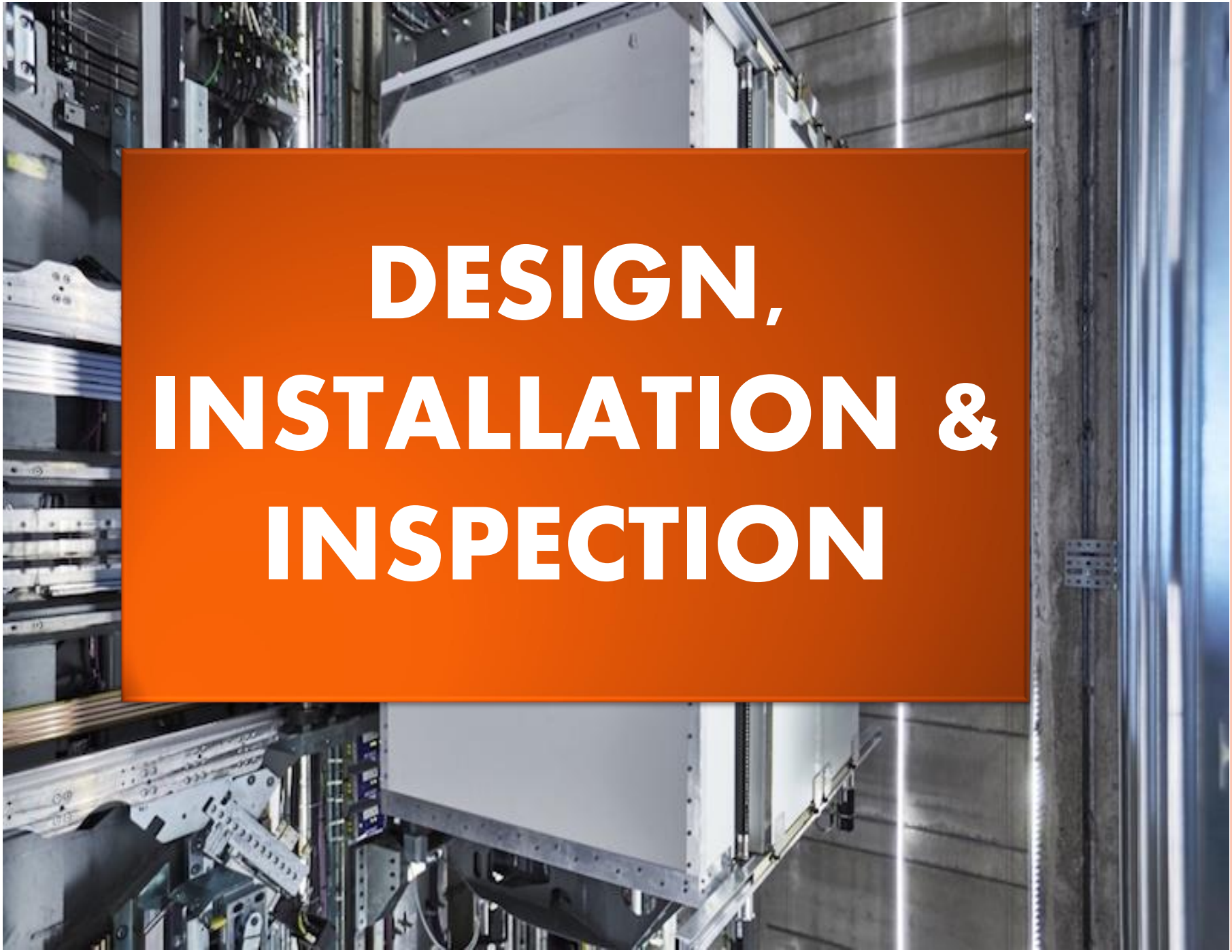
KURSUS REKABENTUK SISTEM LIF & ESKALATOR (LANJUTAN)

7-9 September 2020

PUSAT KECEMERLANGAN KEJURUTERAAN DAN TEKNOLOGI JKR (CREaTE)


DESIGN,
INSTALLATION &
INSPECTION

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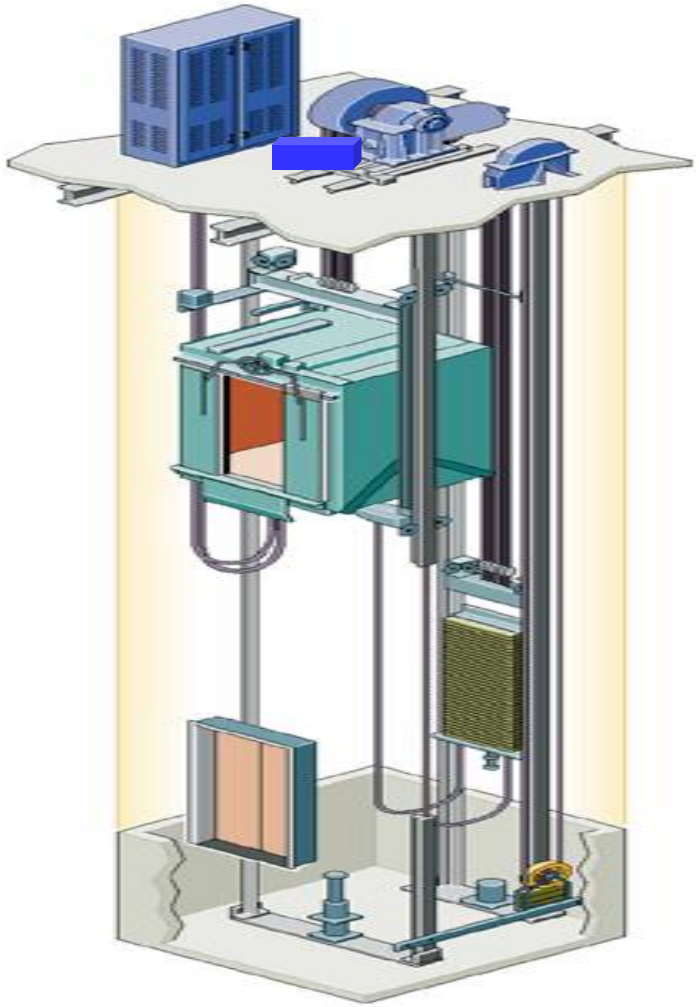

FACTORIES AND MACHINERY (ELECTRIC PASSENGER AND GOODS LIFT) REGULATIONS, 1970

PART II - DESIGN, CONSTRUCTION, INSTALLATION AND TESTS

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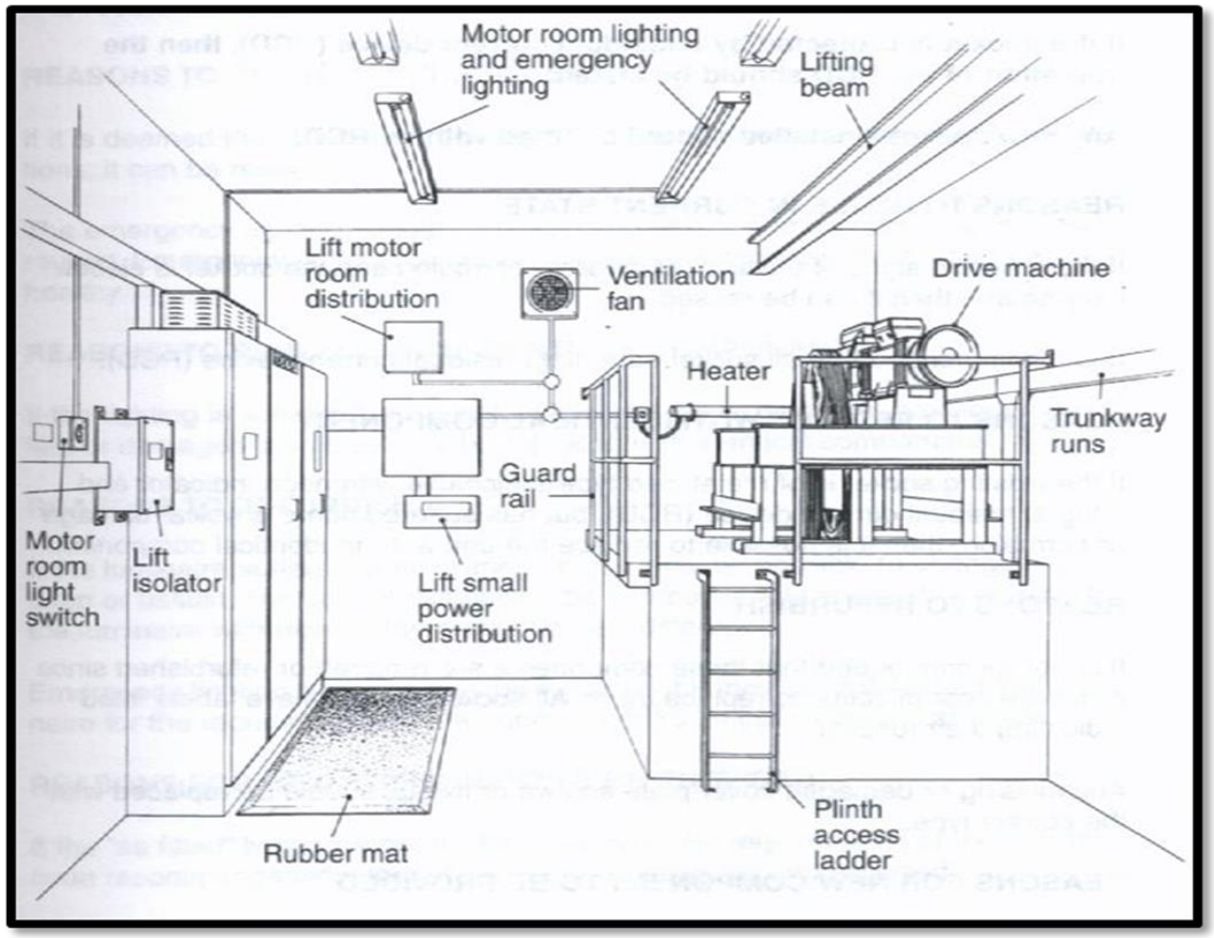
2.1 MOTOR ROOM

2.1.1 General Item At Motor Room

2.1.2 Governor



FACTORIES AND MACHINERY (ELECTRIC PASSENGER AND GOODS LIFT) REGULATIONS, 1970 VS EN81-1:1998

REG./CODE	DESCRIPTION	SPECIFICATION
8(7)	Drum/Sheave diameter	Min. 40:1
8(12)(a)	Span of support beam	Refer note
9(2)(b)	Machine/wall clearance	457mm
9(2)(d) / 6.3.3.3	Clear height of machine room	Min. 2000mm
	Machine to ceiling/beam clearance	Min. 762mm (EN 81-1 : Min. 300mm)
23(2)	Governor tripping speed	See Table II
23(4) / 9.9.6.3	Governor rope diameter	Min. 8mm (EN 81-1 : Min. 6mm)
27(1) / 9.1.2	Suspension rope diameter	Min. 10mm (EN 81-1 : Min. 8mm)
27(2)	Suspension of ropes	Min. 3 ropes

OTHERS

Description	Specification
Safe access to lift machine room	
M/R securely locked with signage	
M/R or M/c space exhaust fan/air-con	
M/R or machine space lighting	10 foot candle at floor 1 foot candle = 10.764 lux EN 81 – 200 lux
Machine room fire extinguisher	
Traction sheave roping	
Sheave-guarding	
13 amps point	
EBOPS for car light and fan	
Governor overspeed switch	

Regulation 7 : Lift loading and capacity

Elaborate on technical requirement:-

- ✓ Contract load of every passenger lift and hospital bed lift shall not be less than given in Table 1.
- ✓ Goods lift:
  - minimum contract load per square foot of inside clear lift car platform area shall not less than fifty pounds (244 kg/m^2)
  - any single piece of goods does not exceed ¼ of the contract load
- ✓ Motor vehicle or automobile lift:
  - minimum contract load per square foot of inside clear lift car platform area shall not less than fifty pounds (147.7 kg/m^2)

Regulation 8 : Lift machine and support

Elaborate on technical requirement:-

- ✓ Drum-driven cannot be use for
  - -any passenger lift
  - -any goods lift with contract speed > 300 ft/min (1.5 m/s)
- ✓ A belt or chain driven machine shall not be use to drive any passenger lift
- ✓ Every drum, sheave or pulley shall be of cast iron or steel and shall have machined rope grooves
- ✓ Cast iron worms & worm gears shall not be used
- ✓ Every lift machine shall be provided with means for winding with hands
- ✓ Every lift machine shall be provided with adequate means lubrication
- ✓ etc..

REGULATION 8 : LIFT MACHINE AND SUPPORT

(7) *(a)* The ratio of the diameter of the drum sheave or pulley to the diameter of the rope wound on it shall not be less than forty to one for all lift cars and counterweight suspension ropes.

(b) The diameter of a drum, sheave or pulley shall mean the centre to centre measurement of the rope wound on it.

