INTERNATIONAL STANDARD 1820

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Continuous mechanical handling equipment for loose bulk materials — Storage equipment : Storage bins and bunkers, silos and hoppers, bin gates — Safety code

Engins de manutention continue pour produits en vrac — Équipement de stockage : Trémies, silos, obturateurs — Code de sécurité

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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.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 101 has reviewed ISO Recommendation R 1820 and found it technically suitable for transformation. International Standard ISO 1820 therefore replaces ISO Recommendation R 1820-1970 to which it is technically identical.

ISO Recommendation R 1820 was approved by the Member Bodies of the following countries :

Austria	Germany	Norway
Belgium	Greece	Peru
Canada	Israel	Poland
Czechoslovakia	Italy	South Africa, Rep. of
Egypt, Arab Rep. of	Japan	Sweden
Finland	Korea, Rep. of	United Kingdom
France	New Zealand	U.S.S.R.

No Member Body expressed disapproval of the Recommendation.

No Member Body disapproved the transformation of ISO/R 1820 into an International Standard.

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Continuous mechanical handling equipment for loose bulk materials — Storage equipment : Storage bins and bunkers, silos and hoppers, bin gates — Safety code

1 SCOPE

This International Standard specifies, in addition to the general safety rules set out in ISO/R 1819, the special safety rules for the following continuous mechanical handling equipment for loose bulk materials : storage equipment such as storage bins and bunkers, silos and hoppers, bin gates.

2 FIELD OF APPLICATION

The safety rules laid down in this International Standard apply regardless of the use for which the equipment is intended.

These safety rules limit the supplier's responsibility to continuous mechanical handling equipment proper, excluding the structures to which such equipment is affixed.

3 REFERENCE

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

4 SPECIAL SAFETY RULES

The construction and operation of storage equipment such as storage bins and bunkers, silos and hoppers, bin gates, shall meet

- the legal and local requirements relating to safety in general[1];
- the principles laid down in clause 1 of ISO/R 1819;
- the general rules laid down in clause 2 of ISO/R 1819;
- the following special rules :

4.1 **In the construction stage** (design and manufacture)

4.1.1 *Bins and bunkers, silos and hoppers*

4.1.1.1 GENERAL

4.1.1.1.1 The components shall be designed to bear the stipulated loads : dead weights, material stored, ancillary superstructures, occasional overloads and climatic overloads if any.

4.1.1.1.2 Stability under all load conditions shall be ensured.

4.1.1.1.3 If the material stored is reclaimed by vehicles or other moving equipment the following minimum free passages shall be left between the supporting structures and the vehicles or other moving equipment :

- 500 mm in the case of a stationary isolated obstacle (post, pile, column, angle of building, etc. less than 300 mm wide, as measured in the direction of movement of equipment);
- 700 mm in the case of a stationary continuous obstacle (wall, warehouse, platform or wharf, building etc.).

4.1.1.1.4 According to the nature of products, the design of bins and bunkers, silos and hoppers, particularly the slopes of the walls, the position and size of discharge openings, shall be such as to ensure satisfactory flow of the product by gravity with or without the help of ancillary means.

Interior struts, interior ladders and other internal fittings shall be avoided as far as possible.

4.1.1.1.5 Bins and bunkers, silos and hoppers intended for use with dry combustible materials shall be constructed of fireproof materials.

NOTE — The above-mentioned rules apply to all bins and bunkers, silos and hoppers. When the latter are more than 1 500 mm deep, risks of workers being buried under products or sinking into them shall be prevented and, in particular, the following complementary rules are to be applied :

4.1.1.2 CLOSED BINS AND BUNKERS, SILOS AND HOPPERS

4.1.1.2.1 Inspection doors and detachable parts of closed bins and bunkers, silos and hoppers shall be fitted with a device enabling them to be locked with a key.

1) See appendix Z of ISO/R 1819.

In many cases a horizontal guard is used consisting either of a grid of bars or of a rigid wire screen completely covering the upper opening. Where the horizontal guard is the only protection, the spacing between the bars of a grid shall not exceed 70 mm, and the mesh of a rigid wire screen shall not exceed 200 mm × 200 mm.

In all other cases, a vertical barrier shall be provided consisting of a guard rail extending above the walls of the bin and bunker, or silo and hopper. This guard rail shall be at least 1 000 mm high and provided with an additional protection such as a protective wire screen; the smooth wall system can be resorted to, if necessary.

4.1.1.3.2 Inspection doors, detachable parts and openings in the above-mentioned barriers shall, as in the case of closed silos, be fitted with a device enabling them to be locked with a key.

4.1.1.3.3 Rules 4.1.1.3.1 and 4.1.1.3.2 are also applicable to bins and bunkers, silos and hoppers partially opened; for example, this is the case when feeding is carried out by mobile conveyors (shuttle conveyors) or by travelling tripper.

4.1.2 *Bin gates*

4.1.2.1 According to the nature of products, bin gates shall be so designed as to ensure satisfactory flow of the material and discharge by gravity.

4.1.2.2 Bin gates shall be so designed that they cannot open accidentally.

4.1.2.3 If they are manually operated, they shall in no case require a muscular force of more than 30 daN[1] pull by the operator.

4.2 During the installation stage (design, commissioning and entry into service)

4.2.1 *Bins and bunkers, silos and hoppers*

4.2.1.1 For open silos equipped with guard gratings, it is recommended that provision be made, by means of a suitable guarded device, for feeding material into the storage receptacles below the level of the grating, thus preventing access to the interior of the silo.

4.2.1.2 If there are any hazards of gas, dust or dangerous mixtures, the lighting, if any, shall be of the safety type.

4.2.1.3 In order to ensure compliance with the requirements of rule 4.1.1.1.3, the following provisions shall be made :

a) if the equipment travels on fixed tracks, these tracks shall be laid to provide the required minimum clearances;

b) where steerable vehicles are used, special devices such as bollards, island plinths or continuous curbs shall be provided to meet these requirements.

4.2.1.4 When the manufacturer is not aware of the special characteristics of the plant, which is generally the case for standard bins and bunkers sold as produced, the contractor in charge of erection shall be responsible for the provision of the safety devices covered by rule 4.1.1.3.1.

4.2.2 *Bin gates*

The means of operating bin gates, whether manual or mechanical, shall be easily accessible. In the case of direct loading of vehicles under the bin gate, the gate control shall be placed so as to permit supervision of the flow.

4.3 During the utilisation stage (operation and maintenance)

4.3.1 Bins and bunkers, silos and hoppers shall not be used for storing materials the characteristics of which are different from those of the products for which they are designed, without the manufacturer's consent.

4.3.2 Arrangements, in appropriate cases automatic, shall be made to stop the flow to open or closed bins and bunkers, silos and hoppers, when their full capacity is reached.

4.3.3 Personnel shall not walk on the guard gratings or wire screens of open bins and bunkers, silos and hoppers, unless the guard gratings provided are designed for walking on.

4.3.4 Access to the inside of bins and bunkers, silos and hoppers shall be prohibited and notice of this prohibition shall be prominently displayed.

Where it is necessary for personnel to enter the bins and bunkers, silos and hoppers, special precautions shall be taken, including the use of safety equipment, and the individual shall be under continuous observation; notices to this effect shall be prominently displayed.

In all cases where keys are provided (rules 4.1.1.2.1 and 4.1.1.3.2) they shall be held by the responsible person.

1) 30 daN ≈ 30 kgf