

Italian National Institute of Occupational Safety and Prevention

Department Of Safety Technologies

GUIDELINES

FOR THE CONSTRUCTION INDUSTRY

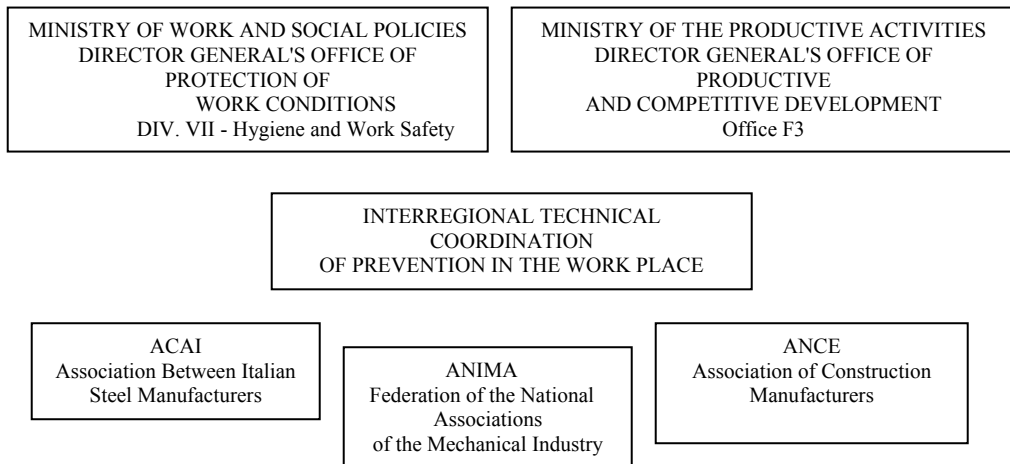
TRANSPORT OF PERSONS AND MATERIALS BETWEEN
FLOORS DEFINED AS TEMPORARY

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Guidelines developed in collaboration with



FOREWORD

Presidential Decree DPR 547/55 has for decades been the fundamental legislation governing workplace safety. Even today in Italy, it is the legislation of reference for sectors not included in the application fields of the European Directives implemented here thus far. But since the 1950's the state of the art in many sectors has changed dramatically. Unforeseen products and technologies, formerly unimaginable, have taken root in Italy and throughout the world but their proliferation has not always engendered prompt enactment of corresponding legislation and technical safety standardization. Among the activities that are carried out in temporary and mobile construction sites, one sector in which this regulatory delay has been heavily affected by technological evolution is that of lift equipment for transporting persons and materials between floors and defined as temporary. ISPESL (Italian National Institute of Occupational Safety and Prevention) has been called on several times, due to its years of experience, by several operators in the industry, to supply its interpretations and to express its opinion where doubts arose concerning which norms to apply and with which modalities.

Aware of employment and market realities, and sensitive to the need to guarantee personal safety for new types of equipment while waiting for this to be effectively dealt with by European legislation, the Institute has decided that it must address this issue completely and thoroughly while awaiting definitive European legislation. The constitution of a specific work group (Lifts Working Group), in which experiences converged and the needs of all those who operate in the field were expressed, seemed the most equitable approach. The development of these guidelines, full of useful directives regarding technical solutions and the correct use of the equipment in their possible configurations, aims to reduce the principle risks associated with them. By operating this way, ISPESL confirms its own commitment to establishing good practices for workplace safety. Moreover, this publication will become part of a program of prevention interventions carried out by European initiatives that have seen the year 2004 dedicated to the prevention of accidents in the construction industry.

Prof. Antonio Moccaldi
President of ISPESL

INTRODUCTION

In the field of lifting equipment for the transport of persons and materials between floors defined as temporary, the ISPESL has stated repeatedly the difficulties of applying DPR 547/55, due substantially to the evolution of the state of the art that took place in the last fifty years and the current lack of specific standards for such equipment.

Numerous calls for technical support for a solution to such problems echo the concerns of individuals and associations involved in various capacities (construction contractors, end-users, workplace safety officials, supervisory bodies, etc). Consequently, there emerged a determination to take timely and effective action to fill the current gaps and to assure adequate levels of safety for affected workers, bearing in mind the evolving nature of legislation and of European standardization.

Recognition is due to all those who contributed to developing this document,. The process involved gathering and documenting the experiences and technical contributions of experts involved not only in the standardization, but also in the construction, management and control of the equipment in question.

The availability in the market of builders' hoists with a loading platform (as opposed to traditional builders' hoists with a loading cage) for the transport of persons and materials which are not regulated by some standards or partial observance of DPR 547/55 regarding the corresponding European technical standards (EN 12159), has led the work group to perform a risk analysis for the equipment in question. The results of this analysis were used to compose the present guidelines. The importance of the results gathered is evidence for the purpose of avoiding further problems and finding a solution by applying consistent rules for workplace safety. Therefore, my intent here is to express my complete satisfaction with this undertaking, and to reiterate the need for widespread distribution of these guidelines.

Dr. Umberto Sacerdote
General Director of ISPESL

The evolution of the technological solutions and the national and European regulatory legislation reference has motivated the development of these guidelines. They have been prepared by the Department of Safety Technologies (DST) of the ISPESL (Italian National Institute of Occupational Safety and Prevention) based on the findings of the specific work group consisting of:

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The group coordinator would like to thank all the members of the group, and also Giovanni BENETTON and Adrian ROSSI from ACAI – Lifting Equipment Group, for their highly qualified collaboration in the development of this document.

Dr. Eng. Roberto Cianotti
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1. ANALYSIS OF THE REGULATORY SITUATION AND OBJECTIVES

The adoption of the provisions of the Machinery Directive, implemented in Italy with DPR 459/96, with the consequent transposition by the national legislature, effectively harmonized and simplified national regulations concerning equipment involved in its field of application in the communitarian territory

On the other hand, there has not been any legal reflection in national regulation concerning the machines excluded, to which the provisions contained in the pertinent national legislation continue to apply.

The case of builders' hoists for the transport of persons or of persons and materials (see Annex 1 - Opinion Committee Machines Doc. 2000.20 Rev.1) is the specific case to be addressed

Regarding the category of lifts, it has been established that:

- "traditional lifts" (which connect floors in permanent service) are regulated by the Lifts Directive (implemented in Italy with DPR 162/99)
- lifts that are "for the transport of materials only" are regulated by the Machinery Directive (not appearing among the excluded types)
- "builders' hoists for the transport of persons, or persons and materials" are excluded from the Machinery Directive, as well as from the Lifts Directive.

Therefore, we can conclude that for this last family of lifts, the only reference in the national regulation remains DPR 547/55.

This circumstance gives rise to a number of issues resulting from the lack of adaptation of the binding nature of the technical regulations and the technological development that has occurred.

It is noteworthy that during the past few decades we have witnessed progressive mechanization of construction site operations resulting from continuous refining of technologies and construction techniques. There has also been a general tendency to produce equipment specifically designed for individual sectors of activity. During that time, a continuous evolution took place both in relation to operations involving the

lifting-positioning at determined height, and the lifting-transport (vertical or inclined), of workers and materials, and of persons or materials only.

The latter sector has changed significantly since the 1950's. In the field of lifting systems, changes have included adding the coupling rack and pinion (to equipment intended for use at a fixed location) to the classic winch/wire rope and adding the hydraulic cylinder-piston (to equipment requiring easy transportability from site to site, or the movement of all or part of the equipment while performing work operations at elevation). In the area of construction configurations, equipment has been developed with modular elements that offer remarkable versatility compared to the previous mono-structured model. This gives it the ability to adapt more flexibly to the morphologic characteristics of the work.

A parallel development can be found in regulatory documents codifying the state of the art construction of this equipment, particularly since the Machinery Directive came into force, conferring upon equipment, built according to the harmonized standards, the presumption of conformity with the Directive's essential safety requirements. This development has led industries involved in production to urge the regulatory bodies to produce standardization documents dedicated to specific families of equipments/machines for the field/sector.

The field of lifting equipment for construction sites has not been exempt; over time European standards have been published regarding:

- Mobile liftable work platforms (EN 280)
- Mast aerial work platforms (EN 1495)
- Suspended platforms to variable levels (EN 1808)
- Builders' hoists (EN 12159)
- Builders' hoists for goods only, with accessible platform (EN 12158-1)

The dynamic and continuous progress in the specific field of construction site hoists has not been followed by a corresponding adjustment of the laws governing the construction of such equipment.

In effect, the legislation of Chapter III of Title V of Presidential Decree No. 547/55 mandated the safety of lifts and hoists not subject to special provisions regarding the types of construction equipment then available. With specific reference to such categories, it identified construction requirements necessary for risk control equipment.

Regarding the specific family of construction site equipment for the transport of persons and materials between floors, it should be noted that the current construction configurations also differ substantially from those used as references for DPR 547/55, and there are abnormalities in several areas.

In the first place, there is a marketing problem. As a result of construction configurations similar to those of other equipment for similar use, but falling within the Machinery Directive, platforms for persons and materials can be found in the market accompanied by a declaration of conformity issued as if those products were covered in the Machinery Directive. These platforms are also bought and installed by operators who are not always aware of the true situation and use them in violation of the enforced provisions. Furthermore, the extreme ease of assembly and remarkable versatility of employment of this type of equipment, along with the presence of the CE mark (even if they are not correctly applied) and the widespread lack of knowledge of the regulatory aspects that affect the continued use in workplaces by their buyer-users, are factors that promote their misuse. However, awareness of being outside the regulations in the face of the practical advantages is not necessarily a sufficient deterrent in dissuading individuals from such practices. It is necessary to recognize that:

- the market requires products in this family, with more satisfactory performance than currently available,
- this family of machines offers various construction solutions for characteristic risks, different from those provided in Presidential Decree No. DPR 547/55,
- construction solutions in the market are in line with the safety legislation of many European countries, justifying high production, market availability and the eventual expansion to all workplaces,
- the modification of the design of such machines conforming to clauses of DPR 547/55 would make them totally inefficient, and it is unthinkable that the market or national users would forego the advantages resulting from ongoing improvements.
- for other equipment characterized by similar risks, but intended for various uses within the scope of the Machinery Directive, there are construction standards harmonized with the same Directive, which ensure compliance with relevant safety requirements.

In view of all the above, these guidelines were developed in order to:

- serve as an instrument to bridge the legislation gap created by the absence of a specific rule establishing the safety requirements for equipment for the transport of persons and materials between floors defined as temporary at the construction site.
- fully respond to the safety needs that using this type of equipment involves, primarily taking into account the types of risks that the legislation of Decree 547/55 has, at the time, attempted to eliminate or reduce in order to achieve a level of protection that is at least equivalent.
- Take into account state of the art acquisitions in fields with very similar types of risks for construction configuration and ultimate use,

Methodologically, the project proceeded sequentially as follows:

- a careful analysis of risk assessment employed by the legislative authors of DPR 547/55,
- detailed examination of construction requirements prescribed therein for a single type of characterized risk,
- identifying and composing the construction requirements and safety measures that the hoist in question should have for each type of risk, taking into account the current state of the art and European standards relating to similar machines. Also, address the need for appropriate integration into the requirements proposed by the Italian legislature.

These guidelines are being made available as a first step towards a solution – primarily legal – regarding safety issues. In addition, they will serve as useful reference for users, manufacturers and control bodies regarding the specific family of construction site equipment under investigation.

2. STRATEGY AND FIELD OF APPLICATION

These guidelines are aimed at reducing the risk of accidents at the construction site during lifting operations of persons and materials between floors defined as temporary. For this purpose the guidelines adopt a dual intervention strategy: to illustrate and promote the adoption of correct procedures by employees, including stages of assembly, testing and periodic equipment maintenance and to provide needed regulatory or technical support to the employer, buyers, contractors, and those engaged in safety checks of such equipment, especially given the lack of clarity and incisiveness of existing regulations. In order to bridge the gaps, the guidelines offer a weighted look at the panorama of the European Union industry and the state of the art.

For the sake of uniformity in addressing operating procedures and risks, the intent here is to limit these guidelines to those dealing only with that equipment having vertically guided cages and guided travel. Given the limited availability in Italy of lifting equipment for persons and materials at construction sites that operates differently, the discussion was narrowed to rack and pinion hoist systems. The special features of these devices, compared to other means of guided lifting at construction sites, has to do mainly with the function of lifting and transporting of persons between floors, defined as temporary. When, compared to lifting and transporting of materials only between levels (hoist), the lifting of persons for the execution of work at elevation (liftable platforms) presents additional risks due respectively to the presence of people on board the carrier and the disembarkation to floors of the transported persons.

