International Standard 7149

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Continuous handling equipment — Safety code — Special rules

Engins de manutention continue — Code de sécurité — Règles particulières

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Descriptors : handling equipment, conveyors, continuous conveyors, belt conveyors, apron conveyors, bucket conveyors, scraper conveyors, truck conveyors, overhead conveyors, tray conveyors, swing-tray conveyors, screw conveyors, chutes, hydraulic conveyors, pneumatic conveyors, elevators (lifts), safety requirements.

Price based on 24 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 7149 was developed by Technical Committee ISO/TC 101, *Continuous mechanical handling equipment*, and was circulated to the member bodies in August 1980.

It has been approved by the member bodies of the following countries :

Australia	France	Romania
Austria	Germany, F.R.	Spain
Belgium	Mexico	Sweden
Czechoslovakia	Netherlands	United Kingdom
Egypt, Arab Rep. of	Norway	USSR
Finland	Poland	

No member body expressed disapproval of the document.

This International Standard cancels and replaces the following International Standards : ISO 1821-1975, 2125-1975, 2149-1975, 2150-1975, 2196-1975, 2381-1972, 2387-1972, 2388-1972, 2389-1972, 2390-1972, 2391-1972, 2392-1972, 3263-1974, 3264-1974, 3276-1975, 3277-1974, 3278-1974, 3279-1974, 3280-1974, 3281-1974, 3283-1974, 5028-1977, 5030-1977, 5035-1977, 5036-1977, 5037-1977, 5038-1977, 5039-1977, 5040-1977 and 5043-1977, of which it constitutes a technical revision.

Printed in Switzerland

Continuous handling equipment — Safety code — Special rules

1 Scope

This International Standard specifies, in addition to the general safety rules set out in ISO 1819, the special safety rules to various types of conveyors defined in clause 2.

2 Field of application

The safety rules laid down in this International Standard apply to the following types of conveyors :

1 Mobile conveyors not self propelled

2 Belt conveyors

3 Throwing machines

4 Picking and assembly table conveyors

5 Slat conveyors and apron conveyors

6 Bucket elevators

7 Scraper conveyors and "en masse" conveyors

8 Single strand floor truck conveyors

9 Overhead conveyors

10 Suspended swing-tray and fixed tray or similar conveyors or elevators

11 Screw feeders and conveyors

12 Live roller conveyors

13 Vibratory conveyors

14 Roller and wheel conveyors

15 Chutes

16 Hydraulic conveyors

17 Pneumatic continuous handling appliances

18 Light-weight vertical tray elevators

19 Transfer points

20 Mobile supporting structures for continuous handling equipment

3 References

ISO 1819, *Continuous mechanical handling equipment — Safety code — General rules.*

ISO 2148, *Continuous handling equipment — Nomenclature.*

ISO 5049/1, *Mobile continuous bulk handling equipment — Part 1 : Rules for the design of structures.*

4 Special safety rules

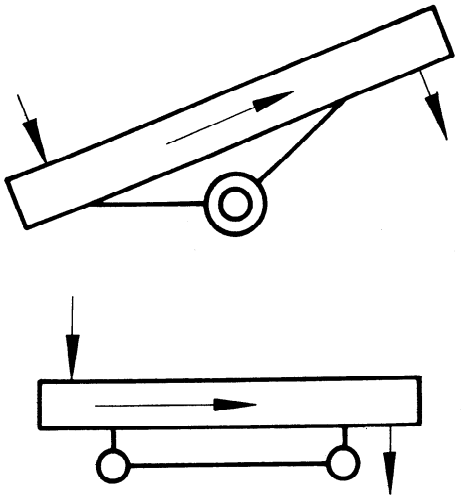
4.1 Mobile conveyors not self propelled

4.1.1 Field of application

4.1.1.1 These safety rules apply to conveyors described as follows :

Mobile units on wheels that are not self propelled, carrying continuous handling equipment, whether adjustable in height or not.

4.1.1.2 Sketch



4.1.1.3 Examples

Title	No. from ISO 2148
1) Mobile belt conveyor	2.21.012 + 2.14.0122
2) Shuttle belt conveyor arrangement	2.14.013
3) Telescopic belt conveyors	2.21.013
4) Mobile slat conveyors	2.21.042
5) Stackers	2.21.05
6) Mobile screw conveyors	—

4.1.2 General rules

The following special safety rules apply in addition to :

4.1.2.1 the general rules laid down in ISO 1819;

4.1.2.2 the special rules applicable to the conveyor to be mounted on the supporting unit.

4.1.3 Special safety rules

4.1.3.1 In the construction stage (design and manufacture)

4.1.3.1.1 When the position of the boom can be adjusted by means of the supporting chassis, this shall be fitted with a safety device to limit the extent of any collapse.

4.1.3.2 During the utilization stage (operation and maintenance)

4.1.3.2.1 It is recommended that the wheels be chocked as soon as the conveyor is in its working position.

4.1.3.2.2 Before moving, the conveyor shall be stopped and brought to the transport position, and the power supply, particularly if electric, shall be disconnected.

This requirement does not apply to small movements (translation or orientation) which may occur in service of the appliance, when it has been designed for this purpose.

4.1.3.2.3 The maximum towing speed, to be indicated by the manufacturer, shall not be exceeded.

4.1.3.2.4 When the conveyor is being moved, nobody is allowed to sit on the machine or to hang beneath it.

4.2 Belt conveyors

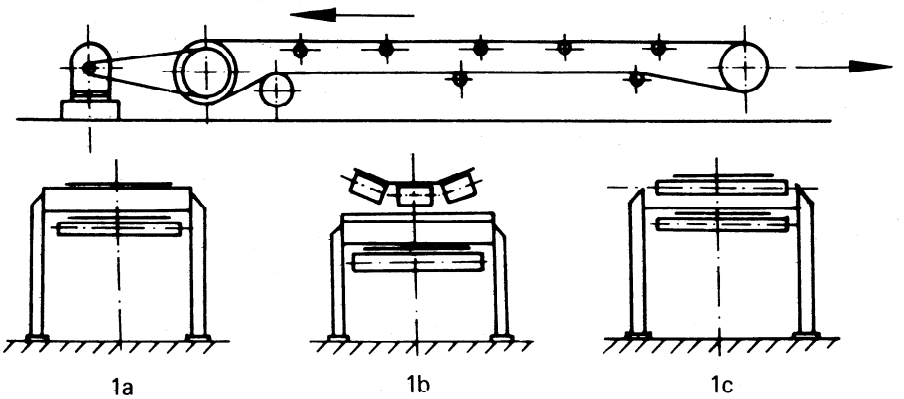
4.2.1 Field of application

4.2.1.1 These special safety rules apply to conveyors described as follows :

Conveyors and feeders for loose bulk materials or unit loads using an endless moving belt (rubber, canvas, steel, plastic, wire mesh, etc.) as the carrying and conveying medium.

The belt may be supported by free-running idlers or suitable flat surfaces.

4.2.1.2 Sketch



1a 1b 1c

4.2.1.3 Examples

Title	No. from ISO 2148
1) Fixed belt conveyors [see 4.2.1.2 sketch a), b) and c)]	2.21.011 + 2.14.011
2) Portable belt conveyors	2.14.0121
3) Movable belt conveyors	2.14.014
4) Mobile belt conveyors	2.14.0122 + 2.21.012
5) Belt feeders	2.13.01
6) Telescopic belt conveyors	2.21.013
7) Steel band conveyors	2.21.02 + 2.14.03
8) Wire mesh belt conveyors	2.21.03 + 2.14.04
9) Chain and cable belt conveyors	2.14.02
10) Stackers	2.21.05 + 2.12.061 + 2.12.062 + 2.12.063
11) Shuttle belt conveyors arrangement	2.14.013
12) Overhead belt transporters	2.12.07
13) Trippers	2.12.05
14) Corner conveyors	—

4.2.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.2.3 Special safety rules

4.2.3.1 In the construction stage (design and manufacture)

4.2.3.1.1 As permitted by rule 2.1.4 of ISO 1819, no safety device is compulsory when, simultaneously, the mass of each unit load is below 50 kg and when the total design load of material on the sloping part of the appliance is below 500 kg.

4.2.3.1.2 In pursuance of the requirements laid down in rule 2.2.10 of ISO 1819, suitable protection should also be provided against accidental dropping of material adhering to the return belt.

