財團法人驗船中心
CR CLASSIFICATION SOCIETY

GUIDELINES FOR ELEVATORS

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GUIDELINES FOR ELEVATORS

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CHAPTER 1 GENERAL

1.1 General Requirements

1.1.1 The Guidelines provide requirements for the elevators on ships classed with the Society. The notation **Elev** may be assigned to ships under the owner's request and where the applicable requirements in the Guidelines are complied with.

1.1.2 Accessible and guide facilities for unable passengers shall be duly considered according to the regulations of flag States. The notation **AccGui Elev** may be assigned to ships under owner's request and where the applicable requirements in the Guidelines are complied with.

CHAPTER 2 PLAN APPROVAL

2.1 Submission of Design Plans and Data

2.1.1 Plans, specifications and design data are to be submitted for approval as follows:

(a) Rated load weights, persons, speed and operating conditions.

(b) Arrangement for accessible and guide facilities for unable passengers.

(c) Hoist way construction and arrangement details including size and location of structural members, machine beams, buffer supports, guide rails and brackets, etc., together with a load diagram indicating magnitude, direction and point application of loads incident to elevator installations. Also, details of openings, doors and fire integrity of enclosure.

(d) Car construction details including entrances and doors, guides and net inside platform area.

(e) Particulars of lighting, alarms, controls, interlocks, safety devices, communication systems, ventilation, wire rope, counterweight construction, driving machines, brakes and buffers.

(f) Electric power installation details including traction or hoisting motors, motor generator sets, controls, wiring and protective devices.

(g) Hydraulic and control piping system details, including cylinders, pumps and hydraulic motors as required for hydraulic installations.

(h) Arrangements for emergency operations, including means of escape, manual control and operation of car and counterweight safeties.

(i) Ventilation arrangements for the elevator car and hoist way.

CHAPTER 3 DESIGN CRITERIA

3.1 Hoist way

3.1.1 Each elevator is to operate in a hoist way (trunk) entirely enclosed over all its height by means of a solid steel enclosure and complying with the following requirements. Hoist ways for an elevator which serve one or more grating levels and which pierce no solid decks (as for engine rooms, cargo holds or pump rooms) may be of the open type, suitably enclosed with wire mesh or expanded metal having openings the maximum of 25 mm. Elevators in atriums on passenger ships serving multiple decks may be of an open type. Where two or more elevators are fitted in one hoist way, the car and counterweight of each elevator is to be separated from those of other elevators by means of sheet steel, which need not be fire rated, over the full height of the hoist way. Wire mesh is not permitted for this purpose. The hoist way enclosure is to be of sufficient strength to prevent contact between the enclosure and the car or counterweight when the enclosure is subjected to a force of 1112 N applied at right angles at any point over an area of 102 mm by 102 mm.

3.1.2 Openings in hoist way bulkheads are to be protected by doors of like construction and fire-resistive rating as the bulkheads. Hoist way enclosures are to be constructed and located so as to prevent the entrance of water and hoist way doors are not to be exposed to the open deck. The hoist way is not to be used as part of the ventilation ducting for the ship, but it is to be ventilated by an independent system. The hoist way is to be fitted with a fixed ladder or pole steps over its entire height, giving access to landing doors and to the escape hatch, if any, in the headroom. Only equipment which forms part of the elevator installation is to be permitted on the interior of the hoist way enclosure. Traveling cables inside the hoist way are to be protected against damage by an internal smooth metal trough, the width of which is to permit passage of the free hanging loop of the traveling cable and which is to be provided with a slot having round edges, permitting the free passage of the cables coming from the elevator car.

3.1.3 Fire Protection

(a) Passenger Ships

For passenger ships, the fire integrity of the hoist way enclosure is to be in accordance with Chapter II-2, Part A, Regulation 2 or Part C, Regulation 9 of SOLAS 1974 and Amendments, as applicable. The hoist way is also to comply with Chapter II-2, Regulation 13.

(b) Cargo Ships

For cargo ships, including tankers, the fire integrity of the hoist way enclosure is to be in accordance with Chapter II-2, Part A, Regulation 2 or Part C, Regulation 9 of SOLAS 1974 and Amendments, as applicable. The hoist way is also to comply with Chapter II-2, Regulation 13.

