on the foundation frame with M24×180 high strength bolts without tightening;



Figure F-2



Figure F-3

c) Install the first mast section (usually without rack, clean the pipe joints at both ends of the mast section and rock pins before installation, and apply a small amount of grease; note the direction of the rack when installing);

d) Install 3-4 mast sections with the same method, insert steel pads evenly into the position between the foundation base frame and the concrete foundation to adjust the levelness of foundation base frame (corrected by a horizontal instrument), measure and adjust perpendicularity of the mast with a theodolite, gradienter or plumb bob to ensure that perpendicularities of each vertical pipe on two adjacent directions are not greater than 1/500, use a 600N • m pretensioning force to tighten coupling bolts between chassis and the foundation frame after being tested;

e) Connect the main base frame and the sub-base frame with M16 bolts; pad the sub-base frame with steel shims with the same method;

f) Place the buffer spring on the buffer spring seat;

g) Connect the base frame, rear guard rail, side guard rail, door of guard rail and electric box frame to the main base frame and sub-base frame with M8 bolts respectively, which will not be tightened temporarily;

h) Install the support for the electric box and the support for the rear guard rail, adjust the perpendicularity of the door of guard rail on two adjacent directions to be not greater than 1/1000; adjust the perpendicularities of the rear guard rail and side guard rail and tighten all coupling bolts; install the lock for the door of guard rail;

i) Install the limit cam of the cage door and the lock for door of guard rail, and adjust the distance between the door lock and the door of guard rail that the door lock can lock the door of guard rail;

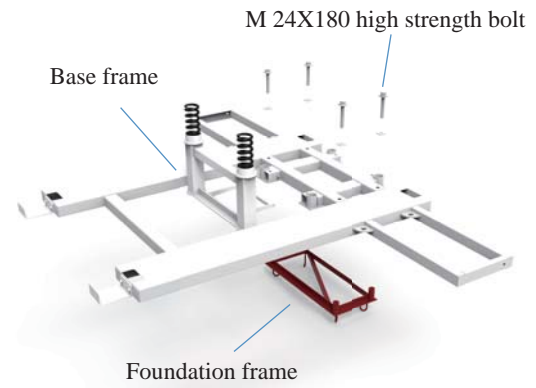


Figure F-4

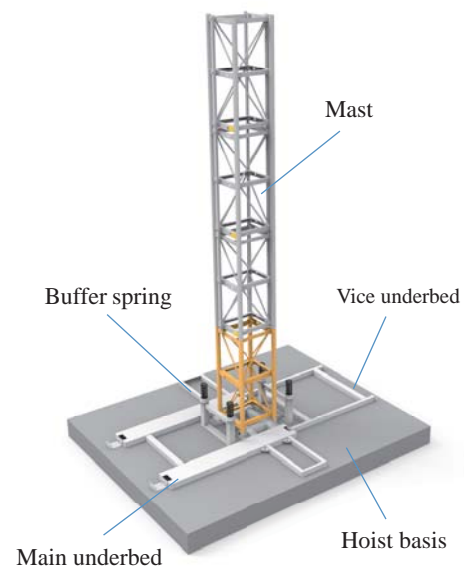


Figure F-5

j) Install the power box on the frame of electric box.

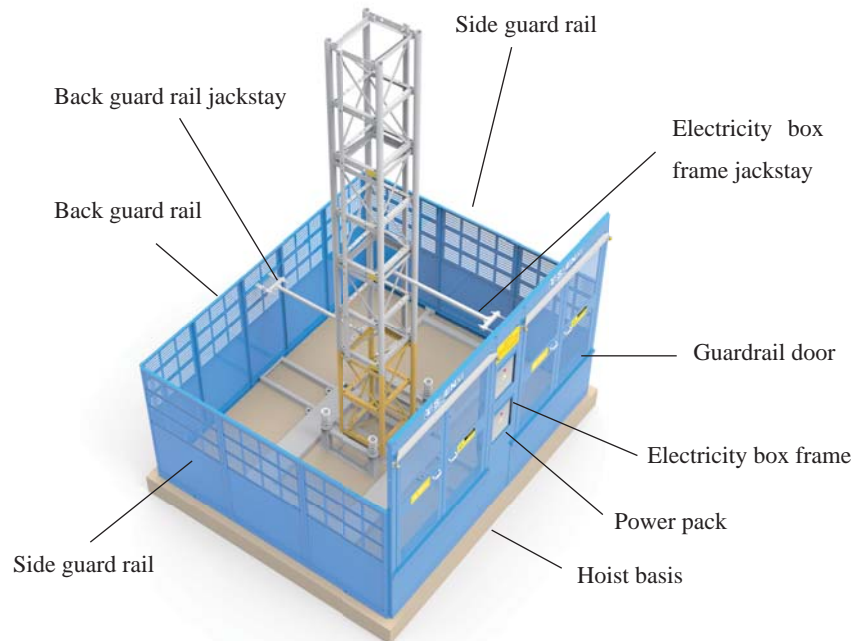


Figure F-6

F.3.3 Installation of cage, drive system guard rail on the top of cage and jib

a) Place a sleeper or other steel on the base frame of guard rail (whose height is greater than the height of buffer spring);

b) An installation personnel stands on the top of the mast to direct and guide the alignment of the cage and the drive system, use a lifting equipment (truck crane or tower crane) to make the cage slowly park on the prepared sleeper or steel from the top of the mast, lift the other cage with the same method;

c) Loosen the three brakes for motor on the drive system, the method is to: Tighten the two nuts on the brake (be sure to make the two nuts on the brake screw in parallel) until the brake is released and the brake disc can be moved freely; use a lifting equipment to make the drive system slowly down from the top of the cage, loose nuts on three motors of the drive system to make it reset when the distance of the connecting lug on the drive system between the connecting lug of the cage is 400mm, lift the other drive system in place in the same way;

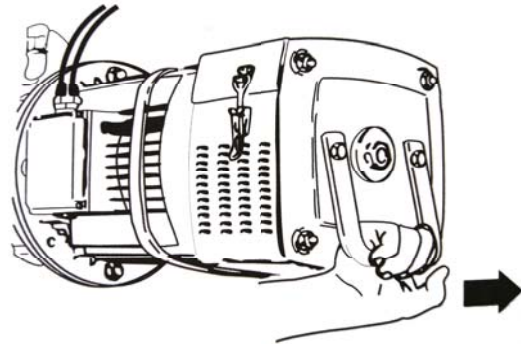


Figure F-7

d) Insert the long guard rail, short guard rail and guard rails on both ends on the top of the cage into corresponding faucet pipes and fasten the guard rails with bolts tightly, note that the ends of guard rails with baffle plates shall be installed inside the cage when installing the guard rails;

e) Assemble the jib on the ground and lift it in place and insert it into the jib hole by lifting equipment; axis of shaft of the jib attached shall be flexible;

f) Installation of the cable boom;



Figure F-8

F.3.4 Heighten the mast to 10.5m, then heighten the mast tie to 15m after attachment of it

Connect and assemble three mast sections with bolts with tightening torques of 300N·m on the ground and lift it on the mast sections assembled with a lifting tool, connect them with butt bolts with tightening torques of 300N·m. After heightening the mast to 10.5m, the first mast tie is needed to setup 9m above the ground (installation of the mast tie shall be performed according to the requirements described in section F.6), and check the perpendicularity of the whole mast with a theodolite, or other detecting equipments in two perpendicular directions, error of perpendicularity of the mast shall be not greater than 5mm, then continue to heighten it to 15m.



Installation of mast is as shown in Figure E-1 Configuration Diagram of Primary Hanging Pipes of Mast Sections when the installation height is higher and the wall thicknesses of primary hanging pipes of mast sections are of different sizes.

F.4 Installation of Electrical Equipment, Control System and Overload Protector

F.4.1 Installation of electrical equipment and control system

a) Installation method of the power supply cable for the construction hoist relates to the type of the crinoline used, which is conventionally divided into two types, including cable reel type and cable tackle type, wherein the cable tackle type is divided into power supply by one cable and power supply by two cables;

b) Use the site owned cable (length \geq 25 sectional area=mm²) to connect the power supply box and the power box on the guard rail of the base frame, connect one end of the cable to the power box on the guard rail of the base frame, and connect the other end of the cable to the terminal block of the cage via the cable boom;

- For cable reel, put the cable into the cable reel directly as per the installation method of crinoline.
- For cable tackle, it will be divided into the following two situations:

1. Perform the above steps if power is supplied for one cable;

2, Perform the above steps using the traveling cable if power is supplied for two cables with different cross-sectional sizes, (wherein the cable with larger cross-section fixed at the mast is called fixed cable, and the other one with smaller cross-section is called traveling cable which is traveled with the cable tackle).

c) connect cable of motor of the drive system to the corresponding position of the electric box in the cage, insert the operation box (7-core aviation plug) on the top of the cage into the corresponding position of the electric box (the plug can not be removed during normal operation);

d) turn on the power switch of the power box on the guard rail of the base frame, close the doors of guard rail and the roof window and operate on the top of the cage, turn the change-over switch of the operation box on the top of the cage to the top cage position, jog the operation box to check whether the phase sequence of power supplied is correct (when jogging the UP button, the drive system rises which indicates that the access phase sequence is correct; otherwise, it indicates that the sequence is reversed, if the phase sequence is reversed, the wiring positions must be interchanged);

f) Install the limit switch on the guard rail of the base frame;

g) Check various safety control switches: including the limit switch of the cage door, limit switch of the roof window door, upper and lower limit switches, final limit switches, limit switch for door of guard rail of base frame and rope protection switch, which can act sensitively, open and close freely;

h) Use a ground resistance tester to measure grounding resistances of the steel structure of the construction hoist and metal cases of electrical equipments, which must not be greater than 4Ω ;

Measure the insulation resistances to ground of motors and electrical components with a 500V megger, which shall not be less than $1M\Omega$.



The power supply must be cut off for all the wiring.

F.4.2 Installation of overload protection device

a) Operate the drive system on the top the cage to move upwards and downwards to link the drive trolley with the connecting lug of the cage with the overload sensing pin penetrating the lug, and plug the split pin and keep it open;

b) Connect the wiring terminal of sensing pin to the wiring terminal of overloading host;

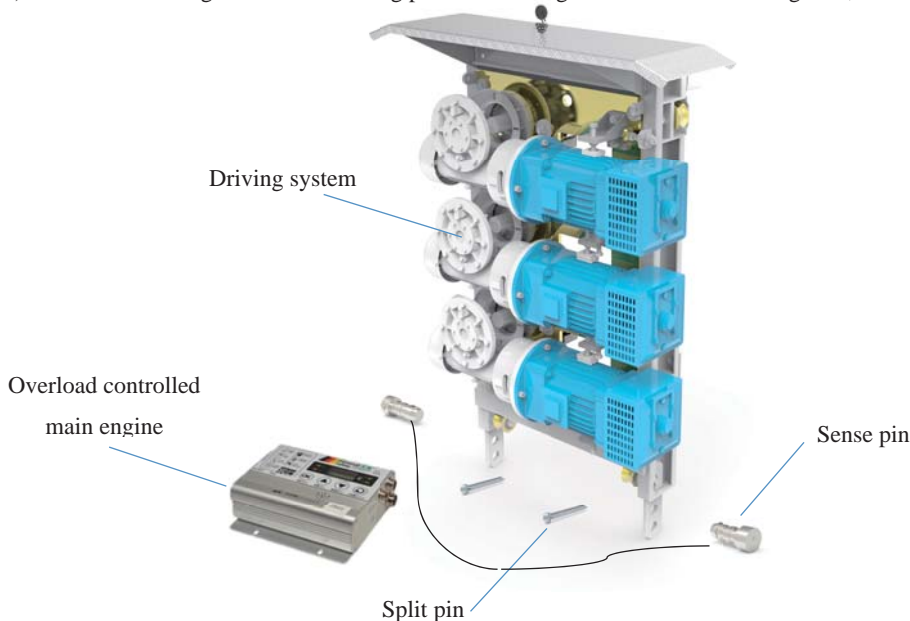


Figure F-9

c) Refer to the *Operation Manual of Overload Protection Device* for setting the overload protection device.

When the actual weight of the cage reaches 95% of the rated load, the warning function is activated, with warning indicator light and the buzzer sending out intermittent sound; When the actual weight is more than 110% of the rated load of the cage (this parameter is adjustable), the warning function is activated, with warning indicator light, the alarm output relay being activated and the buzzer sending out continuous sound.

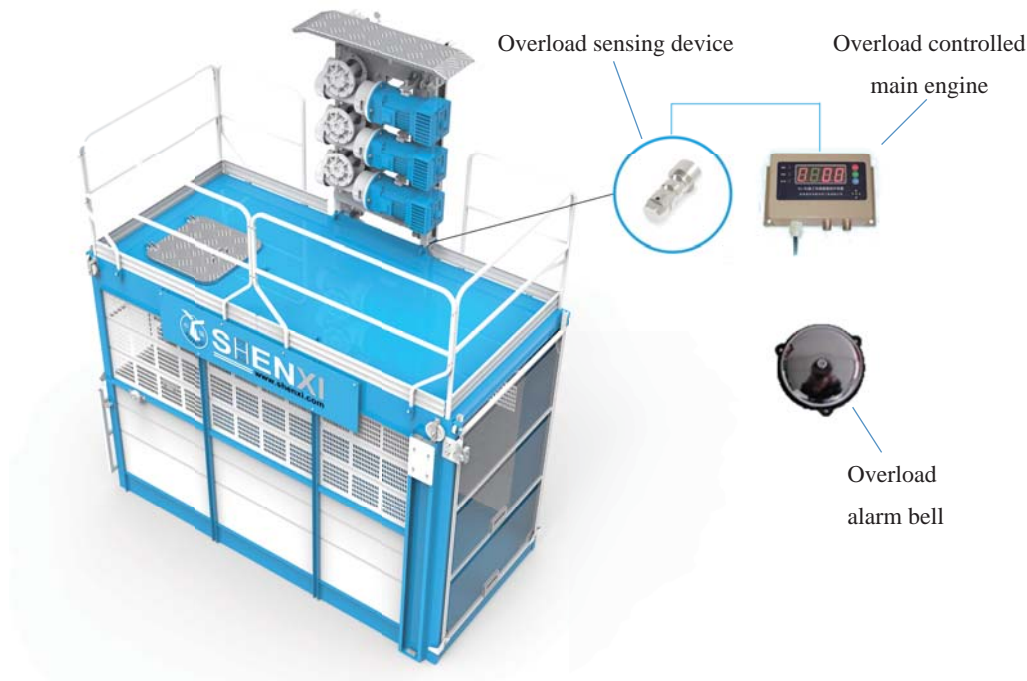


Figure F-10

F.4.3 Overload protection device quick setup guide

a) After the completion of procedures described in F.4.2 a) and b), switch on the power supply of the construction hoist;

b) Long press the ← key, enter the password 123123 using the ▼ ▲ (the password has been set before delivery and can be changed by users referring to the Operation Manual), and long press ← key to enter the main menu. (“Long press” means pressing the ← key for 3 seconds and above);

c) Use ▼ to move the cursor to “weighing Calibration” menu, and short press the Enter key. The screen displays “weight value --10,000 kg”, and long press the ← key after ensuring no load inside the cage, after the “beep” sound, the screen displays “20,000 kg weight value”, and then move into the heavy objects into the cage (the heavy weight is better more than 50% of the rated load), and then using the ▼ ▲ keys in the “weight value 20,000 kg”, at this time, short press the ← key twice to return to the main interface. Weighing calibration is completed;

d) After the setting of weighing calibration function, it can be put into operation;

e) If the user requires additional parameter settings, refer to the Operation Manual.