4.3 Throwing machines

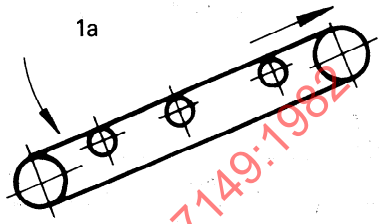
4.3.1 Field of application

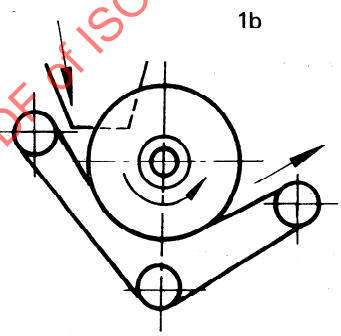
4.3.1.1 These special safety rules apply to machines described as follows :

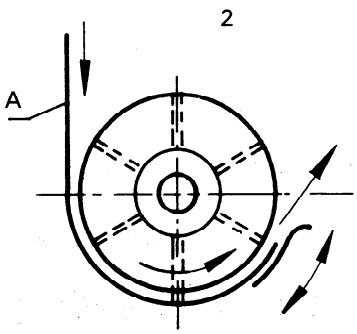
A belt type machine, a vane, or rotating circular plate, intended for throwing loose bulk material at high speed into a predetermined area.

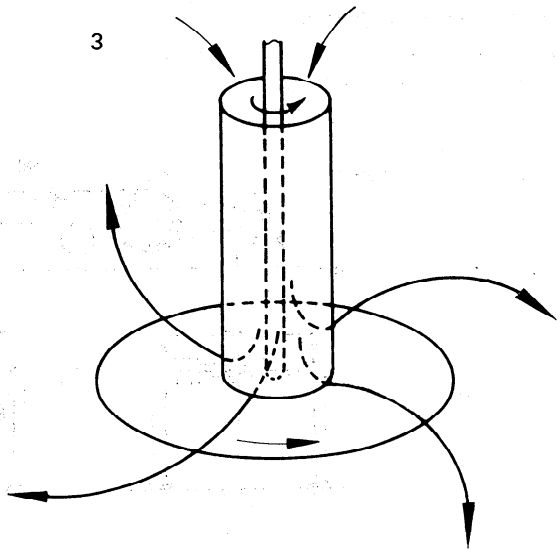
These special safety rules do not apply to snowthrowing machines.

4.3.1.2 Sketches









4.3.1.3 Examples

Title	No. from ISO 2148
1) Bulk throwing machines, belt type (figures 1a, 1b)	2.14.06
2) Throwing machine, vane type (figure 2)	—
3) Throwing machine, rotating circular plate type (figure 3)	—

4.3.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.3.3 Special safety rules

4.3.3.1 In the construction stage (design and manufacture)

4.3.3.1.1 All control devices shall be easily accessible and so located as to allow the operator to remain outside the throwing area.

4.3.3.2 During the utilization stage (operation and maintenance)

4.3.3.2.1 Access to the throwing area of these appliances shall be forbidden.

4.3.3.2.2 If it is necessary to enter the throwing area, the individual concerned shall take all necessary measures to prevent the machine being re-started (for example, lock off).

4.3.3.2.3 Visual and sound warning devices shall be operated well before the machine is started or re-started.

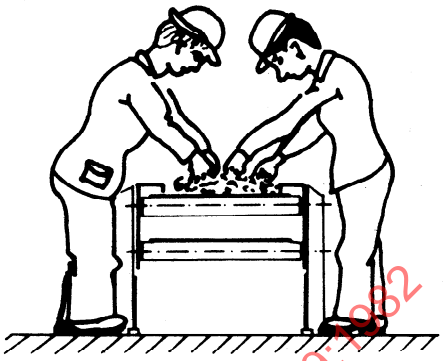
4.4 Picking and assembly table conveyors

4.4.1 Field of application

4.4.1.1 These special safety rules apply to conveyors described as follows :

Conveyors with belts, steel band, wire mesh belts or slats used for carrying unit loads or loose bulk materials, on which manual operations i.e. picking selecting, assembling etc. are being performed.

4.4.1.2 Sketch



4.4.1.3 Examples

Title	No. from ISO 2148
1) Belt assembly and belt table conveyors — with belt	2.21.061
2) Belt assembly and belt table conveyors — with steel band	2.21.062
3) Belt assembly and belt table conveyors — with wire-mesh belt	2.21.063
4) Belt assembly and belt table conveyors — with slats	2.21.064
5) Picking table conveyors	2.14.05

4.4.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.4.3 Special safety rules

4.4.3.1 In the construction stage (design and manufacture)

4.4.3.1.1 Continuous side guarding shall be provided for both carrying and return strands at the working positions.

4.4.3.1.2 In addition to rule 2.1.6 of ISO 1819, the belt speed shall not exceed 0,3 m/s when the mass of the heaviest item to be picked up exceeds 5 kg.

4.4.3.2 During the installation stage (layout, erection and entry into service)

4.4.3.2.1 The height of the working surface above the ground or the service platform shall be suitable for the operations being carried out.

4.4.3.2.2 Any picking table conveyor with a belt wider than 0,65 m shall be served by operators on each side of the belt.

4.4.3.2.3 Adequate space shall be provided for operators to ensure satisfactory level working conditions.

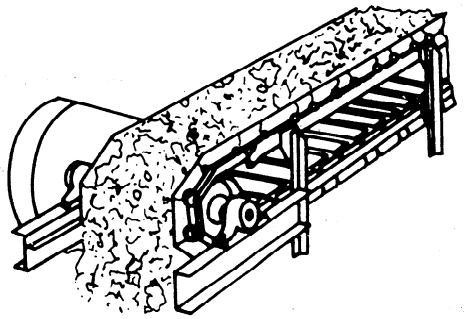
4.5 Slat conveyors and apron conveyors

4.5.1 Field of application

4.5.1.1 These special safety rules apply to conveyors described as follows :

Conveyors for loose bulk materials or unit loads with slats, plates or pans as the carrying medium and with chains as the driving medium.

4.5.1.2 Sketch



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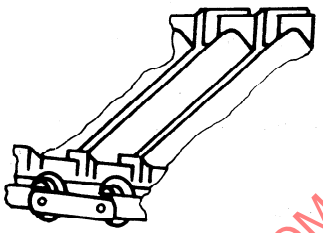
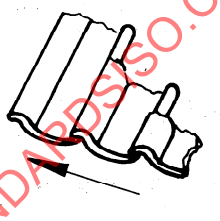
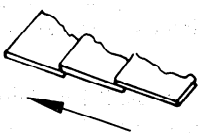
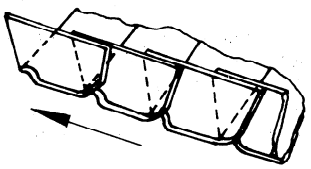
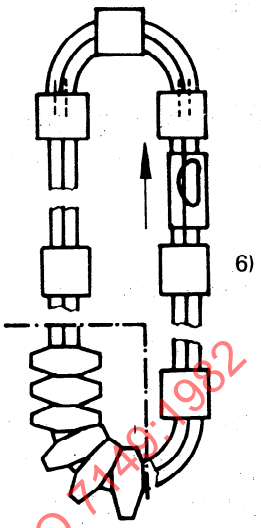










6)

4.5.1.3 Examples

Title	No. from ISO 2148
1) Apron conveyors[1)]	2.14.08
2) Apron conveyors[1)]	2.14.081
3) Pan conveyors	2.14.082
4) Apron conveyors with closed pans	2.14.083
5) Slat conveyors (metal or wood)	2.21.04 + 2.21.041 + 2.21.042
6) Continuous (circular) plate conveyors (horizontal)	2.21.07

4.5.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.5.3 Special safety rules

4.5.3.1 In the construction stage (design and manufacture)

4.5.3.1.1 In addition to rule 2.1.4 of ISO 1819 relating to inclined conveyors, the conveyor chains shall be confined in order to prevent them from rising in the event of the chains breaking or the conveyor running backwards.

4.5.3.1.2 As permitted by rule 2.1.4 of ISO 1819, no safety device is compulsory when simultaneously the mass of each unit load is below 50 kg and when the total design load of material on the sloping part of the appliance is below 500 kg.

1) Including feeders of the same type (see 2.13.01 and 2.13.02).

4.5.3.2 During the installation stage (layout, erection and entry into service)

4.5.3.2.1 In pursuance of the requirements laid down in rule 2.2.10 of ISO 1819, suitable protection shall also be provided against dropping of small or fine material adhering to the return side of the apron.