3.1.4 Ventilation of Hoist way

The hoist way is to be ventilated by a mechanical ventilating system capable of providing five air changes per hour based on the gross volume of the hoist way.

3.2 Operating Conditions

3.2.1 Elevators, together with ancillary equipment and controls, are to be capable of satisfactory operation with the ship in motion under the following conditions inherent to the installation location:

(a) Continuous vibrations: 2 mm peak to peak of frequency 0 to 25 Hz

(b) Rolling: ±10 degrees, period 10 seconds

(c) Pitching: ±5 degrees, period 7 seconds

(d) Heaving amplitude, A: period 10 seconds, calculated by the formula:

$A = 3.8 – 0.01(L – 250)$ m

where L is the length of the ship in m, measured between perpendiculars taken at the extremities of the deepest load line. The heaving amplitude, A, need not be taken to be greater than 3.8 m.

3.2.2 The manufacturer is to certify the maximum conditions of roll and pitch for which the elevator can remain in operation, and when these limits are exceeded, the elevator is not to be operated. In addition to the operational limits noted above, the elevator and ancillary equipment are to be capable of sustaining without damage (in the out-of-service condition) ship motions as follows.

(a) Rolling: ±30 degrees, period 10 seconds

(b) Pitching: ±10 degrees, period 7 seconds

3.3 Rated Load

Rated load for elevators is the lifting capacity and is to be based on the inside net platform area. The rated load is to be not less than shown in the following table.

Inside Net Platform Area (m^2)	Rated Load (N)
0.65	2250
0.77	2650
0.89	3150
1.23	4400
1.45	5400
1.76	6850
2.05	7850
2.25	8850
2.70	11300
3.13	13250
3.53	15700
3.92	17650
4.29	19600
4.65	22050

3.4 Bottom and Top Car Clearance

When the car is resting on its fully compressed buffers, the free distance between the pit floor and the underneath of the car floor is to be at least 600 mm.

For traction lifts, when the counterweight is resting on its fully compressed buffers or, for positive drive lifts, when the car is stopped at its highest possible position, the free distance above the roof of the car is to be at least 750 mm. Additionally, an unobstructed area of not less than 0.5 m^2 is to be provided at the top of the enclosure for refuge space. This space is to measure not less than 600 mm on any side and have a height of no less than 1100 mm when the car has reached its maximum upward movement.

3.5 Guide Rails

Elevators are to be provided with car guide rails and counterweight guide rails (where counterweights are fitted) which are to extend so that guiding members cannot travel beyond the ends of the guide rails with the car in extreme positions of travel.

Car and counterweight rails are to be capable of withstanding loads resulting from operation of the car or counterweight safeties under test conditions, or from loads imposed by motion of the ship as described in 3.1, without permanent deformation. Deflection of car and counterweight guide rails is not to exceed 3 mm for operation under the conditions outlined in 3.2.

Materials for guide rails, brackets, rail clips, fishplates and their fastenings are to be of steel construction. Guide rail brackets being suitably supported are to be provided and appropriately spaced to each other.

3.6 Hoist way Doors

3.6.1 General

Hoist way doors are to be of the single or double panel, horizontal sliding type or single section swinging type, and may be either manually or power operated. They are to be guided top and bottom and are to completely close the hoist way opening. Other types of hoist way doors (i.e., vertical sliding, combination) will be considered provided the design and installation is not less effective. Doors are to be provided with restraint systems so that they will be held closed or held open (as the case may be) against maximum motion of the ship.

3.6.2 Opening and closing of hoist way doors

Doors are to be openable from the hoist way interior without special tools. They are to be openable from the landing side only by a special key. Doors are to be arranged to close automatically if the car leaves the landing for any reason. Doors are to be interlocked with the control system to prevent operation of the car unless the doors are closed.

3.6.3 Vision panels

Each manually operated or self-closing door of the sliding type is to be provided with a vision panel of clear wire inserted glass not less than 6 mm thick having an area not less than 0.015 m^2, except at landings of automatic elevators where a hall position indicator is provided. Vision panels of this type are also to be fitted in all swinging doors. The total area of vision panels in any hoist way door is not to be greater than 0.055 m^2.