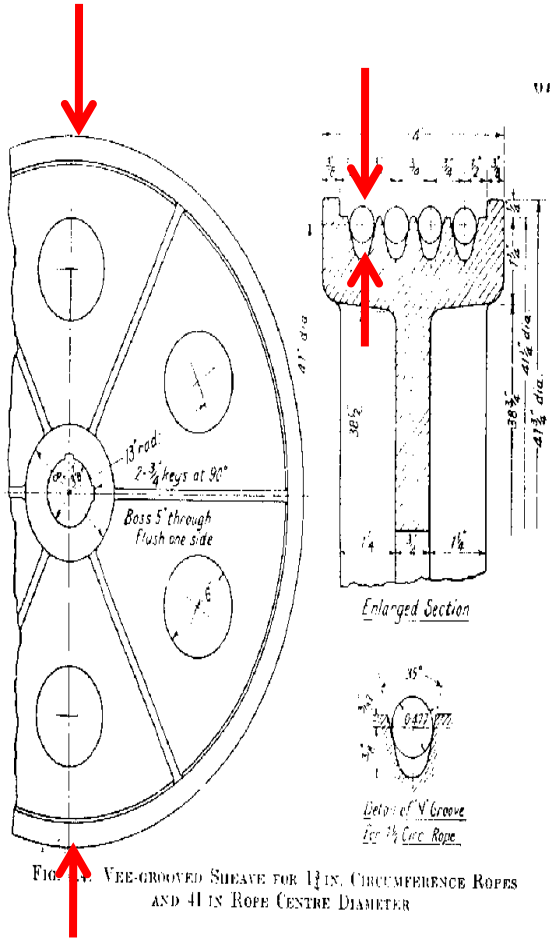


Fig. 14. Vee-grooved Sheave for 1¾ in. Circumference Ropes and 41 in Rope Centre Diameter

REGULATION 8 : LIFT MACHINE AND SUPPORT

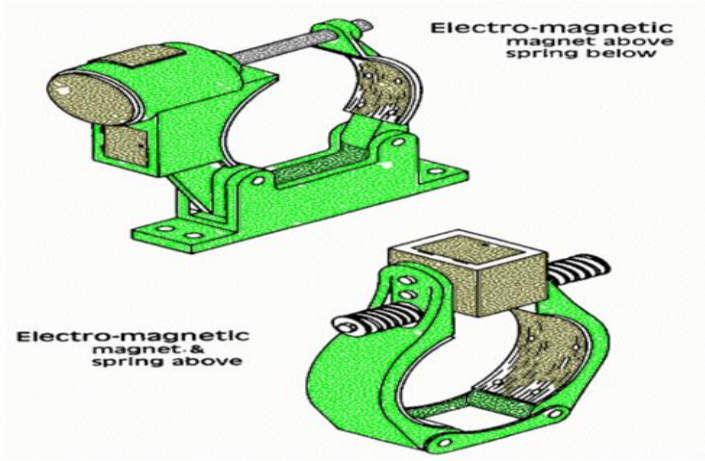
(8) Every lift machine shall be provided with an electromechanical brake which shall comply with the following requirements-

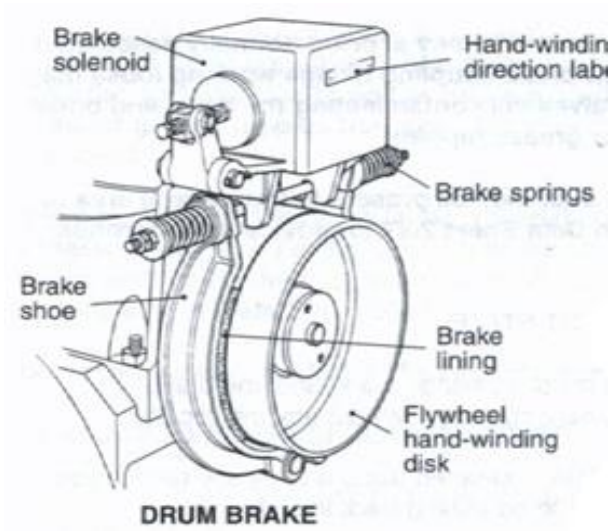
(a) it shall be applied automatically when the operating device is in the "stop" position;

(b) it cannot be released in normal operation until the power has been applied to the motor;

(c) it cannot be held in the "off" position during normal operation by any emergency release device fitted to it; and

(d) no single earth, short-circuit or counter voltage shall prevent it being applied during normal operation.





DRUM BRAKE

REGULATION 9 : MACHINE ROOMS

Every machine room shall be :-

a. designed to carry a load not less than 100 lbs/sq.ft. (488 kg/m²)

b. a minimum distance 18” (457mm) between any part of the machine and adjoining wall

c. weather proof, dry and adequately ventilated

d. have a clear height not less than 6’ 6” (1981mm) from the floor or not less 2’ 6” (762mm) above the highest point of the lift machine if installed on pedestal on the floor

e. provided with permanent electric lighting (illumination > 10 foot candle (107 lux)) and at least one socket & plug (EN 81 – 200 lux)

f. Not used for the storage of articles or material

g. Locked against un-authorised access

Sub-paragraphs (a), (b) and (d) not apply to machine for dumbwaiter

OTHERS

Description	Specification
Detail of machine	(serial no., kW, year of mfg., etc)
Drum/sheave - diameter, condition, grooves, guarding, guide;	
Condition of machine brake – operation, clearance, electrical;	
Condition of machine bearings & gear (sound and vibration);	
Condition of secondary & deflector pulleys - material [FMA:P8(6)];	
Rope fastening at termination (orientation of bulldog clip, tensioning, cotter pin etc);	
Method of machine beam installation (welding, bolting – machine beam/floor, machine beam/machine);	
Lubrication.	

2.1.2 GOVERNOR

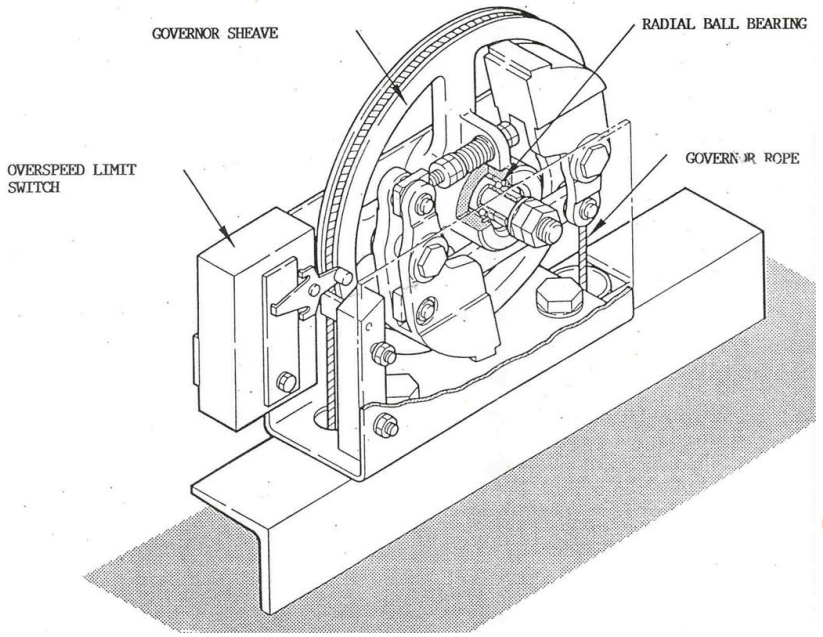
i) Governor rope (diameter, guards, type of wire rope, exemption, defects, etc.);

ii) Governor overspeed device and switches;

iii) Governor tripping speed.

iv) CWT fitted with speed governor.

(CWT Speed Governor tripping speed must be greater than Car Speed Governor but not more than 10% greater).



Regulation 23 : Governors

- Shall be fitted for lift car having a travel between terminal landings greater than 20 feet (6096mm)
- To cause application of the safety gear :

  for lift car

  - at a speed not less than 15% above the contract speed and not more than max. tripping speed at Table II

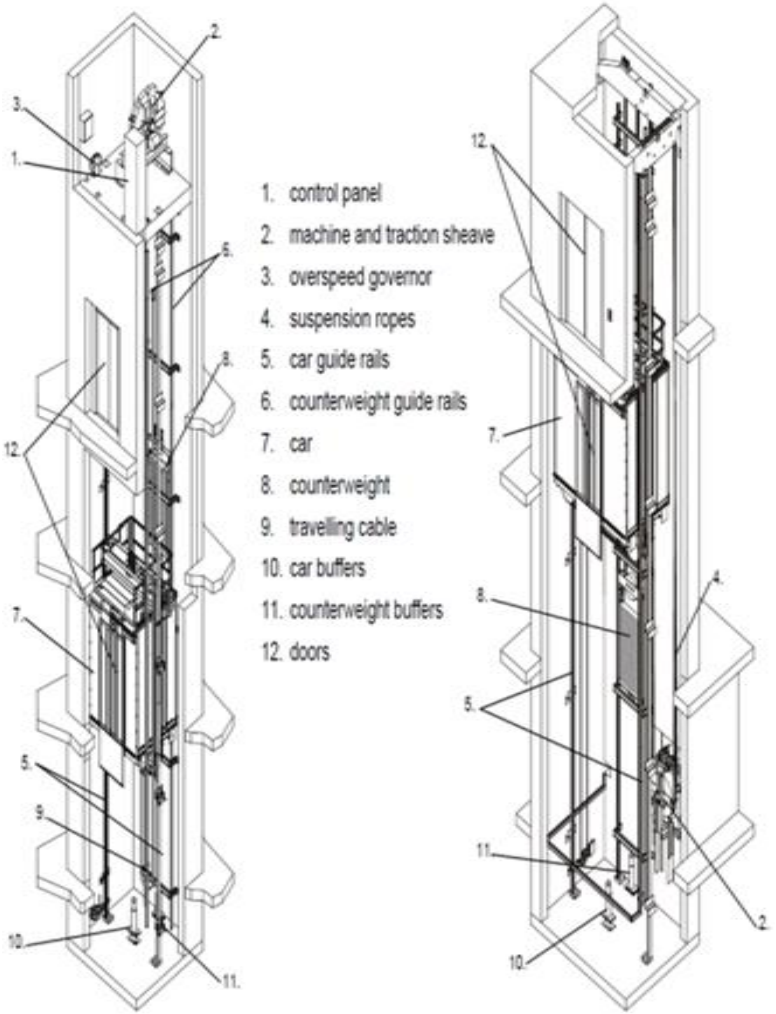
  for counterweight

  - at a speed greater than that at which the car safety gear is applied but not more than 10%
- Governor rope size should be not less than 8 mm

2.2 LIFT SHAFT

2.2.1 Car Top

2.2.2 Hoistway



FACTORIES AND MACHINERY (ELECTRIC PASSENGER AND GOODS LIFT) REGULATIONS, 1970 VS EN81-1:1998

REG./ CODE	DESCRIPTION	SPECIFICATION
10(4)	No. of lifts in one lift well	Max. 4
11(5)	Fascia plate/car nosing clearance	Max. 130 mm
11(6)	Car/ wall clearance	Min. 25 mm
	Cwt/ wall clearance	Min. 25 mm
14(4)	Car frame crosshead	
16	Emergency trap door & switch	
25	Car top clearance	
	Cwt top clearance	
26(4)/ Clause 10.5	Final top limit switch	
26(5)	Cam length	Min. 610 mm
29(1)/ Clause 11.3	Car/ cwt clearance	Min. 40 mm

CONT..

REG./ CODE	DESCRIPTION	SPECIFICATION
29(2)	Car/ Car, Cwt/ cwt, Car/ cwt Of Adjacent Lift	Min. 51 mm
Clause 5.2.2.1.2	Emergency door	Sill to sill distance exceeds 11m
Clause 8.12.4.1.1	Non-stop zone emergency door with special lock	Unlocking triangle
Clause 8.13.3	Car railing/guarding	Consist of a handrail, a toe guard (0.1m height) & an intermediate bar (1/2 height of balustrade)
Clause 8.15 & 13.6	Lighting and 3 pin plug	Lighting & socket outlet in car top
Clause 14.2.2	E-Stop switch	Refer note

OTHERS

DESCRIPTION	SPECIFICATION
Inspection panels and button	Condition
Car pulleys and rope guards	Condition
Rope fastening at termination	Orientation of bulldog clip, tensioning
Condition of car shoes or roller guides	Wear and tear
Oil pan (car and counterweight)	Condition
Location to check wire rope	Condition
Conduits, trunking and wiring, travelling cables, junction boxes	Condition
Guide rails	Securely fastened- male & female, fish plate
Compensating chains or ropes (if any)	Condition

OTHERS

DESCRIPTION	SPECIFICATION
Filler weight	Securely fastened, stopper
Counterweight	Check pulley top cover, pulley shaft and bearing, shoes or roller guides
Distance between guide bracket	Normally <2500mm, depends on the max. deflection, not more than 6.35mm
Landing door (shoes and switch)	Condition

REGULATION 10 : LIFT WELL

- No piping, conduct or equipment apart from lift / necessary equipment for maintenance inside lift well shall be installed.
- Where the counterweight of one lift travels close to the car of an adjacent lift, a continuous screen of adequate strength shall be fixed from top to bottom of the well to protect any person walking in the well or on the lift car from accidental contact with the counterweight in any part of its travel.
- Max. 4 nos. of lift in a lift well
- Clearance 600mm, between pit floor and lowest fitting attached to/projecting to the bottom of car frame when the buffer fully compressed.
- Protection/guard shall be fixed in the lift pit around the path of the counterweight – 300mm height from pit floor to height not less than 2000mm. Not required for lift with compensating ropes.

REGULATION 11 : LIFT WELL ENCLOSURE

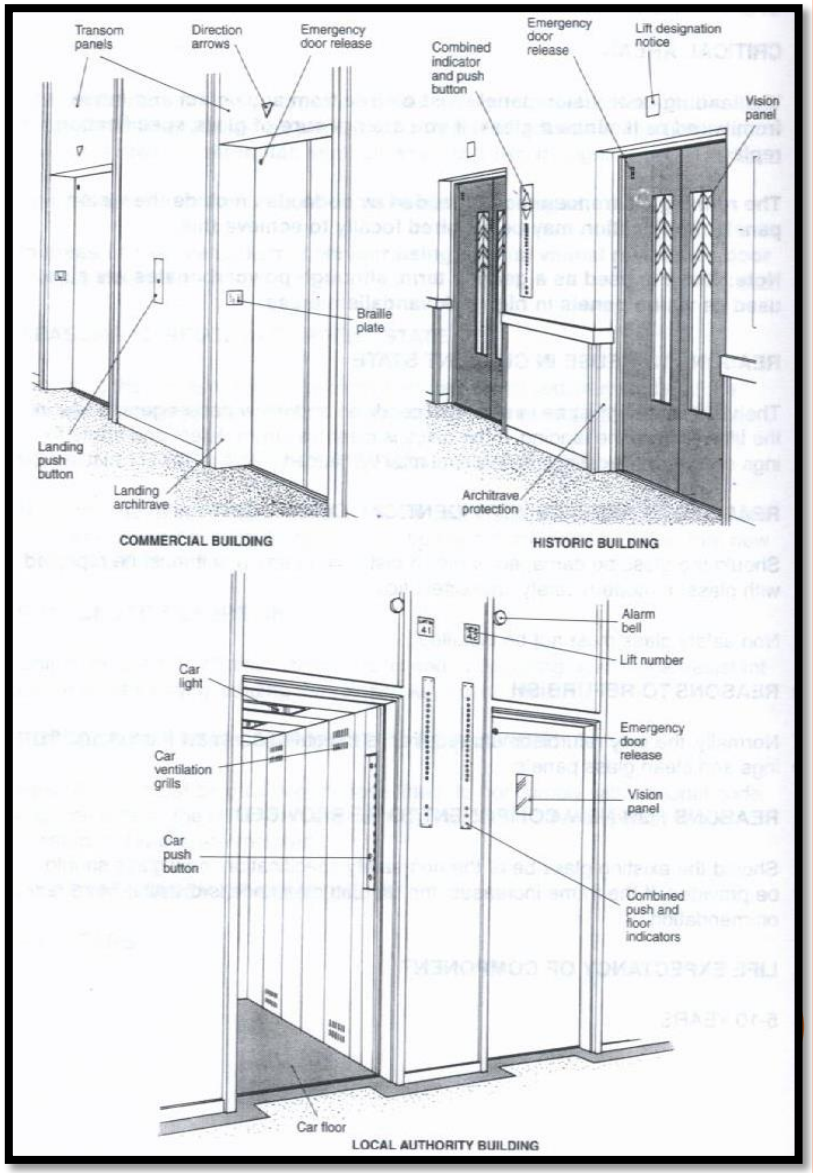
- extend on all sides throughout the height of lift well
- made of brickwork or other suitable fire resisting materials if lift travel greater than 40 feet (12m) above ground floor
- clearance between edge of the landing threshold and car platform nosing –
  - ½ < x <1 inches (30mm)
- clearance of lift well enclosure with loading side of the car platform shall :-