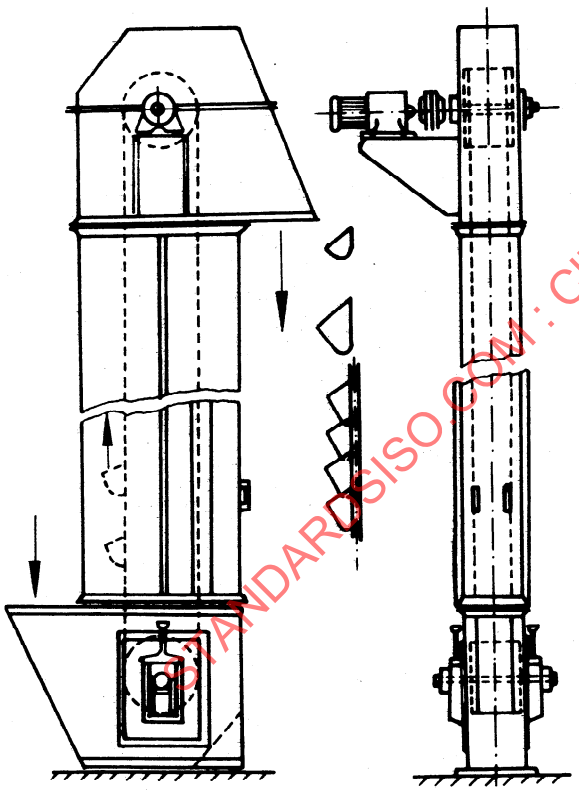
4.6 Bucket elevators

4.6.1 Field of application

4.6.1.1 These special safety rules apply to continuous mechanical handling equipment described as follows :

Elevators for loose bulk materials with buckets as the carrying medium attached to a belt or chains as the driving medium.

4.6.1.2 Sketch



4.6.1.3 Example

Title	No. from ISO 2148
Bucket elevators	2.14.16

4.6.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.6.3 Special safety rules

4.6.3.1 In the construction stage (design and manufacture)

4.6.3.1.1 Cleaning doors shall be provided in the elevator boot in accordance with rule 2.1.11 of ISO 1819. It is recommended that such doors be constructed or arranged in such a way that the product being handled can be easily extracted after opening them — their release must not be instantaneous and they must comply with ISO 1819.

4.6.3.1.2 Whenever materials of a noxious character are to be handled, the elevator casing shall be sealed and where necessary fume and dust extraction equipment shall be provided. Air inlet apertures shall also be provided when fume and dust extraction equipment is to be used.

4.6.3.1.3 As permitted by rule 2.1.4 of ISO 1819, a safety device is not compulsory when the design load of material on the ascending strand is below 300 kg and the vertical distance between chain-wheel shaft centres is below 5 m.

4.6.3.2 During the installation stage (layout, erection and entry into service)

4.6.3.2.1 As required by rule 2.1.7 of ISO 1819, particular care shall be exercised in guarding non-enclosed bucket elevators.

4.6.3.2.2 For non-cased bucket elevators, the areas where materials may normally be expected to fall shall be provided with protective devices, or access to such areas shall be prevented.

4.6.3.3 During the utilization stage (operating and maintenance)

4.6.3.3.1 There shall be regular inspection, adjustment and maintenance of the tension device, in order to avoid scraping of the boot by buckets, and the dangers that may result.

4.7 Scraper conveyors and "en masse" conveyors

4.7.1 Field of application

4.7.1.1 These special safety rules apply to conveyors described as follows :

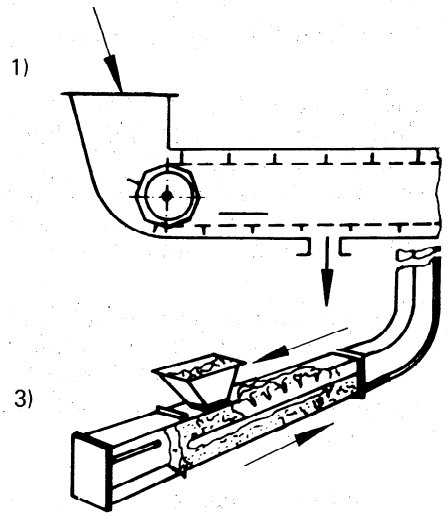
a) Scraper conveyors and drag bar feeders

Conveyors for loose bulk materials with one or more endless chains as the driving medium equipped with scraper bars pushing the material in a trough shaped casing.

b) "En masse" conveyors

Conveyors for loose bulk materials with a chain as the driving medium having attached flights or scraper flights moving the material "en masse" in an enclosing trough.

4.7.1.2 Sketch



4.7.1.3 Examples

Title	No. from ISO 2148
1) Scraper conveyors	2.14.09
2) Drag bar feeders	2.13.03
3) ''En masse'' conveyors	2.14.10

4.7.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.7.3 Special safety rules

4.7.3.1 During the installation stage (layout, erection and entry into service)

4.7.3.1.1 The casing shall be erected with great care in order to be effectively sealed having regard to the material being conveyed.

4.7.3.2 During the utilization stage (operation and maintenance)

4.7.3.2.1 Access to the moving parts of the appliance is prohibited. If work has to be carried out in the machine in motion, it must have been designed with this in view, and a second person, well acquainted with the actions to be taken in case of emergency, must keep watch on the person at work, and hold himself close to and ready to operate a stop device.

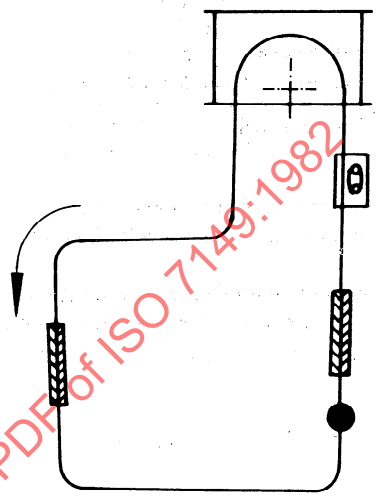
4.8 Single strand floor truck conveyors

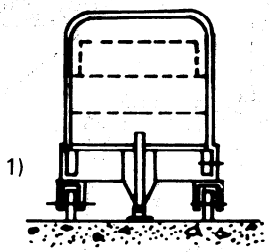
4.8.1 Field of application

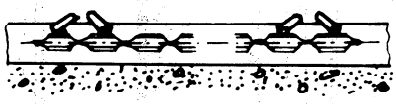
4.8.1.1 These special safety rules apply to conveyors described as follows :

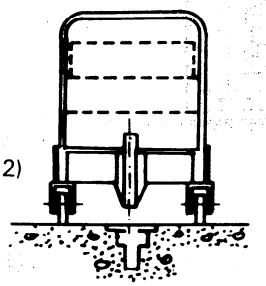
Conveyors for unit loads with a single strand chain or wire rope in a trench just under or above floor level as the driving medium, and load-carrying trucks connected to this by means of a dog.

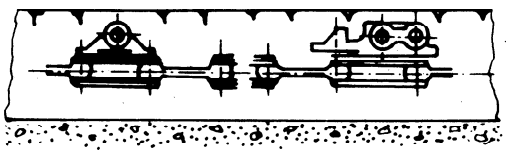
4.8.1.2 Sketch











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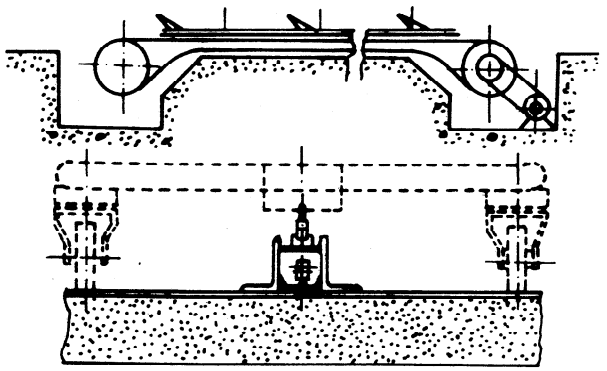


4.8.1.3 Examples

Title	No. from ISO 2148
1) Single strand floor mounted truck conveyors (chain above floor)	2.21.131
2) Single strand floor mounted truck conveyors (chain below floor)	2.21.132
3) Over and under single strand floor truck conveyors (chain above floor)	2.21.135

4.8.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.8.3 Special safety rules

4.8.3.1 In the construction stage (design and manufacture)

4.8.3.1.1 All traction mechanism drives (main sections and branch lines) shall be equipped with load limiters (with or without motor cut-out), which respond when the permissible traction force is exceeded, i.e. independently of the overload safety devices of the electrical switchgear.

4.8.3.1.2 If several drives operate in one group, the entire group shall be cut out when the load limiter of one drive operates.

4.8.3.1.3 On all floors of conveyors with chains below floor level accessible to personnel, the working slot shall not be wider than 30 mm.

4.8.3.1.4 Push dogs moving above floor level shall be of minimum height compatible with reliable engagement with the trucks under all normal working conditions.

4.8.3.1.5 On all inclined sections where runaway can occur in service, accidental disengagement of the trucks shall be prevented by means of safety devices.

4.8.3.1.6 If any manufacturing or assembling work is carried out on trucks while they are in motion, suitable guards shall be provided to safeguard personnel (for instance, floor mounted toe-guards, or skirtings or guards mounted on the trucks).

4.8.3.1.7 Where, for trucks other than those used for manufacturing and assembly work, it is obvious from the operating conditions that dangerous circumstances can arise from a moving truck striking a person or object, a suitable device shall be provided to disengage the truck from the towing medium. This item shall be the subject of agreement between the manufacturer and the user.