3.6.4 Escape doors

In general, an emergency escape door is to be provided at every third deck, but not more than 11 m apart from sill-to-sill. Emergency or access doors for inspection and maintenance may be horizontal swinging type, in which case they are to open outward. All such doors are to be of steel construction and are to be interlocked with the elevator control system to prevent operation of the elevator unless they are in the closed position.. For elevators of the direct-plunger hydraulic type, emergency doors are required only when car safeties are provided.

3.6.5 Hoist way entrances

The clear opening of each hoist way entrance is to be not less than 800 mm wide and 2030 mm high. Hoist way doors are not to be located with direct access to machinery spaces or hazardous areas. Deck areas at entrances to elevators are to be slip resistant.

3.7 Car Frame and Enclosure

3.7.1 General

Car frames, platforms and enclosures are to be of steel construction designed to withstand forces resulting from rated loads and from motion of the ship as outlines in 3.2.

3.7.2 Car doors and escape hatch

Car doors are to be of the single or double panel, horizontal sliding type of a construction similar to that specified for hoist way doors, including restraint systems and interlocks, but excluding the requirements for fire resistive rating. Vision panels may be considered to be provided. Other types of closures will be subject to special consideration. Each power operated door is to be fitted with a protective device on each leaf which will reopen the car door and the hoist way door in the event of obstruction. This device is to extend for the full length of the door.

An escape hatch is to be provided in the overhead of the elevator car. The escape hatch is to have an area of at least 0.26 m^2 and is to measure not less than 400 mm on any side.

3.7.3 Guides

Car frames are to be guided on each guide rail by upper and lower guide shoes or rollers attached to the frame. Guide shoes or rollers are to be of a proven design modified and reinforced as necessary to provide for loading resulting from motion of the ship.

Cars are also to be fitted with a guidance medium independent of the normal guide shoes or rollers. This may be achieved by an independently fixed steel plate which will locate onto the guide rails in the event of primary guidance failure. Where the rail and guidance system are arranged such that the guide rails will not become disengaged under the worst case operating and static conditions, a secondary guidance system will not be required.

Suitable mechanical ventilation shall be provided in car.

3.7.4 Platforms, flooring and handrails of cars

Car platforms and enclosures are to be non-perforated, properly stiffened and attached to the car frame. Cars are to be provided with slip resistant flooring. Handrails are to be provided around the interior of the car except in way of the entrance.

3.7.5 Ventilation of cars

Elevator cars are to be provided with screened ventilation openings and an electric fan drawing from or exhausting to the hoist way. A switch to shut down the fan is to be provided inside the car.

3.8 Car Safety

A car safety is required for each car. Safeties are to operate on overspeed, free-fall or slackening of the suspension ropes. They are to act by applying pressure on the guide rails and are to be applied mechanically. Electric, hydraulic or pneumatic devices are not to be used to apply safeties nor to hold safeties in a retracted position. Safeties are to be released only by upward movement of the car. Stopping distances and governor tripping speeds are to be in accordance with the following table:

Rated Speed, m per minute	Maximum Governor Trip Speed, m per minute	Maximum Stopping Distance, mm
38 or less	54	380

45	63	406
52	75	483
60	84	559

3.9 Marking Plates

A metal plate is to be attached to each safety indicating the maximum tripping speed for which the safety may be used and the maximum weight for which the safety is designed and installed to stop and sustain.

3.10 Counterweights

Counterweights for traction elevators are to be provided with rigid steel frames so designed as to retain the filler weights securely in place. Concrete fillers in counterweights are not permitted. Counterweight frames are to be provided with primary and secondary guides similar to those specified for car frames as specified in 3.7. A safety similar in operation to those specified for elevator cars is to be provided and mounted on the frame of each counterweight. Counterweight runways are to be guarded within the pit area by wire mesh enclosures with removable panels for access and inspection.

3.11 Elevator Pit and Headroom

3.11.1 General

The headroom and pit are to permit a person in the hoist way to be protected when the car is at its highest or lowest position.

3.11.2 Requirements of pit

The depth of the pit is to be sufficient for installation of and access to all elevator accessories located therein and to allow for run by of the elevator car and compression of buffers. Access to the pit may be from the lowest hoist way door or a separate access door may be provided. Where a separate access door is provided, it is to be self-closing with a spring type lock arranged to permit the door to be opened from inside the pit without a key. Such doors are to be normally locked from the outside and are to open outward unless they do not interfere with moving equipment within the pit when opened inward. The base of the pit is to be designed for an imposed load of not less than 5000 N/m^2. Each pit is to be provided with a permanent lighting fixture. There is to be provided in the pit of each elevator a manually operated enclosed switch. When opened, this switch is to cause the electric power to be removed from the driving machine and brake. The switch is to be accessible from the pit access door.

