

**2600SEG135**

## **SAFETY STANDARD FOR INDUSTRIAL LADDERS AND STAIRCASES IN BUILDINGS**

### **1.0 OBJECTIVE**

The purpose of this standard is to establish the minimum requirements applicable to standard ladders and staircases of general use in buildings and industrial installations of the Panama Canal Authority (ACP).

### **2.0 BACKGROUND**

Not applicable.

### **3.0 SCOPE**

This standard is applicable to all ACP employees and installations. This standard does not apply to ladders used in scaffolding or floating equipment.

### **4.0 LEGAL FOUNDATION**

Agreement No. 12 of the Board of Directors of the ACP, Regulation on Risk Control and Occupational Health, Chapter I, Article 3.

### **5.0 DEFINITIONS**

At the time this standard was written, all of the words and terms were known by the users.

### **6.0 GENERAL**

#### **6.1 General requirements for staircases**

**6.1.1** Whenever there is an interruption in the elevation of the walking surfaces greater than 19 inches, an access staircase, a ramp, or an approved elevator for persons, or other safe means to facilitate access to all work points shall be provided.

**6.1.2** In standard staircases for buildings, each side open to falls of these means of access, whose height is greater than four feet, shall be protected with a properly secured standard handrail. This includes accesses to vehicles, wagons, stationary platforms when used for construction activities.

**6.1.3** Only the staircases assigned as medium of access to a building structure shall be utilized.

**6.1.4** The staircases' cargo capacity shall not be exceeded during their use.

**6.1.5** The staircases shall be utilized only for the purpose they were designed for and shall not suffer structural alterations, unless they are approved by a structural engineer and authorized for use.

#### **6.2 Obstacles in staircases**

**6.2.1** Whenever a staircase is the only means of access between two levels, it shall be kept free from obstacles to allow the employees to make use of it without restrictions.

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**6.2.1.1** Whenever two staircases exist as means to provide access between two levels, at least one of them shall remain free from obstacles.

**6.2.1.2** Whenever any equipment or work has to be undertaken that restricts free passage through that stairway, another means shall be provided and utilized.

**6.2.2** Stairway accesses, spaces they occupy (above and below), entrances, rungs, steps, landings, and exits shall be kept free of obstacles and dangers.

#### 6.3 Use of staircases

**6.3.1** The user of any staircase shall not carry any objects that may block visibility while going up or down the ladder, that may cause unbalance, or cause a person to lose his balance while using it.

**6.3.2** Stairway users shall watch their step attentively, and keep at least one free hand while going up or down a standard staircase integrated to a building or structure.

**6.3.3** Staircases shall be kept in safe conditions for use at all times. Slippery surfaces, loose or damaged steps, loose or missing handrails, and any other condition that may cause injury to the user shall be corrected immediately.

**6.3.4** In fixed ladders, in buildings, fixed structures (even temporary ones), towers, poles, metallic structures, users shall:

**6.3.4.1** Utilize protection systems that may be installed for use to prevent falls;

**6.3.4.2** Watch their step;

**6.3.4.3** Always use both hands, and while going up or down keep at least three points of safe contact at all times. Fixed ladders are not built to allow working from them hands-free;

**6.3.4.4** Use of single-rail ladders is prohibited.

**6.3.5** Spiral staircases,

**6.3.5.1** Shall not be used as emergency exits.

**6.3.5.2** Spiral staircases that will not be permanent part of a building shall not be used.

**6.3.5.3** Shall have handrails to prevent the use of areas of the steps whose depths are less than six inches.

#### 6.4 Design of staircases

**6.4.1.** All handrails shall be designed according to the specifications shown in Annex 1.

**6.4.2.** All of the ladders shall be designed considering as a minimum the requirements detailed in Annex 2.

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**6.4.3.** All fixed industrial ladders shall be designed considering as a minimum the requirements detailed in Annex 3.

#### **6.5 Illumination of the staircases**

**6.5.1** The area of use of all staircases shall be kept well illuminated.

**6.5.2** In buildings with several floors, natural or artificial light may be used, and such illumination must cover the staircase completely and substantially, including two levels under the area where the work is taking place. All accesses to the floor where works are being done must always be illuminated and protected.

**6.5.3** Light switches shall be installed in places accessible to the user, on the lower and upper levels of standard staircases of buildings.

**6.5.4** All staircases that are part of an emergency exit route, inside a building, office or similar, where night or mixed shifts are worked that require visibility for safe use shall be illuminated with emergency equipment powered by batteries (or similar), in case of a power outage or a failure of the existing illumination system.

#### **6.6 Fall protection systems**

**6.6.1** Every fixed ladder that exposes its user to a fall of more than 24 feet must have a fall protection system installed that complies as a minimum with the requirements of Annex 4.

**6.6.2** Fall protection systems must be inspected twice a year, and be provided with maintenance as frequently as indicated by existing conditions.