  - for passenger lift : < 5 inches (127mm)

  - for goods lift (vertical sliding hoistway door : < 7 ½ inches (190mm)
- clearance between the sides of the car or counterweight and lift well enclosure > 1 inches (25.4mm)
- No opening to access the car by passing under a counterweight
- If wire grille or similar construction used as enclosure, mesh (opening) not greater than 1 ¼ inches (31mm)
- Any glazing lift well enclosure shall be toughened or shatter-proof glass

REGULATION 12 : LANDING DOORS

- height shall not be less than :-
  - for passenger lift : 6 ‘ 6” (1981mm)
  - for goods lift : 6’ (1828mm)
- distance between lift well side of landing door and the edge of landing threshold shall not be greater than :-
  - for hinged doors : 4 inches (101.6mm)
  - for sliding doors : 2 ¾ inches (69.85mm)
- can be open manually in the event of power failure
- vision panel :-
  - shall be provided for hinged landing door; and also for manual & self- closing landing door for lift with automatic control except car position indicator is provided
  - area of any single vision panel > 25 sq.in and total area of one or more in any landing door < 80 sq.in
  - the centre of panel located at 54 ” < x < 66 ” of the landing



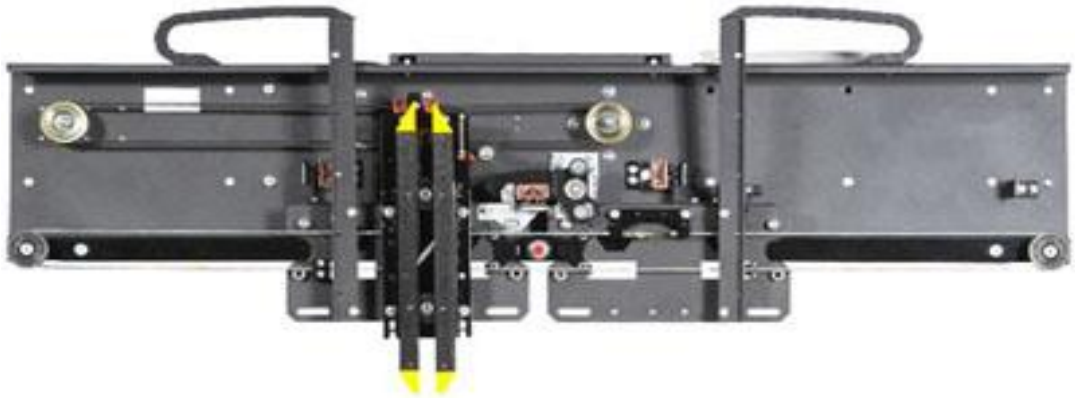
REGULATION 13 : LANDING DOOR LOCKING DEVICES

- Every landing door shall be fitted with electromechanical door lock to ensure that :-

  - lift cannot be moved unless every landing door is closed and locked

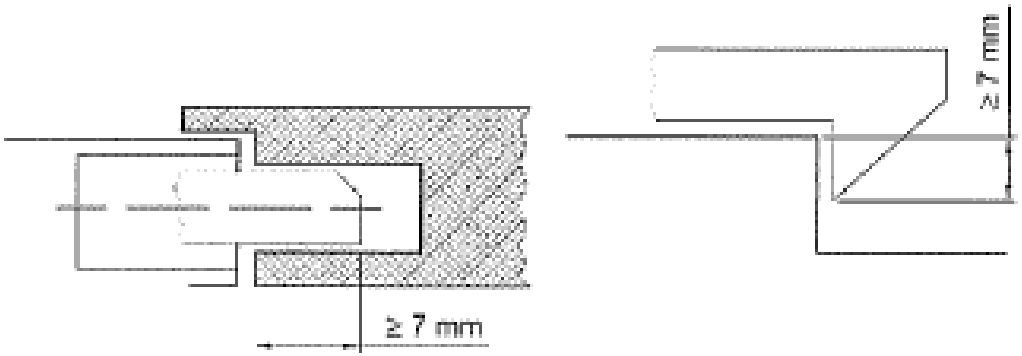
  - any landing door being open the car will come to rest

  - no landing door can be open from landing side unless the car is rest at particular landing or with special key



EN 81-1: LANDING DOOR LOCKING DEVICES

- The door has to be locked effectively before lift car can move.
- Effective locking means the car shall not be able to move until the locking element is engaged at least 7 mm.



REGULATION 16 : EMERGENCY HATCHES

REGULATION 16 : EMERGENCY HATCHES

➢ Side emergency hatch

- direct transfer from one car to other
- distance between the car platforms < 2 ft 6 in (762mm)
- hinged type and open only into the car
- provide with lock from :
  - inside by special key
  - outside by non removable handle
- fitted with car door electric contact
- same material & construction as required for the car enclosure

cont..

CONT....

REGULATION 16:EMERGENCY HATCHES

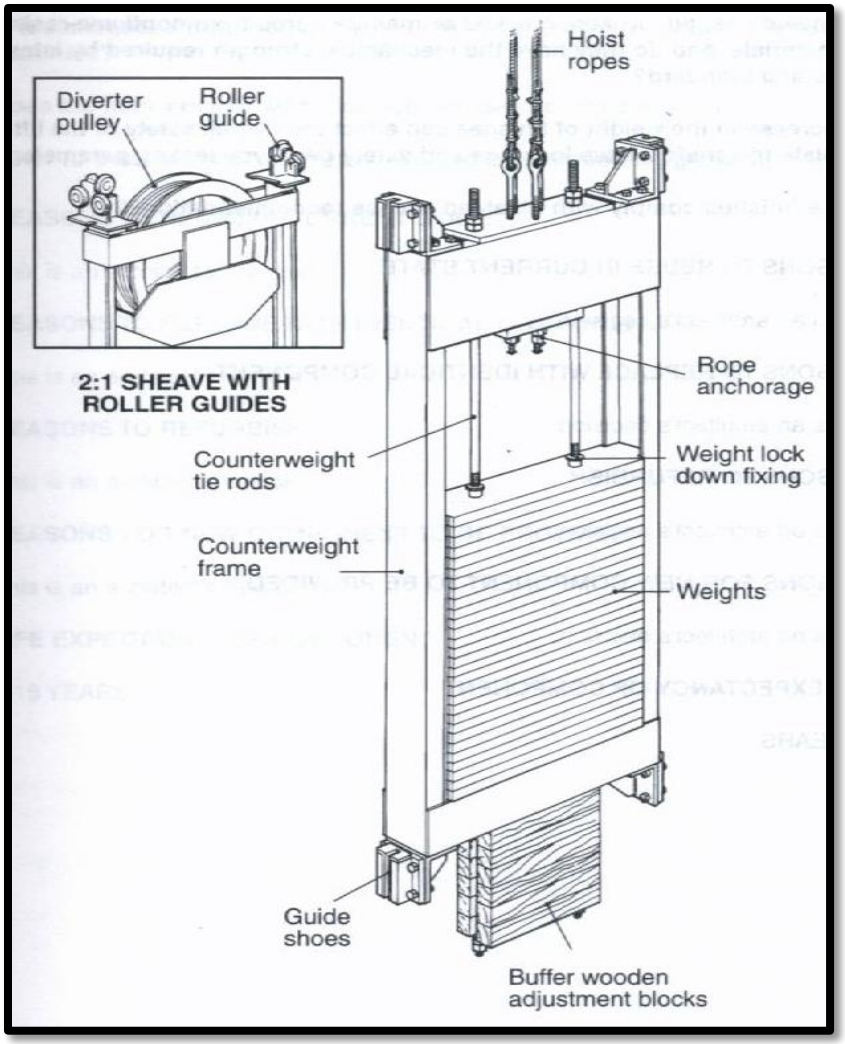
➢ Top emergency hatch

- passage way at the top of a lift car
- hinged or otherwise attached to the lift car top
- open outwards
- can be open from the top of the car only

➢ Keys for emergency hatches

- kept in premises by responsible person for the maintenance and operation of lift car

REGULATION 20 – COUNTER-WEIGHT



- Compulsory for traction drive
- Guides, guide shoes or linings
- Adequately secured – lock nut, cotter pins

REGULATION 21 – GUIDES

(1) Every lift car and counterweight shall be guided throughout its travel by means of rigid steel guides of round or T-section and of such length that it is not possible for the car or counterweight shoes to run off the guides.

(2) Every guide joint shall be tongue and grooved, or dowelled, and fitted with fishplates each secured with not less than four substantial bolts through each rail. The working faces of every joint shall form a smooth continuous surface.

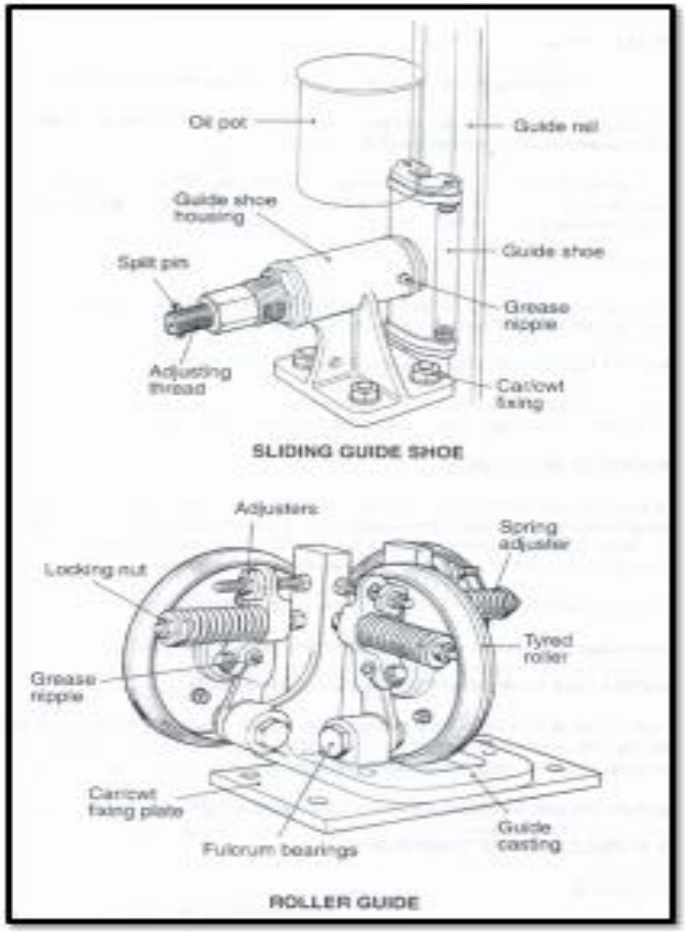
(3) The variation in the distance between guides shall be not greater than three-sixteenths of one inch (4.7mm).

(4) Every guide shall be fastened to suitable supports and every guide and its supports shall withstand the application of the safety gear when stopping a fully loaded car or counterweight.

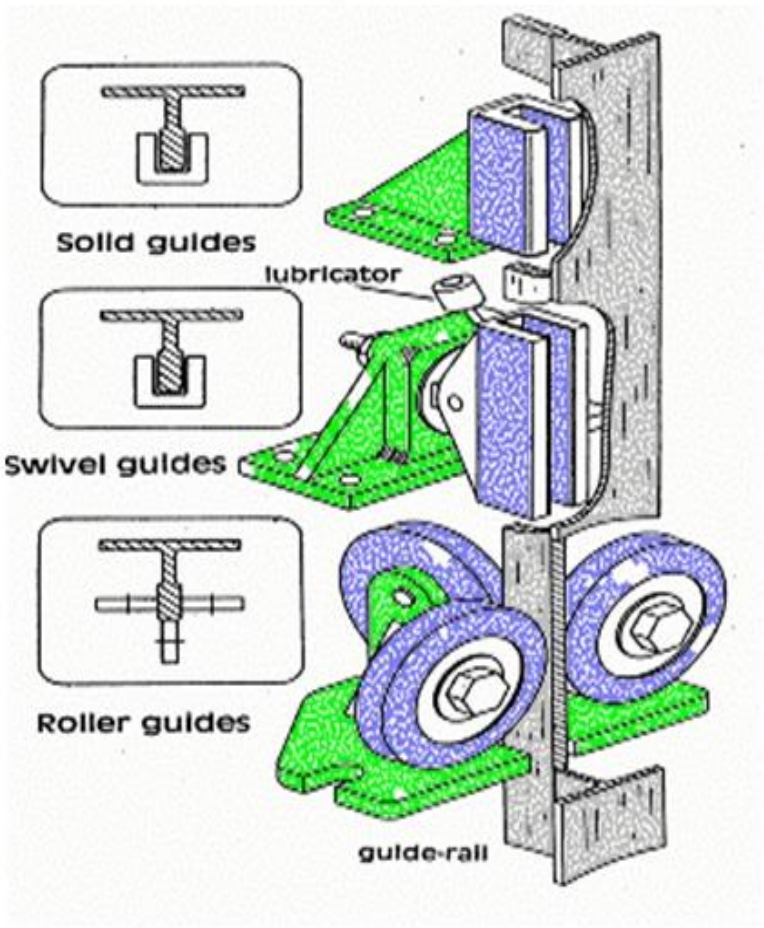
(5) Guide brackets and any shims shall be of steel and shall be bolted to the walls, stairs, structure or building steelwork. Wood blocks, plugs, or similar method shall not be used for fixing guide brackets.