4.8.3.2 During the installation stage (layout, erection and entry into service)

4.8.3.2.1 When dogs or chains are above floor level, the path of the chain shall be painted conspicuously in a standard pattern.

4.8.3.2.2 The chain channel cover must be laid flush with the floor.

4.8.3.2.3 The vehicles shall be painted conspicuously in a standard pattern.

4.8.3.2.4 The tracks (transport routes) should be indicated on the floor by stripes of paint of a standard colour, the width corresponding to the overall width of loaded trucks.

4.8.3.3 During the utilization stage (operation and maintenance)

4.8.3.3.1 Precise instructions to the operating personnel concerning the loading of the trucks, especially as regards maximum load, equilibrium and maximum dimensions, should be displayed in an easily visible position, on each truck if necessary. Loading gauges should be used, as necessary, for checking.

4.8.3.3.2 Personnel must be given strict instructions as regards their movement and be prohibited from stopping on the inclined sections and connected low lying zones.

4.8.3.3.3 Heavy vehicles must not be allowed to pass over the cover plates above the conveyor parts laid below floor-level, unless the cover plates are designed to withstand loads of this type; in this case, a notice showing the maximum dimensions of such vehicles, their maximum load and speed etc must be displayed.

4.8.3.3.4 It is forbidden for personnel to disengage the trucks when they are on a slope.

4.9 Overhead conveyors

4.9.1 Field of application

4.9.1.1 These special safety rules apply to conveyors described as follows :

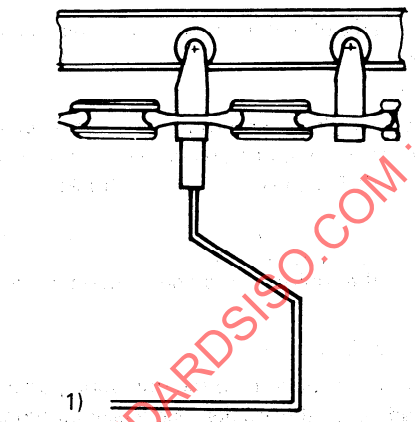
a) Conveyors for unit loads, with an endless driving medium (chain or cable) and a series of trolleys supported by an overhead track.

b) Overhead monorail conveyors : the loads are carried from the trolleys which are permanently linked to the driving medium.

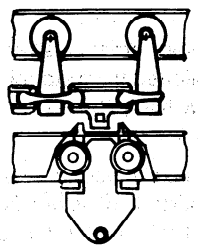
c) Overhead twin rail conveyors (*power and free*) : the load carrying trolleys run on a separate track and are driven by pusher dogs fixed in the driving medium. The trolleys can be diverted away from the driving medium.

d) Overhead mono-rail towing conveyor : load carrying floor trucks are attached to the trolleys of the driving medium by a towing mast or chains.

4.9.1.2 Sketch



1)



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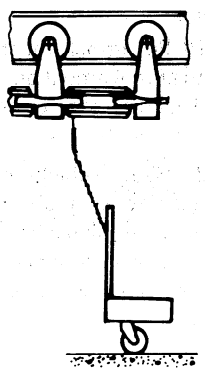


3)

4.9.1.3 Examples

Title	No. from ISO 2148
1) Overhead monorail chain conveyors	2.21.081
2) Overhead twin rail chain conveyors (*power and free*)	2.21.083
3) Overhead monorail chain conveyors towing floor trucks	2.21.082

4.9.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.9.3 Special safety rules

4.9.3.1 In the construction stage (design and manufacture)

4.9.3.1.1 All traction mechanism drives shall be equipped with load limiters (with or without motor cut-out) i.e. independently of the thermal cut-out devices of the electrical switchgear.

4.9.3.1.2 If several drives operate in one group, the entire group shall be cut out when the load limiter of one drive responds.

4.9.3.1.3 Swing trays, hangers and load carrying trolleys must be connected to each other and to the driving medium in such a way that they cannot become detached.

4.9.3.1.4 The driving medium and the load carrying trolleys of the overhead twin rail conveyor must be so designed as to ensure automatic transport even on inclined conveying sections.

4.9.3.1.5 Breaks in the rail at points (hoisting, switching equipment, etc.) must be fitted with safety devices to prevent the load carriers from dropping off.

4.9.3.2 During the installation stage (layout, erection and entry into service)

4.9.3.2.1 Chain or roller tracks less than 2,50 m from the ground must be guarded in zones which are accessible to personnel under normal working conditions.

4.9.3.2.2 In addition to rule 2.2.8 of ISO 1819, attention must be drawn by a visual signal at all authorized passages to the danger of a possible collision with a moving load.

4.9.3.2.3 Where the track is inclined, measures shall be taken to prevent both the loads and the carriers becoming uncontrollable.

4.9.3.3 During the utilization stage (operation and maintenance)

4.9.3.3.1 It is strictly forbidden to lean or place any component (ladder, plank, etc.) on the chain or roller tracks, except for the supervisory and maintenance personnel. These personnel will take all customary precautions, and especially render the conveyor inoperative.

4.10 Suspended swing-tray and fixed tray or similar conveyors or elevators

4.10.1 Field of application

4.10.1.1 These special safety rules apply to conveyors and elevators described as follows :

a) Elevators and conveyors for unit loads, with chains as the tension medium and swing or fixed trap, arms or bars, etc... as carrying medium, generally used for conveying goods vertically, horizontally or on an incline, or any combination of these three cases. For example, through openings in walls or floors.

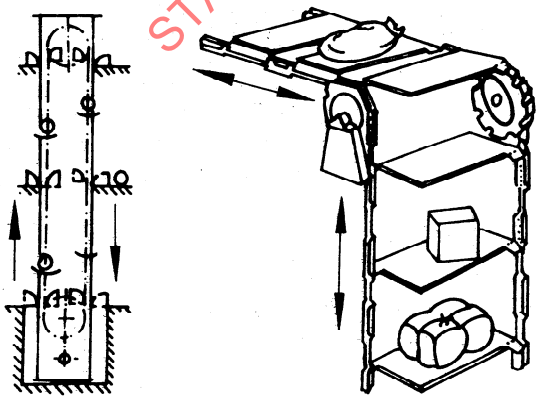
b) Suspended swing-tray conveyors, with swinging trays carried between parallel endless chains.

c) Fixed tray conveyors, in which the carrying trays are pivoted at diagonally opposite corners between two parallel strands of chains, in such a manner as to maintain a horizontal position, irrespective of changes in the direction of travel.

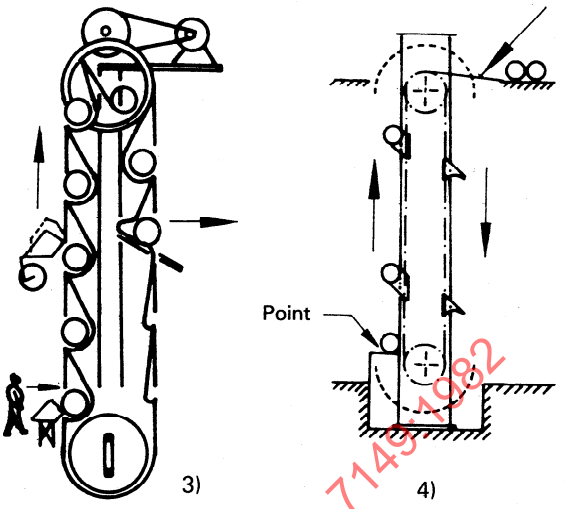
d) Sling elevators, with chains as the tension medium and slings of canvas or similar material between two cross-bars as the conveying medium.

e) Drum elevators, with arms fixed to the chains suitably designed for the conveyance of cylindrical bodies.

4.10.1.2 Sketch



1) 2)



3) 4)

4.10.1.3 Examples

Title	No. from ISO 2148
1) Suspended swing tray conveyors	2.21.09
2) Fixed tray conveyors	2.21.10
3) Canvas sling elevators	2.21.141 + 2.21.142
4) Elevators for cylindrical bodies	2.21.17
5) Arm elevators	2.21.11

4.10.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.10.3 Special safety rules

4.10.3.1 In the construction stage (design and manufacture)

4.10.3.1.1 In amplification of rule 2.1.6 of ISO 1819, the loading operations shall be achieved by means of a mechanical device with or without sequence control, when the speed of the trays exceeds 0,50 m/s, or when the unit mass of the conveyed material exceeds 25 kg. Nevertheless, when the type of load, circumstances or the design of the installation are suitable, a maximum load of 55 kg is acceptable. The unloading shall be achieved automatically when carried out on a moving conveyor, as soon as the speed of the load exceeds 0,5 m/s for loads up to 25 kg and 0,25 m/s for loads exceeding 25 kg.

4.10.3.1.2 Safety devices shall be provided at the working positions to stop the appliance when a person or foreign material is caught between the tray and the casing. In addition to rule 2.2.12 of ISO 1819, manual stopping devices shall be provided at each loading and unloading point.