3.11.3 Headroom escape hatch

For elevators reserved for the crew, the headroom of the hoist way is to be provided with an escape hatch with an area of at least 0.26 m^2 and is to measure not less than 400 mm on any side. The escape hatch in elevators for crew only is to open outward. The opening of the escape hatch is to be possible from the inside without a key. From the outside, opening is to be possible only by means of a special key placed in a box in the immediate vicinity of the hatch accessible in case of emergency (for instance, a break-glass-to-open box), when the exit from the hoist way leads to an area accessible to passengers.

3.12 Buffers

3.12.1 General

Buffers of spring, oil or other approved types are to be installed under all elevator cars and counterweights and are to be mounted on a suitable structure of the ship.

3.12.2 Spring Buffers

(a) Stroke

The stroke of the buffer spring is to be in accordance with the following:

Rated Car Speed (m/min)	Mininum Stroke (mm)
30 or less	38
30.6 ~ 45	63
45.6 ~ 60	100

(b) Load rating

Buffers for cars and counterweights are to be capable of supporting, without being compressed solid or to a fixed stop, a static load of a minimum of two times the total weight of the car plus its rated load for car buffers or the counterweight for counterweight buffers. Buffers are to be compressed solid or to a fixed stop with a static load of three times the total weight of the car plus its rated load for car buffers or the counterweight for counterweight buffers.

(c) Marking plate

Each spring buffer is to be provided with a marking plate indicating its load rating and stroke and the number of springs.

3.12.3 Oil Buffers

(a) Stroke

The minimum stroke for oil buffers is to be such that the car or counterweight, on striking the buffer at 115% of the rated speed, will be brought to rest with an average retardation of not more than 9.81 m/s^2. Peak retardation is not to exceed 24.5 m/s^2.

(b) Load rating

The minimum load rating is to be not greater than the total weight of the car plus 686 N (70 kgf) for car oil buffers or the weight of the counterweight for counterweight oil buffers. The maximum load rating is to be not less than the total weight of the car plus the rated load for car oil buffers or the weight of the counterweight for counterweight oil buffers.

(c) Marking plates

Each oil buffer is to be provided with a marking plate indicating the maximum and minimum loads and maximum striking speeds for which the buffer may be used and the stroke of the buffer.

3.13 Driving Machines

3.13.1 General

The requirements for driving machines will include machine room containing driving machines, type of driving machines, brakes, manual operation, safety factors, etc. If there are hoisting arrangements other than those mentioned above, they will be subject to the Society for special consideration.

3.13.2 Machine room for driving machines

A machine room is to be provided to accommodate the driving machine and other equipment and controls necessary for operation of the elevator. The machine room is to be of steel construction with a permanent and safe means of access and provided with permanent lighting. Only equipment directly associated with the operation of the elevator is to be located in the machine room.

3.13.3 Driving machines of traction type

Driving machines of the traction type may be driven by electric or hydraulic motors and are to have a rated speed not exceeding 60 m per minute. Traction drive elevators are to be fitted with a device to cause the elevator to stop and keep it stopped in the event that a start is initiated but the lift does not rotate, or the car (or counterweight) is stopped in downward movement by an obstacle which causes the ropes to slip on the driving sheave. The device is to function within a time not to exceed the lesser of 45 seconds or the time for traveling the full travel plus 10 seconds, with a minimum of 20 seconds if the full travel time is less than 10 seconds. The device is not to affect operation from the top inspection station or electric recall operation, if any.