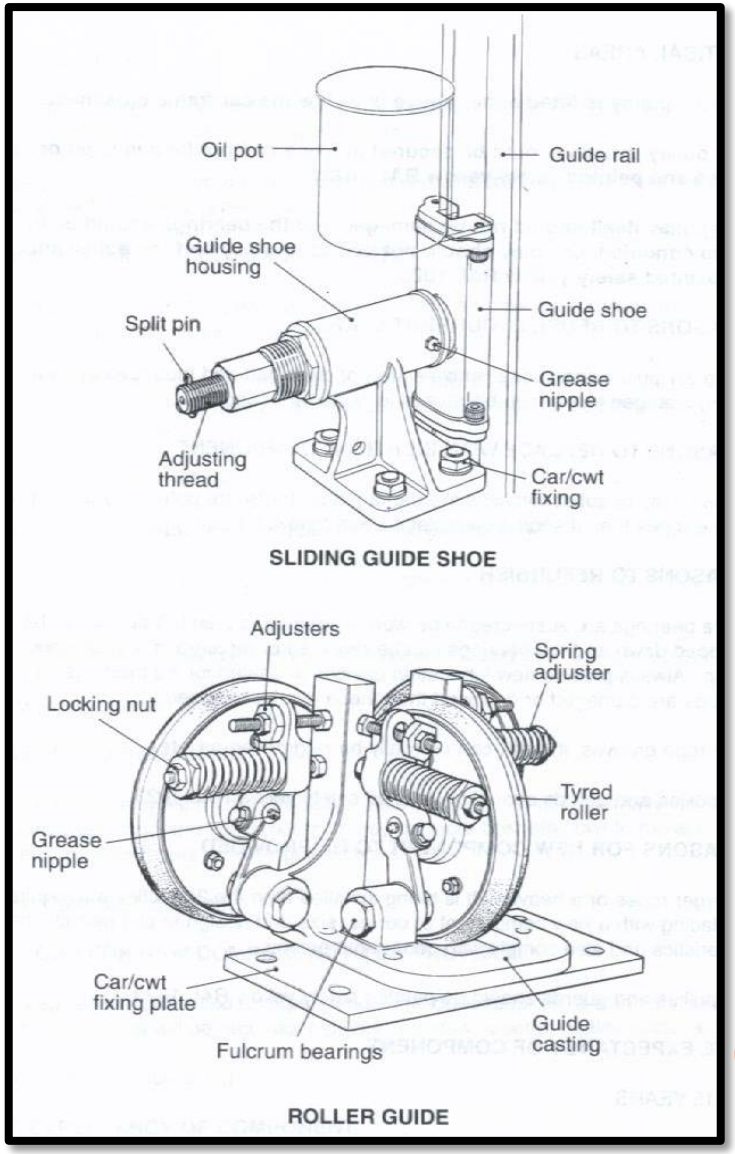
(6) The distance between guide brackets shall be such that the guides shall not deflect more than one quarter of one inch under normal operation (6.35mm).

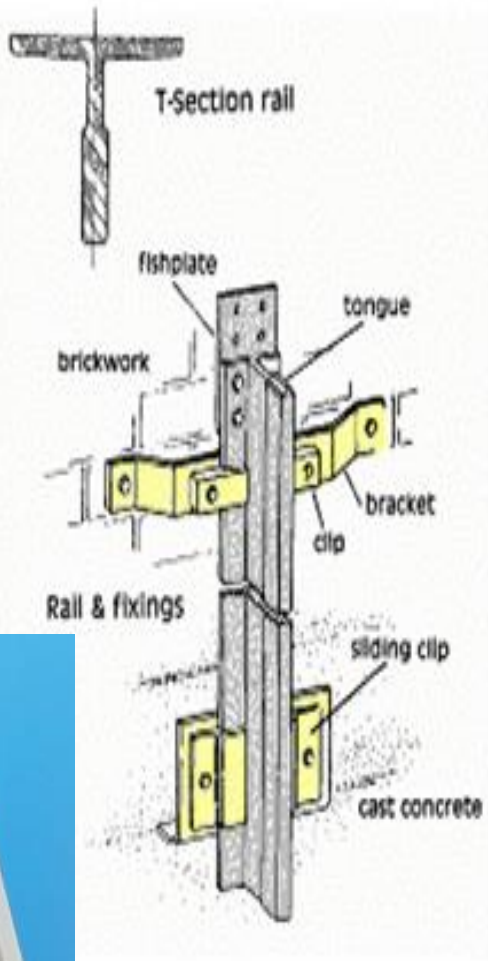
Condition of car shoes or roller guides

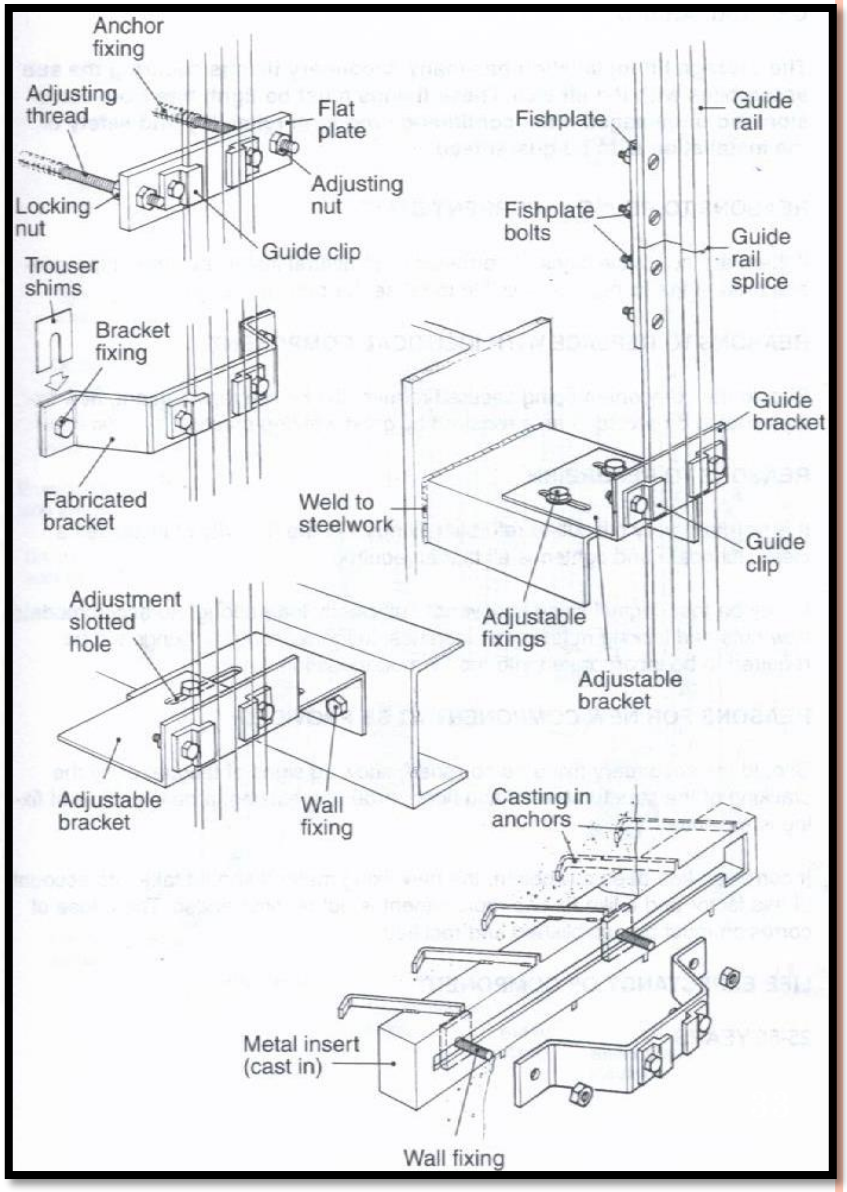


GUIDE SHOES


Solid guides
lubricator
Swivel guides
Roller guides
guide-rail


Oil pot
Guide rail
Guide shoe housing
Guide shoe
Split pin
Grease nipple
Adjusting thread
Car/cwt fixing
SLIDING GUIDE SHOE
Adjusters
Spring adjuster
Locking nut
Tyred roller
Grease nipple
Car/cwt fixing plate
Guide casting
Fulcrum bearings
ROLLER GUIDE


T-Section rail
fishplate
tongue
brickwork
bracket
clip
Rail & fixings
sliding clip
cast concrete


Anchor fixing
Adjusting thread
Flat plate
Locking nut
Adjusting nut
Guide clip
Trouser shims
Fishplate
Guide rail
Fishplate bolts
Guide rail splice
Bracket fixing
Fabricated bracket
Weld to steelwork
Guide bracket
Guide clip
Adjustment slotted hole
Adjustable fixings
Adjustable bracket
Adjustable bracket
Wall fixing
Casting in anchors
Metal insert (cast in)
Wall fixing

REGULATION 26. TERMINAL STOPPING DEVICES

(1) Every lift shall be provided with stopping devices designated the upper and lower normal terminal stopping devices arranged to stop the car automatically at or near the upper and lower terminal landings respectively, with any load up to and including contract load in the car and from any speed attained in normal operation.

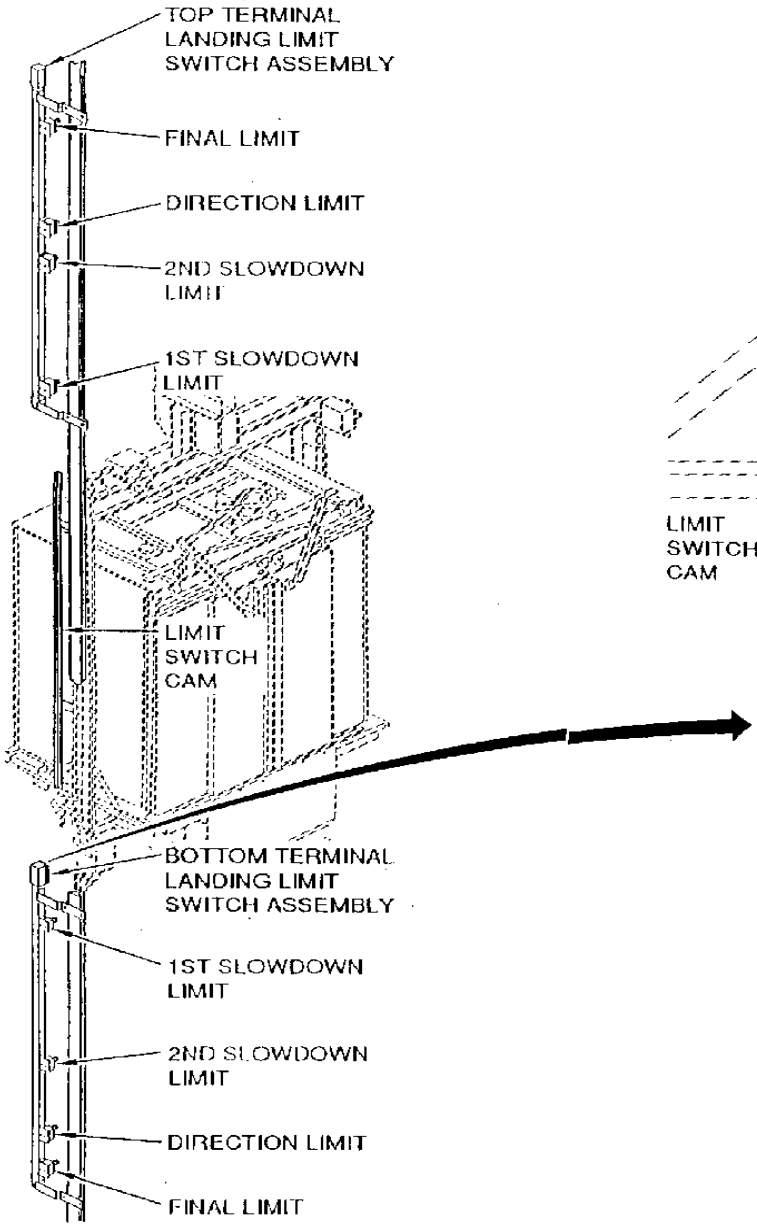
(4) Every lift shall also be provided with stopping devices designated the upper and lower final terminal stopping devices, which shall automatically stop the car independently of the operating devices and the normal terminal stopping devices. Such devices shall function as close to the respective terminal landings as practicable but so that under normal operating conditions, they will not function when the car is stopped by the normal terminal stopping device. Where spring buffers are provided the final lower terminal stopping device shall function before the buffer is engaged.

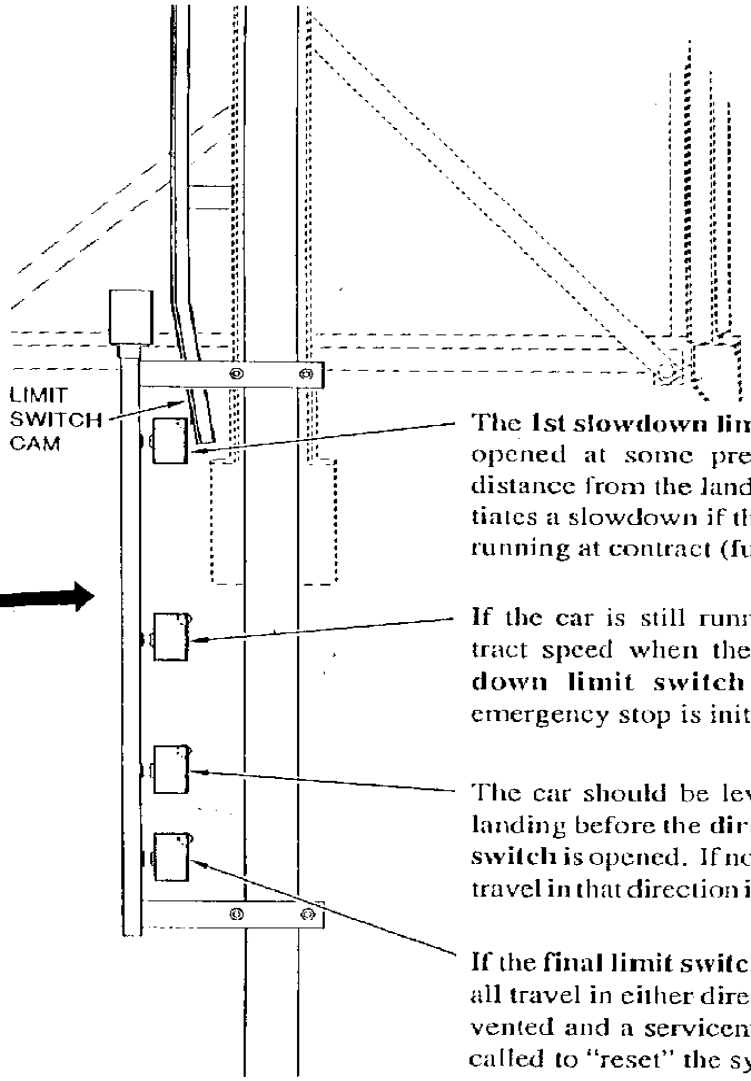
(5) The upper final terminal stopping device shall be held open until the car has travelled above the terminal landing a distance equal to the bottom counterweight clearance plus one-half the buffer stroke, but in no case a distance less than two feet.