4.10.3.1.3 All traction mechanism drives shall be equipped with load limiters ensuring instantaneous cut-out of the conveyor (with or without motor cut-out) i.e. independently of the thermal cut-out devices of the electrical switch-gear.

4.10.3.1.4 Suspended swing and fixed trays shall be connected to the chain in such a way that they cannot become separated accidentally.

4.10.3.2 During the installation stage (layout, erection and entry into service)

4.10.3.2.1 Apart from the necessary openings for loading and unloading operations, guards shall prevent any contact with moving parts normally accessible to personnel.

4.10.3.2.2 In addition to rule 2.2.13 of ISO 1819, it is recommended that all loading and unloading points have an interconnecting audible and/or visual signalling system, when direct communication is not possible.

4.10.3.2.3 In the case of elevators having several manual loading points, when more than one can be used simultaneously, a signalling system should be provided to inform the personnel that loading is authorized when a tray arrives.

4.10.3.2.4 In the case of indexing elevators, the operator should be informed by means of a signal that a load is arriving which has to be unloaded by him.

4.10.3.3 During the utilization stage (operation and maintenance)

4.10.3.3.1 In the close vicinity of any loading or unloading opening, a notice shall be displayed, reading :

"It is strictly forbidden to lean into the casing-well".[1)]

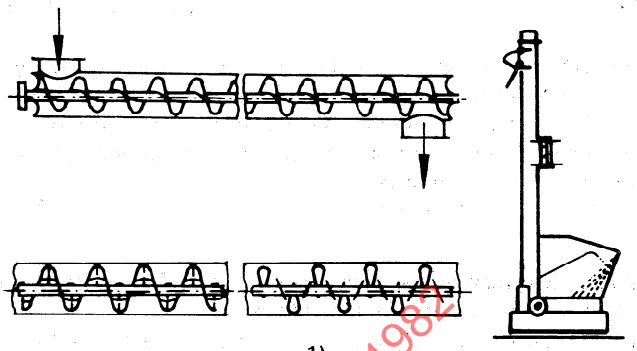
4.11 Screw feeders and conveyors

4.11.1 Field of application

4.11.1.1 These special safety rules apply to conveyors described as follows :

Conveyors for loose bulk materials with a trough or tube as the carrying medium, the material being moved by the action of a rotating helix or broken screw (paddle type).

4.11.1.2 Sketch



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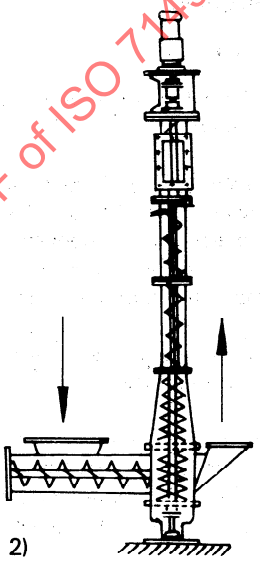

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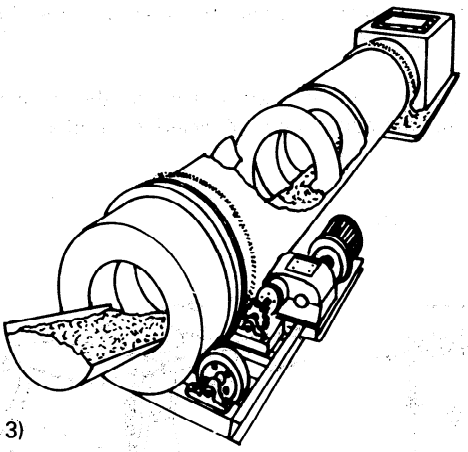


3)

1) The notice may be replaced by a corresponding internationally adopted danger symbol.

4.11.1.3 Examples

Title	No. from ISO 2148
1) Screw conveyors Screw feeders	2.14.13 2.13.06
2) Vertical screw conveyors	2.14.14
3) Screw tube conveyors	2.14.15

4.11.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.11.3 Special safety rules

4.11.3.1 In the construction stage (design and manufacture)

4.11.3.1.1 The top of the trough containing the screw shall be covered at all points other than the feed and discharge points. if for special reasons necessary for operation, these covers cannot be fitted, the screw must be safe by other methods.

4.11.3.1.2 It shall be possible to lubricate the intermediate screw bearings without removing the trough or the cover of the conveyor.

4.11.3.1.3 In cases where a screw is required to convey dangerous or noxious materials, the user shall inform the constructor and specify what special safety measures are to be taken for the construction of the appliance.

4.11.3.2 During the installation stage (layout, erection and entry into service)

4.11.3.2.1 At all places where a screw can be crossed by personnel, provision shall be made for a cover on the trough sufficiently strong to support a man's weight and the weight of any tools he might be carrying, i.e. 150 kg in total.

4.11.3.3 During the utilization stage (operation and maintenance)

4.11.3.3.1 Access to the unprotected rotating part of a screw is prohibited to all persons other than the supervisory and maintenance personnel. No action shall be undertaken by the latter without first having stopped the screw and taken all precautions to prevent it from restarting accidentally.

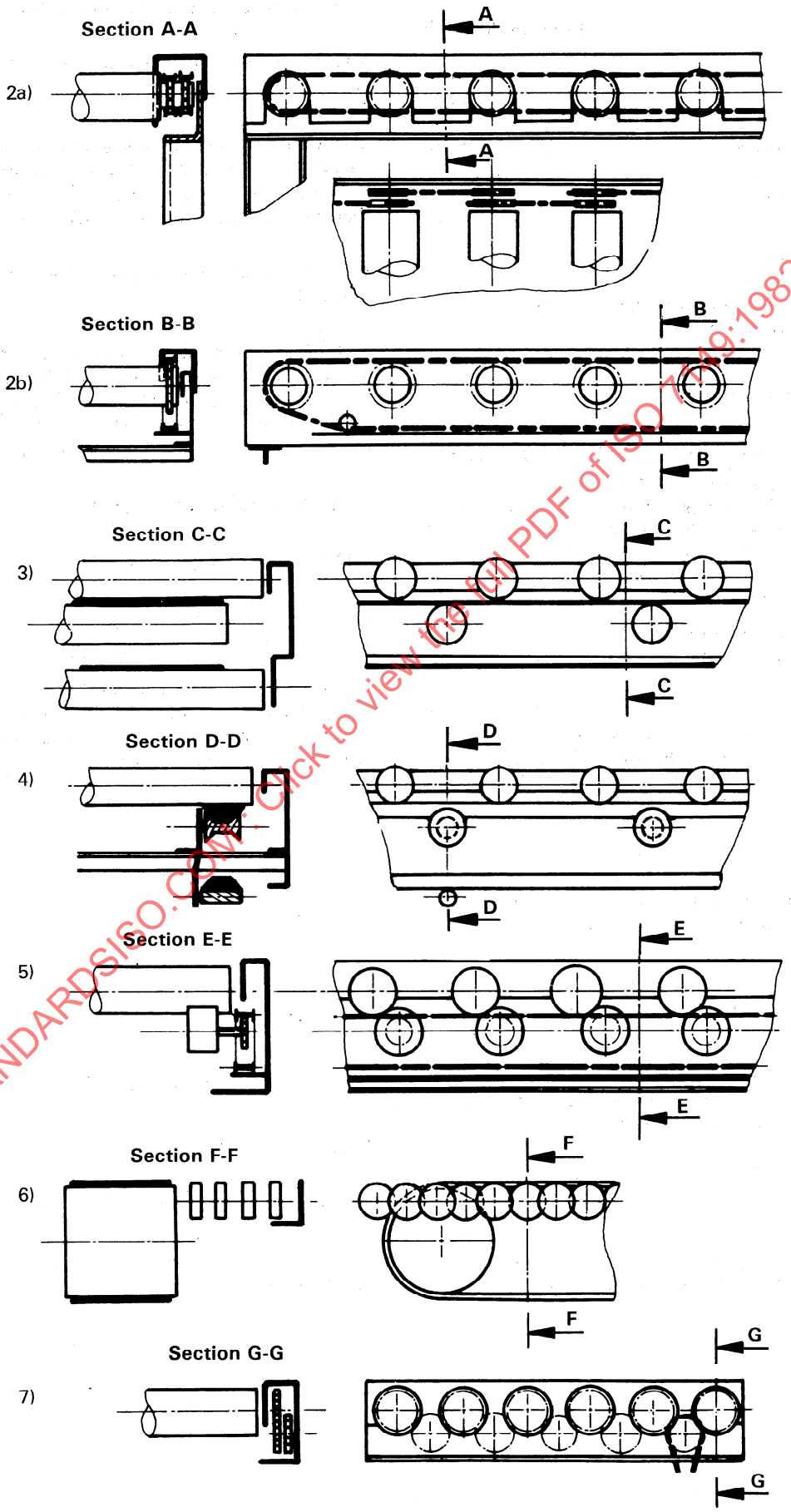
4.12 Live roller conveyors

4.12.1 Field of application

4.12.1.1 These special safety rules apply to conveyors described as follows :

Conveyors for unit loads on which some or all of the rollers are power-driven with positive or friction drives ; also such conveyors with rollers or wheels as the carrying medium and belts or chains as the tension medium.