Before concluding these guidelines it is necessary to pay particular attention to builders' hoists in which the carrier of the cargo consists of a "platform" precisely because of their recent introduction, and to distinguish them from more traditional builders' hoists with a closed cage. This follows the controversial interpretation that made those initially appear at the European level under the purview of the Machinery Directive, and then be subsequently excluded.

PLEASE NOTE:

These guidelines take into account only those relevant safety requirements for risk situations not addressed or completely resolved in technical and regulatory documents currently available. For all the rest, refer back to the enforced standard.

3. LEGISLATIVE AND BIBLIOGRAPHICAL REFERENCES

- DPR n. 547 April 27, 1955 "Standards for the prevention of accidents at the workplace"
- Law Decrees n. 626 and successive integrations and modifications "Performance of directives of the Council 89/391/CEE, 89/654/CEE, 89/655/CEE, 89/656/CEE, 90/269/CEE, 90/270/CEE, 90/394/CEE, 90/679/CEE, 93/88/CEE, 95/63/CE, 97/42/CE, 98/24/CE, 99/38/CE, 99/92/CE and 2001/45/CE regarding the improvement of safety and health of workers while at work." September 19, 1994.
- Law Decrees n. 459 "Regulations for compliance with directives 89/392/CE, 91/368/CEE and 93/68/CEE concerning approximation of Member States' legislation regarding the equipment". July 24, 1996.
- Law Decrees n. 494 and successive integrations and modifications "Compliance with directive 92/57/CEE". August 14, 1996.
- European Commission - Enterprise Directorate - General - 98/37/EC Committee – Working Group on Machinery - "Doc. 2000.20 rev1 (rev. 2000.02) - Transport Platforms – Measures to be proposed by the Commission"
- European Commission - Enterprise Directorate - General - 98/37/EC Committee - Working Group on Machinery - verbal meeting October 23-24, 2003.
- EN 12159:2000 "Builders' hoists for persons and materials with vertically guided cages"
- EN 12158-1: 2000 "Builders' hoists for goods - Parts 1: Hoists with accessible platforms"
- UNI EN 1495:1999 "Liftable platforms – Mast Aerial Work Platforms"
- BGI 825:2002 - BG information "Selection and Use of Transport Construction in Stages"
- CPA Best Practice Guides - "Transport Platforms - Installation, Use, Maintenance, Inspection, Examination and Testing"

4. DEFINITIONS

These guidelines adopt the following definitions:

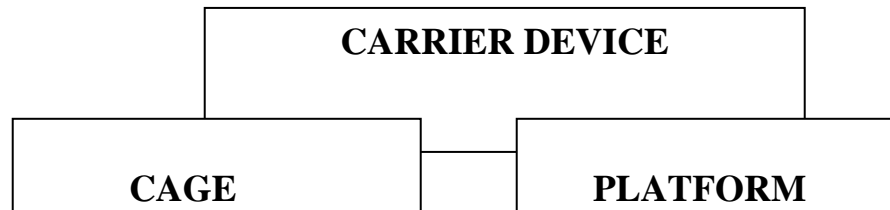
rack and pinion hoist (referred to as “hoist” in the Lifts Directive)	equipment for the transport of persons and materials installed temporarily at construction sites or buildings with a carrier having guided travel serving landing floors (established floors), using a toothed rack and a pinion as the carrier suspension system.
carrier	cage or platform designed to contain the persons and the material from one floor level to another.
hoistway	the total space traveled by the carrier and its load.
rated load	the maximum load the hoist has been designed to carry while in service.
rated speed	the maximum speed of the cage for which the equipment has been designed.
landing floor	level of a building or construction site which has been designated for landing, boarding/disembarkation of persons and/or loading/unloading of materials.
transit level	level of a building or construction site in the path of the hoist which does not provide for the landing, boarding/disembarkation of persons and/or loading/unloading of materials, but where there can be persons present.
Guardrail	fixed structure, different from gates used to prevent people from falling or coming in contact with hazardous areas.
in service	a condition during use of the hoist when the cage is in any position, laden or unladen, moving or stationary.
competent person	designated person, suitably trained, with the requisite knowledge and practical experience, and provided with the necessary instructions to enable the required procedures to be carried out.

5.0 TECHNICAL DIRECTIVES REGARDING PROTECTIVE MEASURES TO ADOPT FOR RISK REDUCTION

This paragraph was developed based on hazardous situations identified by the analysis of the construction requirements contained in the articles of the DPR (Presidential Decree) 547/55 Title V Chapter III and evidenced in the appended Table “Risk Analysis” relative to the arguments presented in DPR 547/55 - Title V Chapter III “Elevators and Builders Hoist”. Situations characterized as hazardous were grouped according to criteria regarding homogeneity and specificity of hazards. Each one of them was matched with those elevator parts designed to contribute to the reduction of the relevant risks. For the elevators that are the subject of these guidelines, the paragraph sets forth construction provisions and safety measures developed in light of the current state of the art. It takes into account European standards relative to similar machines, and the need for appropriate integration and modification in order to satisfy the requirements set by the Italian legislature.

Hazards for persons transported on the carrier:

- fall hazards during the hoist's operation
- crushing, shearing, collision and entanglement hazards due to the movement of the carrier with respect to fixed parts.



5.1 CARRIER

5.1.1 GENERAL REQUIREMENTS

The carrier must be designed to support rated loads.

The carrier must have rigid guide rails to prevent disengagement or jamming.

The carrier must be supplied with effective devices that keep it within the guide rails in the event of a breakdown of the limit cams or the normal guide rollers. The carrier must be supplied with the mechanical means to prevent derailment from the guide rails. These means must function both during normal operation and during assembly, disassembly and maintenance.

The floor and every no-step area must be designed to resist the rated loads, to be constructed of non-skid materials (for example, checkered plate) and allow for unobstructed water drainage. The carrier must have the shape of a cage with the characteristics made reference to in 5.1.2.

In cases where the equipment satisfies the following listed conditions:

- a – maximum rated speed no higher than 0.2 m/s
- b -- number of transported persons no greater than 8,
- c – controlled only by a competent person on board the carrier
- d – “hold to run” controls to enable maintained action,
- e -- distance between the moving parts of the hoist and the parts of the elevator fixed to the plans of access and transit (composed of the base of the perimeter fence) ≥ 50 cm.

then the carrier may consist of a platform with the characteristics set forth in 5.13 of a platform with the characteristics referenced in 5.13.

5.1.2 THE CAGE

The cage shall take the form of a fully enclosed cage.

For prescribing the maximum number of persons permitted in the cage, a cage floor area of 0.2 m² shall be used; each person shall be considered to weigh 80 kg.

5.1.2.1 CAGE WALLS

The cage walls must extend to the full height between the floor and the roof, and must conform to 5.2.4 letter a).

Regarding perforation, the walls must satisfy the requirements in UNI EN 294:1993 (Table 4), but the openings must not allow for passage of a 25 mm. sphere. Any hazardous overhanging projection shall be marked according to ISO 3864:1984.

5.1.2.2 CAGE ROOF

The cage must be equipped with a roof. The minimal interior height clearance shall be 2.0 m. For the transportation of long materials, a maximum opening of 0.15 m² may be provided if it is assured that the materials will not protrude outside the hoistway when in use (paragraph 7.3.2.). The opening must be provided with a locking latch.

If the roof is perforated, the openings must not allow for passage of a sphere of 25 mm.

5.1.2.3 CAGE GATES

The opening of the gate shall have a minimal height clearance of 2.0 m and a minimal clear width of 0.6 m. The gate shall cover the opening completely. Regarding perforation, the walls must satisfy the requirements in UNI EN 294:1993, but the openings must not allow for passage of a 25 mm. sphere. The non-perforated gates, when installed, shall be supplied with a panel that provides a view of the landing threshold.

The gates design shall be in compliance with the provisions on 5.2.3 from letter c) through f) and to 5.2.3.2 (letter f).

The gates shall be fitted with mechanical locks such that, under operating conditions, it shall not be possible to open any cage gate unless the cage floor is within ± 0.25 m of a landing.

It shall not be possible under operating conditions to start and keep the cage in motion unless all cage gates are in the closed position.

Means shall be provided to reduce any horizontal distance between the sill of the cage and the sill of the landing, as well as any openings between the cage and the landing access side protection of not more than 150 mm before the cage gate can be opened, unless this is achieved by the action of opening the gate.

5.1.3 PLATFORM

5.1.3.1 PLATFORM WALLS

All sides of the platform shall be equipped with a fixed guard rail safely attached to the platform. The guard rail shall have a height of at least 1.1 m and must consist of: at least a handrail, a non perforated toe-rail of height no less than 0.15 m and an intermediate cross girder placed at no more than 0.5 m. above the toe-rail, and at no more than 0.5 m under the handrail. Moreover, in order to prevent material from falling, all sides of the

platform must be equipped (besides the toe-rail and up to a minimal height of 0.6 m from the platform floor) with a protection consisting of at least perforated panels with maximum openings of 50x50 mm or fissures with widths not greater than 20 mm.

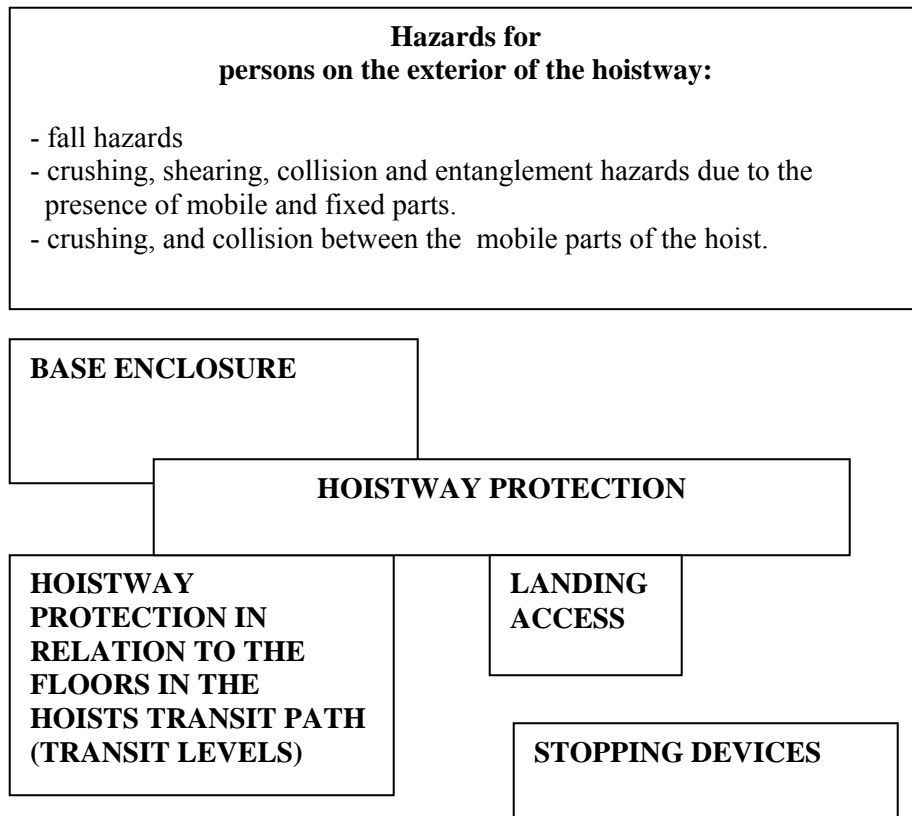
The side of the platform facing the mast must be equipped with a guard of 2 m. in height. The width of the guard must exceed the mast by at least 0.2 m on every side, but not exceed the width of the platform. The dimension of every perforation in the guard must conform to UNI EN 294:1993. If the guard must be removed in order to allow for assembly, disassembly, or maintenance, the positioning of protection of the guard must be interlocked with the movement of the platform.

The walls of the platform must conform to 5.2.4 letter a) and b)

5.1.3.2 PLATFORM GATES

Opening the gate and the devices for disembarking from the platform shall only be possible by an intentional manual action.

It shall not be possible, under normal conditions of operation, either to start or maintain the platform in motion, unless the gates or disembarking devices of the platform are not in closed position and the platform and the relative safety devices are not in the correct position of operation.



5.2 HOISTWAY PROTECTION

When installed for use, and to prevent persons from being struck by moving parts and from falling down the hoistway, the hoist shall have:

- base enclosure;
- hoistway protection;
- landing gates at every point of access.

5.2.1 BASE ENCLOSURE

5.2.1.1 FULL HEIGHT BASE ENCLOSURE

The hoist's base enclosure shall protect all sides to a height of 2.0 m and must conform to 5.2.4 and to UNI EN 294:1993, Table 1. When, for maintenance purposes, the base enclosure is accessed by the base enclosure gate, it shall be opened from the inside.