(6) The lower final terminal stopping device shall be held open until the car rests on fully compressed buffers.

(7) Final terminal stopping devices shall act so as to prevent the movement of the car in either direction.

(11) All terminal stopping devices shall be of the enclosed type and all cams for operating such devices shall be of metal.





The **1st slowdown limit switch** is opened at some predetermined distance from the landing and initiates a slowdown if the car is still running at contract (full) speed.

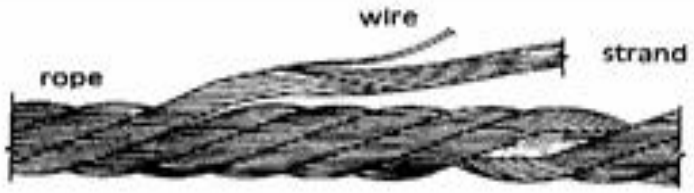
If the car is still running at contract speed when the **2nd slowdown limit switch** opens, an emergency stop is initiated.

The car should be level with the landing before the **direction limit switch** is opened. If not, all further travel in that direction is prevented.

If the **final limit switch** is opened, all travel in either direction is prevented and a serviceman must be called to "reset" the system.

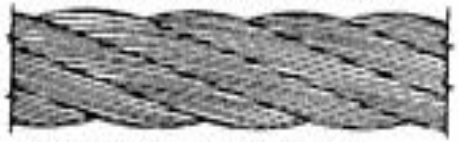
REGULATION 27. SUSPENSION ROPES

(1) Every lift car and counterweight shall be provided with steel suspension ropes having a diameter not less than three-eighth of one inch (9.5mm).
(2) Every traction-drive lift shall be fitted with not less than three ropes, independent of one another, and every drum-drive lift shall be fitted with not less than two ropes, independent of one another, for the car and not less than two ropes, independent of one another, for the counterweight.
(3) Every suspension rope on a lift shall be identical in size, construction, strength and quality, be free from any joint and each end of every suspension rope shall have its own independent attachment to the car, counterweight or anchorage. No rope shall be reeved round a pulley, pin or other device in place of using two ropes.
(4) Every suspension rope on a lift shall be independently fastened to the car frame, counterweight or fixed anchorage in such a manner that all ropes bear an equal share of the load. Means shall be provided to adjust the length of any rope.
(5) Every rope shall comply with the requirements of British Standard Specification No. 329 or 621 or an equivalent specification, in respect of materials, quality and construction.
(6) The factor of safety of car and counterweight ropes, based on maximum static loads, shall not be less than ten in the case of lifts having a contract speed not greater than three hundred and fifty feet per minute (<1.78 m/s), and shall not be less than twelve in the case of lifts having a contract speed of three hundred and fifty feet per minute and above (>1.78 m/s),. For this purpose the maximum static load on the car suspension ropes shall be the contract load plus the weight of the car and suspension ropes and compensation.
(7) A plate giving the number, size and ultimate strength of the ropes required shall be permanently fixed to the machine or to the car crosshead.

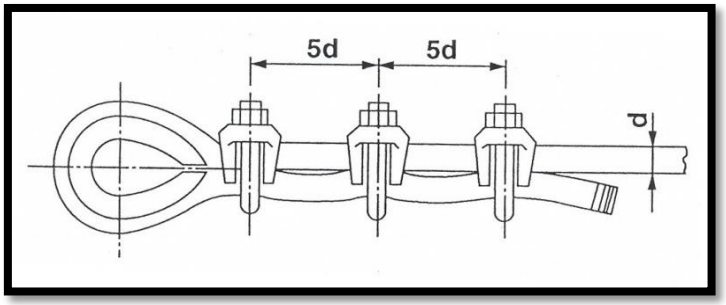


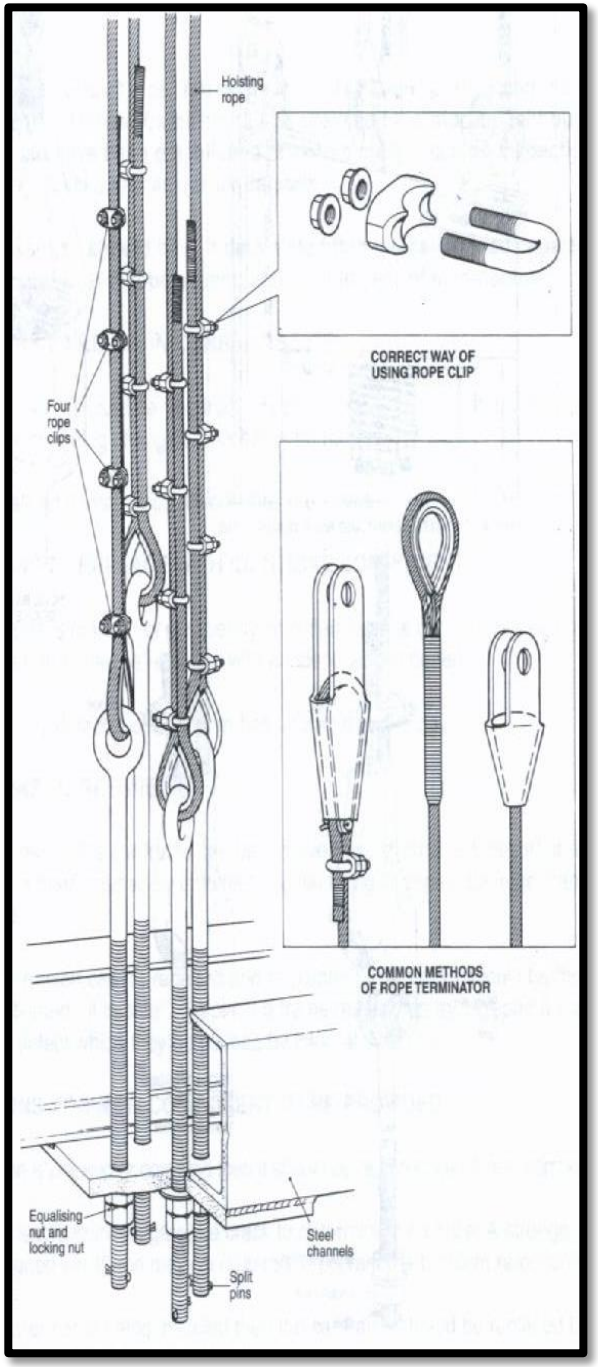
Ordinary lay: right hand

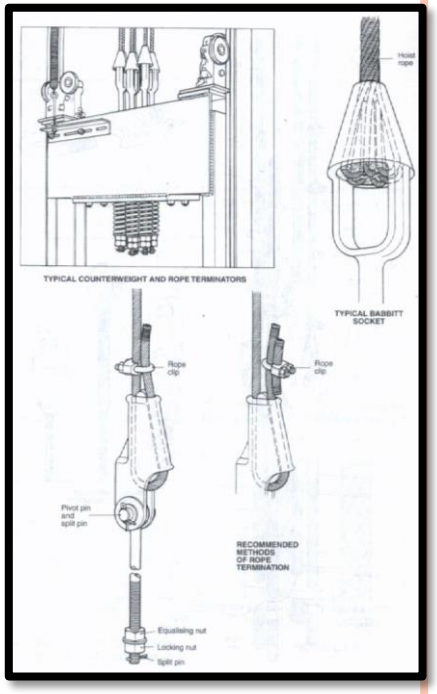
Ordinary lay: left hand



Langs lay: right hand

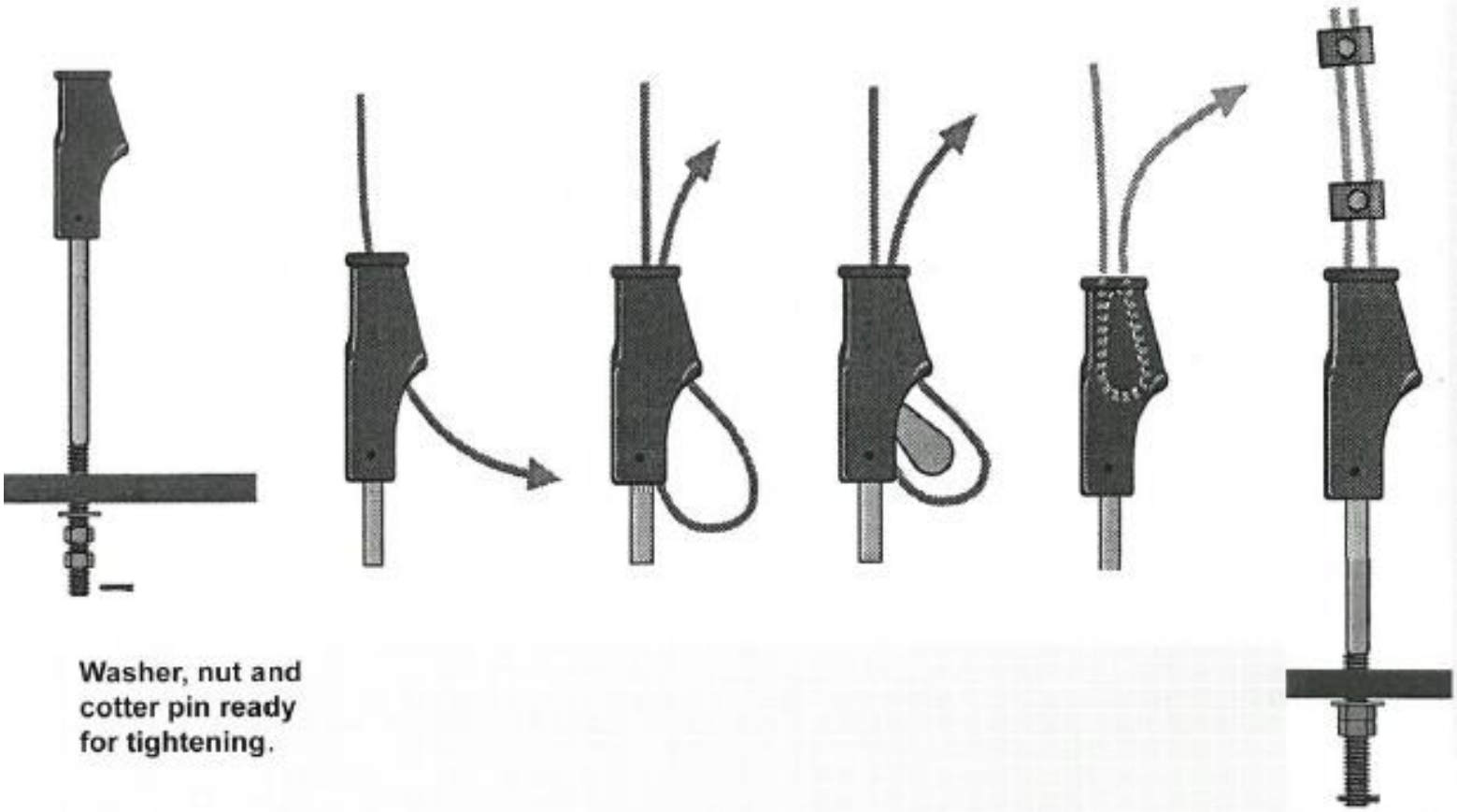






Symmetric wedge socket installation

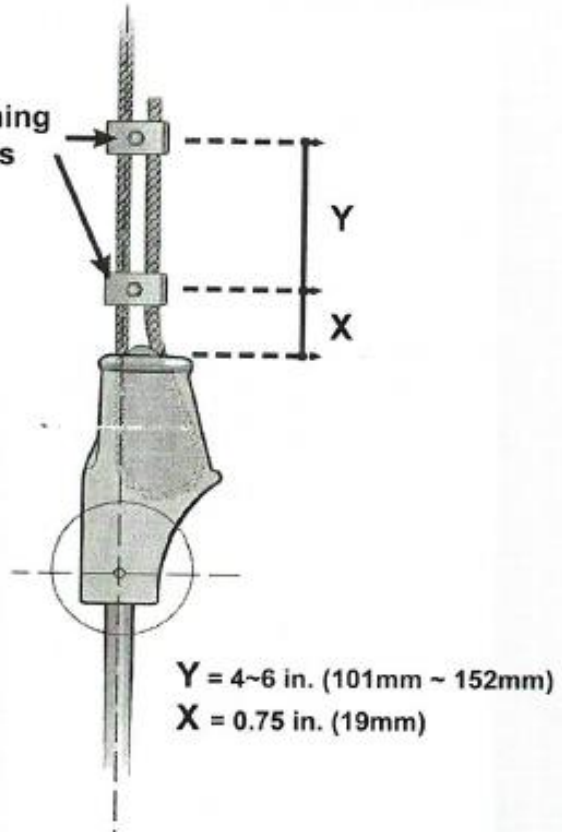
Asymmetric wedge socket installation



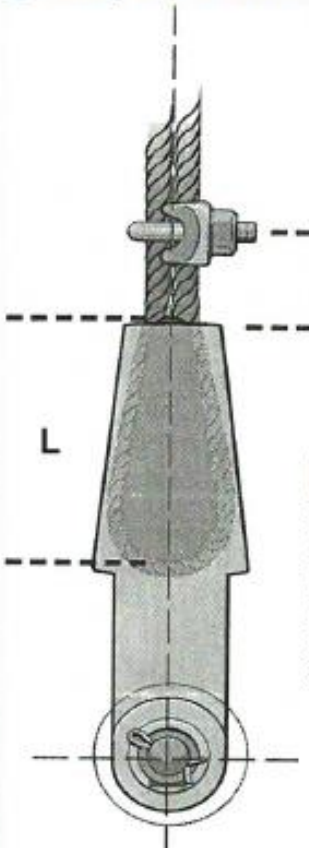
Washer, nut and cotter pin ready for tightening.

