Instruction Manual M306,307-12_R6

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PERSONNEL-AND-MATERIAL HOISTS

NOV 2738 UP(3) F
NOV 3238 UP(3) F
NOV 3242 UP(3) F

Číslo manuálu: M306,307-12
Číslo revize: 12/2020 – R6

Výrobní číslo: ……
Rok výroby: ……..…

Zakázka: ……

M307-12 (M306-12)

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APPENDICES

SUPPLEMENTS

FOREWORD

This manual contains product information, specifies requirements for safe installation, operation, maintenance and periodical re-inspection and testing of construction hoists:
NOV 2738 UP(3) F
NOV 3238 UP(3) F
NOV 3242 UP(3) F

It also contains important information regarding the disposal of the hoist.
The hoist is based on the EN 12159 and ANSI/ASSE A10.4 standards.
Each person that is to install, operate, maintain or test the hoist must be thoroughly acquainted with all the parts of the manual that are relevant for their activity to avoid causing injury to themselves or others, or substantial property damage. It is essential to know the risks that arise from disregarding work safety principles.

The manual therefore contains highlighted sections (in bold print) introduced by the following symbol:

This symbol means “CAUTION! YOUR SAFETY AND THE SAFETY OF YOUR CO-WORKERS IS IN DANGER!”

This symbol means “CAUTION! ELECTRIC SHOCK HAZARD.”

Activities that may cause damage to the equipment are introduced with the exclamation mark symbol.

Additional and complementing information is introduced with the lightbulb symbol.

The requirements contained in this manual are based on customary regulations, knowledge and equipment standards. Local regulations governing the equipment may deviate from instructions contained in this manual. In such cases, the more stringent of the requirements (in favor of higher work safety) will prevail.

Consult special applications, modifications to the hoist and specially fabricated components with the supplier or manufacturer of the equipment.
If the hoist contains non-standard components, a corresponding supplement will be supplied with this manual.

Requirements for qualification of hoist personnel (operation, maintenance, tests) are stipulated in the respective sections of the manual. It is unacceptable for persons without appropriate (and in some cases documented) qualification to work on the hoist.

The intervals stipulated for periodic maintenance, inspections and tests must not be exceeded. If these intervals are given in hours of operation as well as time periods, the interval that comes first will prevail. Activities noted “as needed” will be determined by the hoist user according to the operating conditions.

The manufacturer cannot foresee all the contingencies that may pose possible risk hazard. Therefore, the information and warnings contained in this manual are not comprehensive and exhaustive. When using a tool, procedure or equipment that is not explicitly recommended, you must verify whether it is safe for you and others and if it may damage the equipment or impair its safety.

In the course of using the hoist, procure the latest information regarding the equipment and its operation from the manufacturer or your supplier.
This manual does not determine the configuration in which the machine is supplied. It is a matter of the purchase contract to specify the tower height, number of tie-ins, cable guides, landing gates etc. Consult your supplier.

Before introducing the hoist into the local market, the importer of the machine (or another responsible party) must make out a NATIONAL SUPPLEMENT to this manual in compliance with the local regulations enforced in the country to which it is imported. This document complements, specifies or stipulates other important requirements for the hoist according to the local regulations that govern this type of equipment in the given country. If these regulations require certification from the local authorities, it is the responsibility of the importer to ensure such certification. Without it, the equipment may not be introduced into the market or operated.
The NATIONAL SUPPLEMENT must also stipulate responsibilities of persons using the equipment.

The manufacturer is not responsible for damage caused by disregard of the safety requirements that the manufacturer stipulates, or by curtailing these requirements.

TERMINOLOGY AND SIGNS

TERMINOLOGY

Manual - this document. The major part of operating documentation, which also includes supplements to this manual, spare parts catalogue, logbook, unless agreed otherwise in the purchase contract.

Local regulations - national and local regulations, requirements and authority stipulations pertaining to the given type of equipment and its operation.

Authorized specialist - a person authorized to perform specialist inspections, erection and specialist tests in the required extent.

Authorized person – a designated person, properly trained, qualified by their knowledge and experience, acquainted with applicable codes and regulations, and competent to perform the required activities.

Operator – a person operating the hoist.

Hoist user - a person responsible for the operation of the hoist.

Operation : **in operation/service -** situations while the hoist is in use. The hoist may by at any position, loaded or unloaded, in motion or stationary.

Out of operation/service – a situation when an unloaded car is at the base, disconnected from the mains, and the main disconnect switch in the OFF position and locked.

Emergency actions - procedures for rescuing personnel from the hoist car with the assistance of an authorized person.

EMERGENCY STOP (E-stop) - a device that will stop the hoist and prevent its further operation

Safety distance – the minimum distance between any moving part of the hoist and any place accessible by persons.

Hoist way- the space in which the hoist travels.

Nominal capacity/Rated load - the maximum permissible mass of persons and materials.

Foundation slab – a slab made of reinforced concrete, to which the base frame of the hoist is attached.

Hoist unit- an assembly consisting of a complete base enclosure and a complete hoist car, including control panels and motors.

Base frame - the lowest located load-bearing structure. Vertical forces and bending moments from the hoist operation are transferred into the foundation slab via the base frame.

Mast/Tower - a structure that supports and guides the hoist car. The mast consists of mast sections.

Tie-ins - a system of horizontal supports connecting the mast to the building.

Second car- an additional car in a dual configuration of the NOV 2738 / 3238 / 3242 UP(3) F – II.

Drive unit - it consists of three motors and the safety device.

Landings - the stories in a building (or another structure) designated for loading and unloading the hoist car.

Landing equipment (supplied with the hoist) – a set of landing gates or landing bars, and other parts.

Landing gate – a single-piece hinged, or center swing door, which is mechanically blocked and electrically checked. It allows access into the hoist car from a landing.

Landing bar – an electrically checked movable bar. It allows access into the hoist car from a landing.

Normal limit switch – a device that stops the hoist at the terminal (top and bottom) landings.

Slow down limit switch – it slows the hoist down before it stops at a terminal (top or bottom) landing.

Final limit switch – a device that stops the hoist in the event that it overrides a normal limit switch.

Travelling/Trailing cable – a cable connecting the control panel at the base station with the panel located on the hoist car.

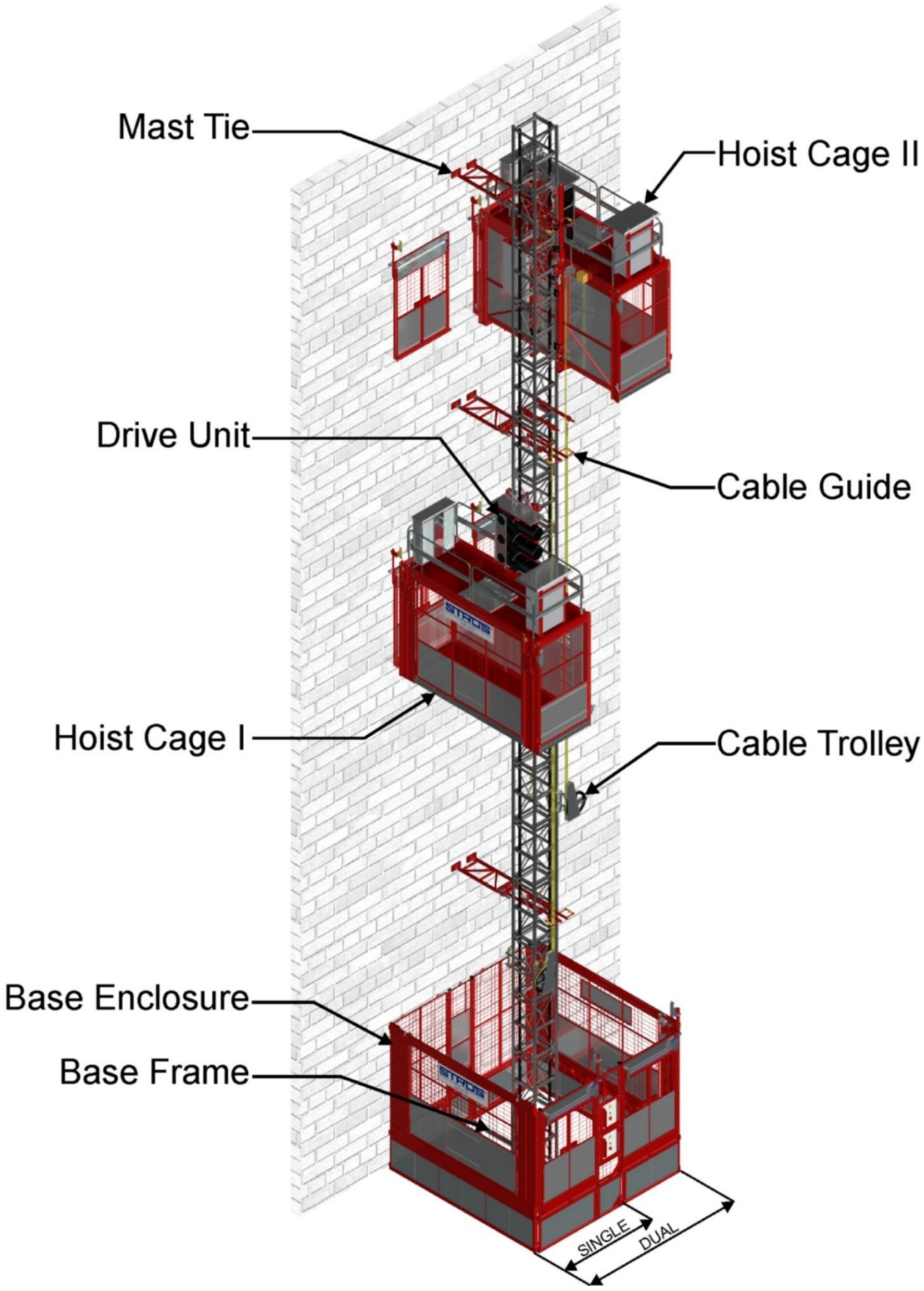
Handling set – part of the hoist accessories. A wire rope lifting device for the hoist car and the hoist unit.

Cable trolley – a device that tenses the travelling cable. It is used with greater tower heights.

Overload (protective) device – a device preventing the car from being overloaded**.**

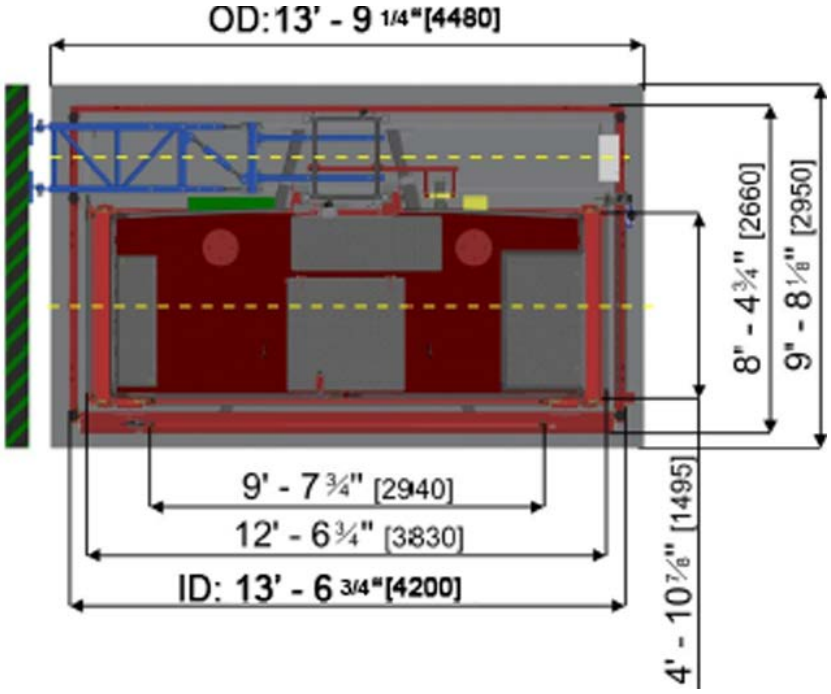
SIGNS

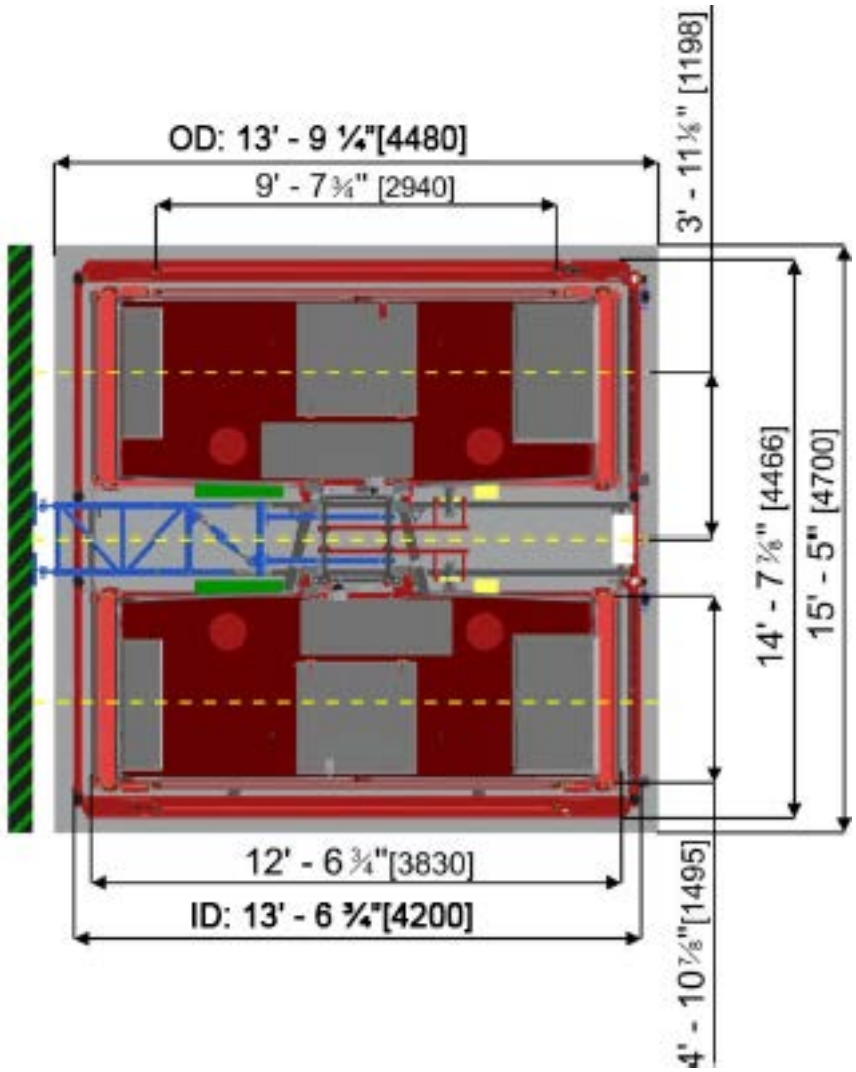
H ft. (mm) …… .mast height
Z ft. (mm) …… .lifting height
L ft. (mm) ……....the distance from the mast center line (y) (tie-in length)
B ft. (mm) …….. horizontal distance between tie-in points on the face of the building
a ft. (mm) ……...….vertical distance of the first tie-in from the ground
b ft. (mm) …… vertical distance between tie-ins
c ft. (mm) ……top mast overhang (untied)
s ft. (mm) ……width
d ft. (mm) ……length
v ft. (mm) ……height
J.N. lb. (kg) ……..nominal capacity
P lb. (kg) ……..vertical loads imparted on the foundation slab
p lb./inch^2 (MPa) …..…… ground pressure from the foundation slab
x …… mast center line (perpendicular to the building)
y …… mast center line (parallel with the building)
(SP) …… Special Procedure. It is detailed in another part of the manual, or its supplement.



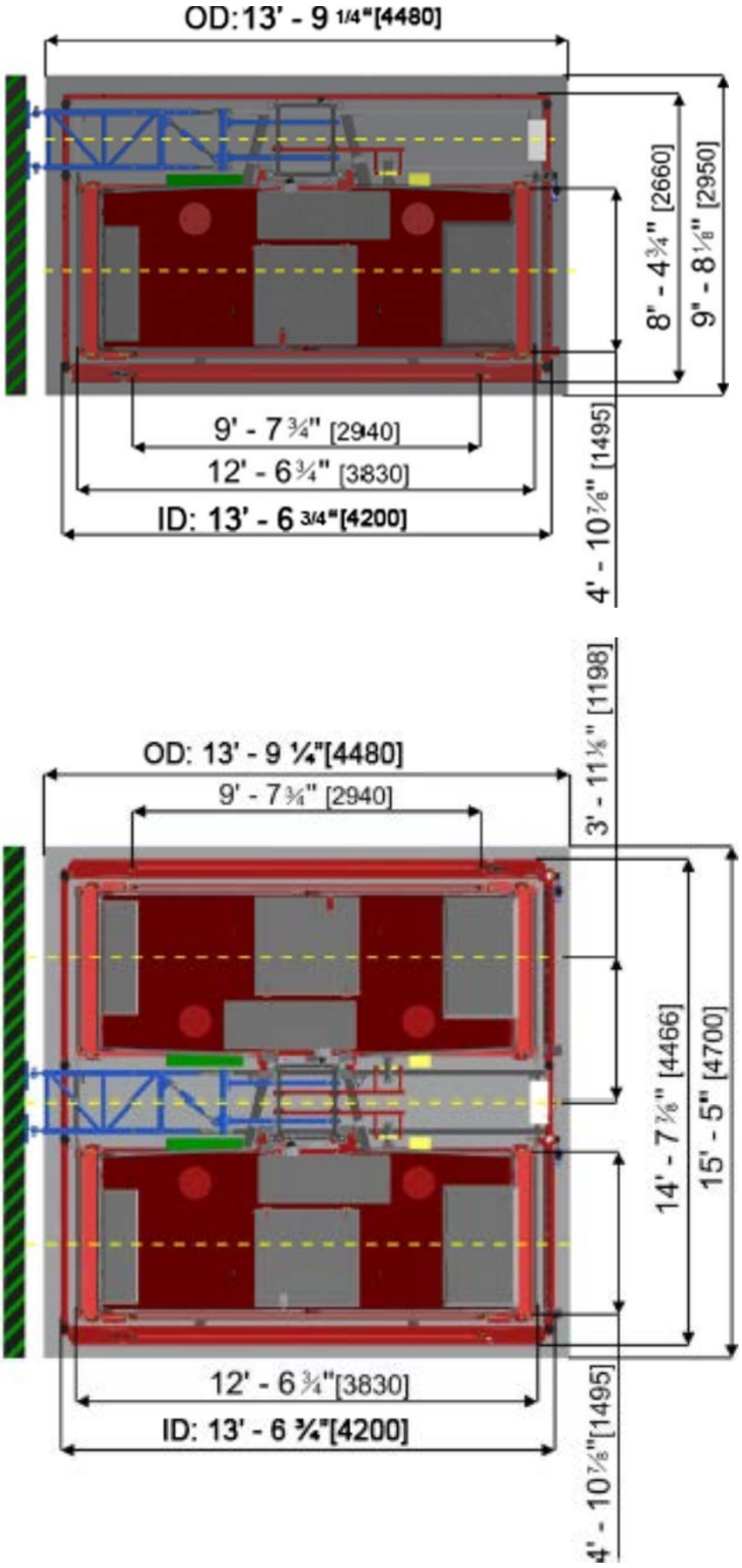
Construction Hoist description
NOV 2738 / 3238 / 3242 UP(3) F - I. a II
Figure 1

Basic dimensions:

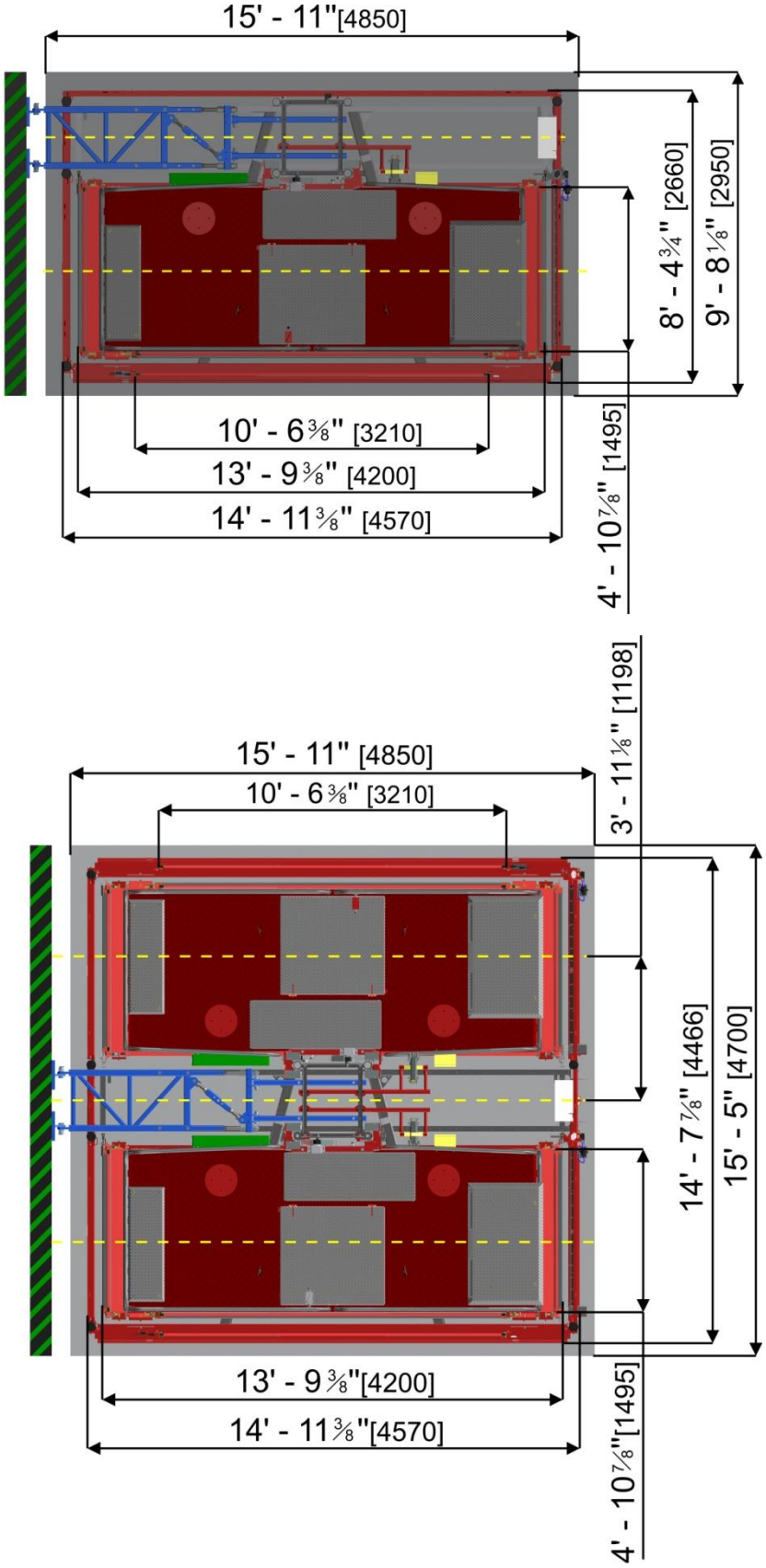




Construction Hoist NOV 2738 UP(3) F – I. and II..
Floor projection – dimensions
Figure 2.1



Construction Hoist NOV 3238 UP(3) F – I. and II..
Floor projection – dimensions
Figure 2.2



Construction Hoist NOV 3242 UP3 F – I. and II.
Floor projection - dimensions
Figure 2.

WORK SAFETY

USER'S BASIC RESPONSIBILITIES:

- To keep and file the hoist operating documentation. To allow authorized personnel to access all the information they need to perform their duty. To keep a register of authorized persons and their certificates of training and health condition.
- To make sure that all work related to the installation, operation, maintenance and testing of the hoist are performed by an authorized person, and that it is appropriately and timely documented.
- To make sure that the daily inspections are performed and documented.
- To stipulate a notification responsibility in the event of failures, including emergency situations. To determine procedures in case of an emergency.
- To determine a procedure in case of an accident.
- To become familiar with and enforce all the safety requirements contained in this manual and its supplements, as well as any local regulations and codes governing the installation, operation, maintenance and tests of personnel-and-material construction hoists.
- To always appoint a foreman (responsible person), if the hoist is be worked on by a group.

IT IS FORBIDDEN TO :

- **use the hoist unless all the required tests and inspections have been performed, or if a defect threatening the safety of operation has been identified,**
- **use the hoist for other than the designated purposes,**
- **use the hoist if its relevant documentation is incomplete,**
- **allow unauthorized personnel to use the hoist,**
- **overload the hoist (with the exception of tests) and/or the landings,**
- **use the hoist if the wind speed exceeds 35 mph (56 km/h),**
- **leave the hoist loaded after use,**
- **use the hoist as a passage way (in walkthrough cars),**
- **allow unauthorized personnel to maintain, repair or modify the hoist,**
- **transport objects protruding out of the car or placed outside of the car,**
- **leave the hoist connected to the mains and unsecured against misuse after finishing the day's operation,**
- **allow unauthorized personnel to perform emergency actions.**

It is essential that the personnel operating the hoist and authorized to work on it be qualified for the given type of work.

These personnel must be: **physically fit**
mentally tenacious
sufficiently trained and authorized

The nature and extent of the authorization is determined by local regulations and codes.

Respect the following warnings:

Always wear a safety hardhat and safety antiskid shoes when installing, maintaining and testing the hoist.
Always use fall arrest gear (safety harness) when working in heights or in an unenclosed space.

Whenever working on the hoist, secure it against undesirable movement by pressing the EMERGENCY STOP button and by turning off and locking out the main disconnect switch.

Always secure the car against falling while working underneath the car, or maintaining or servicing the motors or the safety device.

Study all the other warnings and attentions contained in other parts of this manual.

When in doubt or in need of a clarification, please contact the hoist manufacturer or your supplier. Discontinue any further work without obtaining appropriate instruction or information.

It is necessary to determine a manner of communication between the hoist operator and another responsible person in the event of an emergency.

It is necessary to ensure that wind speed is measured and monitored, and determine a way to provide the information to all the persons for whom it is important.

HOIST DATA

IDENTIFICATION

Manufacturer: STROS – Sedlčanské strojírny a.s.
Strojírenská 791
264 01 Sedlčany
Czech Republic

Supplier:

Machine type and denomination : Construction hoist – NOV 2738 / 3238 / 3242 UP(3) F - I. and II

Machine variants:
- motors above car: UP
- variable frequency drive: F
  Lifting speed - 7 (0-230 ft/min / 0-70 m/min)
  Lifting speed - 9 (0-300 ft/min / 0-90 m/min)
- hoist with third „C“ door - 3
- single hoist configuration: - I
- dual hoist configuration: - II

Machine identification:

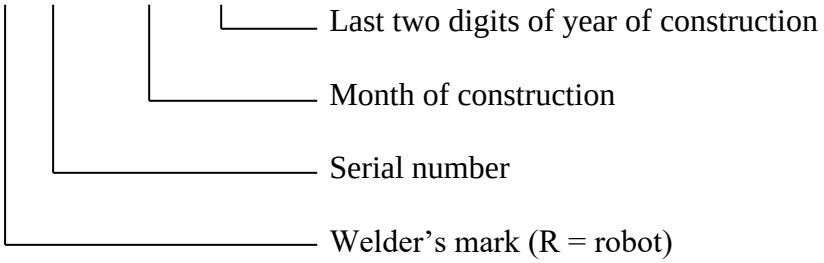
NOV 2738 / 3238 / 3242 UP(3)-I.:: Data plate containing:
- name and address of manufacturer
- machine denomination
- serial number
- year of construction
- nominal capacity
- nominal lifting speed
- service height (standard, maximum)
- weight of basic hoist unit

NOV 2738 / 3238 / 3242 UP(3)-II.: Data plate containing the above information located in each car.

Component identification:

Mast section: mark (on the top lattice)

Mark interpretation: O XXXX/ XX / XX



of the wall thickness of the corner tube is welded on the middle brace of the mast:
Data not specified = tube 76,1x4
6 = tube 76,1x6,3
8 = tube 76,1x8,0

Zachycovač: strojní štítek:
- název a adresa výrobce
- typové označení
- výrobní číslo, rok výroby
- Inspection certificate number
- max. provozní zatížení
- vybavovací rychlost

Refurbishment plate
- latest date of the following safety device refurbishment

Electrical panels: Data plates containing:
- name and address of manufacturer
- panel denomination (type)
- serial number, year of construction
- electrical diagram number
- U, f, In
- control circuit voltage
- IP rating

Electric motors: Data plate of the motor manufacturer.
Erection boom: Data plate (according to the type; stipulated by the corresponding manual)
Gearbox: Data plate of the gearbox manufacturer.

PARAMETERS

Provozní údaje	J.	NOV 2738 UP(3) F	NOV 3238 UP(3) F	NOV 3242 UP(3) F
Nominal capacity	lb (kg)	6000 (2700)	7000 (3200)*	7000 (3200)
Erection capacity	lb (kg)	5000 (2200)	6000 (2700)	6000 (2700)
Rated speed	ft/min (m/min)	230 (70) nebo 300 (90)		
Max. height of an ancored mast with thickness 4mm	ft (m)	492 (150)		
Max. height of an ancored mast with thickness 6,3mm	ft (m)	820 (250)		
Max. height of an ancored mast with thickness 8mm	ft (m)	1150 (350)		
Tie-in spacing	ft (m)	1130 (345)		
Max. top mast overhang	ft (m)	29 (9)		
Max. lifting height of an unancored mast	ft (m)	24 (7,5)		
Tie-in distance (mast max. 100 m)	ft (m)	29 (9)		
Max. height of free-standing mast	ft (m)	24 (7,5)		
Max. permissible wind speed – in service during erection and dismantling	mil/hod (km/hod)	35 (56) 28 (45)		
Max. out of service wind speed	mil/hod (km/hod)	90 až 145** (144 až 232)		
Operating condition - environment - temperature	°C	venkovní -15 až +40		
- relative humidity	%	80% při 35°C		
Noise level		79db		

* The capacity of the hoist NOV 3238 equipped with enclosures is 7000 lbs (3200 kg)
** 90 mph is standard. Higher wind speeds on request and per project's specs.

Special variant upon agreement with the manufacturer (the capacity is stated on a plate inside the car)

Hoist dimensions:

Dimensions	Unit	NOV 2738 UP(3) F
SINGLE hoist unit (outside) W x L x H	ft (mm)	8'-8 3/4"x13'-9 3/8"x9'-8 7/8" (2660x4200x2970)
DUAL hoist unit (outside) W x L x H	ft (mm)	14'-7 7/8"x13'-9 3/8"x9'-8 7/8" (4470x4200x2970)
Mast section (rated) W x L x H	ft (mm)	2'-1 1/2"x 2'–1 1/2"x 4'-11 1/4"(650x650x1508)
Car inside dimensions W x L x H	ft (mm)	4'-10 7/8"12'-3 3/4" x8'-1/2" (1495x3750x2450)
Car floor level at base station (from foundation slab)	ft (mm)	4'-7" (1400)

Dimensions	Unit	NOV 3238 UP(3) F
SINGLE hoist unit (outside) W x L x H	ft (mm)	8'-8 3/4"x13'-9 3/8"x9'-8 7/8" (2660x4200x2970)
DUAL hoist unit (outside) W x L x H	ft (mm)	14'-7 7/8"x13'-9 3/8"x9'-8 7/8" (4470x4200x2970)
Mast section (rated) W x L x H	ft (mm)	2'-1 1/2"x 2'–1 1/2"x 4'-11 1/4"(650x650x1508)
Car inside dimensions W x L x H	ft (mm)	4'-10 7/8"12'-3 3/4" x8'-1/2" (1495x3750x2450)
Car floor level at base station (from foundation slab)	ft (mm)	4'-7" (1400)

The Hoist NOV 3238 UP(3) F can be extended to the dimensions of the Hoist NOV 3242 by extensions 2 x 0'-7 1/4'' (2x185). The original hoist capacity does not change.

Dimensions	Unit	NOV 3242 UP(3) F
SINGLE hoist unit (outside) W x L x H	ft (mm)	8'-8 3/4"x15'-0 1/4"x9'-8 7/8" (2660x4580x2970)
DUAL hoist unit (outside) W x L x H	ft (mm)	14'-7 7/8"x15'-0 1/4"x9'-8 7/8" (4470x4580x2970)
Mast section (rated) W x L x H	ft (mm)	2'-1 1/2"x 2'–1 1/2"x 4'-11 1/4"(650x650x1508)
Car inside dimensions W x L x H	ft (mm)	4'-10 7/8"x13'-6 1/8"x 8´1/2´´(1495x4115x2450)
Car floor level at base station (from foundation slab)	ft (mm)	4'-7" (1400)

The car length may be modified by means of car extensions. However, the manufacturer does not recommend doing so.

Masses:

Masses		NOV 2738 / 3238 UP3 F		NOV 3242 UP3 F	
		Single	Dual	Single	Dual
Complete hoist unit	lb (kg)	10620-11140 (4820-5055)	20920-21300 (9490-9960)	11180-11700 (5070-5305)	22020-26060 (9990-10460)
Car	lb (kg)	4520 (2050)		4850 (2200)	
Drive unit 3x 15kW	lb (kg)	2833 (1285)			
Drive unit 3x 18,5kW	lb (kg)	2900 (1315)			
Panel 90 kW	lb (kg)	474 (215)			
Resistor bank 90 kW	lb (kg)	154 (70)			
Panel 110 kW	lb (kg)	716 (325)			
Resistor bank 110 kW	lb (kg)	176 (80)			
Mast section 6.3 mm	lb (kg)	Single 390(175), Dual 440(200)			

Electrical equipment	Unit	NOV 2738 / 3238 / 3242 UP(3) F
Power supply voltage, frequency	V; Hz	3 x 480V, 60Hz
Variable frequency drive power	kW	90, 110
Motor power - 100% ED	kW	3x 15 nebo 3x 18,5
Control voltage	V; Hz	110; 60 / 24 V DC

Electrical equipment is described in the Supplement.

SAFETY EQUIPMENT

Electrical safety equipment		
Item	Specification	Function, function check
Safety device switch	*TM* ZCMD 25L5+ZCE 02	Safety device tripping.
Switch – car door - door locking device	*TM* ZCK-J7+ZCK-E05+ZCK-Y13 *TM* ZCK-M1+ZCK-D16	Door closing. Door locking.
Switch – enclosure door - locking device	*TM* ZCK-J7+ZCK-E05+ZCK-Y13 ZCK-M1+ZCK-D16	Door closing Door locking
Roof hatch switch	*TM* ZCK-J7+ZCK-E05+ZCK-Y13	Hatch closing
EMERGENCY STOP button on the RM2 panel On the Inspection controller On the DROP TEST controller	TM ZB5AS54+ZB5 AZ009+ZBE102 TM ZB5-AS834+ZB5AZ102 ZA2-BS54+ZB2-BE102	Stops the hoist and prevents its further operation.
Normal limit switch	*SM* TL422-01Y-1801	Top and bottom stop switch.
Final limit switch	*SM* TZ064-01/02Y	Final top and bottom stop switch.

TM = Telemecanique *SM = Schmersal*

Mechanical Safety Devices		
Item	Specification	Function, function check
Safety device	KZ 5	Over speed in down direction.

Safety equipment for erection, dismantling and maintenance		
Item	Specification	Function, function check
DROP TEST controller	STROS 1816427	Remote controller for testing the safety device.
Inspection controller	STROS 1815722	Controlling the hoist from the roof.
"Stop" (toothy block mountable on the rack)	STROS 157 7970	Secures the car against falling down while working under the car or manipulating it.

Emergency lowering device
This device consists of removable manual brake release levers.

ADDITIONAL AND RELATED INFORMATION

Power supply requirements
These requirements are detailed in the Supplement to this manual.

Bolted joints

During erection and repairs, always make sure that:

- **undamaged bolts, nuts and washers of the specified size and strength grade are used,**
- **bolted joints are tightened to the specified torque,**
- **bolted joints are sufficiently secured.**

Use connecting material of 8.8 strength grade for joints subject to strain. Strength class specification is usually stamped on the nut or bolt head. If in doubt as to the connecting material's compliance, do not use it. Use galvanized or zinc plated connecting material.

Bolted joints specification:

Joint	Size	Strength grade	Torque (Nm)
Base frame to foundation	M24	10.9 !	680
Mast to mast/Mast to base frame	M24	8.8	350
Rack to mast	M16	8.8	200
Guide roller carrier	M24	8.8	350
Guide roller	M16	8.8	200
Back-up roller to machinery plate	M20	8.8	300
Machinery plate to frame	M16	8.8	200
Gearbox to machinery plate	M16	8.8	200
Safety device to plate	M16	8.8	100
Landing pipe coupling	M16	8.8	120
Tie-in stirrup to mast	M12	5.6	55

The locking ability of self-locking (nylon) nuts wears down with repeated use. Limit their repeated use to three times at most. It is forbidden to use nuts with substantially reduced locking ability.