The power supply can be switched on only after connecting the sensor plug; otherwise, it may cause false alarms.

F.5 The Installation of Limit Cam at the Bottom of Mast and Power Driven Lifting Test

a) Inside the cage, operate the hoist (with rated load) to the position where the bottom of the cage flush with the threshold of the outer cage and press the scram button, then install lower limit cam and the limit switch cam (lower limit cam and the limit switch cam are both fixed to the frame of mast section with hook bolts; limit switch cam must be installed at the position that enables its activation before the cage touching the buffer spring);

b) After the completion of procedures described in F.4 a) for the hoist, the power supply for power driven lifting test can be switched on, and a full-time driver shall carefully operate the handle at the top of the cage to move the cage up and down along the mast for several times, with a travel of no more than 5 m. It is required that the cage shall run smoothly, without no beating, abnormal sound or other faults, the brake shall work properly, and further inspection on the contact of the guide rollers and mast and the meshing conditions of rack and pinion shall be conducted;

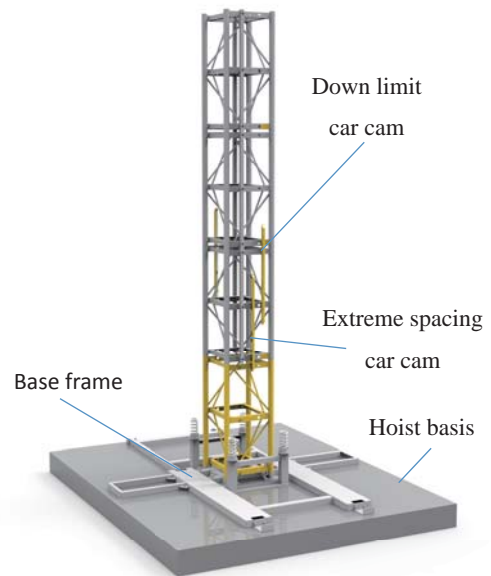


Figure.11

- The meshing clearance of rack and pinion shall be guaranteed within the range of 0.2~0.5 mm;
- The rear clearance of rack and pinion is 0.5 mm;
- The clearance between each roller and the vertical pipe of mast section is 0.5 mm.

c) If the no-load test is normal, conduct the test run with the rated load inside the cage and check the heating condition of motor and reducer;



In the process of test, special attention shall be paid due to the upper limiting plate has not been installed on the top of mast; during inspection, the scram button must be pressed down or switch off the power supply to prevent faulty operation.

F.6 The Machine Commissioning

After the host of construction hoist in place (the height of mast is within 15 meters), the energized test run inspection can be conducted.

Before inspection, it is necessary to ensure the voltage and power of the power supply on construction site meet the requirements; the electric leakage protection device shall be sensitive and reliable. The revolving direction, starting and stopping of the motor inside the cage shall be correct and effective; the power supply phase protection, power limit, upper and lower limit, each door limit and the emergency power off switch shall be sensitive and reliable.

F.6.1 Guide roller gap adjustment

Adjust the eccentric shafts of drive system and cage rollers to make the two columns of cages and drive system column symmetrically placed with respect to the mast section, with a distance from each roller to the vertical pipe of mast section of 0.3~0.5 mm. After adjustment, all bolts must be tightened.

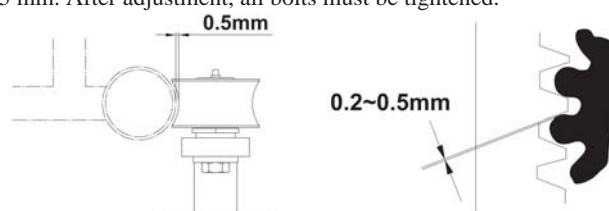


Figure F-12

F.6.2 Meshing clearance adjustment of rack and pinion

In terms of the pinions of construction hoist that running on the rack, the meshing clearance of rack and pinion shall be ensured to meet the specification. During inspection, the lead extrusion can be used to check the concealed clearance, which is required to be within 0.2~0.5 mm. Specifically, the iron wedge can be used to adjust the positions of drive plate and security plate (i.e.: meshing clearance), and after adjustment, all the related bolts shall be tightened.

F.6.3 Clearance adjustment of back pinion and rack

Each back pinion on the construction hoist shall be symmetrically arranged with respect to the center of rack back. The installation clearance between the back pinion and the rack back is 0.5 mm, and specifically, the eccentric sleeve of the back pinion shall be adjusted and then retighten the bolts on the back pinion.

F.6.4 Adjustment of cable trolley

Place the cable tackle of the construction hoist on the ground, and adjust the eccentric shaft to adjust the clearance of corresponding track of guide wheel to 0.5 mm. Make sure that manually pushing and pulling the cable tackle shall be flexible and without blocking phenomenon.

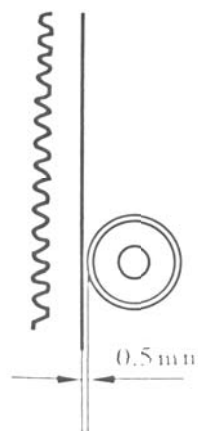


Figure F-13



When there is any installation and adjustment work below the cage, the main power supply must be cut off and the cage bottom shall be supported rigidly, so as to avoid the cage falling accidents.

F.6.5 Adjustment of upper and lower limiting switch touch iron

Adjustment of limiting switch touch block: operating on the top of the cage. When the cage floor is flush with the top-level platform, press the scram button. Install the upper limit cam block, making it contact with the upper limiting baffle plate. Release the scram button to check the sensitivity and reliability of the upper limiting switch. Adjustment of lower limit cam block: operating inside the cage. Move the cage to the position flush with the base frame guard rail threshold (rated load), and press the scram button, then install the lower limiting switch touch block, making it contact with the lower limiting baffle plate. Release the scram button to check the sensitivity and reliability of the lower limiting switch.

F.6.6 All-Round lubrication of hoist

Conduct the lubrication according to the requirements of “Chapter H inspection and lubrication” in this Operation Manual.



The content in F.6.4 ~ F.6.6 shall be conducted after the completion of installation.

F. 7 Drop Test

F.7.1 Operational requirements of anti-falling safety device

- a) The safety devices have been adjusted with lead sealing; therefore, it is not allowed to dismantle the safety device;
- b) During drop test, if the safety device doesn't work normally, that is, braking not in the prescribed distance, the safety device shall be readjusted after identifying the reasons;
- c) If the security device has any abnormal phenomenon (such as damaged parts), it shall be immediately stopped and replace the device with a new one;
- d) After the activation of safety device, the prescribed adjustment must be followed to restore the device; otherwise, it is not allowed to operate the hoist;

e) It is prohibited to inject any oily substance into the safety device, including lubricants.

F.7.2 Drop test description

a) A drop test must be conducted for hoists in the cases of the first time installation, transferring the site and after overhaul. For the hoists in normal operation, a drop test shall be conducted once every three months or on a regular basis according to the local regulations;

b) According to Chinese National Standards, the safety device must be subject to factory test one year (according to the date on label or test report) after leaving the factory (including unused for one year) and must be subject to factory test during use, and can be continuously used after passing the test. The safety device has a service life of 5 years.

F.7.3 Drop test method

a) Heighten the mast to approx. 15 m (install the mast tie at the height of 9 m);
 b) Rated load of hoist;
 c) Cut off the main power supply of the base frame guard rail power box, short connect the test cable to the inching switch of anti-falling safety device, and plug the drop test box (five-core aviation plug) into the interface inside the electric control box;



Figure F-14

d) Put the button box of the drop test on the floor through the door while ensuring that in the process of drop test, the cable will not get stuck and all doors will be closed;
 e) Turn on the main power switch; press the “ascending” button on the button box of the drop test to ascend the drive system 10 m from the ground (pay attention to the drive system not exceeding the roof);

f) Press and hold the “drop” button, the cage will free fall, and after falling a distance, the safety device will lock the cage, and under normal conditions, the braking distance of the cage is 0.15~1.40 m. (*Braking distance shall be calculated from hearing the “bang” sound, and while stopping the cage, the safety device will cut off the power supply through electromechanical interlock.*) ;

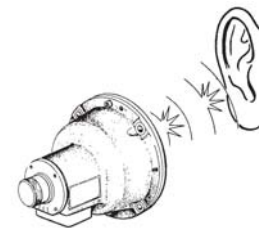




Figure F-15

In case of special circumstances, such as long braking distance, please contact with our company;

	1. During drop test, people are not allowed to stand on top of the cage;
	2. If the cage freely fall about 3m without being stopped, the button must be immediately released to stop the cage, and then jog the “drop” button to lower the cage slowly to the ground and find out the causes

g) Press the “ascending” button to drive the cage ascending about 0.2 m, enabling the reset of centrifugal block of the safety device;

h) Jog “drop” button to lower the cage slowly to the ground, remove the test cable, at this time the cage cannot be started, and then remove the drop test box and reset the safety device according to the method described in F.7.4.

	1. Each time of jogging shall lower the cage not more than 0.2 m; otherwise, the speed limiter will be activated again.
	2. After the completion of drop test, the test cables must be removed

F.7.4 Reset of anti-falling safety device

a) After the activation of anti-falling safety device, it must be reset, before which the construction hoist is not allowed to be operated;

b) In addition to the drop test, before resetting the safety device, it is necessary to identify the causes of activation, and the following content shall be confirmed:

- The electromagnetic brake of the motor shall work normally;
- Worm transmission pair and couplings shall be in good conditions;
- The guide rollers, back pinion and rack of the cage shall work properly;
- The rack and pinion shall be in good condition, and their meshing shall be proper;
- The micro switch inside the anti-falling safety device shall work normally (before resetting, the cage shall not start upon the command of ascending).

c) After confirming the inspection of each item before resetting, cut off the power supply in the first step and then reset the anti-falling safety device according to the following procedures:

- Unscrew the screw 1 and cover 2 ;
- Unscrew the screw 3 ;
- Use special wrench 5 to move the lever 4 and loosen the nut 7 until the end of pin 6 flush with the end of the safety device, at this time, the limit switch circuit is switched on;
- Mount the screw 3 and cover 2;
- Dismantle the cover 9;
- Manually tighten the stud 8 as far as possible, and then use the tools to re-tighten the stud 8 for 30 °, and the stud 8 must be totally loosened upon hearing the “Goo” sound from the inside of the safety device;
- Mount the cover 9;
- Switch on the power supply and drive the cage ascending for 0.2 m to reset the centrifugal block, and the safety device is back to normal.

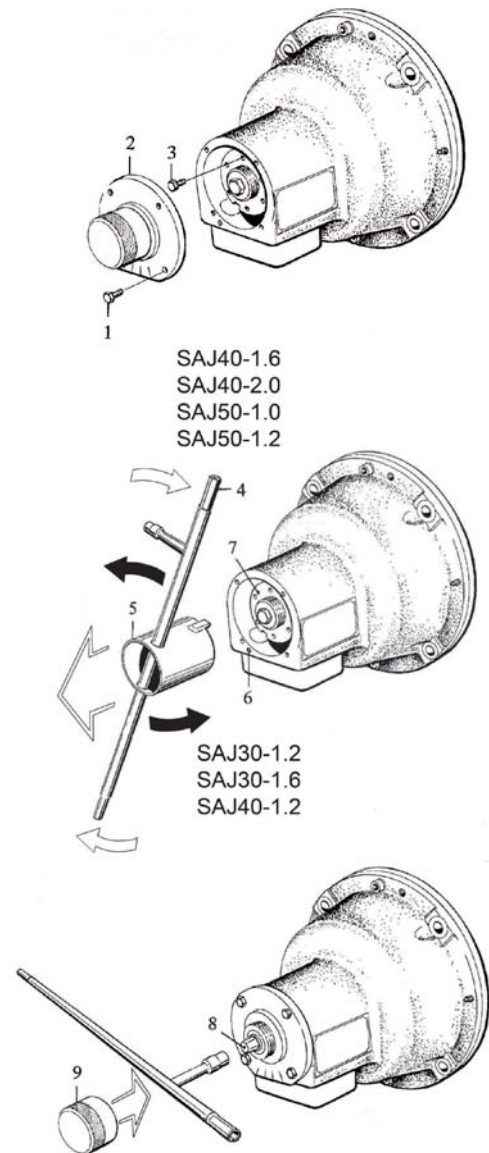


Figure F-16

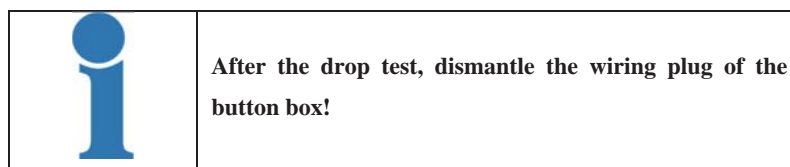


Figure F-17

F.8 Heightening of the mast (meanwhile installing the mast tie) and the installation of limit cam block

F.8.1 Heightening of the mast

After the completion of the above-mentioned installation and commissioning procedures and the qualified

acceptance of “drop test” under rated load, the mast can be heightened.