3.13.4 Driving machines of winding drum type

Driving machines of the winding drum type may be driven by electric or hydraulic motors and be used for limited service applications such as access to cargo holds, pump rooms, etc., for rated loads not exceeding 5480 N. They are not to be used for transport of passengers. Winding drum machines are not to be fitted with counterweights and are restricted to a rated speed not exceeding 15 m per minute and a travel not exceeding 12.5 m. Winding drum machines are to have positive means of removing power from the machine in the event of over-travel. Rated speeds for elevators of the winding drum type are not to exceed 30 m per minute

3.13.5 Hydraulic driving machines

For power units and equipment for direct-plunger hydraulic type and roped hydraulic type elevators, the hydraulic system is to be provided with an automatic check valve which will hold the car with rated load at any point when the pump stops or the maintained pressure drops below the minimum operating pressure. Hydraulic types of elevators are not to have a rated speed in excess of 60 m per minute. In addition, a manually operated valve which permits lowering the car at a speed not exceeding 6.0 m per minute is to be provided and is to be located in an easily accessible area. For roped-hydraulic elevators, the ratio of driving machine speed to car speed is not to exceed 1:2.

3.13.6 Driving machine brakes

Each driving machine is to be equipped with a spring or gravity-applied friction brake capable of holding the rated load plus 25% in excess of the rated load. The brake is to be released by application of electric or hydraulic power (as the case may be) to the driving machine.

3.13.7 Safety factors for driving machines and sheaves

The factors of safety, based on the ultimate strength of the material, to be used in the design of the driving machines and in the design of sheaves used with suspension and compensating ropes are to be not less than the following:

(a) 8 for steel, bronze or other metals having an elongation of at least 14% in a length of 50 mm.

(b) 10 for cast iron or other metals having an elongation of less than 14% in a length of 50 mm.

The load to be used to determine the factor of safety is the total weight of the elevator plus the rated load. Sheaves and drums are to have a pitch diameter of not less than 40 times the diameter of the rope where used with suspension ropes and 32 times the diameter of the ropes where used with compensating ropes.

3.13.8 Manual operation

Driving machines are to be provided with a manual means of operation, allowing the car to be moved to the nearest landing in the event of a power failure. This is to be done by having the end of the drive shaft arranged to receive a hand

crank or by other suitable means. The manual effort to move the car is not to exceed 400 N. A metal plate with instructions for operation of the device is to be permanently mounted in the elevator machine room.

3.13.9 Power supply

The driving machines are to be supplied by circuits which are not subject to load shedding. For passenger ships, the driving machines are to be supplied by an emergency source of power for a period of half-an-hour to bring the elevator car to deck level for the escape of passengers.

3.14 Hoisting Ropes

3.14.1 General

Hoisting ropes are to be of steel wire and are to be certified by the manufacturer that they are suitable for elevator service.

3.14.2 Number of Ropes

The minimum number of hoisting ropes to be used for traction type elevators is three. The minimum number of hoisting ropes to be used for winding drum elevators and for roped hydraulic elevators is two.

3.14.3 Diameter of Ropes

Minimum diameter for hoisting ropes is to be 9.5 mm. Outer wires of ropes are to be not less than 0.6 mm in diameter.

3.14.4 The minimum factor of safety for hoisting ropes is to be in accordance with the following table:

Rope Speed (m/min)	Minimum Factor of Safety
15.2	7.60
22.2	7.75
30.0	7.97
37.2	8.10
45.0	8.25
52.2	8.40
60.0	8.60

3.15 Control System

3.15.1 General

Control systems are to be designed to operate satisfactorily under conditions of vibration, voltage regulation and frequency variation present in the ship.

3.15.2 Normal Terminal Stopping Devices

A system for control and operation of the elevator is to be arranged to automatically slow down and stop the car at the uppermost and lowest landing and to prevent operation past these points.

3.15.3 Final Terminal Stopping Devices

Limit switches or other mechanically operated devices are to be provided and arranged to remove power from the driving machine and brake in the event that the car travels beyond the uppermost or lowest landing. Such devices are to function independently of the normal terminal stopping devices. Where spring buffers are provided, the device is to function before the buffer is engaged. Final terminal stopping devices are not required for elevators of the hydraulic type.

3.16 Interlocks

All hoist way doors, access and emergency openings, elevator car doors and car escape hatches are to be interlocked with the control system to prevent operation of the elevator unless all such units are in the closed position.

3.17 Top-of-Car Operating Device

Means are to be provided to operate the elevator from on top of the car during adjustment, inspection, maintenance and repair. The operating means are to be of the continuous-pressure type, capable of operating the car at a speed not exceeding 45.7 m per minute, and arranged so that when operative, movement of the car is to be solely under the control of this device. The means for transferring control of the elevator to the top-of-car operating device is to be located on the car top and is to be of the manually closed type and be positively opened mechanically.