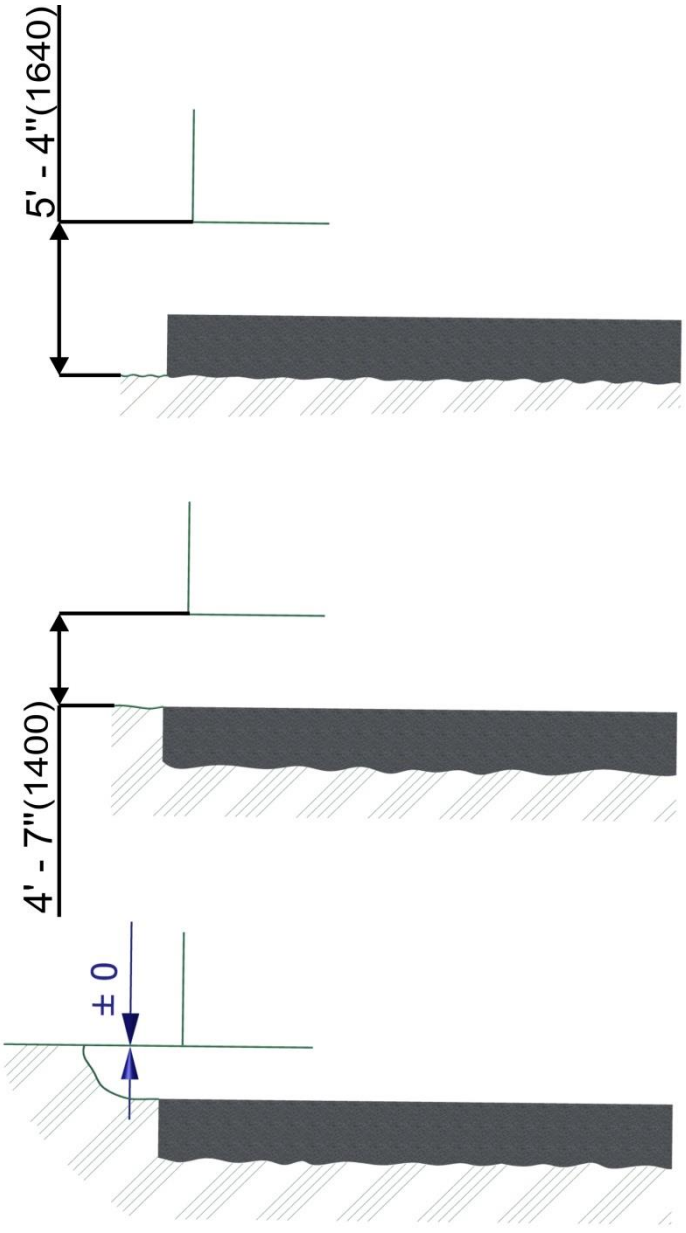
Recommended tightening torques of other bolted joints:

Size	Tightening torque (Nm)	Tightening torque of self-locking nuts (Nm)
M10	25	30
M12	40	45
M16	80	90

Hoist foundation

The hoist foundation consists of a concrete slab made of reinforced concrete with an embedded foundation frame.
The dimensions and configurations of the foundation slab and foundation (embedment) frame are apparent from the pictures below (Fig. 3.1, 3.1a, 3.1b a 3.2).

There are three options for making the concrete slab depending on the ground conditions:



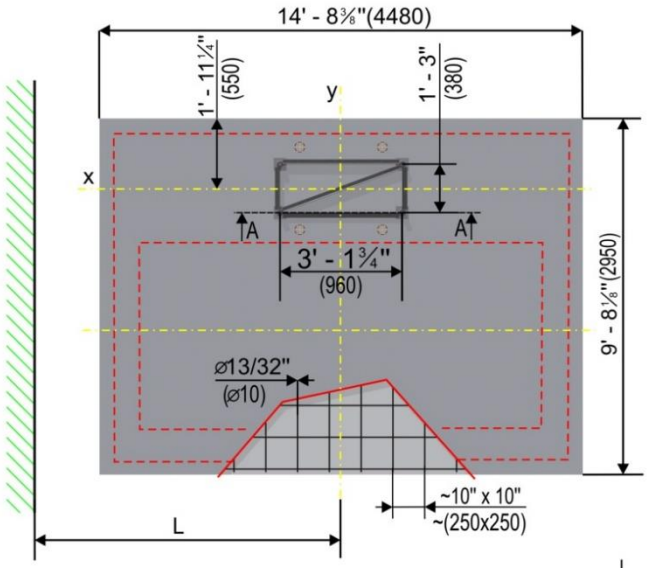
1. *On the ground. In this case no special draining is required but the car floor level is about ~ 5 '- 4" (~ 1640 mm) above ground level.*

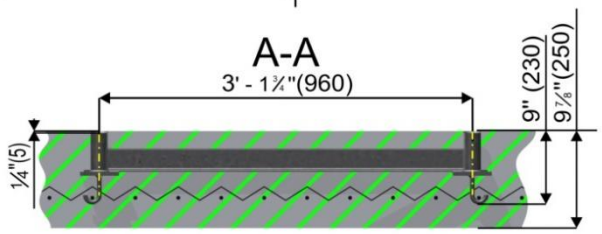
2. *Concrete slab level with ground level. The most common alternative - car floor is about ~4'- 7" (~ 1400 mm) above ground level.*

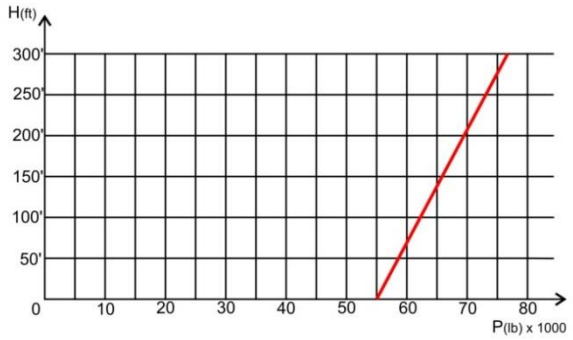
3. *Below ground level. In this case, thorough cleaning and draining are necessary. The car floor can be at ground level.*

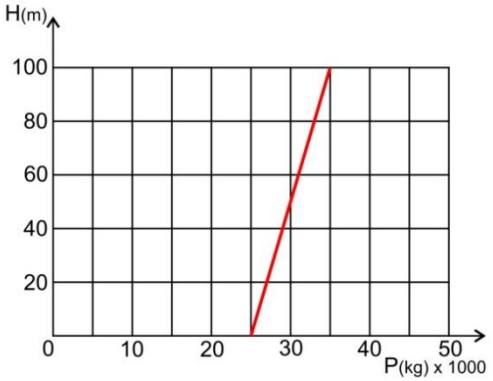
Fig. 3.1

Concrete slab for
NOV 2738 UP3F - I hoist
(Concrete consumption - 116.54 cu ft, 3,3m^3)
requied ground pressure p = 150 bar,0.15 MPa
concrete slab load P - according to the mast height(H)

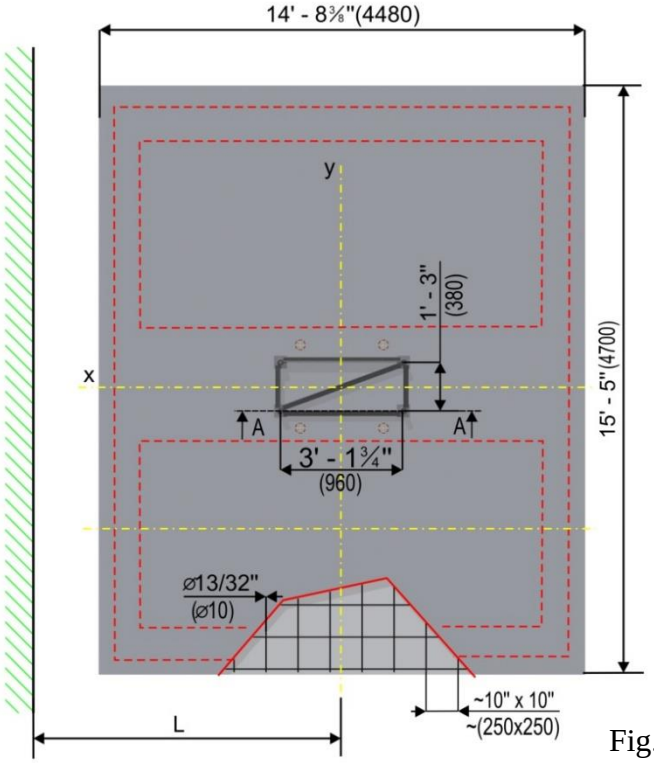


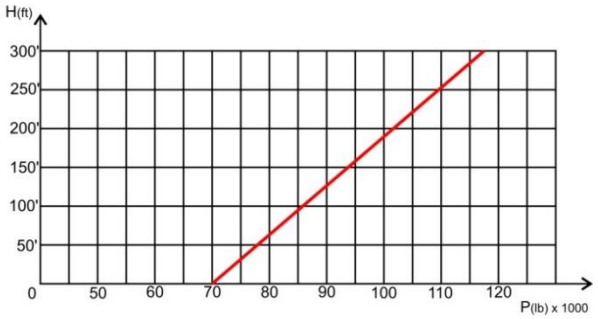






Concrete slab for
NOV 2738 UP3F - II hoist
(Concrete consumption - 187.17 cu ft, 5,7m ^{3})
requied ground pressure p = 150 bar,0.15 MPa
concrete slab load P - according to the mast height(H)





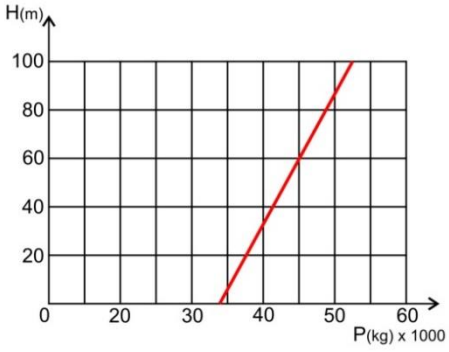
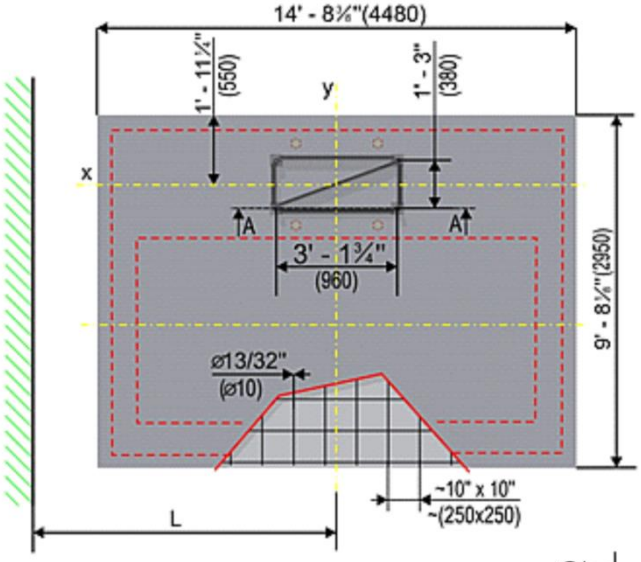
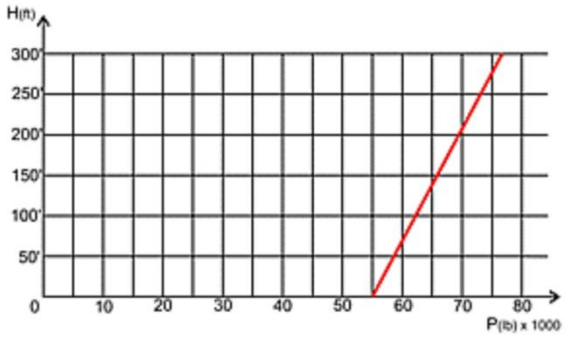
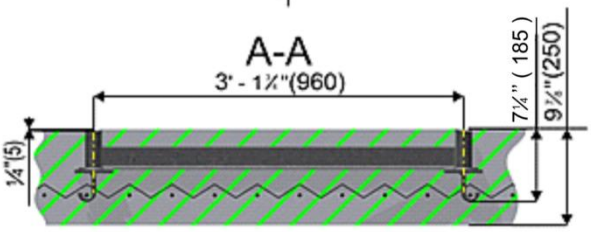


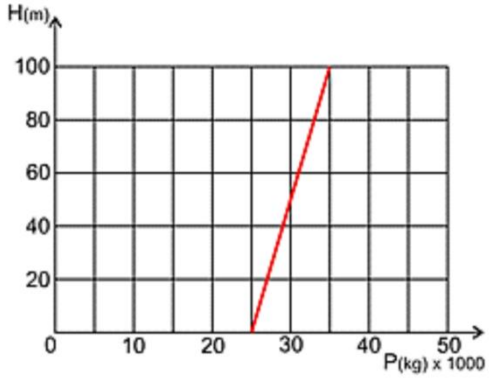
Fig. 3.1a

Concrete slab for
NOV 3238 UP3F - I hoist
(Concrete consumption - 116.54 cu ft, 3,3m^3)
requied ground pressure p = 150 bar,0.15 MPa
concrete slab load P - according to the mast height(H)

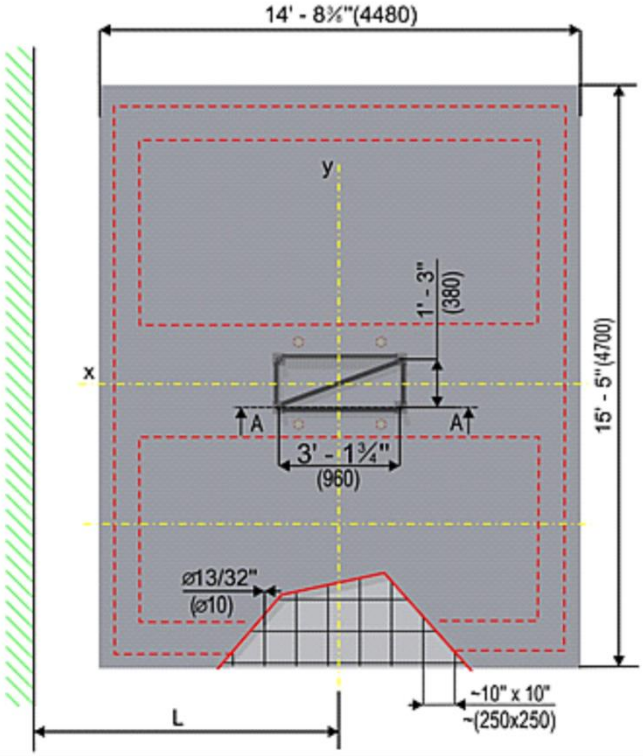


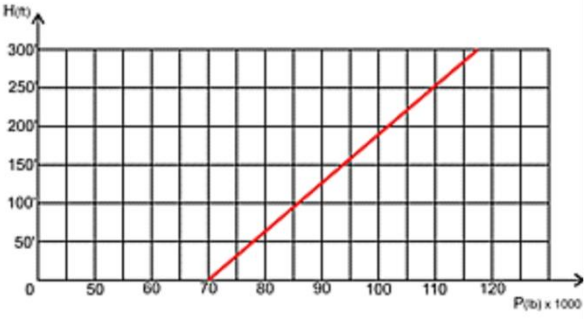


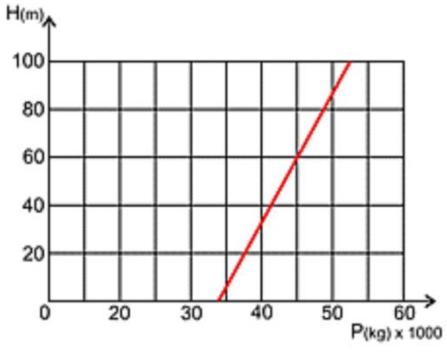




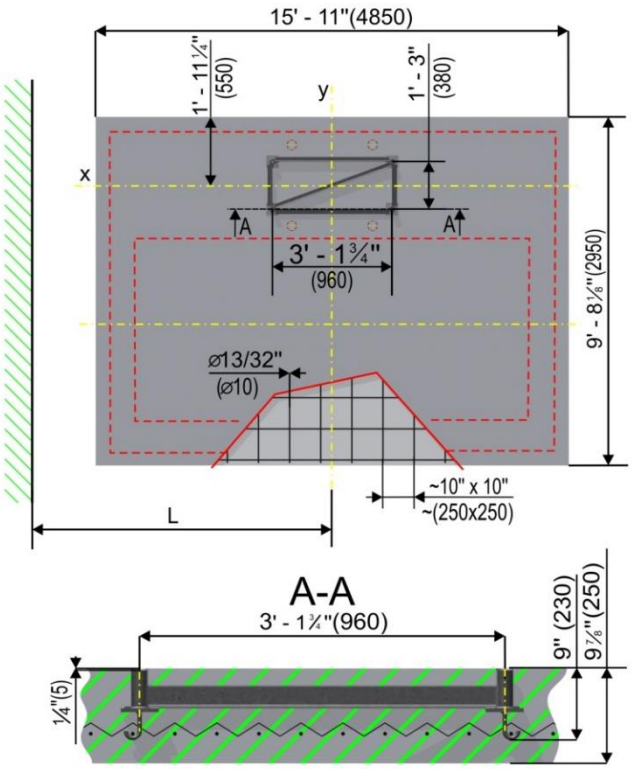
Concrete slab for
NOV 3238 UP3F - II hoist
(Concrete consumption - 187.17 cu ft, 5,7m ^{3})
requied ground pressure p = 150 bar,0.15 MPa
concrete slab load P - according to the mast height(H)

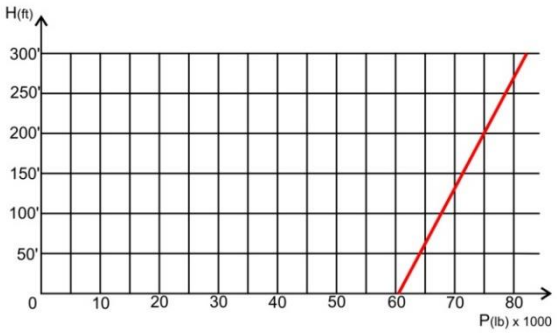


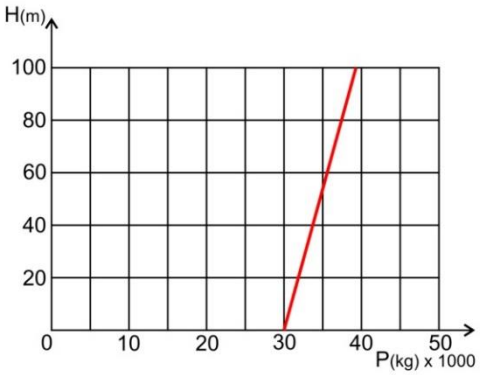




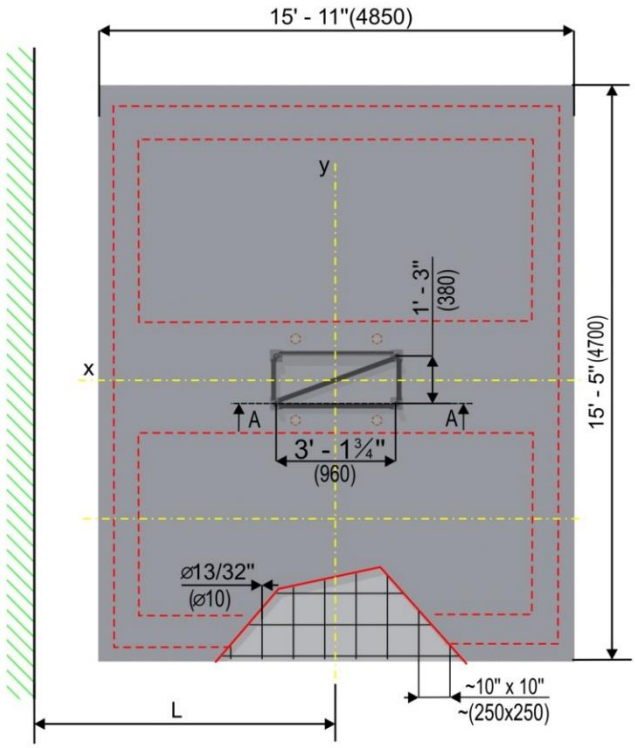
Concrete slab for
NOV 3242 UP3F - I hoist
(Concrete consumption - 127.133 cu ft, 3,6m^3)
requied ground pressure p = 150 bar,0.15 MPa
concrete slab load P - according to the mast height(H)

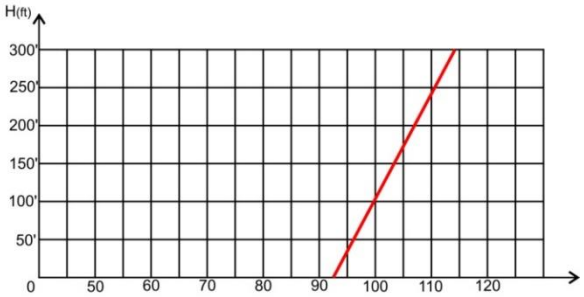






Concrete slab for
NOV 3242 UP3F - II hoist
(Concrete consumption - 201.294 cu ft, 5,7m^3)
requied ground pressure p = 150 bar,0.15 MPa
concrete slab load P - according to the mast height(H)





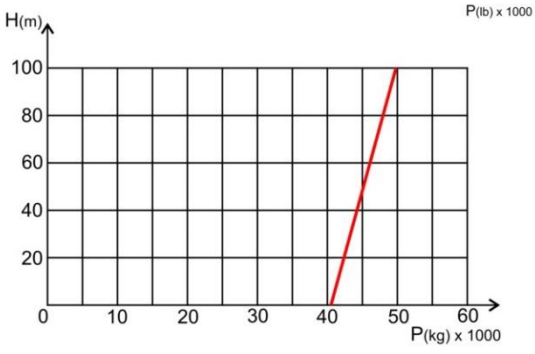
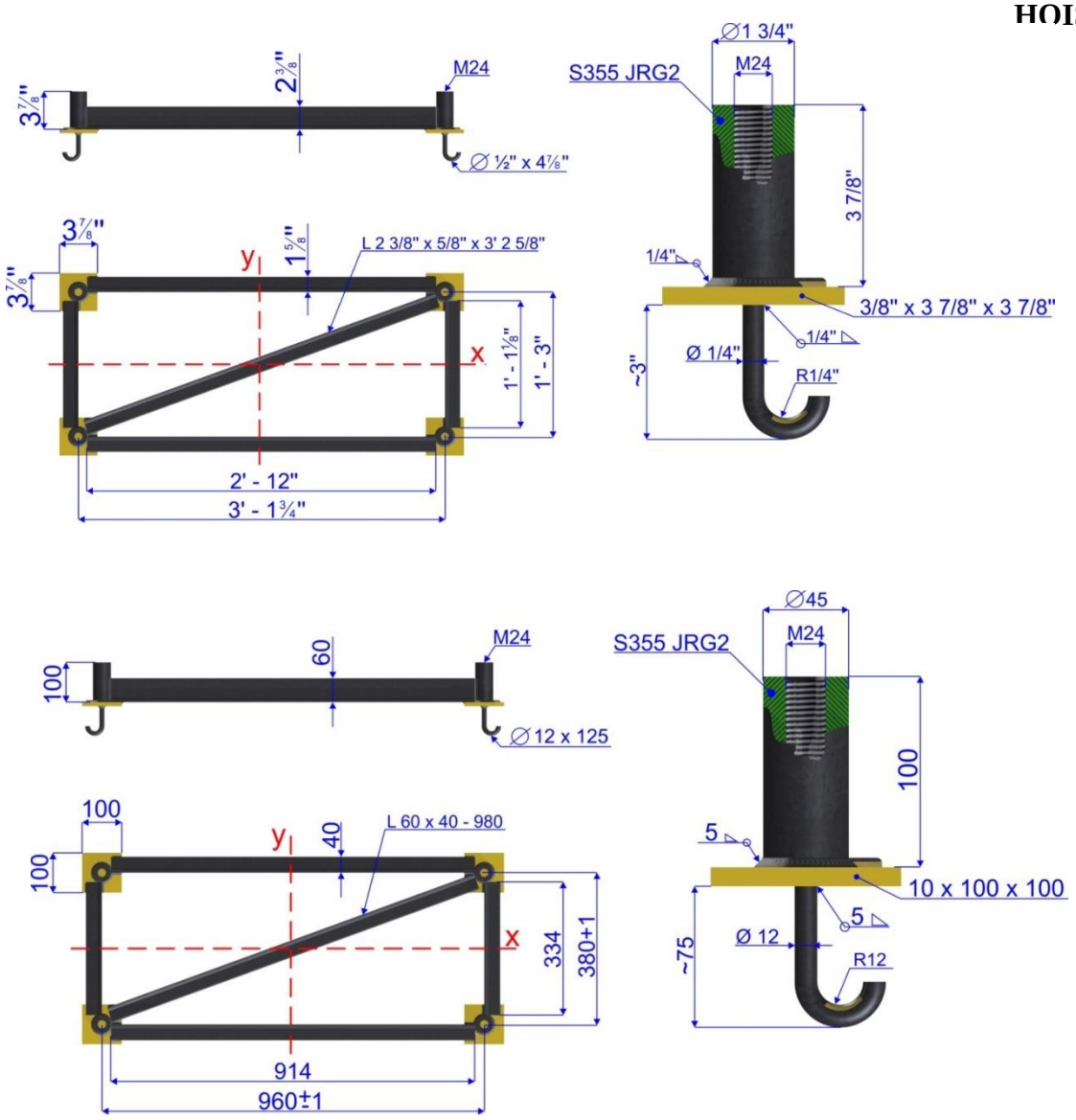


Fig. 3.1c



Foundation frame
Fig. 3.2

The foundation frame must be fabricated accurately.
Good quality S355 JRG2 weldable steel must be used for the parts with M24 thread.
Other parts can be made of S235 JRG2steel.

Before pouring the slab, carefully design the layout of the hoist in relation to the building. Pay special attention to the distance between the hoist and the building (dimension L (mm)) and the possibility to create mast and landing tying points along the entire installation. Make sure the ground underneath the slab has sufficient bearing capacity. Beware of dumped soil or debris, frozen ground, sewage etc. Disregarding the above requirements may cause substantial property damage, or make the erection of the hoist impossible at certain points of the installation.

In order to keep the cost of the hoist erection low, it is necessary to consider the position of the hoist from other points of view:

1. **The place of the hoist installation must be in compliance with local regulations.**
2. **Sufficient power supply must be available and it must be possible to install lighting.**
3. **The place of installation must be readily accessible by trucks and other vehicles.**
4. **There must be room enough for manipulation and erection at the place of installation.**

5. It must be possible to fence round the place of erection.

Pouring the foundation slab (Figure 3.1)

1) The rebar must be a grid with a mesh size of 250 x 250 mm and made of 10 mm diameter steel bar.
2) The foundation frame must be installed in such a way that the M24 threaded holes are protected against filling up with concrete and the top edge of the frame is at least 5 mm below the slab edge.
3) The foundation frame hooks must be hooked to the rebar.
4) The foundation frame must be installed in accordance with the hoist mast (the x and y axes).

Foundation slab without embedded foundation frame

It is possible to build a slab only and attach the base frame to it by means of drop-in anchors (expansion bolts). Use the original attachment points (holes) in the frame, or weld on new holders.(Figure 3.2.1.)

Since this manner of attachment is not equivalent to using the foundation frame, the following conditions must be fulfilled:

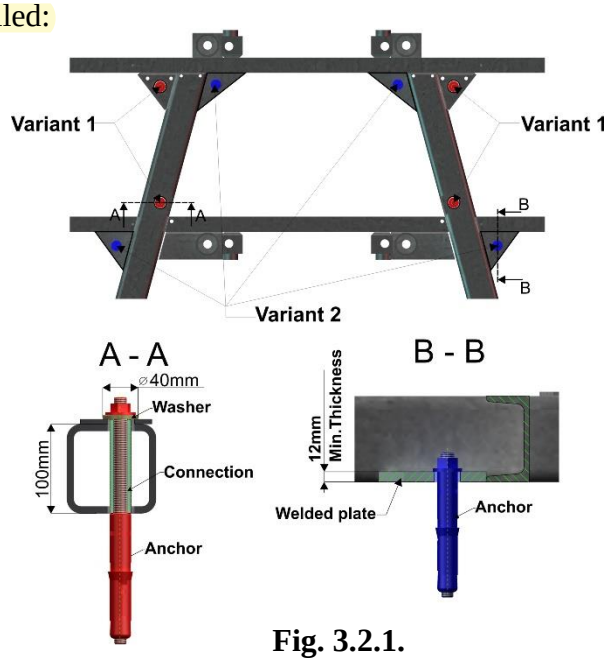


Fig. 3.2.1.

1. The first tie-in must be installed at a maximum height of 5 – 6 m above foundation slab.
2. Before the first tie-in is installed, the mast must be held by a crane to ensure its stability! (Figure 3.2.2.)

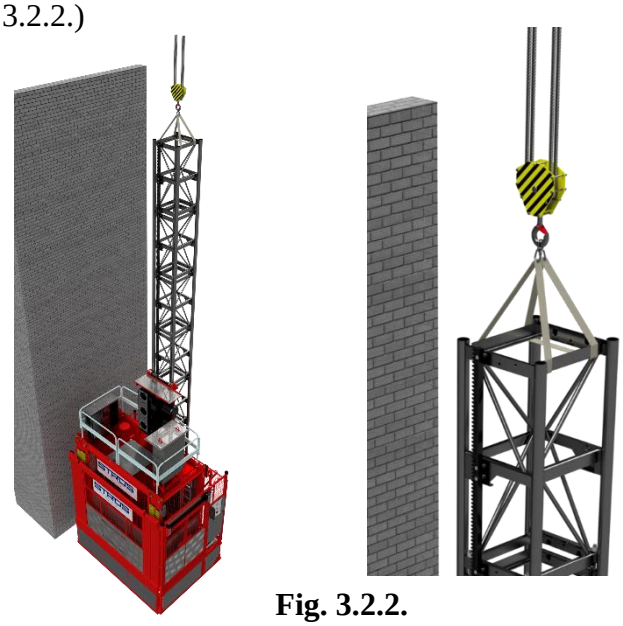
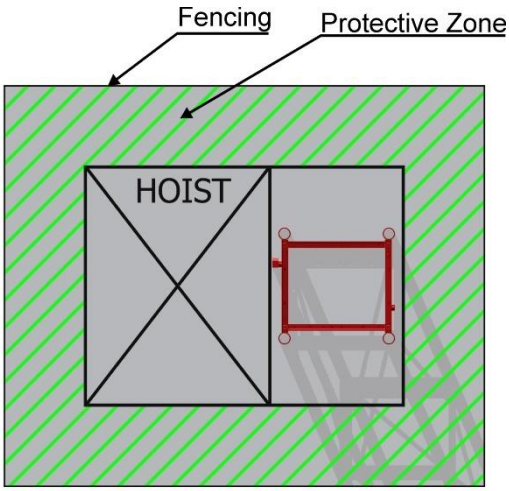


Fig. 3.2.2.

Protective zone around the hoist

During erection and dismantling and when working above the base station, the area around the hoist must be fenced (see figure 3.3). The size of the protective zone is determined by the user based on local regulations and with regard to other circumstances (height of mast, other protective measures, etc.).



Fencing round an elevator, protective zone
Figure 3.3

Mark the fenced area clearly with an appropriate number of "Falling Objects" warning signs.

Mast

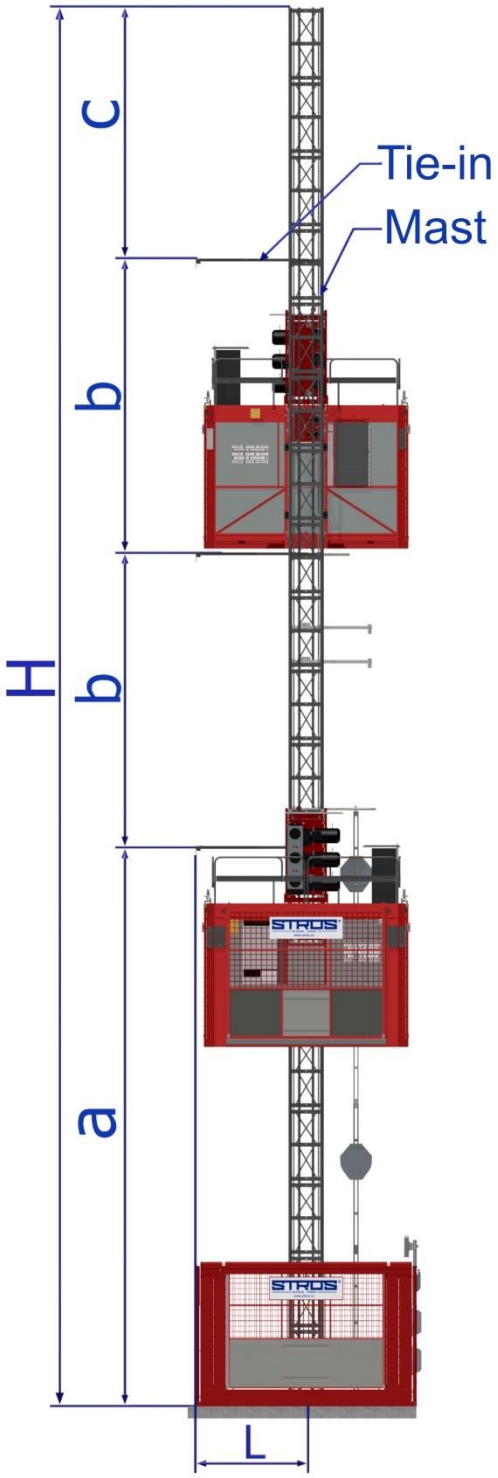
For this type of hoist only reinforced mast sections with racks fixed with 4 bolts can be used.

Tie-ins

The mast must be tied to the building (structure) at regular spacing.

The correlations of tie-in spacing, top mast overhang and total mast height are apparent from the table below and Fig. 3.4.

Standard max. lifting height [ft. (m)]	Tie-in spacing max. a = max. b [ft. (m)]	Max. top mast overhang = c [ft. (m)]
492 (150)	29 (9)	24 (7,5)



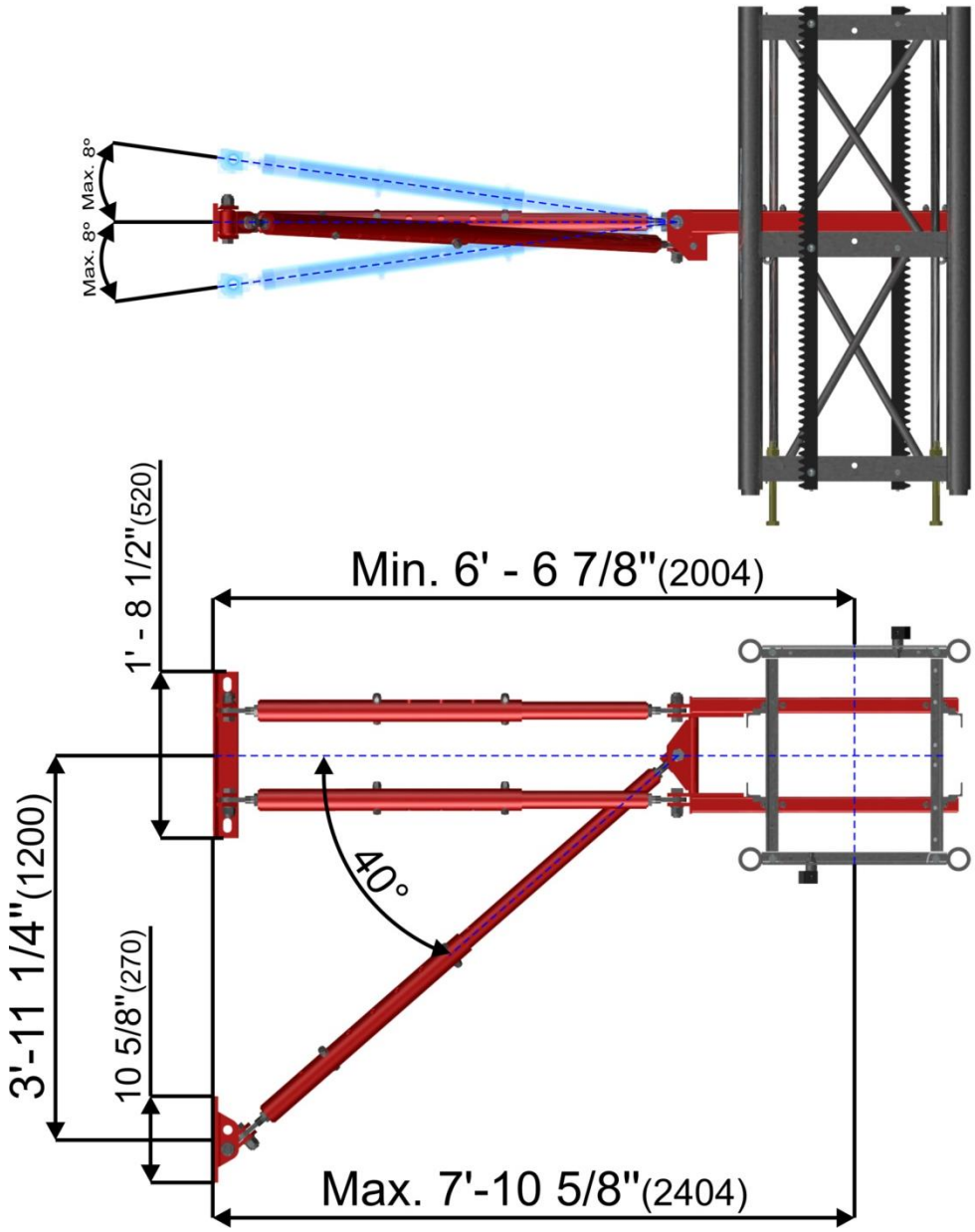
Tie-in spacing
Fig. 3.4

Tie-in types

The following types of tie-ins are designated for use without vertical landing pipes. They vary in the manner of fixing to the building/structure (to face of slab vs. floor of slab). The C type cannot be used for dual hoist configurations.