F. 8. 1.1 Before installation, the top over-travel limit switch shall be installed on the top of the drive frame;

F. 8. 1.2 Before installation, the mast section, mast tie and the components of cable guiding device shall be placed on the dry and solid ground besides the guard rails;

F. 8. 1. In case the mast sections have different specifications, the heightening work shall be conducted according to Figure E.1 Configuration diagram of primary chord pipes of mast sections;


F. 8. 1.4 Heightening procedures of the mast:

a) Insert the plug of jib into the socket at the top of the cage, put down the hook to hook on to the lifting sling;

b) Hook on to one mast section with the lifting sling, and the end with taper sleeve is downwards, and lift the mast section to the top of the cage and place it stably (on top of the cage only three mast sections are allowed to be placed at the same time);

c) Start the hoist, and when the top of drive system approaches the top of the mast, jog the hoist until the top of drive system to the position approx. 300 mm from the top of the mast;

d) Press the scram button to prevent accidents;

	When the cage moves, it is not allowed to place any mast section on the jib.
	The operating personnel on top of the cage shall be aware of safety, preventing the collision with the mast tie and other components.

e) When lifting one mast section, the cone interface of the primary chord pipe shall be coated with lubricating grease. Lift the mast section to the top of the mast and plug it into the connecting hole of next mast section, and tighten all the screws with a tightening torque of not less than 300N•m;

f) Repeat the above procedures until the mast reaching the required mounting height;

- While heightening the mast, install the mast tie according to the requirements;

- With respect to the construction hoist without counterweight, the upper joints of the four main chord tubes must be sealed with rubber sealing top sleeve;

- In case the construction site has suitable lifting equipment, three to four mast sections can be mounted on the ground and then lift the mounted sections directly to the top of the mast for installation.

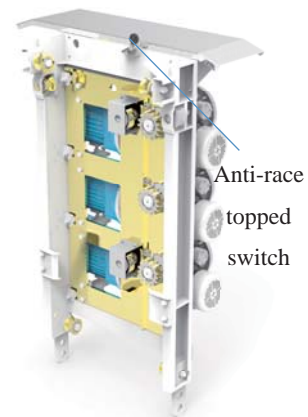


Figure F-18

g) Every time the mast being heightened by 10 m, its overall perpendicularity shall be checked by theodolite or other testing instrument along two vertical force directions, and the requirements on installation perpendicularity deviation are shown in table F.1; once the variance exceeds the tolerance, adjustment shall be conducted in a timely manner.

Table F. 1 Mast installation perpendicularity deviation list

Mast height (m)	$h \leq 70$	$70 < h \leq 100$	$100 < h \leq 150$	$150 < h \leq 200$	$h > 200$
Perpendicularity deviation (mm)	Not more than 0.5/1000 of the erection height of the mast.	≤ 35	≤ 40	≤ 45	≤ 50

When connecting the mast sections, the dislocation geometrical difference of the column pipes of the upper and lower mast sections shall be ensured within 0.5 mm.

F.8.2 Installation of limit cam on the top of mast

After heightening mast, start the construction hoist. When base plate of cage keeps parallel and level with the topmost raised platform, press the stop button, and install upper limit cam and limit switch cam (installation position


of limit switch cam: cage runs upward, and after upper limit switch motion, cage stops automatically. At this time, arm extension of limit switch has 150 mm distance from the bottom of limit switch cam).

F.9 Installation of Mast Tie

Installation of mast tie shall be conducted together with the heightening installation of mast. Operators shall be familiar with all contents in the Chapter E “Mast and Mast Tie”, know the requirements for installation distance of mast tie and maximum free end height of mast, and master the connection requirements and adjustment methods of all parts of mast tie to be installed.

Hoisting method of mast tie may refer to the hoisting method of mast section, using the installation hanger rod on the cage to hoist or using cage to convey. When conveying mast tie by cage, control the cage on the top of cage to convey.

IIS mast tie can be installed and fixed in the concrete floor surface, load-carrying wall, load-carrying beam or load-carrying steel structure of the building, but shall not be installed on the scaffold without load-carrying structure. Installation process of IIS mast tie is as follows:

	1. During installation of mast tie, all split pins must be in the open state;
	2. All bolts must be tightened;
	3. During the installation, press the stop button at any time.

- a) Use 4 Grade-8.8 M16 high-strength bolts or M16 V-shaped bolts to fix the front connecting base of mast tie to the steel angle of top and bottom frame of mast section, and bolt shall not be screwed too tight so as to adjust the position;
- b) Use Grade-8. 8 M24 bolt to fix the mast base to the building;
- c) Use Φ 20 connecting pin to connect intermediate connecting frame with rear connecting base;
- d) Use M30 high-strength bolt to connect rear connecting rod with mast base;
- e) Install adjustable rod in the middle between mast base and intermediate connecting frame;
- f) Correct the perpendicularity of mast and levelness of mast tie in accordance with the requirements;
- g) After the correction, tighten all the connecting bolts. Then slowly start hoist to protect the cage and counterpoise from colliding with the mast tie.

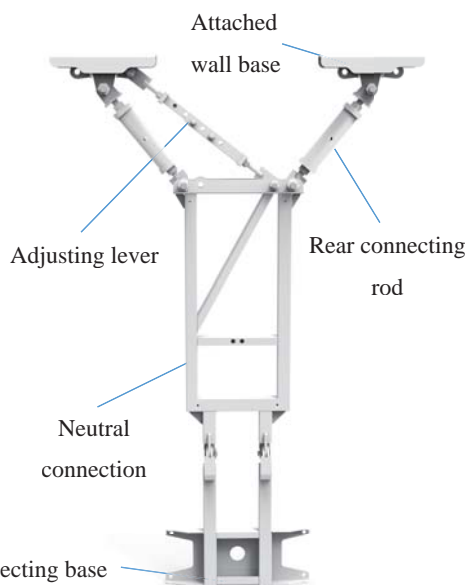



Figure F-19

	The maximum level inclined angle of mast tie is $\pm 8^\circ$, i.e., 144:1000;
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F.10 Installation of Cable Guiding Device

Type of cable guiding device includes cable collecting basket and cable trolley.

F.10.1 Installation of cable collecting basket and cable protecting rack

- a) After completing the installation of F. 1 - F. 3, install the cable collecting basket;
- b) Use the lifting tools to hang coil of cable over the cable collecting basket;

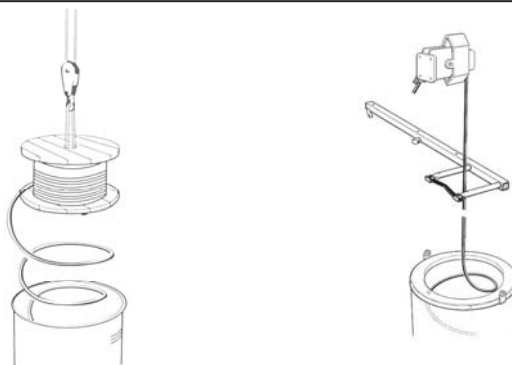


Figure F-20

- c) Pull about E. 2 m cable to connect cable to power box;
- d) Pull out the cable at the bottom of the cable collecting basket, and to the power box. Don't connect them temporarily;
- e) Put the cable in the cable collecting basket by circles clockwise to make each circle keep same big, with diameter of slightly less than that of cable collecting basket;
- f) Fix cable on the cable arm, and insert the cable plug into the socket;
- g) Connect the cable to the power box, and start hoist to check whether cable is winding;

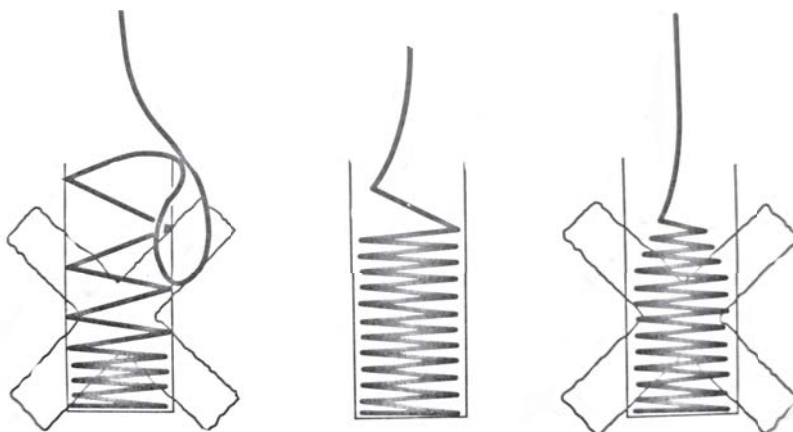


Figure F-21

- h) Install cable protecting rack in the process of heightening mast;
- i) Adjust the position of cable protecting rack and cable arm to ensure that the cable is in the U-shaped center of cable protecting rack.

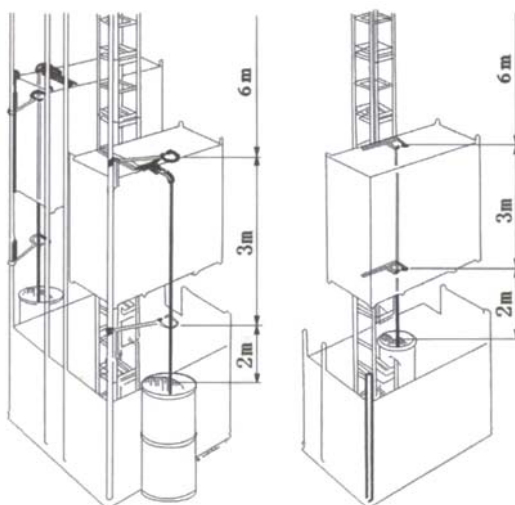


Figure F-22

F.10.2 Installation of cable trolley type of cable guiding device

F.10.2.1 Installation of cable trolley type of cable guiding device with single cage

F.12.2.1.1 When the power is supplied by a cable, the installation program is as follows:

a) Supply power for cage after completing F.4. Because installation of cage is with freely suspended cable, and in order to prevent the cable from reversing and knotting, specially-assigned personnel shall pull and send cable on the ground;

b) Put the cage down to the bottom, cut off the main power supply of power box outside, and remove the connection of cable with power box outside;

c) Roll up all cables and put them on the top of cage, lay down one end of the cable vertically and pull the cable to the power box along the surface of the base frame;

d) Switch on the power, drive cage up and lay down the cable, and use cable clamp to fix it to the mast every 1.5 m;

e) If installation height of mast is less than half of total predetermined erection height plus 3 m, stop the cage on the top of mast, and install the cable fixation frame on the mast section on the top of mast. If installation height of mast reaches and is more than half of total predetermined erection height plus 3 m, stop the cage at the position with half height of mast, and install the cable fixation frame at the position with half height of mast plus 1 m;

f) Install cable in the cable fixation frame;

g) Put the cage down slowly, and install a cable protecting rack every 6 meters. Installation of cable protecting rack shall ensure that plates on both sides of cable trolley and cable arm of cage can pass through the middle of U-shaped rubber sheet of cable protecting rack;

h) When cage is parallel and level with the threshold, use rigid support to support the cage (make sure that there is no danger during the installation cable trolley under the cage);

i) Cut off the power supply, remove the end of cable access to the cage from the cable arm to make it keep the freely vertical state (if the cable cannot keep freely vertical, installation personnel shall straighten it);

j) Remove two rollers from one end of cable trolley, and install cable trolley under the cage;

k) Reinstall the roller, and only tighten the screw with hand;

l) Adjust the roller shaft to make the gap between all rollers and stand pipe keep 0.5 mm;

m) Try to pull cable trolley to ensure that there is no jam;

n) Pull the free end of cable being straightened in the step i) through the cable sheaves, and re-engage it with junction box inside the cage. Make sure that the cable will not be knotted when pulling the cable;

o) Remove the support under the cage;

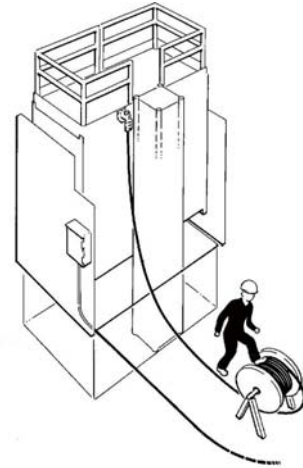


Figure F - 23

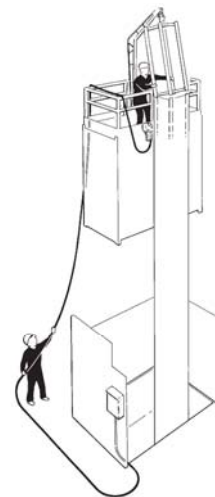


Figure F - 24

p) Don't lift trolley, straighten the cable upwards on the top of cage, and pull the cable again to make trolley connect with the bottom of the cage. Then put down half of the cable pulled again, and clamp the clamp plate on the leading-in bracket of cage to fix the cable;

q) Roll up the remaining cable, and use the adhesive tape to fix it on the guard rail on the top of the cage;

r) Open the main power supply, and ensure that cable connection phase is correct;

s) Start the hoist, and install the protecting rack of remaining cable.

F.10.2.1.2 When power is supplied by two cables, the installation program is as follows:

a) During the installation, power supply of the cage is trailing cable;

b) Put down the cage to the bottom, use suspender to put the coaxial cable on the top of the cage, and use a shaft or pipe penetrate into the cable coil and fix it on the top of the cage to make the cable being released easily;

c) Implement the step e) in F. 10.2.1.1;

d) Ask additional installation personnel to remove the connection of trailing cable on the bottom with power box of base frame, and put all trailing cables back the top of the cage;

e) Connect one end of attached cable to the halfway junction box, and put down the other end vertically to the base frame of cage enclosure, pull the cable to the power box along the base frame surface, fix the remaining cable to the mast (position of cable rack) with adhesive tape, and make sure that the cable will not touch with moving parts of the cage;

f) Connect the end of trailing cable (the end removed from the power box) to the halfway junction box;

g) Put down the cage slowly, install a clamp every 1.5 meters, fix the attached cable to the mast, and until the bottom, install a cable protecting rack every 6 meters. Installation of cable protecting rack shall ensure that plates on both sides of cable trolley and cable arm of cage can pass through the middle of U-shaped rubber sheet of cable protecting rack;

h) Implement steps h) – s) in F.10.1.1, and cable mentioned in steps h) – s) is trailing cable;

F.10.2.2 Installation of cable trolley type of cable guiding device with double cages:

F.10.2.2. 1 When the power is supplied by a cable, the installation program is as follows:

a) Stop two cages at the bottom, and use rigid support to support the cage under the right cage (make sure that there is no danger during the installation cable trolley under the cage);

b) Remove the cable with cage, and use hoisting equipment to hoist the cable of right cage on the left cage;

c) Make the left cage implement the step e) in F.10.2.1.1;

e) Pull one end of the cable through the right cable fixation frame and put down the cable downward to the base frame of cage enclosure, and pull the cable to the power box along the base frame box, and put down the other end on the ground vertically;

f) Put down the cage slowly, install a clamp every 1.5 meters, fix the cable of the right cage from cable fixation frame to power box of cage enclosure to the mast, and install a cable protecting rack every 6 meters. Installation of cable protecting rack shall ensure that plates on both sides of cable trolley and cable arm of cage can pass through the middle of U-shaped rubber sheet of cable protecting rack;

g) Stop the left cage to the bottom, and implement steps j)-s) in F.10.2.1.1 to complete the installation of cable trolley type of cable guiding device of right cage;

h) Use the right cage to complete the installation of cable trolley type of cable guiding device of left cage according to the method of F.10.2.2.1.