#### **6.7 Construction, maintenance, or improvements**

**6.7.1** Except during the construction of a staircase, the traffic of persons is prohibited in staircases that have steps, and or landings that will be filled with concrete or other material, later on, unless those steps and landings are temporarily covered with wood or other solid material up to the border of each tray. Such material shall be replaced as well when it wears down.

**6.7.2** Except during the construction of a staircase, the traffic of persons is prohibited in staircases of metallic frame whenever the permanent steps and landings will be installed later on unless other materials are installed and secured to cover them.

**6.7.3** Steps for temporary use shall be made out of wood or other solid material and be installed so as to cover the width and depth of the stairway.

#### **6.8 Staircases for use during the construction process**

**6.8.1** Stairways that will not be permanent part of a structure in which the construction work is taking place, shall have landing platforms at an elevation of no more than twelve feet, with a dimension of not less than thirty inches in the direction of displacement and extend at least twenty inches in width.

**6.8.2** Landings and metal steps must be secured before filling them with concrete or other material.

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**6.8.3** Handrails that will not be part of a permanent structure that is under construction shall keep a minimum separation of three inches (eight centimeters) among these and the wall, handrail system, and other objects.

**6.8.4** Every part of the staircases shall be free from dangerous protuberances such as nails, splinters, sharp borders, etc.

### **7.0 RESPONSIBILITIES**

Responsibilities for ensuring compliance with this standard are described in the Standard for Safety and Occupational Health Management of the ACP.

### **8.0 CONSULTATIONS**

All information or explanation about the content or application of the present standard shall be requested to the Safety and Industrial Hygiene Unit.

### **9.0 EXCEPTIONS**

### **10.0 DURATION**

This standard is valid until it is modified or revised.

### **11.0 REFERENCES**

**11.1** ANSI A14.3-1956, for fixed ladders.

**ANNEX 1**

**MINIMUM REQUIREMENTS FOR THE DESIGN OF RAILINGS AND HANDRAILS**

1. The staircases that have four or more steps or rungs, or are greater than 30 inches (76 cm.), whichever is smaller, shall have:
  - a. At least one handrail; and
  - b. A fixed ladder protection system on each side or unprotected border (railing).NOTE: Includes accesses to vehicles / wagons, and stationary platforms when they are utilized in construction activities.
2. The superior member utilized as handrail in a wood ladder may be 2 x 4, smooth without splinters, loose knots, or holes.
3. Stairways of less than 44 inches of width or with walls on both sides that exceed that dimension shall have a handrail on the right side as one goes down. And they must have a guardrail on the open side.
4. Stairways of less than 44 inches shall have two handrails.
5. Stairways greater than 44 inches and less than 88 inches wide, with walls on both sides or enclosed shall have a handrail attached to the wall and a guardrail anchored to the floor of the open side.
6. The staircases of over 88 inches with both sides closed shall have a handrail on each side, and a guardrail on each open side, and an intermediate guardrail located halfway of the width of the stairway.
7. The staircases that only use one handrail will utilize it on the side of descent.
8. The height of the handrails for all the staircases whenever they are anchored to the floor, shall not be less than 36 inches (76 cm.), or no greater than 37 inches (94 cm.) of the top surface of the step and in line with the border of the front part of the step. At the landings of the staircases this height must be between 39 to 42 inches (1 m – 1.1 m).
9. Intermediate railings, screens, covers or their equivalent in intermediate structural members shall be installed between the top railing of the guardrail and the steps. The screens or covers, whenever they are utilized, will extend from the top rail of the step, and along the entire opening between the top rail and its supports.
10. Whenever vertical members are used between the supports of the top rail, these shall not be separated by more than 19 inches (48 cm.).
11. Other structural members of the staircases, whenever used, shall be installed so that there are no spaces greater than 19 inches (48 cm.) wide.
12. Handrails and top rails of guardrails of staircases shall be capable of resisting a force of at least 200 pounds (890 N.) applied between 2 inches (5 cm.) of the top border, in any direction and in any point along the top border.
13. Whenever the top border of a guardrail system serves as a handrail, the height between the top part of the border and the step, shall be no more than 37 inches (94 cm.) and no less than 36 inches (91.5 cm.) in line with the border in the front part of the step.
14. The open sides of the staircases shall have 42-inch (1.1-m.) lateral railings over the landing or top platform.
15. The openings on opposite ends of the staircases between the supports of the top rails or handrails shall not be greater than 4 inches.
16. The railing of the handrails shall permit an adequate grasp with the hands to keep the users from falling. The approximate diameter of the surface for holding on shall be between one or two inches.
17. Intermediate railing shall in fact be at a middle level between the top rail and the steps of the staircase.



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18. Surface finishing of guardrail and handrail systems in stairways shall be kept in conditions that prevent injuries, perforations, or lacerations, and free from protuberances that may get stuck to the users' clothing.