C type tie-in

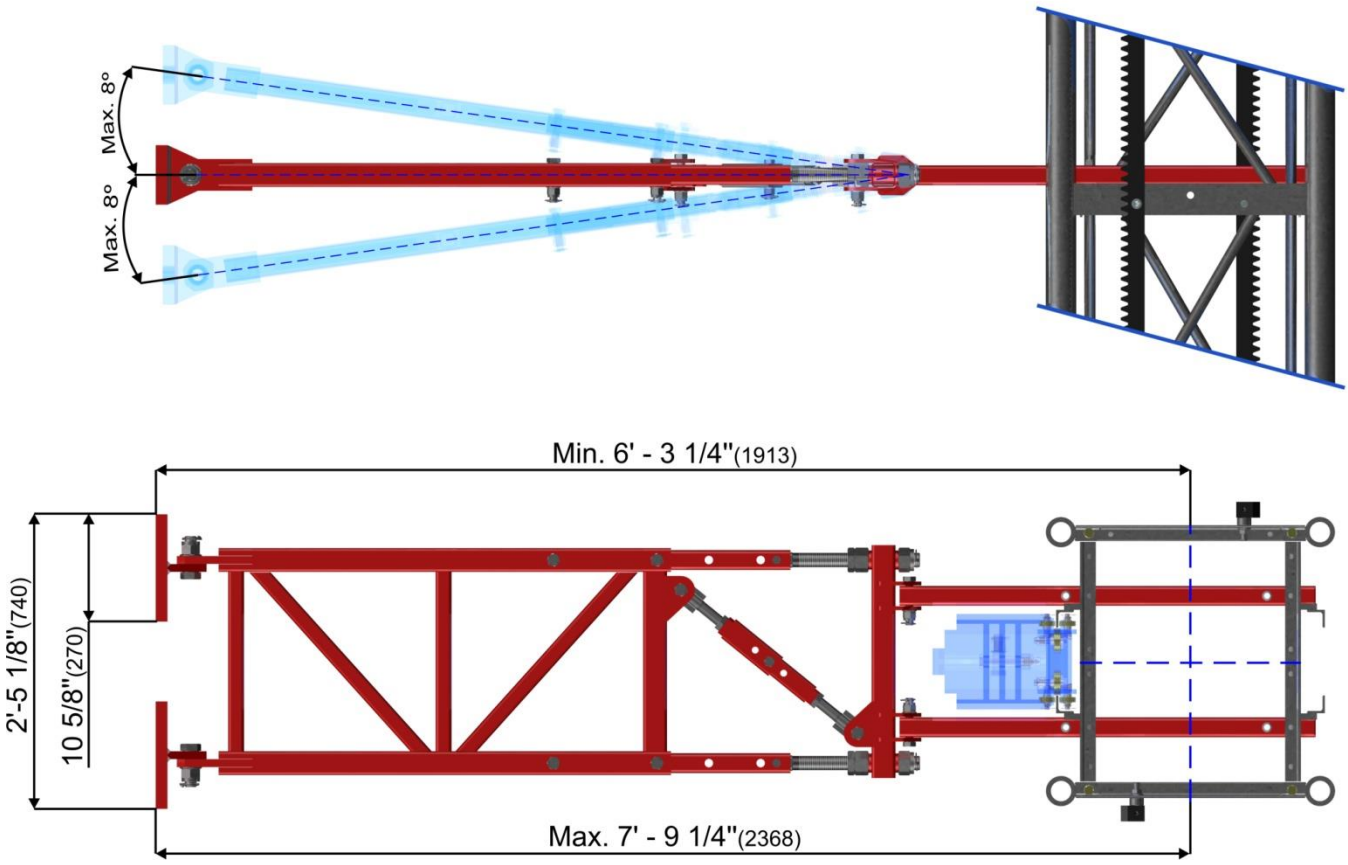
It can only be used with single hoist without vertical landing pipes and without counterweight. The angle at which the tie-in is installed in relation to a horizontal plane must not exceed 8°.



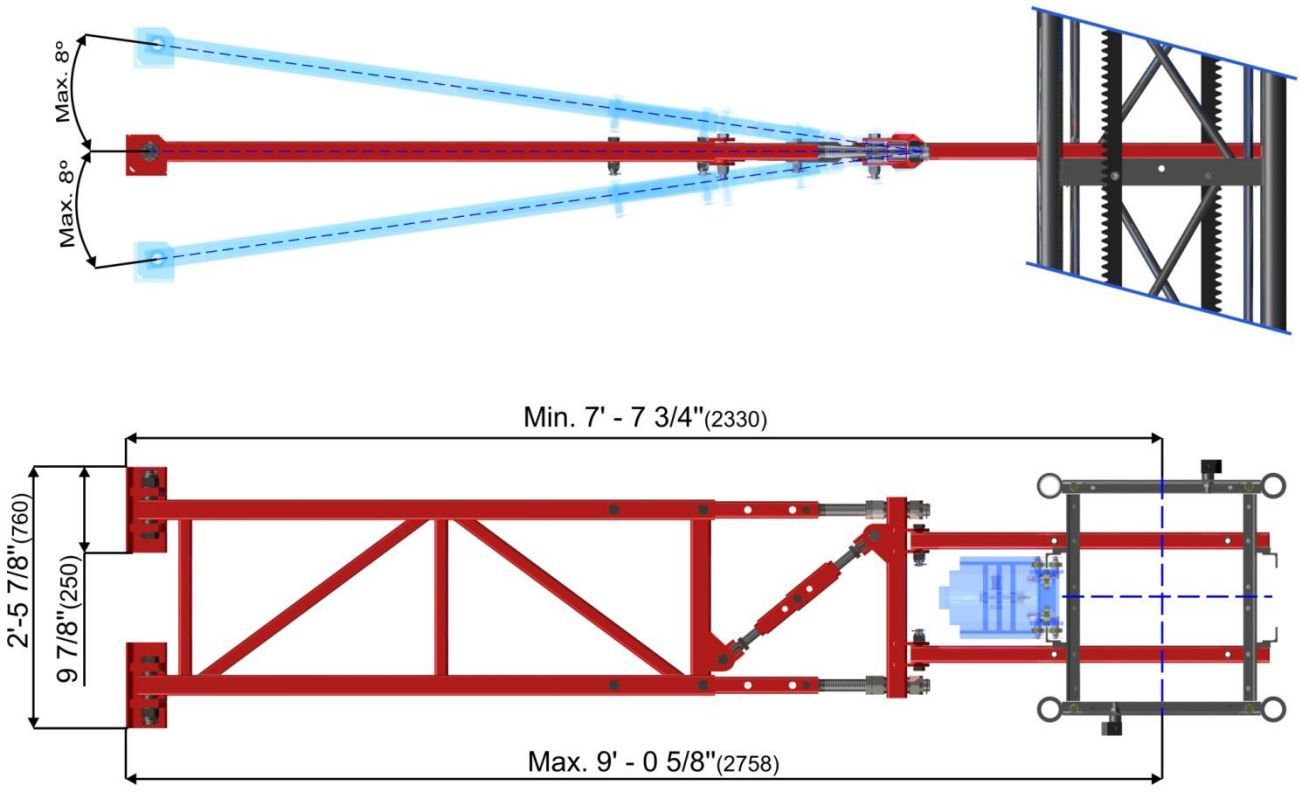
Tie-in
Fig. 3.5

D type tie-in

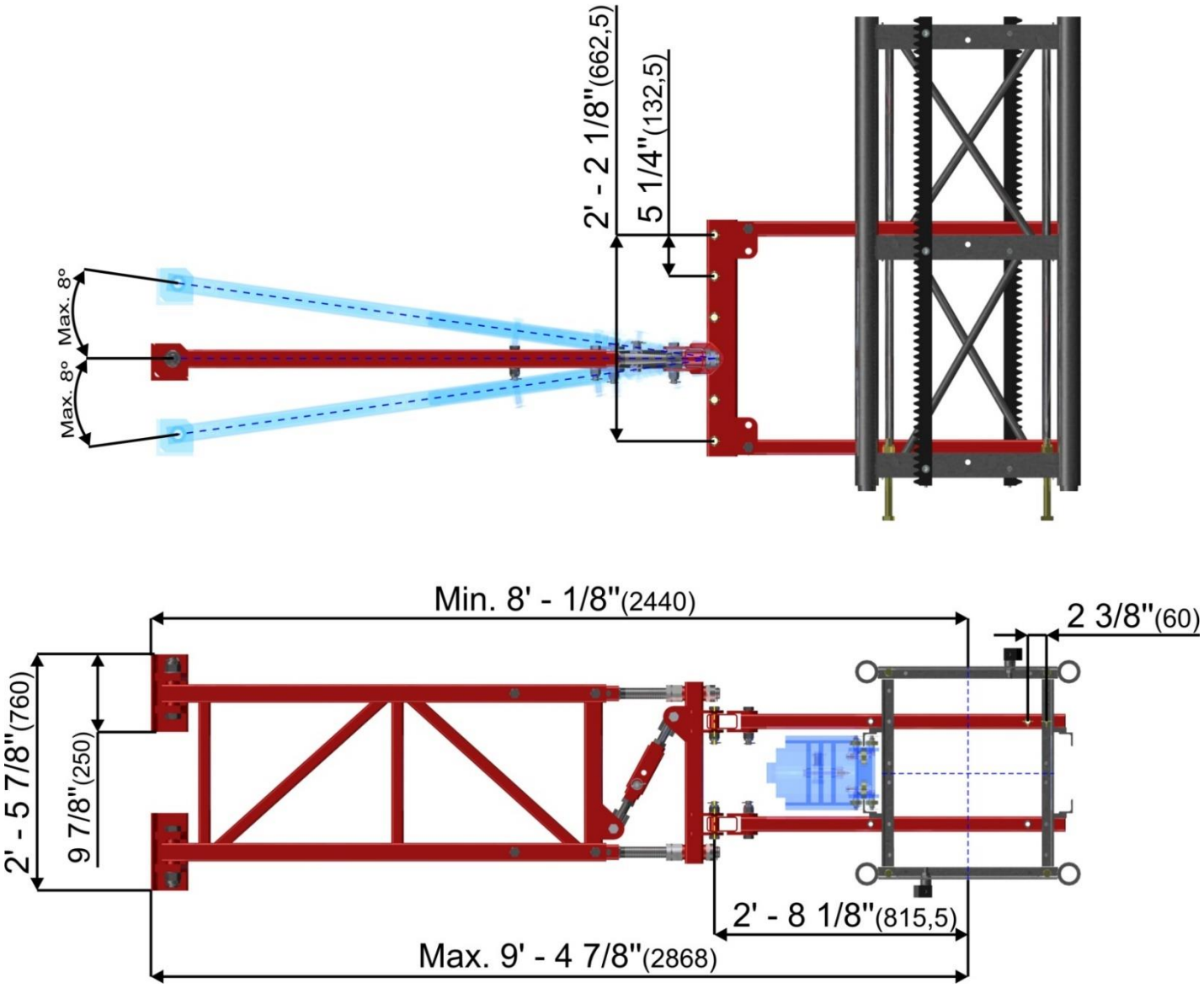
It is also designated for hoists without vertical landing pipes. It is a heavy tie-in for geographical regions with higher wind loads, and it can be used for both single and dual hoist configurations. The angle at which the tie-in is installed in relation to a horizontal plane must not exceed 8°. If this is not feasible, the beams attaching the tie-in to the mast can be doubled as shown in Fig. 3.6c.



Tie-in
Fig. 3.6a



Tie-in
Fig. 3.6b



Tie-in
Fig. 3.6c

The forces imparted by the tie-ins to the building (structure) can be calculated with approximation based on Fig. 3.7 and the following correlations:

$$R_{Ax} = R_{Bx} = \pm F_{max.} \times L/B$$

$$R_{Ay} = R_{By} = \pm F_{max.}$$

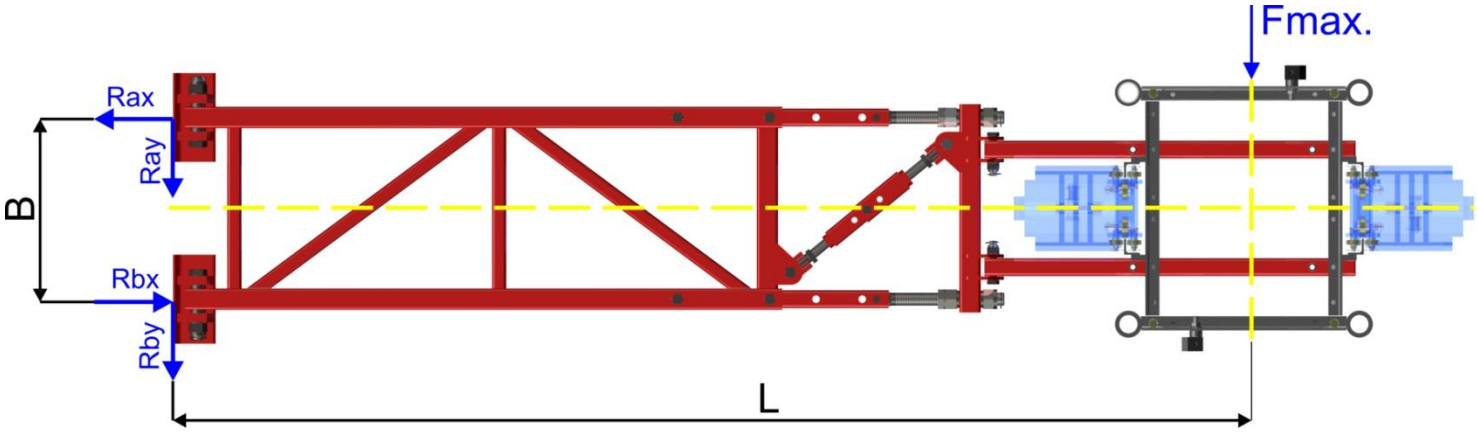
The table below indicates forces in mast center line depending on the maximum wind speed. The calculation is based on standard tie-in spacing (a = 29 ft.) and top mast overhang (c = 24 ft.).

Configuration	Fmax lbf [kN]		
	90 MPH	100 MPH	145 MPH
SINGLE	1900 (8.45)	2350 (10.45)	4930 (21.92)
DUAL	2000 (8.9)	2475 (11)	5200 (23.1)

Example:
L = 2.5 m, B = 0.76 m, F_{max}= 100 MPH, DUAL hoist

$R_{Ax} = R_{Bx} = \pm 2350 \times 2.5/0.76 = 7566$ lbf

$R_{Ay} = R_{By} = \pm F_{max.} = \pm 2350$ lbf



Tie-in forces imparted into the building
Fig. 3.7

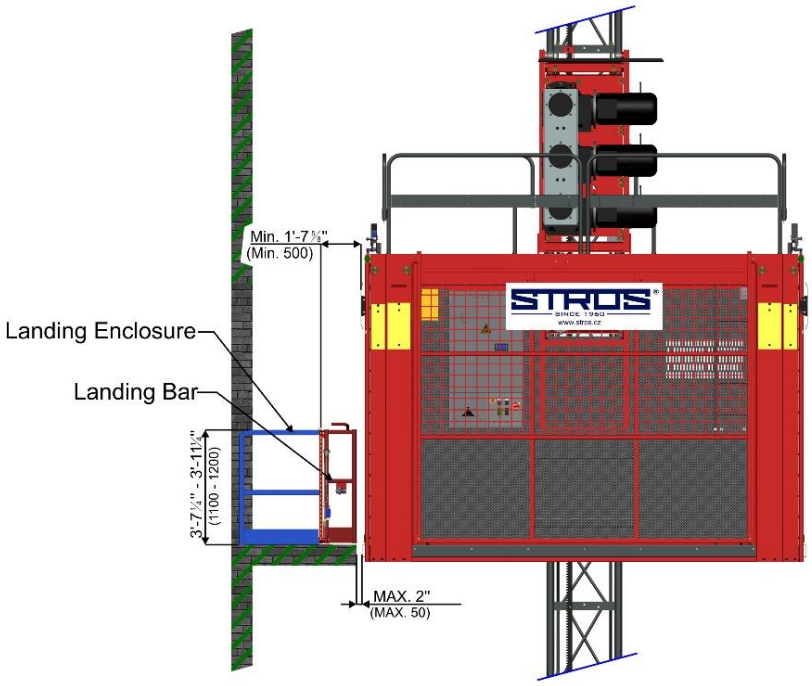
Reduction of hoist structure bearing capacity by corrosion

Parts of the hoist structure severely weakened by corrosion must not be used.
The mast corner pipes must not be thinned by corrosion by more than 10 %.

Safety distances and clearances
In an operating hoist, a safety distance between any moving part of car and any point of access for persons is at least:

Safe horizontal distance inch (mm)	Fixed barrier (wall) height Ft (mm)
4” - 6" (100 – 150)	8 (2500)
min. 14 (350)	6 ½ (2000)
min. 35 ½ (900)	5 ½ (1600)
min. 40 (1000)	4 (1200)

The horizontal distance between a landing side enclosure and a car standing at the landing must not exceed 6” (150 mm).



Low landing bar
Fig. 3.8

The clearance between the car sill and the landing sill must not exceed 2" (50 mm).

However, this clearance should not be smaller than approx. 1 ½" (40 mm). A smaller clearance could cause the car to collide with the landing if other requirements for safe operation were not fully met (clearances, incorrect setting of other hoist components).

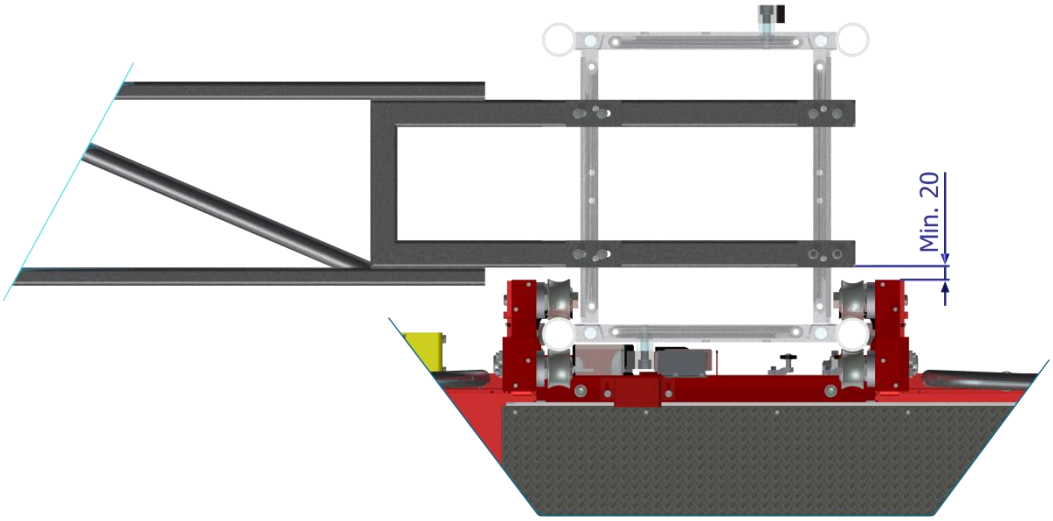
Headroom above car
If there is a horizontal obstruction above the hoist (ceiling etc.), there must be a clearance of at least 6' (1.8 m) between the hoist ceiling and the horizontal obstruction when the car rides onto the final limit. At the same time, there must be a clearance of at least 1' (0.3 m) between the horizontal obstruction and any components protruding above the car roof.

Further travel of at least 7 ¾'' (0.2 m) must be available for the car when it rides onto the final limit.

Clearance under car
If the car rides onto the bottom final limit during operation, the motors must be de-energized before the car comes in contact with the buffers.

For the purposes of working underneath the car, the machine is supplied with a demountable "stop" (rack lock) that mounts onto the rack and prevents the car from moving downwards. The height of the room created underneath the car must be at least 6' (1.8 m).

Clearance between tying system and moving car
This clearance must be at least 3/4''(20 mm) – see Fig. 3.9.



Clearance between tie-in and car
Fig. 3.9

In DUAL hoist configurations, it is necessary to make sure that this clearance is the same in both cars (3/4"/20 mm) during the erection already.

The setting, maintenance and subsequent inspections of specified clearances are very important for the safety of the hoist and the persons using it. Ignoring these requirements can cause serious bodily injury or damage to the machine.

Load on landings

When loading and unloading the hoist, various fluctuating loads are imparted to the landings by persons and materials. The landings (not part of the hoist delivery) must be designed to withstand these loads.

Landings must not be overloaded. Traffic must be organized in such a way that no materials are left and no persons stay at the landings. Landings are designated only for loading, unloading and calling the hoist.

Test loads

The following test loads are prescribed for testing the hoist:

Tests of the hoist itself

Type of test	Test load lb. (kg)	
	NOV 2838 UP(3) F	NOV 3238 / 3242 UP(3) F
Hoist car static test	8 930 (4050)	10 500 (4800)
Single brake test	Empty, unloaded car.	
Dynamic test incl. safety device and motor brake test	6600 (2970)	7700 (3500)
Functional test	2200 (1000)	
Buffer test	6000 (2700)	7000 (3200)

Tests of accessories
Erection boom (type MR 250R and MR 250S)

Druh zkoušky	**Zkušební břemeno (kg)**
Statická zkouška	260
Dynamická zkouška	250

Handling set PN 1570990

Type of test	Test load for one rope! (kg)
Static test	4673 (2120)

1. The buffer test is only performed by the manufacturer.
2. Erection booms MR150(R,S) and MR200(R,S) are tested according to the documentation supplied with them.

Lighting
Inside car - incandescent light, manually controlled (max. 100W)
Landings - lighting for landings is not supplied with the hoist

The hoist user must provide lighting of all landings and access ways leading to them. Sufficient lighting of controllers and moving bars is especially important. Insufficient lighting may cause serious bodily injury.

Storage of hoist and its components

In storage, it is especially important to:
- Clean components, touch up scratches in surface coating, conserve functional surfaces (depending on the storage period).
- Lubricate the machine according to the lubrication schedule, prevent lubricant leakage, especially from the gearboxes.

- Underlay stored components in a suitable manner, prevent soiling by mud, prevent damage.
- Store parts in such a way that they do not collect water (beware of ice formation in cavities).
- Pay special attention to electrical equipment. Treat contacts and moving parts with suitable chemicals. Prevent water and dirt penetration to plugs and sockets. It is recommended to place humidity absorbers (silica gels) inside the electrical enclosures.
- Lock control panels.
- Check, clean and preserve connecting material and store it indoors.

Sheltered storage saves operation costs and extends the life of the machine.

Always be mindful of the risk of possible pollution of the storage area by lubricant leakage or wash-down. Prevent environmental damage. Observe local regulations.

Manipulating the hoist and its parts
The hoist may only be manipulated by personnel authorized for this kind of work.

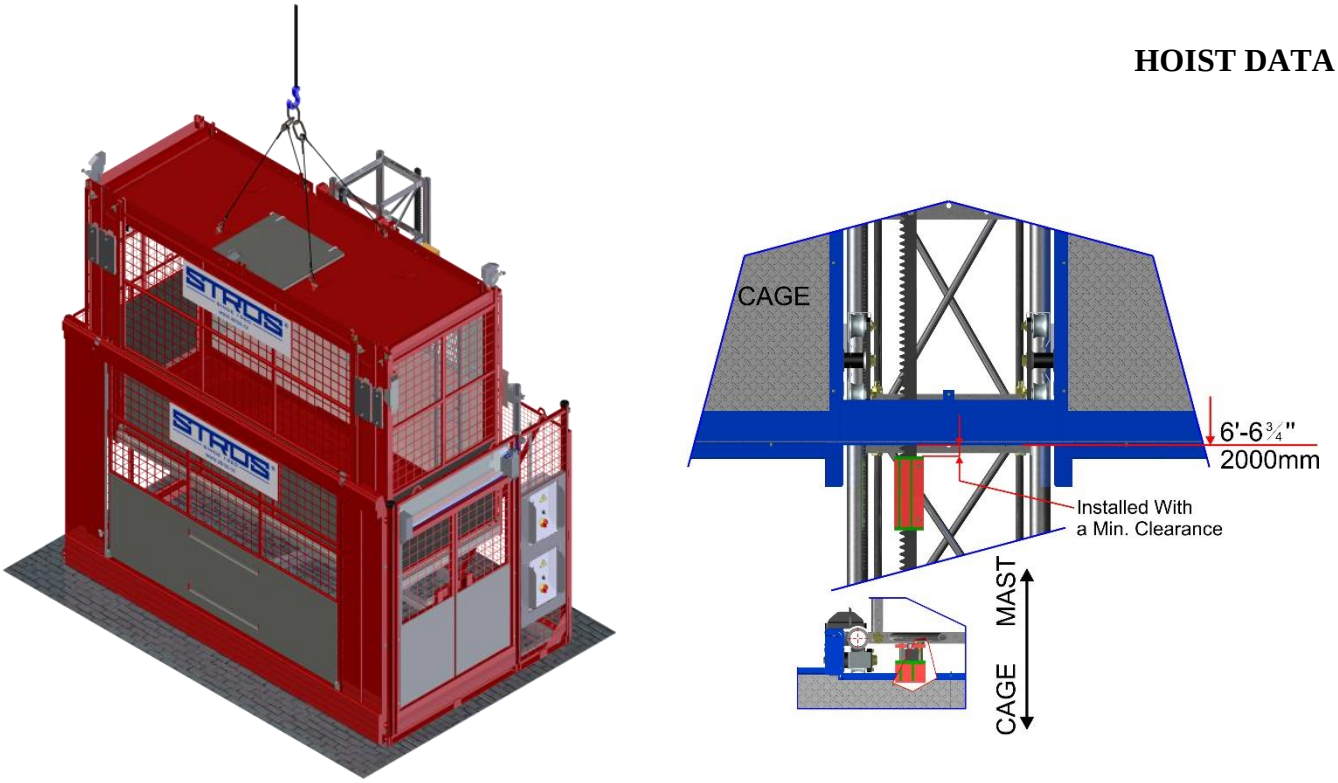
Hoist unit
The hoist may only be manipulated (lifted, transported) in a SINGLE car transportation configuration, that is with:
- the buffer springs removed,
- the car carefully lowered to its terminal bottom position,
- the roof handrail and erection boom removed,
- the supply cable stowed inside the hoist car.

In a DUAL hoist configuration, preparation for manipulation further includes:
- disconnecting the trailing cable from the other car,
- demounting the drive unit,
- removing the other car from the hoist unit (SP),
- removing base enclosure parts for the other car,
- installing an auxiliary brace in the longer side of the base enclosure (past the mast).

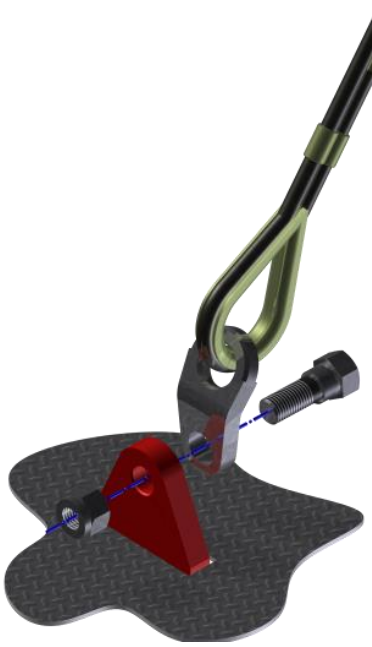
Before lifting the hoist unit, make sure that all fasteners (bolts, grounding etc.) attaching the hoist to its foundation and surrounding area have been removed.

Use the lifting harness supplied with the hoist to manipulate the unit. Attachment of the lifting harness to the hoist car is apparent from Fig. 3.10 and 3.11.

If other parts are transported inside the car, the total weight (including the car) must not exceed 11000 lb. (5000 kg).



Manipulating the hoist unit (without drive unit)
For masses, see the parameters section
(Fig. 3.10)



Attachment of the lifting harness to the car
Fig. 3.11

Before manipulating the hoist unit, the "Stop" (rack lock) must be installed right above the floor plate between the hoist's main vertical structural beams (on removing the cover plate from inside the car). It must provide a firm connection between the car and the base.

Only a sound (undamaged) sling, whose bearing capacity and safety has been verified, can be used to manipulate the hoist.
Do not allow the presence of unauthorized personnel near a suspended load.
Do not stand under a suspended load!

Procedure for manipulating the hoist unit:

1. Remove the bottom cover plate between the main vertical structural beams inside the car.
2. Mount the "Stop" (rack lock) on the rack just above the floor plate between the beams (the same "Stop" that is used for working underneath the car).
3. Remove the third mast section with the drive unit on it. On attaching the lifting harness, the unit is ready for manipulation and transportation.
4. After transportation, use a reverse procedure.

After transportation to a new site, <u>remove</u> the "Stop" from the rack and replace the cover plate.

Hoist car

Before manipulating the hoist car:

- disconnect the trailing cable (from the car)
- remove the car from the hoist unit (SP – special procedure)

The same lifting harness that is used for manipulating the hoist unit is also used for manipulating the car. Its attachment is also identical.

Removing the car from the hoist unit

This action poses an enhanced risk to personnel safety. It can only be performed by personnel authorized and trained to install and repair the given type of equipment.

Procedure:

1. Disconnect the trailing cable from the car, disconnect motor cables.
2. Remove the side of the base enclosure adjacent to the mast (unless it has been removed already).
3. Remove the drive unit with the third tower section as described above.
4. By means of the lifting harness, suspend the car on a suitable crane with low lifting speed (micro speed).
5. Carefully lift the hoist car out of the hoist unit.

The direction of lifting must be vertical. Visually check the perimeter of the car to make sure that there are no obstructions to the car being lifted.

Mast section

The mast is erected and dismantled by means of the erection boom supplied with the hoist.

Other parts and components

They are manipulated by customary means and instruments.

Hoist transportation

Transportation is performed by customary means and in compliance with general principles and local regulations.

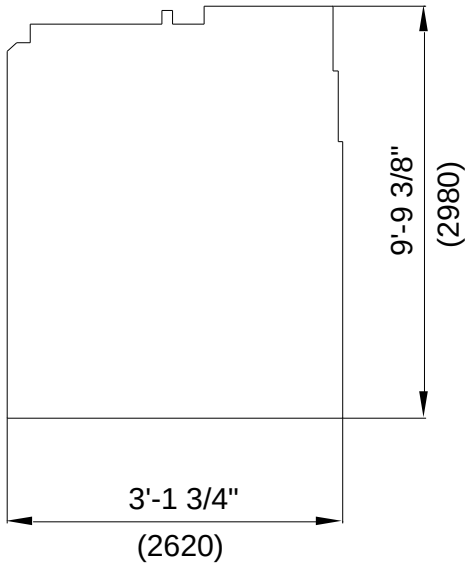
With regard to its dimensions, the hoist unit requires special attention.

Hoist unit

In transportation, the hoist unit must be in the transportation position.

All parts must be securely fastened.

The transportation side view (vertical cross section) is apparent from Fig. 3.12. Any parts protruding out of this profile must be removed.



Transportation side view
Fig. 3.12

Non-standard hoist configurations

This manual contains information regarding customary, standard hoist configurations.

Local regulations and special operating conditions may lead to special technical requirements for some of the hoist components.

This can especially apply to:
- landing equipment
- hoist controls
- tie-ins
- accessories

If you have special requirements for non-standard configurations, contact the manufacturer or your supplier. Be as specific about your requirement as possible.

Request a supplement to this manual for non-standard hoist configurations.

Disposal of the hoist and its components

Parts of the hoist that do not meet requirements for safe operation must be put out of service. Irreparable parts must be disposed of. Dispose of such parts immediately and in such a way that they cannot be used accidentally (by cutting them up, for instance).

The actual disposal depends on local regulations; follow these regulations.

At any rate, it is necessary to:
- Drain oils into a collection tank,
- Remove and separate electrical equipment and conductors from steel structures.

HOIST DESCRIPTION

Base station
The base station consists of a base frame and a separate base enclosure with a hinged center swing type door.
The mast and buffers attach to the base frame. An electrical panel is built in to the base enclosure. The inside of the base enclosure contains a cable drum or cable trolley. The panels of the enclosure are made of wire mesh.
The enclosure door is equipped with a locking device that secures the door when the car is outside of the base station. The base frame is attached to the foundation by means of bolted joints.

A DUAL base enclosure configuration further consists of additional enclosure parts, another control panel and cable drum or trolley for the other car.

Mast
The mast is bolted together of mast sections. The mast sections are equipped with one (SINGLE) or two (DUAL) rack sections. A mast section includes connection bolts and nuts.

Tie-ins
The tie-ins consist of a set of elements connecting the mast to the building. Some of the elements are adjustable, which enables the tie-ins to be used under varying conditions (within a certain extent).

Car
The car frame is welded of steel and it is guided along the mast by means of guide rollers. Car door panels providing lateral access into the car are bolted to the car center piece. The car also has a C-gate in the long side of it for loading by means of a forklift.
The back side of the car is paneled up with aluminum sheeting, and the car doors are paneled up with the same sheeting to a level of 3 ft. (1 m) above the floor, and with wire mesh above this level. The floor and roof are made of steel diamond plate. The car door is one-piece, vertically sliding, statically balanced and equipped with a locking device. The inside of the car contains a safety device and an electrical control panel. The roof contains a hatch with a door, complemented with a portable access ladder.
Furthermore, the car is equipped with a controller, light and other electrical equipment such as limit switches etc.
Along its perimeter, the car roof is equipped with a detachable handrail. It also contains a connection point for an erection boom and attachment points for manipulation.
The back car wall contains the RM2 control panel, and the roof contains the RM3 panel and a resistor bank. The car also contains elements preventing it from falling out of engagement with the mast in extreme breakdown situations.

Drive unit
The drive unit consists of three motors, frame and machinery plate, and it is located above the car. The machinery plate contains two back-up roller (absorbing reactions from the pinions) and elements preventing the pinions from falling out of engagement with the rack.
Each motor consists of a gearbox equipped with an electric brake motor on its input side and a pinion on its output side.
The drive unit is connected to the car by means of pins. If the hoist is equipped with an overload protective device, the load cells are located inside these pins and their distortion indicates the amount of load placed inside the car.

Landing equipment
Landing doors or landing bars can be used to secure the landings.

Overload protective device (if installed)
It consists of a pair of load cells inserted between the drive unit and the hoist car, and a processing unit located inside the car. It prevents the car from being overloaded and is wired into the circuits of the RM2 panel. It is described separately in SUPPLEMENT 1.

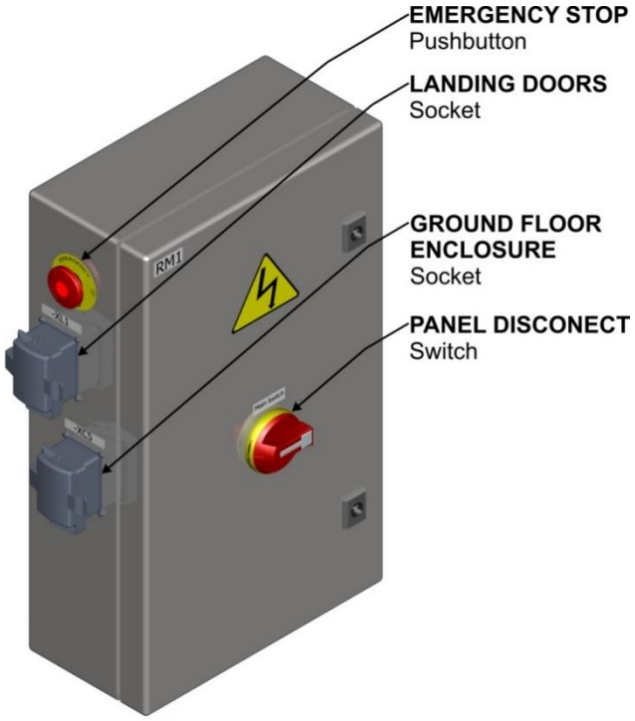
Small and additional parts
These consist of cams of limit switches and locking devices, cable guides, or tie-in inserts (to be embedded in building structures), if supplied.

Electrical equipment
Electrical equipment consists of control panels (at the base station and on the car), resistor bank, all electrical devices, stationary and moving electrical conductors (for power supply, control and safety functions), and car light.
Most of the electrical instruments are concentrated in the control panels, which are interconnected with the trailing cable.
Electrical equipment for DUAL hoist configurations is doubled and mutually independent. A detailed description of electrical equipment is available in the Supplement.