ROPE WEDGE SOCKET

Bull dog clips and retaining clips termination



Y = 4~6 in. (101mm ~ 152mm)
X = 0.75 in. (19mm)



X = 40%of the total length of the wedge L

Note : If **X** is too small, the rope may become deformed. If X is too large, the rope will be too relaxed, which can lead to the wedge not fitting snuggly in the housing and even falling out.

E-STOP SWITCH (FUNCTIONALITY AND TYPE)

14.2.2 Stopping devices

14.2.2.1 A stopping device shall be provided for stopping, and maintaining the lift out of service, including the power operated doors :

a) in the lift pit (**5.7.3.4 a)**) ;

b) in the pulley room (**6.4.5**) ;

c) on the car roof (**8.15**), in an easily accessible position and no more than 1 m from the entry point for inspection or maintenance personnel. This device may be the one located next to the inspection operation control if this is not placed more than 1 m from the access point;

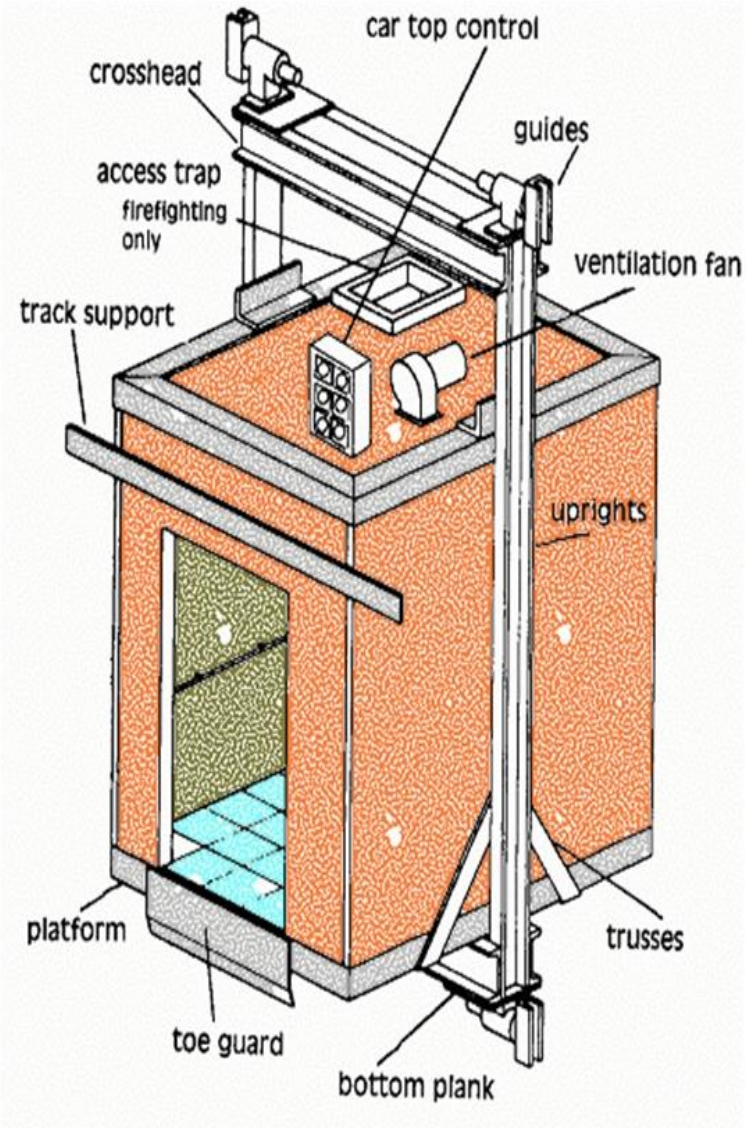
d) at the inspection control device (**14.2.1.3 c)**) ;

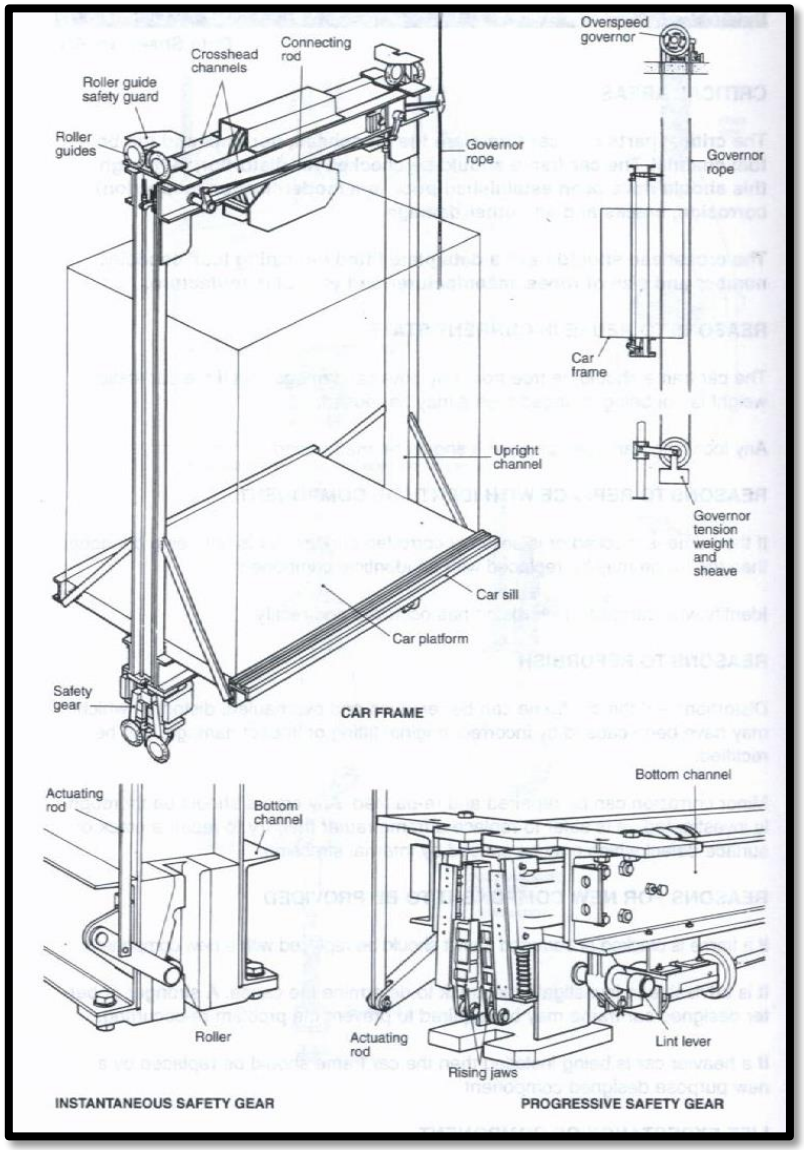
e) in the car of lifts with docking operation (**14.2.1.5 i)**).

The stopping device shall be placed within 1 m of the entrance with docking operation and be clearly identified (**15.2.3.1**).

14.2.2.2 The stopping devices shall consist of electric safety devices in conformity with **14.1.2.** They shall be bi-stable and such that a return to service cannot result from an involuntary action.

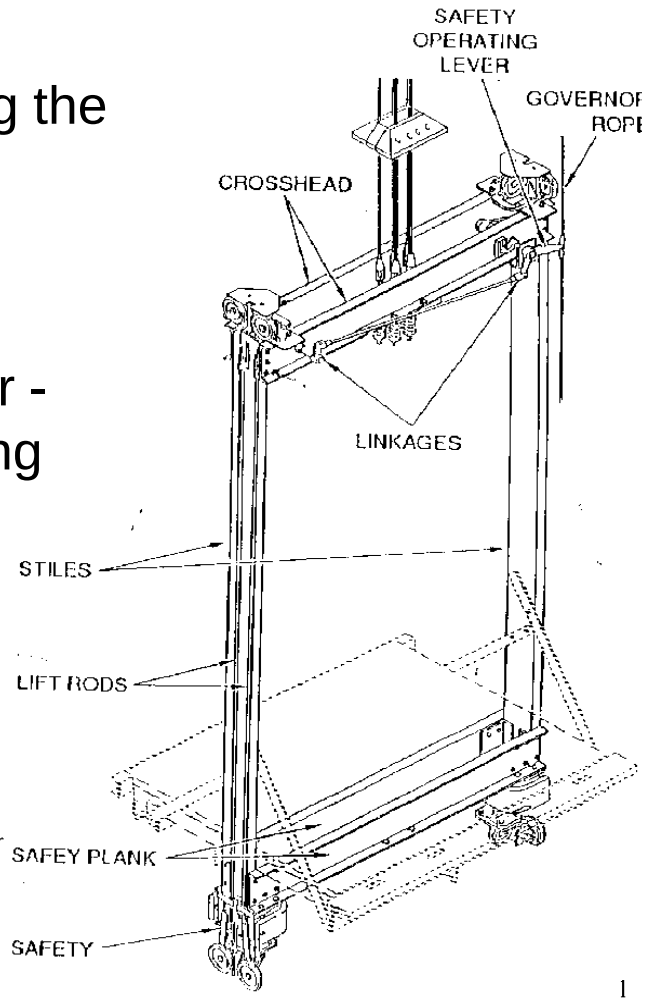
2.3 CAR & FRAME

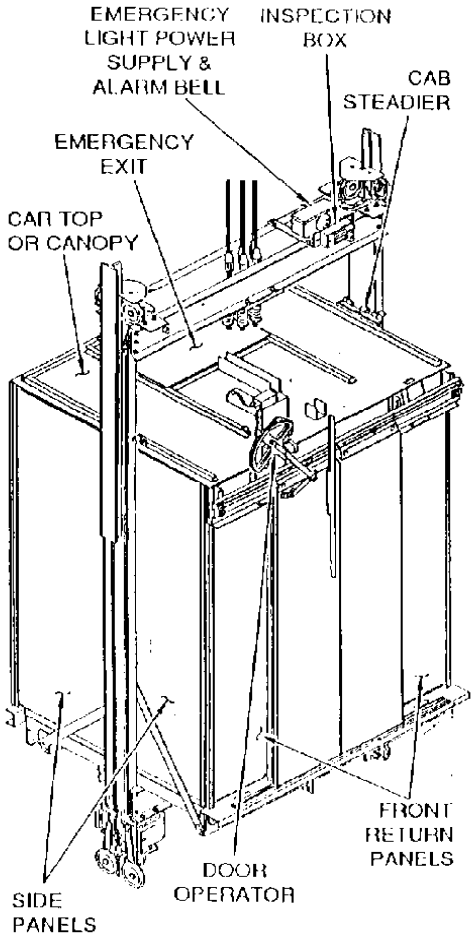

car top control
crosshead
guides
access trap
firefighting only
ventilation fan
track support
uprights
platform
trusses
toe guard
bottom plank


Overspeed governor
Crosshead channels
Connecting rod
Roller guide safety guard
Roller guides
Governor rope
Governor rope
Car frame
Upright channel
Governor tension weight and sheave
Car sill
Car platform
Safety gear
CAR FRAME
Actuating rod
Bottom channel
Roller
Bottom channel
Actuating rod
Lint lever
Rising jaws
INSTANTANEOUS SAFETY GEAR
PROGRESSIVE SAFETY GEAR

LIFT CAR

- clear internal height 2000 mm
- a load plate showing the contract load
- an alarm bell or a telephone
- emergency exit door - hinged panel opening outwards with an electrical interlock
- ventilation
- lighting
- inspection box - for inspection and maintenance job





Regulation 7 : Load loading and capacity

- Every passenger lift shall be designed and constructed to carry the contract load not greater than that given in Table I

Floor Area +/-0.5		Max. No. of Person	Contract Load	
ft^2	m^2		lb	kg
2.2	0.20	1	150	68
4.3	0.40	2	300	136
6.4	0.59	3	450	204
8.3	0.77	4	600	272
10.2	0.95	5	750	340
12.0	1.11	6	900	408
13.8	1.28	7	1,050	476
15.6	1.45	8	1,200	544
17.2	1.60	9	1,350	612
18.9	1.76	10	1,500	680
20.4	1.90	11	1,650	748
22.1	2.05	12	1,800	816
23.6	2.19	13	1,950	885
25.2	2.34	14	2,100	953
26.7	2.48	15	2,250	1,021
28.2	2.62	16	2,400	1,089
29.5	2.74	17	2,550	1,157
30.9	2.87	18	2,700	1,225
32.3	3.00	19	2,850	1,293
33.7	3.13	20	3,000	1,361
35.0	3.25	21	3,150	1,429
36.3	3.37	22	3,300	1,497
37.5	3.48	23	3,450	1,565
38.8	3.60	24	3,600	1,633

REGULATION 14 : LIFT CAR CONSTRUCTION

- Lift comprise : a platform, roof, car enclosure, door and supporting frame
- Design safety factor (sf)

  car platform : for steel : sf not less than 5

  timber : sf not less than 8
- Guide shoe / : at top & bottom of both sides of with roller car frame
- Car roof : support load - 200 lbs. (90kg)
- Car enclosure : height > 6 ft 6 inches (1981mm),
- car enclosure shall withstand a thrust of seventy-five pounds (34 kg) applied normally at any point without permanent deformation, and shall be securely fixed to the platform and frame.