5.2.1.2 REDUCED HEIGHT BASE ENCLOSURE

In cases where the carrier conforms to 5.1.3 the height of the base hoist's base enclosure can be lower than 2.0 m but not lower than 1.1 m, provided that:

- a) the distance between the base enclosure, and every part of the hoist in motion is not greater than 2 m (where it reduces the probability of accumulation of debris inside the base enclosure);
- b) the base enclosure consists of at least a guard rail provided with an intermediate cross girder, with a free space not greater than 0.6 m;
- c) the protection shall conform to 5.2.4;
- d) the carrier's stopping distance, loaded and rated speed shall not be greater than 0.2 m. in the downward direction;
- e) during the descent phase the carrier stops automatically at 2.5 m from the base and it takes off again only following a manual command from the operator of the carrier;
- f) the hoist is equipped with a sound warning mechanism which emits continuous signals when the carrier is approached at less than 2.5 m from the base or from whichever part is closest to it.

5.2.1.3 PRESSURE SENSITIVE DEVICE

In cases where the carrier conforms to 5.1.3, and conditions d) and f) of 5.2.1.2 are followed as an alternative to the base enclosure at reduced height and its gate, it is possible to install at the lower end of the carrier a pressure sensitive device that stops and holds the carrier stationary in case of contact with persons in any position on its projection from the base, such that no harm is done to the persons.

5.2.2 PROTECTION OF THE HOISTWAY IN RELATION TO THE TRANSIT LEVELS

Where the distance between the transit level (floor of transit along the path of the hoist) and any mobile part of the hoist is less than 0.85 m (that is 0.5 m if the rated speed is not greater than 0.7 m/s), a protection of the hoistway must be provided in compliance with UNI EN 294:1993, Table 1, of minimum height equal to 2.0 m or which can extend to the entire height from floor to ceiling where this would be found at less than 2 m; such protection must conform to 5.2.4.

Where the distance between the transit level and any mobile part of the hoist is equal or greater than 0.85 m (that is 0.5 m or greater if the rated speed is not greater than 0.7 m/s), a fixed protection of up to 1.1 m of minimum height, consisting of at least a handrail, a transverse beam at half height, and a non perforated toe-rail having a minimum height of at least 15 cm must be provided. Such protection must conform to 5.2.4.

5.2.3 LANDING ACCESS

When the hoist is assembled, it must be provided with landing gates in the hoistway protection at every point of entry including the base enclosure

- a) landing gates shall not open toward the hoistway;
- b) landing gates must conform to the provisions in 5.2.4. When the gate is made from non perforated material, the user shall be able to know that the carrier is at the landing.
- c) landing gates must be dimensioned correctly and designed taking into account the environmental and atmospheric effects.

- d) horizontal and vertical sliding gates shall be guided, and their movement shall be limited by mechanical stops;
- e) vertical sliding gate panels shall be supported by at least two independent suspension elements;
- f) landing gates must not be able to be opened or closed by a device set in action mechanically, or by any other means, operated by movement of the carrier.

5.2.3.1 FULL HEIGHT GATES (figure 1)

The height of the clear opening in the landing gate frame shall be not less than 2.0 m above the landing threshold. In exceptional cases, when the clear access height into the building is less than 2.0 m, then a reduced height landing gate framework is permitted; however,, under no circumstances shall the height clearance in the frame of the gate be less than 1.8 m above the landing threshold.

Means shall be provided to reduce automatically any vertical openings between the cage and the lateral protection of the landing to no more than 150 mm before access can be achieved between the cage and the landing.

The horizontal distance between the sill of the cage and the sill of the landing shall not exceed 50 mm during loading and unloading. When closed, the landing gates shall fill the hoistway openings. Any openings around the edges of every gate or between sections of the gates must conform to UNI EN 294:1993, Table 4, except under the gate where the opening must not be greater than 35 mm.

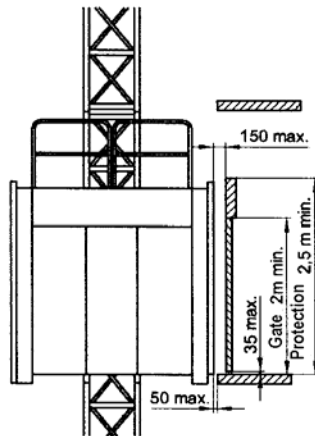


Figure – 1 One example of full height landing gate

5.2.3.2 REDUCED HEIGHT GATES (figure 2 and 3)

Except for the base enclosure a reduced height gate is permissible and 5.2.3.1 does not apply provided that the following measures are fulfilled:

- a) the gate has a height of between 1.1 m and 1.2 m;
 - b) distance A (see figures 2 and 3) between the top of the gate, measured from the surface of the gate towards the landing, and whichever part in motion of the hoist in normal operation is less than 0.85 m, if the rated speed is greater than 0.7 m/s, or 0.5 m if the rated speed is not greater than 0.7 m/s.
- Distance B (to see 2 figure and figure 3) between the top of the gate, measured from the surface of the gate towards the hoistway, and whichever part in motion of the hoist in

- normal operation is not less than 0.75 m, if the rated speed is greater than 0.7 m/s or 0.4 m if the rated speed is not greater than 0.7 m/s;
- c) the gate covers the entire width of the opening and consists of at least a handrail, a transverse beam at half height, and a non-perforated toe-rail having a height of at least 150 mm above the floor, and with a clearance to the floor of a maximum 35 mm. If, below the handrail at 1.1 m – 1.2 m height, any parts of the gate facing the landing are less than 0.5 m from the moving part of the hoist, any opening in the gate shall be protected with material that does not allow the passage of a 50 mm sphere;
- d) the outside edge of the closed landing gate facing the hoist is no farther than 200 mm from the landing threshold;
- e) the landing access side protection is provided for a height of between 1.1 m and 1.2 m and is equipped with at least a handrail, a transverse beam at half height, and a non-perforated toe-rail having a height of at least 150 mm above the floor;
- f) means are provided to reduce automatically any horizontal distance between the sill of the carrier and the sill of the landings, as well as any vertical openings between the carrier and the landing access side protection at a distance not greater than 150 mm before the landing gate is open and at all times while it remains open with the cage at the landing. If the carrier's design conforms to 5.1.3, the requirements are deemed satisfied. This also applies when the reduction of the aforesaid distances occurs as a direct result of the opening of the carrier's gates (manual or mechanical);
- g) if the side protection is part of the landing and remains in the safety distance of 0.85 or 0.5 m during the vertical movement of the carrier, then the minimal opening between the carrier and the side protection shall be 100 mm;
- h) means are provided to reduce any horizontal distance between the sill of the carrier and the sill of the landing to no more than 50 mm during the disembarkation/boarding and/or the loading/unloading.

- $A > 0.5 \text{ m} \quad v < 0.7 \text{ m/s}$
 $A > 0.85 \text{ m} \quad v > 0.7 \text{ m/s}$
 $B > 0.4 \text{ m} \quad v < 0.7 \text{ m/s}$
 $B > 0.75 \text{ m} \quad v > 0.7 \text{ m/s}$
 $C = 1.1 \text{ m} - 1.2 \text{ m}$

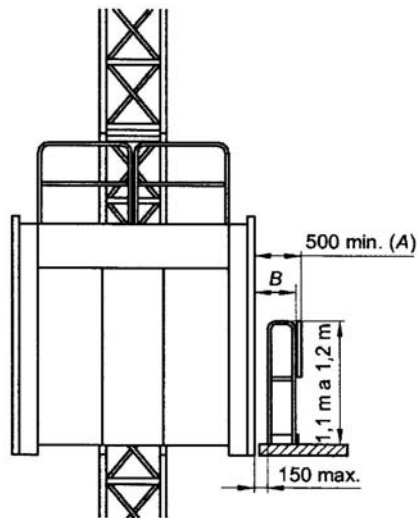


Figure 2. One example of a low height gate with minimum 500 mm safety distance (A)

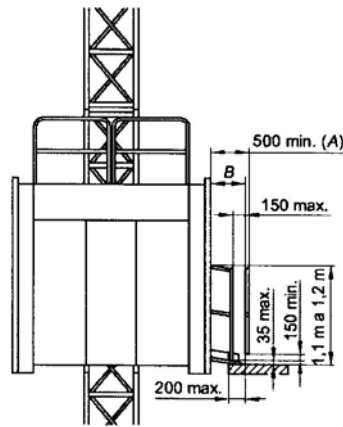


Figure 3. One example of a low height gate with minimum 500 mm safety distance (A) and ramp on the cage to fill the gap

5.2.3.3 LOW BASE ENCLOSURE GATES (figure 2)

If the carrier is designed in compliance with 5.1.3, a reduced height gate is permitted and the requirements from 5.2.3.1 do not apply on condition that the following measures are taken:

- the enclosure base height is reduced in compliance with 5.2.1.2;
- the height of the gate is equal to at least the height of the hoist's base enclosure;
- the gate covers the entire width of the base enclosure's opening;
- the gate shall be designed in compliance with 5.2.4;
- the gate consists of at least a handrail having an intermediate cross girder at a distance such to avoid vertical empty spaces greater than 0.6 m.

5.2.3.4 GATE LOCKING DEVICES

5.2.3.4.1 GATES IN ACCORDANCE WITH 5.2.3.1 (full height gates)

Under normal operating conditions, it shall not be possible:

- to open any landing gate unless the floor of the cage is within ± 0.25 m of that particular landing;
- to start or keep the cage in motion unless all landing gates are in closed position, except during any re-leveling movement. All landing gates must be able to be unblocked from the landing with the aid of a special key, e.g. unlocking triangle.

5.2.3.4.2 GATES IN ACCORDANCE WITH 5.2.3.2 (reduced height gates)

a) The landing gates shall be provided with a self locking device that can be released manually. It shall not be possible under normal operating conditions to start and keep the carrier in motion unless all landing gates are closed and locked, except during any re-leveling movement.

b) If the carrier is designed in compliance with 5.1.3, as an alternative to what is required in point a), it is possible to equip the landing gates with a mechanical device that is not easy to bypass, and which is interlocked with the disembarkation device.

fixed to the support of the cargo. Such an interlocking device must not allow the opening of the landing gate until the disembarkation device has reached its final opening position and it must not allow the removal of the disembarkation device until the gate is closed and blocked.

5.2.3.4.3 BASE ENCLOSURE GATES IN ACCORDANCE WITH TO 5.2.3.3 (reduced height gates)

It shall not be possible to start and keep the carrier in motion unless the base enclosure gate is in closed position.

5.2.4 MATERIALS FOR ENCLOSURE AND GUARDING

- a) The full landing gates must possess mechanical strength such that in the locked position and when a force of 300 N is applied at right angles to the gate at any point on either face, the force being applied using a rigid square or round flat face of 5 mm², they shall
- resist without permanent deformation;
 - resist without elastic deformation greater than 30 mm;
 - operate satisfactorily after such a test.

When a force of 600 N is applied at right angles to the gate at any point of either face, the force being applied using a rigid square or round flat face of 5 mm², may fail the above criteria but shall remain secure.

b) The reduced height landing gates in accordance with 5.2.3.2 and 5.2.3.3 must possess mechanical strength such that when a force of 1kN is applied at right angles at any point along the top of the gate, and separately when a force of 300N is applied horizontally at any point along the top bar,,the intermediate bar and the toe-rail must be able to:

- resist without permanent deformation;
- operate satisfactorily after such a test.

c) The hoistway protection shall withstand the same force and achieve the same resistance as indicated in a) and b).

d) the size of any perforation or opening in the hoistway protection and gates, when closed, in relation to the clearances from adjacent moving parts, shall be in accordance with UNI EN 294:1993, Table 4, except where the distance between the hoistway protection and gates and any traveling part of the hoist in normal operation is not less than 0.85 m, if the rated speed exceeds 0.7 m/s or 0.5 m if the rated speed is not more than 0.7 m/s.

2.5 STOPPING DEVICES

The following devices shall be provided for stopping and maintaining the hoist out of service, including any power operated gates positioned:

- a) outside the base enclosure
- b) on the cage roof, if intended to be accessible

- c) at the installation/service/inspection control device
- d) on board the carrier
- e) outside the base enclosure in cases where the solution provided in 5.2.1.2 is adopted
- f) in proximity of the hoist base and in easy to reach position, in case the solution provided in 5.2.1.3 is adopted

The stopping device in a) must be a stopping device in compliance with UNI EN 1037:1997 and its function must clearly be marked. The stopping devices in b), c) e) and f) shall be emergency stopping devices in compliance with UNI EN 418:1994, Category 0.