F.10.2.2.2 When power is supplied by two cables, the installation program is as follows:

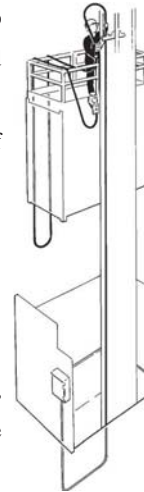


Figure F - 25



Figure F-26

- a) Stop two cages at the bottom, and use rigid support to support the cage under the right cage (make sure that there is no danger during the installation cable trolley under the cage);
- b) Remove the cable with cage, and use hoisting equipment to hoist the cable of right cage on the left cage;
- c) Make the left cage implement the step e) in F.10.2.1.1;
- d) Implement step e) in F.10.2.1.2;
- e) Connect the end of trailing cable (the end removed from the power box) to the halfway junction box, and put down the other end to the ground along the mast;
- f) Implement steps f)- h) in F.10.2.2.1 to complete the installation of cable trolley type of cable guiding device of right cage;
- g) Use the right cage to complete the installation of cable trolley type of cable guiding device of left cage according to the method of F.10.2.2.2;

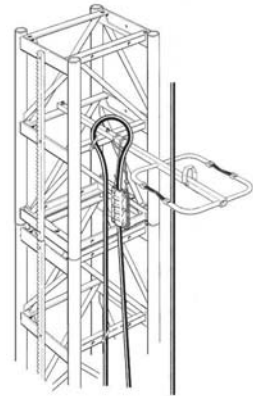


Figure F-27

F.10.2.3 Heightening cable trolley type of cable guiding device

After heightening the mast, if the installation height of cable rack is less than half height of mast plus 3 m, move the cable rack upwards when heightening the mast again. The method is as follows:

- a) Loosen the cable on the top of cage (stop the cage at the bottom when loosening), fasten the cable again; if the hoist uses the cable with one same specification, the loosening length shall be equal to 3 times of upward height of cable fixation frame; If the hoist uses the cable with two specifications, the loosening length shall be equal to 2 times of upward height of cable fixation frame;
- b) Drive the cage upwards until its distance from cable fixation frame is equal to the loosening length; and fix the bottom cable and cable trolley to the cable arm to make cable fixation frame carry no load;

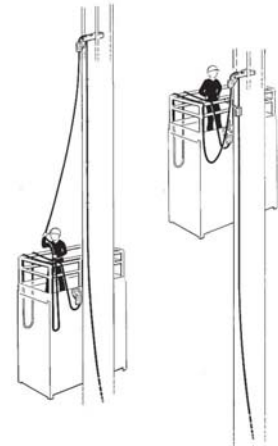


Figure F-28

- c) Drive the cage to the position of cable fixation frame to make sure that the cable from cable fixation frame to power box of cage enclosure is fixed firmly. If the hoist uses the cable with two specifications, loosen the cable left in the cable fixation frame, with loosening length being equal to the upward height of cable fixation frame;
- d) Remove the cable fixation frame, and drive the cage the new installation position of cable fixation frame, and install the cable fixation frame;
- e) Connect the cable to the cable fixation frame;
- f) Make the cable and cable trolley reach the free state;
- g) Start the cage slowly for pilot run to check whether various parts have collision.

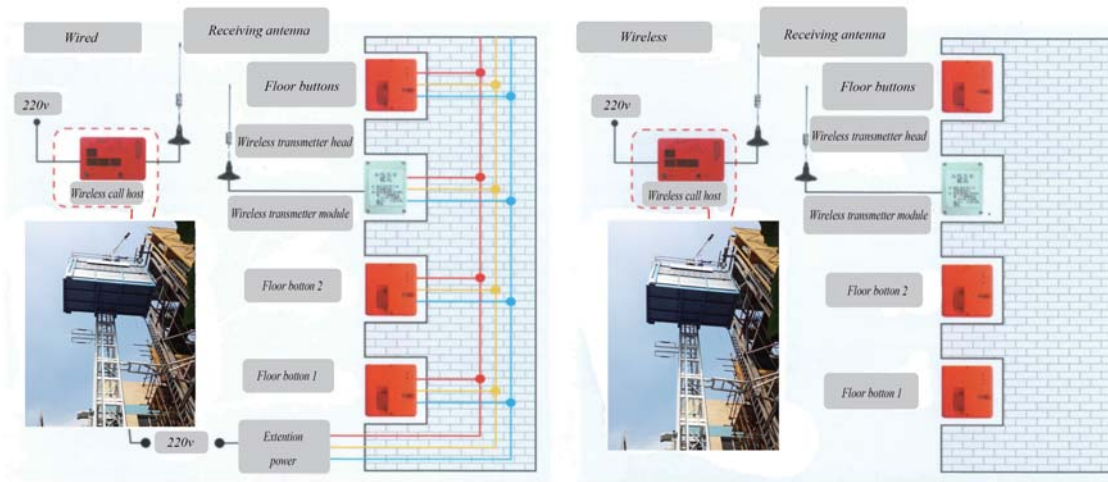
F.11 Installation of Floor Call System (Selective Assembly)

Each floor shall establish floor call system which is used to contact with operator of hoist. If users need to configure the hoist floor call system. Install according to the following method, and specific installation method sees Operation Instruction of Hoist Floor Call System.

- a) Lead out three lines from the red, yellow and blue terminal (12V) of extension work unit inside the power box and fix them to the building along the direction of building height;
- b) Install floor extension at each floor, and connect the red, yellow and blue wires of the extension to three wires led out from the extension work unit;
- c) Install a shooting head every 50~80 meters nearby the mast, and connect the red, yellow and blue wires of the shooting head to three wires led out from the extension work unit;



Red, yellow and blue lines are provided by the user, with specification of copper wire with section $>1\text{mm}^2$.





Operation



G.1 Safety Check before Operation

Operator of hoist must receive the training, obtain the operation certificate of hoist, and know the performance and operation skill of all parts well.

Before operation, operator shall conduct daily check of the construction hoist:

a) Conduct the specified routine check and lubrication according to the requirements of “Check and Lubrication” in Chapter H;

b) Check whether baffle of limit switch and position of baffle is sensitive and reliable, safe and effective;

c) Check whether guard rail door and electromechanical interlocking device of cage door is under good condition;

d) Stop the cage at the ground station, open and close the external guard rail door, charge door of cage, discharge door of cage and roof door to guarantee they are under good condition. At this time, the cage shall not be started;

e) Drive the cage upwards and stop it at the position with about 3 meters of height, and charge door of cage and external guard rail door shall be locked and cannot be opened;

f) Check the function of upper and lower limit switch and power limit switch; Turn off upper and lower limit switch and power limit switch, the cage cannot be started;

g) For construction hoist with counter weight, check the function of loosening limit switch in the eccentric ropes, and turn off this switch, the cage cannot be started;

h) Make sure that there is no any barrier inside the counterweight way, and keep frequent monitoring;

i) Remove the suspender on the top of the cage, and forbid to operate on the suspender with load;

k) Adopt operation on the top of the cage under operating condition of installation;

l) Remind all personnel before starting the cage, and immediately press stop button if finding any abnormal situation;

m) If the hoist has any abnormalities, timely notify the relevant maintenance personnel, and prohibit anyone beyond maintenance personnel to tamper with it;

n) Cut off main power supply when checking circuit, and start to check 10 minutes later;

o) Prohibit any personnel or object inside the cage to rest on or extrude the cage door;

p) After construction hoist suffers the rainstorm or violent typhoon, professional engineering technician shall

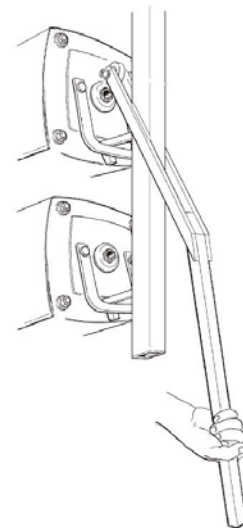



Figure G-1

check all key parts;

q) Conduct the check, maintenance and drop test regularly according to the requirements.

	<p>Inside the base frame guard rail, when there are personnel working in the forbidden area like mast, mast tie and top of cage, it is prohibited to operate the construction hoist;</p> <p>It is prohibited to overload, and cargoes, hands and heads to reach out the cage.</p> <p>Except the driver, it is prohibited to carry other personnel or cargoes in the driving cab;</p> <p>When wind speed is more than 20m/s, it is prohibited to operate the construction hoist;</p> <p>When mast and cable are frozen, it is prohibited to start construction hoist;</p>
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G.2 Operation

Before the operation of construction hoist, operator shall conduct the check in accordance with the regulation on “G.1 Safety Check before Operation”, and start the normal operation after confirming all reach the standard.

- a) Power-on;
- b) Load cargo or personnel into the cage;
- c) Close all doors, including charge door and discharge door of cage, roof door, external guard rail door, to make sure that discharge door is locked.

G.2.1 Operating methods:

Pull control handle according to the required direction to start the cage, and when the cage reaches the required height, turn control handle to second gear, and the cage will stop.

When working on the top of the cage, operation box shall be operated on the top of the cage.

If meeting abnormal situation during the operation, such as electrical failure, immediately press stop button, and don't turn on it before removing the failure.

G.2.2 When the cage cannot be started, check the following items:

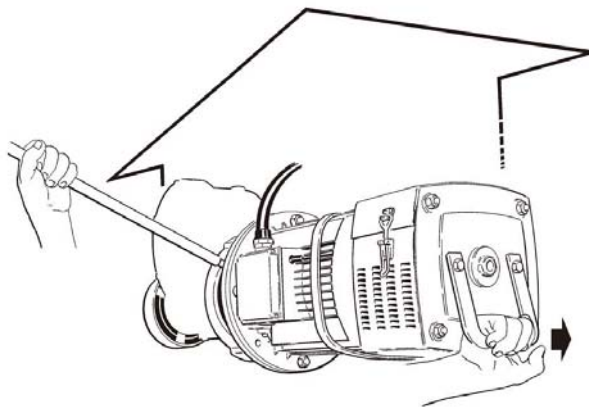


Figure G-2

- a) Ground power switch shall be “on”. Electrical circuit of the cage shall be power on;
- b) “Stop” button has been loosened or electric lock has been opened;
- c) Power limit switch shall be “on”;
- d) External guard rail door, cage door and roof door shall be closed well;
- e) For construction hoist with counter weight, check whether the position of loosening limit switch in the eccentric ropes is corrects;
- f) Fuse protector shall be in good condition (breaker shall be power on).

If after conducting above check and taking corresponding measures, the cage still cannot be started, see the “Maintenance” in **chapter I**.

G.2.3 When the cage of construction hoist stops at the stop layer due to power failure or other electrical (fuse protector, thermorelay of engine) failure, it is suggested to conduct manual release of brake when confirming there is no other method, and the operation process must be conducted by trained professional personnel. The specific method is as follows:

When drive system only has one engine, pull out the manual handle or pull rod of brake in the trailing end of engine slowly to make the cage slide downwards slowly;


When drive system has two or more engines, the brake of one engine or more than one engine shall be jacked up for release, and only left one engine conducts the manual release operation;

When jacking up the brake of one engine or more than one engine, the operation must be conducted one by one. If the cage glides downward during the jacking, the operation must be stopped to restore the function of the brake.

The possible situation is:

1. After jacking up the brake of one engine or more than one engine, the combined brake torque of remaining brakes is not enough to stop the cage, especially under full load;
2. Remaining brakes may be worn seriously, and even lost the ability to stop.

Under such situation, the order of brake released can be changed. If meeting the following situations, brake of more than one engine shall be released. For example, drive system has 3 engines, and the cage glides downwards when releasing the second engine, operator shall conduct manual release of brake of the second engine.

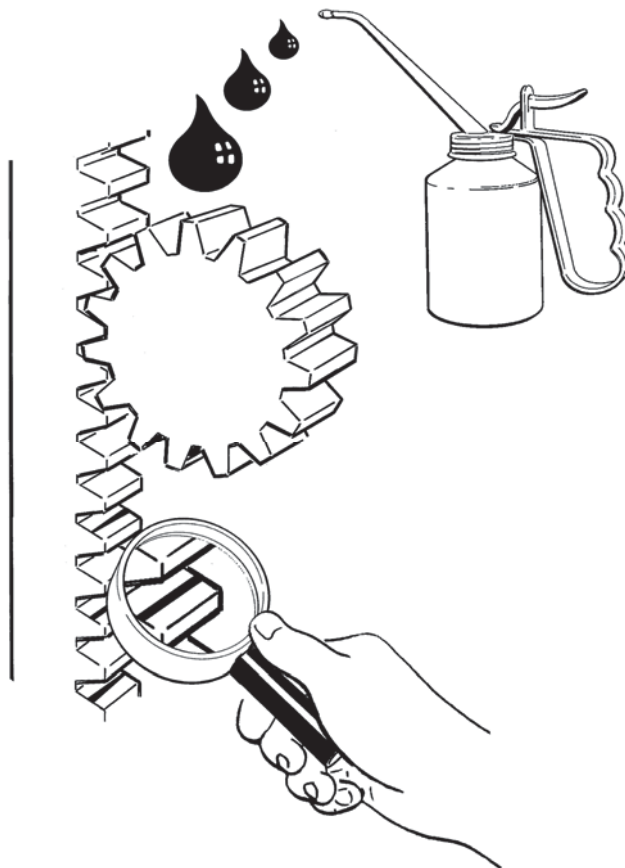
	<p>Manual release of brake shall be conducted interruptedly, and distance of glide shall be short each time, and shall not exceed the normal speed of the cage. Under overspeed, safety device shall be used to stop the cage. The cage can slide downwards after restoring</p>
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	the safety device. The cage slides downwards for 20 meters. Stop 1 minute to cool the engine brake Pay attention to safety during the operation on the top of the cage.
--	--

G.2.4 If the cage descends to the position of power limit switch due to the heavy load of construction hoist and wear of engine brake (brake torque is short), thus three-phase supply is cut off, and cage cannot ascend by power supply, arm extension of limit switch shall be unscrewed for a certain distance to restore the limit switch, the cage will be driven to ascend, and distance of arm extension of limit switch is adjusted to make it touch with limit cam effectively.



Check and Lubrication



The check of construction hoist is divided into daily, weekly, monthly, seasonal, yearly and special check.