4.12.1.2 Sketch



4.12.1.3 Examples

Title	No. from ISO 2148
1) Live roller conveyors	2.21.15
2) Chain driven live roller conveyors	2.21.151
3) Belt driven live roller conveyors	2.21.152
4) Vee belt live roller driven conveyors	—
5) Friction driven live roller conveyors	2.21.153
6) Driven wheel conveyors	—
7) Gear driven live roller conveyors	—

4.12.2 General rules

The following special safety rules apply in addition to the general rules laid in down in ISO 1819.

4.12.3 Special safety rules

4.12.3.1 In the construction stage (design and manufacture)

4.12.3.1.1 In addition to rule 2.1.7 of ISO 1819 :

— in the case of positive drive, the pinions and driving chains shall be guarded if they are normally accessible;

— in the case of friction drive, friction points must be guarded if they are accessible.

4.12.3.1.2 In addition to the requirements appearing in rule 2.1.6 of ISO 1819, the loading and unloading operations shall be achieved by means of a mechanical device when the travelling speed of the load exceeds 0,70 m/s and the mass exceeds 10 kg.

4.12.3.2 During the installation stage (layout, erection and entry into service)

4.12.3.2.1 Circuits on which unit loads travel at speeds exceeding 1,5 m/s must be installed outside working or traffic areas or, alternatively must be adequately guarded.

4.12.3.3 During the utilization stage (operation and maintenance)

4.12.3.3.1 Manual interference with the load shall be prohibited when the speed of the load exceeds 0,70 m/s and the mass exceeds 10 kg.

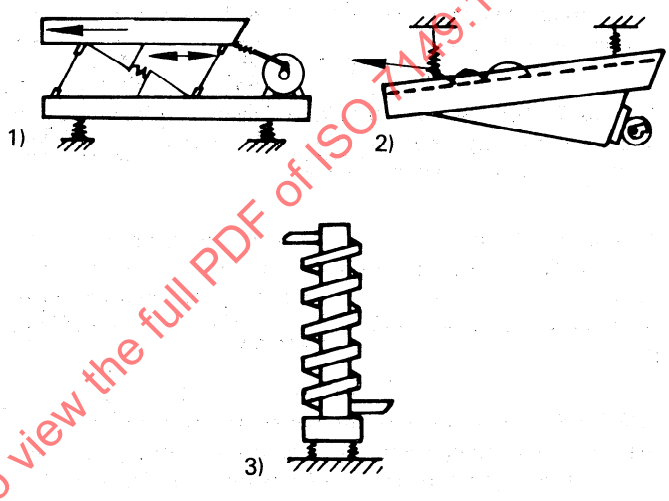
4.13 Vibratory conveyors

4.13.1 Field of application

4.13.1.1 These special safety rules apply to conveyors described as follows :

Conveyors for loose bulk materials which consists of a flexibly mounted trough or tube, in which the material moves under the effect of vibrations.

4.13.1.2 Sketch



4.13.1.3 Examples

Title	No. from ISO 2148
1) Oscillating conveyors[1)]	2.14.11
2) Vibrating conveyors[1)]	2.14.12
3) Helicoidal vibrating conveyors	—

General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.13.3 Special safety rules

4.13.3.1 In the construction stage (design and manufacture)

4.13.3.1.1 In addition to compliance with rule 2.1.1 of ISO 1819, special care should be taken to study the effects of dynamic stresses.

1) Including feeders of the same type (see 2.13.07 and 2.13.08).

4.13.3.1.2 In addition to rule 2.1.3 of ISO 1819, a safety device (rails, barrier, guards, etc.) should be provided in the feeding zone if it is normally foreseeable that material could be ejected.

4.13.3.1.3 Inspection holes or flaps with a self locking attachment should be provided on totally enclosed appliances.

4.13.3.2 During the installation stage (layout, erection and entry into service)

4.13.3.2.1 The openings of feed or transfer hoppers and chutes should be guarded if normally accessible to personnel. It is recommended that inspection doors be provided on main hoppers and chutes.

4.13.3.2.2 Special care should be taken in the design of guards protecting moving mechanical parts, in particular rotating eccentric masses.

4.13.3.2.3 On account of the dynamic stresses produced by these appliances, special care should be taken in the design and manufacture of supporting or suspending elements, including isolation of the appliances as far as practicable from the supporting structure.

4.13.3.2.4 Where the speed of a mobile appliance or equipment travelling alongside a traffic gangway is designed to exceed 0,10 m/s, an audible or visible warning device should be operated prior to and (where applicable) during movement.

4.13.3.2.5 Necessary precautions shall be taken so that the personnel are not submitted to vibrations at an unacceptable level.

4.13.3.3 During the utilization stage (operation and maintenance)

4.13.3.3.1 To comply with the recommendations contained in rule 2.3.2 of ISO 1819, the user should be particularly careful to ensure a regular feed avoiding, even momentarily, overloading of vibrating conveyors.

4.13.3.3.2 It is necessary to check the installations at regular intervals to ensure that the vibrations do not have an adverse effect on the personnel, the apparatus or the environment.

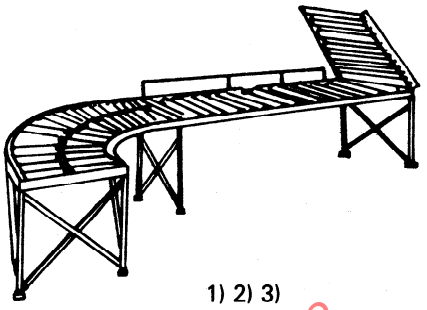
4.14 Roller and wheel conveyors

4.14.1 Field of application

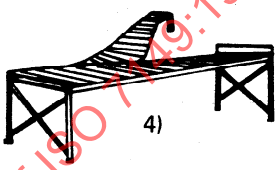
4.14.1.1 These special safety rules apply to conveyors described as follows :

Gravity conveyors for unit loads consisting of a framework having free running carrying rollers or wheels.

4.14.1.2 Sketch



1) 2) 3)



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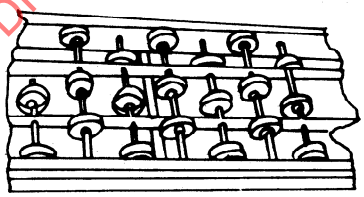

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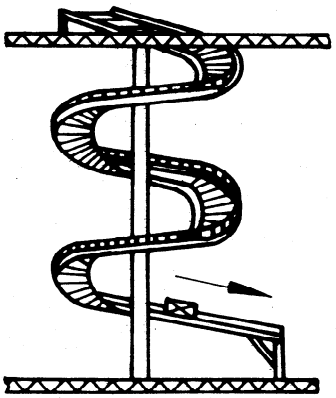


6)

4.14.1.3 Examples

Title		No. from ISO 2148
1)	Roller conveyor arrangements	2.22.01
2)	Normal gravity roller conveyors	2.22.011
3)	Extendable or telescopic gravity roller conveyors	2.22.012
4)	Hinged roller conveyors (gates)	2.22.013
5)	Wheel conveyors	2.22.02
6)	Spiral roller conveyor chutes	2.22.03

4.14.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.14.3 Special safety rules

4.14.3.1 In the construction stage (design and manufacture)

4.14.3.1.1 When the height of the top of the rollers or wheels exceeds 1,80 m above the ground or the service platform, or where there is a risk of personnel being injured by a falling load, continuous guiding devices shall be provided, high and strong enough to prevent accidental dropping off of the load. Such guides need not be provided at loading or unloading points.

4.14.3.1.2 In addition to rule 2.1.6 of ISO 1819, the loading and unloading operations shall be achieved by means of a mechanical device when the dimensions, the speed, the mass, etc., of the loads or parcels, according to the information received from the user, are too great for manual handling.

4.14.3.1.3 In addition to rule 2.1.9 of ISO 1819, the gates or other access devices which interrupt the circuit shall be so designed that, when in the open (access) position, the flow of materials is automatically stopped before arriving at the gate or device.

4.14.3.1.4 Where necessary, vertically hinged gates shall be adequately counterbalanced.

4.14.3.2 During the utilization stage (operation and maintenance)

4.14.3.2.1 Extensible-roller or telescopic-roller conveyors and hinged sections of roller conveyors (gates) shall be operated exclusively by the means provided by the constructor.

Notices shall be displayed adjacent to gates to indicate that they must be closed properly after use.

Instructions shall be given to the personnel accordingly.