**Crushing hazards for maintenance workers between
the carrier and the fixed parts at the end of the
hoistway**

SAFETY DISTANCE AND CLEARANCES

CLEARANCES UNDER THE CARRIER

5.3 SAFETY DISTANCES AND CLEARANCES UNDER THE CARRIER

All the safety distances not already established in these guidelines, must conform to UNI EN 294:1993 and UNI EN 811:1998. All the free spaces shall conform to UNI EN 349:1994.

In order to provide safe access under the carrier, for maintenance purposes, a mechanical blocking device must be provided to create a minimum vertical distance (a moveable prop or equivalent) of at least 1.8 m. Such clearance/distance shall extend under the entire area of the carrier. The assembly and dismantling of the aforementioned blocking devices must be able to take place outside of the projection area of the carrier.

Falling, crushing, shearing, collision, and other hazards for persons transported due to vertical free-fall of the carrier

Safety device to prevent the carrier from falling

5.4 SAFETY DEVICE TO PREVENT THE CARRIER FROM FALLING.

Hoists with travel distance longer than 2.0 m shall be fitted with a safety device to prevent the carrier from falling.

Falling, crushing, shearing, collision and other hazards for persons transported, due to collision of the carrier against the fixed stops at the end of the “hoistway,” or carrier separation from the mast/vertical guide

Automatic end stops

5.5 AUTOMATIC END STOPS

The hoists shall be equipped with a mechanical stopping device for arrest of the travel distance. The hoists shall also be equipped with end-stop switches which become engaged before engaging the mechanical device.

**Falling or collision hazards for persons transported
due to uncontrolled movements of the carrier when
descending with a disengaged motor**

Descent with engaged motor

5.6 DESCENT WITH ENGAGED MOTOR

Under normal operation the hoist's movement must always take place with an engaged motor.

INSTRUCTION MANUAL

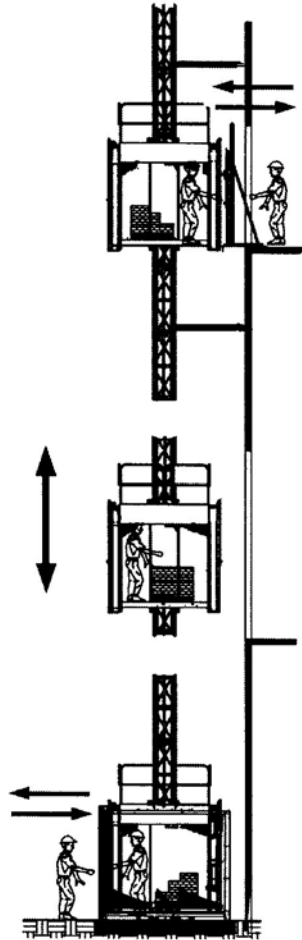
5.7 INSTRUCTION MANUAL

The hoist must be accompanied by an instruction manual, written in compliance with all provisions of UNI EN 292-2, which must clearly indicate the configurations foreseen by the manufacturer for installing the hoist. Where non-standard configurations are required, resorting to configurations not previewed is admissible, but these must be agreed upon between the manufacturer, the installer and the user, and information must be added as addendum to the instruction manual.

The instruction manual must supply detailed indications regarding the type, the characteristics, the positioning and the modalities of assembly for the hoistway protections needed at every landing of transit. The protections of the hoistway at any transit landing must be determined by the “user” according to the instructions supplied by the manufacturer in the instruction manual. In the instruction manual it must be clearly indicated that any envisioned reduced height enclosure does not have to be positioned at a distance less than 0.50 m in relation to the moveable parts of the hoist.

6. TYPES AND MAIN CHARACTERISTICS

The cargo (persons or materials) is transported inside a closed CAGE, fitted with WALLS of ≥ 2.0 m. HEIGHT and ROOF



Builder's hoist with loading cage

The NUMBER OF PERSONS who can be transported is a function of the rated capacity of the equipment and the weight of the loaded material:

$$n^{\circ} \text{ of persons} = \frac{\text{nominal range-loaded material [kg]}}{80 \text{ [kg]}}$$

The CONTROL devices for the movement of the cage can be installed in various positions:

in the cage
 at the base
 on the landings

The MANEUVER of the cage can be of varied types:

hold- to-run
 universal remote with push buttons
 maneuver reservation (reservation ascent / descent on request)

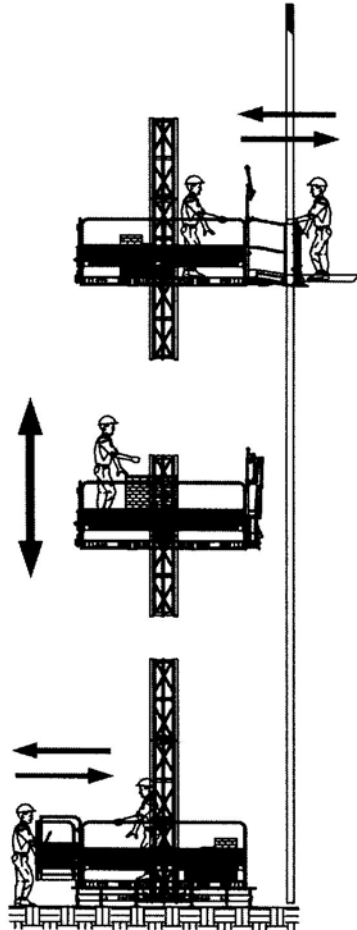
The SPEED of movement of the cage is established by the manufacturer. There are no reasons for its prior limitation

The DISTANCE of the moveable parts fixed to the cage from the fixed parts shall be $d \geq 0.5$ m from the landing gates if those are at reduced height (comprised between 1.1 and 1.2 m)

A BASE ENCLOSURE of $h_b \geq 2.0$ m height with a full height gate having an interlocking mechanical device with the cage and which is electrically controlled

BUILDER'S HOIST WITH LOADING CAGE

The cargo (persons or materials) is transported inside a PLATFORM, fitted with WALLS of ≥ 1.1 m. HEIGHT consisting of at least a top bar, an intermediate bar and a toe board (height ≥ 1.5 m)



Builder's hoist with loading cage

The NUMBER OF PERSONS that can be transported is given by:

$$n^{\circ} \text{ of persons} = \frac{\text{nominal range-loaded material [kg]}}{80 \quad [\text{kg}]}$$

but in each case the NUMBER OF TRANSPORTED PERSONS ≤ 8

The CONTROL devices for the normal movement of the platform shall be installed on board of the platform only

The MANEUVER of the cage shall be hold-to-run type and it can be operated by trained personnel only

The SPEED of movement of the platform must be $v \leq 0.2$ m/s

The DISTANCE of the moveable parts fixed to the platform from the fixed parts shall be $d \geq 0.5$ m

A BASE ENCLOSURE of $h_b \geq 2.0$ m height with a full height gate having an interlocking mechanical device with the cage and which is electrically controlled

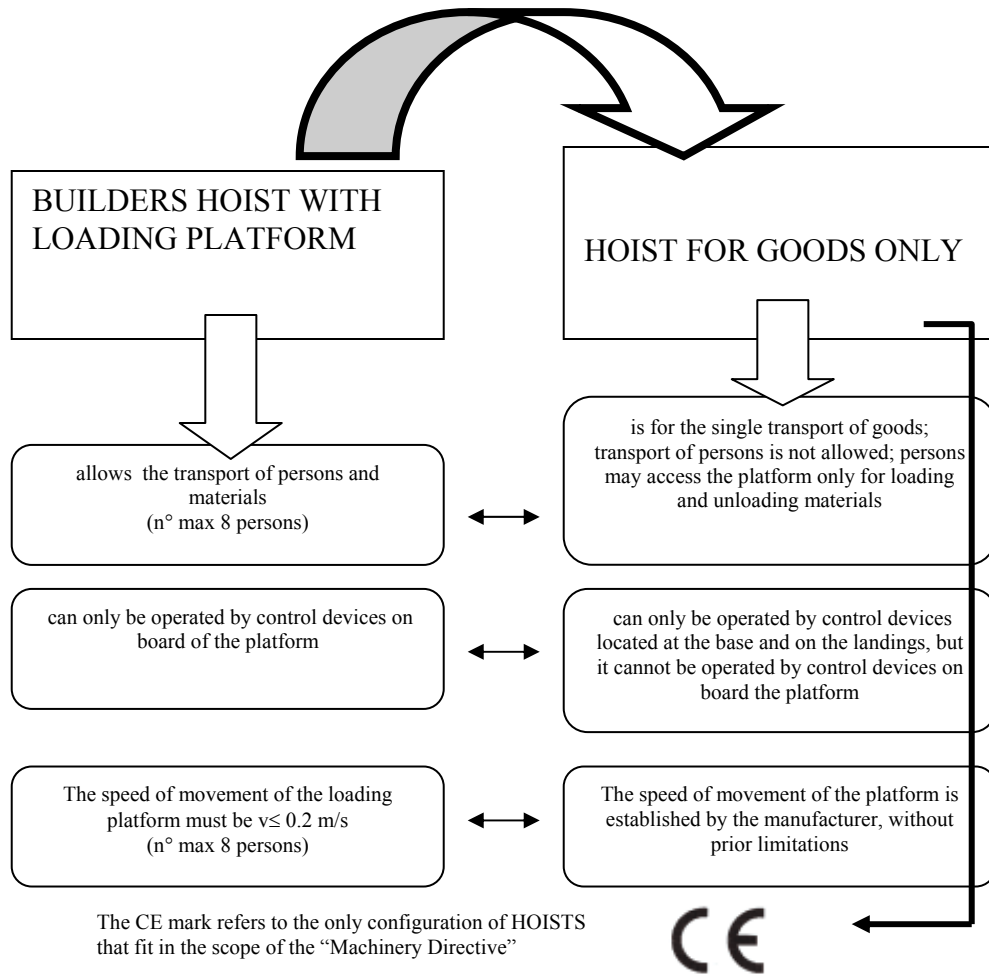
BUILDER'S HOIST WITH LOADING PLATFORM

PLEASE NOTE

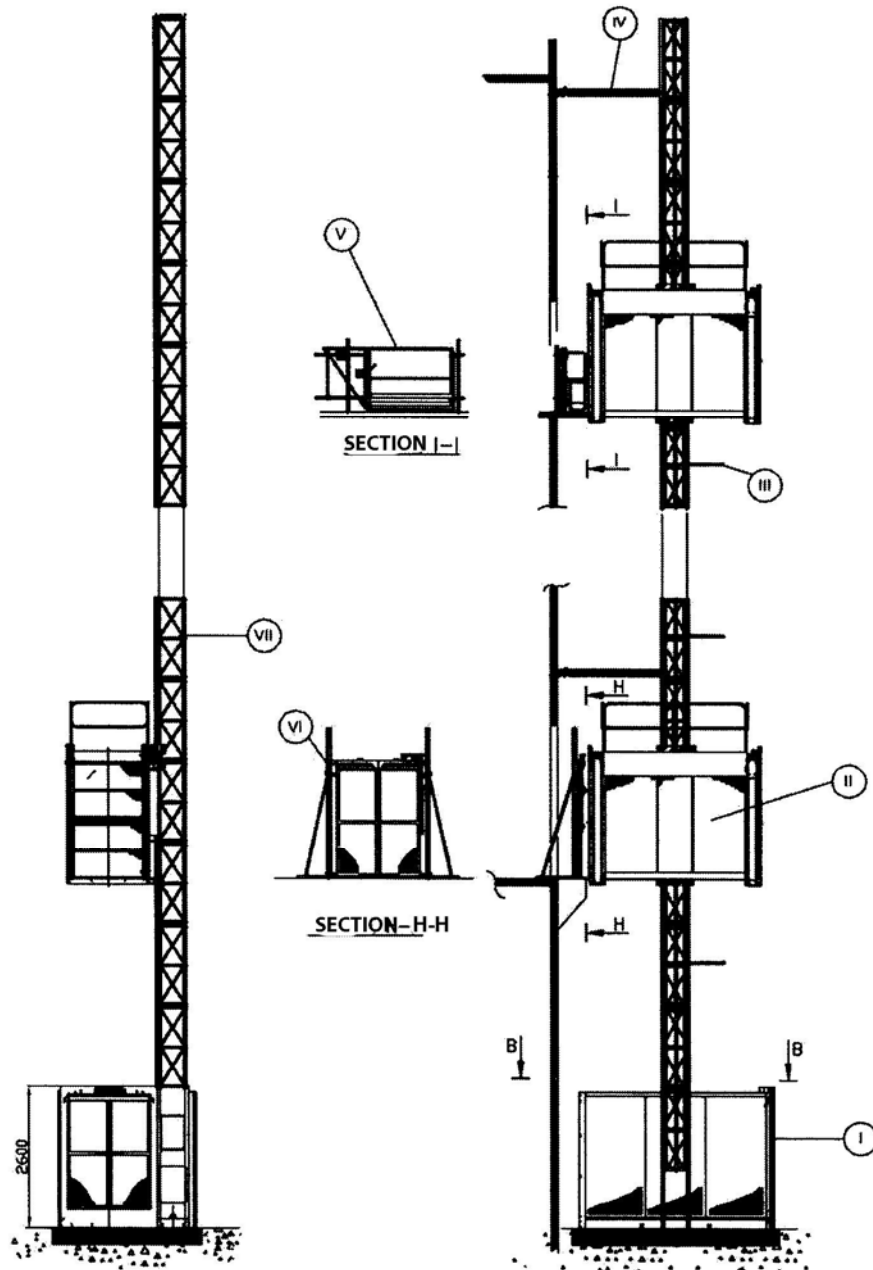
There are builders' hoists on the market with a loading platform (for persons and materials) that may be transformed into "hoist for goods only" while keeping the structure and mechanical equipment unchanged. The same equipment can be configured for use by changing the position, on an appropriate selector, to "builders hoist" (for persons and materials), or "hoist for goods only." In the selection for use as "hoist for goods only," the equipment shall be in compliance of essential safety requirements from the Machinery Directive (harmonized norm of reference is EN 12158-1).

