confusion are avoided during times of emergencies. In multi-story buildings where more than one employer is on a single floor, it is essential that these employers coordinate their plans with each other to avoid conflicts and confusion.

4. *Fire prevention housekeeping.* The standard calls for the control of accumulations of flammable and combustible waste materials.

It is the intent of this standard to assure that hazardous accumulations of combustible waste materials are controlled so that a fast developing fire, rapid spread of toxic smoke, or an explosion will not occur. This does not necessarily mean that each room has to be swept each day. Employers and employees should be aware of the hazardous properties of materials in their workplaces, and the degree of hazard each poses. Certainly oil soaked rags have to be treated differently than general paper trash in office areas. However, large accumulations of waste paper or corrugated boxes, etc., can pose a significant fire hazard. Accumulations of materials which can cause large fires or generate dense smoke that are easily ignited or may start from spontaneous combustion, are the types of materials with which this standard is concerned. Such combustible materials may be easily ignited by matches, welder's sparks, cigarettes and similar low level energy ignition sources.

5. *Maintenance of equipment under the fire prevention plan.* Certain equipment is often installed in workplaces to control heat sources or to detect fuel leaks. An example is a temperature limit switch often found on deep-fat food fryers found in restaurants. There may be similar switches for high temperature dip tanks, or flame failure and flashback arrester devices on furnaces and similar heat producing equipment. If these devices are not properly maintained or if they become inoperative, a definite fire hazard exists. Again employees and supervisors should be aware of the specific type of control devices on equipment involved with combustible materials in the workplace and should make sure, through periodic inspection or testing, that these controls are operable. Manufacturers' recommendations should be followed to assure proper maintenance procedures.

[45 FR 60714, Sept. 12, 1980]

Subpart F—Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms

Authority: 29 U.S.C. 653, 655, and 657; Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), 5-2007 (72 FR 31159), or 1-2012 (77 FR 3912), as applicable; and 29 CFR part 1911.

§ 1910.66 Powered platforms for building maintenance.

(a) *Scope.* This section covers powered platform installations permanently dedicated to interior or exterior building maintenance of a specific structure or group of structures. This section does not apply to suspended scaffolds (swinging scaffolds) used to service buildings on a temporary basis and covered under subpart D of this part, nor to suspended scaffolds used for construction work and covered under subpart L of 29 CFR part 1926. Building maintenance includes, but is not limited to, such tasks as window cleaning, caulking, metal polishing and reglazing.

(b) *Application —*

(1) *New installations.* This section applies to all permanent installations completed after July 23, 1990. Major modifications to existing installations completed after that date are also considered new installations under this section.

(2) *Existing installations.*

(i) Permanent installations in existence and/or completed before July 23, 1990 shall comply with paragraphs (g), (h), (i), (j) and appendix C to subpart I of this part.

(ii) In addition, permanent installations completed after August 27, 1971, and in existence and/or completed before July 23, 1990, shall comply with appendix D of this section.

(c) *Assurance.*

(1) Building owners of new installations shall inform the employer before each use in writing that the installation meets the requirements of paragraphs (e)(1) and (f)(1) of this section and the additional design criteria contained in other provisions of paragraphs (e) and (f) of this section relating to: required load sustaining capabilities of platforms, building components, hoisting and supporting equipment; stability factors for carriages, platforms and supporting equipment; maximum horizontal force for movement of carriages and davits; design of carriages, hoisting machines, wire rope and stabilization systems; and design criteria for electrical wiring and equipment.

(2) Building owners shall base the information required in paragraph (c)(1) of this section on the results of a field test of the installation before being placed into service and following any major alteration to an existing installation, as required in paragraph (g)(1) of this section. The assurance shall also be based on all other relevant available information, including, but not limited to, test data, equipment specifications and verification by a registered professional engineer.

(3) Building owners of all installations, new and existing, shall inform the employer in writing that the installation has been inspected, tested, and maintained in compliance with the requirements of paragraphs (g) and (h) of this section and that all anchorages meet the requirements of § 1910.140(c)(13).

(4) The employer shall not permit employees to use the installation prior to receiving assurance from the building owner that the installation meets the requirements contained in paragraphs (c)(1) and (c)(3) of this section.

(d) *Definitions.*

Anemometer means an instrument for measuring wind velocity.

Angulated roping means a suspension method where the upper point of suspension is inboard from the attachments on the suspended unit, thus causing the suspended unit to bear against the face of the building.

Building face roller means a rotating cylindrical member designed to ride on the face of the building wall to prevent the platform from abrading the face of the building and to assist in stabilizing the platform.

Building maintenance means operations such as window cleaning, caulking, metal polishing, reglazing, and general maintenance on building surfaces.

Cable means a conductor, or group of conductors, enclosed in a weatherproof sheath, that may be used to supply electrical power and/or control current for equipment or to provide voice communication circuits.

Carriage means a wheeled vehicle used for the horizontal movement and support of other equipment.

Certification means a written, signed and dated statement confirming the performance of a requirement of this section.

Combination cable means a cable having both steel structural members capable of supporting the platform, and copper or other electrical conductors insulated from each other and the structural members by nonconductive barriers.

Competent person means a person who, because of training and experience, is capable of identifying hazardous or dangerous conditions in powered platform installations and of training employees to identify such conditions.

Continuous pressure means the need for constant manual actuation for a control to function.

Control means a mechanism used to regulate or guide the operation of the equipment.

Davit means a device, used singly or in pairs, for suspending a powered platform from work, storage and rigging locations on the building being serviced. Unlike outriggers, a davit reacts its operating load into a single roof socket or carriage attachment.

Equivalent means alternative designs, materials or methods which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

Ground rigging means a method of suspending a working platform starting from a safe surface to a point of suspension above the safe surface.

Ground rigged davit means a davit which cannot be used to raise a suspended working platform above the building face being serviced.

Guide button means a building face anchor designed to engage a guide track mounted on a platform.

Guide roller means a rotating cylindrical member, operating separately or as part of a guide assembly, designed to provide continuous engagement between the platform and the building guides or guideways.

Guide shoe means a device attached to the platform designed to provide a sliding contact between the platform and the building guides.

Hoisting machine means a device intended to raise and lower a suspended or supported unit.

Hoist rated load means the hoist manufacturer's maximum allowable operating load.

Installation means all the equipment and all affected parts of a building which are associated with the performance of building maintenance using powered platforms.

Interlock means a device designed to ensure that operations or motions occur in proper sequence.

Intermittent stabilization means a method of platform stabilization in which the angulated suspension wire rope(s) are secured to regularly spaced building anchors.

Lanyard means a flexible line of rope, wire rope or strap which is used to secure the body belt or body harness to a deceleration device, lifeline or anchorage.

Lifeline means a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Live load means the total static weight of workers, tools, parts, and supplies that the equipment is designed to support.

Obstruction detector means a control that will stop the suspended or supported unit in the direction of travel if an obstruction is encountered, and will allow the unit to move only in a direction away from the obstruction.

Operating control means a mechanism regulating or guiding the operation of equipment that ensures a specific operating mode.

Operating device means a device actuated manually to activate a control.

Outrigger means a device, used singly or in pairs, for suspending a working platform from work, storage, and rigging locations on the building being serviced. Unlike davits, an outrigger reacts its operating moment load as at least two opposing vertical components acting into two or more distinct roof points and/or attachments.

Platform rated load means the combined weight of workers, tools, equipment and other material which is permitted to be carried by the working platform at the installation, as stated on the load rating plate.

Poured socket means the method of providing wire rope terminations in which the ends of the rope are held in a tapered socket by means of poured spelter or resins.

Primary brake means a brake designed to be applied automatically whenever power to the prime mover is interrupted or discontinued.

Prime mover means the source of mechanical power for a machine.

Rated load means the manufacturer's recommended maximum load.

Rated strength means the strength of wire rope, as designated by its manufacturer or vendor, based on standard testing procedures or acceptable engineering design practices.

Rated working load means the combined static weight of men, materials, and suspended or supported equipment.

Registered professional engineer means a person who has been duly and currently registered and licensed by an authority within the United States or its territories to practice the profession of engineering.

Roof powered platform means a working platform where the hoist(s) used to raise or lower the platform is located on the roof.

Roof rigged davit means a davit used to raise the suspended working platform above the building face being serviced. This type of davit can also be used to raise a suspended working platform which has been ground-rigged.

Rope means the equipment used to suspend a component of an equipment installation, i.e., wire rope.

Safe surface means a horizontal surface intended to be occupied by personnel, which is so protected by a fall protection system that it can be reasonably assured that said occupants will be protected against falls.

Secondary brake means a brake designed to arrest the descent of the suspended or supported equipment in the event of an overspeed condition.

Self powered platform means a working platform where the hoist(s) used to raise or lower the platform is mounted on the platform.

Speed reducer means a positive type speed reducing machine.

Stability factor means the ratio of the stabilizing moment to the overturning moment.

Stabilizer tie means a flexible line connecting the building anchor and the suspension wire rope supporting the platform.

Supported equipment means building maintenance equipment that is held or moved to its working position by means of attachment directly to the building or extensions of the building being maintained.

Suspended equipment means building maintenance equipment that is suspended and raised or lowered to its working position by means of ropes or combination cables attached to some anchorage above the equipment.

Suspended scaffold (swinging scaffold) means a scaffold supported on wire or other ropes, used for work on, or for providing access to, vertical sides of structures on a temporary basis. Such scaffold is not designed for use on a specific structure or group of structures.

Tail line means the nonsupporting end of the wire rope used to suspend the platform.

Tie-in guides means the portion of a building that provides continuous positive engagement between the building and a suspended or supported unit during its vertical travel on the face of the building.

Traction hoist means a type of hoisting machine that does not accumulate the suspension wire rope on the hoisting drum or sheave, and is designed to raise and lower a suspended load by the application of friction forces between the suspension wire rope and the drum or sheave.

Transportable outriggers means outriggers designed to be moved from one work location to another.

Trolley carriage means a carriage suspended from an overhead track structure.

Verified means accepted by design, evaluation, or inspection by a registered professional engineer.

Weatherproof means so constructed that exposure to adverse weather conditions will not affect or interfere with the proper use or functions of the equipment or component.

Winding drum hoist means a type of hoisting machine that accumulates the suspension wire rope on the hoisting drum.

Working platform means suspended or supported equipment intended to provide access to the face of a building and manned by persons engaged in building maintenance.

Wrap means one complete turn of the suspension wire rope around the surface of a hoist drum.

(e) ***Powered platform installations—Affected parts of buildings —***

(1) ***General requirements.*** The following requirements apply to affected parts of buildings which utilize working platforms for building maintenance.

(i) Structural supports, tie-downs, tie-in guides, anchoring devices and any affected parts of the building included in the installation shall be designed by or under the direction of a registered professional engineer experienced in such design;

(ii) Exterior installations shall be capable of withstanding prevailing climatic conditions;

(iii) The building installation shall provide safe access to, and egress from, the equipment and sufficient space to conduct necessary maintenance of the equipment;

(iv) The affected parts of the building shall have the capability of sustaining all the loads imposed by the equipment; and,

(v) The affected parts of the building shall be designed so as to allow the equipment to be used without exposing employees to a hazardous condition.

(2) *Tie-in guides.*

(i) The exterior of each building shall be provided with tie-in guides unless the conditions in paragraph (e)(2)(ii) or (e)(2)(iii) of this section are met.

Note: See figure 1 in appendix B of this section for a description of a typical continuous stabilization system utilizing tie-in guides.

(ii) If angulated roping is employed, tie-in guides required in paragraph (e)(2)(i) of this section may be eliminated for not more than 75 feet (22.9 m) of the uppermost elevation of the building, if infeasible due to exterior building design, provided an angulation force of at least 10 pounds (44.4 n) is maintained under all conditions of loading.

(iii) Tie-in guides required in paragraph (e)(2)(i) of this section may be eliminated if one of the guide systems in paragraph (e)(2)(iii)(A), (e)(2)(iii)(B) or (e)(2)(iii)(C) of this section is provided, or an equivalent.

(A) Intermittent stabilization system. The system shall keep the equipment in continuous contact with the building facade, and shall prevent sudden horizontal movement of the platform. The system may be used together with continuous positive building guide systems using tie-in guides on the same building, provided the requirements for each system are met.

(*1*) The maximum vertical interval between building anchors shall be three floors or 50 feet (15.3 m), whichever is less.

(*2*) Building anchors shall be located vertically so that attachment of the stabilizer ties will not cause the platform suspension ropes to angulate the platform horizontally across the face of the building. The anchors shall be positioned horizontally on the building face so as to be symmetrical about the platform suspension ropes.

(*3*) Building anchors shall be easily visible to employees and shall allow a stabilizer tie attachment for each of the platform suspension ropes at each vertical interval. If more than two suspension ropes are used on a platform, only the two building-side suspension ropes at the platform ends shall require a stabilizer attachment.

(*4*) Building anchors which extend beyond the face of the building shall be free of sharp edges or points. Where cables, suspension wire ropes and lifelines may be in contact with the building face, external building anchors shall not interfere with their handling or operation.