H.1 Safety Cautions:

a) Only the qualified personnel can conduct the operation, for example, the electrical checking personnel must have electrician operation certification and relative knowledge training;

b) When in the process of electrical checking, insulated shoes shall be worn;

c) When in the process of electrical checking, only when the main power supply is cut off for ten minutes can recondition be conducted;

d) Check personnel shall be in accordance with the high-place operation safety requirement, including wearing safety helmet, safety belt, antiskid shoes and no wearing loose clothes, but work clothes;

e) Operation and check at night or after drinking is strictly prohibited;

f) When the construction hoist is at runtime, operating personnel must not stretch his hand and head out of the safety rail;

g) In addition to inspect the connection of the head sheave, the mast tie, mast section, and crinoline, cage shall be stopped at corresponding check location; when conducting other kinds of check, cage shall be stopped at the ground floor.

H.2 Daily Check:

a) Check that the appearance of the travelling cable and attached cable shall be well and there is no twisted and damaged phenomenon with eyes;

b) Check that fastening situation of all the fastening bolts shall be well with eyes;

c) Check that the operation situation of all guide roller and back gear shall be well and does not deflect;

d) Conduct the routine daily check according to the requirement of "G.1 Safety Check before Operation";

e) Check the interlocking switch of the outer guard bar; when opening the door, the cage can not start;

f) Check that the upper and lower buffer shall be sensitive, reliable, safe and effective;

g) Conduct the safety test of the switches respectively one by one. When testing, cage cannot be moved:

- Opening the cage door of feedstock and discharge;

- Opening the outer guard rail door;

- Move the rope-break protection device;

- Press the scram button;

h) Check that there is no obstacles in the cage and the outer-weight way;

i) Check whether there are tough sundries like cement or stones and so forth on the cable, cable pulley, and

mast section stand pipe or wheel gear and rack. If have, clear it in time.

H.3 Weekly Check:

- a) Check that the fastening situation of the driver board bolt shall be well;
- b) Check that the coupling bolt of gear, rack, guide roller, back gear, all mast tie and mast section shall be well;
- c) Check that the coupling bolt of the cable cantilever crane and cable wire-protected frame shall be well and not loose or location moving;
- d) Check that the lubricant housing shall be lubricated well. The temperature of the worm reducer cannot surpass 100°C. Check the oil situation of the driving system, such as seeping, leaking, or insufficiency. If so, replenish lubricants in time;
- e) Check that the head sheave and rope sheave on the head heave frame shall be rotating flexibly without abnormal sound. Jointing part shall be fastened well;
- f) Check that the counterweight wheel shall be rotating flexibly. As for steel wire rope, there is no fracture of wire, not out of shape and no severely damaged. Jointing part of the rope end is fastened well;
- g) Check that there is no abnormal heating and sound in the electric machine and the reducer.

H.4 Monthly Check:

- a) Check the cage door and ensure that it will not break away with door frame rail. By adjusting the position of the door, keep the gap between door and two rails consistent;
- b) Check whether the cage and the door lock of the outer guard rail is loose or out of shape;
- c) Check the gap between gear and rack and ensure that the gap is 0.2 to 0.5 mm.

H.5 Seasonal Check:

- a) Check the running condition of all guide rollers, back gear and pulley's bearing and adjust and change according to one's discretion;
- b) Check the wear pattern of all guide rollers. (as the rules in the Figure H-1) Adjust the regulated gap between guide roller and mast section pipe to 0.5 mm;

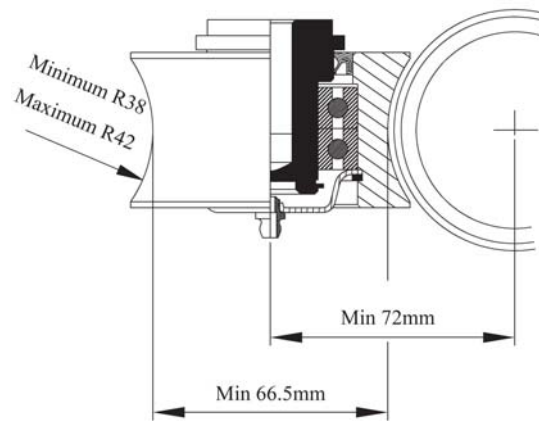


Figure H-1

- c) Check the wear pattern of the brake disc and brake pad. (Check with feeler gauge) the minimum extreme dimension of it is 0.3mm;
- d) Check the reliability of the safety anti-falling device and make drop test according to the test cycle of the anti-falling device;
- e) Check that the jointing part of the adhesion device shall be fixed well;
- f) Check the cooling fan of the electric machine; make sure that there is no abnormal vibration and sound;
- g) Check that the insulation resistance, the electrical equipment and the ground resistance of metal shell and steel structure should conform to the specific requirement.

H.6 Yearly Check

- a) Check the appearance of the travelling / attached cable; if there is any severely twisted, damaged, and aging phenomenon, replace immediately;
- b) Check the elastic element (polyurethane rubbers) between the electric machine and the reducer; if damaged, and aging, replace immediately;
- c) Check all the possibly eroded structural components and worn accessories and make specific authentication. As for the severely eroded, worn and damaged structural components, replace it.

H.7 Special Inspection

H.7.1 The test of transmission gear

Check the worn pattern of the transmission gear by the gear common normal micrometer: the size of the new tooth is 37.1 mm; and the worn extreme dimension is 35.1 mm.

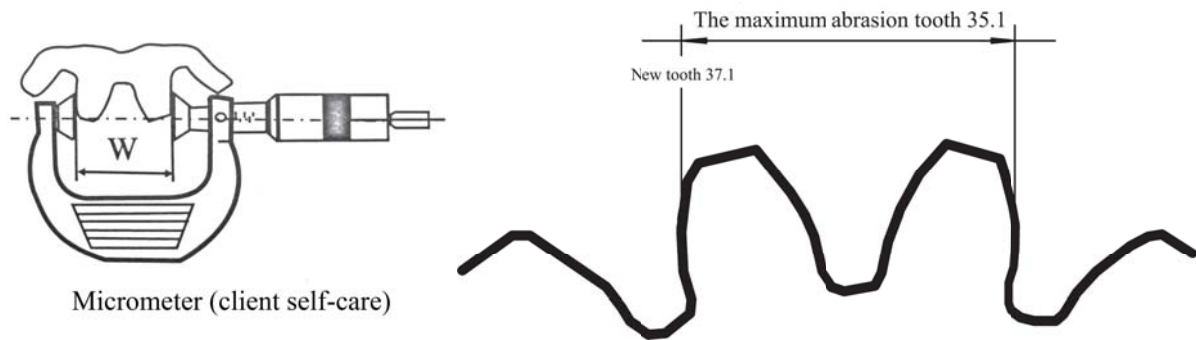


Figure H-2

H.7.2 The test of the rack

Check the abrasion of the rack using specified rack measurement gauge: the size of the tooth thickness of the new tooth is 12.56 mm; the wear extreme dimension is 10.6mm; and measures it by rack.

If the gauge can touch the bottom of the tooth thickness section, replace the rack.

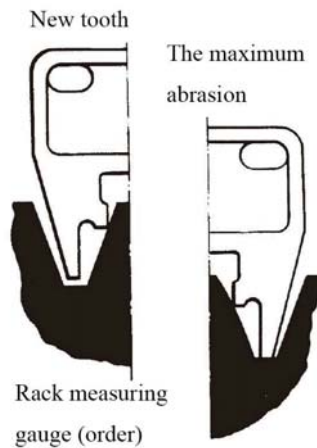


Figure H-3

H.7.3 The test of the wheel worm tooth

Check the abrasion of the wheel worm tooth by specific worm wheel measure gauge: Open the check hole on the side of the worm reducer, and measure the wheel worm tooth vertically by worm wheel measure gauge which labeled 100%. If the measure slot of the worm wheel measure gauge can be inserted into the wheel worm tooth, the abrasion is much more severe and replacement is needed. Otherwise, generally, in order to inspect whether the degree of abrasion is more than or less than 50%, use the worm wheel measure gauge whose side labeled 50% so that it can be used as the reference in daily application.

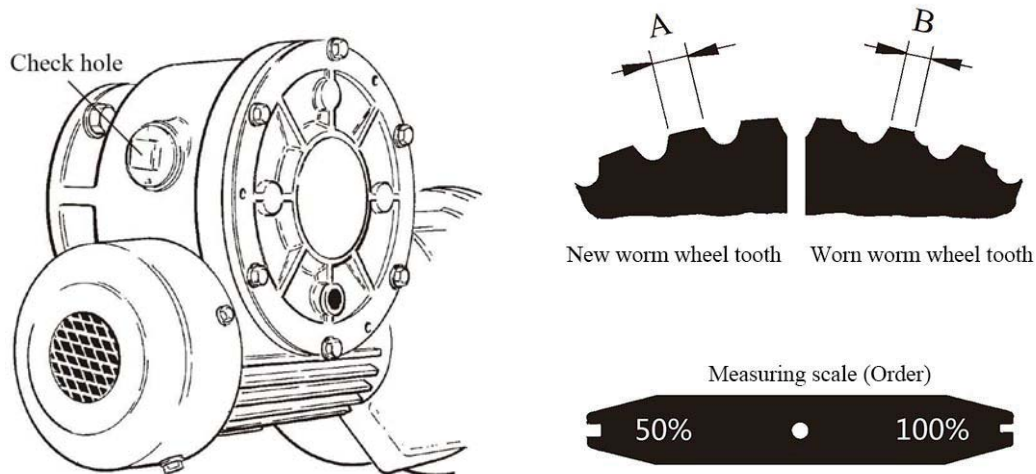


Figure H-4

H.7.4 The test of the retarding torque

Test the retarding torque of electrician machine using lever and spring scales.

The concrete measurement of the motor torque is that the distance (m) of levers multiplies the tension force

(N): $N \cdot m$

- 11kw motor torque is $120N \cdot m \pm 10\%$;
- 15kw motor torque is $170N \cdot m \pm 10\%$.

As for other power of motor torque, refer to corresponding operation instruction of electrical machine.

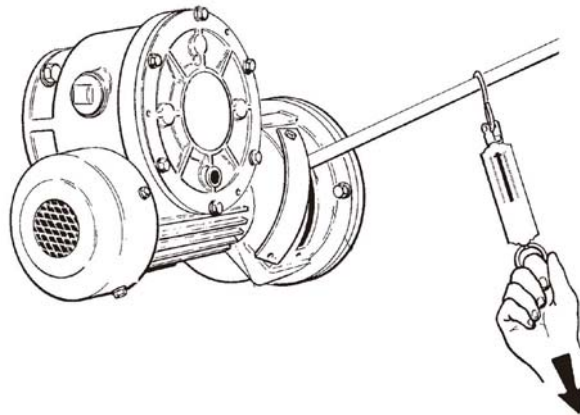


Figure H-5

H.8 Lubrication

Every time install hoist and before putting it into use, lubricate all the accessories. When running normally, conduct as the table.

Before lubricating, clean the lubricated part stained with lime sand clearly, especially the gear, rack, wheel, etc.

H.8.1 After the construction hoist is newly installed and used for a week, clean and replace the lubricant in the

worm reducer. Later, replace it once a half year.

Lubricant which is used to lubricate the worm reducer shall be applied according to the nameplate of the worm reducer; looking up the rules in the reference chart is allowed and no mixed using.

Table H.1 Lubricant / grease selection reference chart

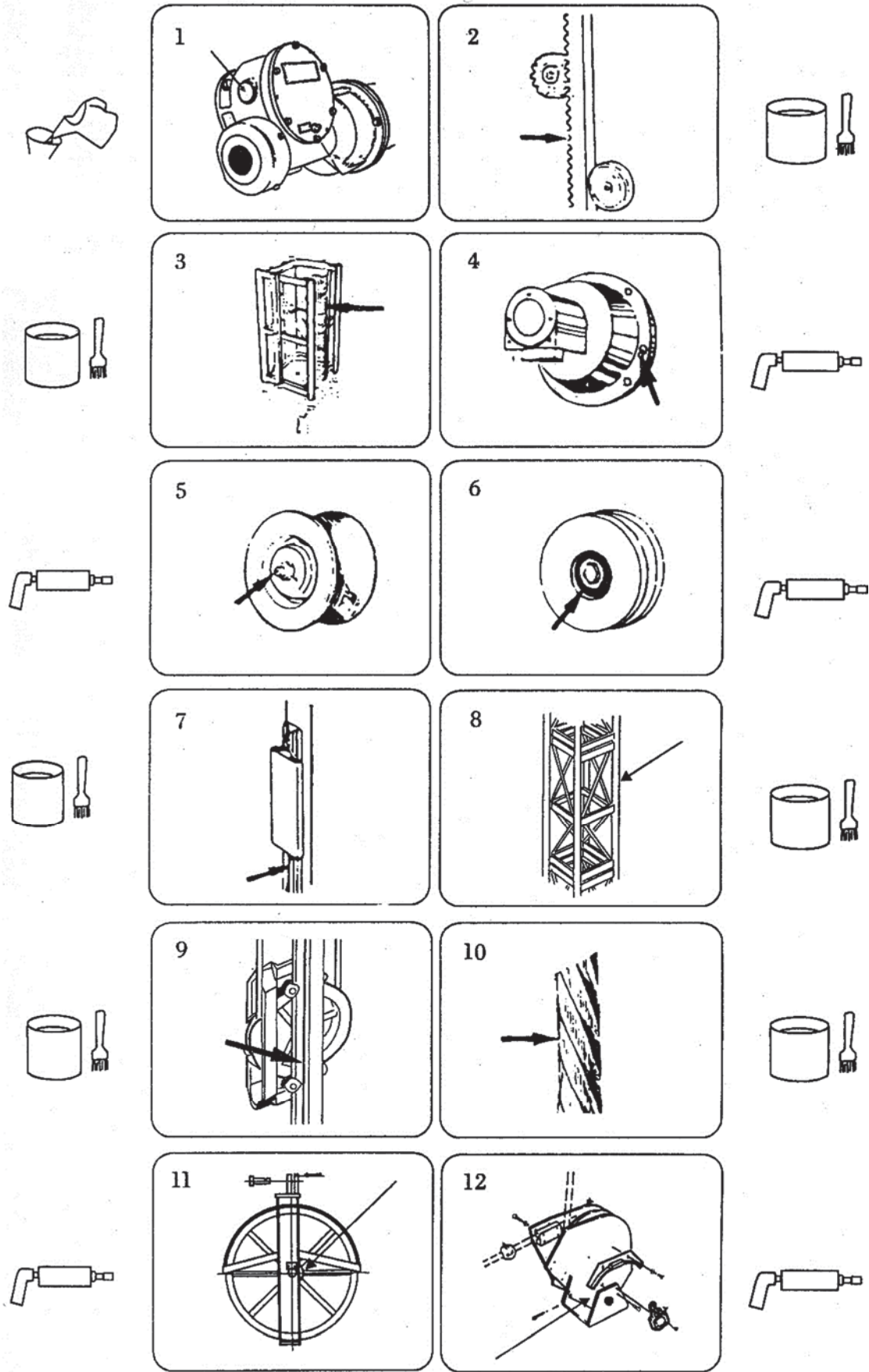
Name	Type	Scope of work	Viscosity 40°C	Made in China	Mobil	SHELL
Worm wheel speed-changing boxes	Lubricant (SH0094)	0 ~ 40°C	288 ~ 352	L-CKE/P 320 Worm wheel oil	Mobilgear 636 GX140	Shell Omala Oi1680
		-20 ~ 25°C	198 ~ 242	L-CKE/P 320 Worm wheel oil	Mobilgear 630 GX140	Shell Omala Oi1220
General purpose	Lubricant (SH5903)	0 ~ 40°C	135 ~ 165	L.CKB 150 gear oil	Mobil Glygoyl e 30	Shell Tivela Oil WB
	Lubricating grease			Lime grease (GB491) Lithium lubricating grease (GB7324)	Mobilux 3	Shell Alvania Grease R3

H.8.2 The lubrication of different parts of the construction elevator components and accessories shall be referred to the regulation of reference Table H.2 and Figure H.6.