ATTENTION

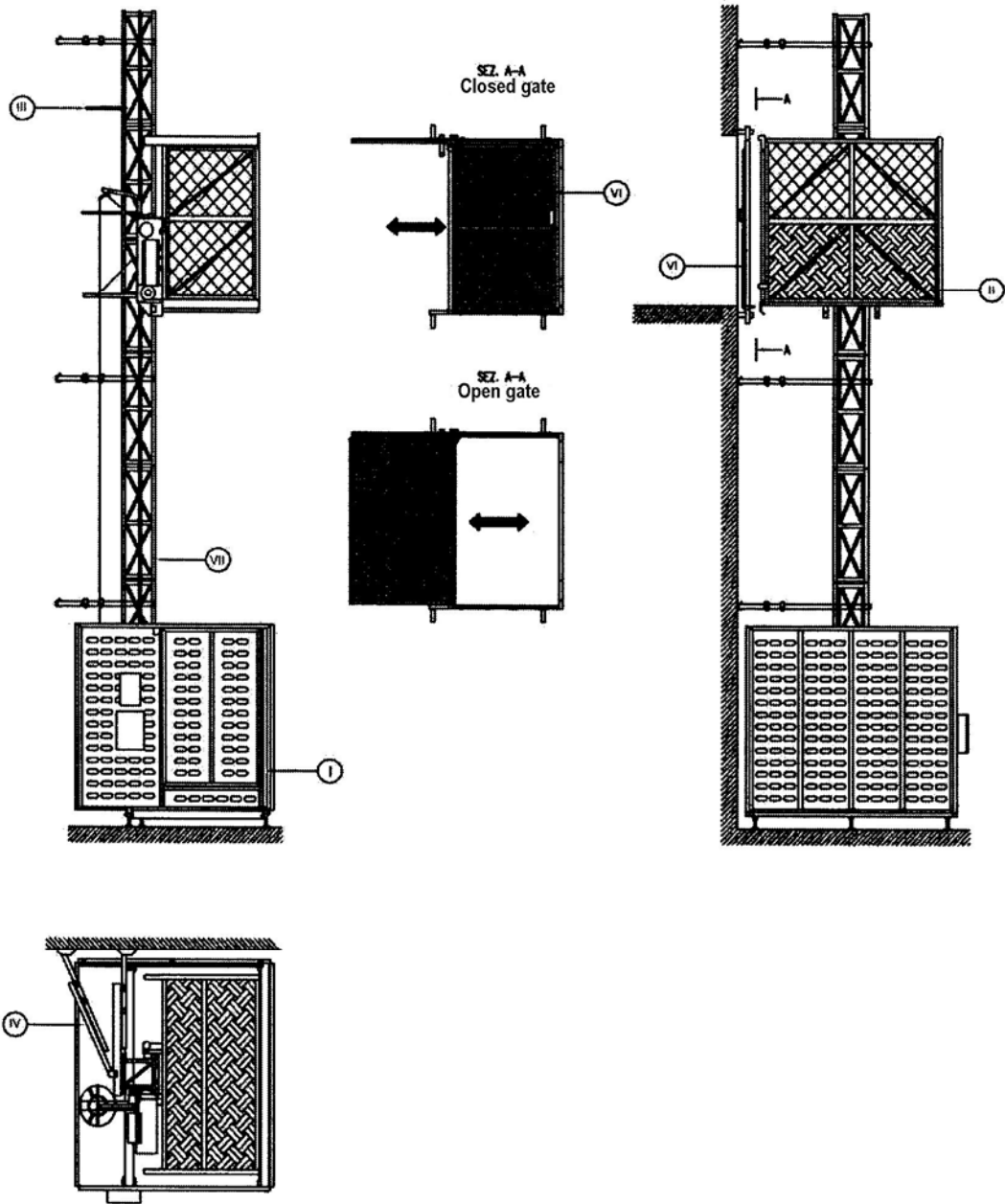
The use of the equipment in the two configurations is completely different. The Instruction manual that accompanies the machine must clearly show the two different uses and the relevant procedures. It is important to use them correctly.



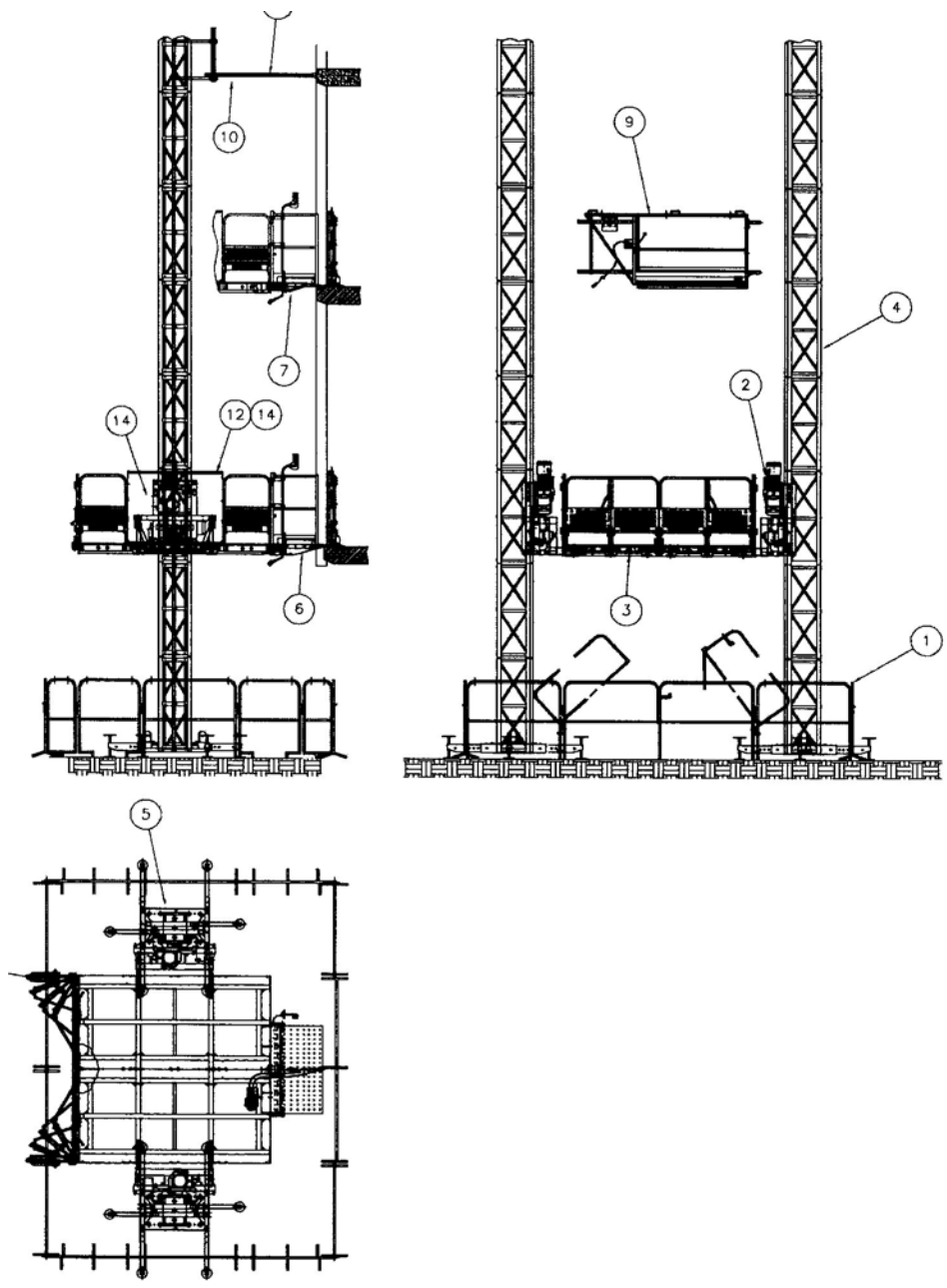
6.1 EXAMPLE OF EQUIPMENT CURRENTLY ON THE MARKET



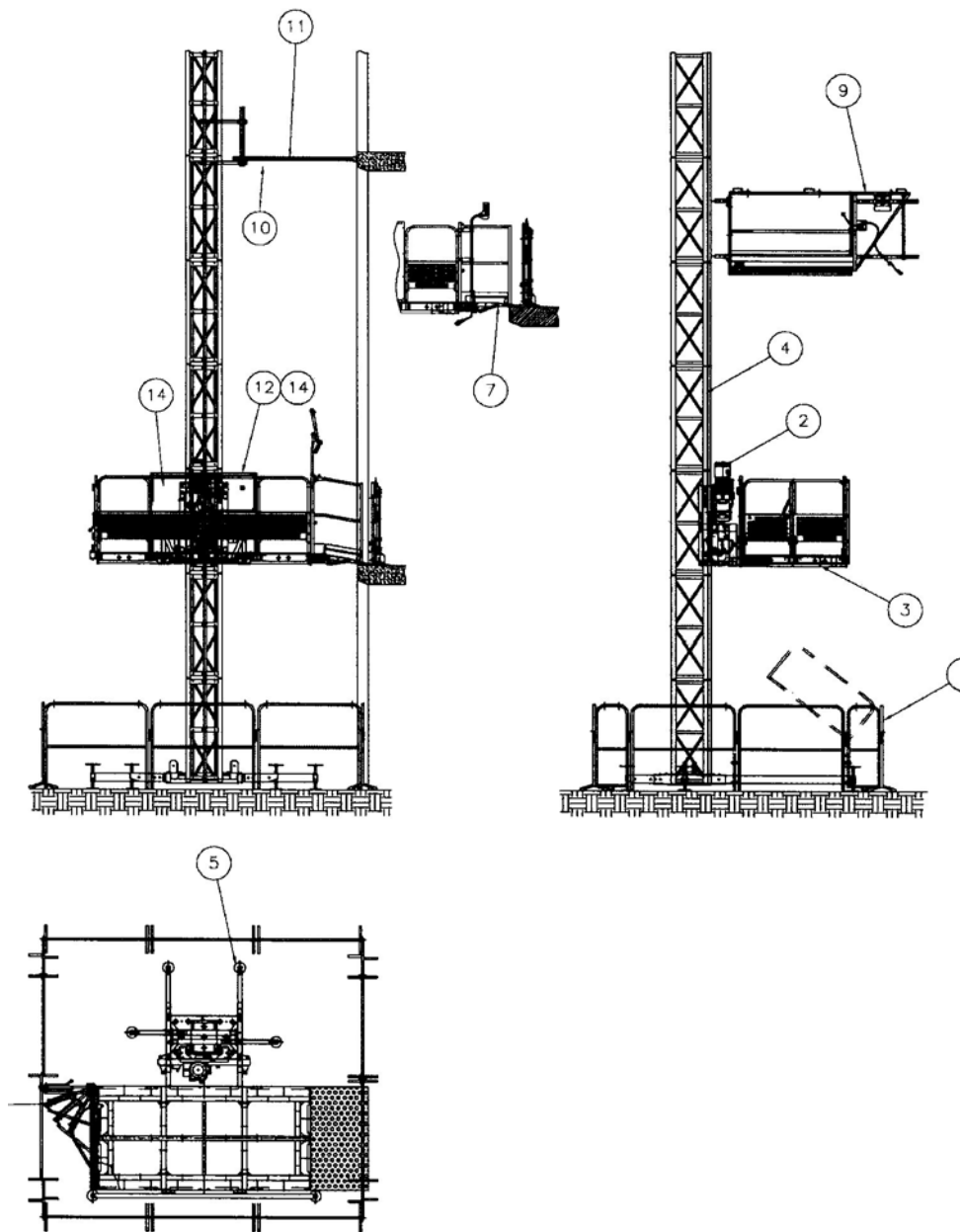
Builders hoist with loading cage
Main construction features (example n° 1)



