

of walkways or passageways. Flashing lights or audible devices can be mounted on vehicles to warn employees of the presence of vehicles.

Adequate clearance must be provided to permit safe use of walkways, passageways, and aisles by employees when mobile equipment is parked in walkways, passageways, or aisles, and left unattended. Attended means that the operator is within 25 feet (7.5 m) of the vehicle and can see it [see § 1910.178(m)(5)(ii)]. Normally, adequate clearance can be considered as a one-way free passage of 18 inches (46 cm) or greater. However, consideration should be given to the number of employees using the passage; whether traffic will be in both directions; and whether the passageway is part of a means of emergency egress. (See subpart E—Means of Egress for specific requirements.)

4. *Application of loads.* Floor loading limitations would be of greatest concern to those employers engaged in the warehousing or storage of goods and materials. Surfaces that should receive special attention so as not to be overloaded include ramps, lifting platforms, dockboards, scaffolds and ladders.

It is important that employees involved in materials handling be made aware of the loading limitations of any surface upon which they may work or walk. Floor loading of a work surface will vary according to the nature of the work performed. For example, a work surface used as an office would not need the continued control of floor loading that would be necessary if the space was used as a warehouse.

5. *Training.* Employees who are expected to inspect, maintain, and/or repair surfaces must be trained in the skills needed to perform their duties. They should also be aware of the strength of the materials with which they are working, and the load bearing capabilities of the equipment or surfaces they are expected to maintain.

Section 1910.23 Ladders

1. *Use of ladders.* Employees should be trained and retrained as necessary to use ladders in the manner for which the ladders were designed to be used. The majority of ladder accidents are apparently due to improper use, placement or selection. The reading and understanding of the hazard warnings and safety use instruction markings that are attached to recently manufactured portable ladders that meet the ANSI standards would be helpful in promoting employee safety.

A general guideline for proper ladder placement for non-self-supported portable ladders is to place the ladder so that the climber's hands would just touch the ladder when the arms are fully extended, and horizontal while the climber is standing

straight facing the ladder with the climber's toes touching the side rails at the base of the ladder.

Employers should make sure that extensions placed on ladder siderails for leveling ladders during placement are installed so that the connectors are secured to the siderails and do not affect their strength. If the ladder is to be used for an extended period of time, it should be secured to the building or structure to prevent its accidental displacement. Employees should also be made aware that the use of individual sections of multisectional ladders as single ladders, and the use of self-supporting ladders in the non-self-supporting mode (e.g., a step ladder folded up and leaned against a wall) is not a safe practice since the ladders are not designed for this use and may slip. Extension ladders need to be equipped with positive locking devices to lock the ladder at the desired climbing length before they may be used.

Employees should not climb ladders while carrying objects in their hands. They should maintain a firm hold on the rungs or siderails and have the necessary objects attached to their belt via straps or loops or have the objects hoisted up by the use of a line once they have reached their work position.

Section 1910.24 Step Bolts and Manhole Steps

1. *Step bolts.* Step bolts are bolts connected to poles, towers, or similar structures for use in ascending or descending to different levels. They are normally installed in an alternating pattern on opposite sides of the structural member to be climbed. They are seldom installed directly on opposite sides from one another, except to establish a standing or rest position, although this is an acceptable method of installation.

An effective maintenance program is required to assure the adequacy of step bolts. For example, over a period of extended use, bolts may become bent or otherwise damaged and thus be unsafe to use. Bolts should be checked to assure that they remain in proper position. Since step bolts also serve as hand grips during climbing, they should be kept free of puncture or laceration hazards. It is also important to check the point of anchorage to the structure. Often, due to changing climatic conditions, anchorage nuts may loosen, or fatigue cracks may appear. These are early signs of premature failure of a bolt, and they must not be ignored. These unsafe conditions should be corrected quickly by repair or replacement.

2. *Manhole steps.* Because of the varied environmental conditions found below ground in manhole structures, special consideration should be given to the type and strength of the materials used to manufacture the step, in order to ensure good service life.

Employees climbing through conical sections of manholes may have to climb in positions not normally used because of the design of the conical section. For example, the standards for ladders prohibit climbing ladders where the climbing side of the ladder exceeds 90 degrees from the horizontal. However, in conical sections, the design of the section may be such that climbing at angles exceeding 90 degrees may be necessary for a short distance. If ladder or step offsets or extensions cannot be installed to provide a straight climb, employees should be made aware of the hazards of climbing on the conical sections.

Rungs and steps should be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the likelihood of slipping.

Section 1910.25 Stairs

Numerous hazards can cause an employee to trip, slip, or fall on stairs. Good housekeeping principles should be followed at all times. Unnecessary obstructions, debris, tools or other loose objects should be kept out of the stairway.

Where carpeting is used on stairs, special attention should be given to the pattern or design on the carpet because some carpet/rug patterns make it difficult to detect the leading edges of the stair tread. It may be necessary to highlight the leading edge of the stair with a different textured material.

If any repairs are necessary, and the work requires the use of tools and materials which would create a hazard, the stairs should be closed to employees until the repairs are made.

There should be adequate lighting on stairways when stairs are in use. Lighting should be maintained and a periodic inspection of stairs should be conducted to assure adequate lighting.

Stairs that may become wet or slippery as part of a work operation or as a result of weather conditions should be equipped with slip-resistant surfaces, such as a non-slip finish or an abrasive paint. To prevent shoes from slipping, exterior stairs should have landings and steps with surfaces that limit the collection of water.

The preferred slope for a stairway is between 30 and 35 degrees from the horizontal.

Figure D-1—Recommended Angles for Stairs, Ramps and Ladders

- A—Ramps: 30° or less
- B—Typical Fixed Stair: 50° or less
- C—Ship Stairs: 50° to 70°
- D—Alternating Tread Stairs: 50° to 70°
- E—Ladders: 60° to 90°

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