Table H.2 lubrication part of components/accessories operating table

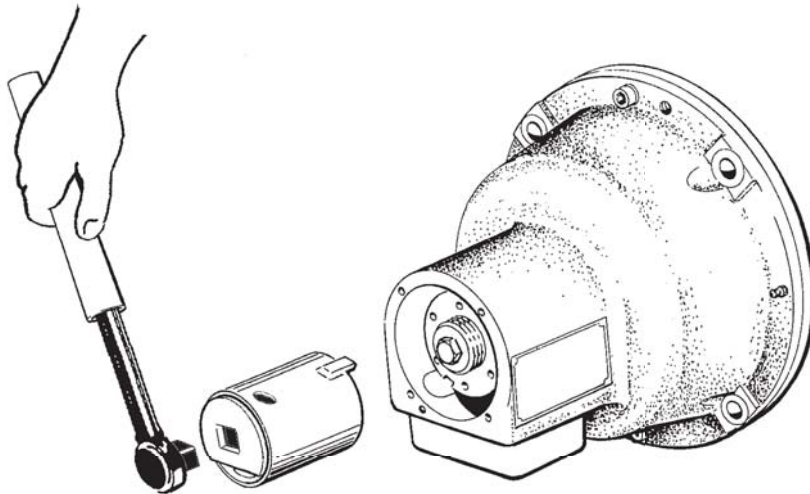
Period	Items	Lubricating position	Lubricant	Consumption	Remarks
Weekly	1	Retarder	Refer to Table H. 1 for details.		Add when necessary after checking oil level
	2	Rack and pinion	2# lime grease		Brushwork
	3	Counterweight slide	2# lime grease		Brushwork
	4	Mast track bracket main	2# lime grease		Brushwork

		pipe (Φ76)			
Monthly	5	Safety device	2# lime grease		Oil gun refuel
	6	Roller	2# lime grease		Oil gun refuel
	7	Back gear	2# lime grease		Oil gun refuel
	8	Door guide pulley and door pulley	2# lime grease		Brushwork
	9	Counterweight guide pulley	2# lime grease		Oil gun refuel
	10	Door slide and door balance weight slide	2# lime grease		Brushwork
Seasonally	11	Window hinge	2# lime grease		Oil gun refuel
	12	Electricity box hinge	20# Gear oil		Drip
	13	Electric brake taper sleeve	20# Gear oil		Instill, must not instill on the friction disk
Every half year	14	Retarder	Refer to Table 8.1 for details.	2.2 L	Replace the lubricant after cleaning





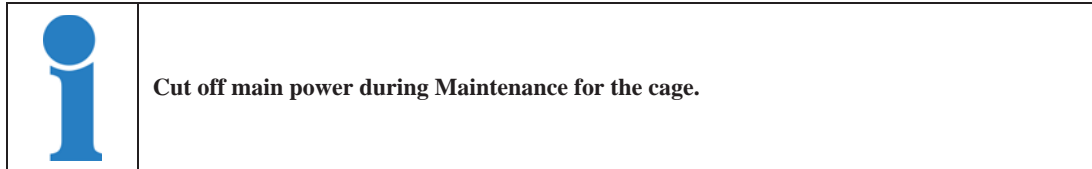
Maintenance



Maintenance for construction hoist mainly consists of electrical system and mechanical system two parts.

Construction hoist Maintenance personnel shall possess related qualification certificate.

I.1 Electrical system failure inspection



Construction hoist maintenance personnel shall inspect electrical system failure with multimeter. Specific check procedures are as follows:

a) Before diagnosing electrical system failure, the maintenance personnel shall understand all theories in electrical schematic diagram as well as component structure and corresponding functions. Meanwhile, confirm the following procedures:

- Confirm shutdown control circuit is not disconnected; namely, thermal relay is not started;
- Safety device microswitch, cage door switch, outer guard rail door switch and other safety device contacts

shall be closed;

- Confirm emergency stop button is not pressed;
- Confirm power proximity limit switch is not disconnected;
- Confirm the upper and lower limit switch is intact, acts correctly.

b) Inspect three-phase power supply input into ground power box on ground stop layer and confirm power has been connected;

c) Check when ground power box master switch (automatic air switch) is open, whether the main contact in the box is connected, and inspect output cable and confirm it has been connected with power;

d) Carry out electrical system failure inspection in the cage after the power has been connected;

e) Connect the voltmeter between zero terminal and the terminal indicated in electrical schematic diagram, confirm the part to be charged with electricity has been connected to power, test shall be carried out terminal by terminal to find out fault location through exclusive method;

f) Check the “up” and “down” instructions (voltage) from control button and device and confirm they have been sent correctly to electrical control box;

g) Cage commissioning to ensure the upper contactor electromagnetic coils have been connected with power (be started) during up and down running. Ensure brake contactor is started (brake coil has been connected with power), brake acts;

h) Above procedures can be used for failure inspection of lighting and other auxiliary circuits.

I.1.1 Electrical system failure inspection experience judgment diagnosis method:

Table I.1 Common failure table of electrical system

Failure phenomenon	What are the reasons?	Failure diagnosis solution
a.It trips along with main power switch	Circuit internal damage, short circuit, or phase line is short connected to ground..	Find out the location of short circuit or grounding, repair or replace.
b.Safety breaker trips	Cable, limit switch damages The circuit is moderate or is short connected to ground.	Replace the damaged cable and limit switch.
c.Construction hoist suddenly shuts down or can not be started.	Shutdown circuit and limit switch are started, safety breaker starts.	Release “emergency push button”; Restore thermal relay function; Restore other safety devices.
d.Cage can not run after being started	Interlocking circuit is open. (Refer to Electrical schematic diagram):	Close the door or release “emergency push button”; check 52 interlocking control circuit, namely: the connection of each gear limiting device between terminal 2 and terminal 12 should be in good condition.
e.Power source is normal, main contactor doesn't get absorbed	Some individual limit switches aren't reset; Connect phase sequence falsely. Component damage or circuit is open.	Reset limit switch; Reconnect phase sequence; Replace components or repair the circuit.
f.It is difficult to start the motor, and there is abnormal sound.	Motor brake is not open or there is no direct voltage(rectifier element is damaged); Severe overloading; Supply voltage is lower than 360V	Restore brake function (adjust working clearance) or restore direct voltage (replace rectifier element); Reduce cage load; Restore supply voltage to 380V.
g.Upper/lower limit switch is out of order	Upper/lower limit switch is damaged; Upper/lower limit collision block is	Replace upper/lower limit switch; Restore upper/lower limit collision

during operation, power proximity limit switch is limited,	moved.	block position
h.During operating, action is sometimes normal and sometimes abnormal.	Circuit contact is not good or terminal wiring is loose; contactor is adhesion or reset is blocked.	Restore circuit contact function, make terminal wiring firm; restore or replace contactor.
i.The cage can be restarted after shutdown, but will shut down again later	The contact of control device (button, handle) is not good and loose; Looseness of phase-sequence relay; Gate limit switch and baffle are misplaced.	Restore or replace control device (button, handle); Fasten phase sequence relay; Restore gate limit switch and baffle position.
j.Automatic stop phenomenon occurs when cage runs up/down	The contact of upper/lower limit switch is not good or damaged; Severe overloading; Control device (button, handle); Contact is not good to damaged.	Restore or replace upper/lower limit switch; Reduce cage load; Restore or replace control device (button, handle);
k.Contactor is burnt down easily	Power supply pressure drop is too large, starting current is too large	Shorten the distance between power supply and construction hoist, or enlarge power supply cable section.
l.Motor is overheated	Brake work is out of sync; Long time overload operation; Start, brake is too frequent; Low supply voltage.	Adjust or replace the brake; Reduce cage load, make appropriate adjustment for operation; Adjust supply voltage.

I.2 Mechanical system fault inspection experience adjustment diagnosis method


Table I.2 Common fault table of mechanical system

Failure phenomenon	What are the reasons?	Failure diagnosis solution
a.Vibration during cage operation is too large	Guide roller connecting bolt is loose;	Fasten guide roller bolt; Adjust pinion and rack back lash or

	Pinion and rack back lash is too large or lack of lubrication; Clearance between guide roller and back gear is too large.	add lubrication; Adjust guider roller and back gear clearance.
b. There is beat when cage starts or stops	Motor braking torque is overload; Block rubber in motor and reducer coupling is damaged.	Re-adjust motor braking torque; Replace block rubber in coupling.
c. Motor beats when the cage is running	Motor fixing device is loose; Motor rubber pad is damaged or lost; Connecting bolt between reducer and driver board is loose.	Fasten motor fixing device; Replace motor rubber pad; Fasten connecting bolt between reducer and driver board.
d. There is beat when cage is running	Mast section tube docking jump is too large; Rack bolt is loose, docking jump is too large; Heavy wear of the gear.	Adjust mast section tube docking; Fasten rack bolt and adjust docking jump; The gear wheel shall be replaced.
e. There is swing when cage is running	Guide roller connecting bolt is loose; Supporting board bolt is loose.	Fasten guide roller connecting bolt; Fasten supporting board bolt.
f. Cage start/brake vibration is too large	Motor braking torque is too large; Pinion/rack back lash is improper.	Re-adjust motor braking torque; Re-adjust pinion/rack back lash.

<p>g.Brake pad wears quickly</p>	<p>Bad lubrication of brake thrust bearing, can't work synchronously. Power supply pressure drop is too large, brake voltage is insufficient, brake can't be opened.</p>	<p>Lubricate or replace bearing; Shorten the distance between power supply and construction hoist, or enlarge power supply cable section, increase working (braking) voltage.</p>
<p>h.Brake noise is too large</p>	<p>Brake thrust bearing is damaged; Brake rotary disc swings.</p>	<p>Replace brake thrust bearing; Adjust or replace brake rotary disc.</p>
<p>i.Worm wheel of speed reducer is worn too fast</p>	<p>Model of lubricating oil is not correct or not replace lubricating oil on time; Center distance between worm wheel and worm deviates.</p>	<p>Replace the lubricant; Adjust the center distance between worm wheel and worm.</p>
<p>j.Glide distance is too long when cage brakes.</p>	<p>Motor braking torque size</p>	<p>Adjust regulating sleeve of motor tail end appropriately. Replace brake block(brake disc)</p>

I.3 Replacement of wearable parts

	<p>Cut off the main power when perform cage maintenance.</p> <p>Cage must stop on the buffer spring in the bottom when carry out inspection.</p> <p>For the cage equipped with counterweight device, the cage must be locked on the mast.</p>
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I.3.1 Replace the motor

- a) Take the top hole cover on the top of the cage down. (Lifting hook of hoisting device can be put in from the top hole);
- b) Dismantle electric connection of electromotor and well mark it in order to rewire after replacing the electromotor;
- c) Hoisting device or tool (truck crane and chain block, etc.) whose lifting weight is greater than 200kg should be set above the replaced electromotor;

- d) Dismantle speed reducer on driver board and connecting bolt on motor stand. Discharge speed reducer and electromotor assembly;
- e) Dismantle bolts around the connecting flanges of electromotor and speed reducer, and take out electromotor;
- f) Loosen retaining screw, use three-jaw draw plate to remove half-coupling from principal axis of electromotor;
- g) Use lithium lubricating grease to lubricate principal axis of new electromotor and use installation tool to reload half-coupling to principal axis of electromotor and screw in the stop screw;



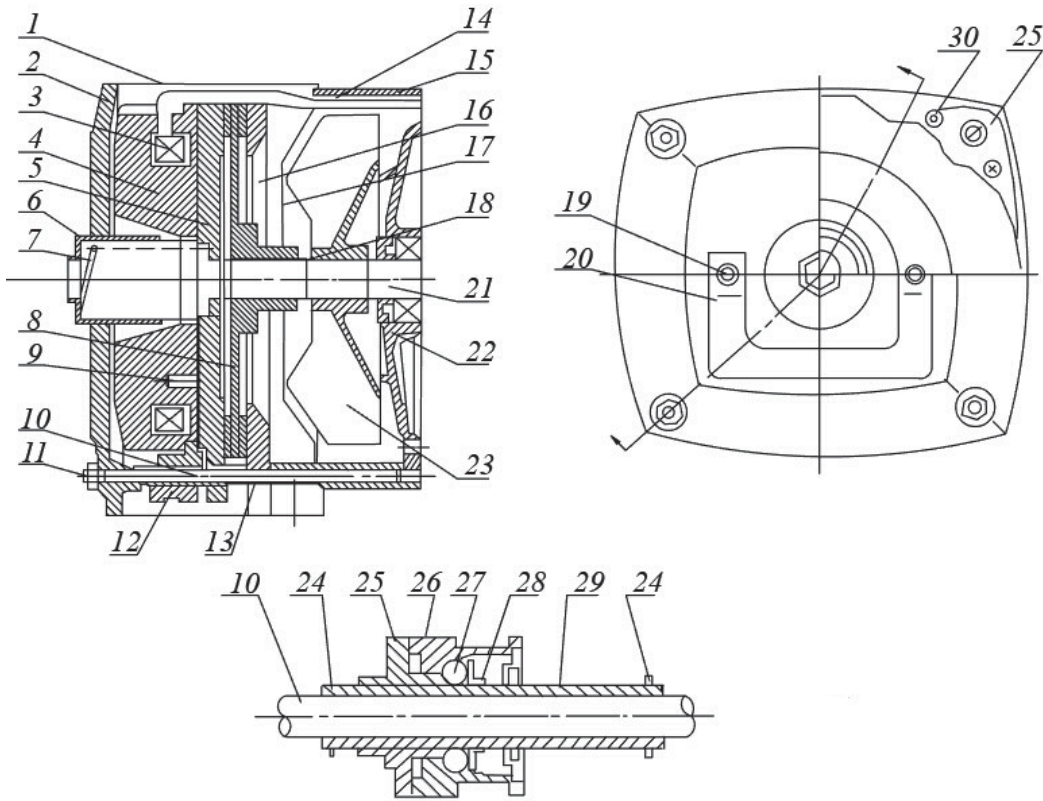
Do not use hammer to hit when install coupling, only rubber hammer can be used to hit.