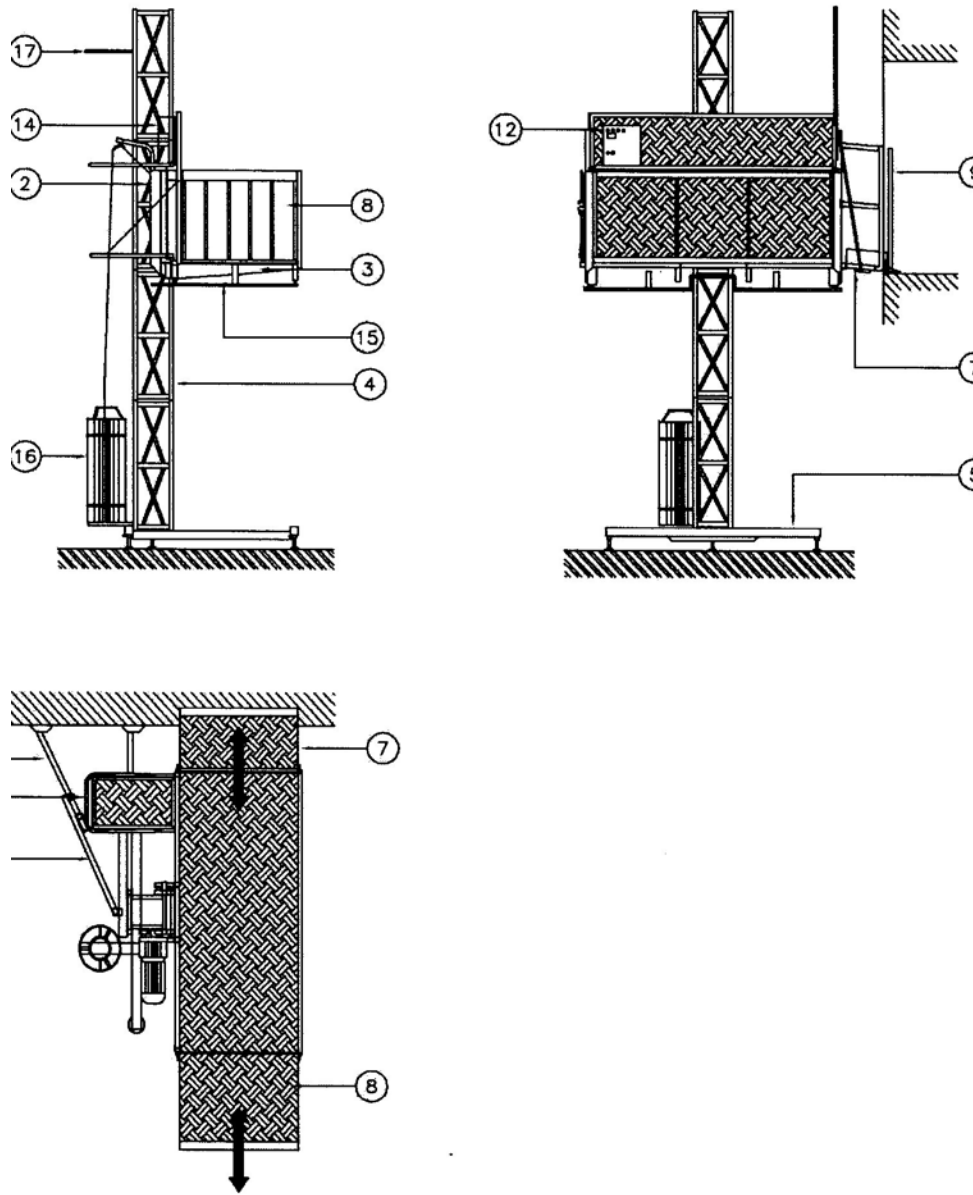
Builders hoist with loading cage
Main construction features (example n° 2)



Builders hoist with loading cage
 DOUBLE MAST TYPE WITH REDUCED HEIGHT BASE ENCLOSURE
 Main construction features



Builders hoist with loading cage
 SINGLE MAST TYPE WITH REDUCED HEIGHT BASE ENCLOSURE
 Main construction features



Builders hoist with loading cage
 SINGLE MAST TYPE WITH PRESSURE SENSITIVE DEVICE
 Main construction features

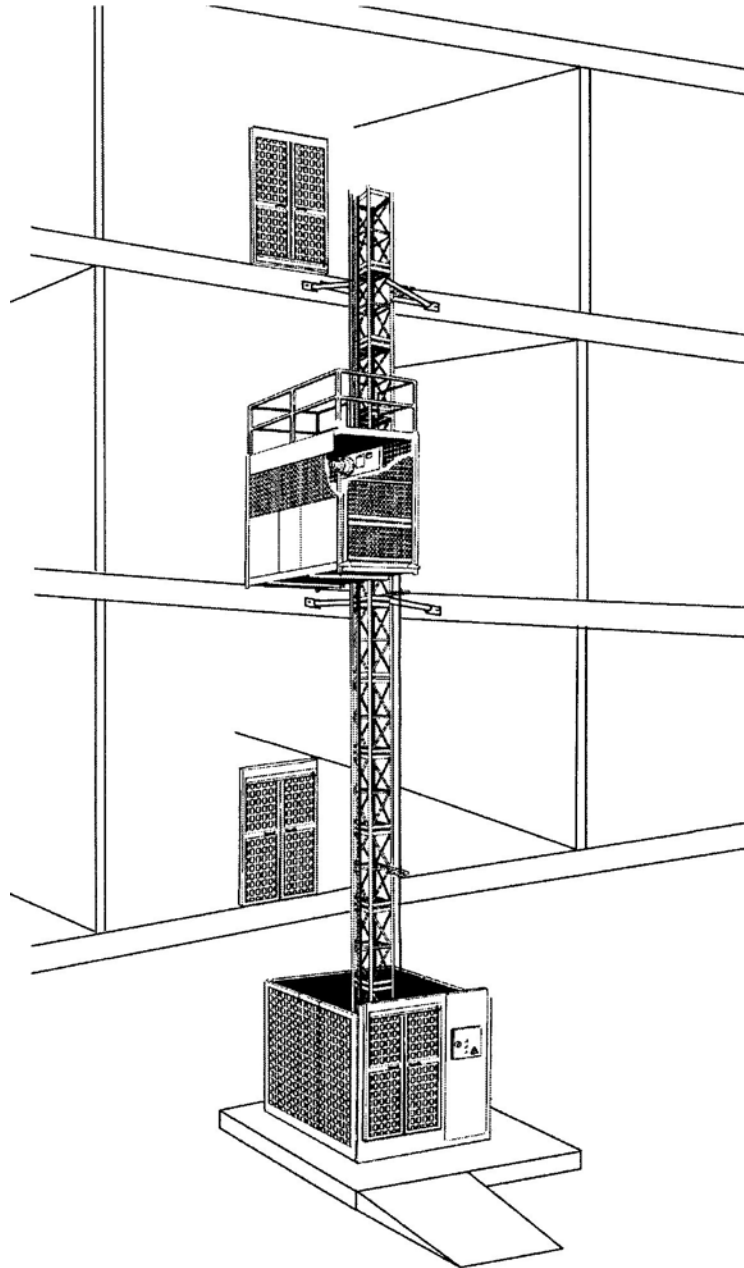
LEGEND

- I. Base enclosure
- II. Cage
- III. Cable guide
- IV. Anchorage
- V. Reduced height landing gate
- VI. Full height landing gate
- VII. Vertical guide element

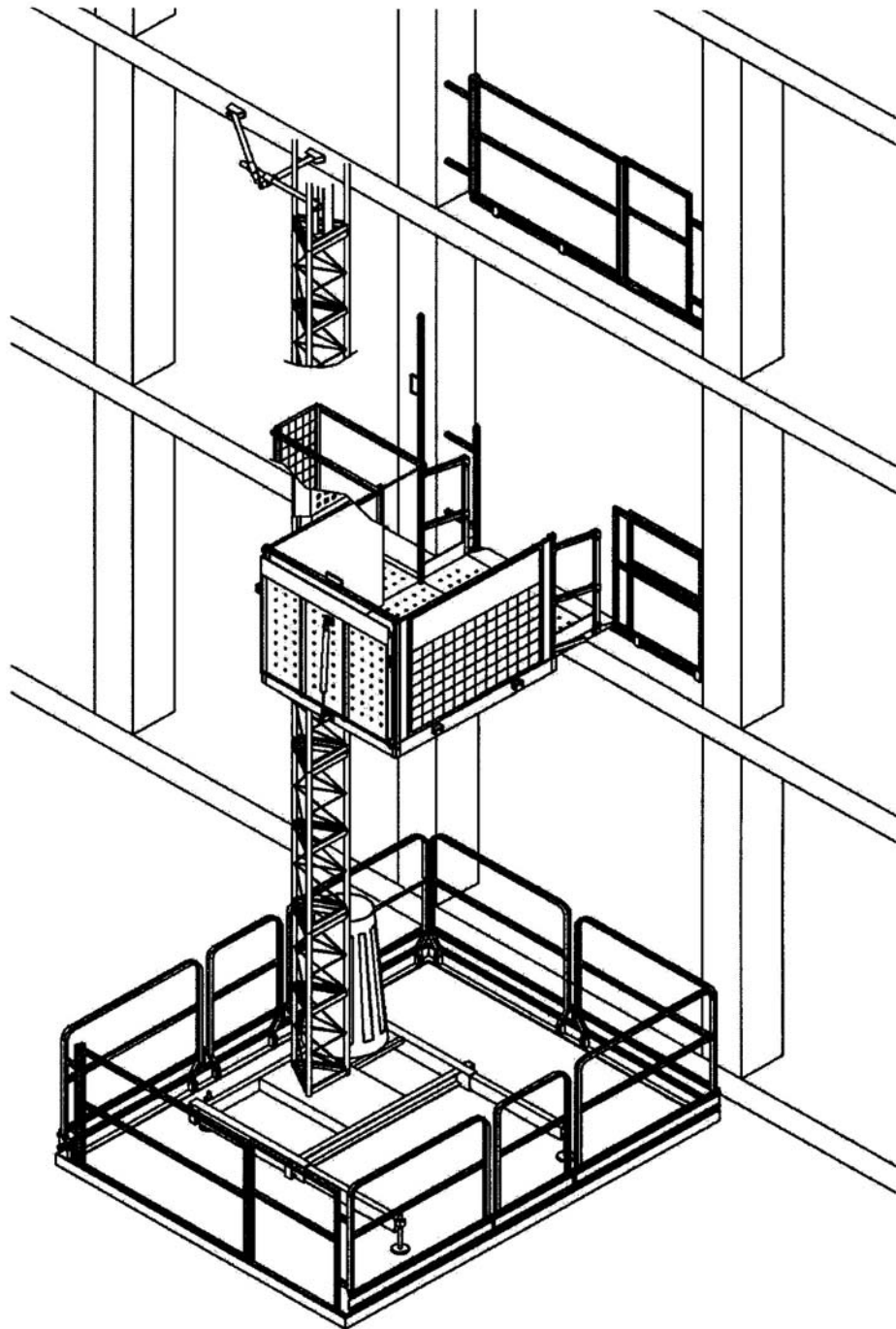
Builders hoist with loading cage

- 1. Base enclosure
- 2. Lifting group
- 3. Platform
- 4. Vertical guide element
- 5. Foundation
- 6. Self-supporting disembarking device
- 7. Disembarking device with support
- 8. Gate/Entry step board
- 9. Reduced height landing gate
- 10. Anchorage
- 11. Wall tubes
- 12. Control panel
- 13. Bed railing for hoist installation
- 14. Switchboard
- 15. Pressure sensitive device
- 16. Wire rope spooling system
- 17. Cable guide