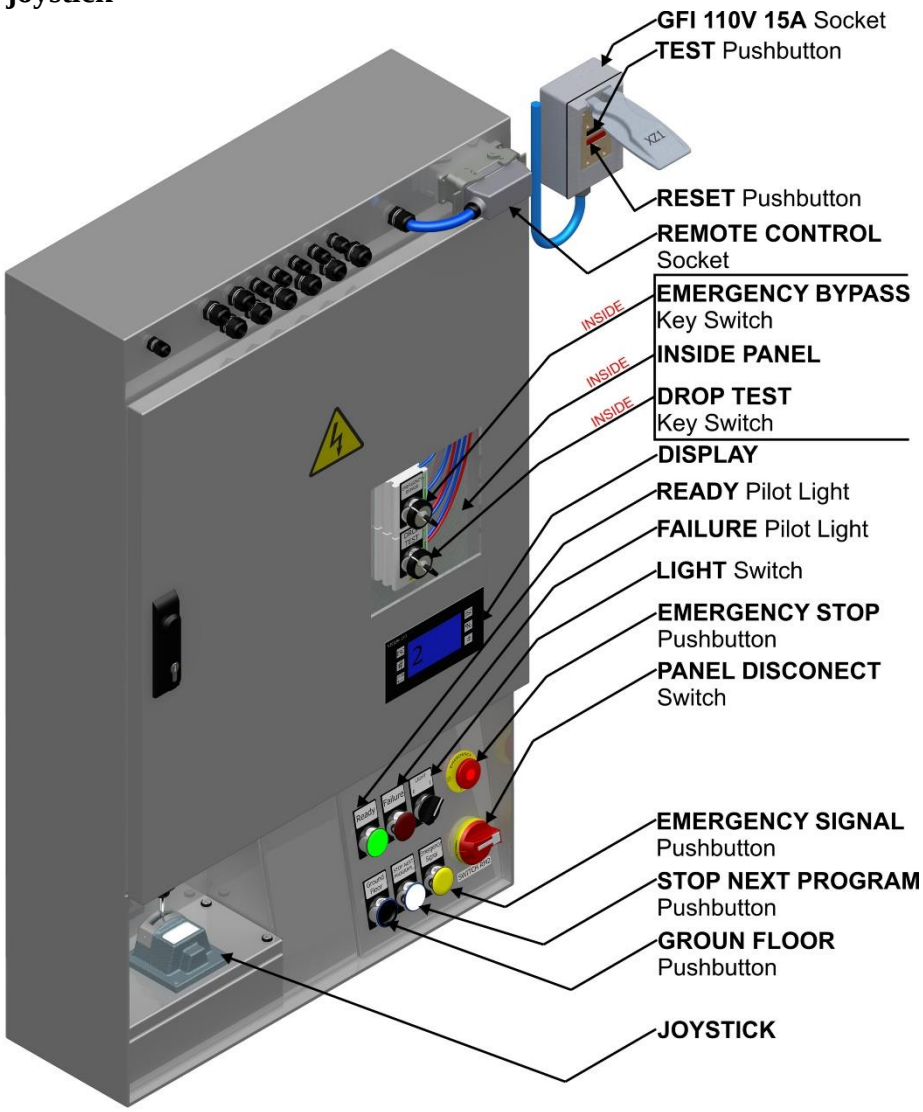
Accessories
Accessories consist of :
- erection boom and platform for mast erection
- lifting harness for manipulation of the hoist unit
- tools for emergency actions and safety device setting
- DROP TEST controller
- Stop (for manipulating the car working underneath it)

HOIST CONTROLLERS

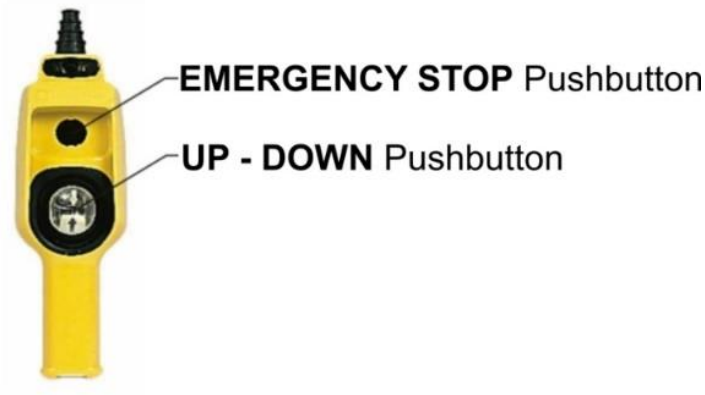
RM1 panel
(in the base enclosure)



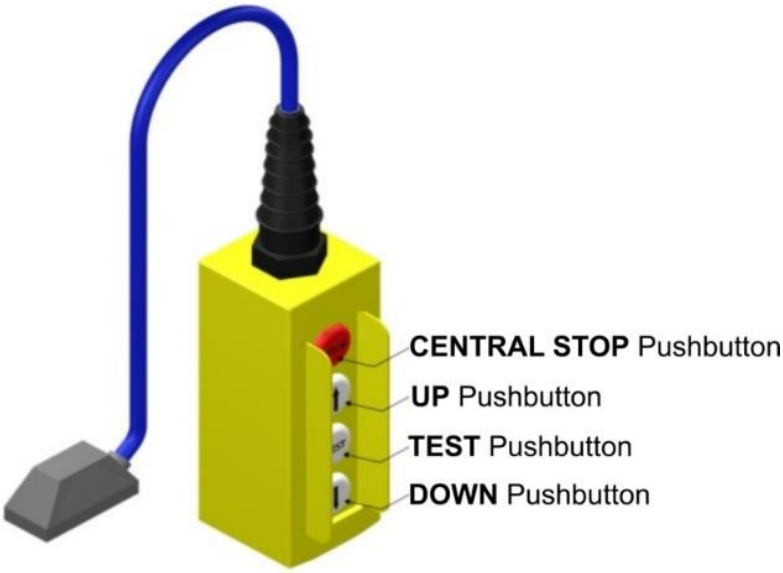
RM2 panel with joystick
(in the hoist car)



Inspection controller
(on the hoist roof)



DROP TEST controller
(for testing purposes,
located outside the hoist)



Hoist controllers
Fig. 3.13

HOIST ERECTION

Erection and dismantling may only be performed by authorized personnel trained and experienced in the erection of rack-and-pinion construction hoists and familiar with the given type.
The extent and type of authorization is stipulated by local regulations and issued by local authorities.
Only persons with appropriate authorization in the given field of work may connect and inspect the main power supply to the hoist.
Erection and dismantling must be performed in a professional manner and all work safety regulations, as well as technical and safety requirements contained herein must be adhered to.
Re-read this manual thoroughly before starting a new installation and make sure that it is permitted and complies with local regulations.

PRELIMINARY AND PREPARATORY WORK BEFORE ERECTION

Procedure:

1) Examine the suitability of the place of the erection site (distance of the hoist from the building, ground bearing capacity, tie-in locations, landings, power supply, site lighting and fencing, transportation, manipulation, emergency situations action plans etc.)
2) Prepare the foundation slab.

Before pouring the foundation slab, double check that the distance between the mast center line and the tie-in locations in the building (the L dimension) corresponds with the type of tie-in used.

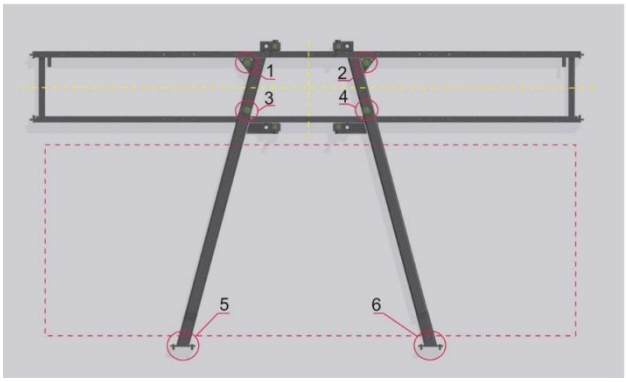
3) Check all components that are to be installed. Check pinions, rack and guide and back-up rollers for wear.
4) Check the electrical equipment.
5) Check availability of documentation for the unit.
6) Check if all required settings, inspections, tests and maintenance have been performed, especially of the safety device, geared motors, electrical equipment, erection boom etc.
   Rectify any shortcomings.

See when the safety device was last refurbished (max. 3 years). Depending on its expected time of operation at the new site of installation, resolve as to its possible refurbishment.

INSTALLATION OF HOIST UNIT

Procedure:

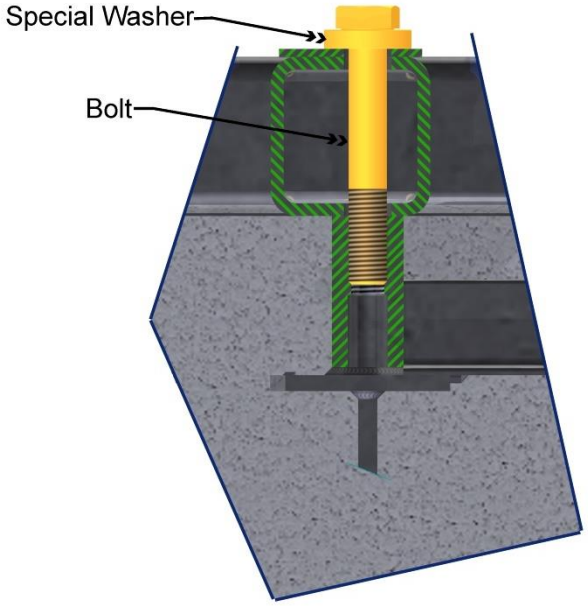
1) Clean the foundation slab, remove plugs from the foundation (embedded) frame, clean the threaded holes (M24)
2) Remove the part of the base enclosure adjacent to the mast.
3) Mount the third mast section with the drive unit on it; connect the mast sections to each other and the drive unit to the car.
4) Place the hoist unit on the foundation, checking alignment of the holes in the base frame with those in the foundation (embedded) frame (spots 1 through 4 in Fig. 4.1).



Setting up the base frame
Fig. 4.1

5) Bolt the base frame to the foundation frame. Do not tighten, leave a margin for variation.

The bolts attaching the base frame must be of the specified grade, combined with a special washer and tightened to the specified torque after setting up the base and mast (see Fig. 4.2).



Attachment of base frame
Fig. 4.2

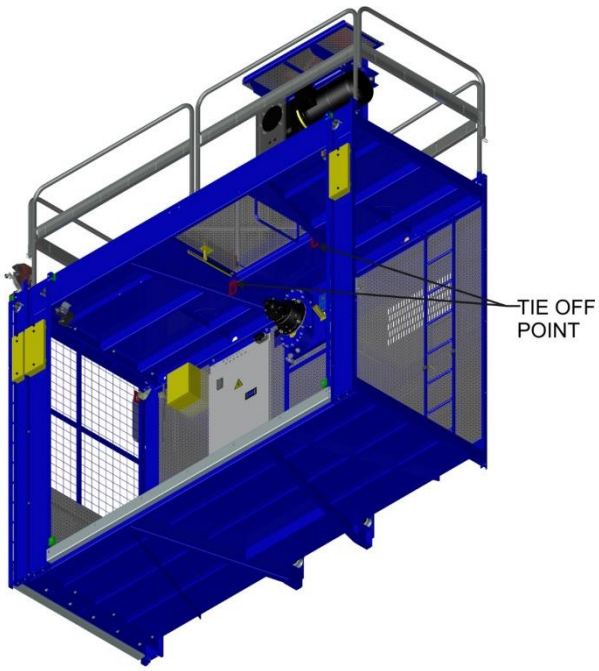
6) Set up the base frame so the mast is completely plumb (using theodolite or plumb).

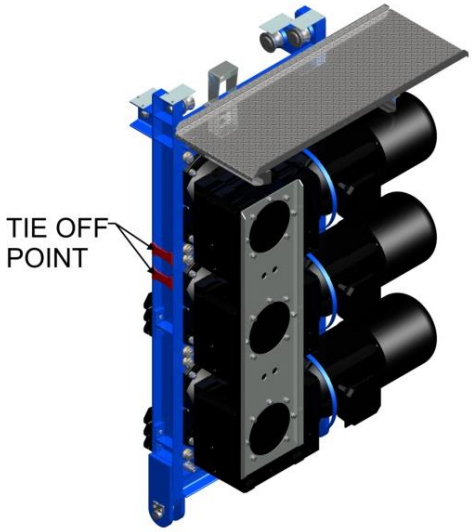
Use metal shims to set up the base and place these shims as close as possible to the attachment bolts in spots 1 through 4 in Fig. 4.1.

7) Tighten the attachment bolts lightly.
8) Double check that the mast is plumb in both planes.
9) Tighten the bolts to the specified torque.
10) Shim the base frame in spots 5 and 6 (Fig. 4.1).
11) Detach the lifting harness from the hoist unit and crane.

It is at this point at the latest that the place of installation must be fenced around. If it is not, discontinue the installation.

When working in heights or at a risk of falling, a safety harness must be used and securely tied off. There are designated tie-off points on the hoist car:
- **On either side of the drive unit**
- **By the roof hatch inside the car**



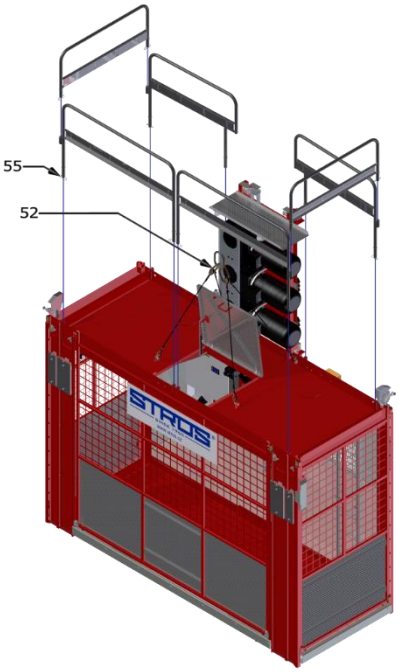


12) Mount the handrail on the car roof and attach the RM2 panel and resistor bank to it. Wire the motors to the RM2 panel and the encoder to the corresponding terminals in the variable frequency drive.

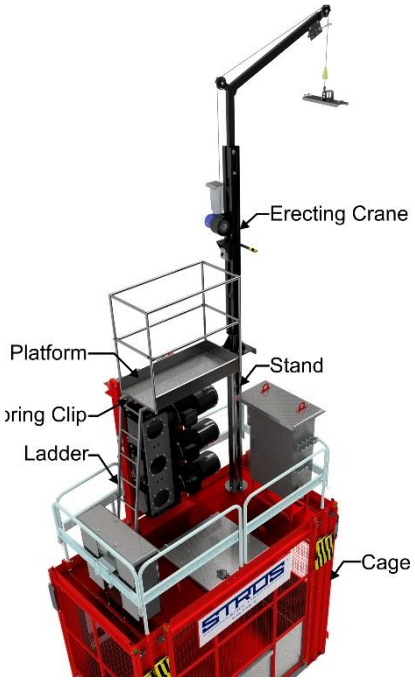
Take special care in connecting the shielded conductors of the encoder by means of the stirrups.

13) Connect the trailing cable to the terminal board in the RM2 panel.
14) Install the erection platform and erection boom on the car roof.

Car roof assembly is apparent from Fig. 4.3. The handling set (52) is shown in a taut position. All the handrail parts must be held with spring pins (55). Install the erection platform and boom as shown in the picture and attach with bolts. An electric erection crane must also be plugged in the corresponding outlet.



Car roof
Fig. 4.3



Erection platform and boom
Fig. 4.4

15) Connect the hoist to an external grounding network.

Use the marked grounding point on the base frame. Proceed in accordance with local regulations.

16) Adjust the end-of-rack proximity switch (SP).
17) Check if a dummy plug is present in the connector on the RM1 panel at the base (to bypass the landing gates circuit).
18) Perform a partial inspection of the electrical equipment of the unit and connect it to the power supply.

The supply cable must be laid or hung and protected against damage. Proceed in compliance with local regulations.

19) Turn the main disconnect switch on and check the phase sequence.

To ensure the safety of further installation steps, persons authorized to install the hoist and inspect its electrical equipment must cooperate to check that all safety requirements for the hoist are complied with.
This check must be performed

- **before connecting the hoist to a power supply**
- **when activating the unit (initiating power to the unit)**

The electrical equipment inspection must be logged and attached to the hoist's documentation.
Before connecting the unit to power supply, it must be inspected in the following extent:

- **Inspection of the protective circuit**
- **Inspection (measurement) of the hoist's insulation**
- **Grounding inspection**
- **Inspection and measurement of protection against dangerous touch voltage**

20) Test the erection boom (SP).

It is forbidden to use an untested erection boom. It also applies to its attachment, electrical equipment (in an electrical boom, type 150/200S) and lifting jig.

21) Mount one mast section (SP).
22) Ride up (approx. 2'-6").

This short ride up must be performed by an authorized person from inside the car by holding the final limit bypass switch and the UP button at the same time (SP – see emergency situations).
Be careful not to ride out of the mast!

23) Mount the buffers to the base frame.

When installing the buffers, no persons must be present in the car or on the roof, the main disconnect switch must be off and the EMERGENCY STOP buttons in the car and at the base must be activated.
The person installing the buffers will do so from the mast side and in such a way that they do not expose any of their body parts to potentially being crushed by the car.

24) Turn the mode selection switch the RM3 panel (on the roof) to the INSPECTION position.
25) Control the hoist by means of the directional buttons on the RM3 panel.
26) **Complete the inspection of the activated electrical equipment in the following range:**
    - Function of the directional pushbuttons or joystick
    - Function of the bottom normal and final limits (SP)
    - Function of the EMERGENCY STOP button
    - Function of the end-of-rack proximity switch
    - Function of the car doors and base enclosure doors, including their locking devices

In relation to the testing of the base enclosure door, the base enclosure must be shimmed properly.

27) Mount two more mast sections (SP).
28) Test the brakes (single brake test) (SP).
29) Mount another mast section (SP).
30) Inspect the hoist's parts, checking especially tooth clearances (between pinions and rack), setting and clearances of guide rollers, clearances of safety hooks and supports (SP)
31) Test the brakes of the drive unit (SP)
32) Test the safety device (SP)
33) Test all the functions of the hoist necessary for further erection.

Before moving on with the erection, check that all the previous steps have been performed.
Also, make sure that the length of the trailing cable is sufficient for the project's final height.
Fill out the "Pre-erection test" report.

INSTALLATION OF A DUAL HOIST UNIT

The procedure is analogous to the SINGLE hoist installation with the following digressions:
1) Install the buffers for the other car simultaneously with those for the first car.
2) Install the other car in the base hoist unit after activating and testing the first car (SP).
3) Mount the drive unit for the other car and pin it to the car.

To ease the installation of the other car, it is advisable to temporarily remove the mast section that was used to activate the first car. On installing the other car, replace the mast section.

4) Connect the other car to the trailing cable.
5) Complete the installation of the base enclosure including the enclosure door.
6) Perform all tests and similar procedures as in the first car.

The other car must be equipped in the same way as the first car, with the exception of the erection boom, which does not have to be installed in the other car.

Do not use the other car unless its safety has been verified.
Do not forget to shim the base enclosure along its entire perimeter.

CONTINUATION OF INSTALLATION

The continuation of the hoist's erection lies in the installation of:

- mast
- landing equipment
- tie-ins
- limit switch cams
- cable guides

The installation of these components is performed from the car roof by two technicians, one of who is appointed as a foreman.

The above components are installed simultaneously. It is important to pay special attention to the following:

- **the mast being plumb and straight**
- **respecting the maximum tie-in spacing**
- **tightening bolted joints to the specified torque**
- **preventing structures from suffering from additional loads**

In erecting the unit, make and maintain specified clearances between the moving car and stationary parts of the tie-ins, landings and base enclosure.

Tighten individual parts in a timely manner and continuously check their position.
Do not exceed the values specified for a safe installation and subsequent safe operation of the hoist.
Do not overload the hoist

When installing any of the hoist's components, always secure the car against involuntary travel by activating the EMERGENCY STOP switch on the erection controller. Only release this switch when you have completed the installation of the component and warned your workmate(s) that you are going to move the car.

When the car is in motion, do not lean over the perimeter of the car! There is a hazard of getting crushed between the car and a tie-in or landing.

During erection, always control the hoist from the roof by means of the erection controller on the RM3 panel.
It is forbidden to control the hoist from inside the car during erection.

Always wear a safety harness when working outside of the roof area. Use the lifting harness attachment points on the car roof to tie yourself off. Always secure the car against involuntary travel, by activating the EMERGENCY STOP switch on the erection controller as a bare minimum.

Always wear a hardhat and safety anti-slip boots when working on the hoist. If the nature of the work calls for it, wear safety glasses.

MAST ERECTION

Mast sections with corner pipe wall thickness of 6.3 mm may be used up to a height of 820 ft. (250 m). If the final lifting height of the project is to be greater, consult the manufacturer prior to commencing the installation, as mast with thicker pipe must be used at the bottom.

When mounting or removing a mast section, it must be attached to the erection boom for as long as the bolted connections are being installed or removed.
A tower section must not be attached to the erection boom while the car is in motion.

Mast bolt
Fig. 4.5

The bolts connecting the mast sections together must be installed with the nut facing up. That way it is easy to make sure that the nut is tightened correctly.

Procedure:

1) Load mast sections in the car at the base (3 sections at most).
2) Lower the erection crane hook into the car through the roof hatch, attach a mast section to it, lift it and place it on the car roof.
3) Close the hatch.
4) Ride to where the mast is to be jumped.
5) Lift the mast section, clean the spigot and socket joints and the rack guide pin (at the bottom of the section).
6) Swivel the erection boom to bring the mast section over the top of the mast, set it in place and attach with four M24 bolts and nuts. Tighten the nuts in the usual way (Fig. 4.5).
7) Detach the erection boom from the mast and the lifting jig, swivel it over the car and secure it against swiveling.
8) Tighten the mast connection bolts to the specified torque.
9) Check the tightening of the bolts attaching the rack to the mast.

The EMERGENCY STOP button on the erection controller must be activated for as long as a mast section is being installed.

Repeat the procedure above to install remaining mast sections.

INSTALLATION OF TIE-INS

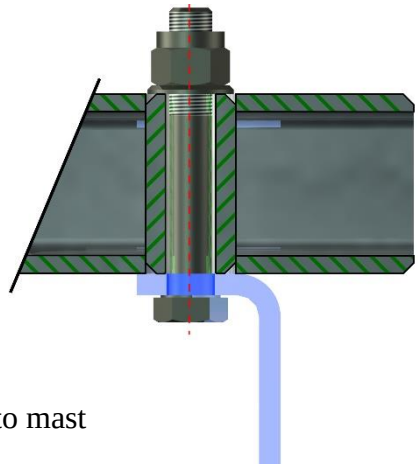
Respect specified tie-in distances and spacing. Respect the forces imparted by the tying system to the building. Make sure that the connections of all tie-in elements are properly secured. Check clearances between the car and the tie-ins.

Read the tie-in description section.

Procedure:

1) Mount the tie-in frame to the mast.

The tie-in frame is attached to the mast by means of bolts and nuts (Fig. 4.8). The tie-in frame must be installed horizontally.

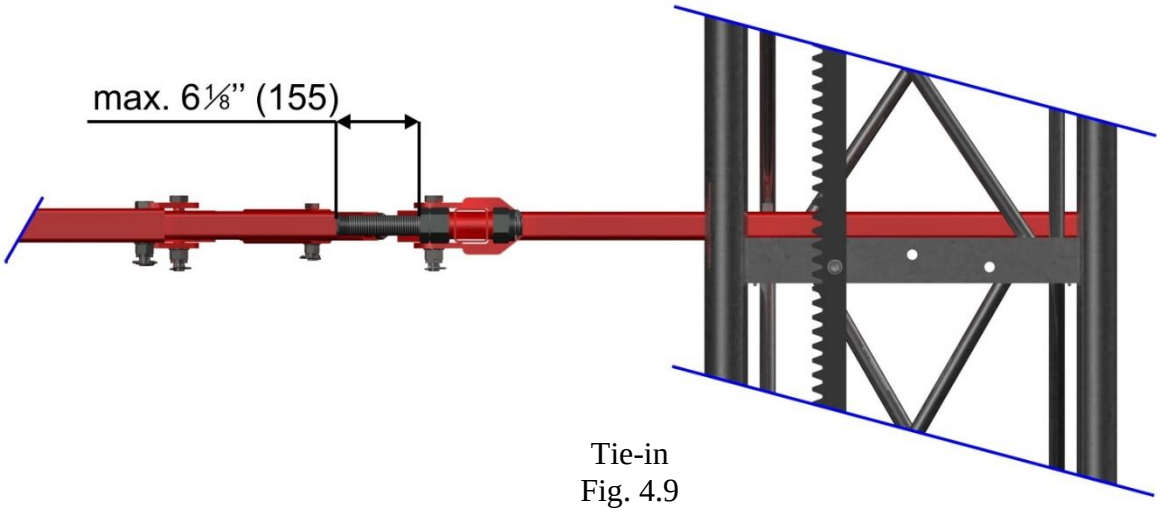


Attachment of tie-in frame to mast

Fig. 4.8

2) Attach the tie-in shoes (brackets) to the wall (or other tie-in point).
3) Install the middle section of the tie-in.

The length of the tie-in is adjustable within a certain extent. Rough adjustment is performed by means of the holes in the tie-in frame, while fine adjustment is performed by means of the turnbuckles.

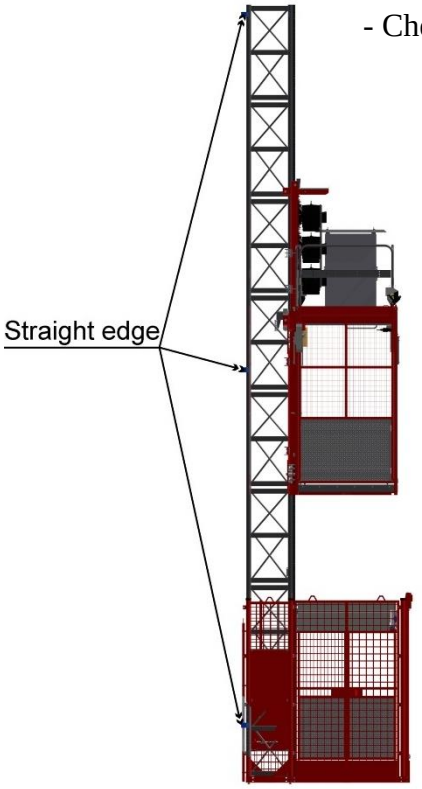


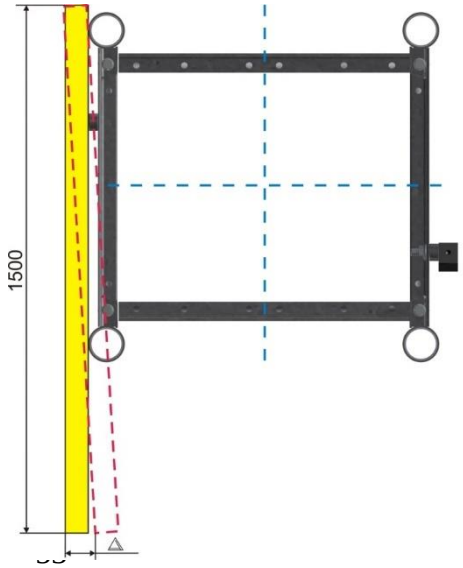
Tie-in
Fig. 4.9

On installing a tie-in (and straightening the mast), check the placement of the pins and tighten the bolted connections. The maximum distance of 6 1/8" (155 mm) must not be exceeded. (Fig. 4.9).

Straightening the mast

The mast can be straightened (made plumb, prevented from twisting) by extending or shortening the individual pipe elements of the tie-in. Ensure that the mast is straight at the first tie-in. A recommended procedure making use of a straight edge (ruler) and theodolite is apparent from Fig. 4.11. Principles:
- the straight edge is 5' (1.5 m) long
- The straight edge is put to the mast at the place of a tie-in
- Check the mast for both plumb and twist simultaneously





Mast straightening
Fig. 4.11

Erection boom and platform dismantling
These items are dismantled when the erection of the mast is completed.

While the hoist is in operation, the handrail remains installed on the roof. It is forbidden to operate the hoist without the handrail.
The erection boom and platform may not remain installed on the roof while the hoist is in operation.

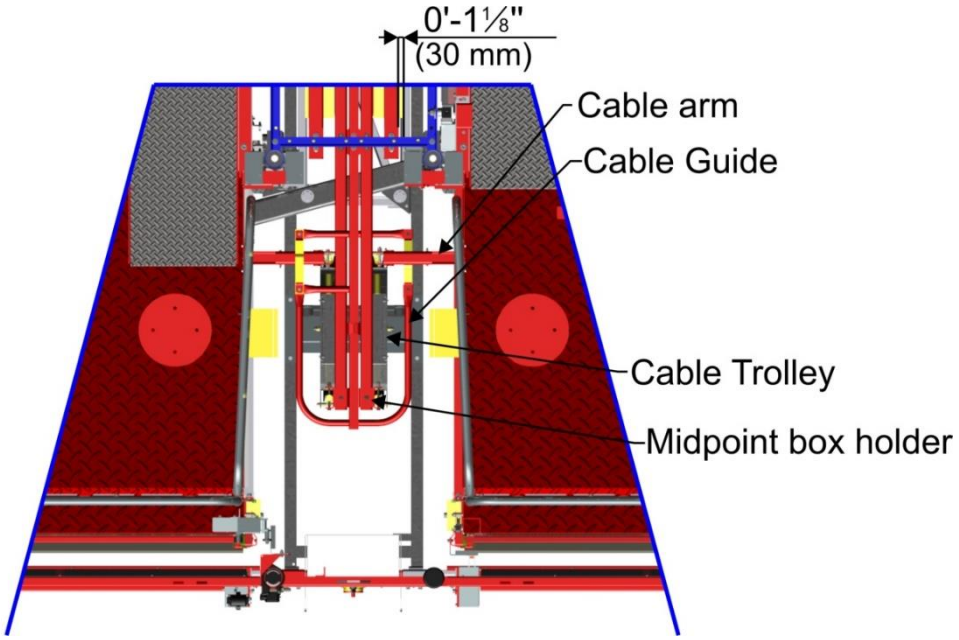
Cable guide installation
The installation of cable guides is performed simultaneously with the erection of mast. Distances between cable guides are detailed in the table below:

Cable guide No.	Distance ft. (m)
1	5'-9"(1.75 m) above cable drum
2	10' (3 m) above first cable guide
3	14'-9" (4.5 m) above second cable guide
4 +	19'-7"(6 m) above previous cable guide

These distances may be modified depending on local conditions.

Cable guides are attached to the mast in a way similar to tie-ins, i.e. by means of stirrups (U-bolts) or bolts and nuts.

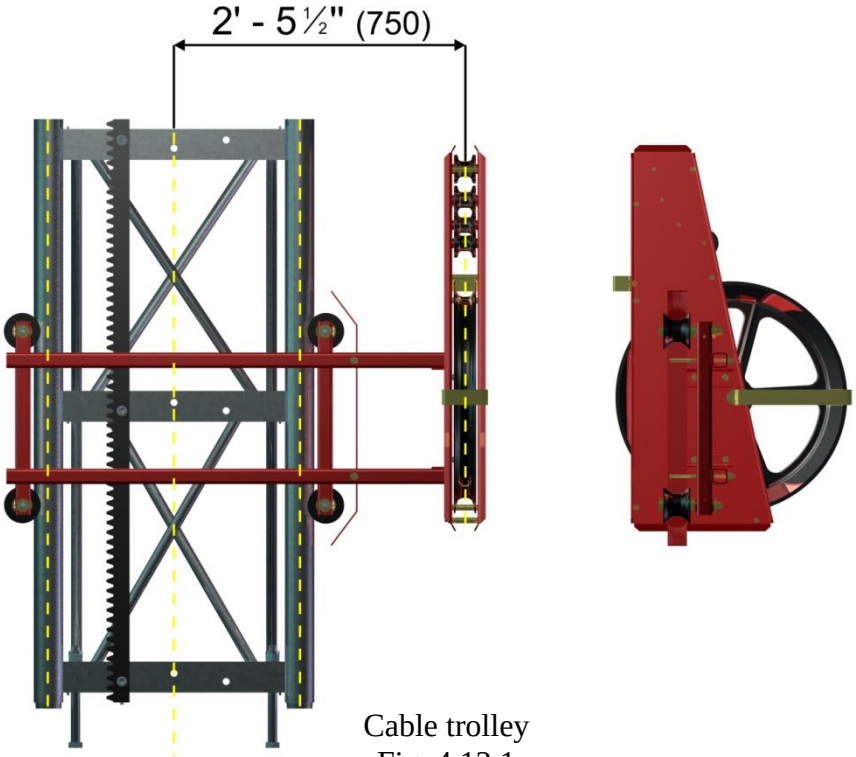
Check clearances between the car and the cable guides. Make sure they are sufficient.
Make sure that the cable arm passes through the cable guides in the right way.



Cable guides in a DUAL configuration with cable trolleys
Fig. 4.12

Cable trolley installation

In greater lifting heights, the power cable is run halfway up the mast (fixed power cable) from there it is suspended to the car (trailing cable). A cable drum is not used.

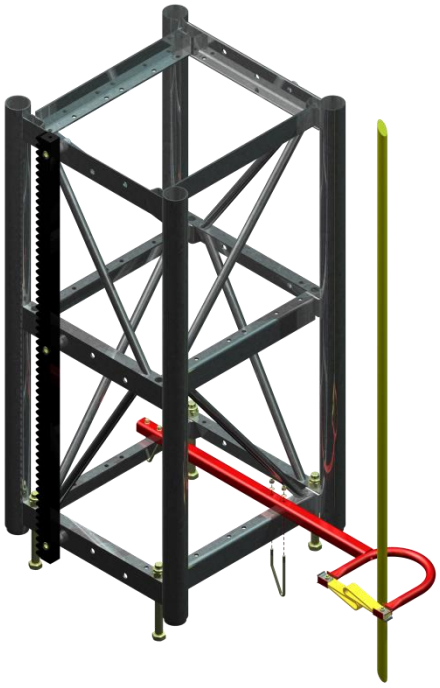


Cable trolley
Fig. 4.12.1

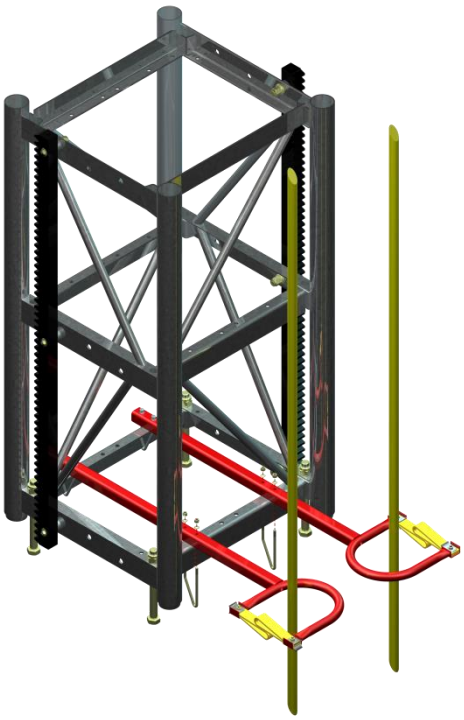
The cable trolley travels along the mast pipes below the car. Therefore, the car door sill must be higher off the ground, the base enclosure must be equipped with pit screens and the buffer must be made higher (on a stand).

Procedure:

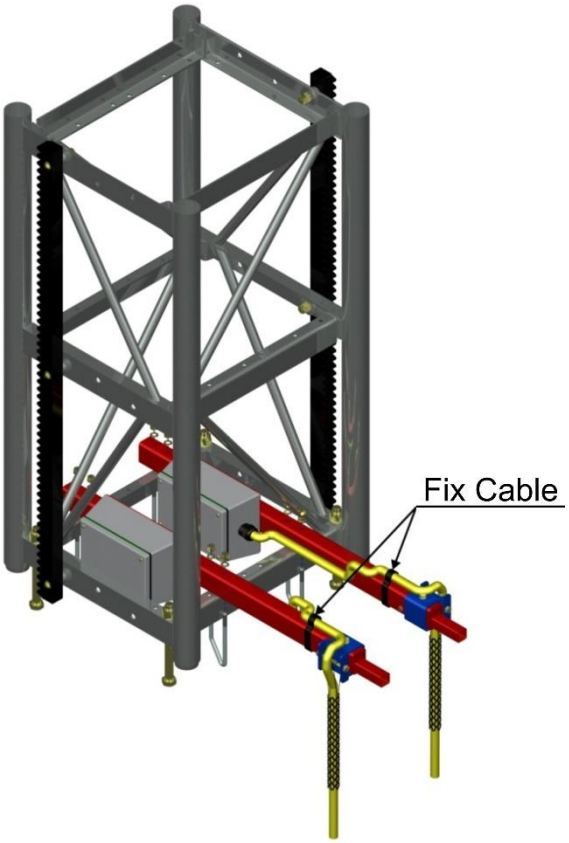
1. The first stages of the hoist's installation are performed in the same way as in a standard version, including tie-ins and cable guides, with the following alterations:
   - high buffers are installed underneath the car,
   - the base enclosure is set on pit screens, which brings the car sill to a height of ~ 4'-7" (1.4m) off the ground,
   - one more mast section must be used when installing the mast.
2. A rubber cable is used as fixed power cable. Attach it in the cable arm on the car and let it hang down freely into the base enclosure. The cable that will be used in the trolley should be coiled and placed on the car roof, together with the midpoint junction box.
3. Follow the standard procedure to erect the mast above the midpoint of the final height.
4. Install the cable trolley below the car.
5. Ride to the end of the mast.
6. Install the junction box above the midpoint and run the trailing cable from the junction box through the cable trolley and back to the cable holder on the car roof. This cable must not be twisted and must hang freely.
7. Run the fixed power cable on the outside of the mast from the midpoint junction box to the RM1 panel at the base and clamp it to the cable guides or the mast (this depends on the customary practice of the hoist contractor).
8. Follow the standard procedure to erect the mast to the final height.



SINGLE cable guide
Fig. 4.12.2



DUAL cable guides
Fig. 4.12.3



Midpoint junction box in dual configuration
with cable trolleys
Fig. 4.12.4

The length of the trailing cable and the location of the junction box must be determined in such a way that the cable does not get damaged when the car rides to the top terminal position, and the cable trolley does not hit the base frame when the car is at the base station.

INSTALLATION OF CATHEAD AND COUNTERWEIGHT

In some cases, when a higher load capacity of the car is required, a counterweight can be added and the load capacity increased to a maximum of 8,000 lbs (3600 kg). In order that this can be done, the car must have a counterweight attachment and mast sections with counterweight rails must be used. A 2400 kg counterweight assembly is mounted on the rails that are part of the mast at the beginning of the hoist installation, after the hoist unit is set up. The mast is then erected to the required height.

Procedure:

1. Mount the equalizer drum (counterweight suspension) on the car, with the switch cam taken off.
2. Mount the cathead on the top of the mast.
3. Ride the car to the top of the mast, drop the wire ropes to the counterweight assembly and pin them together.

Two wire ropes must be used for each counterweight assembly. The rope attaches to the counterweight by means of a pin and nut, which must be secured with a split pin.

4. Coil the other ends of the ropes around the equalizer drum and clamp them in place in such a way that both the ropes are equally long. If one of the ropes stretches or breaks, the equalizer drum tilts and the safety switch trips.

Run at least two turns of each rope around the equalizer drum.

5. The length of the ropes must be so adjusted that when the car makes the top final limit, the counterweight does not sit on the buffer, and when the car is on the bottom buffer, the counterweight does not hit the cathead.
6. Mount the cam of the safety switch.

Clearances between the counterweight and static parts of the mast, especially the tie-ins, must be monitored. These clearances may not be less than 0.879” (20 mm).

When the installation of the counterweight is complete, check the position of the safety switch cam to make sure that the switch is functional.