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### ANNEX 2

### MINIMUM REQUIREMENTS FOR THE DESIGN OF STAIRCASES IN BUILDINGS

1. Fixed stairways in structures or buildings shall support at least two concentrated loads, of 250 pounds each, in addition to other loads such as safety rails, etc. All of the steps shall support at the center a concentrated force of 250 pounds.
2. The free distance between the sides of fixed stairways of individual steps or with lateral rails shall be 30 inches free as a minimum. If unavoidable obstructions exist this dimension shall not be less than 24 inches (61 cm.), as long as there is a deflection device to guide the user around each obstacle.
3. The free distance between the sides of fixed stairways of individual steps and the minimum distance to the railings of other fixed stairways shall be 16 inches (41 cm.)
4. The free distance behind the steps shall be 7 inches (18 cm.), with the exception of elevator pit ladders that may be 4.5 inches (61 cm.).
5. The distance between two steps of fixed stairways shall be 12 inches (30 cm.), measured between the centers of consecutive steps.
6. Fixed stairway pits shall surround them, and remain free from projections. The distance between the centers of the stairway shall extend from 27 inches (68 cm.) to 30 inches (76 cm.). The minimum width of the pit is 30 inches (76 cm.). The lower part of the pit shall be from 7 feet (2.1 m.) to 8 feet over the access.
7. Standard staircases in buildings shall be installed at an angle of at least 30 and no more than 50 degrees with the horizontal.
8. Fixed and standard stairways that will be used to reach work elevations shall have for each 12 feet (or less) of elevation, on the side or passing through them, platforms for resting measuring 30 inches deep and 22 inches wide (76 x 56 cm.).
9. The height and depth of the steps must be uniform between the different stretches of stairways. Variations in height and depth of the steps shall be no greater than  $\frac{1}{4}$  inch (0.6 cm.).
10. Whenever doors or accesses to areas open directly over a stairway a resting platform shall be provided on the staircase side and its top part so that the turn of the door when opened does not reduce the effective width of that platform to 20 inches (51 cm.) beyond the door.

**ANNEX 3  
MINIMUM REQUIREMENTS FOR THE DESIGN OF  
FIXED INDUSTRIAL LADDERS**

1. Of metal with individual steps:
  - a. They shall be shaped so as to prevent skidding when used.
  - b. The dimension of circle-shaped steps in fixed ladders shall have a minimum of  $\frac{3}{4}$  inch in diameter for metal ladders and of 1  $\frac{1}{8}$  inches in wood ladders.
  - c. The surface of the steps shall not be slippery.
2. If they have a height of more than 24 feet in any of their sides, before the workers need to use it, they must be
  - a. Provided and installed with an **approved fall protection system**, or with retractable lifelines and resting platforms at intervals that do not exceed 150 feet (45.7 m); or
  - b. Install protection cages that cover completely the user's ascent and descent.
3. Fixed ladders may have equal sections of ladders that do not exceed 50 feet (15.2 m)
4. Whenever approved fall protection systems are installed, the distance between lateral rails of the extension shall not be greater than 36 inches (91 cm.)
5. Fixed ladders in which two or more of them separately are used to reach works in elevation shall not be in line with the platforms for resting or in the points of going up or down.
6. In a structure there shall be platforms for resting, with a dimension no less than 30 inches in the direction of displacement and at least 22 inches wide.
7. The distance of the footstep from the fixed ladder to the platform shall be between 7 inches (18 cm.) and 12 inches (30 cm.). If this maximum distance of 12 inches is exceeded, a walking platform (with fall protection) must be installed alongside the separation.
8. They shall not be used at an angle greater than 90 degrees with the horizontal, measured in the part where it is fixed.
9. That pass through the platforms, the top steps forming part of that extension may be eliminated as long as there remains a space not smaller than 24 inches or greater than 30 inches between lateral rails.
10. With landings or lateral platforms, the last steps that form part of that extension shall remain.
11. Of individual steps (without lateral rails), except for those used in spaces with covers and manholes, shall comply with the 42-inch extension continuing the steps or placing handle bars that have the same lateral spacing than the vertical support of the steps.
12. The free distance on each side of the fixed ladders that do not have a protective cage installed shall have a width of 15 inches to the nearest object on each side of the central line of the ladder.



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**ANNEX 4**

**APPROVED FALL PROTECTION SYSTEM**

Includes systems such as: life lines, tie-up ropes, safety belts and connection devices, harnesses, deceleration devices, etc.; positioning systems such as straps with fastening belt; displacement restriction systems and all of the systems to climb ladders such as rails and belts with sliding and braking mechanisms, etc.

1. The length of the connection from the connection to the belt or strap according to the case shall not exceed 9 inches (23 cm.)
2. All of these systems must support without failing a test load of 500 pounds (226 kg.) in an 18-inch (41-cm.) fall.
3. These systems shall allow the hands-free movement of personnel without having to grab, push, or pull any of its parts.
4. All of the systems shall activate at no more than two feet (61 cm.) after an accidental fall occurs, and shall limit the speed of descent to 7 feet per second (2.1 m/sec.) or less.