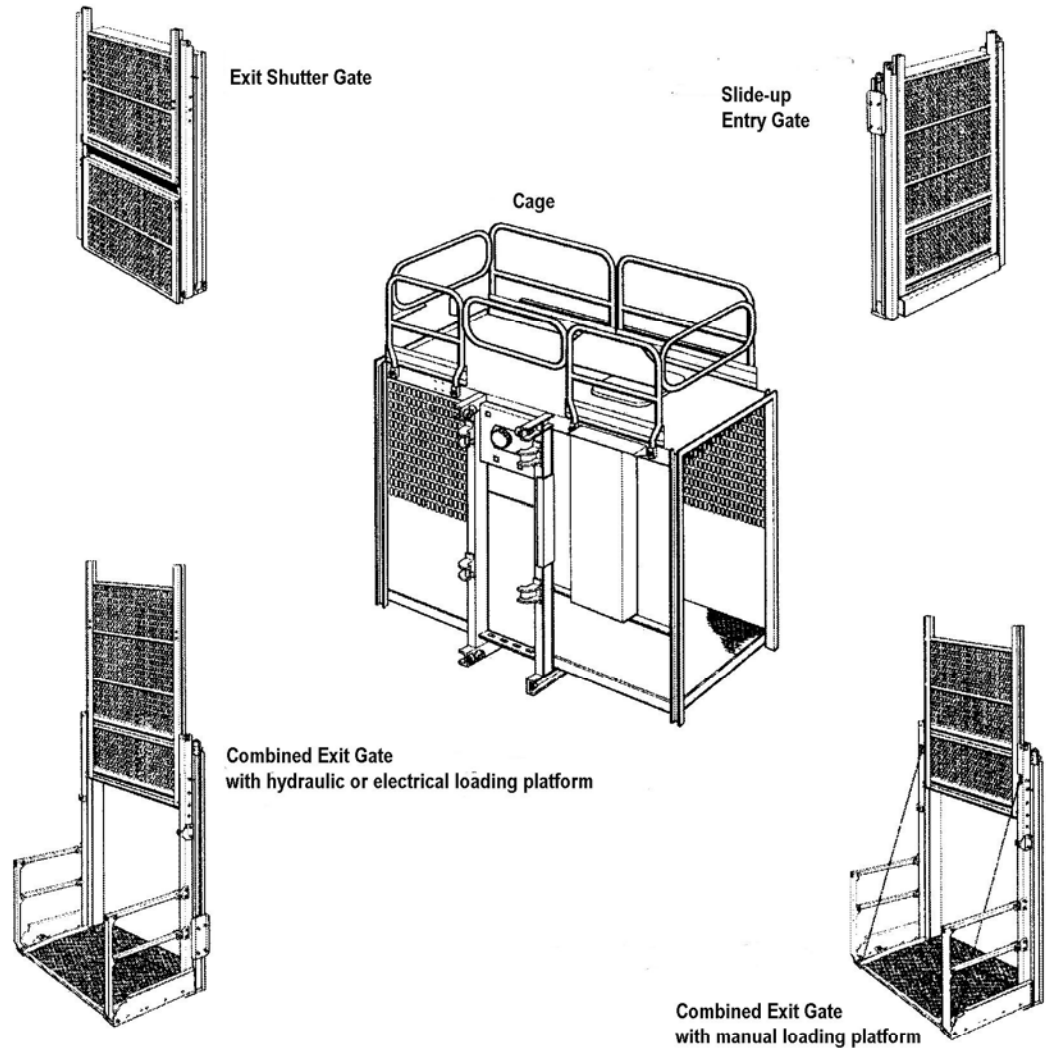
6.2 ASSEMBLY CONFIGURATIONS AND CONSTRUCTION DETAILS



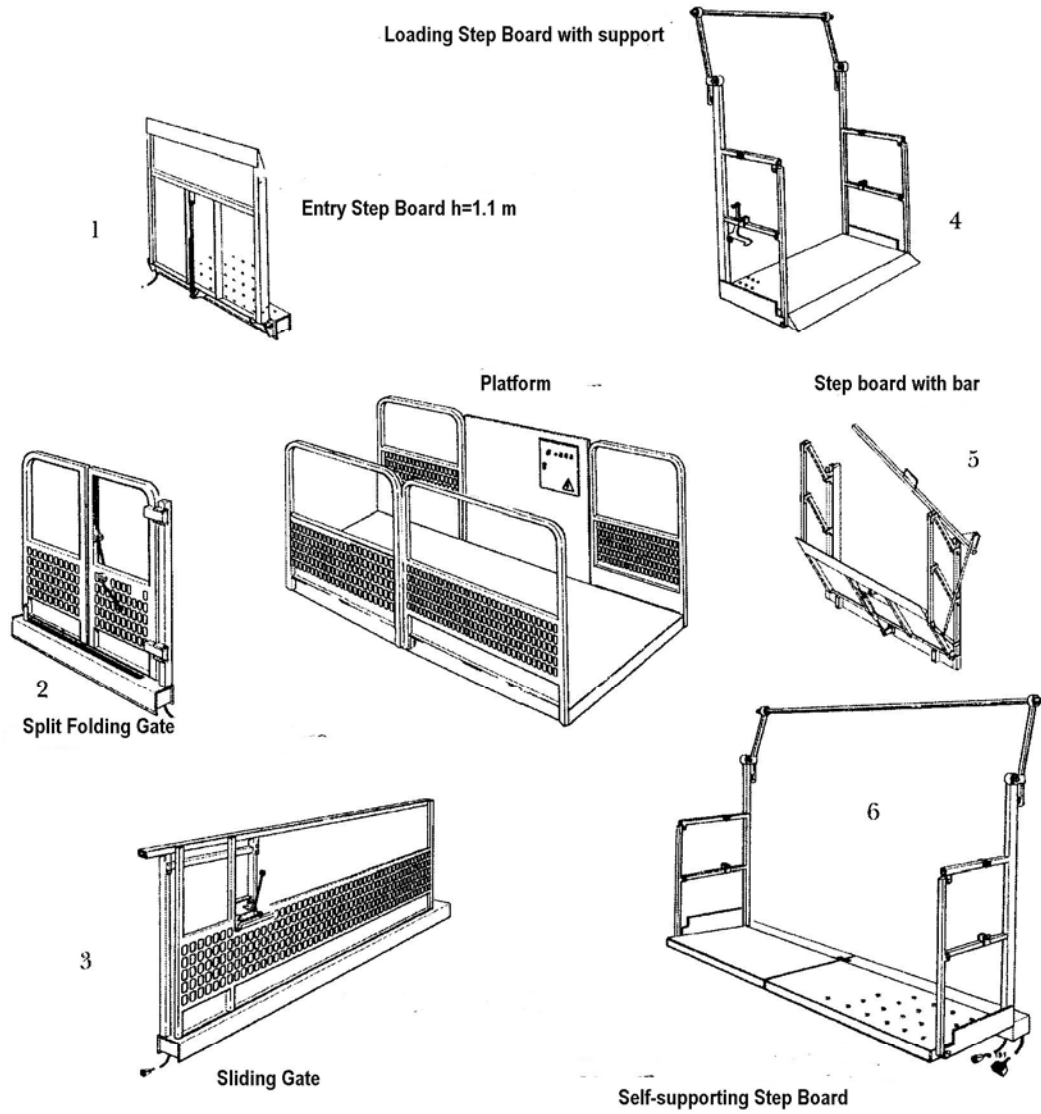
Builders hoist with loading cage



Builders hoist with loading cage

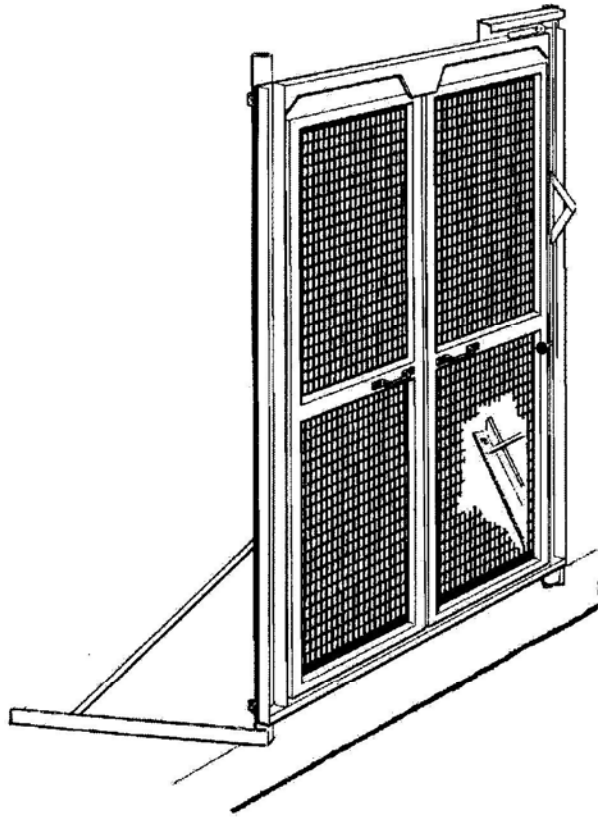


Cage in compliance with 5.1.2 and examples of landing devices

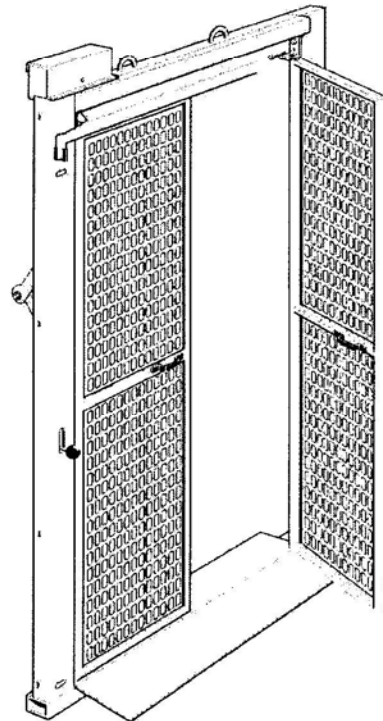


1, 2, 3: to ground level
 4, 5, 6: to floors

Platform in compliance with 5.1.3 and examples of landing devices



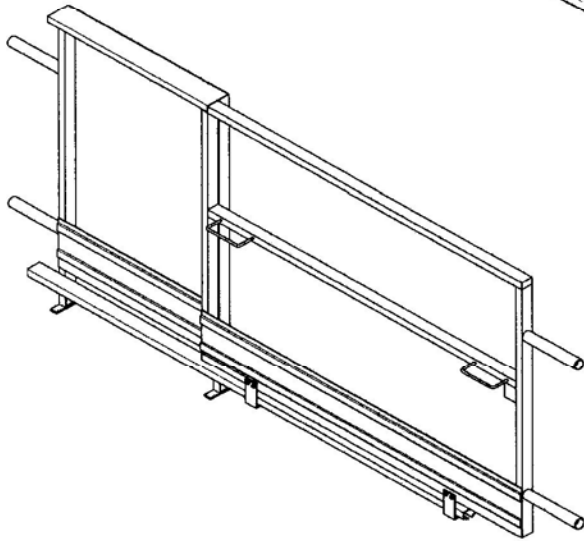
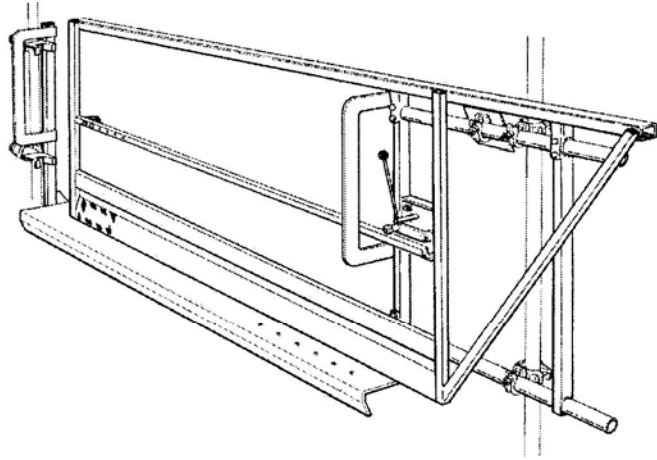
Side view of hoist with closed gate