3.18 Slack Rope Switch

Winding drum machines are to be provided with a slack rope switch of the manually reset type which will remove power from the driving machine and brake in the event the hoisting ropes become slack. Roped hydraulic elevators are to be provided with a similar slack rope switch which will remove power from the pump motor and control valves in the event any rope becomes slack.

3.19 Stop Switches

An emergency stop switch is to be provided in each elevator car. Operation of this device is to cause power to be removed from the driving machine and brake. Stop switches are also to be provided on top of every elevator and in every elevator pit.

3.20 Phase-reversal and Failure Protection

For elevators with polyphase alternating current power supply, means are to be provided to prevent operation in the event of incorrect phase rotation or failure of any phase.

3.21 Release and Application of Driving Machine Brakes

Driving machine brakes are not to be electrically released until power has been applied to the driving machine motor. All power feed lines to the brake are to be opened and the brake is to apply automatically when the operating device of a car-switch or continuous-pressure elevator is in the stop position, a floor stop device functions, or any of the electrical protective devices functions.

3.22 Indicators

A light is to be provided at each landing to indicate when the elevator car is in use. Additionally, sufficiently visible notices or signals are to be provided to permit persons in the car to know at which landing the elevator has stopped.

3.23 Means of Escape

3.23.1 In case of emergency, it is to be possible to rescue ship's passengers from the elevator car. The ship's crew is to be able to escape from the elevator car and hoist way by their own resources. A vertical steel ladder is to be permanently installed for the full height of each hoist way and is to be so arranged as to give access to the hoist way escape doors. This ladder is to be accessible also from the escape hatch of the car required. A ladder is to be provided for entering the car through the emergency hatch in the car roof. The ladder is to be kept in a watchkeeping room or a room to which only the ship's crew has access. For elevators reserved for the crew, a fixed ladder or similar device is to be provided in the car. The escape hatch in elevators for crew only is to open outward. The opening of the escape hatch is to be possible from the inside without a key. From the outside, opening is to be possible only by means of a special key placed in a box in the immediate vicinity of the hatch accessible in case of emergency (for instance, a break-glass-to-open box), when the exit from the hoist way leads to an area accessible to passengers. The escape hatch in cars for passengers is to be fitted with a mechanical latch-type lock with a handle on the outside only. The escape hatch in cars for crew only is to be fitted with a mechanical latch-type lock with handles on both inside and outside. Opening of the escape hatches is to break the safety circuit and thereby cause the car to stop. The safety circuit is to remain broken until the escape hatch is closed. Resumption of service is to be possible only after manual and intentional resetting of the circuit on the roof of the car. Notices in at least two relevant languages and pictographs describing the escape routing are to be fixed in the following locations:

(a) Inside the car

(b) On the car roof

(c) Inside the hoist way, adjacent to every exit

(d) In the elevator machine room

3.24 Communication

An alarm device, which can be activated from the inside of each elevator car and will produce an audible and visual display in a manned control center, is to be provided and is to be independent of the power and control systems. In all cars, a telephone is to be permanently installed and connected to a permanently manned area. The telephone may be sound powered, battery operated or electrically powered from the emergency source of power and is to be independent of the ship's service electrical power and control circuits.

3.25 Lighting

3.25.1 Normal Lighting

Car illumination is to be provided by not less than two lights. Light intensity at the car floor is to be not less than 54 lux. Lighting fixtures are to be shock resistant of a type suitable for elevator service. The machine room is to have normal illumination by more than one light to an intensity of not less than 54 lux. Permanently installed lighting fixtures are to be provided in the hoist way at every escape door given in 3.6.4. Elevator landings are to be illuminated to an intensity of not less than 50 lux. In locations where illumination to such an intensity would interfere with the normal working environment of the space (e.g., wheelhouse darkened at nighttime), special consideration will be given to alternate arrangements. The hoist way pit is to be illuminated to an intensity of not less than 100 lux at the pit floor. Light bulbs are to be adequately protected from mechanical damage and the light switch is to be accessible from the pit access door.

3.25.2 Emergency Lighting

The car, hoist way and machine room are to be provided with emergency lighting fed from the emergency source of power. In addition, a battery operated emergency light with rechargeable batteries and automatic charger is to be

provided in the car. This emergency light is to be capable of providing illumination in the event of failure of the normal and emergency lighting circuits for a period of at least one hour.