(*5*) The intermittent stabilization system building anchors and components shall be capable of sustaining without failure at least four times the maximum anticipated load applied or transmitted to the components and anchors. The minimum design wind load for each anchor shall be 300 (1334 n) pounds, if two anchors share the wind load.

(*6*) The building anchors and stabilizer ties shall be capable of sustaining anticipated horizontal and vertical loads from winds specified for roof storage design which may act on the platform and wire ropes if the platform is stranded on a building face. If the building anchors have different spacing than the suspension wire rope or if the building requires different suspension spacings on one platform, one building anchor and stabilizer tie shall be capable of sustaining the wind loads.

Note: See figure 2 in appendix B of this section for a description of a typical intermittent stabilization system.

(B) Button guide stabilization system.

(*1*) Guide buttons shall be coordinated with platform mounted equipment of paragraph (f)(5)(vi) of this section.

(*2*) Guide buttons shall be located horizontally on the building face so as to allow engagement of each of the guide tracks mounted on the platform.

(*3*) Guide buttons shall be located in vertical rows on the building face for proper engagement of the guide tracks mounted on the platform.

(*4*) Two guide buttons shall engage each guide track at all times except for the initial engagement.

(*5*) Guide buttons which extend beyond the face of the building shall be free of sharp edges or points. Where cables, ropes and lifelines may be in contact with the building face, guide buttons shall not interfere with their handling or operation.

(*6*) Guide buttons, connections and seals shall be capable of sustaining without damage at least the weight of the platform, or provision shall be made in the guide tracks or guide track connectors to prevent the platform and its attachments from transmitting the weight of the platform to the guide buttons, connections and seals. In either case, the minimum design load shall be 300 pounds (1334 n) per building anchor.

Note: See paragraph (f)(5)(vi) of this section for relevant equipment provisions.

Note: See figure 3 in appendix B of this section for a description of a typical

button guide stabilization system.

(C) System utilizing angulated roping and building face rollers. The system shall keep the equipment in continuous contact with the building facade, and shall prevent sudden horizontal movement of the platform. This system is acceptable only where the suspended portion of the equipment in use does not exceed 130 feet (39.6 m) above a safe surface or ground level, and where the platform maintains no less than 10 pounds (44.4 n) angulation force on the building facade.

(iv) Tie-in guides for building interiors (atriums) may be eliminated when a registered professional engineer determines that an alternative stabilization system, including systems in paragraphs (e)(2)(iii) (A), (B) and (C), or a platform tie-off at each work station will provide equivalent safety.

(3) ***Roof guarding.***

(i) Employees working on roofs while performing building maintenance shall be protected by a perimeter guarding system which meets the requirements of paragraph (c)(1) of § 1910.23 of this part.

(ii) The perimeter guard shall not be more than six inches (152 mm) inboard of the inside face of a barrier, i.e. the parapet wall, or roof edge curb of the building being serviced; however, the perimeter guard location shall not exceed an 18 inch (457 mm) setback from the exterior building face.

(4) ***Equipment stops.*** Operational areas for trackless type equipment shall be provided with structural stops, such as curbs, to prevent equipment from traveling outside its intended travel areas and to prevent a crushing or shearing hazard.

(5) ***Maintenance access.*** Means shall be provided to traverse all carriages and their suspended equipment to a safe area for maintenance and storage.

(6) ***Elevated track.***

(i) An elevated track system which is located four feet (1.2 m) or more above a safe surface, and traversed by carriage supported equipment, shall be provided with a walkway and guardrail system; or

(ii) The working platform shall be capable of being lowered, as part of its normal operation, to the lower safe surface for access and egress of the personnel and shall be provided with a safe means of access and egress to the lower safe surface.

(7) ***Tie-down anchors.*** Imbedded tie-down anchors, fasteners, and affected structures shall be resistant to corrosion.

(8) ***Cable stabilization.***

(i) Hanging lifelines and all cables not in tension shall be stabilized at each 200 foot (61 m) interval of vertical travel of the working platform beyond an initial 200 foot (61 m) distance.

(ii) Hanging cables, other than suspended wire ropes, which are in constant tension shall be stabilized when the vertical travel exceeds an initial 600 foot (183 m) distance, and at further intervals of 600 feet (183 m) or less.

(9) ***Emergency planning.*** A written emergency action plan shall be developed and implemented for each kind of working platform operation. This plan shall explain the emergency procedures which are to be followed in the event of a power failure, equipment failure or other emergencies which may be encountered. The plan shall also explain that employees inform themselves about the building emergency escape routes, procedures and alarm systems before operating a platform. Upon initial assignment and whenever the plan is changed the employer shall review with each employee those parts of the plan which the employee must know to protect himself or herself in the event of an emergency.

(10) ***Building maintenance.*** Repairs or major maintenance of those building portions that provide primary support for the suspended equipment shall not affect the capability of the building to meet the requirements of this standard.

(11) ***Electrical requirements.*** The following electrical requirements apply to buildings which utilize working platforms for building maintenance.

(i) General building electrical installations shall comply with §§ 1910.302 through 1910.308 of this part, unless otherwise specified in this section;

(ii) Building electrical wiring shall be of such capacity that when full load is applied to the equipment power circuit not more than a five percent drop from building service-vault voltage shall occur at any power circuit outlet used by equipment regulated by this section;

(iii) The equipment power circuit shall be an independent electrical circuit that shall remain separate from all other equipment within or on the building, other than power circuits used for hand tools that will be used in conjunction with the equipment. If the building is provided with an emergency power system, the equipment power circuit may also be connected to this system;

(iv) The power circuit shall be provided with a disconnect switch that can be locked in the “OFF” and “ON” positions. The switch shall be conveniently located with respect to the primary operating area of the equipment to allow the operators of the equipment access to the switch;

(v) The disconnect switch for the power circuit shall be locked in the “ON” position when the equipment is in use; and

(vi) An effective two-way voice communication system shall be provided between the equipment operators and persons stationed within the building being serviced. The communications facility shall be operable and shall be manned at all times by persons stationed within the building whenever the platform is being used.

(f) ***Powered platform installations—Equipment —***

(1) ***General requirements.*** The following requirements apply to equipment which are part of a powered platform installation, such as platforms, stabilizing components, carriages, outriggers, davits, hoisting machines, wire ropes and electrical components.

(i) Equipment installations shall be designed by or under the direction of a registered professional engineer experienced in such design;

(ii) The design shall provide for a minimum live load of 250 pounds (113.6 kg) for each occupant of a suspended or supported platform;

(iii) Equipment that is exposed to wind when not in service shall be designed to withstand forces generated by winds of at least 100 miles per hour (44.7 m/s) at 30 feet (9.2 m) above grade; and

(iv) Equipment that is exposed to wind when in service shall be designed to withstand forces generated by winds of at least 50 miles per hour (22.4 m/s) for all elevations.

(2) ***Construction requirements.*** Bolted connections shall be self-locking or shall otherwise be secured to prevent loss of the connections by vibration.

(3) ***Suspension methods.*** Elevated building maintenance equipment shall be suspended by a carriage, outriggers, davits or an equivalent method.

(i) ***Carriages.*** Carriages used for suspension of elevated building maintenance equipment shall comply with the following:

(A) The horizontal movement of a carriage shall be controlled so as to ensure its safe movement and allow accurate positioning of the platform for vertical travel or storage;

(B) Powered carriages shall not exceed a traversing speed of 50 feet per minute (0.3 m/s);

(C) The initiation of a traversing movement for a manually propelled carriage on a smooth level surface shall not require a person to exert a horizontal force greater than 40 pounds (444.8 n);

(D) Structural stops and curbs shall be provided to prevent the traversing of the carriage beyond its designed limits of travel;

(E) Traversing controls for a powered carriage shall be of a continuous pressure weatherproof type. Multiple controls when provided shall be arranged to permit operation from only one control station at a time. An emergency stop device shall be provided on each end of a powered carriage for interrupting power to the carriage drive motors;

(F) The operating controls(s) shall be so connected that in the case of suspended equipment, traversing of a carriage is not possible until the suspended portion of the equipment is located at its uppermost designed position for traversing; and is free of contact with the face of the building or building guides. In addition, all protective devices and interlocks are to be in the proper position to allow traversing of the carriage;

(G) Stability for underfoot supported carriages shall be obtained by gravity, by an attachment to a structural support, or by a combination of gravity and a structural support. The use of flowing counterweights to achieve stability is prohibited.

(*1*) The stability factor against overturning shall not be less than two for horizontal traversing of the carriage, including the effects of impact and wind.

(*2*) The carriages and their anchorages shall be capable of resisting accidental over-tensioning of the wire ropes suspending the working platform, and this calculated value shall include the effect of one and one-half times the stall capacity of the hoist motor. All parts of the installation shall be capable of withstanding without damage to any part of the installation the forces resulting from the stall load of the hoist and one half the wind load.

(*3*) Roof carriages which rely on having tie-down devices secured to the building to develop the required stability against overturning shall be provided with an interlock which will prevent vertical platform movement unless the tie-down is engaged;

(H) An automatically applied braking or locking system, or equivalent, shall be provided that will prevent unintentional traversing of power traversed or power assisted carriages;

(I) A manual or automatic braking or locking system or equivalent, shall be provided that will prevent unintentional traversing of manually propelled carriages;

(J) A means to lock out the power supply for the carriage shall be provided;

(K) Safe access to and egress from the carriage shall be provided from a safe surface. If the carriage traverses an elevated area, any operating area on the carriage shall be protected by a guardrail system in compliance with the provisions of paragraph (f)(5)(i)(F) of this section. Any access gate shall be self-closing and self-latching, or provided with an interlock;

(L) Each carriage work station position shall be identified by location markings and/or position indicators; and

(M) The motors shall stall if the load on the hoist motors is at any time in excess of three times that necessary for lifting the working platform with its rated load.

(ii) ***Transportable outriggers.***

(A) Transportable outriggers may be used as a method of suspension for ground rigged working platforms where the point of suspension does not exceed 300 feet (91.5 m) above a safe surface. Tie-in guide system(s) shall be provided which meet the requirements of paragraph (e)(2) of this section.

(B) Transportable outriggers shall be used only with self-powered, ground rigged working platforms.

(C) Each transportable outrigger shall be secured with a tie-down to a verified anchorage on the building during the entire period of its use. The anchorage shall be designed to have a stability factor of not less than four against overturning or upsetting of the outrigger.

(D) Access to and egress from the working platform shall be from and to a safe surface below the point of suspension.

(E) Each transportable outrigger shall be designed for lateral stability to prevent roll-over in the event an accidental lateral load is applied to the outrigger. The accidental lateral load to be considered in this design shall be not less than 70 percent of the rated load of the hoist.

(F) Each transportable outrigger shall be designed to support an ultimate load of not less than four times the rated load of the hoist.

(G) Each transportable outrigger shall be so located that the suspension wire ropes for two point suspended working platforms are hung parallel.

(H) A transportable outrigger shall be tied-back to a verified anchorage on the building with a rope equivalent in strength to the suspension rope.

(I) The tie-back rope shall be installed parallel to the centerline of the outrigger.

(iii) *Davits.*

(A) Every davit installation, fixed or transportable, rotatable or non-rotatable shall be designed and installed to insure that it has a stability factor against overturning of not less than four.

(B) The following requirements apply to roof rigged davit systems:

(*1*) Access to and egress from the working platform shall be from a safe surface. Access or egress shall not require persons to climb over a building's parapet or guard railing; and

(*2*) The working platform shall be provided with wheels, casters or a carriage for traversing horizontally.

(C) The following requirements apply to ground rigged davit systems:

(*1*) The point of suspension shall not exceed 300 feet (91.5 m) above a safe surface. Guide system(s) shall be provided which meet the requirements of paragraph (e)(2) of this section;

(*2*) Access and egress to and from the working platform shall only be from a safe surface below the point of suspension.

(D) A rotating davit shall not require a horizontal force in excess of 40 pounds (177.9 n) per person to initiate a rotating movement.

(E) The following requirements shall apply to transportable davits:

(*1*) A davit or part of a davit weighing more than 80 pounds (36 kg) shall be provided with a means for its transport, which shall keep the center of gravity of the davit at or below 36 inches (914 mm) above the safe surface during transport;

(*2*) A davit shall be provided with a pivoting socket or with a base that will allow the insertion or removal of a davit at a position of not more than 35 degrees above the horizontal, with the complete davit inboard of the building face being serviced; and

(*3*) Means shall be provided to lock the davit to its socket or base before it is used to suspend the platform.

(4) *Hoisting machines.*

(i) Raising and lowering of suspended or supported equipment shall be performed only by a hoisting machine.

(ii) Each hoisting machine shall be capable of arresting any overspeed descent of the load.

(iii) Each hoisting machine shall be powered only by air, electric or hydraulic sources.

(iv) Flammable liquids shall not be carried on the working platform.

(v) Each hoisting machine shall be capable of raising or lowering 125 percent of the rated load of the hoist.