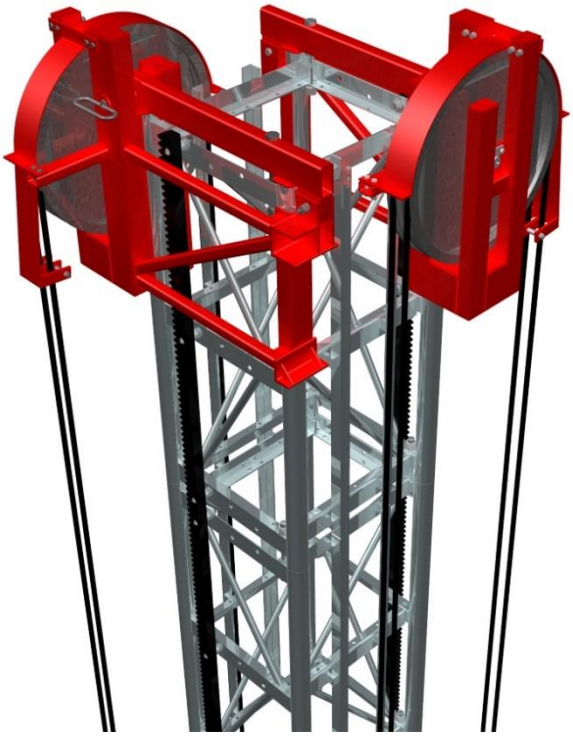
The load capacity is reduced during installation, because:

- **The counterweight is not in service**
- **The car has an erection platform and boom installed on the roof.**

Load capacity during installation is therefore reduced to 5,000 lbs (2,200 kg) in the NOV 2738 F models, and to 6,000 lbs (2,700 kg) in theNOV 3238 and NOV 3242 F models.

Vertically sliding cathead for single or dual car hoists

The cathead makes it possible to jump a hoist (extend its lifting height) without having to remove the cathead from the mast.



Sliding cathead
Fig. 4.12.6

Conditions:

When this equipment is used, the following conditions must be fulfilled:

IMPORTANT! In order to prevent damage to the sheave bearings by corrosion, it is advisable to inspect them periodically and replace them as necessary.

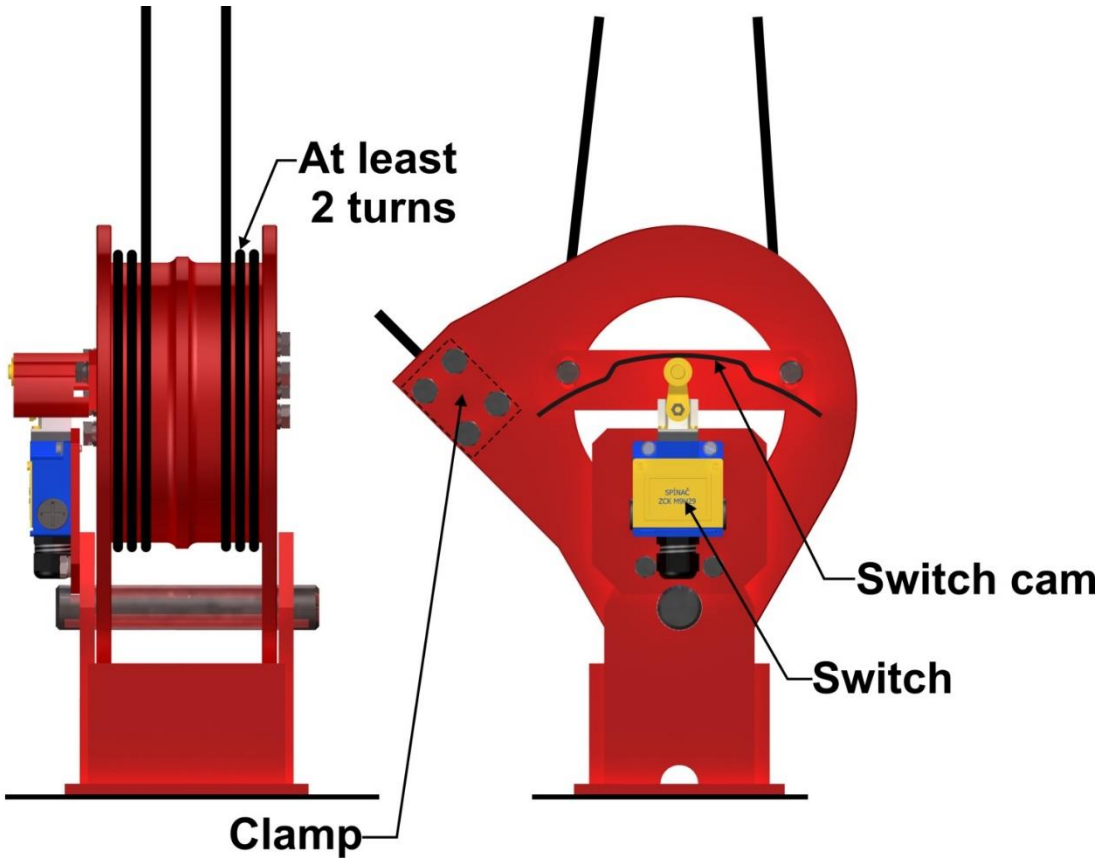
1. A length of wire rope sufficient for the project's final lifting height must be available on the car roof.
2. The rope must be stowed in such a way that it can be conveniently unreeled without forming loops.
3. When jumping the mast, it is absolutely unacceptable to exceed the maximum top mast overhang (height of free-standing mast).
4. Exercise caution in manipulating loose wire rope and prevent it from falling.
5. When jumping the mast, monitor the rope constantly to make sure that it does not get run over by the car, caught on the car, tie-in or another object protruding out of the hoist structure or the building.

Procedure:

Before the jump, bring adequate amounts of mast sections, tie-ins and cable guides to the top landing.

1. Switch the control mode to Inspection (i.e. car is controlled from the roof).
2. Ride both the cars to the top landing.
3. Remove the limit switch cams from the mast.
4. Carefully run the car to right below the cathead, so that the cathead does not drop when released (opened).
5. When the car is in this position, the counterweight is resting on its buffer.
6. Loosen the bolted joints of the cathead and lift the support arm to a vertical position.
7. Repeat the procedure in the other car and its counterweight.

On releasing the cathead, secure the other car against use so it cannot be run while the jump is being performed. On securing the car, the operating personnel transfers to the car from which the jump will be performed.



Equalizer drum
Fig. 4.12.6

The mast jump is then performed as follows:

8. Unreel and measure a length of rope that corresponds exactly to the length of the intended jump.
9. Loosen the clamps on the equalizer drum and feed the measured length of rope through the drum towards the cathead. The loop that forms should ideally be transferred to the space above the car.
10. Install mast sections to extend the mast to the required height.
11. Attach the cathead to the top of the mast.
12. Ride the car 0.3 m (1 ft) down and clamp the ropes to the equalizer drum in such a way that the drum is vertical when the ropes are tensed.
13. Ride the car down to the top landing and reinstall the limit switch cams.
14. When the car is in this position, the counterweight must be 150 – 200 mm above the buffer.
15. Mount the safety switch cam on the equalizer drum.
16. When the car makes the top final limit, the counterweight must not sit on the buffer, and when the car is on the bottom buffer, the counterweight must not hit the cathead.
17. Repeat the procedure in the other car.

INSTALLATION OF LIMIT CAMS

The car's stopping correctly at the top and bottom limit positions is an important part of the hoist's entire safety system, which is reflected in doubling the function (normal and final limit).
Insufficient attachment, setting or function of the limit switches and the cams interacting with them must not be tolerated.

Setting requirements

Stopping at the base:

Normal limit
An empty car must stop in such a way that the car sill is approx. 1 1/4′′ (30 mm) above the base enclosure sill.

Final limit
In the event that the car overrides the normal limit, it must stop on the final limit. An empty car must stop in such a way that there is at least 1 1/2′′ (40 mm) between the buffer springs and the bottom of the car.
If a cable trolley is used, it must be at least 3′′ (75 mm) above the base frame.

Stopping at the top terminal landing

Normal limit
An empty car must stop in such a way that the car sill is approx. 1′′ (25 mm) above the landing sill.

Final limit
In the event that the car overrides the normal limit, it must stop on the final limit. An empty car should stop approx. 4" to 9" (100 to 150 mm) above normal limit.
If a cable trolley is used, it must be able to travel freely for at least another 3" (75 mm) when the car stops on the final limit.

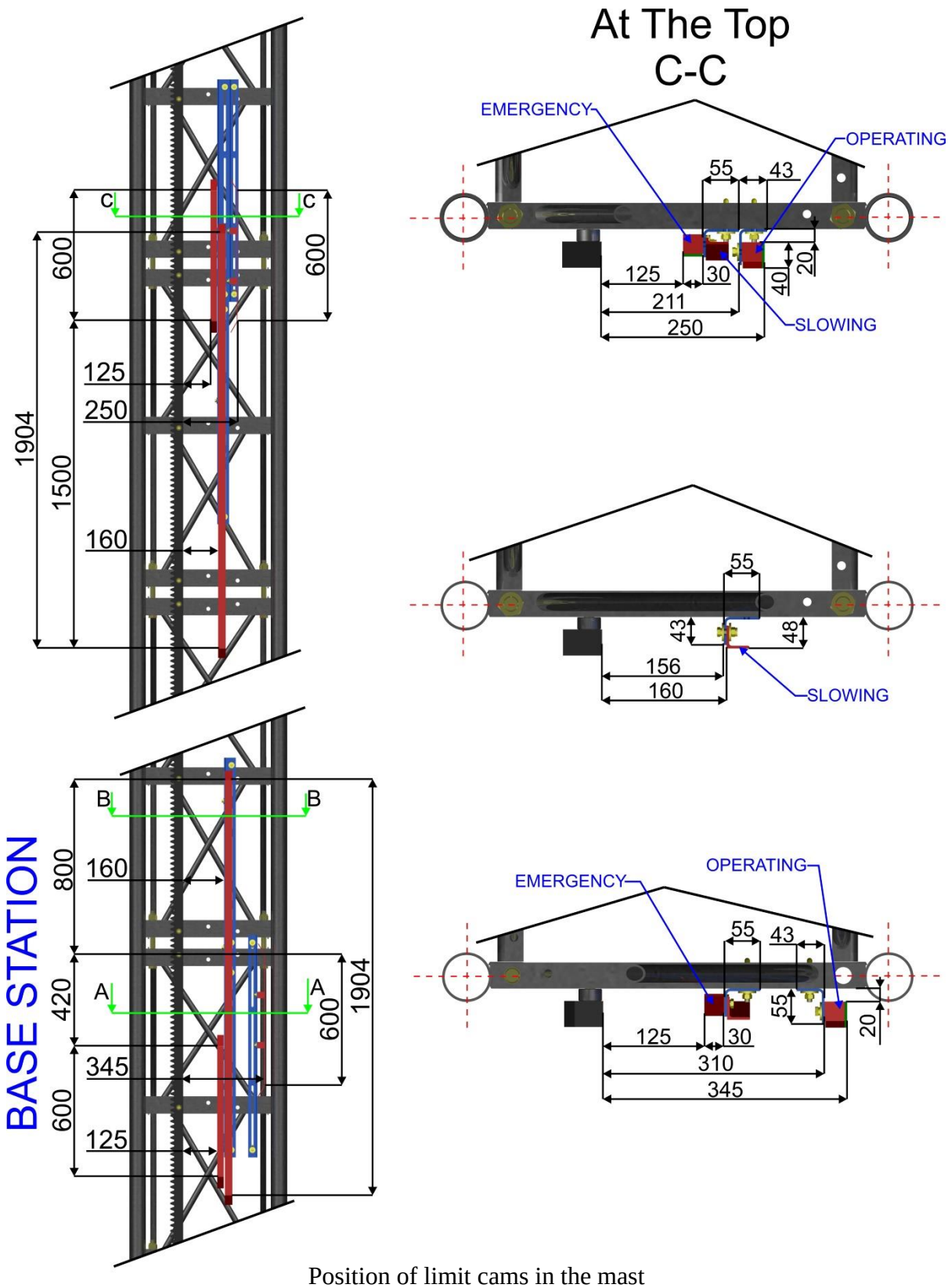
If the car stops on the top final limit, all clearance and safety distance requirements contained in this manual must be adhered to without exception.

Slow down cam installation
Slow down cams at both terminal stations must be installed in such a way that the car slows down to low speed before it makes the normal limit.

The location and position of limit cams are apparent from Fig. 4.13.

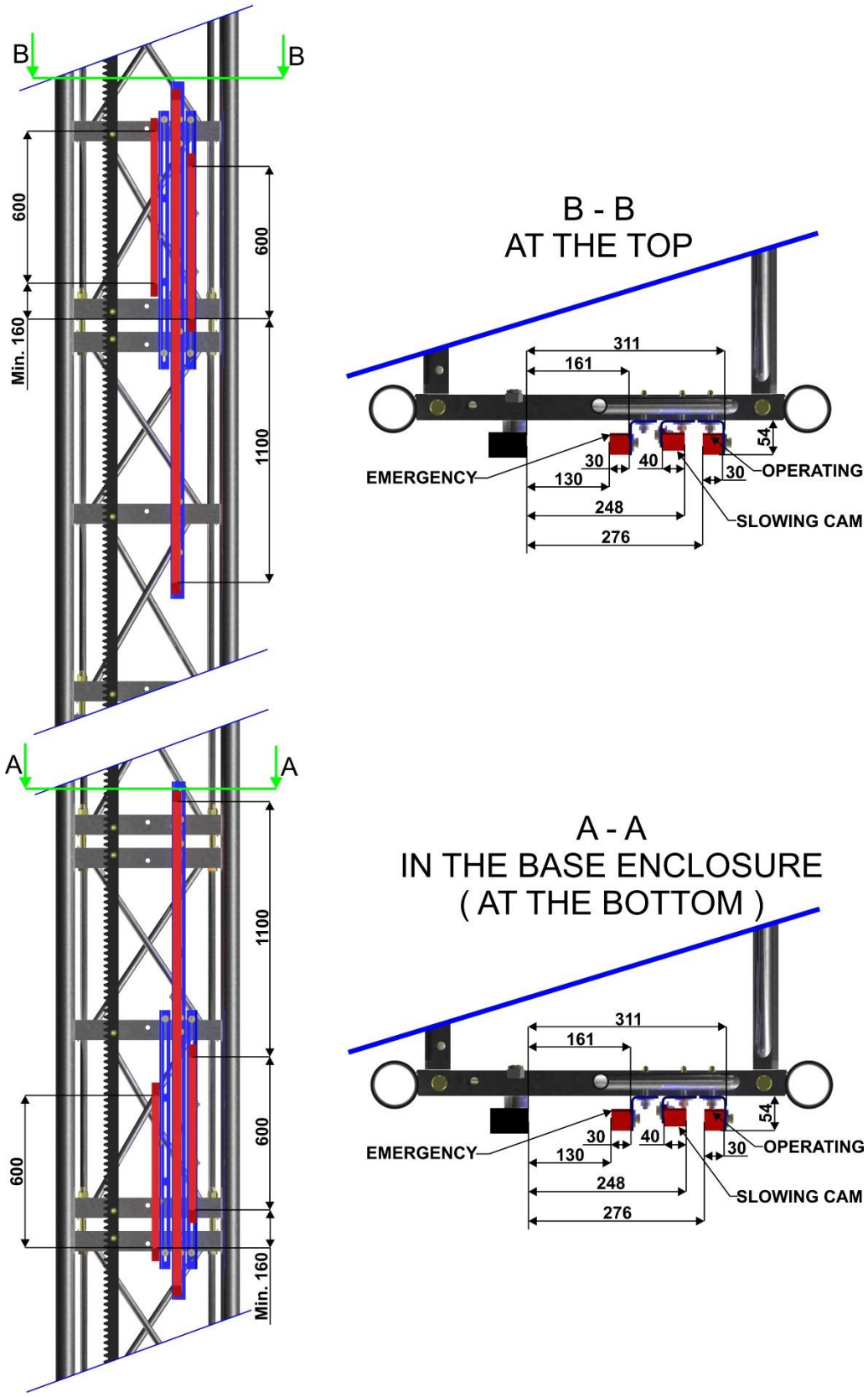
Make sure that the limit switch rollers come in contact with the middle section of the cams, and that the cams are mounted parallel with the vertical axis of the mast.
The setting of the cams must ensure that the limit switch contacts open sufficiently, and that the limit switch levers have room for overriding.

Schmersal limit switches



Position of limit cams in the mast
(SCHMERSAL)

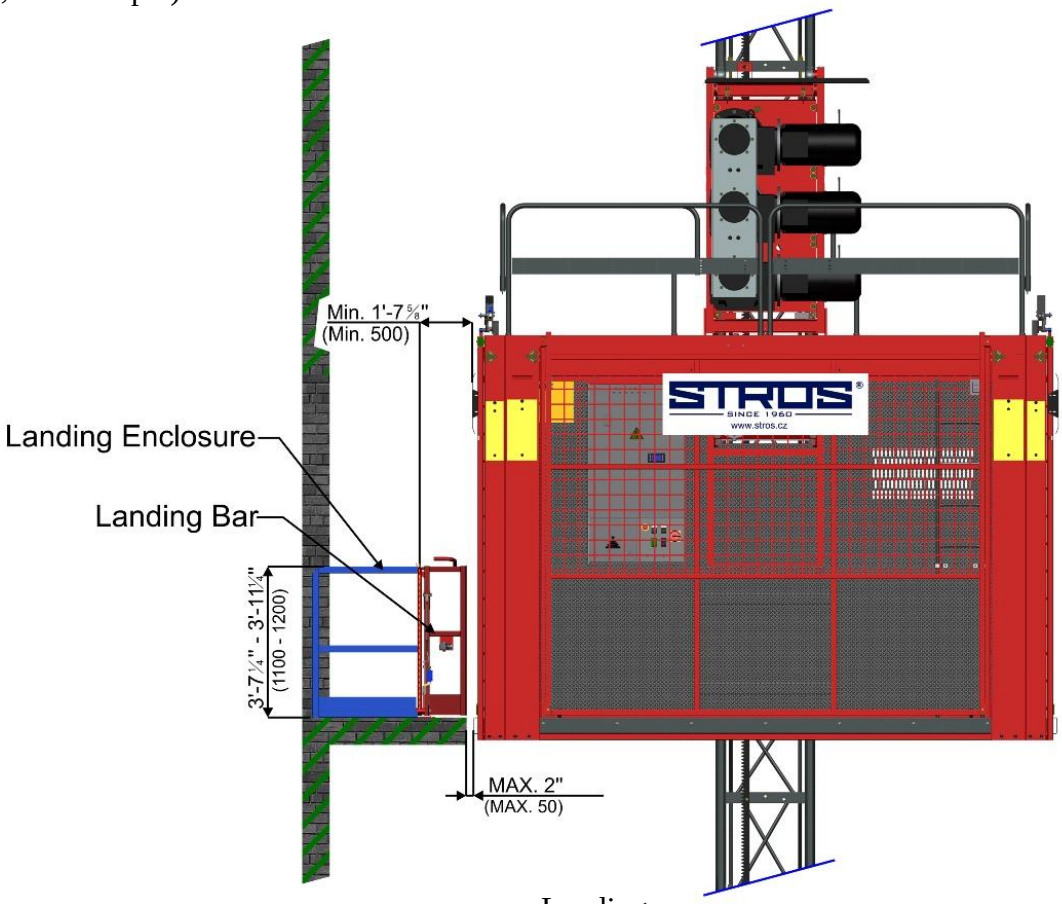
Schneider limit switches (ZCK)



Position of limit cams in the mast
(SCHNEIDER)
Fig. 4.13

Completing installation at landings

The manufacturer recommends using landing bars or landing gates to safely secure the landings (Fig. 4.14, for example).



Landing
Fig. 4.14

Landing floor and side enclosure

These structures are not part of the hoist. It is essential that they be safe, compliant with local regulations, and able to transfer the loads exerted on them.
Side enclosure must have a handrail at least 3'-7 1/4" to 3'- 11 1/4" (1.1 to 1.2 m) high, with a middle bar at half the height of the handrail, and a kick plate of at least 6" (150 mm) in height.

The floor of a landing must be securely fixed in place.
Prescribed landing clearances must be adhered to.
Personal injury and property damage hazards.

The above-described installation procedures, related to component setting, always pose an increased personal injury hazard.
It is therefore necessary to always secure the car against undesirable movement by activating the EMERGENCY STOP switch and turning off the main disconnect switch on the RM2 panel.

COMPLETION OF INSTALLATION

Procedure:

1) Lubricate the machine.
2) Check tooth clearances in the pinions, setting of guide rollers, clearances between the mast and the safety hooks and supports.
3) Check that all bolt connections are tightened properly (especially the mast, rack and tie-ins).
4) Turn the mode selector switch on the RM2 panel to the OPERATION position.
5) Test run the hoist and check its completeness.

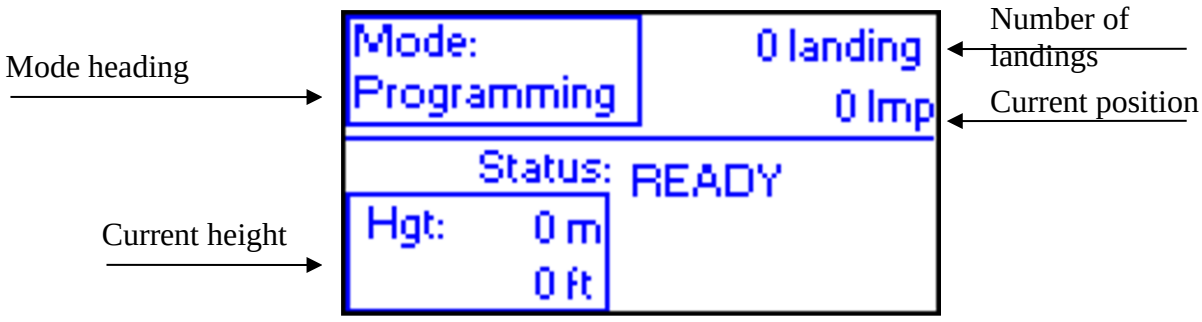
The test run includes testing all operation functions, tuning the precision of stopping at terminal landings, checking the clearances in the counterweight, cable trolley and other hoist parts, checking safety clearances and distances, and the closing and locking of all doors and gates. The completeness check lies in checking if anything has been omitted during the installation and if the hoist is equipped as needed (instruction signs, data plates, equipment for emergency procedures and maintenance, documentation).

Programming of landings

For the Stop-Next-Landing function to work properly, the landing positions must be saved in the PLC memory.

Procedure:

1. Go to the base to activate the bottom limit switch.
2. Hold the PROGRAMMING button for approx. 5 seconds (the button is located either on the control panel, or inside the RM2).
3. The PLC screen will turn over to the programming mode. It will show the following variables: Height, impulses from the proximity switch mounted on the safety device pinion (1 impulse = 2.5 cm = 1") and the number of landings that have been saved.
4. Press the E-Stop to erase all previously saved landings (from the last programming session). If you are only adding or correcting a landing, do not perform this step.
5. Go to the next upper landing. The IMP and HGT values on the screen will be changing.
6. Press the PROGRAMMING button shortly to save the landing position. The number of programmed landings on will change into 1.
7. Repeat the previous step at all the upper landings. The number of programmed landings increases by increments of 1.
8. Go to the base landing. The programming mode is terminated automatically when the bottom limit is activated. The PLC will show the normal operation screen.



Correction of landings
A landing can only be corrected within a range of ±10 teeth (±25 cm) from the originally saved position.

Procedure:
1. Go to the landing you wish to correct.
2. Hold the PROGRAMMING button for approx. 5 seconds. The landing position will be corrected.

On completing the installation, the hoist must be inspected and tested by an authorized specialist.
The hoist must be tested in the extent of the "Hoist erection test" and "Electrical equipment inspection". Local regulations may stipulate otherwise. However, the extent of tests detailed in this manual must be regarded as a bare minimum and adhered to.

HOIST DISMANTLING

Similar requirements that apply to the hoist's installation also apply to its dismantling. Thoroughly re-read the installation section, especially all the safety requirements and warnings.

The hoist dismantling follows a reverse procedure than its installation.

A skeleton procedure for dismantling:

1) Fence the safety area around the hoist (SP).
2) Prevent persons from entering the landings.
3) Disconnect the landing gates from the panel at the base.

Take the dummy plug out of the last landing gate and put it in the base panel.

4) Turn the mode selector switch on the RM2 panel to the INSPECTION position.
5) Install the erection platform and boom on the car roof and test them.

Make sure that:
– the erection controller including the EMERGENCY STOP button functions properly
– the remote controller is disconnected,
– the roof handrail is properly installed.

6) remove the limit cams from the top of the mast,
7) dismantle the mast, landing equipment and tie-ins simultaneously,

When dismantling a mast section, it must be suspended from the erection boom (the rope being slightly tight) before you proceed to loosen and remove the mast connection bolts.
After removing the bolts, detach the section from the mast. Do not overload the boom.
Always make sure that the guide rollers at the top of the drive unit are below the bottom edge of the section that is being removed.

8) remove the cable trolley and the buffers (SP)

Do this when there are 3 mast sections left on the base frame and the landing equipment is completely dismantled. Remove the enclosure part adjacent to the mast to perform the above step.

When removing the buffers, observe the safety requirement that apply to their installation.

Re-read the relevant section of the manual.

9) remove the fourth mast section
10) Remove the erection platform and boom.
11) Disconnect the hoist from power supply
12) Lower the car to the lowest possible (transportation) position

Perform this operation with enhanced caution by pulling at the brake release levers and lowering the car in a controlled way and at a very slow speed.

13) Dismantle the power supply, disconnect the grounding.
14) Remove the bolts holding the base frame to the foundation slab
15) Remove the pins connecting the drive unit and the car, disconnect the motor cables and remove the bolts connecting the second and third mast section
16) Use a crane to remove the third mast section with the drive unit on it.
17) Fix the car on the mast using the “Stop” part (as described in the INSTALLATION section).
18) In a dual hoist configuration, first dismantle the other car complete with the drive unit before manipulating the hoist unit.
19) If pit screens are used, the manufacturer recommends also removing the base enclosure due to its sizeable height.
20) When removing the buffers, observe the safety requirements contained in the section on their installation.
21) Replace the previously removed enclosure part(s).
22) Lubricate the hoist, conserve functional surfaces.
23) Inspect and install the lifting harness for lifting and further manipulating the hoist unit.
24) Inspect the dismantled parts and remove those that are ineligible for further operation.

OPERATION

DAILY INSPECTION

Since a construction hoist does not usually have one single operator, special attention must be paid to the daily inspection before startup each day, and the safety of its operation must be checked continuously during the day.

The elevator user must appoint personnel responsible for performing the daily inspections and continuous check-ups.

Above all, this person must:
Before startup each day:

1. Visually check the base station and the hoist car for any changes that could impair safe operation.
2. Connect the power cable to the mains and turn on the main disconnect switch.
3. Test run the car, verify if it stops correctly at the terminal positions, check the EMERGENCY STOP button in the car, car door and landing gate locking devices, and the overall performance of the hoist (noise, vibrations).

Do not put the hoist in operation if it is showing defects posing a work safety hazard.

During the day:

- check if the hoist is utilized the right way
- check if it is showing defects posing a hazard to personnel and materials.

If the hoist is showing defects, discontinue its operation and prevent it from unauthorized use.

At the end of the day:

- Visually inspect the base station and the car for any changes that could impair its safe operation.
- Turn off and lock out the main disconnect switch.
- Close the car door and the base enclosure gate.

The person authorized for daily inspections must keep a logbook containing at least the following: Date, daily inspection outcome, any defects that were discovered and how they were rectified, name and signature. The logbook is presented during regular inspections and maintenance by the hoist contractor.

HOIST USAGE AND CONTROL

The hoist user must acquaint all persons appointed to operate the hoist with the requirements of this manual, at least with the sections Work Safety, Hoist Operation and Emergency Situations.

The hoist user must instruct these persons in emergency procedures and impose a duty to notify and report defects discovered in the hoist.

The elevator user refreshes these persons' knowledge with periodic training and keeps record of their authorization and training.

Controlling the hoist from inside the car:

Do not use the hoist if: - you have not been trained to use it,
- the daily inspection has not been carried out,
- the wind speed is higher than 35 MPH (56 km/h),
- you have discovered a fault (report the fault),
- you are unsure whether all required tests have been performed, or whether regular inspections and maintenance are duly carried out.

When loading the hoist – do not exceed the nominal capacity or number of persons,
- prevent uneven distribution of load or its protrusion out of the car,
- do not transport poorly stowed load.

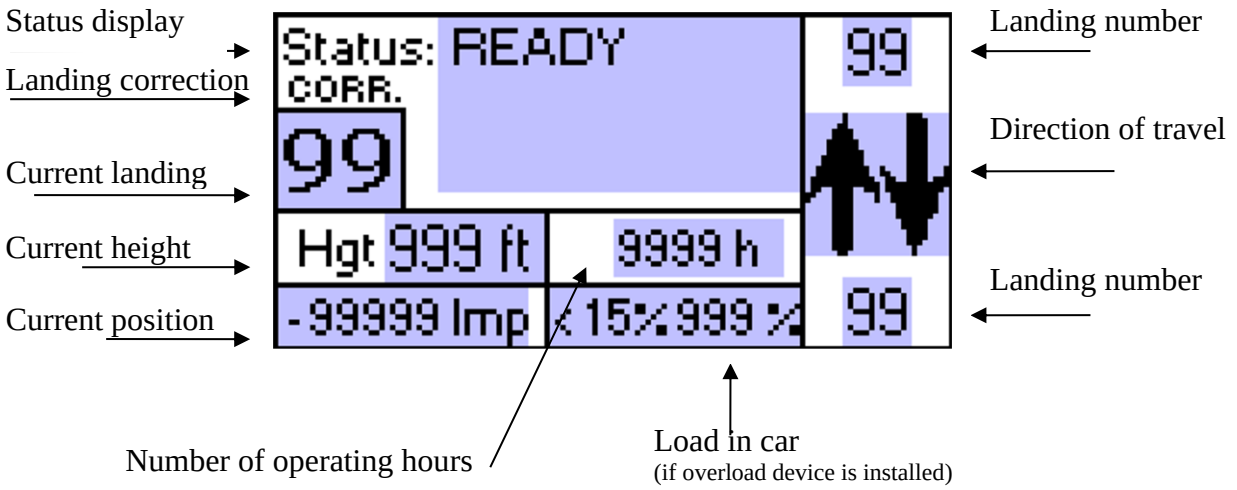
Before a ride - close the landing gate and car door properly.

Control the hoist - by tilting the joystick (UP or DOWN); in the first position the car travels at a slow speed, and in the terminal position the car travels at its maximum speed,
- with the EMERGENCY STOP button in an emergency (the car will stop instantly and its further operation will be prevented).

Emergency situation - report with a pre-agreed signal.

The landing programming procedure is described in the *Completion of Installation* section.

Display of operation statuses:

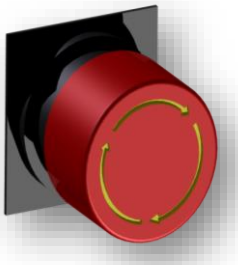


In the event of an emergency (the hoist will not move, the safety device has tripped etc.), it is forbidden for the persons inside the car to attempt at releasing the hoist and continuing its operation.
Unless the hoist is at a landing, stay inside and wait for the arrival of an authorized person and follow their instructions.

While the hoist is in operation, the overload protective device must be activated (if it is installed).
See SUPPLEMENT 1.

The light switch operates the main car light. The emergency light is on permanently. In the event of a power blackout, the main light goes out and the emergency light stays on for about 1 hour in an emergency mode. When it goes out, it can be restarted by turning the switch to the third, self-reversible position. This starts another hour for which the light stays on and it can be repeated until the battery runs flat (approx. 8 hours if the battery is fully charged). The battery is monitored by an electronic module and if its voltage drops below a safe level, the module will not allow the light to restart. The main light is supplied with 230 VAC from the separation transformer.

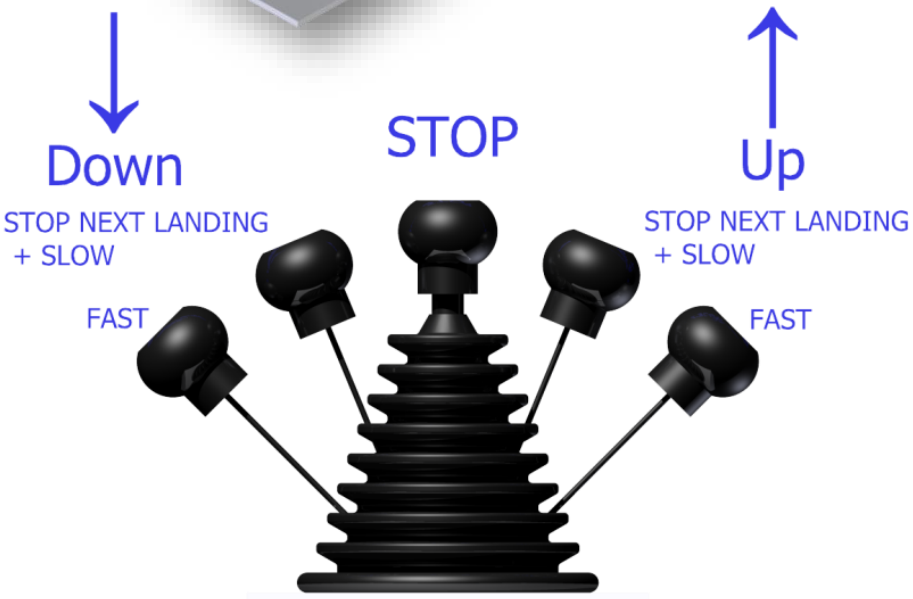
Main disconnect
(lockable in OFF position)



EMERGENCY STOP button
(release in direction of arrow)

DOWN button
(in Inspection mode)

UP button
(in Inspection mode)



Joystick

Switches and controllers marking

Fig. 5.1.

EMERGENCY SITUATIONS, FAILURES

Emergency situations during operation may include the following:

- Activating the final limit (both top and bottom).
- Overriding the bottom final limit and hitting the buffers.
- Safety device tripping.
- A prolonged power blackout, or a phase loss.
- Another defect that renders the unit inoperable.
- A frequency inverter error – the red pilot lights on the RM3 and inside the car come on.

All the above situations immobilize the hoist and call for special actions.

An emergency action is reported to the person responsible for the hoist's operation by the passengers in the car. This person ensures appropriate further action.

All emergency situations that occur during the hoist's operation must be dealt with by a qualified and authorized person who is trained in emergency actions. It is forbidden for the persons inside the car to attempt to release the hoist and continue its operation.

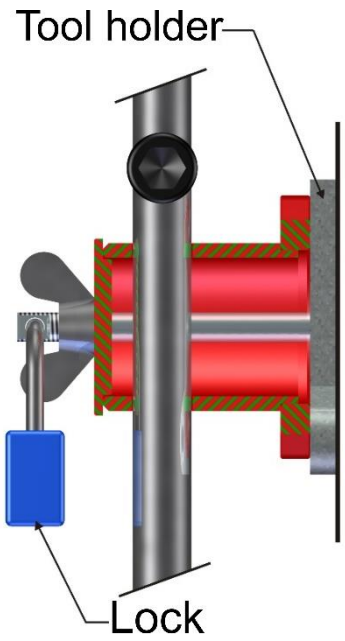
Basic rules for emergency actions:

1) Check if the unit is connected to power supply and all circuit breakers at the base are on.
2) Check if motor thermal overload has tripped.

The thermal overload is self-reversible. When the motors cool down, the unit will continue to work.

If the above steps did not succeed in returning the hoist back to operation, the authorized person determines further procedure, which may involve the authorized person's entering the hoist car.

In an emergency, the car is accessed through the roof hatch. The inside of the car contains a safety device reset tool and a triangular key that unlocks the hatch from inside the car. These tools are only accessible on unlocking the padlock on their holder. (Fig. 7.1).



Tools inside the car
Fig. 7.1

Entering the hoist car in an emergency

Only a person authorized for emergency actions may enter the car in an emergency. Prior to doing so, the hoist must be disconnected from power supply, the main disconnect switch off and locked out. Ensure that the authorized person is transported to the car roof in an absolutely safe manner.

This manual cannot detail the exact procedure for entering the car in an emergency. The procedure must be determined based on the situation and in accordance with local regulations and the safety requirements contained in this manual.

On entering the car, the authorized person identifies the cause of the emergency situation, which may be the following:
- the safety device has tripped,
- another reason.

To identify the cause of an emergency situation, it is usually necessary to perform some measurement in the electrical panel inside the car.

Should it become necessary to connect the hoist to a power supply in order to identify the cause, it must be done by a qualified person and at the instruction of the authorized person inside the car.
A flawless communication between these two persons must be ensured, and the performance of individual actions mutually confirmed. When finished, turn off and lock the main switch.

SAFETY DEVICE TRIPPING

Procedure:
1) Passengers are evacuated from the hoist car regardless of why the safety device has tripped.
2) By inspecting the hoist, the authorized person identifies the cause of the safety device tripping. This inspection focuses on the brakes, gearboxes, pinions and rack, guide and back-up rollers.

When evacuating people from inside the car, the hoist must be disconnected from the power supply, the main disconnect switch off and locked out.

The procedure for resetting the safety device is determined after identifying the cause of its having tripped.
The cause must be eliminated before resetting the safety device.

If the cause of the safety device tripping is not identified and eliminated with absolute certainty, the safety device must be released by an authorized person from outside of the car by means of the DROP TEST controller.

If the safety device trips again, further procedure must be determined by an authorized specialist.

OVERRIDING THE TOP LIMIT AND POWER BLACKOUT

If the car overrides the top limit, or in the event of a power blackout, an authorized person lowers the car to the nearest landing by manually releasing the motor brakes, and makes it possible for the car to be evacuated and unloaded.

Procedure:

1) Turn off the disconnect switch on the RM2 panel and push the EMERGENCY STOP button.
2) Install the manual brake release levers, unless already in place.
3) Carefully open the brakes and lower the car at a slow speed to the nearest lower landing. Unload the car.

The speed of the descent must be controlled by applying variable pressure to the brake release levers. A high speed will cause the safety device to trip!
Discontinue the descent after every 65' (20 m) and let the brakes cool down for approx. 5 minutes.

4) Lower an empty car all the way to the base station. Rectify the problem and test the hoist for proper function.

OVERRIDING THE BOTTOM NORMAL OR FINAL LIMIT

In either case, an authorized person has the car unloaded.

Procedure:

1) Turn the mode selector switch on the RM2 panel to the INSPECTION position.
2) Turn the final limit bypass switch all the way over to the right (bypass position).
3) Ride the car approx. 2' (0.6 m) up by means of the UP button.
4) Return the final limit bypass switch all the way to the left and remove the key.

The final limit bypass switch has three positions. It is not possible to ride the car up when it is in the middle position.