Regulation 15 : Car Doors and Gates

- Height of car doors or gates :-
  - -passenger lift : not less than 6’6”(1981mm)
  - -goods lift : not less than 6’ (1828mm)
- No lift car shall have more than two entrances
- Provided with an electric switch to prevent the lift car being started or kept in motion unless all gates and doors are closed
- Power operated car door or gate shall be capable of being opened manually
- Designed that it’s closure is not likely to injured any person

FIREFIGHTER LIFT (EN 81-72:2003)

- 5.2.2 A firefighter lift shall serve every floor of the building
- 5.2.3 Size min. 1100mm width x 1400mm depth
  - Rated load min 630 kg
  - Min clear entrance width 800mm
- Stretcher/bed lift
  - Min rated lift 1000kg
  - Dimension min 1100mm width x 2100mm depth

REGULATION 17 : VENTILATION

- Adequate permanent ventilation for lift car
- Where ventilating fans or blower are used

  - securely fastened in place and located above the car ceiling or outside the car enclosure

Regulation 18 : Lighting

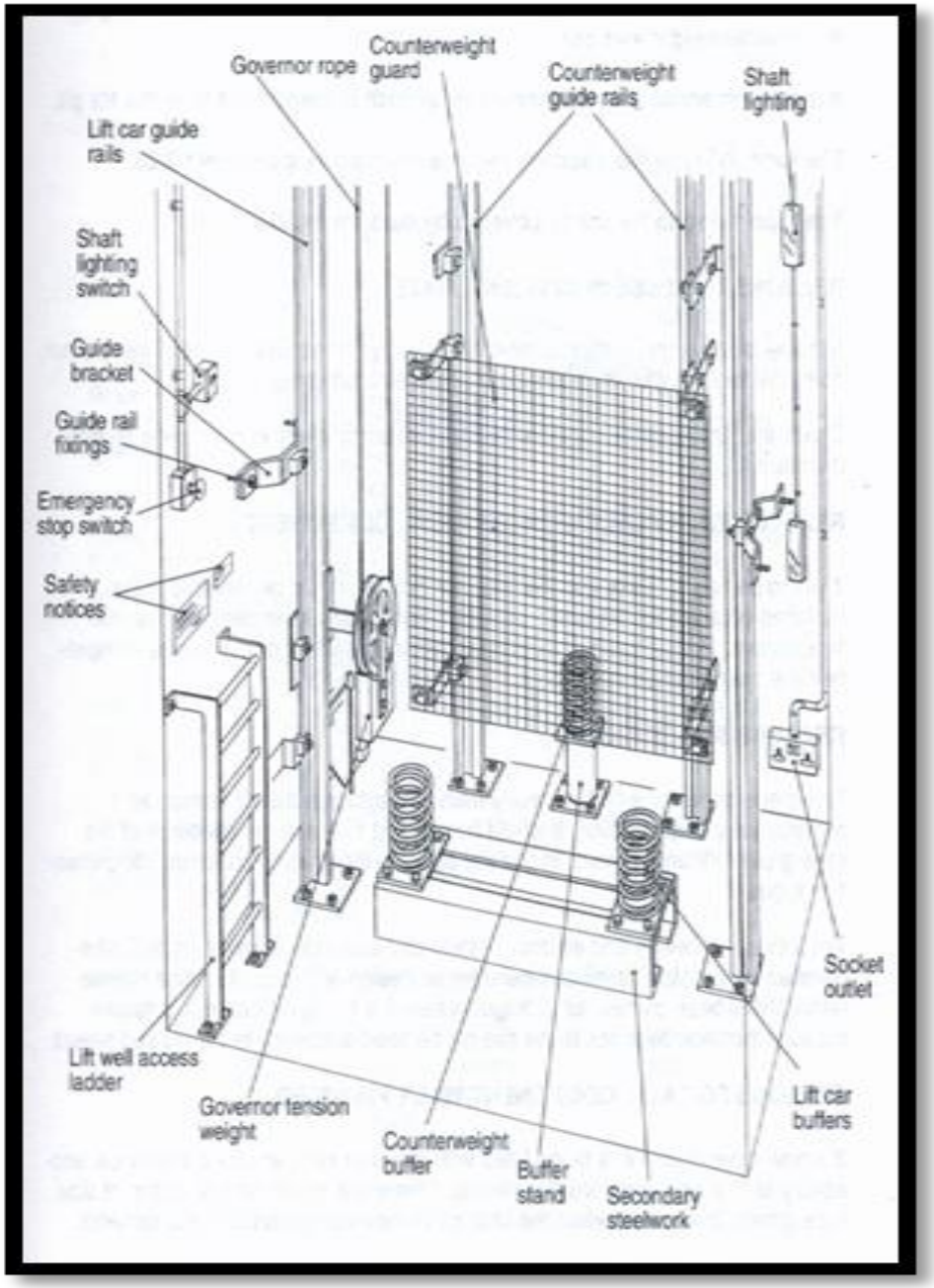
- At least two lamps in each car
- Light bulbs and tubes shall be guarded
- Min. illumination at landing edge of car platform when car & landing doors are open > 5 foot candles (EN 81 ~100lux)

REGULATION 19 : GENERAL

- Only toughened or shatterproof glass shall be used in any car
- Every car shall be provided with :
  - emergency signal (outside the lift well)
  - lighting socket (on top and underneath)
  - emergency switch (on top)

2.4 LIF PIT

2.4.1 Lift Well
2.4.2 Safety Gear
2.4.3 Buffer



FACTORIES AND MACHINERY (ELECTRIC PASSENGER AND GOODS LIFT) REGULATIONS, 1970 VS EN81-1:1998

REG. / CODE	DESCRIPTION	SPECIFICATION
10(2) / Clause 5.5	Suspended lif pit	Refer note
10(5)(b)	Fully compressed buffer	Min. 610mm
10(6)	Lif pit depth	
10(8)	Top height c/w guard	Min. 2000mm
	Bottom clearance c/w guard	Max. 300mm
	Compensating chain/rope	
14(4)	Car bottom span	
22(4)	Stopping distance (full load test)	

REGULATION & CODE (CONT')

REG. / CODE	DESCRIPTION	SPECIFICATION
24(6)	Buffer stroke (car & c/w)	symmetrical, alignment, switch, stroke, stroke calculated, location of striking plate, installation- buffer stand/floor, buffer stand/buffer
25	Bottom runby (car & c/w)	
	Safety gear	Clamp jaw move freely, gap, all safety jaw move simultaneously); Counterweight guard/fencing not compulsory to install.

OTHERS

DESCRIPTION	SPECIFICATION
Pit emergency stop switch	Functionality/location/quantity
Pit light	Functionality
Pit ladder	Location
Car bottom light	Functionality
Pit waterproofing	Free from water
Oil buffer switch	Functionality
Governor tension switch	Functionality/location
Safety gear switch	Functionality/location
Bottom limit switch	Functionality/location
Common lift pit guarding	2.5m up from lowest ground
Compensating rope tension switch	Counterweight guard/fencing not compulsory to install Functionality/location

OTHERS (CONT')

DESCRIPTION	SPECIFICATION
Housekeeping	Clean & dry
Oil pan	
Overload switch	Functionality using full load and etc
Governor	Switch, alignment, rope tension device, free movement with no contact
Maintenance platform	Applicable for high speed lift – follow P10(5)(b)
Firefighters Lift	Refer EN 81-72

REGULATION 10 : LIFT WELL

1) No piping, conduct or equipment shall be installed
2) No room passage or thoroughfare shall be permitted under lift well
3) To provide a continuous screen from top to bottom of the lift well if the counterweight of one lift travels close to the car of an adjacent lift
4) Not more than 4 lifts shall be located in any one lift well
5) a. shall be soundly constructed

   b. Vertical clearance not less than 2 feet (610mm) between any fitting attached to the bottom of the car frame and the pit floor when the buffer is fully compressed.

   c. clear floor area to permit a person lie on the pit floor
6) Depth of lift pit greater than 3’ 6’’ (1142.6mm) (from bottom terminal landing) – to provide footholds and handholds to aid ingress and egress
7) Access shall be only from bottom terminal landing
8) Guard shall be fixed around the path of the counterweight - extend from the height not more 12” (305mm) above lift pit floor to a height of not less than 6’ 6” (1981mm)

EXEMPTION FOR SUSPENDED LIFT PIT

Regulation 10. Lift well.

(2) No room passage or thoroughfare shall be permitted under a lift well provided that where a lift well does not extend to the lowest floor of the building, such room, passage, or thoroughfare may be allowed under conditions to be laid down by the Chief Inspector.

Suspended Lift Pits:

- Letter from Professional Engineer Declaring the Strength of the Suspended Pit & Safety Factor
- Calculation of Lift Suspended Pit endorsed by Ir.
- Solid piers extending down to solid ground or counterweight safety gear.
- Lift wells should preferably not be situated above a space accessible to persons.

EXEMPTION FOR SUSPENDED LIFT PIT

EN81-1:1998+A3:2009

5.5 Protection of any spaces located below the car, the counterweight or the balancing weight

If accessible spaces do exist below the car, the counterweight or the balancing weight, the base of the pit shall be designed for an imposed load (see also 5.3.2.2 and 5.3.2.3) of at least 5 000 N/m², and either:

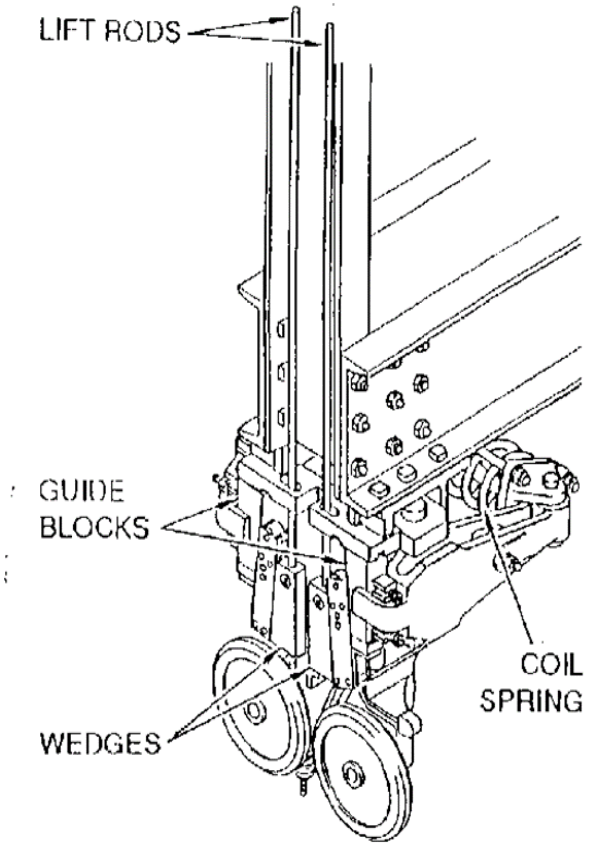
a) there shall be installed below the counterweight buffer or under the travelling area of the balancing weight, a solid pier extending down to solid ground; or

b) the counterweight or the balancing weight shall be equipped with safety gear.

NOTE : Lift wells should preferably not be situated above a space accessible to persons.

2.4.2 SAFETY GEAR

- Every lift car shall be provided with one or more safety gear
- At least one safety gear shall be located within or below the lower member of the car frame
- Application of safety gear (Contract load & stopping distance)

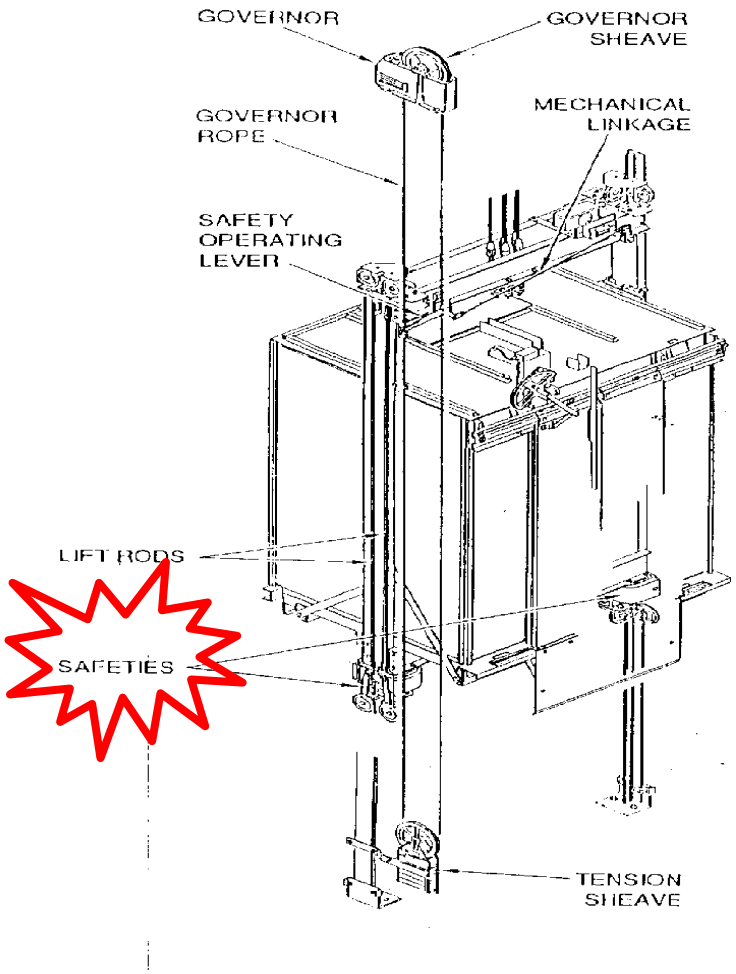


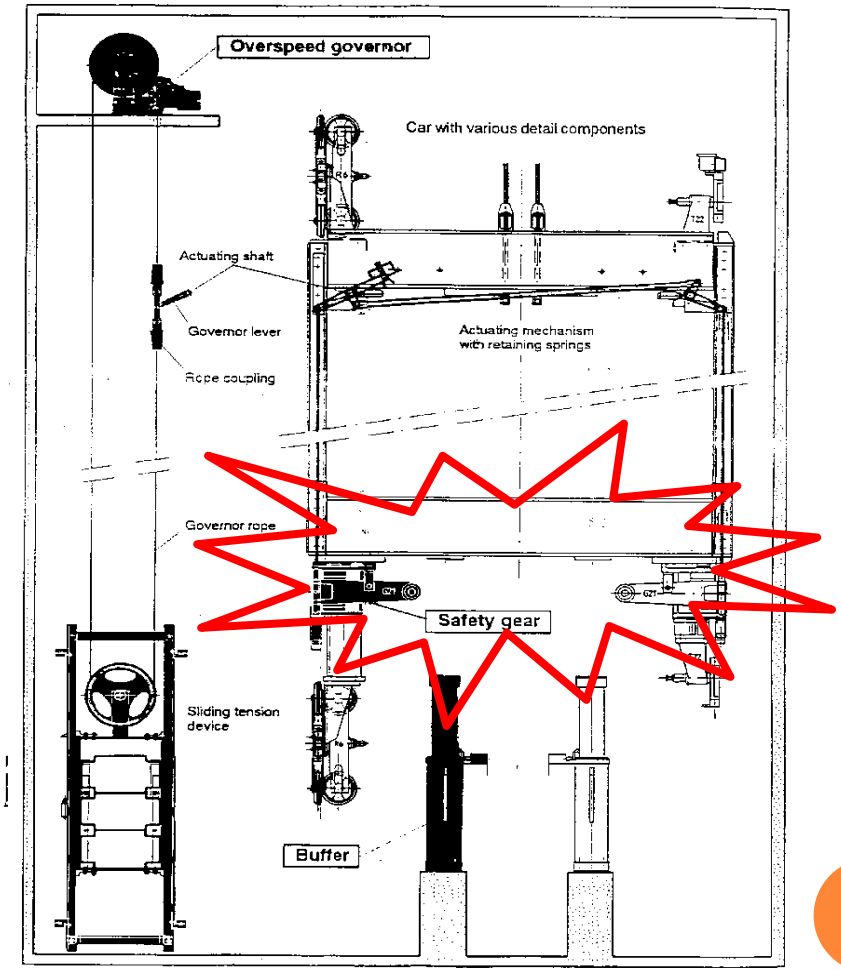
REGULATION 22 : SAFETY GEAR (CONT')