(vi) Moving parts of a hoisting machine shall be enclosed or guarded in compliance with paragraphs (a)(1) and (2) of § 1910.212 of this part.

(vii) Winding drums, traction drums and sheaves and directional sheaves used in conjunction with hoisting machines shall be compatible with, and sized for, the wire rope used.

(viii) Each winding drum shall be provided with a positive means of attaching the wire rope to the drum. The attachment shall be capable of developing at least four times the rated load of the hoist.

(ix) Each hoisting machine shall be provided with a primary brake and at least one independent secondary brake, each capable of stopping and holding not less than 125 percent of the lifting capacity of the hoist.

(A) The primary brake shall be directly connected to the drive train of the hoisting machine, and shall not be connected through belts, chains, clutches, or set screw type devices. The brake shall automatically set when power to the prime mover is interrupted.

(B)

(*1*) The secondary brake shall be an automatic emergency type of brake that, if actuated during each stopping cycle, shall not engage before the hoist is stopped by the primary brake.

(*2*) When a secondary brake is actuated, it shall stop and hold the platform within a vertical distance of 24 inches (609.6 mm).

(x) Any component of a hoisting machine which requires lubrication for its protection and proper functioning shall be provided with a means for that lubrication to be applied.

(5) ***Suspended equipment —***

(i) ***General requirements.***

(A) Each suspended unit component, except suspension ropes and guardrail systems, shall be capable of supporting, without failure, at least four times the maximum intended live load applied or transmitted to that component.

(B) Each suspended unit component shall be constructed of materials that will withstand anticipated weather conditions.

(C) Each suspended unit shall be provided with a load rating plate, conspicuously located, stating the unit weight and rated load of the suspended unit.

(D) When the suspension points on a suspended unit are not at the unit ends, the unit shall be capable of remaining continuously stable under all conditions of use and position of the live load, and shall maintain at least a 1.5 to 1 stability factor against unit upset.

(E) Guide rollers, guide shoes or building face rollers shall be provided, and shall compensate for variations in building dimensions and for minor horizontal out-of-level variations of each suspended unit.

(F) Each working platform of a suspended unit shall be secured to the building facade by one or more of the following methods, or by an equivalent method:

(*1*) Continuous engagement to building anchors as provided in paragraph (e)(2)(i) of this section;

(*2*) Intermittent engagement to building anchors as provided in paragraph (e)(2)(iii)(A) of this section;

(*3*) Button guide engagement as provided in paragraph (e)(2)(iii)(B) of this section; or

(*4*) Angulated roping and building face rollers as provided in paragraph (e)(2)(iii)(C) of this section.

(G) Each working platform of a suspended unit shall be provided with a guardrail system on all sides which shall meet the following requirements:

(*1*) The system shall consist of a top guardrail, midrail, and a toeboard;

(*2*) The top guardrail shall not be less than 36 inches (914 mm) high and shall be able to withstand at least a 100-pound (444 n) force in any downward or outward direction;

(*3*) The midrail shall be able to withstand at least a 75-pound (333 n) force in any downward or outward direction; and

(*4*) The areas between the guardrail and toeboard on the ends and outboard side, and the area between the midrail and toeboard on the inboard side, shall be closed with a material that is capable of withstanding a load of 100 pounds (45.4 KG.) applied horizontally over any area of one square foot (.09 m^2). The material shall have all openings small enough to reject passage of life lines and potential falling objects which may be hazardous to persons below.

(*5*) Toeboards shall be capable of withstanding, without failure, a force of at least 50 pounds (222 n) applied in any downward or horizontal direction at any point along the toeboard.

(*6*) Toeboards shall be three and one-half inches (9 cm) minimum in length from their top edge to the level of the platform floor.

(*7*) Toeboards shall be securely fastened in place at the outermost edge of the platform and have no more than one-half inch (1.3 cm) clearance above the platform floor.

(*8*) Toeboards shall be solid or with an opening not over one inch (2.5 cm) in the greatest dimension.

(ii) ***Two and four-point suspended working platforms.***

(A) The working platform shall be not less than 24 inches (610 mm) wide and shall be provided with a minimum of a 12 inch (305 mm) wide passage at or past any obstruction on the platform.

(B) The flooring shall be of a slip-resistant type and shall contain no opening that would allow the passage of life lines, cables and other potential falling objects. If a larger opening is provided, it shall be protected by placing a material under the opening which shall prevent the passage of life lines, cables and potential falling objects.

(C) The working platfrom shall be provided with a means of suspension that will restrict the platform's inboard to outboard roll about its longitudinal axis to a maximum of 15 degrees from a horizontal plane when moving the live load from the inboard to the outboard side of the platform.

(D) Any cable suspended from above the platform shall be provided with a means for storage to prevent accumulation of the cable on the floor of the platform.

(E) All operating controls for the vertical travel of the platform shall be of the continuous-pressure type, and shall be located on the platform.

(F) Each operating station of every working platform shall be provided with a means of interrupting the power supply to all hoist motors to stop any further powered ascent or descent of the platform.

(G) The maximum rated speed of the platform shall not exceed 50 feet per minute (0.3 ms) with single speed hoists, nor 75 feet per minute (0.4 ms) with multi-speed hoists.

(H) Provisions shall be made for securing all tools, water tanks, and other accessories to prevent their movement or accumulation on the floor of the platform.

(I) Portable fire extinguishers conforming to the provisions of §§ 1910.155 and 1910.157 of this part shall be provided and securely attached on all working platforms.

(J) Access to and egress from a working platfrom, except for those that land directly on a safe surface, shall be provided by stairs, ladders, platforms and runways conforming to the provisions of subpart D of this part. Access gates shall be self-closing and self-latching.

(K) Means of access to or egress from a working platform which is 48 inches (1.2 m) or more above a safe surface shall be provided with a guardrail system or ladder handrails that conform to the provisions of subpart D of this part.

(L) The platform shall be provided with a secondary wire rope suspension system if the platform contains overhead structures which restrict the emergency egress of employees. A horizontal lifeline or a direct connection anchorage shall be provided as part of a personal fall arrest system that meets the requirements of subpart I of this part for each employee on such a platform.

(M) A vertical lifeline shall be provided as part of a personal fall arrest system that meets the requirements of subpart I of this part for each employee on a working platform suspended by two or more wire ropes, if the failure of one wire rope or suspension attachment will cause the platform to upset. If a secondary wire rope suspension is used, vertical lifelines are not required for the personal fall arrest system, provided that each employee is attached to a horizontal lifeline anchored to the platform.

(N) An emergency electric operating device shall be provided on roof powered platforms near the hoisting machine for use in the event of failure of the normal operating device located on the working platform, or failure of the cable connected to the platform. The emergency electric operating device shall be mounted in a secured compartment, and the compartment shall be labeled with instructions for use. A means for opening the compartment shall be mounted in a break-glass receptable located near the emergency electric operating device or in an equivalent secure and accessible location.

(iii) *Single point suspended working platforms.*

(A) The requirements of paragraphs (f)(5)(ii) (A) through (K) of this section shall also apply to a single point working platform.

(B) Each single point suspended working platform shall be provided with a secondary wire rope suspension system which will prevent the working platform from falling should there be a failure of the primary means of support, or if the platform contains overhead structures which restrict the egress of the employees. A horizontal life line or a direct connection anchorage shall be provided as part of a personal fall arrest system that meets the requirements of subpart I of this part for each employee on the platform.

(iv) *Ground-rigged working platforms.*

(A) Groundrigged working platforms shall comply with all the requirements of paragraphs (f)(5)(ii) (A) through (M) of this section.

(B) After each day's use, the power supply within the building shall be disconnected from a ground-rigged working platform, and the platform shall be either disengaged from its suspension points or secured and stored at grade.

(v) *Intermittently stabilized platforms.*

(A) The platform shall comply with paragraphs (F)(5)(ii) (A) through (M) of this section.

(B) Each stabilizer tie shall be equipped with a “quick connect-quick disconnect” device which cannot be accidently disengaged, for attachment to the building anchor, and shall be resistant to adverse environmental conditions.

(C) The platform shall be provided with a stopping device that will interrupt the hoist power supply in the event the platform contacts a stabilizer tie during its ascent.

(D) Building face rollers shall not be placed at the anchor setting if exterior anchors are used on the building face.

(E) Stabilizer ties used on intermittently stabilized platforms shall allow for the specific attachment length needed to effect the predetermined angulation of the suspended wire rope. The specific attachment length shall be maintained at all building anchor locations.

(F) The platform shall be in continuous contact with the face of the building during ascent and descent.

(G) The attachment and removal of stabilizer ties shall not require the horizontal movement of the platform.

(H) The platform-mounted equipment and its suspension wire ropes shall not be physically damaged by the loads from the stabilizer tie or its building anchor. The platform, platform mounted equipment and wire ropes shall be able to withstand a load that is at least twice the ultimate strength of the stabilizer tie.

Note: See figure II in appendix B of this section for a description of a typical intermittent stabilization system.

(vi) *Button-guide stabilized platforms.*

(A) The platform shall comply with paragraphs (f)(5)(ii) (A) through (M) of this section.

(B) Each guide track on the platform shall engage a minimum of two guide buttons during any vertical travel of the platform following the initial button engagement.

(C) Each guide track on a platform that is part of a roof rigged system shall be provided with a storage position on the platform.

(D) Each guide track on the platform shall be sufficiently maneuverable by platform occupants to permit easy engagement of the guide buttons, and easy movement into and out of its storage position on the platform.

(E) Two guide tracks shall be mounted on the platform and shall provide continuous contact with the building face.

(F) The load carrying components of the button guide stabilization system which transmit the load into the platform shall be capable of supporting the weight of the platform, or provision shall be made in the guide track connectors or platform attachments to prevent the weight of the platform from being transmitted to the platform attachments.

Note: See figure III in appendix B of this section for a description of a typical button guide stabilization system.

(6) *Supported equipment.*

(i) Supported equipment shall maintain a vertical position in respect to the face of the building by means other than friction.

(ii) Cog wheels or equivalent means shall be incorporated to provide climbing traction between the supported equipment and the building guides. Additional guide wheels or shoes shall be incorporated as may be necessary to ensure that the drive wheels are continuously held in positive engagement with the building guides.

(iii) Launch guide mullions indexed to the building guides and retained in alignment with the building guides shall be used to align drive wheels entering the building guides.

(iv) Manned platforms used on supported equipment shall comply with the requirements of paragraphs (f)(5)(ii)(A), (f)(5)(ii)(B), and (f)(5)(ii) (D) through (K) of this section covering suspended equipment.

(7) *Suspension wire ropes and rope connections.*

(i) Each specific installation shall use suspension wire ropes or combination cable and connections meeting the specification recommended by the manufacturer of the hoisting machine used. Connections shall be capable of developing at least 80 percent of the rated breaking strength of the wire rope.

(ii) Each suspension rope shall have a “Design Factor” of at least 10. The “Design Factor” is the ratio of the rated strength of the suspension wire rope to the rated working load, and shall be calculated using the following formula:

$$F = \frac{S\,(N)}{W}$$

Where:

F = Design factor

S = Manufacturer's rated strength of one suspension rope

N = Number of suspension ropes under load

W = Rated working load on all ropes at any point of travel

(iii) Suspension wire rope grade shall be at least improved plow steel or equivalent.

(iv) Suspension wire ropes shall be sized to conform with the required design factor, but shall not be less than $^{5}/_{16}$ inch (7.94 mm) in diameter.

(v) No more than one reverse bend in six wire rope lays shall be permitted.

(vi) A corrosion-resistant tag shall be securely attached to one of the wire rope fastenings when a suspension wire rope is to be used at a specific location and will remain in that location. This tag shall bear the following wire rope data:

(A) The diameter (inches and/or mm);

(B) Construction classification;

(C) Whether non-preformed or preformed;

(D) The grade of material;

(E) The manufacturer's rated strength;

(F) The manufacturer's name;

(G) The month and year the ropes were installed; and

(H) The name of the person or company which installed the ropes.

(vii) A new tag shall be installed at each rope renewal.

(viii) The original tag shall be stamped with the date of the resocketing, or the original tag shall be retained and a supplemental tag shall be provided when ropes are resocketed. The supplemental tag shall show the date of resocketing and the name of the person or company that resocketed the rope.

(ix) Winding drum type hoists shall contain at least three wraps of the suspension wire rope on the drum when the suspended unit has reached the lowest possible point of its vertical travel.

(x) Traction drum and sheave type hoists shall be provided with a wire rope of sufficient length to reach the lowest possible point of vertical travel of the suspended unit, and an additional length of the wire rope of at least four feet (1.2 m).

(xi) The lengthening or repairing of suspension wire ropes is prohibited.

(xii) Babbitted fastenings for suspension wire rope are prohibited.

(8) ***Control circuits, power circuits and their components.***

(i) Electrical wiring and equipment shall comply with subpart S of this part, except as otherwise required by this section.

(ii) Electrical runway conductor systems shall be of a type designed for use in exterior locations, and shall be located so that they do not come into contact with accumulated snow or water.

(iii) Cables shall be protected against damage resulting from overtensioning or from other causes.