The cause of the override must be identified by an authorized person. The hoist may only be restored to operation after the cause is eliminated and the hoist tested in an appropriate extent.

INSPECTIONS AND MAINTENANCE

Inspections and maintenance are an integral part of the hoist's safety and eligibility for operation. Maintenance includes checks, cleaning, lubrication and setting performed at regular intervals, or as called for by the nature and conditions of the operation. The individual tasks vary in the level of qualification they require.

The hoist user must appoint persons authorized to inspect and maintain the hoist, and determine the extent of their responsibilities.

The hoist user logs and files must contain information regarding periodic inspections and maintenance of the hoist by means of the CHECKLIST (see Appendix I), together with other operation documentation.

PERIODIC INSPECTIONS AND MAINTENANCE

PERFORMED BY THE OPERATOR

Before startup each day:

- Visually check the ground enclosure and the hoist car for any changes that could impair its safe operation,
- Unlock and turn on the main disconnect switch,
- Test run the car, verify stopping at the bottom and top positions, the function of the in-car EMERGENCY STOP button, enclosure gates and locking devices and the overall performance of the hoist (noise, vibrations)

During the day:

- check if the hoist is utilized the right way
- check if it is showing defects posing a hazard to personnel and materials.

PERFORMED BY THE OPERATOR OR A PERSON RESPONSIBLE FOR THE HOIST

Weekly (50 hours) – perform at least the following:

1) Check if the daily inspections are performed and if the hoist is put into proper operation at startup each day.
2) Inspect the car, check legibility and completeness of all instructions and directions for use.
3) Verify that the car door locking device is functional when the car is outside of a landing.
4) Verify that the enclosure gate locking device is functional when the car is outside of the base.
5) Verify the safety of landing gates and the function of their locking devices.
6) Verify that the cable arm passes through the cable guides in the correct manner.
7) Verify the integrity and condition of the supply and trailing power cables, as well as the function of the cable trolley.

PERFORMED BY THE MAINTENANCE CONTRACTOR

Monthly (200 hours) – in addition to the above:

8) Check the tightening of the fixing bolts of the machinery plate, gearboxes and the safety device.
9) Check the tightening of the guide and back-up roller bolts.
10) Visually check the condition of the guide roller bogeys and check the tightening of their bolts.
11) Check all the bolted connections of the mast, rack and tie-ins.
12) Check the attachment of all limit cams.
13) Check the attachment of the limit switches.
14) Check the stopping at the top and bottom positions.
15) Check the function of top and bottom limit switches.
16) Check the function of the EMERGENCY STOP and STOP buttons.

17) Check the function of the motor brakes by performing the Single Brake Test. If necessary, clean the brakes of dust and impurities.
18) Check wear of the rack and pinions.
19) Check the position (alignment) of the rack and pinions.
20) Lubricate the rack.
21) Lubricate the safety device bearings.
22) Lubricate the pins of the landing gates.
23) Test the ground fault protectors, check the connection of terminals and conductors, clean the inside of the electrical panels, check the connection of the limit switch levers.

Every 3 months (600 hours) – in addition to the above:

24) Check the wear and adjustment of the car guide rollers; check the clearances of the safety hooks and supports on the car and drive unit.
25) Lubricate the car door wire ropes, lubricate the guide rails of the door counterweights.
26) Lubricate the hinges of the roof hatch.
27) Check and adjust the motor brakes.

Every year (2400 hours) – in addition to the above:

28) Lubricate the car guide rollers.
29) Lubricate the back-up rollers on the drive unit.
30) Lubricate the transmission rollers of the car door wire ropes.
31) Maintain and lubricate the locking devices of the enclosure gates.
32) Maintain and lubricate the locking devices of the car doors.

Every 3 years (7200 hours) – in addition to the above:

33) Replace oil in the gearboxes (See the ATTENTION in the Lubrication section).
34) Replace the safety device.
35) Replace the attachment bolts and nuts of the guide roller bogeys. The procedure is detailed in the supplement D501-19.

Any changes in the hoist's performance (higher current consumption, higher operating temperature, increased drive unit vibrations and noise) indicate that there might be a serious fault in the motors or other parts. Discontinue the operation until an authorized person identifies and eliminates the fault.
Failure to comply with this requirement may result in serious bodily harm or property damage.

The safety device must be tested every 6 months. The test is carried out as part of the Specialized Inspection (see the Testing section of this manual).

HOIST LUBRICATION

The hoist is lubricated according to the Lubrication Chart and Fig. 8.1. below.

Lubrication Chart

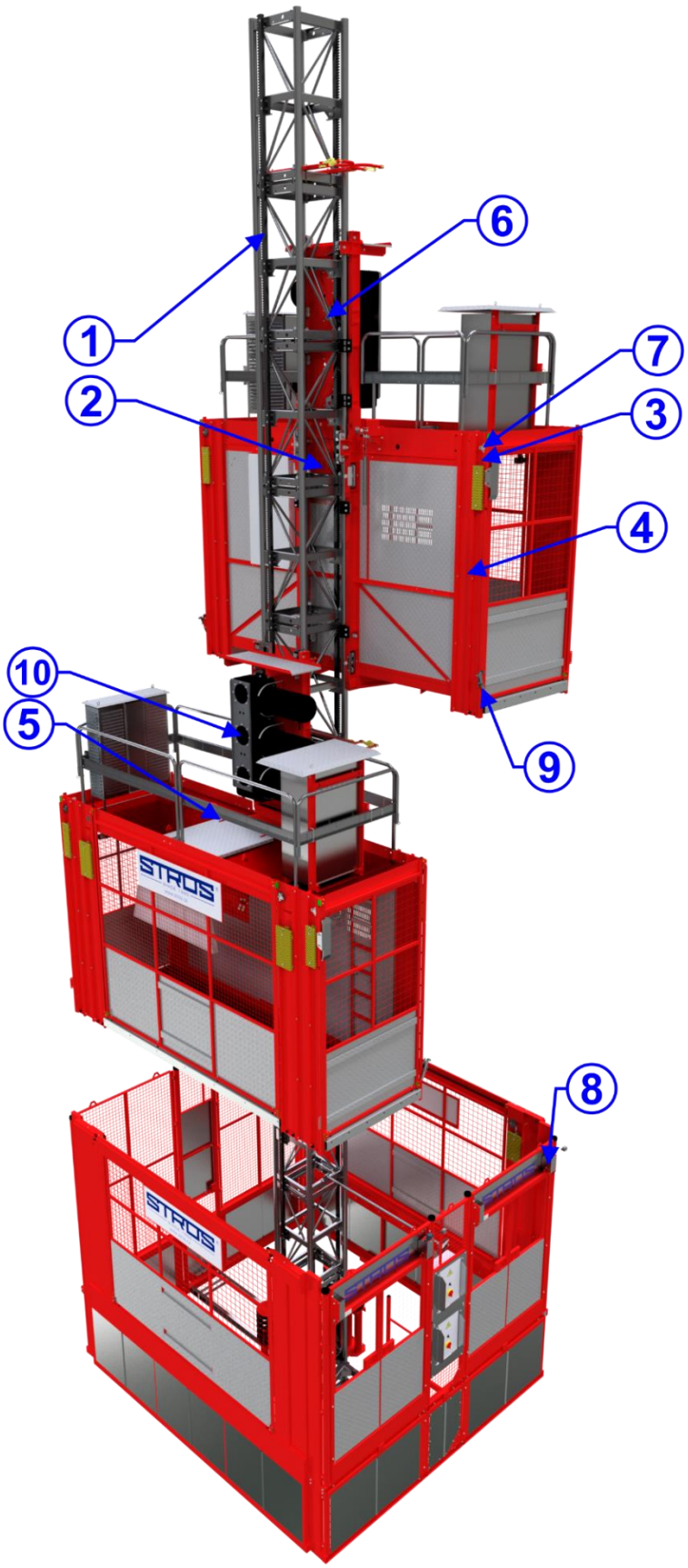
Lubricated place	Lubricant	Method
Each month (200 hours)		
1. Rack	Graphite grease	smearing
2. Wheels of the safety plate	grease*	smearing
Every 3 months (600 hours) – in addition		
3. Car door wire ropes and their suspensions	grease	smearing
4. Door balance counterweight rails	grease	smearing
5. Hatch hinges	oil	smearing
Every year (2400 hours) – in addition		
6. Back-up rollers	grease	grease gun
7. Wire rope transmission rollers	grease	refill
8. Pins of locking devices of enclosure door	grease	refill
9. Pins of car door locking devices	grease	refill

Every three years (7200 hours) – in addition to the above		
10. Gearboxes	Gear oil – see Note	refill

** . . . see the Safety Device Manual for lubricant specification.*
Grease = universal grease for rolling and sliding bearings of class NL GI 2-3 (for example Mogul K3).
Graphite grease = grease for high pressure areas, class NL GI 3, ISO 6743/9 CAHB 3 (for example Mogul G3).
Oil = class SAE 10-30 lubrication oil.

The gearboxes are usually filled by the manufacturer with SYNTHETIC OIL of viscosity class ISO VG 220 (for example Shell Tivela Oel WB), which has a temperature range of -25 to + 80°C (-13 to 176°F).
Replace SYNTHETIC OIL every three to four years.
The refill volume is 4.5 liters per one SK9042.1 gearbox, or 7.5 liters per one SK9052.1 gearbox.

Do not mix MINERAL and SYNTHETIC oils.



Hoist lubrication
Fig. 8.1

Setting of hoist cage, drive unit and safety device plate

Note: Applies to drive units equipped with adjusting screws between the drive unit frame and the top of the machinery plate (replacement for the previously used load sensing screws). In October 2014, this manual was revised to include the older version using a rubber strip in place of the current adjusting screws (Revision 1).

MOUNTING CAGE AND DRIVE UNIT ON MAST

1. Before mounting the hoist cage, the cage front rollers should be adjusted to half their eccentricity, and the side rollers loosened all the way.
2. Adjust the machinery plate and the safety device plate so that the bushings of the fastening bolts are centered on the holes in the plates. The top of the safety device plate is pushed against the cage frame with a clearance of 0.1 – 0.2 mm.
3. The machinery plate is propped against the frame via the two adjusting screws at the top. The guide rollers (front and rear), as well as the back-up rollers on the machinery plate, are loosened all the way.
4. Mount the cage and the drive unit onto the mast and pin them together (with regular pins or load sensing pins).

SETTING CAGE ON MAST

5. Adjust the front and rear cage rollers so that the cage structural beams are parallel with the mast tubes and the side rollers are in the middle of their axial float (ideal state). All the front and rear rollers are in contact with the mast pipes. In some cases, the front rollers come in contact with the mast pipes only after the cage is loaded.
Check the setting of the front and rear rollers by measuring the distance between the two mast pipes and the face of the beam (U 160), **see Fig. 1a**, detail A. Use any straight edge (e.g. an aluminum profile) and a tape measure. With the U 160 beam, the ideal distance is 3.5 mm at both the top and bottom of the cage.
Adjust the side rollers so that the beams are parallel and symmetrical with the mast pipes and the front and rear rollers are in the middle of their axial float (ideal state). Check the symmetry (the X dimension) by means of gauges (9 – 13 mm), by measuring the gap between the beam and the mast pipe (right and left, top and bottom).
In a pair of opposite side rollers, at least one of the rollers must be adjusted with a clearance (0.5 – 1 mm).
An example of ideal setting: The top left side roller has 1 mm clearance, while the top right roller has no clearance (snug on the pipe), the bottom left roller has no clearance, while the bottom right roller has 1 mm clearance. Alternatively, all the side rollers have 0.5 mm clearance while the mast pipes and cage beams are parallel and symmetrical,

see Fig. 1 a, b, c.

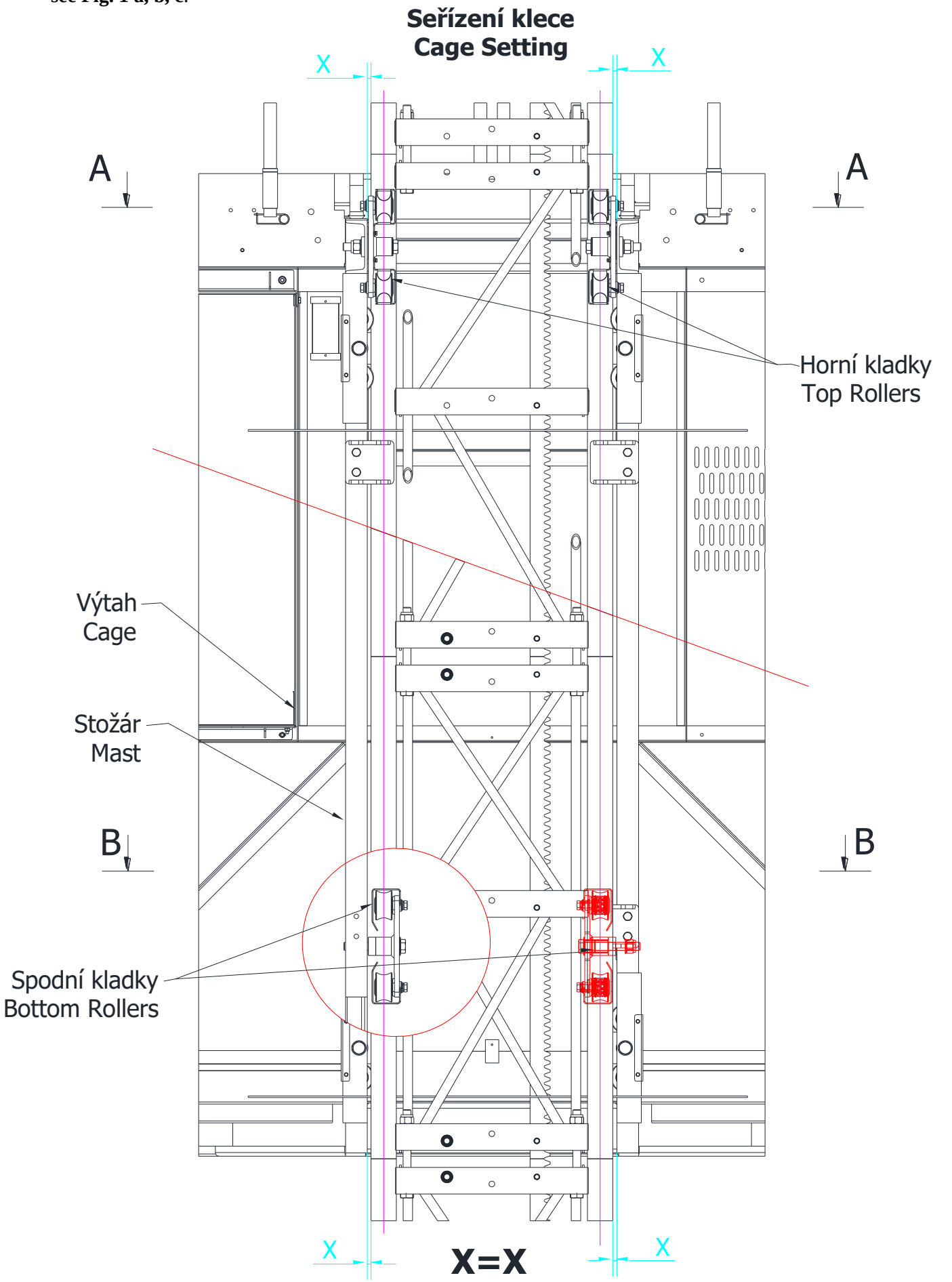

Seřízení klece
Cage Setting
X
X
A
A
Horní kladky
Top Rollers
Výtah
Cage
Stožár
Mast
B
B
Spodní kladky
Bottom Rollers
X
X
X=X

Fig. 1a

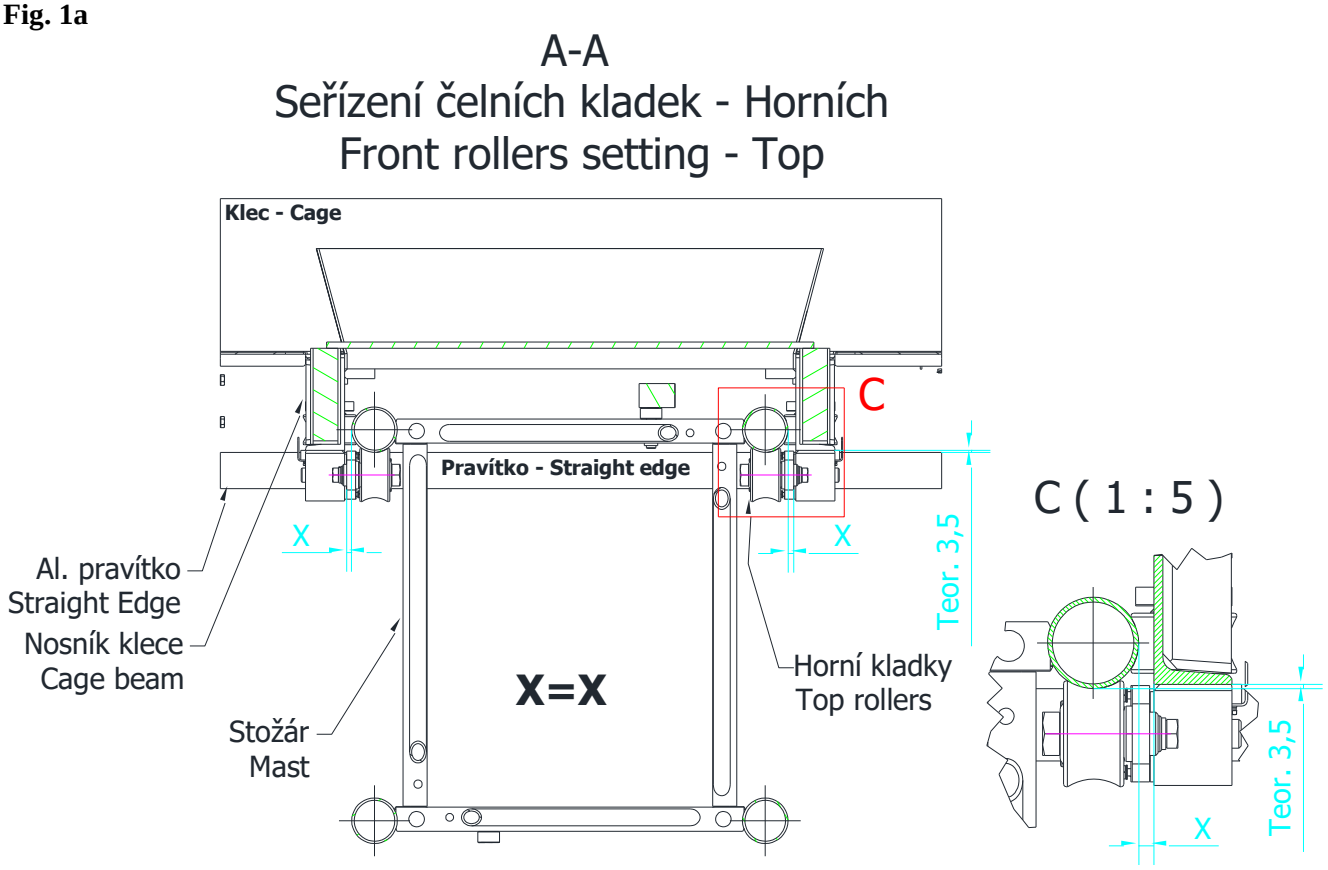

A-A
Seřízení čelních kladek - Horních
Front rollers setting - Top
Klec - Cage
Pravítko - Straight edge
C
X
X
Teor. 3,5
Al. pravítko
Straight Edge
Nosník klece
Cage beam
Stožár
Mast
X=X
Horní kladky
Top rollers
C (1 : 5)
Teor. 3,5
X

Fig. 1b

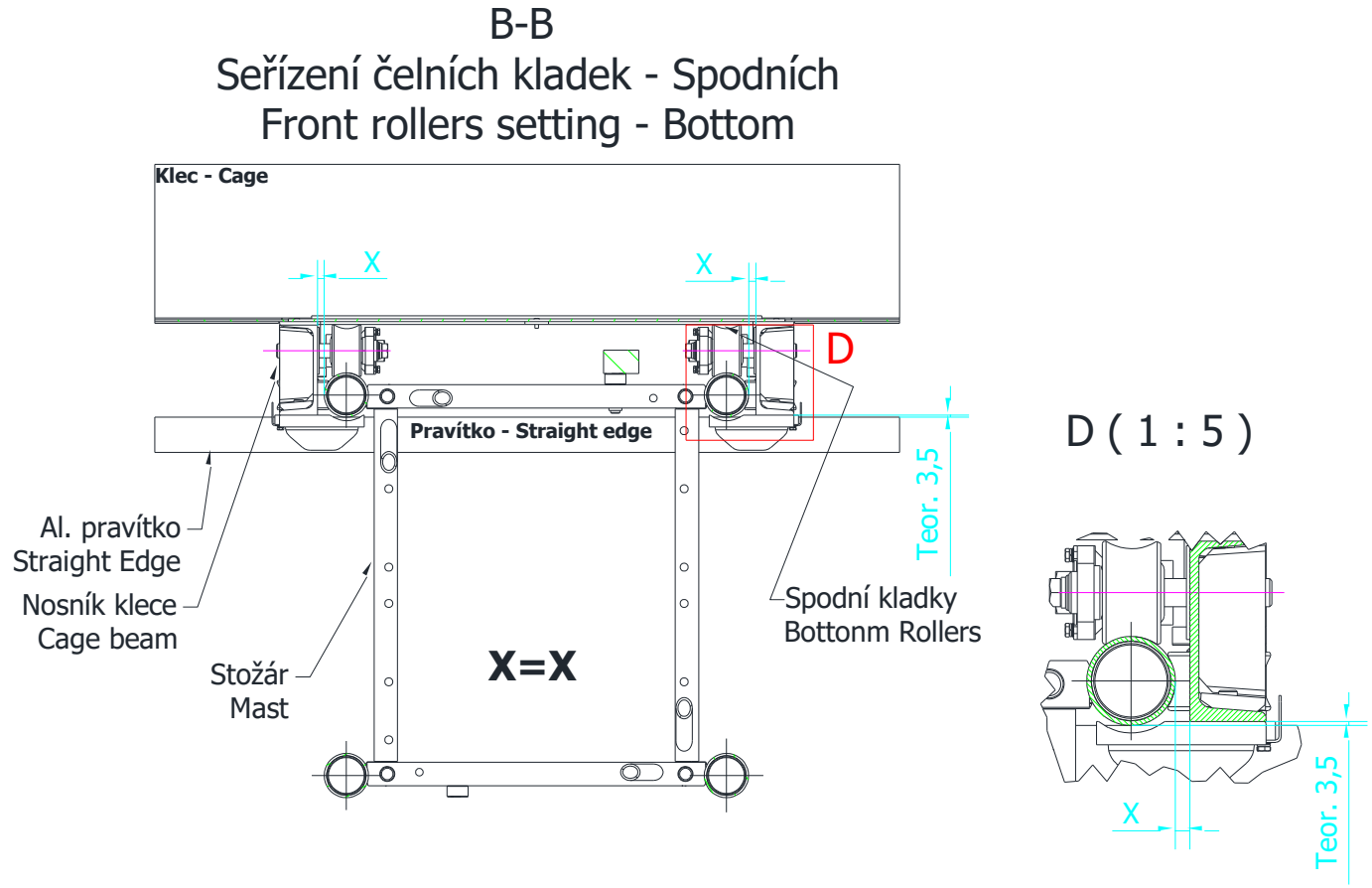
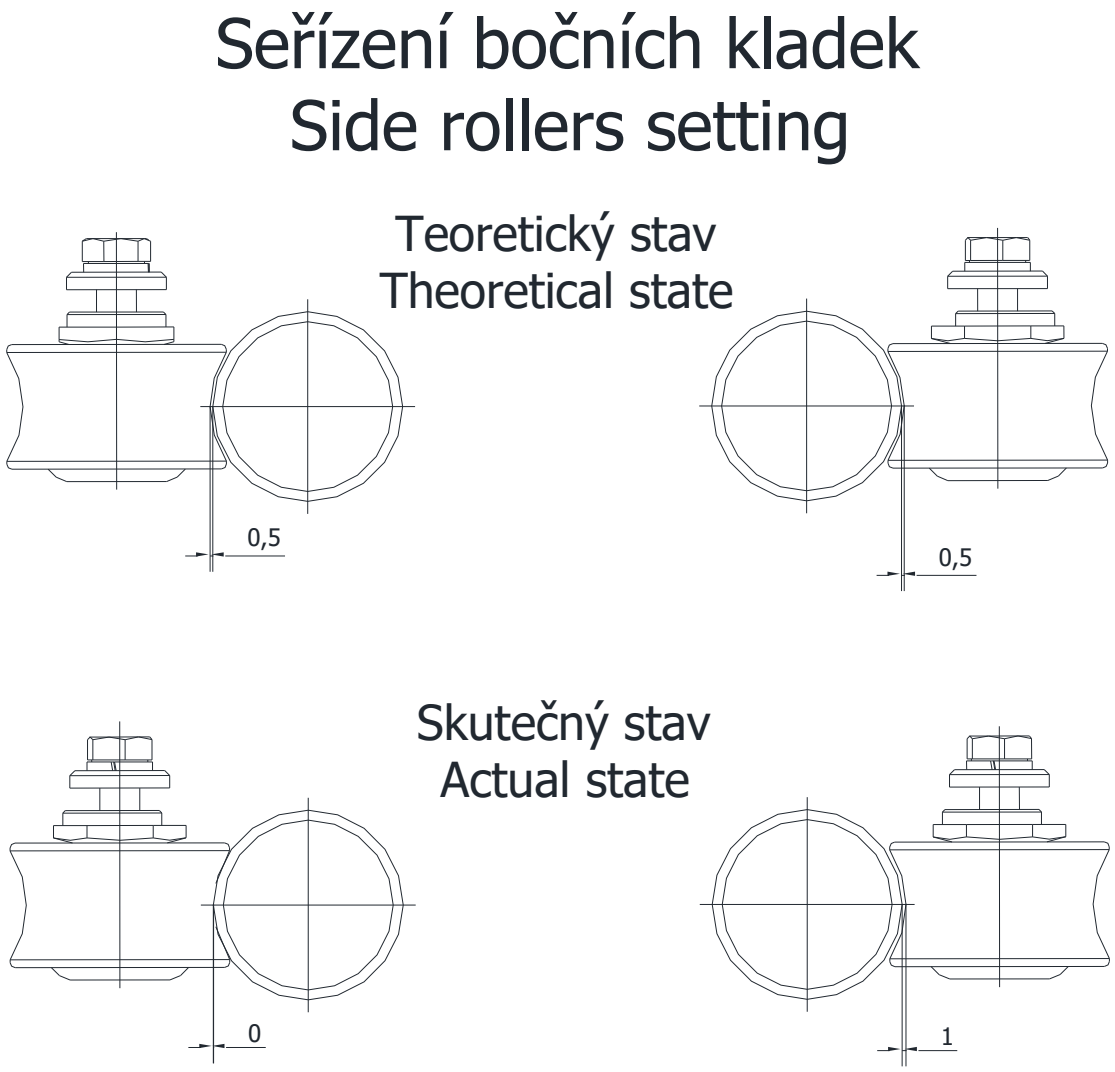

B-B
Seřízení čelních kladek - Spodních
Front rollers setting - Bottom
Klec - Cage
X
X
D
Pravítko - Straight edge
Teor. 3,5
Al. pravítko
Straight Edge
Nosník klece
Cage beam
Stožár
Mast
X=X
Spodní kladky
Bottonm Rollers
D (1 : 5)
X
Teor. 3,5

Fig. 1c



Ride up a short way (approx. 0.5 m) and check the setting of the rollers (consistent clearances in side rollers, front and rear rollers in contact with the mast pipes). Readjust if necessary and tighten the guide roller fastening bolts to 200 Nm.

5.1 Setting by means of front auxiliary guide rollers

5.1.1 High cages have front outer auxiliary guide rollers located in the lower portion of the cage beams, **see Fig. 1d**. These auxiliary guide rollers are used for stabilizing the cage and, if need be, making the rear inner bogeys snug on the mast pipe for the purpose of alignment per section 5. It is however important that a 1 mm clearance always be maintained between the rollers and the mast pipes. In practice it means that the bogey will be snug on the mast pipe and the opposite front roller will have a clearance of 1 mm, or the bogey will have a clearance of 1 mm and the front auxiliary roller will be snug on the pipe.

5.1.2 Dual mast cages have front inner auxiliary guide rollers located in the upper portion of the cage beams, **see Fig. 1e**. In these cages, the front auxiliary guide rollers are used for preventing the masts from being pulled together and thus helping keep them parallel over the entire lifting height. It is again important that a clearance of 1 mm be maintained in opposite rollers, see section 5.1.1.

5.1.3 Small, light cages have front inner auxiliary guide rollers located in the upper portion of the cage beams, **see Fig. 1e**. These auxiliary guide rollers are used for stabilizing the cage and, if need be, making the rear inner bogeys snug on the mast pipe for the purpose of alignment per section 5. It is however important that a 1 mm clearance always be maintained between the rollers and the mast pipes, see section 5.1.1 above.

Fig. 1d Location of lower front outer auxiliary guide rollers in high cages.

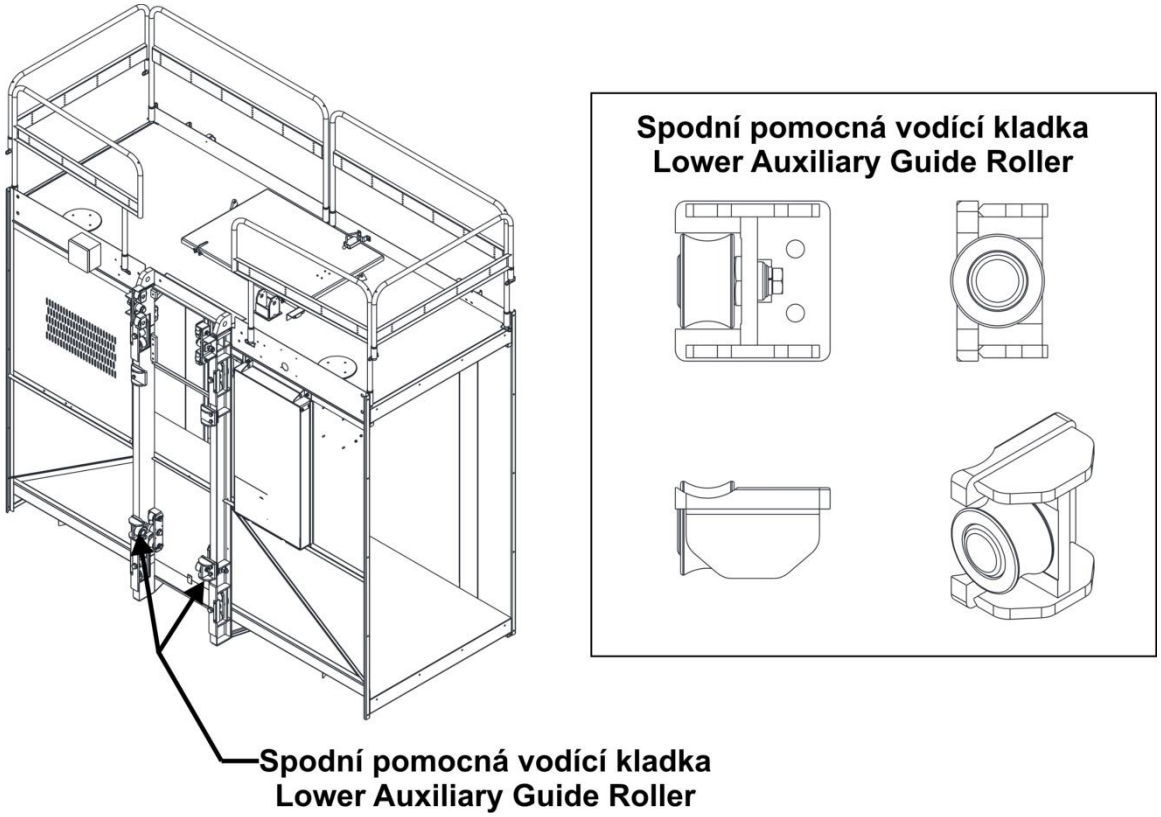
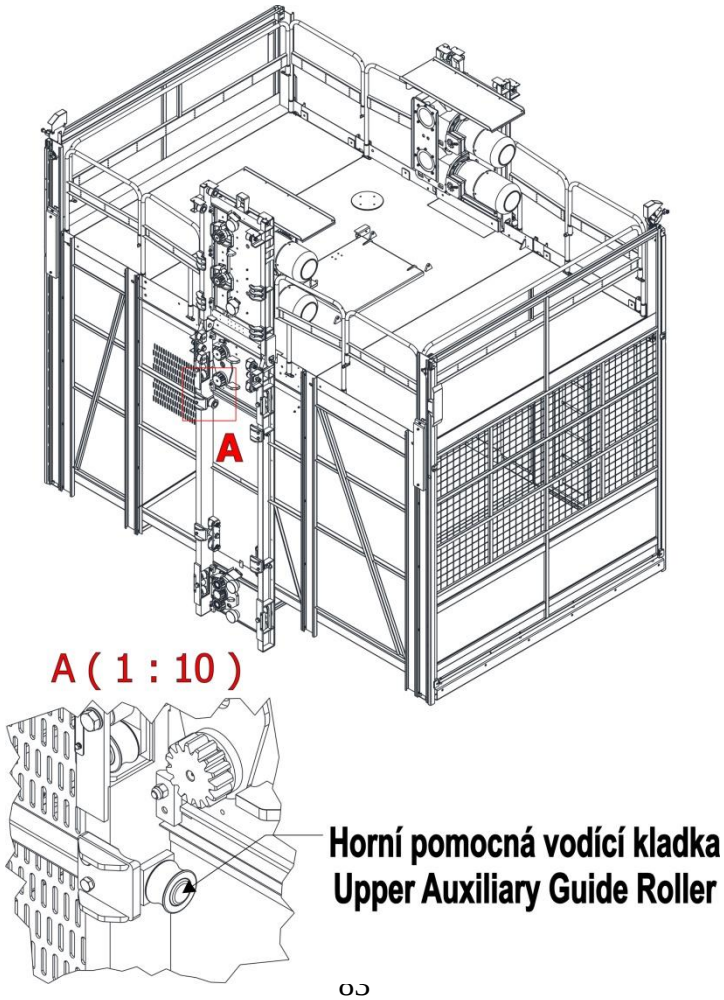
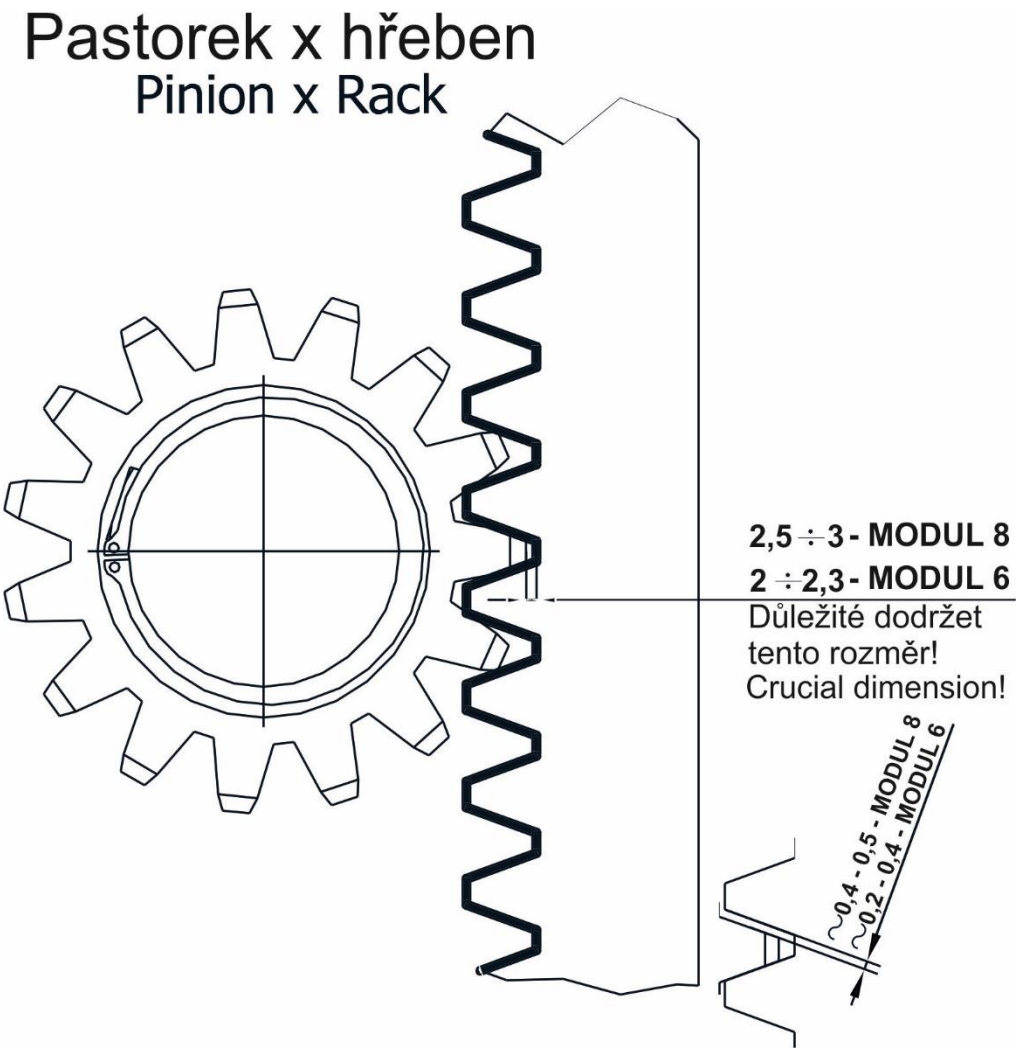


Fig. 1e Location of upper front inner auxiliary guider rollers in small and dual mast cages.