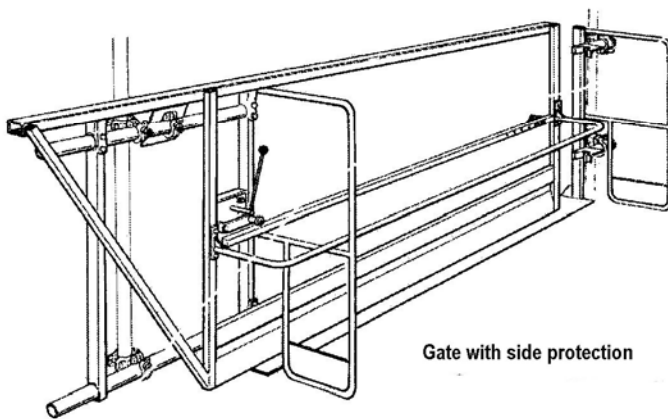
Side view of the building with open gate

Examples of full height landing gates, in compliance with 5.2.3.1 and 5.2.3.4.1

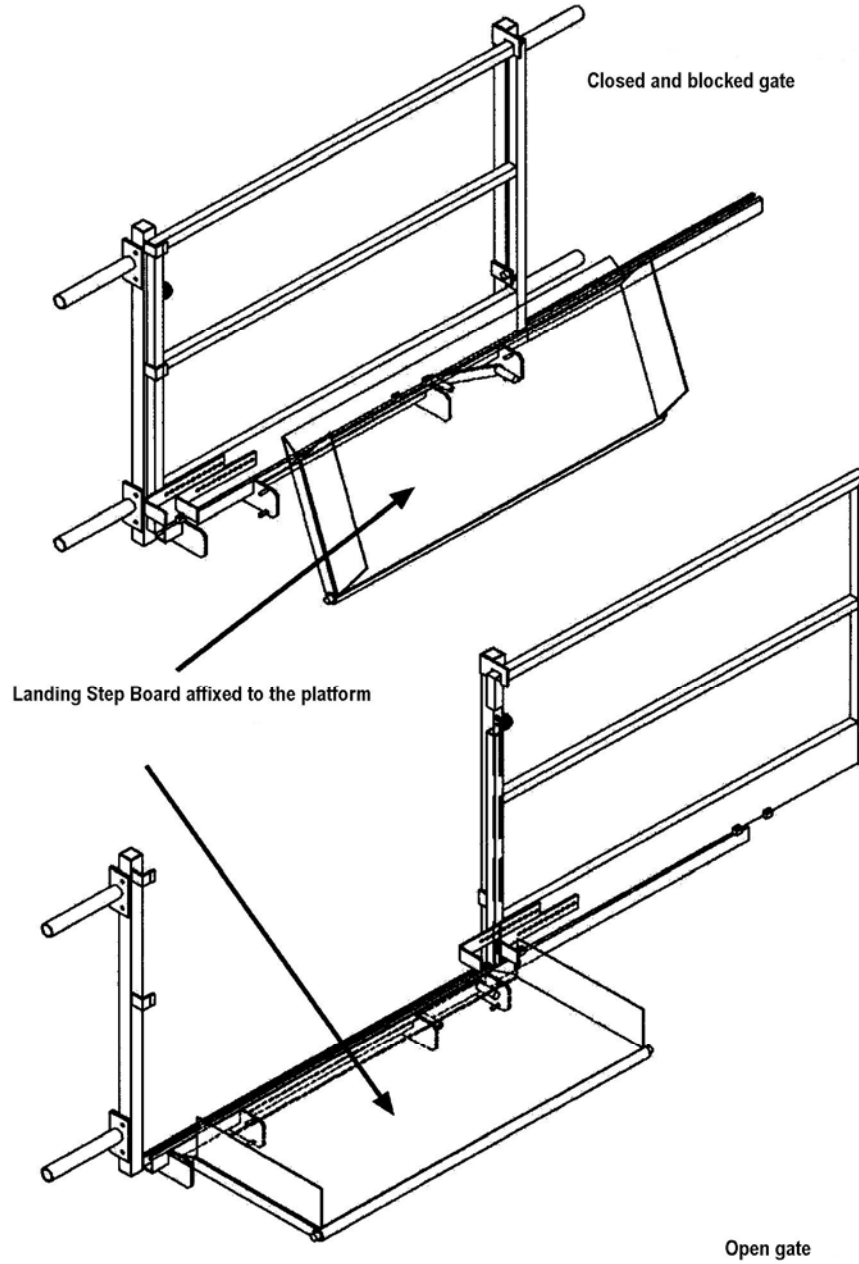
Gates without side protection



Gate with side protection



Examples of reduced height landing gates, in compliance with 5.2.3.2 and 5.2.3.4.2a



Examples of reduced height landing gates, in compliance with 5.2.3.2 and 5.2.3.4.2b

7. - RISK REDUCTION IN RELATION TO USE

7.1 – ACQUISITION, INSTALLATION AND DISMANTLING

The builders' hoist, because of its definition as "temporary," as opposed to other equipment installed permanently in the same place and with the same configuration, has a need for repeated assemblies, often in various configurations, as well as dismantling and transport from one site to another. Consequently, the manufacturer tends to adopt, as much as possible, technical solutions that can guarantee maximum flexibility in using the equipment. Also, the market has been structured in such a way as to offer a degree of flexibility that cannot be found in the construction field, allowing the user to better damp the costs of the necessary equipment over time. This result in middle-men, lenders and contractors who acquire the equipment from the manufacturer on a lease or rental basis, paying by the time period. Naturally, in view of the obvious advantages that this market structure offers, technical and organizational complications emerge that, if not addressed appropriately, can have significantly impact on the safety management of such equipment. This paragraph provides directives regarding the main safety measures to adopt in order to reduce the risks of "management" of the equipment.

7.1.1 - ACQUISITION OF THE EQUIPMENT

The acquisition phase of equipment represents the first stage towards reducing risks related to operating the hoist. At the very least, these minimum rules must be followed

Before acquiring a builders' hoist it is necessary to identify the type and the configuration most adapted to the specific requirements (type of worksite, requirements of use, etc.)

Collaboration between:

Supplier (Constructor or Middle-men)

Installer (Constructor, Middle-men, Specialized Company, User)

User

In order for the user to acquire and install equipment adapted to the requirements and the specific characteristics of its site, it is necessary that all interested parties collaborate and exchange all relevant information.

Upon executing the contract (purchase or lease) it is indispensable to specify in writing the respective attributes regarding activities that have an effect on safe use of the equipment

contractual definition regarding the obligation regarding:
installation - training of the staff
maintenance - dismantling - etc.

The User, the Supplier and Installer shall clearly agree on the respective contractual obligations and the ways that these must be carried out in order to avoid improper activities that could negatively affect equipment safety. In other words, they must stipulate the appropriate contractual clauses in order to guarantee the User the type of assistance and advice requested from the Supplier and the Installer.

7.1.2 – PLANNING OF INSTALLATION AND DISMANTLING

The planning and management of installation and dismantling operations must be conducted under the supervision of an ASSIGNED CONTROL BODY in possession of the specific information

- Before planning the hoist's assembly operations, the Installer, in close collaboration with the User and eventually with the assistance of the Supplier, must verify the suitability of the equipment to the specific site and identify the most appropriate configuration.

verification of the suitability of the equipment regarding:

characteristics of the site - specific previewed use

organizational requirements – operating personnel – any other specific factors

Particular attention must be paid to the choice of a suitable site for the hoist installation and to the "engineering" of disembarking at the landing levels.

At any landing of the building not intended for disembarkation (transit levels), suitable protection shall be provided (prescribed guard rails) in order to prevent persons from falling into the hoistway. The protections, in cases where they are not provided with the equipment and except in some contractual agreements, shall be decided by the User according to the indications in the hoist's Instruction manual. The Installer, however, is held responsible for the verification of the correct installation.

- Before planning the operations for the hoist's installation the Installer must coordinate with the User for the purpose of specific risk analysis of the equipment regarding its insertion in the site.

specific risk and site analysis

- Before planning the operations for the hoist's installation, the Installer shall verify that all the necessary documentation for the installation of the equipment is available in clear and comprehensible form, and eventually shall provide any missing document. In particular, the Installer will have to verify the presence of:

the equipment's support documents

(instruction manual, any certificates, etc.)

eventual executive project plan, or assessment of the structure on which the equipment will be installed

(with particular reference to the foundations and the parts on which anchorages will be made)

executive project plan, or assessment of the site concerning the installation

(with reference to the elevation, ground and underground)

executive project plan of the support plan of the equipment's support

(if necessary)

executive project plan of the premises destined to receive the anchorages of the equipment

- Before planning the operations for the hoist installation, the Installer shall produce or acquire the plan of the specific configuration to install, prepared on the basis of the documentation described above

executive plans of the configuration to install

- The Installer shall provide, for the person in charge of the realization and management of the electrical system, all the necessary data on the equipment so that the electrical connections to the site's network can be arranged. The installer must supply in particular:

characteristics of absorption and connections

position of the hoist's installation

any other data eventually requested

- Before starting the installation and dismantling operations, the Installer must plan the relative activities on the basis of all the documentation, and the information and elements available.

planning of the installation and dismantling operations

When carrying out the planning, the Installer will have to consider the following elements and documents:

specific risk and site analysis

the equipment's Instruction Manual

elaborated/ plan designs

any recommendations (from the constructor or the middle-man)

characteristics of the site found "in situ"

other specific factors that can influence the installation operations

VERIFICATION OF THE FEASIBILITY

In the risk analysis and successive planning, on-site verification of the feasibility regarding the specific installation must be carried out:

ACTIVITY:

Verification, “in situ”, of the site’s characteristics regarding the requirements and dimensional characteristics and type of hoist, as well as the absence of contraindications to the installation and the use of the equipment.

Documentation

Hoist’s Instruction Manual

Executive project designs of the structure on which the hoist it will be installed (if necessary).

Executive project and designs relative to the site area involved, with particular regard to the underground situation or below (if necessary).

Equipment, Means and Materials

INDIVIDUAL PROTECTION DEVICES (IPD)

IPD generally necessary at the site (helmet, protective work clothes, gloves, protective/security shoes, etc.)

Any other protection devices deemed necessary

Risks	Safety and Prevention Measures
Differences between project plans and state of fact of the building	The effective dimensions of the building on which the hoist will be installed, shall be accurately established, noted, and compared with the available project plans. The Installer must verify that the dimensions measured effectively fit those accepted in the equipment's Instruction Manual
Presence of obstacles along the hoistway and possibility of accidental contact with foreign elements close to the path of travel	The absence of obstructions at height that impede the regular travel course or the mounting of the hoist must be verified. Particular attention must be paid to the eventual presence of electrical and telephone lines anchored at the building, taking into account the appropriate safety distance and the work equipment that will have to be used for the assembly, also considering their possible projection. In case such obstacles are present, the Installer shall adopt a different configuration or change the position of the hoist
Building not suitable for the prescribed anchoring	The Installer shall verify that the premises in which the wall anchoring will take place are geometrically and structurally suitable to that purpose, pursuant to the directives from the Instruction Manual and from the executives,. If the situation of the site does not allow for use of standard solutions established in the Instruction Manual, each anchoring must be subject to a written plan and shall be signed by the constructor or a qualified technician
Sinking due to insufficient support of the flat rest surface of the hoist's base frame	Total permissible loads for the flat rest surface must be determined by the Installer on the basis of the directives established in the Instruction Manual. The Installer shall communicate the load rates to the qualified technician in charge of calculations verification, who must release a written declaration of suitability of the support plan for the specified loads
Soil sinking due to the presence of pipelines or underground cavities	The absence of pipelines or sewage systems, or other underground cavities that may determine soil sinking, or collapse of the cement footing must be established

7.1.3 – INSTALLATION AND DISMANTLING MANAGEMENT

PERSONNEL AND WORKERS MANAGEMENT

- The personnel in charge of assembly and dismantling operations must be qualified professionals, adequately trained and must be highly familiar with the Instruction Manual for the specific equipment.

Verification of the adequacy of the staff assigned in terms of:

Professional preparation Training Familiarity with the instruction manual

- The personnel in charge of assembly and dismantling operations must be supplied with all necessary documentation for assembly or dismantling. They must have all necessary work equipment and the IPD specified in the procedures for assembly or dismantling operations.

Verification of:

Documentation for the assembly or dismantling Work equipment IPD
--

INSTALLATION AND DISMANTLING SUPERVISION

In order to prevent errors in assembly and dismantling procedures that could increase risk, the Installer must make sure that all operations are carried out in total compliance with the directives of the Instruction Manual and the supplied documentation. He must also verify that the indications/instructions given by him/her are respected and are consistent with current standards and good practice.

Respect of the procedures,

The Installer, during all phases of assembly, must ensure that the adopted configuration is installed effectively in accordance with the Instruction Manual and the supplied documentation, without unapproved variations or modifications.

Realization of the correct configuration