(iv) Devices shall be included in the control system for the equipment which will provide protection against electrical overloads, three phase reversal and phase failure. The control system shall have a separate method, independent of the direction control circuit, for breaking the power circuit in case of an emergency or malfunction.

(v) Suspended or supported equipment shall have a control system which will require the operator of the equipment to follow predetermined procedures.

(vi) The following requirements shall apply to electrical protection devices:

(A) On installations where the carriage does not have a stability factor of at least four against overturning, electrical contact(s) shall be provided and so connected that the operating devices for the suspended or supported equipment shall be operative only when the carriage is located and mechanically retained at an established operating point.

(B) Overload protection shall be provided in the hoisting or suspension system to protect against the equipment operating in the “up” direction with a load in excess of 125 percent of the rated load of the platform; and

(C) An automatic detector shall be provided for each suspension point that will interrupt power to all hoisting motors for travel in the “down” direction, and apply the primary brakes if any suspension wire rope becomes slack. A continuous-pressure rigging-bypass switch designed for use during rigging is permitted. This switch shall only be used during rigging.

(vii) Upper and lower directional switches designed to prevent the travel of suspended units beyond safe upward and downward levels shall be provided.

(viii) Emergency stop switches shall be provided on remote controlled, roof-powered manned platforms adjacent to each control station on the platform.

(ix) Cables which are in constant tension shall have overload devices which will prevent the tension in the cable from interfering with the load limiting device required in paragraph (f)(8)(vi)(B) of this section, or with the platform roll limiting device required in paragraph (f)(5)(ii)(C) of this section. The setting of these devices shall be coordinated with other overload settings at the time of design of the system, and shall be clearly indicated on or near the device. The device shall interrupt the equipment travel in the “down” direction.

(g) *Inspection and tests —*

(1) ***Installations and alterations.*** All completed building maintenance equipment installations shall be inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required. A similar inspection and test shall be made following any major alteration to an existing installation. No hoist in an installation shall be subjected to a load in excess of 125 percent of its rated load.

(2) ***Periodic inspections and tests.***

(i) Related building supporting structures shall undergo periodic inspection by a competent person at intervals not exceeding 12 months.

(ii) All parts of the equipment including control systems shall be inspected, and, where necessary, tested by a competent person at intervals specified by the manufacturer/supplier, but not to exceed 12 months, to determine that they are in safe operating condition. Parts subject to wear, such as wire ropes, bearings, gears, and governors shall be inspected and/or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation.

(iii) The building owner shall keep a certification record of each inspection and test required under paragraphs (g)(2)(i) and (ii) of this section. The certification record shall include the date of the inspection, the signature of the person who performed the inspection, and the number, or other identifier, of the building support structure and equipment which was inspected. This certification record shall be kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer.

(iv) Working platforms and their components shall be inspected by the employer for visible defects before every use and after each occurrence which could affect the platform's structural integrity.

(3) *Maintenance inspections and tests.*

(i) A maintenance inspection and, where necessary, a test shall be made of each platform installation every 30 days, or where the work cycle is less than 30 days such inspection and/or test shall be made prior to each work cycle. This inspection and test shall follow procedures recommended by the manufacturer, and shall be made by a competent person.

(ii) The building owner shall keep a certification record of each inspection and test performed under paragraph (g)(3)(i) of this section. The certification record shall include the date of the inspection and test, the signature of the person who performed the inspection and/or test, and an identifier for the platform installation which was inspected. The certification record shall be kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer.

(4) *Special inspection of governors and secondary brakes.*

(i) Governors and secondary brakes shall be inspected and tested at intervals specified by the manufacturer/supplier but not to exceed every 12 months.

(ii) The results of the inspection and test shall confirm that the initiating device for the secondary braking system operates at the proper overspeed.

(iii) The results of the inspection and test shall confirm that the secondary brake is functioning properly.

(iv) If any hoisting machine or initiating device for the secondary brake system is removed from the equipment for testing, all reinstalled and directly related components shall be reinspected prior to returning the equipment installation to service.

(v) Inspection of governors and secondary brakes shall be performed by a competent person.

(vi) The secondary brake governor and actuation device shall be tested before each day's use. Where testing is not feasible, a visual inspection of the brake shall be made instead to ensure that it is free to operate.

(5) *Suspension wire rope maintenance, inspection and replacement.*

(i) Suspension wire rope shall be maintained and used in accordance with procedures recommended by the wire rope manufacturer.

(ii) Suspension wire rope shall be inspected by a competent person for visible defects and gross damage to the rope before every use and after each occurrence which might affect the wire rope's integrity.

(iii) A thorough inspection of suspension wire ropes in service shall be made once a month. Suspension wire ropes that have been inactive for 30 days or longer shall have a thorough inspection before they are placed into service. These thorough inspections of suspension wire ropes shall be performed by a competent person.

(iv) The need for replacement of a suspension wire rope shall be determined by inspection and shall be based on the condition of the wire rope. Any of the following conditions or combination of conditions will be cause for removal of the wire rope:

(A) Broken wires exceeding three wires in one strand or six wires in one rope lay;

(B) Distortion of rope structure such as would result from crushing or kinking;

(C) Evidence of heat damage;

(D) Evidence of rope deterioration from corrosion;

(E) A broken wire within 18 inches (460.8 mm) of the end attachments;

(F) Noticeable rusting and pitting;

(G) Evidence of core failure (a lengthening of rope lay, protrusion of the rope core and a reduction in rope diameter suggests core failure); or

(H) More than one valley break (broken wire).

(I) Outer wire wear exceeds one-third of the original outer wire diameter.

(J) Any other condition which the competent person determines has significantly affected the integrity of the rope.

(v) The building owner shall keep a certification record of each monthly inspection of a suspension wire rope as required in paragraph (g)(5)(iii) of this section. The record shall include the date of the inspection, the signature of the person who performed the inspection, and a number, or other identifier, of the wire rope which was inspected. This record of inspection shall be made available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer.

(6) *Hoist inspection.* Before lowering personnel below the top elevation of the building, the hoist shall be tested each day in the lifting direction with the intended load to make certain it has sufficient capacity to raise the personnel back to the boarding level.

(h) *Maintenance —*

(1) ***General maintenance.*** All parts of the equipment affecting safe operation shall be maintained in proper working order so that they may perform the functions for which they were intended. The equipment shall be taken out of service when it is not in proper working order.

(2) ***Cleaning.***

(i) Control or power contactors and relays shall be kept clean.

(ii) All other parts shall be kept clean if their proper functioning would be affected by the presence of dirt or other contaminants.

(3) ***Periodic resocketing of wire rope fastenings.***

(i) Hoisting ropes utilizing poured socket fastenings shall be resocketed at the non-drum ends at intervals not exceeding 24 months. In resocketing the ropes, a sufficient length shall be cut from the end of the rope to remove damaged or fatigued portions.

(ii) Resocketed ropes shall conform to the requirements of paragraph (f)(7) of this section.

(iii) Limit switches affected by the resocketed ropes shall be reset, if necessary.

(4) ***Periodic reshackling of suspension wire ropes.*** The hoisting ropes shall be reshackled at the nondrum ends at intervals not exceeding 24 months. When reshackling the ropes, a sufficient length shall be cut from the end of the rope to remove damaged or fatigued portions.

(5) ***Roof systems.*** Roof track systems, tie-downs, or similar equipment shall be maintained in proper working order so that they perform the function for which they were intended.

(6) ***Building face guiding members.*** T-rails, indented mullions, or equivalent guides located in the face of a building shall be maintained in proper working order so that they perform the functions for which they were intended. Brackets for cable stabilizers shall similarly be maintained in proper working order.

(7) ***Inoperative safety devices.*** No person shall render a required safety device or electrical protective device inoperative, except as necessary for tests, inspections, and maintenance. Immediately upon completion of such tests, inspections and maintenance, the device shall be restored to its normal operating condition.

(i) ***Operations —***

(1) ***Training.***

(i) Working platforms shall be operated only by persons who are proficient in the operation, safe use and inspection of the particular working platform to be operated.

(ii) All employees who operate working platforms shall be trained in the following:

(A) Recognition of, and preventive measures for, the safety hazards associated with their individual work tasks.

(B) General recognition and prevention of safety hazards associated with the use of working platforms, including the provisions in the section relating to the particular working platform to be operated.

(C) Emergency action plan procedures required in paragraph (e)(9) of this section.

(D) Work procedures required in paragraph (i)(1)(iv) of this section.

(E) Personal fall arrest system inspection, care, use and system performance.

(iii) Training of employees in the operation and inspection of working platforms shall be done by a competent person.

(iv) Written work procedures for the operation, safe use and inspection of working platforms shall be provided for employee training. Pictorial methods of instruction, may be used, in lieu of written work procedures, if employee communication is improved using this method. The operating manuals supplied by manufacturers for platform system components can serve as the basis for these procedures.

(v) The employer shall certify that employees have been trained in operating and inspecting a working platform by preparing a certification record which includes the identity of the person trained, the signature of the employer or the person who conducted the training and the date that training was completed. The certification record shall be prepared at the completion of the training required in paragraph (i)(1)(ii) of this section, and shall be maintained in a file for the duration of the employee's employment. The certification record shall be kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative.

(2) *Use.*

(i) Working platforms shall not be loaded in excess of the rated load, as stated on the platform load rating plate.

(ii) Employees shall be prohibited from working on snow, ice, or other slippery material covering platforms, except for the removal of such materials.

(iii) Adequate precautions shall be taken to protect the platform, wire ropes and life lines from damage due to acids or other corrosive substances, in accordance with the recommendations of the corrosive substance producer, supplier, platform manufacturer or other equivalent information sources. Platform members which have been exposed to acids or other corrosive substances shall be washed down with a neutralizing solution, at a frequency recommended by the corrosive substance producer or supplier.

(iv) Platform members, wire ropes and life lines shall be protected when using a heat producing process. Wire ropes and life lines which have been contacted by the heat producing process shall be considered to be permanently damaged and shall not be used.

(v) The platform shall not be operated in winds in excess of 25 miles per hour (40.2 km/hr) except to move it from an operating to a storage position. Wind speed shall be determined based on the best available information, which includes on-site anemometer readings and local weather forecasts which predict wind velocities for the area.

(vi) On exterior installations, an anemometer shall be mounted on the platform to provide information of on-site wind velocities prior to and during the use of the platform. The anemometer may be a portable (hand held) unit which is temporarily mounted during platform use.

(vii) Tools, materials and debris not related to the work in progress shall not be allowed to accumulate on platforms. Stabilizer ties shall be located so as to allow unencumbered passage along the full length of the platform and shall be of such length so as not to become entangled in rollers, hoists or other machinery.

(j) ***Personal fall protection.*** Employees on working platforms shall be protected by a personal fall arrest system meeting the requirements of subpart I of this part and as otherwise provided by this standard.

Appendix A to § 1910.66, Guidelines (Advisory)

1. *Use of the Appendix.* Appendix A provides examples of equipment and methods to assist the employer in meeting the requirements of the indicated provision of the standard. Employers may use other equipment or procedures which conform to the requirements of the standard. This appendix neither adds to nor detracts from the mandatory requirements set forth in § 1910.66.

2. *Assurance.* Paragraph (c) of the standard requires the building owner to inform the employer in writing that the powered platform installation complies with certain requirements of the standard, since the employer may not have the necessary information to make these determinations. The employer, however, remains responsible for meeting these requirements which have not been set off in paragraph (c)(1).

3. *Design Requirements.* The design requirements for each installation should be based on the limitations (stresses, deflections, etc.), established by nationally recognized standards as promulgated by the following organizations, or to equivalent standards:

AA—The Aluminum Association, 818 Connecticut Avenue, NW., Washington, DC, 20006

Aluminum Construction Manual

Specifications For Aluminum Structures

Aluminum Standards and Data

AGMA—American Gear Manufacturers Association, 101 North Fort Meyer Dr., Suite 1000, Arlington, VA 22209

AISC—American Institute of Steel Construction, 400 North Michigan Avenue, Chicago, IL 60611

ANSI—American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018

ASCE—American Society of Civil Engineers, 345 East 47th Street, New York, NY 10017

ASME—American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017

ASTM—American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

AWS—American Welding Society, Inc., Box 351040, 550 NW. LeJeunne Road, Miami, FL 33126

JIC—Joint Industrial Council, 2139 Wisconsin Avenue NW., Washington, DC 20007

NEMA—National Electric Manufacturers Association, 2101 L Street, NW., Washington, DC 20037

4. *Tie-in-guides.* Indented mullions, T-rails or other equivalent guides are acceptable as tie-in guides in a building face for a continuous stabilization system. Internal guides are embedded in other building members with only the opening exposed (see Figure 1 of appendix B). External guides, however, are installed external to the other building members and so are fully exposed. The minimum opening for tie-in guides is three-quarters of an inch (19 mm), and the minimum inside dimensions are one-inch (25 mm) deep and two inches (50 mm) wide.