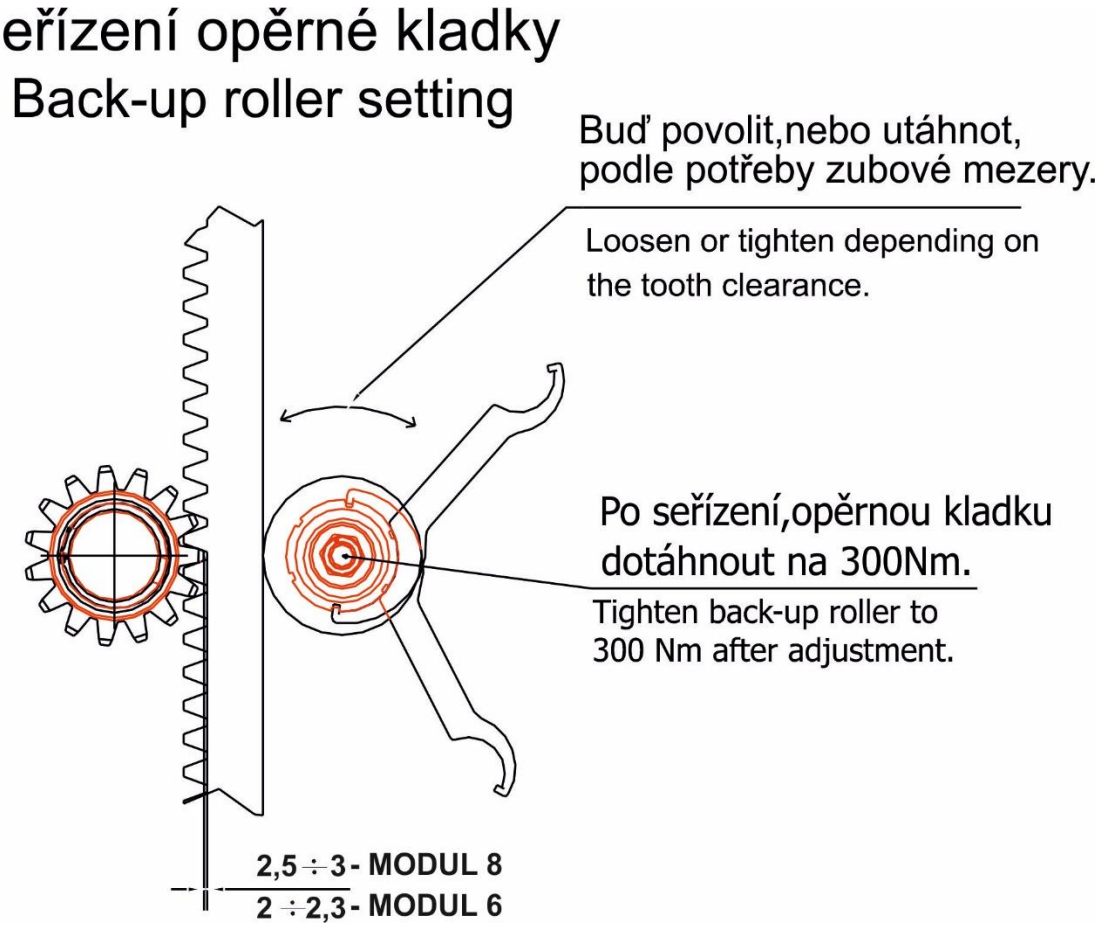
ADJUSTING CLEARANCE BETWEEN PINION AND RACK

6. The cage must not be loaded. Alternatively, the brake of the motor whose pinion is being adjusted can be opened manually to take the load off the pinion.
Example (in a three-motor drive unit):
a) top motor – open brake manually, adjust pinion according to section 7 below
middle motor – open brake manually
bottom motor – brake closed
b) top motor – brake closed
middle motor – open brake manually
bottom motor – open brake manually, adjust pinion according to section 7 below
Before you start adjusting the pinions, loosen the bolted connections between the machinery plate and the drive unit frame. If the machinery plate contains a middle back-up roller, it must be loosened so it does not impede the alignment of the top and bottom back-up rollers, see section 10A.
7. The goal of this adjustment is to set the clearance between the rack tooth valley and the tip of the pinion tooth to 2.5 – 3 mm (in module 8) or 2 – 2.3 mm (in module 6). Use the designated gauge (for module 8 or 6 respectively) and use the top and bottom back-up rollers to adjust the clearance, **see Fig. 3**. In new rack and pinion, this adjustment corresponds with a tooth side clearance of 0.4 – 0.5 mm (in module 8) or 0.2 – 0.4 mm (in module 6). Under normal operation conditions, this value is usually around 0.5 mm (in module 8) or 0.4 mm (in module 6), measured with a feeler gauge, **see Fig. 2**.



7. To move the pinion away from the rack, loosen the back-up roller that is closer to the pinion and eccentrically adjust it to create such a clearance between the back-up roller and the back of the rack that will result in a clearance of 2.5 – 3mm (module 8 mm) a 2 – 2.3 mm (module 6 mm) between the rack tooth valley and the pinion tooth tip when the back-up roller is pressed against the rack. **When the cage is loaded, the back-up rollers must always be in contact with the rack (impossible to turn by hand), and must always be re-tightened to 300 Nm after adjustment, see Fig. 3.** If having difficulties bringing the back-up rollers in contact with the rack, adjust the top setting screws per section 11.

Fig. 3



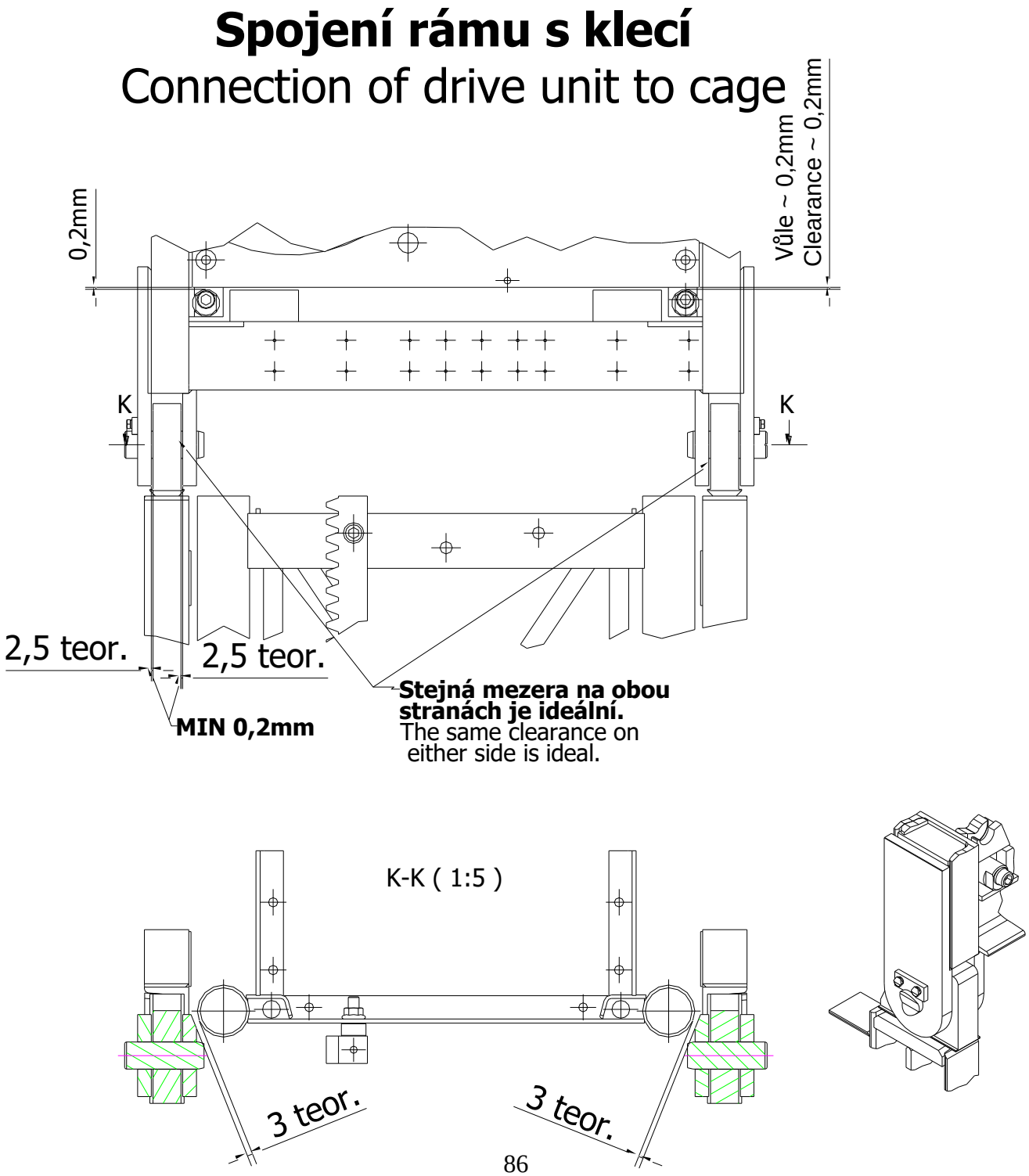
8. After riding approx. 1 – 2 m in the up direction, the pinion will move away from the rack and the back-up roller will lean against the back of the rack. Check the clearances between the rack and pinion teeth, and between the back of the rack and the dog on the machinery plate (max. 3 mm, measured with a feeler gauge), **see Fig. 2**.

9. To move the pinion into the rack, proceed according to sections 6 and 7 above. With the machinery plate bolted connections loosened and with the motor relieved (brake released), the pinion can be moved into the rack by means of the back-up roller, **see Fig. 3**. On riding the cage up (approx. 1 – 2 m), check the clearances according to sections 7 through 9 above.

10A. Adjustment of the middle back-up roller (since April 2017, from serial number 21713A/2017 onward) is only performed after adjusting the top and bottom back-up rollers, **see Fig. 5a**. Turn the roller until it touches the rack, and then pre-load it by turning it a further 45°at most. The tooth clearance in the middle pinion is not as critical as in the top and bottom pinions, where a clearance of 2,5 – 3 mm (for module 8 mm) and 2 - 2,3 mm (for module 6 mm) must always be maintained, see section 7. On adjusting the middle back-up roller, it is necessary to verify the tooth clearances and a contact between the top and bottom back-up rollers and the rack, see sections 7 through 9.

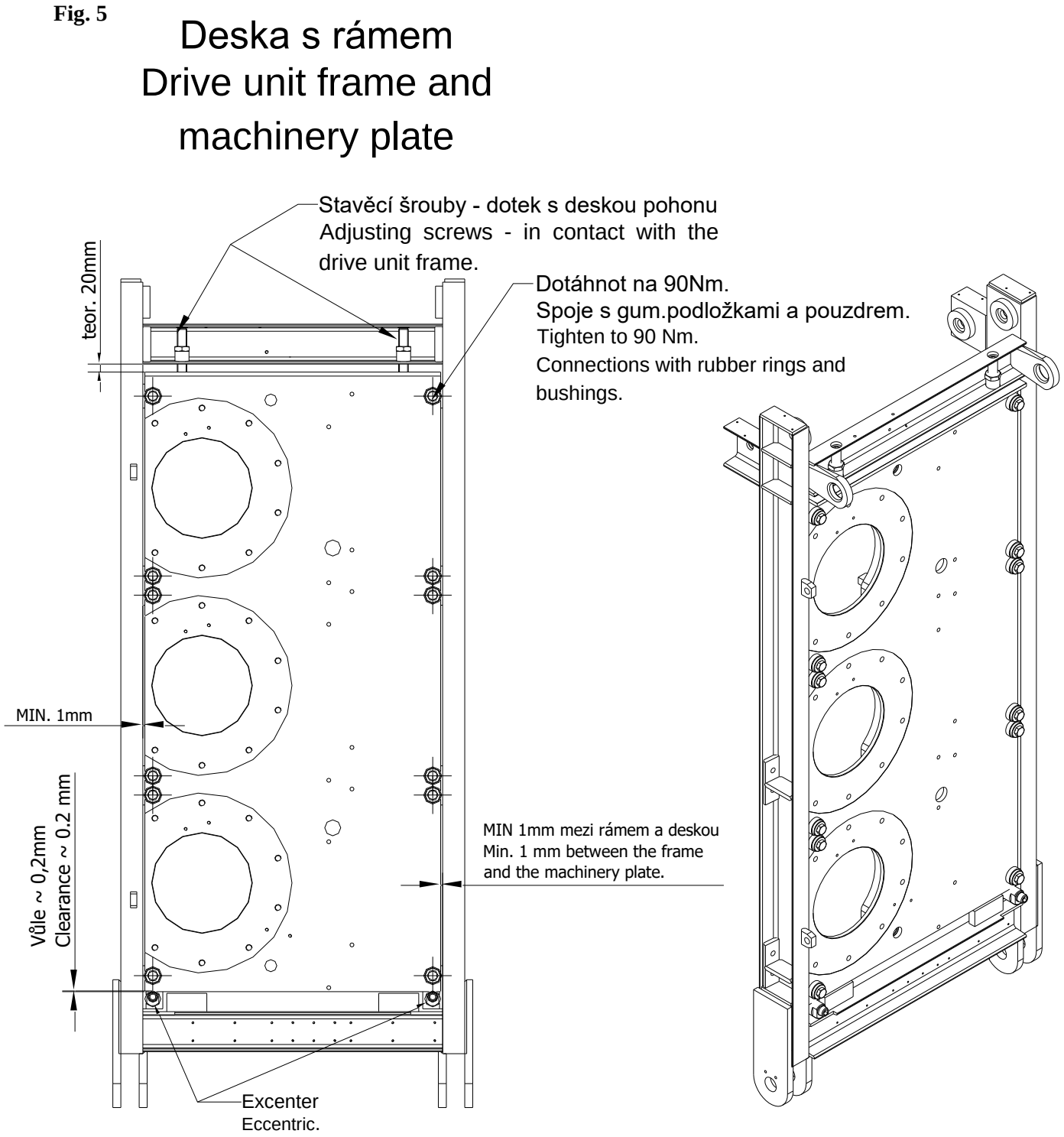
11. The adjusting screws at the top of the drive unit must be in contact with the machinery plate. These screws are used to adjust the right position of the machinery plate in relation to the drive unit frame and with regard to a correct setting of the teeth clearances, and also to make the back-up rollers come in contact with the rack. The older drive unit version has a rubber strip in place of the adjusting screws; the machinery plate must then prop against the drive unit frame with its full width. Shifting the machinery plate when adjusting the tooth clearances changes the side clearances between the machinery plate and the frame. The minimum side clearance is 1 mm. At the same time, the cage suspension eye lugs should be centered on the drive unit suspension eye lugs (ideal state), but there must always be a minimum clearance of 0.2 mm on the sides of the cage suspension eye lug, see **Fig. 4**.

Fig. 4



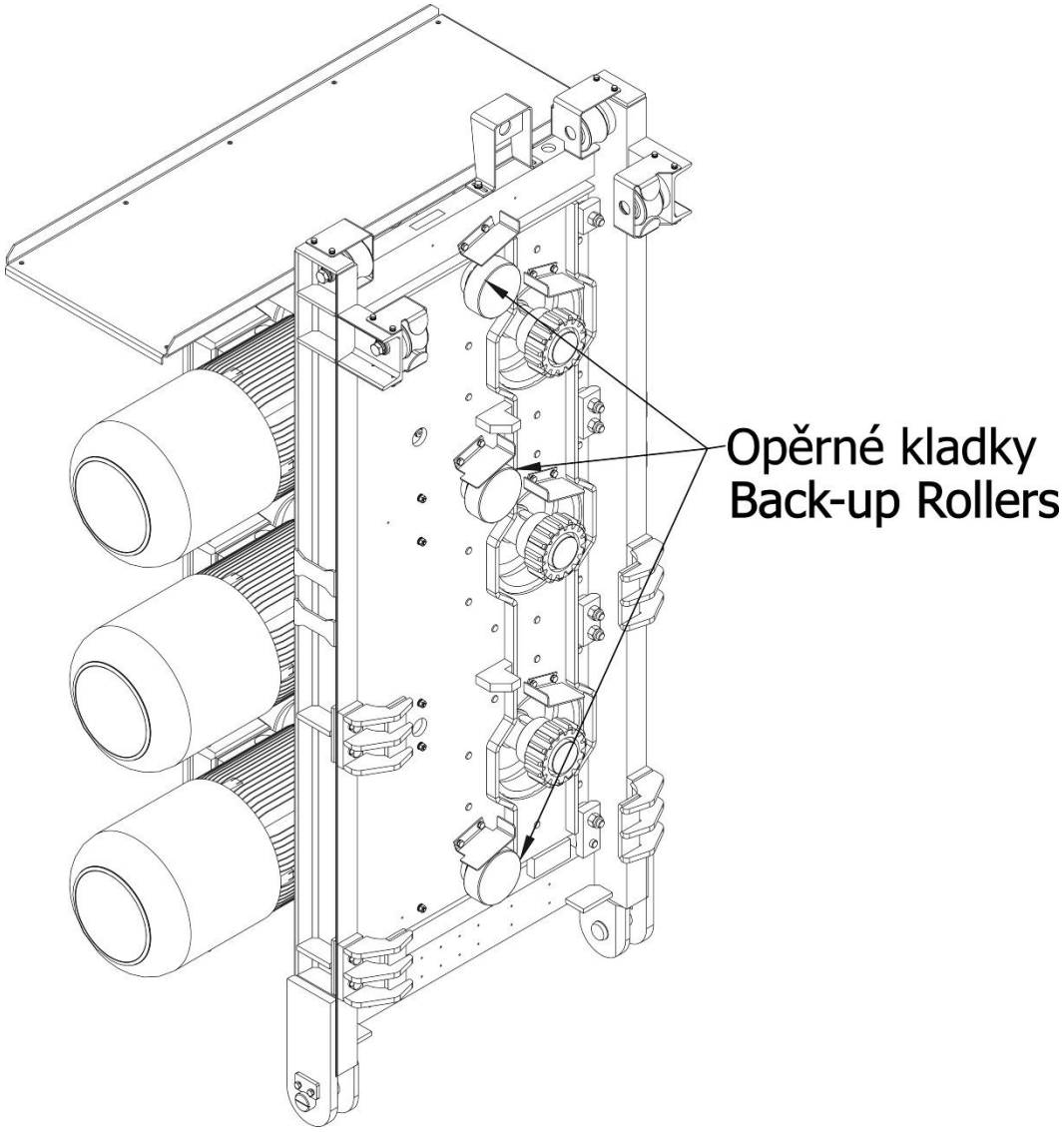
12. If the prescribed clearances are adhered to, tighten the bolts along the perimeter of the machinery plate to **90 Nm, see Fig. 5**. If the clearances are not adhered to, follow section 13 below.

Fig. 5



Note: In the older drive unit version, the machinery plate is propped agains the drive unit frame via a rubber strip and the adjusting screws are not used.

Fig. 5a A third (middle) back-up roller was added in April 2017 (from serial number 21713A/2017 onward).



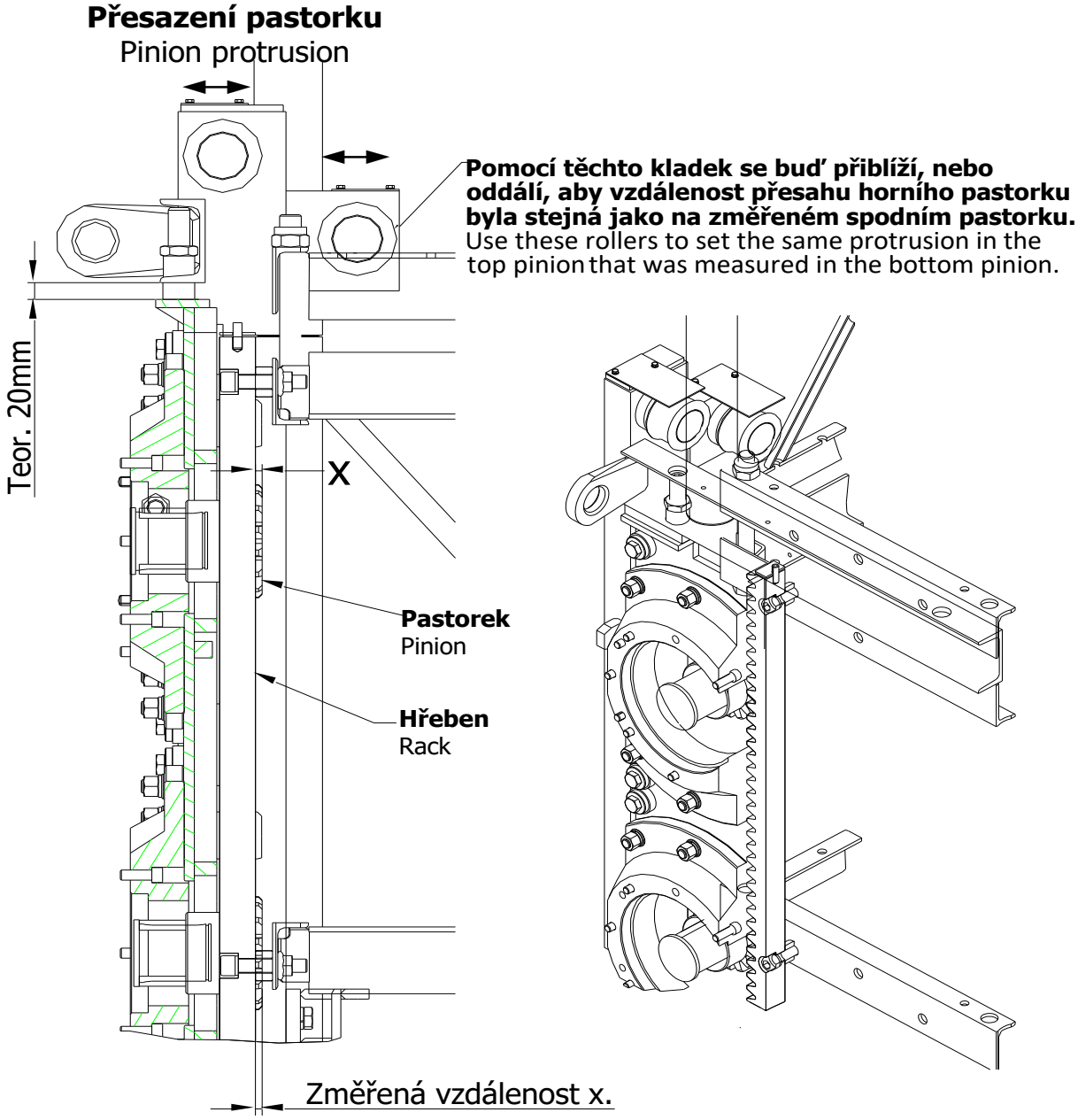
DRIVE UNIT FRAME SETTING

10. Set the drive unit frame so that its eye lugs are symmetrical to the mast pipes (ideal state), but with a minimum clearance of 0.2 mm on either side of the cage eye lugs. After adjusting the symmetry and clearances of the drive unit frame, it is necessary to check the tooth clearances and the position of the machinery plate. Adjusting the drive unit frame is directly related to adjusting the clearances between the drive unit frame and the machinery plate, see section 11 and Figure 4 above. It is therefore possible to adjust the drive unit frame only, independent of the machinery plate (the tooth clearances are set correctly). The drive pinions are meshed with the rack (the cage is empty), the bolts connecting the machinery plate to the frame must be loosened, and there must be a clearance between the mast pipes and the front and rear guide rollers at the top of the drive unit. Move the drive unit frame by driving a wedge between the cage eye lug and the drive unit eye lug. Keep checking the clearance between the inner drive unit eye lug and the mast pipe (the milled face must be at least 3 mm away from the mast pipe with regard to the symmetry of the frame). When the adjustment is complete, tighten the bolted connections of the machinery plate to **90 Nm**.

14. On checking the alignment of the cage and the drive unit frame, measure the lateral protrusion of the bottom drive pinion past the rack, and set the same protrusion in the top pinion (the cage must be aligned and the protrusion

in both the pinions must be measured/checked in the same place in the rack). The protrusion is adjusted by means of the pair of guide rollers that is closer to the pinion (viewed from the tower, they are the ones the right hand side of the drive unit frame), **see Fig. 6**. On completing the adjustment, one of the guide rollers must have at least 1mm clearance, **see Fig. 7, detail C**.

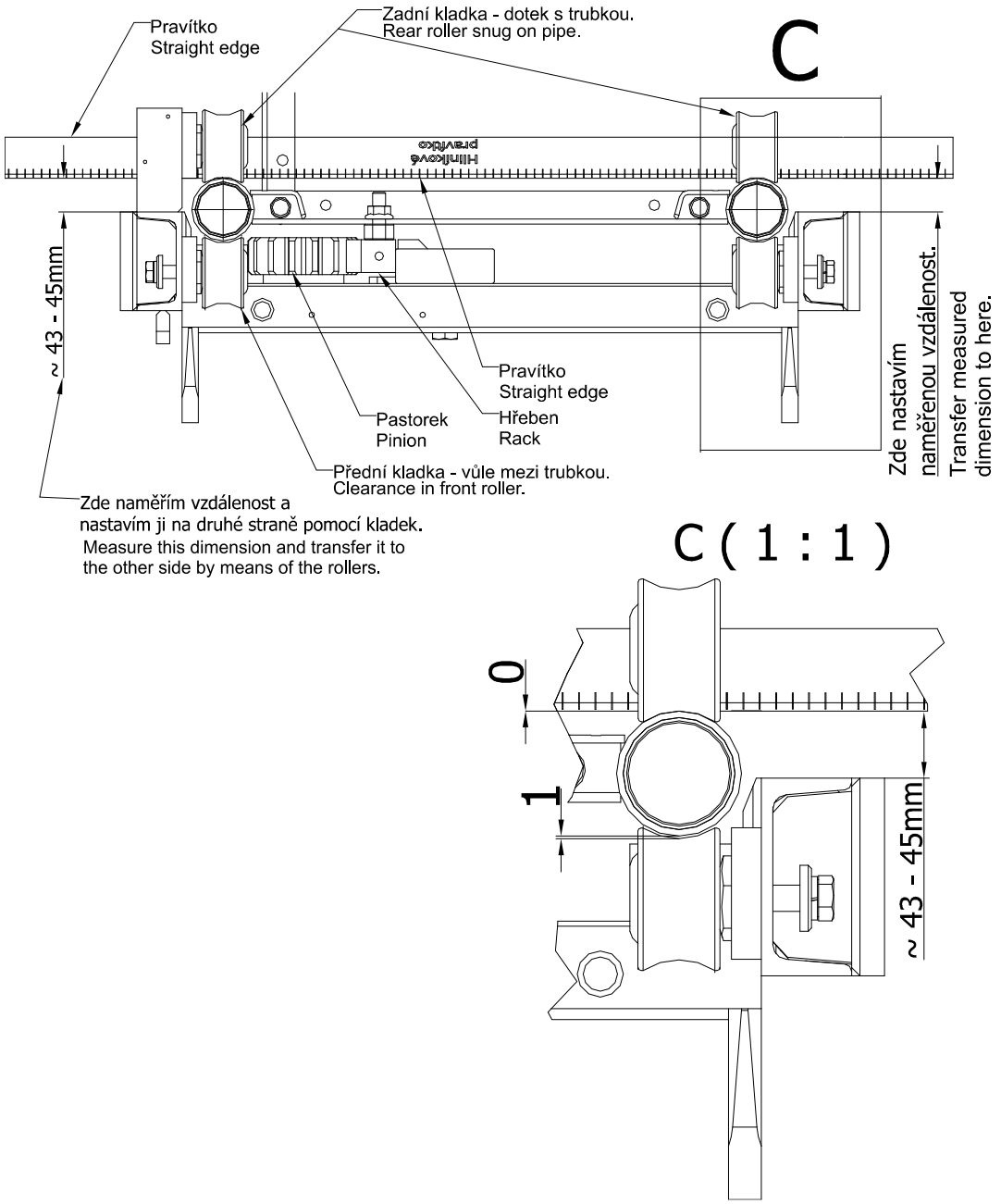
Fig. 6



15. On setting the protrusion, take the measurement between the beam of the drive unit frame and a straight edge pushed against the mast tubes, **see Fig. 7**. Set the same measurement (approx. 43 – 45 mm in a U120 beam) on the left side of the frame, again by means of the guide rollers. Ideally, the rear rollers should be in contact with the mast pipe and the front rollers should be adjusted with a **clearance of at least 1 mm** (or vice versa) and tightened to 200 Nm, **see Fig. 7, detail C**. On test running the hoist, check the position of the cage and drive unit guide rollers (the prescribed guide roller and tooth clearances must be adhered to).

Fig. 7

Regulace sklonu desky s ohledem
na přesazení pastorků.
Adjustment of the incline of the drive unit with
regard to the protrusion of the pinions.

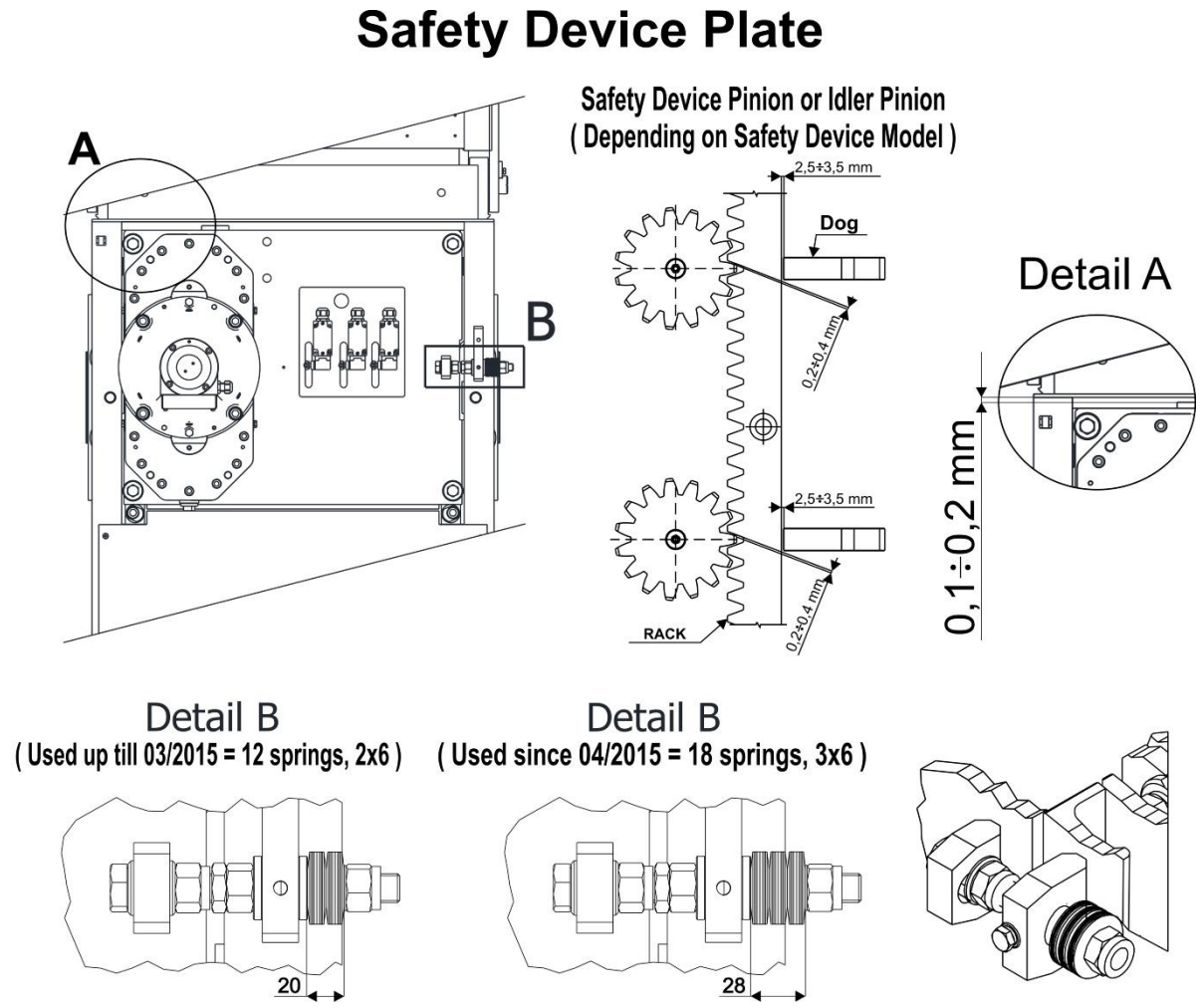


16. Check that the machinery plate bolted connections are tightened to 90 Nm, and the back-up rollers to 300 Nm. A loose back-up roller increases the clearance between the rack and the pinion, which results in vibrations and faster wear. Check the tightening of the bolted connections periodically according to Table 1.

SAFETY DEVICE PLATE SETTING

17. Check the clearance between the top edge of the plate and the cage frame (0.1 – 0.2 mm), **see Fig. 8, detail A**. If the clearance is too small, the plate must be moved downwards by means of the two eccentrics at the bottom.

Fig. 8



18. Loosen the bolted connections along the perimeter of the plate and adjust the tooth clearance between the rack and the pinion(s) to 0.2 – 0.4 mm (measured with a feeler gauge). It should always be possible to turn the pinion(s) slightly by hand (within the tooth clearance). The safety device plate can be moved sideways by means of the adjusting screw with the disc springs. The safety device plate should be parallel with the cage frame and the clearance between the back of the rack and the dogs on the back of the safety device plate must be 2.5 – 3.5 mm. When the safety device trips, the safety device plate must be able to move enough to bring the hooks in contact with the back of the rack.
The safety device plate can be lifted by means of the two eccentrics located at the bottom of the safety device plate (perform these adjustments after loosening the bolted connections along the perimeter of the plate and while checking the tooth clearances). On setting the safety device plate, tighten the bolts attaching the plate to the car (the ones with the yellow rubber rings) to **90 Nm** and the bolts of the eccentrics to **200 Nm**.

19. a) Set the preload of the disc springs by compressing their volume to 20 mm. They are in a serial-parallel sequence of //\\ //\\//\\ (12 springs). This configuration was used until March 2015 (up till but not including KZ5 safety device s.n. 51528).
b) Set the preload of the disc springs by compressing their volume to 28 mm. They are in a serial-parallel sequence of ///\\\//\\\//\\\ (18 springs). This configuration has been used since April 2015 (starting with KZ5 safety device s.n. 51528).

20. Perform further operations with the safety device (positioning, connection tightening) according to the technical documentation for the specific safety device model.

21. Check the setting of the safety device plate and lubricate the safety device pinion(s) (or the pinions of the safety device countershaft, if applicable) weekly when the unit is in operation.

Priorities:

1. **Tooth clearance between pinion and rack (position: machinery plate vs. drive unit frame, dogs vs. rack)**
2. **Lubrication of rack and pinions.**
3. **Tightening of back-up rollers to 300 Nm (prevention of increasing clearance between rack and pinion) and rack bolts to 250 Nm.**
4. **Clearances in the cage guide rollers and the front and rear guide rollers of the drive unit (prevention of vibrations and wear of the guide rollers and mast pipes).**
5. **Setting the same protrusion of the drive pinions past the rack (incline of the drive unit, even wear of the tooth surface).**
6. **Symmetry of the drive unit frame in relation to the mast.**
7. **Symmetry of the cage in relation to the mast.**
8. **Incline of the cage in relation to the mast pipes.**

Table 1: Specified bolted connection torque values

Connection	Size	Grade	***Torque (lb-ft)***	Torque (Nm)
Base frame to foundation slab	M24	10.9	***500***	680
Mast section to mast section	M24	8.8	***260***	350
Rack to mast	M16	8.8	***185***	250
Guide roller bogey	M24	8.8	***260***	350
Guide roller to bogey (to cage)	M16	8.8	***150***	200
Back-up roller to machinery plate	M20	8.8	***220***	300
Machinery plate to drive unit frame	M16	8.8	***65***	90
Safety device plate to drive unit frame	M16	8.8	***65***	90
Gearbox to machinery plate	M16	8.8	***130***	180
KZ3 safety device to plate KZ5 safety device to countershaft	M16	8.8	***65***	90
Joint of vertical pipes of landings	M16	8.8	***90***	120
Tie-in stirrups to mast	M12	5.6	***40***	55

Note: 1Nm = 0.738 lb-ft

CHECK OF RACK AND PINIONS

Procedure:

1) Visually check the integrity of the pinions, shaft run-out and pinion attachment.
2) Measure the pinion teeth wear (Fig. 8.2). The “z” dimension over two teeth must be bigger than 1 13/32" (35.8) mm (z = 1 29/64" (37.1) mm in a brand new pinion).

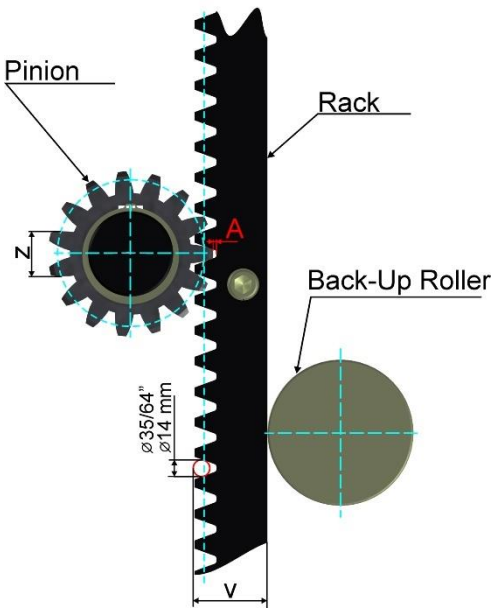
If a pinion is worn over the above limit, discontinue operation and replace the pinion.

Before installing the hoist on a new jobsite, check if the current condition of the pinions will not make it necessary to replace them within the duration of the job. If worn, it is then advisable to replace them prior to installation.