- h) Place module below the motor brake release handle (or use the method in Figure 6.9), loose the motor brake;
- i) Make left half-coupling coincide with right half-coupling and make their clearance conform to requirements and use bolt to connect electromotor with speed reducer After installed, coaxiality error of motor shaft and worm shaft is less than or equal to 0.05mm;
- j) Lift up electromotor with speed reducer, use bolt and motor stand to fasten it to driving baseboard, tightening torque of speed reducer and baseboard connecting bolt is 170N•m;
- k) Dismantle hoisting devices or tools;
- l) Connect cables, install motor housing and dismantle the module below the brake release handle (or reset screw nut);
- m) Adjust braking torque according to instruction about inspecting braking torque in Chapter H "*Inspection of lubrication*";
- n) Install cage hole cover which has been dismantled;
- o) Connect the main power and perform trail run to ensure the brake can be operated normally.



Replaced electromotor models must be consistent.

I.3.2 Maintenance of electromagnetic brake

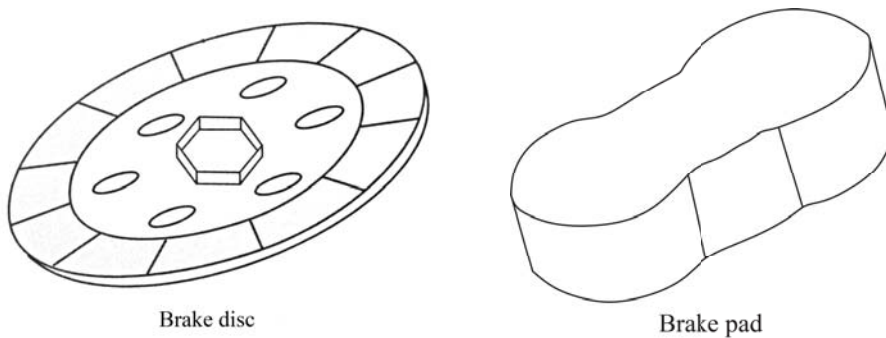


Figures I-1

- 1. Motor protection 2. End cover 3. Magnet coil 4. Magnet frame 5. Armature
- 6. Adjusting shaft sleeve 7. Brake spring 8. Rotatable brake disc 9. Compression spring
- 10. Brake pad 11. Bolt 12. Nut 13. Ferrule 14. Coil wire 15. Wire clip 16. Fan
- 17. Fixed brake disc 18. Fan casing 19 Key 20. Set screw 21. End cover

Major part of electromagnetic disk brake is DC electromagnet which is equipped with rotatable brake disc of brake pad which can freely moves in axial direction. Two stationary brake discs (they are respectively electromagnet/armature which can automatically follow up brake pad).

The distance between electromagnet and armature holds constant.



Figures I-2

- When electromagnet coil(3) is not charged with electricity, apply braking torque to the brake, brake spring(7) press brake pad (10) on stationary brake disc(17) through armature which can move in axial direction from axial 1. When electromagnet coil is charged with electricity, the brake is released.

- Brake can adjust constantly and automatically along with the wear of brake pad(10), that is it adjusts through armature (5) and electromagnet frame approaching to rotatable brake disc(8) automatically and the distance between electromagnet and armature is constant.

- When brake disc and brake block are worn to a certain extent, they must be replaced.

I.3.2.1 Manual brake release of brake, manual brake release can be done if necessary, procedures for brake release:

- a) Brake can be released after pulling brake release handle at the tail end of brake open to a certain extent.
- b) Tighten brake tail end bolt through methods in Figure 6.9 until pressure that brake spring (7) putting on armature is invalid, then brake is released at this moment.



Braking torques of brakes have been adjusted well when they leave factory, so do not easily change the braking torque when do manual brake release.

I.3.2.2 Replacement of brake pad


Brake pad (10) of brake must be replaced before clearance between armature (5) and rotatable brake disc (8) is less than 5mm. Procedures for replacing pad:

- a) Dismantle protective cover (1);
- b) Measure and make a location mark for adjusting shaft sleeve (6) so that the adjusting shaft sleeve can be installed to its original position after replacing pad;
- c) Dismantle adjusting shaft sleeve (6) and take out brake spring (7);
- d) Unscrew the nut (12) and turn it to tail end of the bolt (11);
- e) Drag end cover (2) out and make it cling to the nut (12);
- f) Drag magnet frame (4) out and put it close to end cover;
- g) Dismantle old brake pad (10) using special tools and install new brake pad;
- h) Push magnet frame (4) back to its position along the bolt (11), make armature (5) stick closely to new brake pad;
- i) Push end cover back (2) and tighten the nut (12);

j) Reinstall the spring (7) and screw adjusting shaft sleeve (6) to original position according to the requirement of b);

k) Try the brake out several times and put it into service until it normally work after inspection;

l) Install protective cover (1).

	<p>When replace brake block, take ten blocks as one group, they must be replaced at the same time. Thickness tolerance of brake blocks in the same group is not more than 0.01mm, their surface can not be stained with oil.</p>
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I.3.2.3 Procedures need to be checked when the brake fails to act (be released):

- a) The regulator shall work normally;
- b) Contactor of the brake should work normally;
- c) Measure the voltage of electromagnet coil (rated value DC 195V);

Replace corresponding electrical elements if problems were found in the inspection of above three items.

I.3.3 Replacement of safety device

- a) Open cover cap below safety device and dismantle electric wire of microswitch;
- b) Loosen bolts fixed on safety device plate and dismantle safety device;
- c) Install a new safety device, make mounting flange cling to safety device plate and tighten bolts connected to safety device plate;
- d) Switch on electric wire of microswitch to do drop test;
- e) Reset safety device and lubricate it according to instruction in Chapter 8 "Inspection of lubrication".

	<p>Do not use hammer to hit when install safety device, only rubber hammer can be used to hit and drop test must be done after replaced.</p>
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I.3.4 Replacement of guide roller

When guide roller reaches wear limit stipulated in Clause H.5, through adjusting eccentric shaft to limit case, it still can not meet the requirement of clearance stipulated in Clause F. 6. 1. and guide roller should be replaced.

I.3.5 Replacement of side guide roller

- a) Lock (put aside) the cage, loosen load of side guide roller to be replaced;
- b) Dismantle side guide roller using special purpose spanner;
- c) Install a new side guide roller and rotate eccentric shaft of side guide roller;
- d) Tighten fixed bolt and tightening torque is 200N•m .

I.3.6 Replacement of upper double guide roller

- a) Stuff a carve iron between mast stand column pipe and safety hook and fix cage on the mast; When guide

roller is dismantled, carve iron should have adequate support so as to make the cage can not slide down;

b) Loosen positioning bolt of guide roller, rotate eccentric shaft to leave a suitable clearance between guide roller and mast stand column pipe;

c) Dismantle old guide roller;

d) Install new guide roller, adjust eccentric shaft of guide roller until carve iron becomes flexible and falls down, then tighten fixed bolt, tightening torque is $170 \text{ N}\cdot\text{m}$.

I.3.7 Replacement of lower double guide roller

a) Stuff a carve iron outside of lower safety hook and mast stand column pipe and fix cage on the mast;

b) Loosen central shaft nut of lower double guide roller device and dismantle the whole double guide roller device;

c) Loosen positioning bolt or nut of guide roller device and dismantle old guide roller from double guide roller device;

d) Install a new guide roller, do not tighten positioning bolt or nut;

e) Reinstall lower double guide roller device fitted with new guide roller to its original position, tightening torque of center axle is $600 \text{ N}\cdot\text{m}$;

f) Adjust eccentric shaft of guide roller until carve iron becomes flexible and falls down and tighten the positioning bolt of guide roller (Tightening torque is $170 \text{ N}\cdot\text{m}$).

I.3.8 Replacement of transmission gear

Before installation, check the abrasion status of the transmission gear for easy replacement.

Suggestion: even if the abrasion loss has not reached the maximum allowable value, gear that can just work for a short period through verification should also be replaced.

When replacing the transmission gear of the construction hoist that has been put into use,, the cage must be stopped stably on the base frame with sleeper, the height of the sleeper must be larger than that of the buffer spring and it should be flat and solid to dismantle the gear. Then, replace the gear as the following procedures:

a) Remove the external circlip for shaft on the outer side of the transmission gear, and use special dismantling tool to dismantle the old gear;

b) Clean and lubricate the spline of the principle shaft, and then install the new transmission gear;

c) Install armshaft circlip;

d) Check the meshing status of the pinion and the rack and make adjustment in accordance with relevant contents of Article H.4;

- e) Remove the sleeper under the cage.

I.3.9 Replacement of the rack

In accordance with stipulations in Article I.7.2, if the rack has reached the extreme of abrasion or been damaged, replace it as the following procedures:

- a) Dismantle the old rack, (if it is difficult to dismantle, use gas welding to heat the rack to loose the bolt);
- b) Clean the threaded hole on the cushion block of the rack;
- c) Install new rack. The tightening torque of the bolt is $170N\cdot m$.

I.3.10 Replacement of backgear

a) Use special jig to clamp the rack and the transmission gear as well as the gear of the safety device separately to dismantle the backgear;

- b) Remove the old backgear;

c) Install the new backgear, adjust excentric sleeve to make the gap between the backgear and the reverse side of the rack 0.5mm. Then screw up the fixed bolt, the tightening torque is $300N\cdot m$;

- d) Special jig for dismantlement and bow-shaped clamp.

I.3.11 Replacement of worm reducer

a) Separate the electromotor and the worm reducer in accordance with the procedures stated in the “Replacing the electromotor” of Article I.3.1;

- b) Use the special drawplate to dismantle half of the coupling from the reducer;

- c) Clear the lubricating oil of the reducer;

d) Equipping the new reducer with the transmission gear should abide by the procedures of Article I.3.8 “Replacement of transmission gear”;

- e) Smear lubricating grease on the input shaft of the new reducer, and install the other half dismantled coupling;

- f) Place the module under the brake-releasing handle of the electromotor to release the brake of the electromotor;

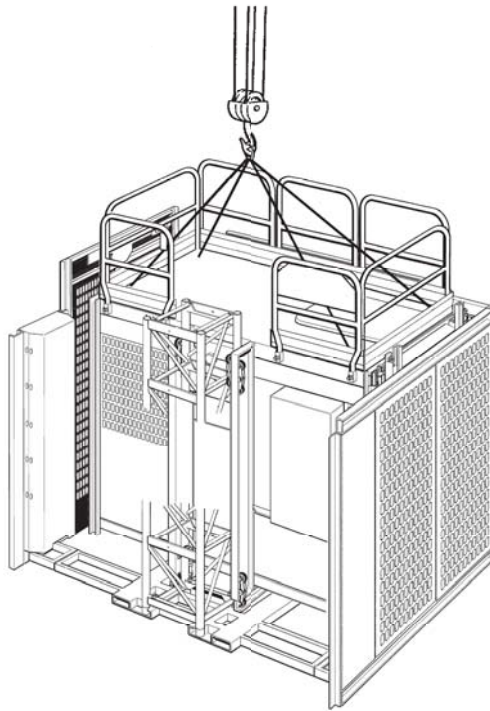
g) Make the half-coupling on one side of the reducer fit with the half-coupling on one side of the motor. The gap between them complies with the requirements and use bolts to connect the electromotor and the reducer.

Meanwhile, ensure the coaxial error between the motor shaft and worm shaft is less than 0.05mm;

h) Install the reducer and the assembly of the electromotor in accordance with relevant procedures of Article 1.3.1 “Replacing the electromotor”.



Disassembly



J.1 Disassembly of Safety Setup Procedure

Before disassembly, construction personnel shall know, master and read the detailed regulation on disassembly in chapter B “Important explanation on safety”. And carry out the following disassembly procedure:

- a) Construction personnel must follow ten disciplines of safety production after entering the disassembly construction site;
- b) Disassembly construction site shall set safety alert area and arrange specially-assigned personnel for monitoring;
- c) Construction personnel shall not wear hard shoes and high-heeled shoes, wear close-fitting clothes, and wear safety belt;
- d) Personnel shall find the safe and suitable position in own post, wear safety belt and safety hook when working high above the ground such as installation and disassembly of mast section;
- e) In the disassembly procedure of construction hoist, the scrapped rope and hoisting machines and tools shall not be used. Bolt, shaft pin and split pin disassembled shall be kept properly;
- f) It is prohibited to conduct vertical transport during the descending of construction hoist;
- g) Pay attention to make guide wheel of the cage close to the mast section during the descending of construction hoist.

J.2 Preparatory Phase of Disassembly Operation

- a) Check whether all parts work normally before disassembly of construction hoist. Conduct the disassembly construction after confirming all are under normal situation;
- b) Before the disassembly of construction hoist, check the foundation and attachments of construction hoist, and conduct the construction after confirming they are under normal situation;
- c) Clean the site for disassembly, and make sure that the road surface of the site shall be level and solid, and have no any barrier;
- d) Make sure that there is no high-voltage wire and cable over the site, and if any, they shall be approved by relevant department;
- e) The construction party of disassembly of construction hoist shall make the program document of Assembly and Disassembly Construction Task Disclosure List of Construction Hoist and Assembly and Disassembly Construction Scheme of Construction Hoist, and complete the procedures related to certificate confirmation;
- f) The construction party of disassembly of construction hoist shall make the detailed Assembly and Disassembly Construction Scheme of Construction Hoist.