Employers should be aware of the hazards associated with tie-in guides in a continuous stabilization system which was not designed properly. For example, joints in these track systems may become extended or discontinuous due to installation or building settlement. If this alignment problem is not corrected, the system could jam when a guide roller or guide shoe strikes a joint and this would cause a hazardous situation for employees. In another instance, faulty design will result in guide rollers being mounted in a line so they will jam in the track at the slightest misalignment.

5. *Building anchors (intermittent stabilization system).* In the selection of the vertical distance between building anchors, certain factors should be given consideration. These factors include building height and architectural design, platform length and weight, wire rope angulation, and the wind velocities in the building area. Another factor to consider is the material of the building face, since this material may be adversely affected by the building rollers.

External or indented type building anchors are acceptable. Receptacles in the building facade used for the indented type should be kept clear of extraneous materials which will hinder their use. During the inspection of the platform installation, evidence of a failure or abuse of the anchors should be brought to the attention of the employer.

6. *Stabilizer tie length.* A stabilizer tie should be long enough to provide for the planned angulation of the suspension cables. However, the length of the tie should not be excessive and become a problem by possibly becoming entangled in the building face rollers or parts of the platform machinery.

The attachment length may vary due to material elongation and this should be considered when selecting the material to be used. Consideration should also be given to the use of ties which are easily installed by employees, since this will encourage their use.

7. *Intermittent stabilization system.* Intermittent stabilization systems may use different equipment, tie-in devices and methods to restrict the horizontal movement of a powered platform with respect to the face of the building. One acceptable method employs corrosion-resistant building anchors secured in the face of the building in vertical rows every third floor or 50 feet (15.3 m), whichever is less. The anchors are spaced horizontally to allow a stabilization attachment (stabilizer tie) for each of the two platform suspension wire ropes. The stabilizer tie consists of two parts. One part is a quick connect-quick disconnect device which utilizes a corrosion-resistant yoke and retainer spring that is designed to fit over the building anchors. The second part of the stabilizer tie is a lanyard which is used to maintain a fixed distance between the suspension wire rope and the face of the building.

In this method, as the suspended powered platform descends past the elevation of each anchor, the descent is halted and each of the platform occupants secures a stabilizer tie between a suspension wire rope and a building anchor. The procedure is repeated as each elevation of a building anchor is reached during the descent of the powered platform.

As the platform ascends, the procedure is reversed; that is, the stabilizer ties are removed as each elevation of a building anchor is reached. The removal of each stabilizer tie is assured since the platform is provided with stopping devices which will interrupt power to its hoist(s) in the event either stopping device contacts a stabilizer during the ascent of the platform.

Figure 2 of appendix B illustrates another type of acceptable intermittent stabilization system which utilizes retaining pins as the quick connect-quick disconnect device in the stabilizer tie.

8. *Wire Rope Inspection.* The inspection of the suspension wire rope is important since the rope gradually loses strength during its useful life. The purpose of the inspection is to determine whether the wire rope has sufficient integrity to support a platform with the required design factor.

If there is any doubt concerning the condition of a wire rope or its ability to perform the required work, the rope should be replaced. The cost of wire rope replacement is quite small if compared to the cost in terms of human injuries, equipment down time and replacement.

No listing of critical inspection factors, which serve as a basis for wire rope replacement in the standard, can be a substitute for an experienced inspector of wire rope. The listing serves as a user's guide to the accepted standards by which ropes must be judged.

Rope life can be prolonged if preventive maintenance is performed regularly. Cutting off an appropriate length of rope at the end termination before the core degrades and valley breaks appear minimizes degradation at these sections.

9. *General Maintenance.* In meeting the general maintenance requirement in paragraph (h)(1) of the standard, the employer should undertake the prompt replacement of broken, worn and damaged parts, switch contacts, brushes, and short flexible conductors of electrical devices. The components of the electrical service system and traveling cables should be replaced when damaged or significantly abraded. In addition, gears, shafts, bearings, brakes and hoisting drums should be kept in proper alignment.

10. *Training.* In meeting the training requirement of paragraph (i)(1) of the standard, employers should use both on the job training and formal classroom training. The written work procedures used for this training should be obtained from the manufacturer, if possible, or prepared as necessary for the employee's information and use.

Employees who will operate powered platforms with intermittent stabilization systems should receive instruction in the specific ascent and descent procedures involving the assembly and disassembly of the stabilizer ties.

An acceptable training program should also include employee instruction in basic inspection procedures for the purpose of determining the need for repair and replacement of platform equipment. In addition, the program should cover the inspection, care and use of the personal fall protection equipment required in paragraph (j)(1) of the standard.

In addition, the training program should also include emergency action plan elements. OSHA brochure #1B3088 (Rev.) 1985, “How to Prepare for Workplace Emergencies,” details the basic steps needed to prepare to handle emergencies in the workplace.

Following the completion of a training program, the employee should be required to demonstrate competency in operating the equipment safely. Supplemental training of the employee should be provided by the employer, as necessary, if the equipment used or other working conditions should change.

An employee who is required to work with chemical products on a platform should receive training in proper cleaning procedures, and in the hazards, care and handling of these products. In addition, the employee should be supplied with the appropriate personal protective equipment, such as gloves and eye and face protection.

11. *Suspension and Securing of Powered Platforms (Equivalency).* One acceptable method of demonstrating the equivalency of a method of suspending or securing a powered platform, as required in paragraphs (e)(2)(iii), (f)(3) and (f)(5)(i)(F), is to provide an engineering analysis by a registered professional engineer. The analysis should demonstrate that the proposed method will provide an equal or greater degree of safety for employees than any one of the methods specified in the standard.

Appendix B to § 1910.66—Exhibits (Advisory)

The three drawings in appendix B illustrate typical platform stabilization systems which are addressed in the standard. The drawings are to be used for reference purposes only, and do not illustrate all the mandatory requirements for each system.

Figure 1. Typical Self-Powered Platform--Continuous External or Indented Mullion Guide System