3.26 Traveling Cables

Traveling cables for electrical supply, control and communication to the elevator car are to have a flame retardant and moisture resistant outer cover and are to be of a flexible type constructed to applicable recognized standards suitable for this service.

CHAPTER 4 MATERIALS

4.1 General Requirements

Materials intended for use in the construction of elevators are to be manufactured and tested in accordance with the requirements of Part XI of CR Rules for Steel Ships as applicable. Materials conforming to other recognized standards may be accepted if agreed by the Society.

4.2 Non-combustible Materials

All materials used in the construction of the hoist way, car frame and car and machine room are to be incombustible except that material of low flame spread may be used for decorative trim within the car.

CHAPTER 5 TEST AND SURVEY

5.1 Test

5.1.1 Acceptance Tests

New elevators, after completion and before being placed in service, are to be subjected to acceptance tests and inspections on the ship to determine that the installation conforms to the requirements of this Guide and that all safety equipment functions as required. A similar test and inspection is to be made following a major alteration to an existing installation. Acceptance tests are to be witnessed by the Surveyor. The following are to be included in the test program:

(a) Test of car safety with rated load in car

(b) Test of counterweight safety

(c) Test of governor tripping speed

(d) Test of hoist way and car door interlocks and escape hatch interlocks

(e) Operating test of entire installation including check of car and position indicators

(f) Operating test of manual hoisting device

(g) Test of driving machine brake with maximum load weight plus 25% of rated load

(h) Test of buffers

(i) Test of slack rope switch

5.1.2 Periodic Tests and Inspections

Periodic tests and inspections of the elevator installation are to be made at Annual Survey, each second or third Annual Survey and 5-Year Special Survey, as applicable. The tests are to be witnessed by the Surveyor.

Inspection is to be made of the entire installation at this time with particular attention to the following:

(a) Hoisting cables

(b) Driving machine brake

(c) Safeties

(d) Guide rails and guide shoes or rollers

5.2 Survey

5.2.1 Annual Survey

(a) No load functional test – satisfactory operation of car and counterweight safeties.

(b) No load manual operation – to be operated freely of governors.

(c) No load manual operation – to be worked correctly of slack rope devices or winding drum machineries.

(d) No load functional test – to be worked correctly of normal and final terminal stopping devices.

(e) Rated load functional test – to be worked correctly of firefighters' emergency operation.

(f) No load functional test – to be worked correctly of standby or emergency power operation.

(g) No load functional test – to be worked correctly of power operation of door system.

(h) No load functional test – to be worked correctly of broken rope, tape or chain switch.

(i) Less than 1.5 times working pressure test of hydraulic relief valve setting and system and functional test – bypass and endurance.

(j) Rated load test of hydraulic cylinders and visual inspection and endurance for 15 min.

(k) Pressure test equal to relief valve setting pressure of hydraulic flexible hose and fitting assemblies and visual inspection and endurance for 30 seconds.

(l) Rated load test of hydraulic pressure switch and functional test – to be worked correctly.

5.2.2 Intermediate survey

(a) In addition to the items of annual survey, the following shall be added:

(b) No load test of unexposed portions of hydraulic pistons and visual inspection – wear or corrosion.

(c) 1.5 times working pressure test of hydraulic pressure vessels and visual inspection and endurance for 1 min.

5.2.3 Special survey

(a) In addition to the items of annual and/or intermediate survey, the following shall be added:

(b) Rated load operation test of car and counterweight safeties.

(c) Rated load working test of governors.

(d) Rated load manual working test of oil buffers.

(e) 1.25 times working load test of braking system.

(f) 1.25 times working load test of standby or emergency power operation.

(g) Rated load working test of emergency terminal stopping and speed limiting devices.

(h) Rated load functional test of power operation of door system.

(i) Rated load functional test of leveling zone and leveling speed.

(j) Rated load working test of inner landing zone.

(k) 1.25 times working load test of emergency stopping distance.

(l) Pressure test equal to relief valve setting pressure of hydraulic flexible hose and fitting assemblies and visual inspection and endurance for 30 seconds.

(m) Rated load working test of hydraulic pressure switch.