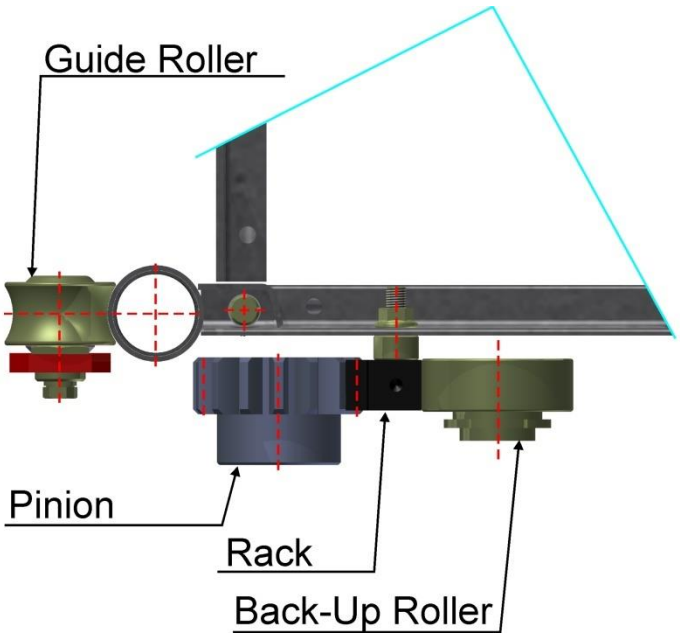
3) Measure the rack wear (Fig. 8.2).
While inspecting the rack (along the height of the mast), measure its wear at several places by inserting a 35/64" (14 mm) diameter roll between the rack teeth.
The “V” dimension must be at least 2 5/16" (58.8 mm).

It is advisable to perform the measurement in all mast sections, and to also perform it after dismantling the hoist. Use mast sections with enough rack life left for new job installations. Replacing rack in an erected hoist is very costly and practically unfeasible without a partial dismantle of the mast.

4) Measure the clearance between the pinion and rack (Fig. 8.2). The “A” dimension must be between 3/32" and 1/8" (2.5 to 3 mm).
5) Verify that the pinion (viewed from above) overlaps the rack equally on either side, and that the back-up roller area makes full contact with the back of the rack (it does not overlap the rack edge on either side) (Fig. 8.3).



Check of rack and pinions
Fig. 8.2



Top view
Fig. 8.3

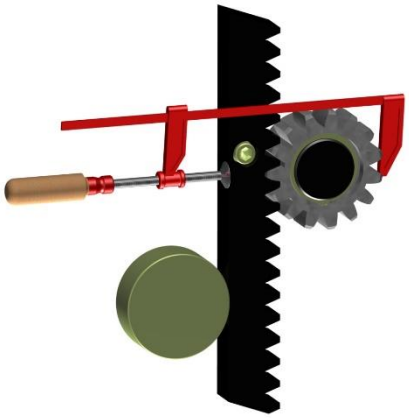
Tooth clearance adjustment

The tooth clearance is adjusted by turning the eccentric bolt of the back-up roller.

Procedure:

1) Check that all the car front guide rollers rest on the mast corner pipes properly. Adjust accordingly.
2) Check the clearance of the side guide rollers (ideally 0.5 mm). See Fig. 8.7.
3) Loosen the bolts fixing the back-up rollers to the machinery plate.
4) Turn the back-up roller eccentric bolts to achieve the correct tooth clearance.
5) Tighten the bolts fixing the back-up rollers to the machinery plate to the specified torque.

To make the procedure easier, it is advisable to use a C-clamp to pull the pinion into the rack (see Fig. 8.4). A couple of C-clamps is usually used for both rollers.



Pulling pinion into rack
Fig. 8.4

The same method can be used to remove a back-up roller from the machinery plate (after first removing the fixing bolt).

Rack replacement

Perform the replacement in a detached section.

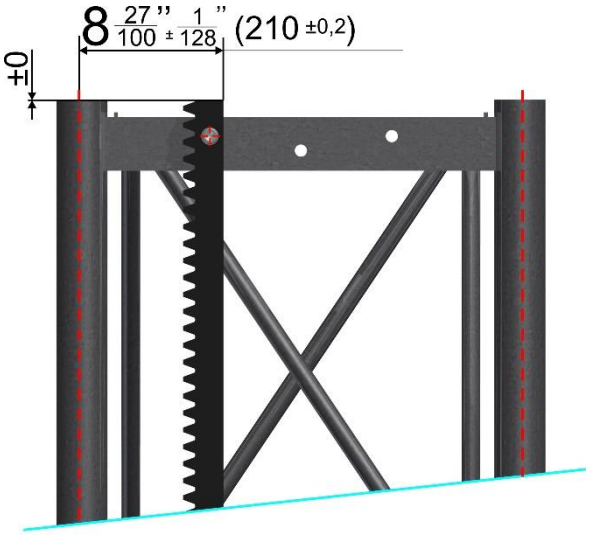
Procedure:

1) Remove the three fixing bolts and take off the old rack section.

If necessary, heat the joint to release the bolt.

2) Clean the contact areas.
3) Check and clean the threaded holes for the fixing bolts.
4) Mount a new rack section.

The position of a newly installed rack section must be as shown in Fig. 8.5.
The fixing bolts must be secured with spring washers and their threads glued with thread locking glue (Loctite 242). Tighten to the specified torque.



Position of rack on mast section
Fig. 8.5

Pinion replacement

It is only possible to replace a pinion when the drive unit or a gearbox are dismantled. It is usually more convenient to take off the top gearbox first, then the bottom gearboxes.

When dismantling the gearboxes, always make sure that the hoist is disconnected from the power supply, the main disconnect switch is off and locked out, and the EMERGENCY STOP buttons are activated.

When dismantling these components, the car must be supported on suitable wooden beams inserted between the car and the base frame, and the drive pinions must not be under load.

When lifting a gearbox assembly, always use a suitable sling and a safe lifting device with a capacity of at least 550 lbs. (250 kg).
Make sure the assembly is safely suspended before loosening the bolts fixing the gearbox to the machinery plate.

Gearbox demounting procedure

1) Ride the car approx. 1'-8" (0.5 m) up, remove the part of the base enclosure adjacent to the mast, activate the EMERGENCY STOP button in the base enclosure, and remove the buffers.
2) Insert suitable wooden beams between the car and the base frame.

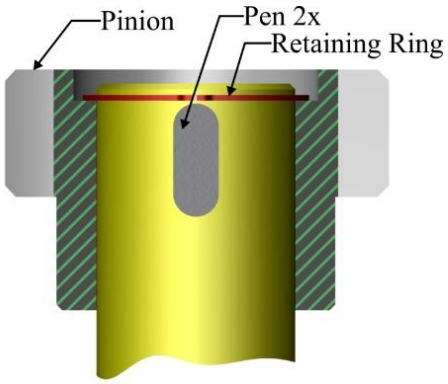
Deploy the beams in such a way that the car will rest on them when lowered all the way down.

3) Manually release the motor brakes and lower the car onto the beams.
4) Disconnect the hoist from power supply, turn off and lock out the main disconnect switch.
5) Disconnect the motor cables.
6) Remove the collar plate running over the motor.
7) Take of the motor cover and install the manual brake release lever (unless already in place).
8) Suspend the gearbox assembly on a suitable sling.
9) Loosen the bolts fixing the gearbox to the machinery plate.
10) Release the pinion from engagement with the rack (by turning the motor fan).
11) While keeping the sling tight, take the gearbox out of the machinery plate and put it on the car roof.

Repeat the procedure to remove the second and third gearbox assembly.

Pinion mounting and demounting

The procedure is apparent from Fig. 8.6. Remove the groove ring and pull out the pinion by means of a puller.



Pinion mounting
Fig. 8.6

Use original spare parts only. Make sure he shaft, parallel keys and groove ring are flawless.
All functional surfaces of the pinion, shaft, keys etc. must be clean and coated with a thin layer of grease. Do not hammer the pinion on the shaft, but press it on with a bolt.

Gearbox reinstallation

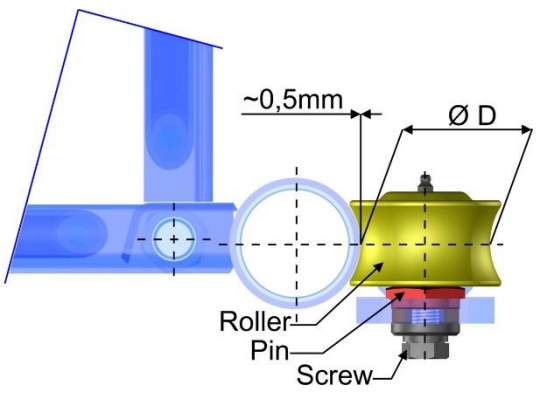
Reinstall the gearbox by reversing the demounting procedure. Respect all safety requirements. Tighten the bolts to the specified torque.

On installing the gearboxes, the setting of the tooth clearances and back-up rollers must be checked. Further procedure is concurrent with the section Emergency Situations – Overriding Bottom Final Limit.

On replacing the pinions, perform the After Repair Test, at least in the extent of the Static Test, Dynamic Test and Single Brake Test.

GUIDE ROLLER SETTING AND REPLACEMENT

The front guide rollers (the ones installed on the carriers) must distribute load equally on either side of the mast. They must not apply eccentric pressure to the mast pipes.
The side guide rollers must be adjusted in such a way that the clearance between the roller and the mast pipe is 1/64" (~ 0.5 mm) (Fig. 8.7).



Side guide roller
Fig. 8.7

To adjust a guide roller, loosen the fixing bolt and turn the eccentric bolt.

Guide roller replacement

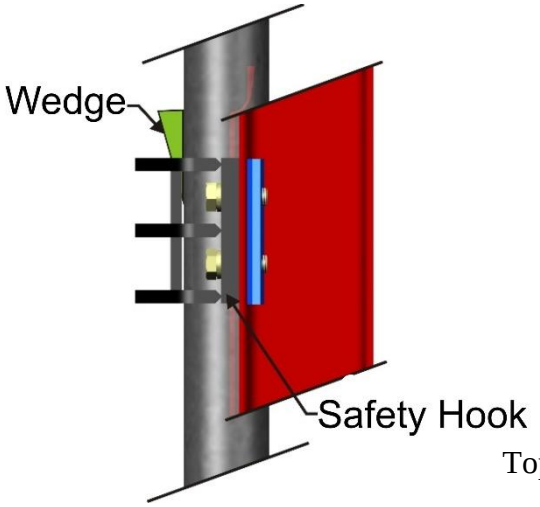
Replace a guide roller when it is worn out, beyond adjustment, or faulty (e.g. bad bearing).

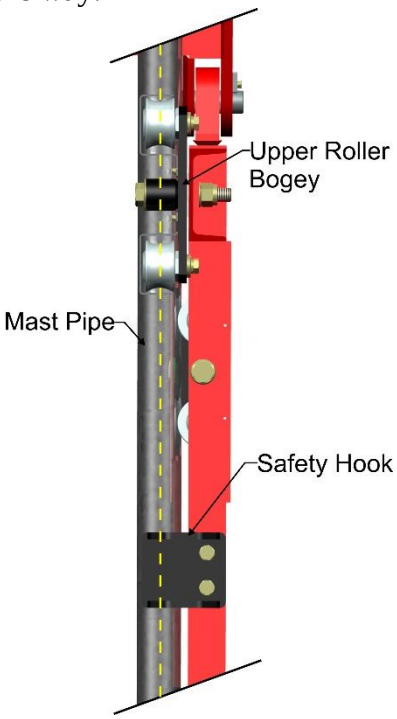
Assess the wear of a guide roller by measuring its diameter (ø D in Fig. 8.7). ø D = 2 31/32" (75 mm) in a brand new roller. Replace a roller when ø D is less than 2 25/32" (71 mm).

Top roller carrier (assembly) removal (Fig. 8.8).

Procedure:

1) Gently drive a suitable wedge between the safety hook and the mast pipe.
2) Loosen the roller fixing bolts and loosen the eccentric bolts all the way.
3) Remove the roller carrier fixing bolt.
4) Take out the roller carrier.



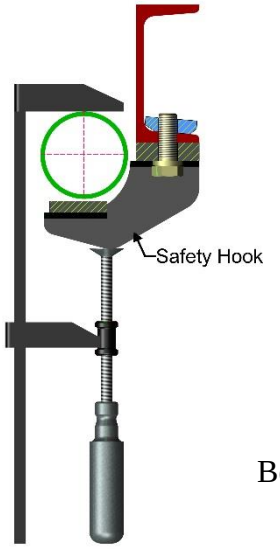


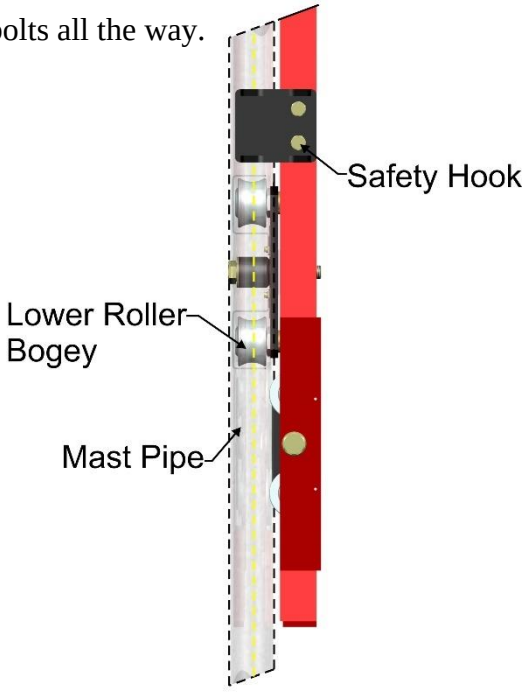
Top roller carrier removal
Fig. 8.8

Bottom roller carrier (assembly) removal (Fig. 8.9).

Procedure:

1) Using a C-clamp (installed over the safety hook and mast pipe), take pressure off the bottom roller carrier.
2) Loosen the roller fixing bolts and loosen the eccentric bolts all the way.
3) Remove the roller carrier fixing bolt.
4) Remove the roller carrier.





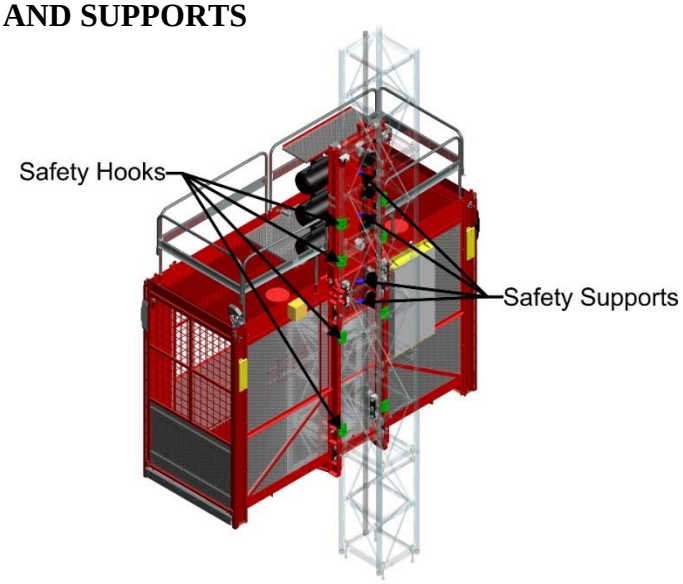
Bottom roller carrier removal
Fig. 8.9

When replacing guide rollers and roller carriers, always make sure that:
- **the clearances in rollers, safety hooks and supports are correctly adjusted**
- **the front guide rollers (on the carriers) distribute load equally on either side of the mast**
- **the roller and carrier fixing bolts are tightened to the specified torque**
- **the pinion tooth clearance and its position in relation to the rack is checked and correct**

Always verify the accuracy of installation and setting by test running the car.

Incorrectly adjusted guide rollers may cause serious (irreparable) damage to the mast.

SAFETY HOOKS AND SUPPORTS



Hoist car
viewed from the mast side
Fig. 8.10

Clearances in safety hooks and supports
Fig. 8.11

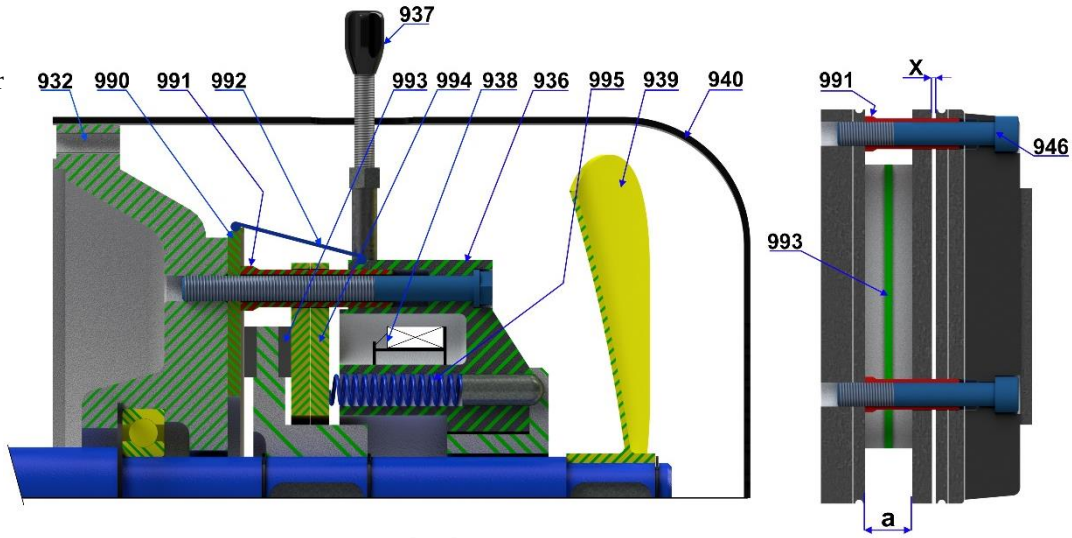
As a result of wear in the guide rollers, pinions and rack, as well as adjustment of guide and back-up rollers, the clearances between the safety hooks and mast and between the dogs and rack may vary. Continuously check if these clearances are at least 5/16" (2 mm) (Fig. 8.10 and 8.11).

MAINTENANCE AND ADJUSTMENT OF ELECTRIC MOTORS AND GEARBOXES

The electric motors are equipped with disc brakes, which generate braking effect with the pressure of a set of springs (Fig. 8.12).

A flawless function of the brakes is basic prerequisite for the hoist's safety. It is therefore essential that all maintenance and repairs be carried out by a qualified specialist.
After each time the brakes are adjusted or taken apart, verify their correct function by testing them and test running the hoist.

932 B-end shield
936 complete brake
937 manual release lever
938 brake hub
939 fan
940 fan cover
946 fixing bolt
971 O-ring
990 friction plate
991 adjusting nut
992 dust seal
993 brake lining
994 armature
995 pressure spring
998 washer/gasket
999 V-ring



Motor brake
Fig. 8.12

Brake adjustment check

The procedure is detailed in the Supplement.

After adjusting the air gap, always test the brakes with the Single Brake Test.
After dismembering or replacing the brake lining, test the brakes with the specified load in the car in addition to the above.

Motor maintenance
Alongside the specified lubrication and brake maintenance, it is necessary to keep to motors clean, especially the surface of the cooling ribs. This is especially important in summer and in high ambient temperatures.

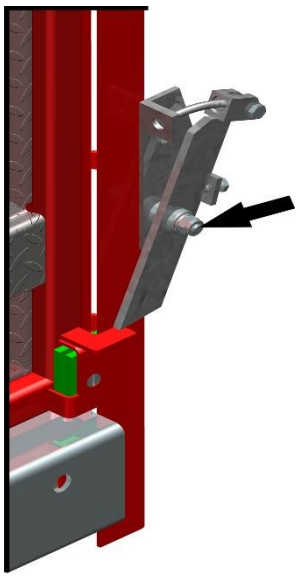
Have the gearbox/motor assemblies completely inspected and refurbished by the manufacturer no later than after 10 years of operation.

MAINTENANCE AND LUBRICATION OF ENCLOSURE AND CAR DOOR LOCKING DEVICES

Procedure:

1) Clean working parts.
2) Check working parts for damage and excessive wear.
3) Lubricate the pins in bushings (see Fig. 8.13).

If you take the locking device apart, make sure to put it back together the right way. All the parts must move easily and their smooth function must not be impeded in any way. On performing maintenance on the locking devices, test their function and check the clearances between the cams and the locking device rollers.



Car door locking device
Fig. 8.13

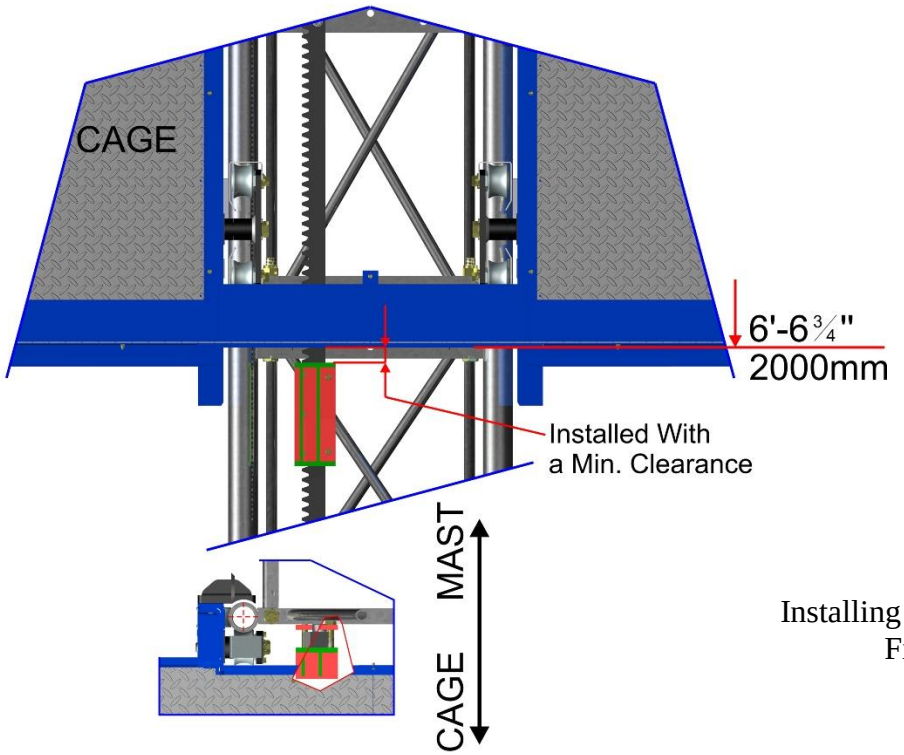
SAFETY DEVICE REPLACEMENT AND MAINTENANCE

See the KZ5 Safety Device Manual for instructions and procedures. Study it thoroughly.

WORKING UNDER THE CAR

It is only allowed to work under the car if it is secured against spontaneous movement in the down direction. Use the "Stop" mounted on the rack to secure the car. The minimum vertical clearance under the car's lowest point is 6' (1.8 m).
Never enter the space under an unsupported car.

Procedure:
1) Drive the car up to at least 6′-8" (2 m) above the foundation slab.
2) Turn off and lock out the main disconnect switch.
3) Remove the part of the base enclosure adjacent to the mast.
4) Install the "Stop" in the rack from the mast side, without entering the space under the car (Fig. 8.14). The gap between the "Stop" and the underside of the car must be as small as possible (less than 1"/25 mm).



Installing Stop in rack
Fig. 8.14

Do not forget to remove the "Stop" when finished working under the car.

When working under a car in a DUAL configuration, personal safety must be ensured in a similar way.

Procedure (in a DUAL configuration):
1) Ride the car under which you are not going to work to approx. 10' (3 m) above the foundation slab. Turn off and lock out its main disconnect switch.
2) Mount the "Stop" on the rack under this car from the roof of the other car.

When installing the "Stop", the main disconnect switches of both the cars must be turned off and locked out to secure the cars against unwanted movement.

3) Ride the other car up so its floor is approx. 6´-8" (2 m) above the foundation slab.
4) Turn off and lock out its main disconnect switch.
5) Use the enclosure door of the other car to get under it, and activate the EMERGENCY STOP buttons in the enclosure for both the cars.
6) Mount the "Stop" under the car without entering the space under it.

ELECTRICAL EQUIPMENT

It is described in the Supplement.

TESTING

Before testing::
1) The hoist's documentation must be available.
2) Test conditions must be provided.
3) The hoist must be in a test worthy condition.

Test conditions include the following: Test loads (with verified mass), handling equipment, auxiliary manpower.
This section does not include daily inspections nor inspections performed as part of the hoist maintenance (weekly, monthly etc.), nor pre-erection tests. These are contained in the Installation, Operation, and Inspections and Maintenance sections.

While tests are in progress, it is forbidden to enter the car, its roof or hoistway, unless doing so is directly related to retrieval of test results.

Test load must be distributed evenly in the car and prevented from shifting.
Tests should not be performed too frequently, as they impose strain on the hoist.
All tests must be performed in strict compliance with the safety requirements of this manual and local regulations.

The extent of tests may be determined by local regulations.
However, the extent of tests detailed in this manual must be regarded as a bare minimum and adhered to.

TESTS CARRIED OUT BY THE USER

Apart from the tests detailed herein, the hoist is must always be tested:
- after completion of erection – Erection Test (SP)
- once a year – Expert Test (SP)
- after repairs (at least in the extent of the repair performed)

The above tests must be performed by an authorized specialist.

Erection Test (Expert Test)
Extent of Erection (Expert) Test:
- check of completeness of operating documentation,
- check of compliance with relevant regulations and documentation,
- check of parts – see the Checked Parts section (SP),
- load less test (SP)
- static test (SP)
- dynamic test (SP)
- overload device test (SP).

Before the Erection (Expert) Test, the electrical equipment must be inspected by an authorized specialist. This inspection must be logged and filed with the hoist's documentation.

Verification Test

After the first Erection Test, every new hoist must be tested (and, if need be, registered) in compliance with local regulations. This test is usually performed by an inspector of a work safety technical surveillance authority, who also determines its extent.

The extent of the Verification Test is usually similar to that of the Erection Test.

Expert Inspections

The safety of every hoist's operation must be verified by an Expert Inspection carried out every three months by an authorized specialist.

The safety device must be tested during every other Expert Inspection (i.e. every six months). The 6-month interval must not be exceeded.

Expert Inspection extent:
- check of completeness of operation documentation and proper fulfillment of duties by responsible personnel
- check of hoist parts – see Checked Parts (SP)
- safety device test (performed every six months, SP)
- load less test (SP).

Each Erection or Expert Test must be recorded. The record must determine whether the hoist is eligible for further operation or not (see Appendix IV).
Each Expert Inspection must be recorded. The record must determine whether the hoist is eligible for further operation or not (see Appendix III).
Similarly, a test following a repair must always be recorded. The hoist user records and files information about tests and Expert Inspections together with other operation documentation of the hoist.

Check of hoist parts

Checked parts

Base station
- base frame (attachment to the foundation slab, shimming, attachment of the first mast section, grounding)
- buffers (spring mounting and attachment)
- cable trolley or cable drum (attachment, cable coiling)
- base enclosure (shimming, attachment, completeness)
- limit cams (position, attachment)
- doors (integrity, rigidity, functionality, locking device function)
- electrical panels (integrity, door closing, main disconnect switch, controllers, marking, power supply)
- EMERGENCY STOP button (inside the enclosure).

Car
- car frame (geometric shape, welded joints)
- floor, ceiling, walls (integrity)
- guide rollers, safety hooks and dogs (setting and wear of rollers, clearances, integrity)
- car roof (handrail, hatch incl. switch, absence of erection boom in operation)
- car doors (suspension, balance, locking device function, cables)
- drive unit attachment
- control panel (integrity, door closing, switches, controllers, marking)
- counterweigh wire ropes incl. attachment and limit switch (if applicable)
- controllers (integrity, marking)
- limit switches and stop-next-landing proximity switch (integrity, fixation)
- End of Rack proximity switch (integrity, position)
- electrical conductors (position, integrity)
- lighting and signalization (function)
- tools for emergency actions and car ladder
- signs and plates.

Drive unit
- safety device (marking, condition, date of last test and date of last refurbishment by the manufacturer)
- gearboxes and pinions (gearing condition, pinion tooth clearance, attachment, oil leakage)
- motor brakes (cleanness, movability – manual release, mounting)
- back-up rollers (setting and wear).

Mast, tie-ins, landing equipment
- mast sections (flawlessness, wear, rack mounting)
- section joints (integrity, fastening, bolts and nuts)
- mast (plum, straight, twist)
- tie-ins (tie-in spacing, top mast overhang, attachment to mast and wall, joints of tie-in elements, safety clearances)
- landing bars or gates (mounting, height, controllers, safety distances, conductors)
- landings (bearing capacity, sill clearances, landing enclosures)
- limit cams (position, mounting, car overriding, safety distances)
- car door locking device cams (position, mounting)
- cable guides (position, attachment, spacing)

Other parts:
- other signs, warnings, instructions and markings
- stowage and condition of accessories (incl. keys to padlocks and switches for emergency situations)
- lighting at landings (if required).

Load less test

It is performed by riding the car up and down all the way in order to assess the hoist's characteristics and individual functions.

Verify specifically the following:
- brake function by performing the Single Brake Test (SP)
- noise, motor vibrations and overheating, car starting and stopping
- function of the normal and final limit switches (SP), all the STOP and EMERGENCY STOP buttons, landing controllers, hatch switch
- precision of stopping at landings, base enclosure, car door and landing gate locking devices
- safety distances, clearances, overrides

If any defects are discovered during this test, they must be rectified before operation is restored (or before the test is continued).

Static Test
It is performed with a corresponding test load distributed evenly over the car floor. The duration of the test is 10 minutes. The car must stand still approx. 8” (200 mm) above the buffers.
Verify specifically the following:
- that the car has not moved (static brake efficiency)
- that the car has not been permanently deformed (car frame rigidity)
- that the gearbox assemblies have not suffered damage (pinion and gearing strength)
- that the car floor has not suffered damage (floor strength).

If defects are discovered during this test, they must be rectified before further testing can be performed.

Dynamic Test
It is performed with a corresponding test load distributed evenly over the car floor.
Verify specifically the following:
- safety device function (safety device test - SP)
- brake function (make sure the car stops repeatedly and accurately each time)
- operation properties (all the hoist’s functions incl. normal limits, STOP and EMERGENCY STOP buttons, door and locking device function properly)

Single Brake Test

It is performed by an authorized person from the car roof (without any other load).

Procedure:
1) Turn the mode selector switch to INSPECTION and ride approx. 16’ (5 m) up.
2) Open two of the three brakes by means of the manual release levers.
3) Ride a short way down and press the STOP button. The one brake must stop the car. Test the other two brakes in the same way.
4) Turn over to OPERATION.

Safety device test

During a safety device test, no person is allowed inside the hoist car or on its roof.
The correct function and efficiency of the motor brakes must be verified before the safety device can be tested.
Do not allow other persons to be near the hoist unit.

The test is performed by an authorized person by means of the DROP TEST controller, which controls the hoist remotely, from outside the hoistway.

The car must be loaded with a corresponding test load distributed evenly over the car floor.

Procedure:
1) Study the documentation for the safety device.
2) Turn off the main disconnect switch.
3) Turn the switch on the RM2 panel to TEST.
4) Connect the DROP TEST controller to the control panel. Lower the controller to the base station.
5) Turn the main disconnect switch on. Press the UP button on the DROP TEST controller and ride the car to a height of approx. 20’ (6 m).
6) Press the TEST button on the DROP TEST controller and hold it until the car free falls and the safety device trips.

If the safety device fails to trip by the time the car is approx. 6'-6" (2 m) above the bottom position, release the TEST button. The car will be stopped by the motor brakes.
In such a case, the reason why the safety device did not trip must be identified.
The reason may be - the tripping speed was not reached
- the safety device is not functional.

7) Ride the car to the nearest upper landing by means of the UP button on the DROP TEST controller and turn over to OPERATION.
8) Activate the EMERGENCY STOP switch to secure the car against accidental movement.

Before resetting the safety device, verify the correct functionality of:
57) - gearbox/motor assemblies,
58) - guide and back-up rollers,
59) - pinions.
60) - Verify that the safety device switch is engaged and prevents the car from going

9) Unplug the DROP TEST controller and plug in the normal OPERATION controller.
10) Secure the car against accidental movement by activating the EMERGENCY STOP button.
11) Reset the safety device according to the safety device manual. (SP).

Final limit switch test

Test of final bottom position
Procedure:
1) Lower the car to just above the buffers by manually opening the motor brakes.
2) Push the UP and DOWN buttons in the car to verify that the car will not move in either direction.
3) Follow the instructions in the Emergency Situations sections to put the car back into operation.

Test of final top position

This test must always be performed by means of the Inspection controller on the RM3 panel on the car roof. The car must not be loaded.

Procedure:
1) Switch to INSPECTION.
2) Ride the car into position to remove the **normal** limit cam. Remove this cam. Activate the EMERGENCY STOP button.
3) Check if the **final** limit cam is correctly installed. Check if the final limit switch is correctly installed.
4) Press the UP button on the Inspection controller and ride onto the final limit. The car must stop.

In danger, release the UP button, or hit the EMERGENCY STOP button.

5) Press the UP and DOWN buttons on the Inspection controller to make sure that the car will not move in either direction.
6) Activate the EMERGENCY STOP button.
7) Manually open the brakes and lower the car by approx. 6'-6" (2 m).
8) Re-install the normal limit cam.
9) Test the function of the normal limit.
10) Go to the base station and turn over to OPERATION.
11) Test top and bottom normal limits in normal operation.

Overload device test

It is described in the Supplement (if applicable).

SERVICE

Specialized service and technical information is provided by your supplier:

Urban Construction Equipment Ltd. 33 Maplecrete Rd. Concord, Ontario L4K 1A5 Canada	Tel.: 905-669-2558 Fax.: 905-669-6773 Toll Free:855-277-2558 E-mail: info@ucel.ca http://www.ucel.ca

and by the manufacturer:

STROS – Sedlcanske strojirny, a.s. Strojirenska 791 264 01 Sedlcany Czech Republic	Tel.: 011-420-318-842-404 Fax: 011-420-318-821-230 E-mail: info@stros.cz http://www.stros.cz

Specialized service of gearboxes and brake electric motors is provided by representatives of the drive manufacturer:
Getriebebau NORD
Schlickt + Küchenmeister GmbH & Co.
D-22934 Bargteheide / Hamburg PO Box 1262

Representation in …….

	Tel.: Fax: E-mail: http://www.

CHECK LIST

Company:		**Construction Hoist type: NOV 2738 / 3238 / 3242 UP3 F -**									**Check list No.:**				
		Ser. No.: Year:									Page 1/2				
Inspection and maintenance		Date: Year:													
	Item	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Weekly (50 hours)	1														
	2														
	3														
	4														
	5														
	6														
	7														
Monthly (200 hours)	8														
	9														
	10														
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	21														
	22														
Every 3 months (600 hours)	23														
	24														
	25														
	26														
Every year (2400 hours)	27														
	28														
	29														
	30														
	31														
Every 3 years (7200 hours)	32														
	33														
Hour meter (hrs.)															
Name & signature of authorized person															

CHECK LIST

Company:	**Construction Hoist type: NOV 2738 / 3238 / 3242 UP3 F -**	**Check list No.:**
	Ser. No.: Year:	Page 2/2

Legend: Item numbers correspond to the activities in the "Instructions Manual" – Periodic inspections and maintenance of the elevator.

Example of filling out the form:

✕	. . .	activity carried out – no problems
---	. . .	activity not carried out
a)	. . .	further information needed – see note a)

Always fill in: date, hour, meter reading, name and signature of the authorized person.

Notes:	
a)	

PROTOCOL

Pre-Erection Test carried out on the day …….

Construction Hoist type: **NOV 2738 / 3238 / 3242 UP3 F -**	Ser. No.:	Year:
Load capacity:		Location:
User:		
Hoist contractor:		
Test result:		
		Compliant:
- check of completeness of operating documentation		YES – NO
- check of all elevator parts required for installation		YES – NO
- check of pinions and safety device (date of next refurbishment)		YES – NO
- erection boom		YES – NO
- electrical equipment test - before connection to mains		YES – NO
- after connection to mains		YES – NO
- Single Brake Test		YES – NO
- tooth clearance check, guide rollers check		YES – NO
- motor brakes test		YES – NO
- safety device test		YES – NO
- test of all functions necessary for the hoist erection		YES – NO
Faults (remarks):		
Conclusion **The hoist IS – IS NOT eligible for safe erection.**		
Electrical equipment tested by: (name, position, company, date, signature)		
Test carried out by (installation supervisor): (name, position, company, date, signature)		

Delete what does not apply.

P R O T O C O L

Expert Inspection carried out on the day…….

Construction Hoist type: **NOV 2738 / 3238 / 3242 UP3 F -**	Ser. No.:	Year:
Load capacity:	Number of landings:	Location:
User :		
Specialized inspection results:		Compliant:
- check of completeness of operating documentation		YES – NO
- check of the elevator components (“Instructions Manual – Checked parts”)		YES – NO
- safety device test		YES – NO
- load less test		YES – NO
Faults (remarks):		
Conclusion **The elevator IS – IS NOT eligible for safe operation.**		
User: (name, position, date, signature)	Specialized inspection carried out by: (name, company, position, stamp, date, signature)	

Delete what does not apply.

P R O T O C O L

Erection/Expert Test carried out on the day…….

Construction Hoist type: **NOV 2738 / 3238 / 3242 UP3 F -**	Ser. No.:	Year:
Load capacity:	Number of landings:	Location:
User:		
Inspection of the electrical equipment was carried out on: Test report No.: with satisfying result		
Results of Erection/Expert test: Compliant: - check of completeness of operating documentation YES – NO - check of compliance with relevant regulations and documentation YES – NO - check of elevator components (“Instructions Manual – Checked parts”) YES – NO - load less test YES – NO - static test YES – NO - dynamic test YES – NO		
Faults (remarks):		
Conclusion **The elevator IS – IS NOT eligible for safe operation.**		
User: (name, position, date, signature)	Tested by: (name, company, position, stamp, date, signature)	

Delete what does not apply.

Revision List

Revision No.	Effective date	Description	Revised by
10/2017-R4	**01.10.2017**	Changes on pages 15, 23, 44 and 50 through 52	**Vorel**
09/2020-R5	**21.9.2020**	Changes on pages 52 through 55.	**Vorel**
12/2020-R6	**18.12.2020**	Add NOV 3238	**Vorel**

Tabulka revizí dokumentu

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