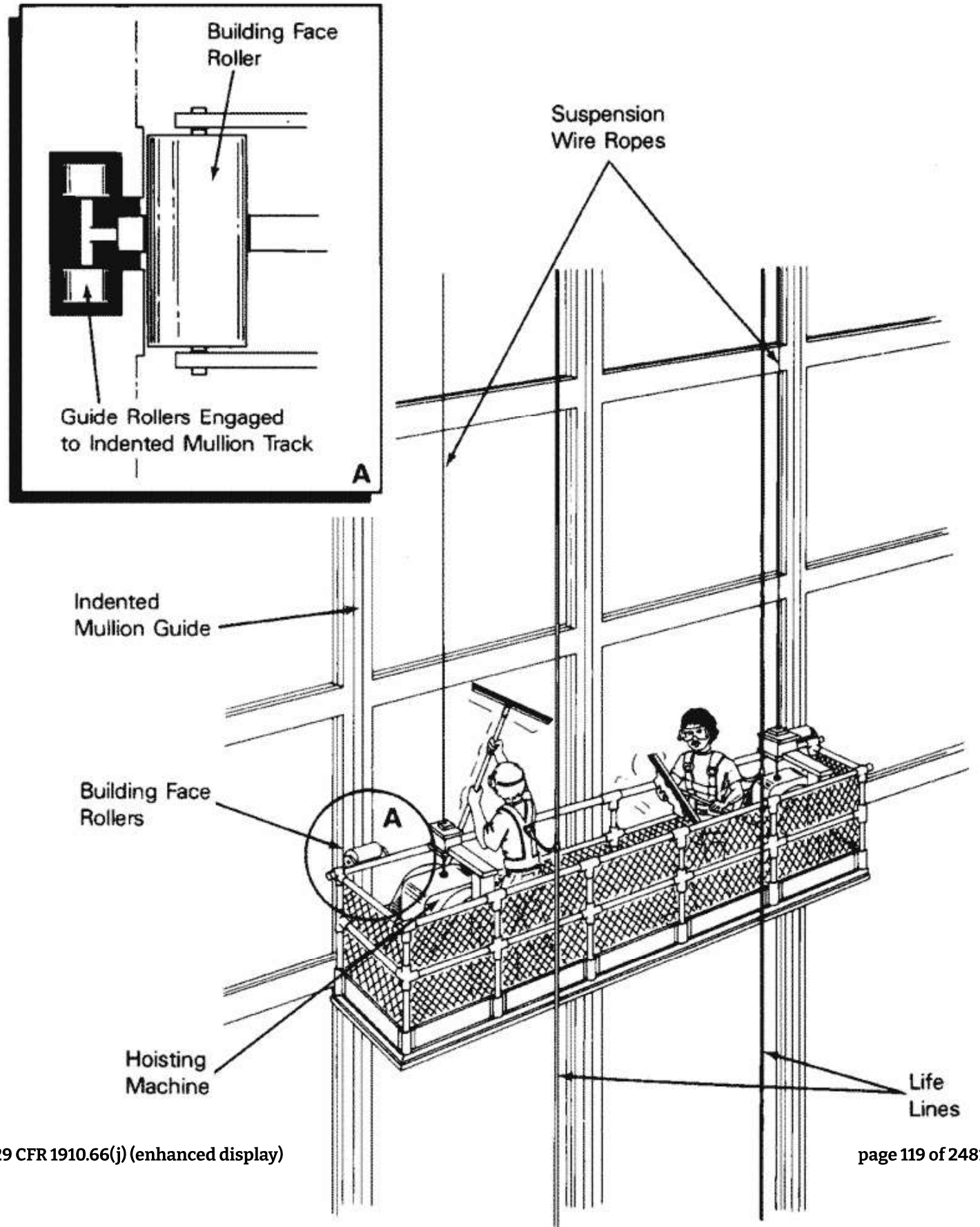


Figure 2. Typical Self-Powered Platform-- Intermittent Tie-In System

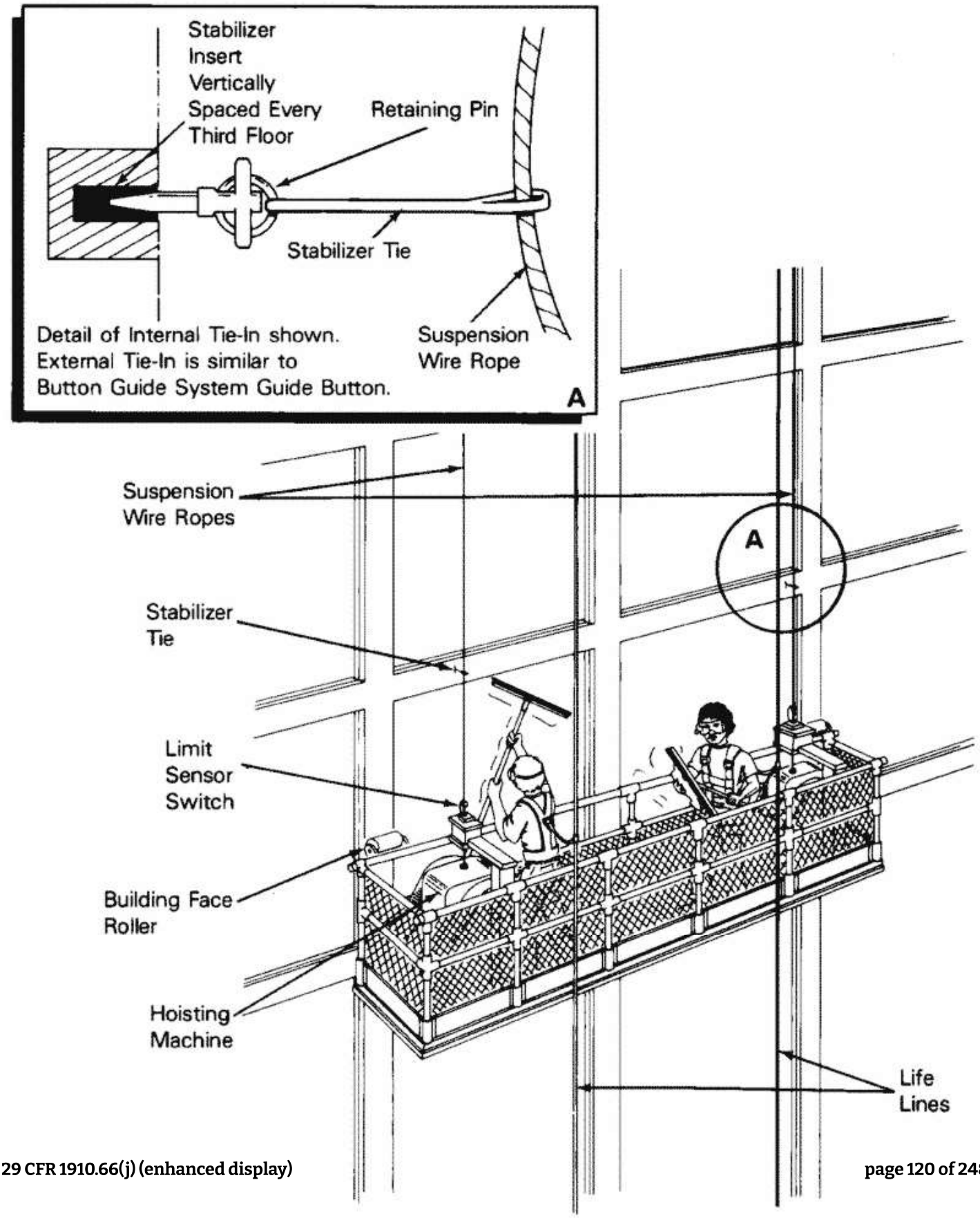
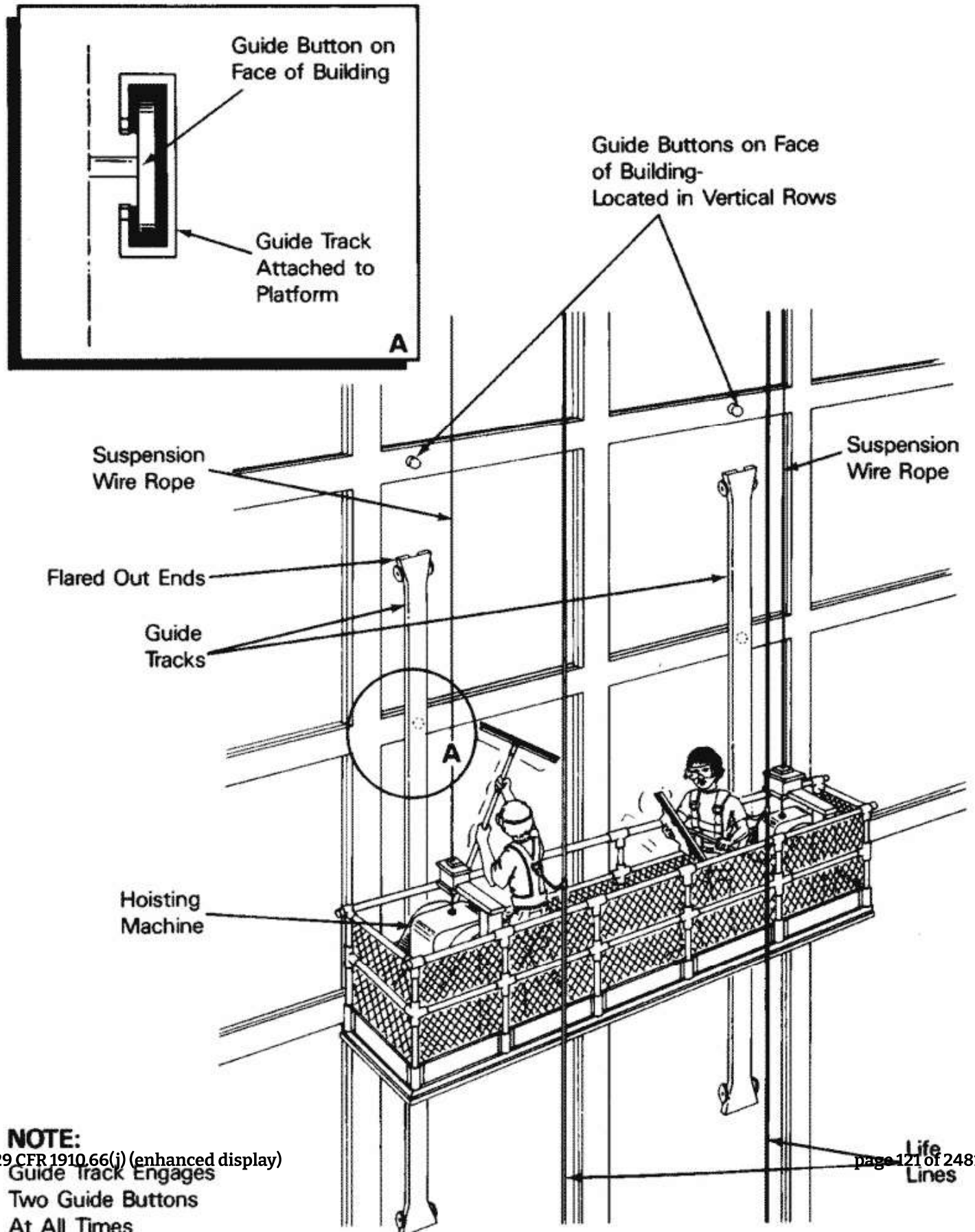


Figure 3. Typical Self-Powered Platform-- Button Guide System



Appendix C to § 1910.66 [Reserved]

Appendix D to § 1910.66—Existing Installations (Mandatory)

Use of the Appendix

Appendix D sets out the mandatory building and equipment requirements for applicable permanent installations completed after August 27, 1971, and no later than July 23, 1990 which are exempt from the paragraphs (a), (b)(1), (b)(2), (c), (d), (e), and (f) of this standard. The requirements in appendix D are essentially the same as unrevised building and equipment provisions which previously were designated as 29 CFR 1910.66 (a), (b), (c) and (d) and which were effective on August 27, 1971.

> Note: All existing installations subject to this appendix shall also comply with paragraphs (g), (h), (i), (j) and appendix C of the standard 29 CFR 1910.66.

(a) *Definitions applicable to this appendix*—(1) *Angulated roping.* A system of platform suspension in which the upper wire rope sheaves or suspension points are closer to the plane of the building face than the corresponding attachment points on the platform, thus causing the platform to press against the face of the building during its vertical travel.

(2) *ANSI.* American National Standards Institute.

(3) *Babbitted fastenings.* The method of providing wire rope attachments in which the ends of the wire strands are bent back and are held in a tapered socket by means of poured molten babbitt metal.

(4) *Brake—disc type.* A brake in which the holding effect is obtained by frictional resistance between one or more faces of discs keyed to the rotating member to be held and fixed discs keyed to the stationary or housing member (pressure between the discs being applied axially).

(5) *Brake—self-energizing band type.* An essentially undirectional brake in which the holding effect is obtained by the snubbing action of a flexible band wrapped about a cylindrical wheel or drum affixed to the rotating member to be held, the connections and linkages being so arranged that the motion of the brake wheel or drum will act to increase the tension or holding force of the band.

(6) *Brake—shoe type.* A brake in which the holding effect is obtained by applying the direct pressure of two or more segmental friction elements held to a stationary member against a cylindrical wheel or drum affixed to the rotating member to be held.

(7) *Building face rollers.* A specialized form of guide roller designed to contact a portion of the outer face or wall structure of the building, and to assist in stabilizing the operators' platform during vertical travel.

(8) *Continuous pressure.* Operation by means of buttons or switches, any one of which may be used to control the movement of the working platform or roof car, only as long as the button or switch is manually maintained in the actuating position.

(9) *Control.* A system governing starting, stopping, direction, acceleration, speed, and retardation of moving members.

(10) *Controller.* A device or group of devices, usually contained in a single enclosure, which serves to control in some predetermined manner the apparatus to which it is connected.

(11) *Electrical ground.* A conducting connection between an electrical circuit or equipment and the earth, or some conducting body which serves in place of the earth.

(12) *Guide roller.* A rotating, bearing-mounted, generally cylindrical member, operating separately or as part of a guide shoe assembly, attached to the platform, and providing rolling contact with building guideways, or other building contact members.

(13) *Guide shoe.* An assembly of rollers, slide members, or the equivalent, attached as a unit to the operators' platform, and designed to engage with the building members provided for the vertical guidance of the operators' platform.

(14) *Interlock.* A device actuated by the operation of some other device with which it is directly associated, to govern succeeding operations of the same or allied devices.

(15) *Operating device.* A pushbutton, lever, or other manual device used to actuate a control.

(16) *Powered platform.* Equipment to provide access to the exterior of a building for maintenance, consisting of a suspended power-operated working platform, a roof car, or other suspension means, and the requisite operating and control devices.

(17) *Rated load.* The combined weight of employees, tools, equipment, and other material which the working platform is designed and installed to lift.

(18) *Relay, direction.* An electrically energized contactor responsive to an initiating control circuit, which in turn causes a moving member to travel in a particular direction.

(19) *Relay, potential for vertical travel.* An electrically energized contactor responsive to initiating control circuit, which in turn controls the operation of a moving member in both directions. This relay usually operates in conjunction with direction relays, as covered under the definition, “relay, direction.”

(20) *Roof car.* A structure for the suspension of a working platform, providing for its horizontal movement to working positions.

(21) *Roof-powered platform.* A powered platform having the raising and lowering mechanism located on a roof car.

(22) *Self-powered platform.* A powered platform having the raising and lowering mechanism located on the working platform.

(23) *Traveling cable.* A cable made up of electrical or communication conductors or both, and providing electrical connection between the working platform and the roof car or other fixed point.

(24) *Weatherproof.* Equipment so constructed or protected that exposure to the weather will not interfere with its proper operation.

(25) *Working platform.* The suspended structure arranged for vertical travel which provides access to the exterior of the building or structure.

(26) *Yield point.* The stress at which the material exhibits a permanent set of 0.2 percent.

(27) *Zinced fastenings.* The method of providing wire rope attachments in which the splayed or fanned wire ends are held in a tapered socket by means of poured molten zinc.

(b) *General requirements.* (1) Design requirements. All powered platform installations for exterior building maintenance completed as of August 27, 1971, but no later than [insert date, 180 days after the effective date], shall meet all of the design, construction and installation requirements of part II and III of the "American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance ANSI A120.1-1970" and of this appendix. References shall be made to appropriate parts of ANSI A120.1-1970 for detail specifications for equipment and special installations.

(2) *Limitation.* The requirements of this appendix apply only to electric powered platforms. It is not the intent of this appendix to prohibit the use of other types of power. Installation of powered platforms using other types of power is permitted, provided such platforms have adequate protective devices for the type of power used, and otherwise provide for reasonable safety of life and limb to users of equipment and to others who may be exposed.

(3) *Types of powered platforms.* (i) For the purpose of applying this appendix, powered platforms are divided into two basic types, Type F and Type T.

(ii) Powered platforms designated as Type F shall meet all the requirements in part II of ANSI A 120.1-1970, American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance. A basic requirement of Type F equipment is that the work platform is suspended by at least four wire ropes and designed so that failure of any one wire rope will not substantially alter the normal position of the working platform. Another basic requirement of Type F equipment is that only one layer of hoisting rope is permitted on winding drums. Type F powered platforms may be either roof-powered or self-powered.

(iii) Powered platforms designated as Type T shall meet all the requirements in part III of ANSI A120.1-1970 American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance, except for section 28, Safety Belts and Life Lines. A basic requirement of Type T equipment is that the working platform is suspended by at least two wire ropes. Failure of one wire rope would not permit the working platform to fall to the ground, but would upset its normal position. Type T powered platforms may be either roof-powered or self-powered.

(iv) The requirements of this section apply to powered platforms with winding drum type hoisting machines. It is not the intent of this section to prohibit powered platforms using other types of hoisting machines such as, but not limited to, traction drum hoisting machines, air powered machines, hydraulic powered machines, and internal combustion machines. Installation of powered platforms with other types of hoisting machines is permitted, provided adequate protective devices are used, and provided reasonable safety of life and limb to users of the equipment and to others who may be exposed is assured.

(v) Both Type F and Type T powered platforms shall comply with the requirements of appendix C of this standard.

(c) *Type F powered platforms*—(1) *Roof car, general.* (i) A roof car shall be provided whenever it is necessary to move the working platform horizontally to working or storage positions.

(ii) The maximum rated speed at which a power traversed roof car may be moved in a horizontal direction shall be 50 feet per minute.

(2) *Movement and positioning of roof car.* (i) Provision shall be made to protect against having the roof car leave the roof or enter roof areas not designed for travel.

(ii) The horizontal motion of the roof cars shall be positively controlled so as to insure proper movement and positioning of the roof car.

(iii) Roof car positioning devices shall be provided to insure that the working platform is placed and retained in proper position for vertical travel and during storage.

(iv) Mechanical stops shall be provided to prevent the traversing of the roof car beyond its normal limits of travel. Such stops shall be capable of withstanding a force equal to 100 percent of the inertial effect of the roof car in motion with traversing power applied.

(v)(a) The operating device of a power-operated roof car for traversing shall be located on the roof car, the working platform, or both, and shall be of the continuous pressure weather-proof electric type. If more than one operating device is provided, they shall be so arranged that traversing is possible only from one operating device at a time.

(b) The operating device shall be so connected that it is not operable until:

(*1*) The working platform is located at its uppermost position of travel and is not in contact with the building face or fixed vertical guides in the face of the building; and

(*2*) All protective devices and interlocks are in a position for traversing.

(3) *Roof car stability.* Roof car stability shall be determined by either paragraph (c)(3) (i) or (ii) of this appendix, whichever is greater.

(i) The roof car shall be continuously stable, considering overturning moment as determined by 125 percent rated load, plus maximum dead load and the prescribed wind loading.

(ii) The roof car and its anchorages shall be capable of resisting accidental over-tensioning of the wire ropes suspending the working platform and this calculated value shall include the effect of one and one-half times the value. For this calculation, the simultaneous effect of one-half wind load shall be included, and the design stresses shall not exceed those referred to in paragraph (b)(1) of this appendix.