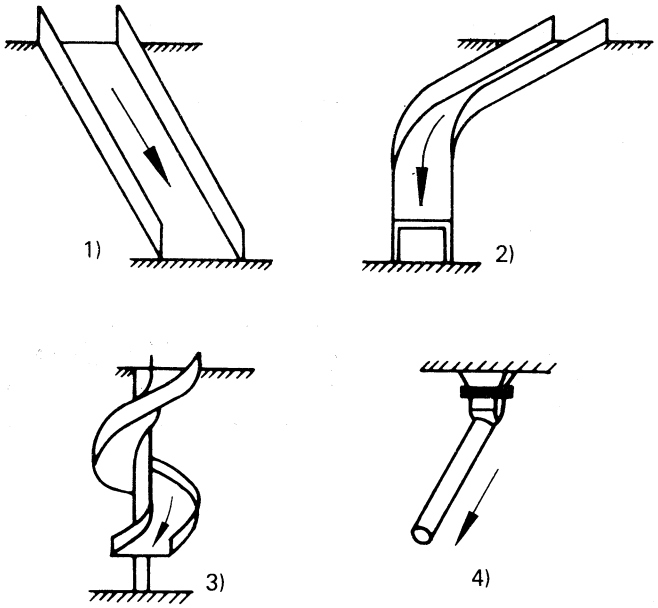
4.15 Chutes

4.15.1 Field of application

4.15.1.1 These special safety rules apply to conveyors described as follows :

Straight, curved or spiral smooth troughs in which loose bulk material or unit loads are directed and lowered by gravity, also tubes in which loose bulk material is lowered by gravity.

4.15.1.2 Sketch



4.15.1.3 Examples

Title	No. from ISO 2148
1) Straight chutes	—
2) Curved chutes	—
3) Spiral chutes	2.22.04
4) Gravity fall tubes	—

4.15.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.15.3 Special safety rules

4.15.3.1 In the construction stage (design and manufacture)

4.15.3.1.1 It is recommended that, where necessary, the appliance should be enclosed, or fenced so as to prevent whole or partial access by unauthorized personnel.

4.15.3.1.2 The discharge ends of chutes excluding transfer points shall be designed or positioned so that the load is not projected in such a manner as to endanger personnel. Where necessary, retarding devices shall be fitted.

4.15.3.2 During the installation stage (layout, erection and entry into service)

4.15.3.2.1 In addition to rules 2.1.3 and 2.2.10 of ISO 1819, guards shall also be provided to prevent the load being accidentally thrown out of the appliances or leaving the appliances in such a manner as to endanger personnel.

4.16 Hydraulic conveyors

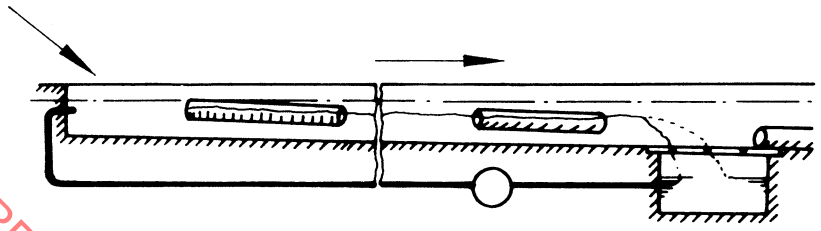
4.16.1 Field of application

4.16.1.1 These special safety rules apply to conveyors described as follows :

Conveyors for loose bulk material or unit loads with a trough, flume or tube, in which the material or loads are conveyed by a moving stream of water or another liquid.

4.16.1.2 Sketch

1)



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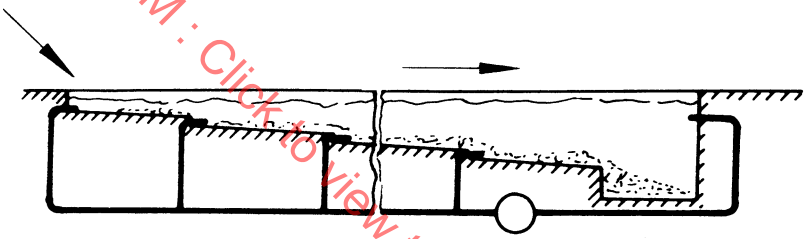

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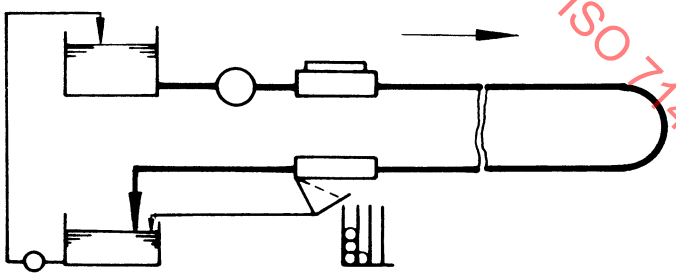
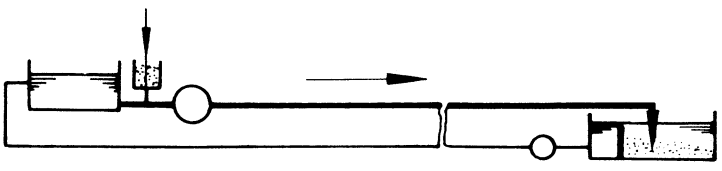




4.16.1.3 Examples

Title	No. from ISO 2148
1) Hydraulic conveyors for loose bulk material (open type)	2.14.19
2) Hydraulic conveyors for unit loads (tube type)	2.21.24
3) Hydraulic conveyors for loose bulk material (tube type)	—

4.16.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.16.3 Special safety rules

4.16.3.1 In the construction stage (design and manufacture)

4.16.3.1.1 The use of internal combustion engines to drive pumping units shall entail the systematic application of the special safety rules for this type of equipment (removal of exhaust gases, fire hazards, etc.).

4.16.3.1.2 Hydraulic conveying systems must be fitted with adequate safety devices to protect against inadmissible high pressure or vacuum which may occur when operating the plant.

4.16.3.1.3 In the special case of hydraulic conveying of unit loads, the receiving station of the units conveyed shall be designed with braking devices, preventing excessive shocks at the discharge point.

4.16.3.2 During the installation stage (layout, erection and entry into service)

4.16.3.2.1 When the pumping units are fed with materials through cistern-hoppers in series, if any collecting devices for overflows are provided, they shall drain off outside the points normally accessible to personnel.

4.16.3.2.2 Protection shall be provided against any hazards as a result of any discharge from safety valves.

4.16.3.2.3 Drain devices, vents and valves shall be fitted with shields.

4.16.3.3 During the utilization stage (operation and maintenance)

4.16.3.3.1 The control and regulation appliances shall be kept in perfect operating condition.

4.16.3.3.2 According to the degree of danger, caused by the opening of valves at low points during operation, the responsible person shall determine the corresponding safety measures.

4.16.3.3.3 The wear and tear condition of the conveying piping shall be checked as often as necessary according to the abrasive or corrosive character of the materials conveyed.

4.17 Pneumatic continuous handling appliances

4.17.1 Field of application

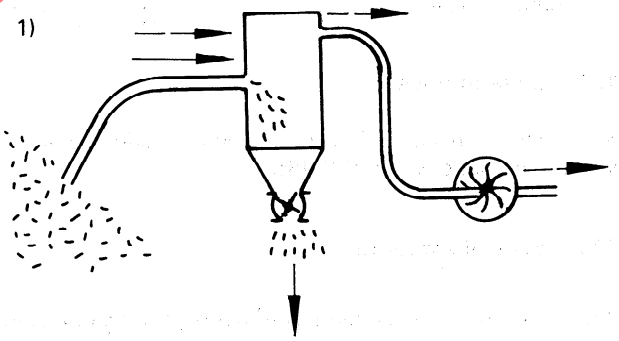
4.17.1.1 These special safety rules apply to conveyors described as follows :

a) Conveyors for loose bulk materials with a tube system, in which the materials are conveyed by the gas-stream of a blowing or suction system.

b) Conveyors for unit loads with a tube system in which the loads are conveyed directly or in a container in either direction by an air stream, or by pressure produced by a blowing or suction system.