- the safety gear function to stop the car when the car begins to travel at excessive speed
- types of safety gear; its depends on the contract speed
  - instantaneous type - limited to speeds not exceeding 48 m/min
  - non-instantaneous type; the safety gear engage the guide and applying a constant retarding force to bring the car gradually and smoothly to a stop

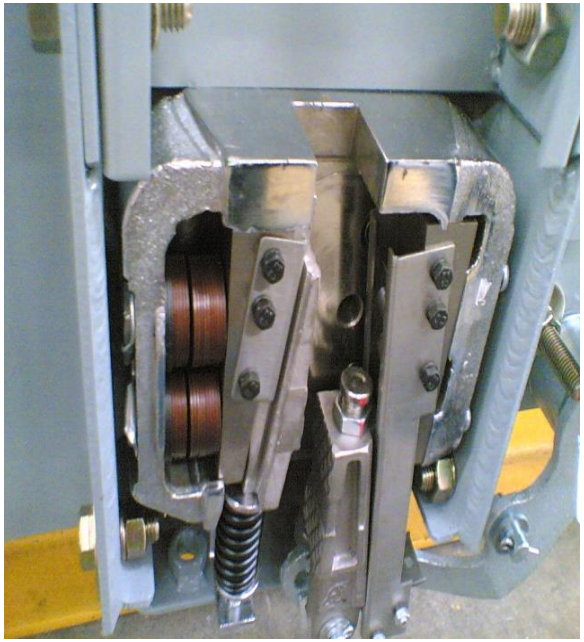
Contract Speed		Governor Tripping Speed				Stopping Dist. (in.)			
		Min		Max		Min		Max	
ft/min	mpm	ft/min	mpm	ft/min	mpm	in	mm	in	mm
0 ~ 125	38	143.8	44	175	53	6	152.4	15	381.0
	45		52						
150	46	172.5	53	210	64	6	152.4	16	406.4
175	53	201.3	61	250	76	8	203.2	19	482.6
200	61	230.0	70	280	85	9	228.6	22	558.8
225	69	258.8	79	308	94	10	254.0	24	609.6
250	76	287.5	88	337	103	11	279.4	27	685.8
300	91	345.0	105	395	120	13	330.2	33	838.2
350	107	402.5	123	452	138	15	381.0	40	1016.0
400	122	460.0	140	510	155	18	457.2	48	1219.2
450	137	517.5	158	568	173	21	533.4	58	1473.2
500	152	575.0	175	625	191	25	635.0	68	1727.2
600	183	690.0	210	740	226	33	838.2	91	2311.4
700	213	805.0	245	855	261	43	1092.2	118	2997.2
800	244	920.0	280	970	296	54	1371.6	150	3810.0
900	274	1035.0	315	1085	331	65	1651.0	183	4648.2
1000	305	1150.0	351	1200	366	80	2032.0	222	5638.8

REGULATION 22 : SAFETY GEAR (CONT')





REGULATION 22 : SAFETY GEAR (CONT')

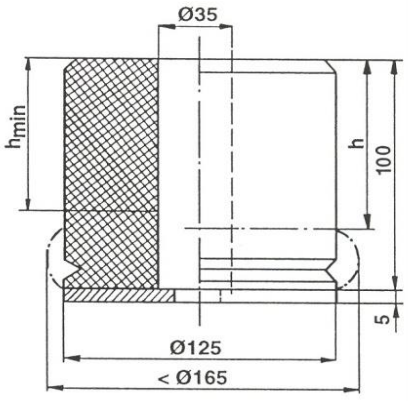


REGULATION 24 : BUFFERS

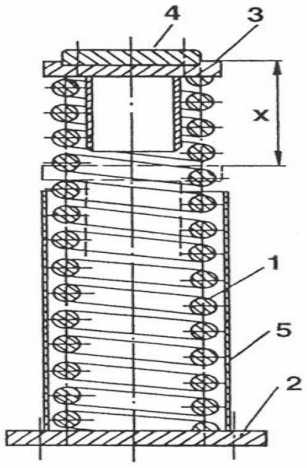
- Shall be installed under every car and counterweight
- If contract speed

  > 75 ft/min (22.86mpm @ 0.38 m/s) - solid buffer shall not be installed

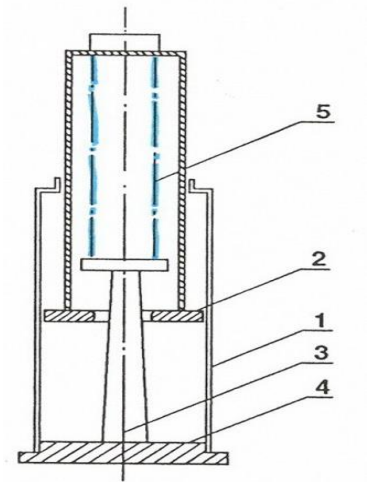
  > 200 ft/min (60.96mpm @ 1m/s) - spring buffer shall not be installed
- the suitability of buffer stroke depending upon the application of contract speed

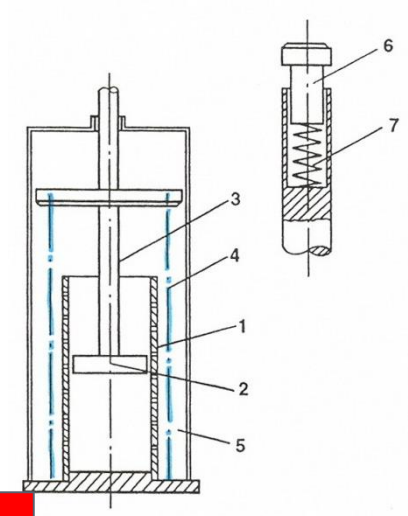


Polyurethane buffer



Spring buffer



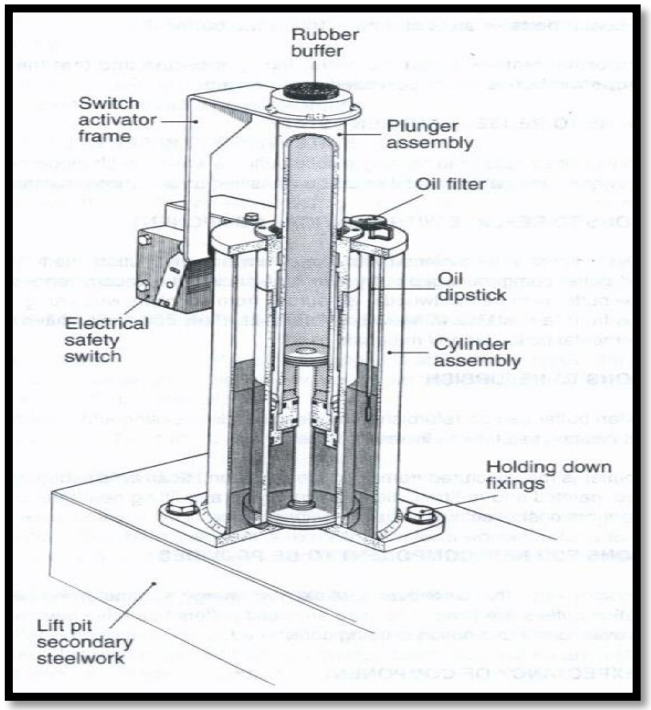


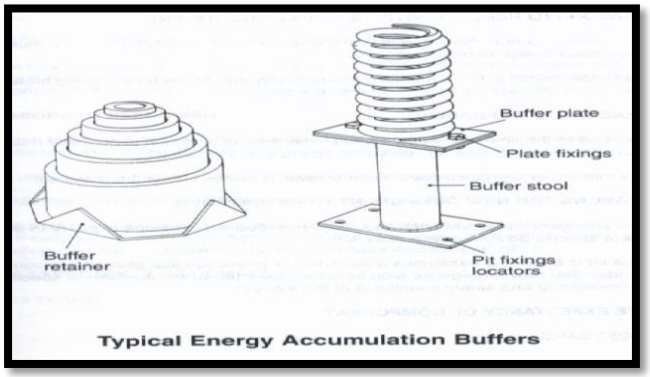
Oil buffer

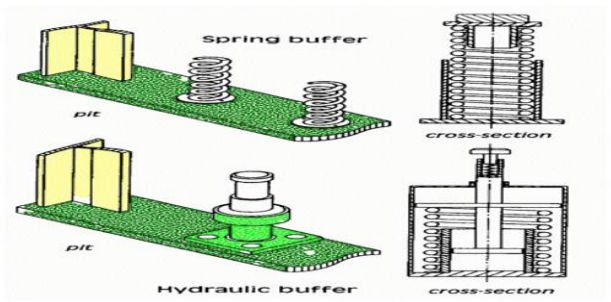
REGULATON 24(6) : EXEMPTION FOR REDUCED BUFFER STROKE

Regulation 24. Buffers.

(1) The minimum stroke of an oil buffer shall be such that the lift car or the counterweight on striking the buffer at one hundred and fifteen per cent of contract speed shall be brought to rest with an average retardation of not more than thirty-two point two feet per second per second.







- Underneath, symmetrical, no contact during normal operation
- Solid, v < 75 ft/min
- Spring, v < 200 ft/min, stroke > 102 mm
- Oil, v ≥ 200 ft/min

REGULATON 24(6) : EXEMPTION FOR REDUCED BUFFER STROKE

EN81-1-1998

10.4.3.1 The total possible stroke of the buffers shall be at least equal to the gravity stopping distance corresponding to 115 % of the rated speed ($0.0674v^2$), the stroke being expressed in metres.

10.4.3.2 When the slowdown of lift at the ends of its travel is monitored according to 12.8, the speed at which the car (or the counterweight) comes into contact with the buffers may be used instead of the rated speed, when calculating the buffer stroke according to 10.4.3.1. However, the stroke shall not be less than:

(a)one half of the stroke calculated according to 10.4.3.1 if the rated speed does not exceed 4.0m/s. In any event, the stroke shall not be less than 0.42 m; and

(b)one third of the stroke calculated according to 10.4.3.1 if the rated speed exceeds 4.0 m/s. In any event the stroke shall not be less than 0.54 m.

REGULATON 24(6) : EXEMPTION FOR REDUCED BUFFER STROKE (CONT.)

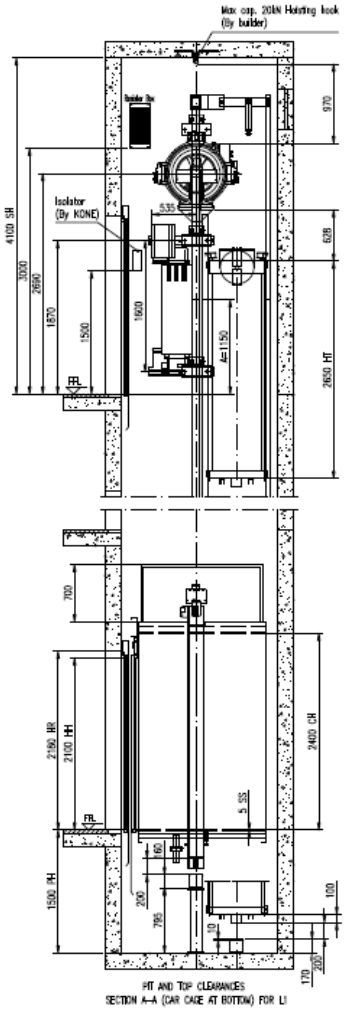
12.8 Monitoring the normal slowdown of the machine in case of reduced buffer stroke

12.8.1 In the case of 10.4.3.2, devices shall check that the slowdown is effective before arrival at terminal landings.

12.8.2 If the slowdown is not effective these devices shall cause the car speed to be reduced in such a way that, if the car or the counterweight comes into contact with the buffers, the striking speed shall not exceed that for which the buffers were designed.

REGULATION 25 : CLEARANCES AND OVERTRAVEL FOR LIFT CAR & COUNTERWEIGHT

- For lifts with spring buffers, there shall be a car top clearance of at least 610 mm in overhead when cwt. buffer is fully compressed.
- For lifts with oil buffers, the minimum car top clearance shall be sum of:
  - distance between the counterweight buffer and its block (not less than 6” (152mm))
  - the stroke of the counterweight buffer used;
  - 6” (152mm); and
  - the counterweight buffer stroke corresponding to governor tripping speed, less one-half the stroke of the counterweight buffer used.
- In the event of a lift over run in the descending direction, there shall be a clearance of at least 610 mm between the lowest point of car frame and the pit floor when the car buffer is fully compressed.



REGULATION 30 : TESTS

- Every new lift shall be tested before it is input into service

Type of Safety Gear (Instantaneous Type)	Test Condition
Governor Controlled	At contract speed & governor tripped by hand
Broken-Rope	Obtaining sufficient slack rope to cause the gear to function
Others	At governor tripping speed if practicable or if not; the governor shall be tripped by hand at maximum speed obtainable

CONT…

REGULATION 31: DUTIES OF THE OWNER

- To ensure that :
  - lift well and pit is maintained in a dry and clear condition
  - no material not forming part of the lift equipment is place on the top of the lift car
  - lift is not operated at a load greater than the contract load specified in certificate of registration
  - operated by lift attendant more than 18 years of ages for others than an automatic control lift
  - no wire or current carrying devices is substituted for the proper fuse or circuit-breaker in any lift control circuit.

REGULATION 32 : NOTICES

- The owner of every lift shall cause the certificate of registration notices to be posted in the lift car or adjacent to the bottom terminal landing
- The owner of every lift shall notices to be posted :

  - at the ground floor landing showing the name and phone number of the person to be contacted should any failure of the occur

  - inside the lift car instructing passengers to sound the alarm bell should any failure of the lift occur

REGULATION 33 : ATTENDANTS

- Inspector may direct such person to cease to work, operate or be in charge of any lift without authority in writing if it appear to an inspector that any lift attendant is incompetent

REGULATION 34 : PENALTIES

- Penalty for an offence
  - not exceeding **RM1000.00**


Thank
You!