(iii) If the load on the motors is at any time in excess of three times that required for lifting the working platform with its rated load the motor shall stall.

(4) *Access to the roof car.* Safe access to the roof car and from the roof car to the working platform shall be provided. If the access to the roof car at any point of its travel is not over the roof area or where otherwise necessary for safety, then self-closing, self-locking gates shall be provided. Access to and from roof cars must comply with the requirements of subpart D of this part.

(5) *Means for maintenance, repair, and storage.* Means shall be provided to run the roof car away from the roof perimeter, where necessary, and to provide a safe area for maintenance, repairs, and storage. Provisions shall be made to secure the machine in the stored position. For stored machines subject to wind forces, see special design and anchorage requirements for "wind forces" in part II, section 10.5.1.1 of ANSI A120.1-1970 American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance.

(6) *General requirements for working platforms.* The working platform shall be of girder or truss construction and shall be adequate to support its rated load under any position of loading, and comply with the provisions set forth in section 10 of ANSI A120.1-1970, American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance.

(7) *Load rating plate.* Each working platform shall bear a manufacturer's load rating plate, conspicuously posted; stating the maximum permissible rated load. Load rating plates shall be made of noncorrosive material and shall have letters and figures stamped, etched, or cast on the surface. The minimum height of the letters and figures shall be one-fourth inch.

(8) *Minimum size.* The working platform shall have a minimum net width of 24 inches.

(9) *Guardrails.* Working platforms shall be furnished with permanent guard rails not less than 36 inches high, and not more than 42 inches high at the front (building side). At the rear, and on the sides, the rail shall not be less than 42 inches high. An intermediate guardrail shall be provided around the entire platform between the top guardrail and the toeboard.

(10) *Toeboards.* A four-inch toeboard shall be provided along all sides of the working platform.

(11) *Open spaces between guardrails and toeboards.* The spaces between the intermediate guardrail and platform toeboard on the building side of the working platform, and between the top guardrail and the toeboard on other sides of the platform, shall be filled with metalic mesh or similar material that will reject a ball one inch in diameter. The installed mesh shall be capable of withstanding a load of 100 pounds applied horizontally over any area of 144 square inches. If the space between the platform and the building face does not exceed eight inches, and the platform is restrained by guides, the mesh may be omitted on the front side.

(12) *Flooring.* The platform flooring shall be of the nonskid type, and if of open construction, shall reject a $^{9}/_{16}$-inch diameter ball, or be provided with a screen below the floor to reject a $^{9}/_{16}$-inch diameter ball.

(13) *Access gates.* Where access gates are provided, they shall be self-closing and self-locking.

(14) *Operating device for vertical movement of the working platform.* (i) The normal operating device for the working platform shall be located on the working platform and shall be of the continuous pressure weatherproof electric type.

(ii) The operating device shall be operable only when all electrical protective devices and interlocks on the working platform are in position for normal service and, the roof car, if provided, is at an established operating point.

(15) *Emergency electric operative device.* (i) In addition, on roof-powered platforms, an emergency electric operating device shall be provided near the hoisting machine for use in the event of failure of the normal operating device for the working platform, or failure of the traveling cable system. The emergency operating device shall be mounted in a locked compartment and shall have a legend mounted thereon reading: "For Emergency Operation Only. Establish Communication With Personnel on Working Platform Before Use."

(ii) A key for unlocking the compartment housing the emergency operating device shall be mounted in a break-glass receptacle located near the emergency operating device.

(16) *Manual cranking for emergency operation.* Emergency operation of the main drive machine may be provided to allow manual cranking. This provision for manual operation shall be designed so that not more than two persons will be required to perform this operation. The access to this provision shall include a means to automatically make the machine inoperative electrically while under the emergency manual operation. The design shall be such that the emergency brake is operative at or below governor tripping speed during manual operation.

(17) *Arrangement and guarding of hoisting equipment.* (i) Hoisting equipment shall consist of a power-driven drum or drum contained in the roof car (roof-powered platforms) or contained on the working platform (self-powered platform).

(ii) The hoisting equipment shall be power-operated in both up and down directions.

(iii) Guard or other protective devices shall be installed wherever rotating shafts or other mechanisms or gears may expose personnel to a hazard.

(iv) Friction devices or clutches shall not be used for connecting the main driving mechanism to the drum or drums. Belt or chain-driven machines are prohibited.

(18) *Hoisting motors.* (i) Hoisting motors shall be electric and of weather-proof construction.

(ii) Hoisting motors shall be in conformance with applicable provisions of paragraph (c)(22) of this appendix, Electric Wiring and Equipment.

(iii) Hoisting motors shall be directly connected to the hoisting machinery. Motor couplings, if used, shall be of steel construction.

(19) *Brakes.* The hoisting machine(s) shall have two independent braking means, each designed to stop and hold the working platform with 125 percent of rated load.

(20) *Hoisting ropes and rope connections.* (i) Working platforms shall be suspended by wire ropes of either 6 × 19 or 6 × 37 classification, preformed or nonpreformed.

(ii) [Reserved]

(iii) The minimum factor of safety shall be 10, and shall be calculated by the following formula:

$F = S \times N/W$

Where

S = Manufacturer's rated breaking strength of one rope.

N = Number of ropes under load.

W = Maximum static load on all ropes with the platform and its rated load at any point of its travel.

(iv) Hoisting ropes shall be sized to conform with the required factor of safety, but in no case shall the size be less than $^{5}/_{16}$ inch diameter.

(v) Winding drums shall have at least three turns of rope remaining when the platform has landed at the lowest possible point of its travel.

(vi) The lengthening or repairing of wire rope by the joining of two or more lengths is prohibited.

(vii) The nondrum ends of the hoisting ropes shall be provided with individual shackle rods which will permit individual adjustment of rope lengths, if required.

(viii) More than two reverse bends in each rope is prohibited.

(21) *Rope tag data.* (i) A metal data tag shall be securely attached to one of the wire rope fastenings. This data tag shall bear the following wire rope data:

(a) The diameter in inches.

(b) Construction classification.

(c) Whether nonpreformed or preformed.

(d) The grade of material used.

(e) The manufacturer's rated breaking strength.

(f) Name of the manufacturer of the rope.

(g) The month and year the ropes were installed.

(22) *Electrical wiring and equipment.* (i) All electrical equipment and wiring shall conform to the requirements of subpart S of this Part, except as modified by ANSI A120.1—1970 “American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance” (see § 1910.6). For detail design specifications for electrical equipment, see part 2, ANSI A120.1-1970.

(ii) All motors and operation and control equipment shall be supplied from a single power source.

(iii) The power supply for the powered platform shall be an independent circuit supplied through a fused disconnect switch.

(iv) Electrical conductor parts of the power supply system shall be protected against accidental contact.

(v) Electrical grounding shall be provided.

(a) Provisions for electrical grounding shall be included with the power-supply system.

(b) Controller cabinets, motor frames, hoisting machines, the working platform, roof car and roof car track system, and noncurrent carrying parts of electrical equipment, where provided, shall be grounded.

(c) The controller, where used, shall be so designed and installed that a single ground or short circuit will not prevent both the normal and final stopping device from stopping the working platform.

(d) Means shall be provided on the roof car and working platform for grounding portable electric tools.

(e) The working platform shall be grounded through a grounding connection in a traveling cable. Electrically powered tools utilized on the working platform shall be grounded.

(vi) Electrical receptacles located on the roof or other exterior location shall be of a weatherproof type and shall be located so as not to be subject to contact with water or accumulated snow. The receptacles shall be grounded and the electric cable shall include a grounding conductor. The receptacle and plug shall be a type designed to avoid hazard to persons inserting or withdrawing the plug. Provision shall be made to prevent application of cable strain directly to the plug and receptacle.

(vii) Electric runway conductor systems shall be of the type designed for use in exterior locations and shall be located so as not to be subject to contact with water or accumulated snow. The conductors, collectors, and disconnecting means shall conform to the same requirements as those for cranes and hoists in subpart S of this Part. A grounded conductor shall parallel the power conductors and be so connected that it cannot be opened by the disconnecting means. The system shall be designed to avoid hazard to persons in the area.

(viii) Electrical protective devices and interlocks of the weatherproof type shall be provided.

(ix) Where the installation includes a roof car, electric contact(s) shall be provided and so connected that the operating devices for the working platform shall be operative only when the roof car is located and mechanically retained at an established operating point.

(x) Where the powered platform includes a powered-operated roof car, the operating device for the roof car shall be inoperative when the roof car is mechanically retained at an established operating point.

(xi) An electric contact shall be provided and so connected that it will cause the down direction relay for vertical travel to open if the tension in the traveling cable exceeds safe limits.

(xii) An automatic overload device shall be provided to cut off the electrical power to the circuit in all hoisting motors for travel in the up direction, should the load applied to the hoisting ropes at either end of the working platform exceed 125 percent of its normal tension with rated load, as shown on the manufacturer's data plate on the working platform.

(xiii) An automatic device shall be provided for each hoisting rope which will cut off the electrical power to the hoisting motor or motors in the down direction and apply the brakes if any hoisting rope becomes slack.

(xiv) Upper and lower directional limit devices shall be provided to prevent the travel of the working platform beyond the normal upper and lower limits of travel.

(xv) Operation of a directional limit device shall prevent further motion in the appropriate direction, if the normal limit of travel has been reached.

(xvi) Directional limit devices, if driven from the hoisting machine by chains, tapes, or cables, shall incorporate a device to disconnect the electric power from the hoisting machine and apply both the primary and secondary brakes in the event of failure of the driving means.

(xvii) Final terminal stopping devices of the working platform:

(a) Final terminal stopping devices for the working platform shall be provided as a secondary means of preventing the working platform from over-traveling at the terminals.

(b) The device shall be set to function as close to each terminal landing as practical, but in such a way that under normal operating conditions it will not function when the working platform is stopped by the normal terminal stopping device.

(c) Operation of the final terminal stopping device shall open the potential relay for vertical travel, thereby disconnecting the electric power from the hoisting machine, and applying both the primary and secondary brakes.

(d) The final terminal stopping device for the upper limit of travel shall be mounted so that it is operated directly by the motion of the working platform itself.

(xviii) Emergency stop switches shall be provided in or adjacent to each operating device.

(xix) Emergency stop switches shall:

(a) Have red operating buttons or handles.

(b) Be conspicuously and permanently marked “Stop.”

(c) Be the manually opened and manually closed type.

(d) Be positively opened with the opening not solely dependent on springs.

(xx) The manual operation of an emergency stop switch associated with an operating device for the working platform shall open the potential relay for vertical travel, thereby disconnecting the electric power from the hoisting machine and applying both the primary and secondary brakes.

(xxi) The manual operation of the emergency stop switch associated with the operating device for a power-driven roof car shall cause the electrical power to the traverse machine to be interrupted, and the traverse machine brake to apply.

(23) *Requirements for emergency communications.* (i) Communication equipment shall be provided for each powered platform for use in an emergency.

(ii) Two-way communication shall be established between personnel on the roof and personnel on the stalled working platform before any emergency operation of the working platform is undertaken by personnel on the roof.

(iii) The equipment shall permit two-way voice communication between the working platform and

(a) Designated personnel continuously available while the powered platform is in use; and

(b) Designated personnel on roof-powered platforms, undertaking emergency operation of the working platform by means of the emergency operating device located near the hoisting machine.

(iv) The emergency communication equipment shall be one of the following types:

(a) Telephone connected to the central telephone exchange system; or

(b) Telephones on a limited system or an approved two-way radio system, provided designated personnel are available to receive a message during the time the powered platform is in use.

(d) *Type T powered platforms*—(1) *Roof car.* The requirements of paragraphs (c)(1) through (c)(5) of this appendix shall apply to Type T powered platforms.

(2) *Working platform.* The requirements of paragraphs (c)(6) through (c)(16) of this appendix apply to Type T powered platforms.

(i) The working platform shall be suspended by at least two wire ropes.

(ii) The maximum rated speed at which the working platform of self-powered platforms may be moved in a vertical direction shall not exceed 35 feet per minute.

(3) *Hoisting equipment.* The requirements of paragraphs (c) (17) and (18) of this appendix shall apply to Type T powered platforms.

(4) *Brakes.* Brakes requirements of paragraph (c)(19) of this appendix shall apply.

(5) *Hoisting ropes and rope connections.* (i) Paragraphs (c)(20) (i) through (vi) and (viii) of this appendix shall apply to Type T powered platforms.

(ii) Adjustable shackle rods in subparagraph (c)(20)(vii) of this appendix shall apply to Type T powered platforms, if the working platform is suspended by more than two wire ropes.

(6) *Electrical wiring and equipment.* (i) The requirements of paragraphs (c)(22) (i) through (vi) of this appendix shall apply to Type T powered platforms. "Circuit protection limitation," "powered platform electrical service system," all operating services and control equipment shall comply with the specifications contained in part 2, section 26, ANSI A120.1-1970.