4.17.1.2 Sketch

1)



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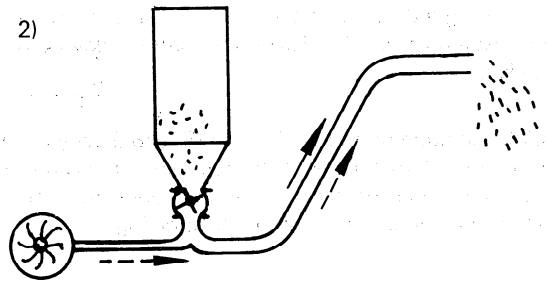
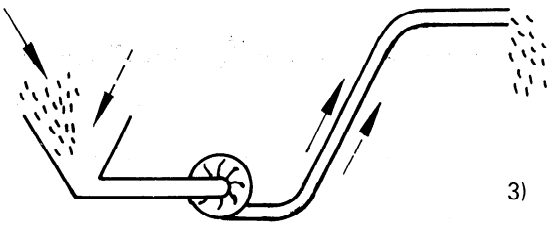
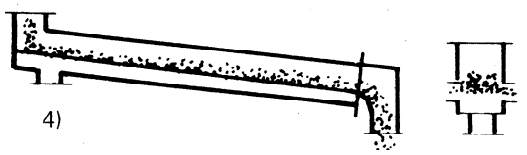
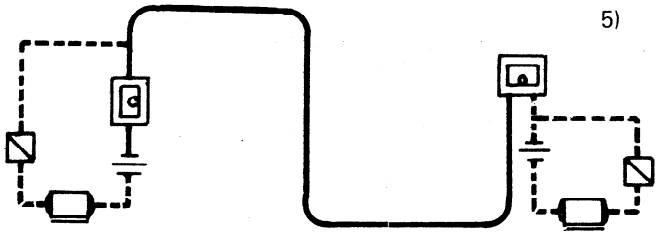




3)





4.17.1.3 Examples

Title		No. from ISO 2148
1)	Suction system	2.31.01
2)	Blowing system	2.31.02
3)	Suction/pressure system	2.31.031 + 2.31.032
4)	Airslides	2.31.04
5)	Pneumatic post	2.21.231

4.17.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.17.3 Special safety rules

4.17.3.1 In the construction stage (design and manufacture)

4.17.3.1.1 Each component of the pneumatic installation must be designed to withstand the maximum pressure or vacuum resulting from the design calculations determined for the installation.

4.17.3.1.2 In addition to rule 2.1.1 of ISO 1819, when designing the mobile derrick-jib and its possible supporting equipment, account shall be taken of a load applying a force of 100 daN at the lower end of the vertical piping.

4.17.3.1.3 The extreme positions of the derrick-jib shall be limited by stopping devices.

4.17.3.2 During the installation stage (layout, erection and entry into service)

4.17.3.2.1 Pneumatic handling installations must be fitted with adequate safety devices against inadmissible high pressure or vacuum.

4.17.3.2.2 In addition to rule 2.2.11 of ISO 1819, interlocking devices must be provided between the different components of the installation so that it is only possible to achieve the correct starting and stopping sequences.

4.17.3.2.3 In cases where pneumatic installations are operating by means of noxious conveying gas or convey a noxious product, the pressure relief valve or other similar device must not discharge the gas or product to an area which is normally accessible to personnel.

4.17.3.2.4 When combustible or explosive materials are conveyed, care shall be taken to avoid fire or explosions, and the consequences thereof, in particular taking into account the generation of static electricity through material movement, and if necessary also using an inert gas.

4.17.3.2.5 Access to the jib has to be provided for inspection and repair.

4.17.3.3. During the utilization stage (operation and maintenance)

4.17.3.3.1 Controlling devices must be kept in good working order.

4.17.3.3.2 The amount of wear in pipes shall be checked as often as needed according to the abrasive or corrosive character of the product conveyed.

4.17.3.3.3 The plant should be regularly checked to see that it is gas tight. Special attention should be paid to exposed points such as joints, bends, shutting off equipment, safety valves, inspection doors, etc.

4.17.3.3.4 Leakages leading to gas escaping from or entering the installation and any dust escape must be remedied immediately.

In the case of a large escape of the product, the installation should be shut down.

If it is not possible to shut down the installation, care must be taken in order to ensure that personnel are safe, and in particular any movement of personnel or vehicles into this area must be prohibited.

4.17.3.3.5 The good state of cables and suspension units of derrick-jibs must be checked at regular intervals.

4.17.3.3.6 In compliance with clauses 2.3.1 and 2.3.16 of ISO 1819, any alteration to the installation shall only be made by agreement with the manufacturer.

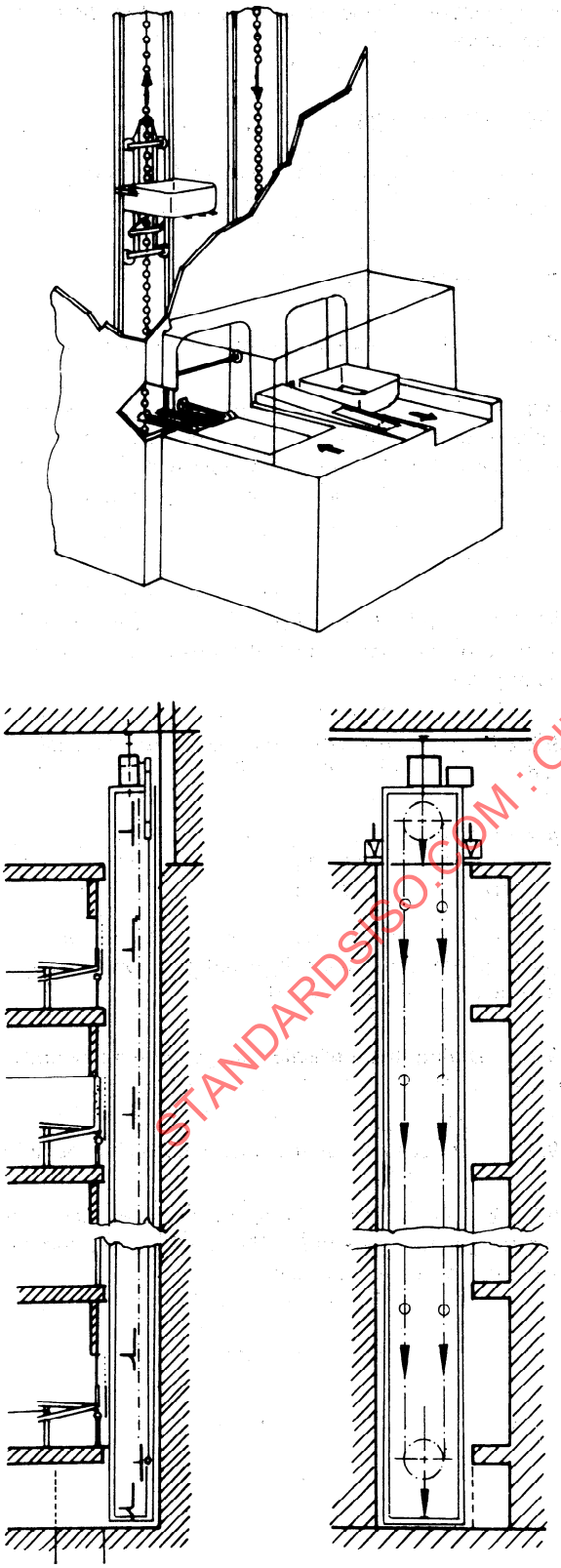
4.18 Light-weight vertical tray elevators

4.18.1 Field of application

4.18.1.1 These special safety rules apply to machines described as follows :

Elevators for light-weight unit loads with chains as the tension medium, and swing trays, especially for vertical transport between several floors in high buildings, for example, for documents.

4.18.1.2 Sketch



4.18.1.3 Example

Title	No. from ISO 2148
Light-weight vertical tray elevator	—

4.18.2 General rules

The following special safety rules apply in addition to the general rules laid down in ISO 1819.

4.18.3 Special safety rules

4.18.3.1 In the construction stage (design and manufacture)

4.18.3.1.1 In modification of rule 2.1.6 of ISO 1819, the loading and unloading operations shall be carried out by mechanical means when the running speed of the swing trays or support plates is higher than 0,20 m/s, or when the unit mass of the transported products is higher than 5 kg.

4.18.3.1.2 If loading and unloading is manual and is carried out through an opening giving access into the casing, the elevator shall be fitted with a safety device in such a way that the unit shall stop before any risk of bodily injury occurs. Such a safety device shall be placed :

a) when the loading or unloading is on the ascending strand, in the upper part of the opening;

b) when the loading or unloading is on the descending strand, in the lower part of the opening.

4.18.3.1.3 Automatic equipment for loading and unloading shall be fitted with adequate protection to prevent personnel reaching moving parts (chains, trays and loads) (see 2.1.10 of ISO/1819).

4.18.3.1.4 Elevators more than 15 m high shall be fitted with a slack-chain detecting device, that will stop the unit in case of excessive chain stretch.

4.18.3.1.5 Where practicable, the elevator shall be so installed that a person cannot pass under it. Where this is not practicable, the base of the elevator shall be so constructed that it can support the collapse of the moving assembly and its maximum load.

4.18.3.1.6 Fire resistant enclosures and doors shall be provided as necessary.

4.18.3.1.7 The operating gear shall be so designed that the strand with its trays and loads can be raised or lowered manually in an emergency.

4.18.3.1.8 Swing trays shall be so designed that they are stable whatever the load distribution within the maximum allowable load limit.