J.3 Implementation Phase of Disassembly

- a) Construction personnel shall read and be familiar with the operation instruction and disassembly construction scheme of construction hoist, and make sure that the whole process of disassembly is implemented in accordance with the relevant operating provision of construction hoist to be disassembled;
- b) Construction personnel shall supervise relevant personnel entering the construction site, and follow the safety discipline of construction site;
- c) Construction personnel shall follow the operating provision of descending construction hoist, and descend it to the specified height, and disassemble the relevant attachments according to the condition of construction site;
- d) Construction personnel shall conduct the safe operation for disassembly of construction hoist step by step according to the disassembly procedure of construction hoist to be disassembled;
- e) Construction personnel shall check the connection and fastening of all parts during the disassembly of construction hoist, correct the problem, and make sure that operation of construction hoist is safe and reliable during the disassembly;
- f) Construction personnel shall make timely cleaning, packing, transport and transfer after the disassembly of construction hoist. Construction personnel shall complete the transfer for use and storage for maintenance.

J.4 Disassembly Operation Procedure

Disassembly operation of construction hoist is basically same with installation procedure, but the order is completely opposite. (Detailed disassembly procedure see the flashback procedure of chapter 6 “Installation and Commissioning”). Here, following procedure for disassembly is introduced:

- a) Put operation box on the top of the cage for disassembly operation;
- b) Install the suspender on the top of the cage;
- c) Drive the cage to the top of mast, and disassemble the upper limit switch cam and power limit switch cam;
- d) Remove the buffer spring with counter weight, and put high enough sleeper under the counter weight;
- e) Drive the cage upwards for proper distance, and stop the counter weight at the sleeper, and unload the steel wire rope;
- f) Remove the steel wire rope from the counter weight and eccentric ropes, and use steel wire rope coil to pack up all steel wire ropes;
- g) Disassemble the head sheave;
- h) Disassemble the mast (mast section) and mast tie, and disassemble the cable guiding device;
- i) Retain the bottom mast composed of three mast sections, remove the suspender, and buffer spring under the

cage, stop dog of lower limit switch and limit switch;

j) Put two suitable sleepers on the base frame of fence;

k) Release the brake handle of engine brake to let the cage glide to the sleeper and stop steadily;

l) Cut off the main power of power box on the ground, and remove the cable connected to the cage;

m) Hang drive system away from mast;

n) Hang the cage away from mast;

o) Hang the counter weight away from mast;

p) Disassemble the fence and retained three mast sections;

q) When disassembling the mast, make sure that the highest guide roller of the cage shall be under the joint of mast (mast section) to be disassembled, and remove the connecting bolt only after lifting device and suspender are put in place.



Disassembly operation cannot be conducted when wind speed is more than 12.5m/s, or under lifting device such as thunderstorm or snow!

Press the stop button in the operation box when conducting disassembly of the cage!

Appendix

1. Appendix I

Table J.1 Construction hoist electronic component table

Serial No.	Name	Diagram No.	Model specification	Quantity	Remarks
1	Control transformer	BK1	JBK-160	1	
2	Control transformer	BK2	JBK-700	1	
3	Bridge rectifier	D	KBPC 35-10	1	1000V/10A
4	Trembler	DL	UC-100-200V	1	
5	Weak Current circuit loop	FV	RX20-20-1.5KΩ ZP10	1	
6	phase sequence protective relay	KAP	XJ3-G/380V	1	
7	Intermediate relay	KA1	J2C4-22	1	For conversion
8	AC contactor	KB	CJX2-1801	1	For braking
9	AC contactor	KH	LCD1 95E7C	2	
10	AC contactor	KM; KM1; KD	LCD1 80E7C	3	
11	Electric motor	M1; M2; M3	YZEJ 132M-4	3	
12	Miniature circuit breakers	QF2/QF3/QF5	DZ47-60 C6 1P6KA	4	
13	Load breaker	QF1	NM1LE-100S	1	
14	AC limit switch	QB	QJK16-100	1	
15	Instruction operation switch	SHD	XD2 PA22CR	1	
16	Button	SDL	ZB2-BA2C	1	For bell
17	Button	SFL	ZB2-BD2C	1	For lighting
18	Drop test box			1	For drop test
19	Cage top operation box			1	For installation and maintenance
20	Load breaker	QF4	DZ47-60C102P	1	
21	Travel switch	SQ1、SQ2、 SQ3、SQ4	YBLX-43/20S/T	4	
22	Travel switch	SQD; SQH	XCK-JC	2	
23	Voltage suppressor	UR		1	
24	Voltmeter	V	8511-V	1	
25	Relay	FR1、FR2、 FR3	NR4-63	3	
26	Scram button	STP1、STP2、 STP3	ZB2-BS54C	3	

2. Appendix II

Table J.2 Construction hoist main damageable parts table

Serial No.	Name	Part coding	Model specification	Quantity	Remarks
1	Transmission gear	00040010380000001		6	
2	Cam set assembly	00040010280005000		4	
3	Wheel Assembly	00040010280003000		32	
4	Long roller assembly	00040010780120000		8	
5	Oil seal	H G4- 692- 67	PD 40× 52× 7	6	
6	Button	GB14048. 5	LAY3-11ZS/1	2	Scram button
7			LAY3-11×2	2	Power starting switch
8			LAY3- 11	2	Bell button
9	Instruction operation switch		XD2 PA22	2	Up and down
10	Buffer octagonal rubber	103040001031	ML8	6	Coupling
11	AC contactor		LCD195E7C	4	
12			LC1D18E7C	2	
13	Micro switch		LXW5-11QI	2	Safety device
14	Travel limit		XCK-JC or YBLX- K3-20S/ T	14	Upper, lower; limit; limit inside the cage; limit of fence door
15	Brake Pads	BZJ.274. 030	FM- I03G copper-based powder metallurgy material	60	Motor
16	Disc brake pad	5ZJ. 275. 038	copper-based foam asbestos	6	
17	Bearing	GB/T276. 1994	6308-Z(40 × 90× 23)	6	
18		GB/T276. 1994	6308-Z(35 × 80× 21)		
19	Bearing	GB297- 84	7510		Retarder
20		GB297- 84	7313		
21		G8283-81	42309		
22	Bearing	G8298-64	27309E	4	Retarder
23		GB1235-76	220× 5. 7		Retarder
24		GB1235-76	140× 3. 1		
25	O-type sealing ring	GB1235-76	115× 3.1		
26		GB1235-76	100× 3. 1		Retarder
27	Bridge rectifier		1000V/ 10A	8	

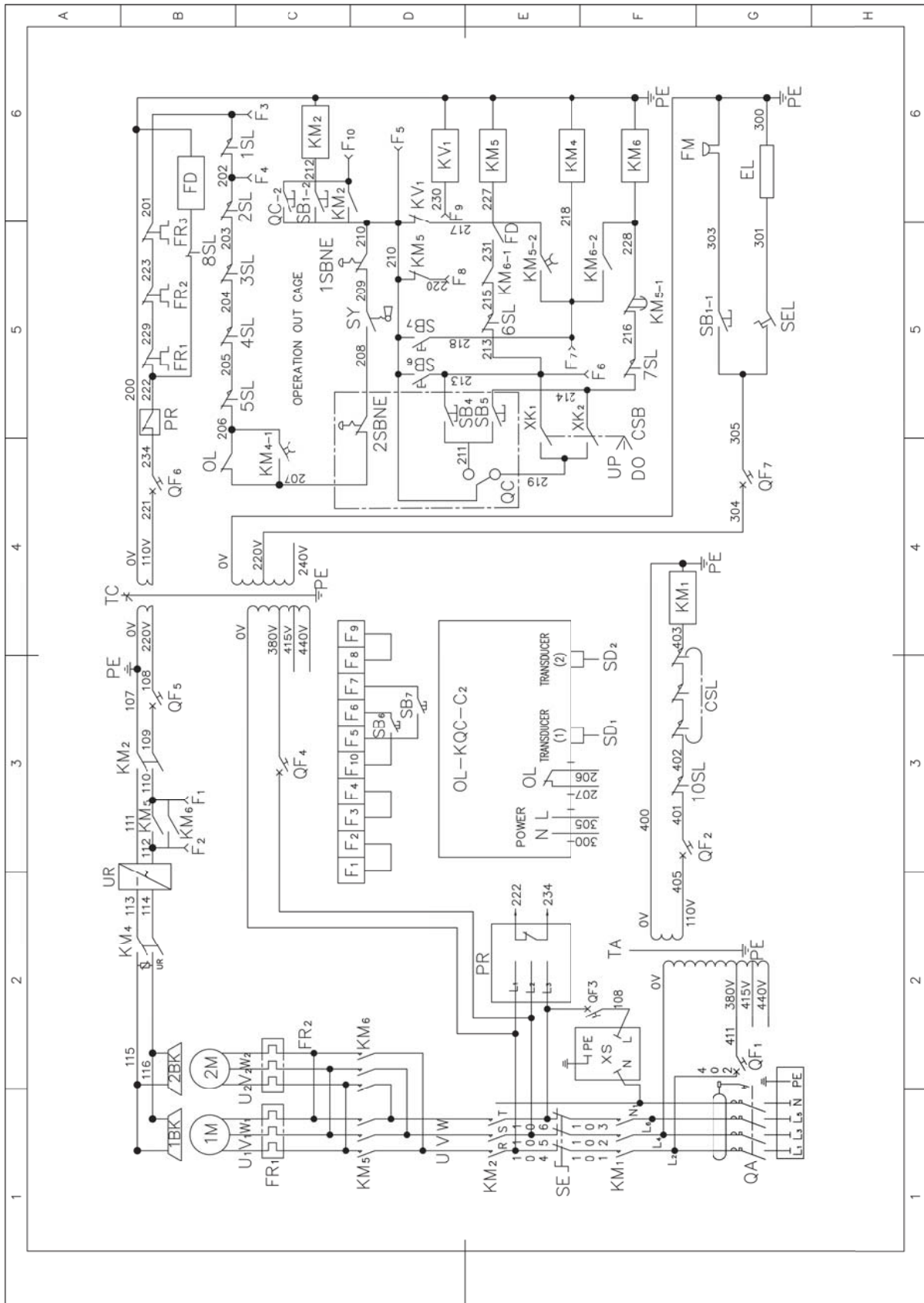
Notes: Number in above table is for construction hoist with double cages and three engines.

3. Appendix III

Table J.3 Construction hoist main purchased parts table

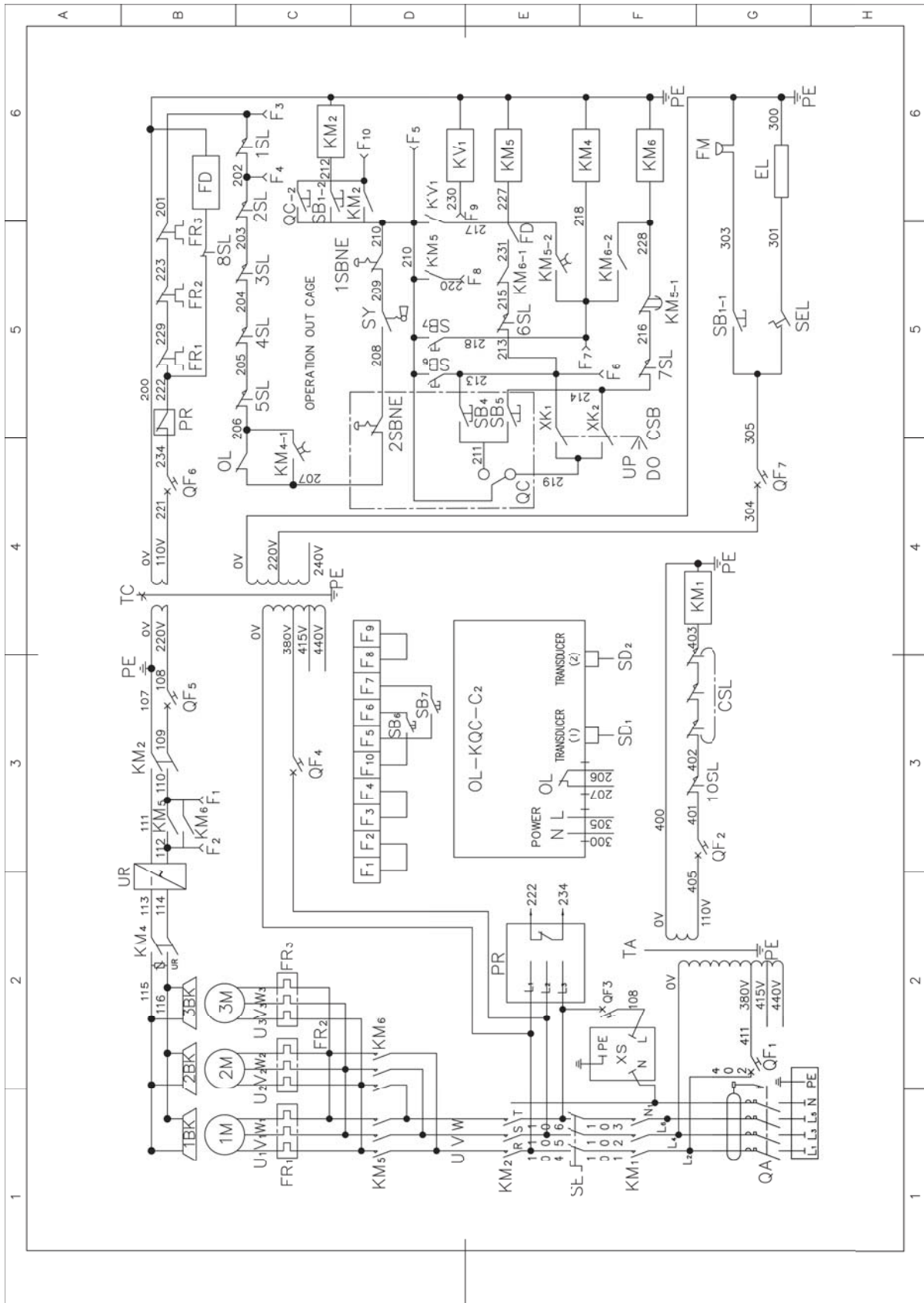
Serial No.	Name	Quantity		Model	Specifications
		Single cage	Double cages		
1	Electric motor	3	6	YZEJ 132M- 4	P=11KW JC=25%
2	Retarder	3	6	TCW125-16	i=16 L=125mm
3	Safety device	1	2	SAJ30 - 1. 2	Rated brakeload: 3kN Rated braking speed: 1. 2m/s
				SAJ40-1. 2	Rated brakeload 40kN Rated braking speed: 1. 2m/ s
4	Power supply cable			YC cable	3× 16+2× 6
5	Guide roller	20	40		Bottom diameterφ74mm
6	Transmission gear	3	6		m=8; z=15
7	Rack (each mast section)	1	2		m=8; z=60
8	Overload protection	1	2	SC-1	

4.Appendix IV



Two motors control

5. Appendix V



Three motors control