(ii) For electrical protective devices the requirements of paragraphs (c)(22) (i) through (viii) of this appendix shall apply to Type T powered platforms. Requirements for the "circuit potential limitation" shall be in accordance with specifications contained in part 2, section 26, of ANSI A120.1-1970.

(7) *Emergency communications.* All the requirements of paragraph (c)(23) of this appendix shall apply to Type T powered platforms.

[54 FR 31456, July 28, 1989, as amended at 61 FR 9235, Mar. 7, 1996; 72 FR 7190, Feb. 14, 2007; 81 FR 82998, Nov. 18, 2016]

§ 1910.67 Vehicle-mounted elevating and rotating work platforms.

(a) ***Definitions applicable to this section —***

(1) ***Aerial device.*** Any vehicle—mounted device, telescoping or articulating, or both, which is used to position personnel.

(2) ***Aerial ladder.*** An aerial device consisting of a single- or multiple-section extensible ladder.

(3) ***Articulating boom platform.*** An aerial device with two or more hinged boom sections.

(4) ***Extensible boom platform.*** An aerial device (except ladders) with a telescopic or extensible boom. Telescopic derricks with personnel platform attachments shall be considered to be extensible boom platforms when used with a personnel platform.

(5) ***Insulated aerial device.*** An aerial device designed for work on energized lines and apparatus.

(6) ***Mobile unit.*** A combination of an aerial device, its vehicle, and related equipment.

(7) ***Platform.*** Any personnel-carrying device (basket or bucket) which is a component of an aerial device.

(8) ***Vehicle.*** Any carrier that is not manually propelled.

(9) ***Vertical tower.*** An aerial device designed to elevate a platform in a substantially vertical axis.

(b) ***General requirements.***

(1) Unless otherwise provided in this section, aerial devices (aerial lifts) acquired on or after July 1, 1975, shall be designed and constructed in conformance with the applicable requirements of the American National Standard for "Vehicle Mounted Elevating and Rotating Work Platforms," ANSI A92.2—1969, including appendix, which is incorporated by reference as specified in § 1910.6. Aerial lifts acquired for use before July 1, 1975 which do not meet the requirements of ANSI A92.2—1969, may not be used after July 1, 1976, unless they shall have been modified so as to conform with the applicable design and construction requirements of ANSI A92.2—1969. Aerial devices include the following types of vehicle-mounted aerial devices used to elevate personnel to jobsites above ground:

(i) Extensible boom platforms,

(ii) aerial ladders,

(iii) articulating boom platforms,

(iv) vertical towers, and

(v) a combination of any of the above. Aerial equipment may be made of metal, wood, fiberglass reinforced plastic (FRP), or other material; may be powered or manually operated; and are deemed to be aerial lifts whether or not they are capable of rotating about a substantially vertical axis.

(2) Aerial lifts may be "field modified" for uses other than those intended by the manufacturer, provided the modification has been certified in writing by the manufacturer or by any other equivalent entity, such as a nationally recognized testing laboratory, to be in conformity with all applicable provisions of ANSI A92.2—1969 and this section, and to be at least as safe as the equipment was before modification.

(3) The requirements of this section do not apply to firefighting equipment or to the vehicles upon which aerial devices are mounted, except with respect to the requirement that a vehicle be a stable support for the aerial device.

(4) For operations near overhead electric lines, see § 1910.333(c)(3).

(c) *Specific requirements —*

(1) ***Ladder trucks and tower trucks.*** Before the truck is moved for highway travel, aerial ladders shall be secured in the lower traveling position by the locking device above the truck cab, and the manually operated device at the base of the ladder, or by other equally effective means (e.g., cradles which prevent rotation of the ladder in combination with positive acting linear actuators).

(2) ***Extensible and articulating boom platforms.***

(i) Lift controls shall be tested each day prior to use to determine that such controls are in safe working condition.

(ii) Only trained persons shall operate an aerial lift.

(iii) Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted.

(iv) Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.

(v) A personal fall arrest or travel restraint system that meets the requirements in subpart I of this part shall be worn and attached to the boom or basket when working from an aerial lift.

(vi) Boom and basket load limits specified by the manufacturer shall not be exceeded.

(vii) The brakes shall be set and outriggers, when used, shall be positioned on pads or a solid surface. Wheel chocks shall be installed before using an aerial lift on an incline.

(viii) An aerial lift truck may not be moved when the boom is elevated in a working position with men in the basket, except for equipment which is specifically designed for this type of operation in accordance with the provisions of paragraphs (b)(1) and (b)(2) of this section.

(ix) Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Upper controls shall be in or beside the platform within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Controls shall be plainly marked as to their function. Lower level controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.

(x) Climbers shall not be worn while performing work from an aerial lift.

(xi) The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating value.

(xii) Before moving an aerial lift for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position, except as provided in paragraph (c)(2)(viii) of this section.

(3) ***Electrical tests.*** Electrical tests shall be made in conformance with the requirements of ANSI A92.2—1969, Section 5. However, equivalent DC voltage tests may be used in lieu of the AC voltage test specified in A92.2—1969. DC voltage tests which are approved by the equipment manufacturer or equivalent entity shall be considered an equivalent test for the purpose of this paragraph (c)(3).

(4) ***Bursting safety factor.*** All critical hydraulic and pneumatic components shall comply with the provisions of the American National Standards Institute standard, ANSI A92.2—1969, Section 4.9 Bursting Safety Factor. Critical components are those in which a failure would result in a free fall or free rotation of the boom. All noncritical components shall have a bursting safety factor of at least two to one.

(5) ***"Welding standards."*** All welding shall conform to the following American Welding Society (AWS) Standards which are incorporated by reference as specified in § 1910.6, as applicable:

(i) Standard Qualification Procedure, AWS B3.0—41.

(ii) Recommended Practices for Automotive Welding Design, AWS D8.4-61.

(iii) Standard Qualification of Welding Procedures and Welders for Piping and Tubing, AWS D10.9-69.

(iv) Specifications for Welding Highway and Railway Bridges, AWS D2.0-69.

[39 FR 23502, June 27, 1974, as amended at 40 FR 13439, Mar. 26, 1975; 55 FR 32014, Aug. 6, 1990; 61 FR 9235, Mar. 7, 1996; 79 FR 37190, July 1, 2014; 81 FR 82999, Nov. 18, 2016]

§ 1910.68 Manlifts.

(a) ***Definitions applicable to this section —***

(1) ***Handhold (Handgrip).*** A handhold is a device attached to the belt which can be grasped by the passenger to provide a means of maintaining balance.

(2) ***Open type.*** One which has a handgrip surface fully exposed and capable of being encircled by the passenger's fingers.

(3) ***Closed type.*** A cup-shaped device, open at the top in the direction of travel of the step for which it is to be used, and closed at the bottom, into which the passenger may place his fingers.

(4) ***Limit switch.*** A device, the purpose of which is to cut off the power to the motor and apply the brake to stop the carrier in the event that a loaded step passes the terminal landing.

(5) ***Manlift.*** A device consisting of a power-driven endless belt moving in one direction only, and provided with steps or platforms and handholds attached to it for the transportation of personnel from floor to floor.

(6) ***Rated speed.*** Rated speed is the speed for which the device is designed and installed.

(7) ***Split-rail switch.*** An electric limit switch operated mechanically by the rollers on the manlift steps. It consists of an additional hinged or "split" rail, mounted on the regular guide rail, over which the step rollers pass. It is springloaded in the "split" position. If the step supports no load, the rollers will "bump" over the switch; if a loaded step should pass over the section, the split rail will be forced straight, tripping the switch and opening the electrical circuit.

(8) ***Step (platform).*** A step is a passenger carrying unit.

(9) ***Travel.*** The travel is the distance between the centers of the top and bottom pulleys.

(b) ***General requirements —***

(1) ***Application.*** This section applies to the construction, maintenance, inspection, and operation of manlifts in relation to accident hazards. Manlifts covered by this section consist of platforms or brackets and accompanying handholds mounted on, or attached to an endless belt, operating vertically in one direction only and being supported by, and driven through pulleys, at the top and bottom. These manlifts are intended for conveyance of persons only. It is not intended that this section cover moving stairways, elevators with enclosed platforms ("Paternoster" elevators), gravity lifts, nor conveyors used only for conveying material. This section applies to manlifts used to carry only personnel trained and authorized by the employer in their use.

(2) ***Purpose.*** The purpose of this section is to provide reasonable safety for life and limb.

(3) ***Design requirements.*** All new manlift installations and equipment installed after the effective date of these regulations shall meet the design requirements of the "American National Safety Standard for Manlifts ANSI A90.1-1969", which is incorporated by reference as specified in § 1910.6, and the requirements of this section.

(4) ***Reference to other codes and subparts.*** The following codes and subparts of this part are applicable to this section: Safety Code for Mechanical Power Transmission Apparatus, ANSI B15.1-1953 (R 1958); Safety Code for Fixed Ladders, ANSI A14.3-1956; and subparts D, O, and S. The preceding ANSI standards are incorporated by reference as specified in § 1910.6.

(5) ***Floor openings —***

(i) ***Allowable size.*** Floor openings for both the "up" and "down" runs shall be not less than 28 inches nor more than 36 inches in width for a 12-inch belt; not less than 34 inches nor more than 38 inches for a 14-inch belt; and not less than 36 inches nor more than 40 inches for a 16-inch belt and shall extend not less than 24 inches, nor more than 28 inches from the face of the belt.

(ii) ***Uniformity.*** All floor openings for a given manlift shall be uniform in size and shall be approximately circular, and each shall be located vertically above the opening below it.

(6) ***Landing —***

(i) ***Vertical clearance.*** The clearanace between the floor or mounting platform and the lower edge for the conical guard above it required by subparagraph (7) of this paragraph shall not be less than 7 feet 6 inches. Where this clearance cannot be obtained no access to the manlift shall be provided and the manlift runway shall be enclosed where it passes through such floor.

(ii) ***Clear landing space.*** The landing space adjacent to the floor openings shall be free from obstruction and kept clear at all times. This landing space shall be at least 2 feet in width from the edge of the floor opening used for mounting and dismounting.

(iii) ***Lighting and landing.*** Adequate lighting, not less than 5-foot candles, shall be provided at each floor landing at all times when the lift is in operation.

(iv) ***Landing surface.*** The landing surfaces at the entrances and exits to the manlift shall be constructed and maintained as to provide safe footing at all times.

(v) ***Emergency landings.*** Where there is a travel of 50 feet or more between floor landings, one or more emergency landings shall be provided so that there will be a landing (either floor or emergency) for every 25 feet or less of manlift travel.

(*a*) Emergency landings shall be accessible from both the “up” and “down” rungs of the manlift and shall give access to the ladder required in subparagraph (12) of this paragraph.

(*b*) Emergency landings shall be completely enclosed with a standard railing and toeboard.

(*c*) Platforms constructed to give access to bucket elevators or other equipment for the purpose of inspection, lubrication, and repair may also serve as emergency landings under this rule. All such platforms will then be considered part of the emergency landing and shall be provided with standard railings and toeboards.

(7) *Guards on underside of floor openings —*

(i) ***Fixed type.*** On the ascending side of the manlift floor openings shall be provided with a bevel guard or cone meeting the following requirements:

(*a*) The cone shall make an angle of not less than 45° with the horizontal. An angle of 60° or greater shall be used where ceiling heights permit.

(*b*) The lower edge of this guard shall extend at least 42 inches outward from any handhold on the belt. It shall not extend beyond the upper surface of the floor above.

(*c*) The cone shall be made of not less than No. 18 U.S. gauge sheet steel or material of equivalent strength or stiffness. The lower edge shall be rolled to a minimum diameter of one-half inch and the interior shall be smooth with no rivets, bolts or screws protruding.

(ii) ***Floating type.*** In lieu of the fixed guards specified in subdivision (i) of this subparagraph a floating type safety cone may be used, such floating cones to be mounted on hinges at least 6 inches below the underside of the floor and so constructed as to actuate a limit switch should a force of 2 pounds be applied on the edge of the cone closest to the hinge. The depth of this floating cone need not exceed 12 inches.

(8) *Protection of entrances and exits —*

(i) ***Guard rail requirement.*** The entrances and exits at all floor landings affording access to the manlift shall be guarded by a maze (staggered railing) or a handrail equipped with self-closing gates.

(ii) ***Construction.*** The rails shall be standard guardrails with toeboards that meet the requirements in subpart D of this part.

(iii) ***Gates.*** Gates, if used, shall open outward and shall be self-closing. Corners of gates shall be rounded.

(iv) ***Maze.*** Maze or staggered openings shall offer no direct passage between enclosure and outer floor space.

(v) Except where building layout prevents, entrances at all landings shall be in the same relative position.

(9) ***Guards for openings*** —

(i) ***Construction.*** The floor opening at each landing shall be guarded on sides not used for entrance or exit by a wall, a railing and toeboard or by panels of wire mesh of suitable strength.

(ii) ***Height and location.*** Such rails or guards shall be at least 42 inches in height on the up-running side and 66 inches on the down-running side.

(10) ***Bottom arrangement*** —

(i) ***Bottom landing.*** At the bottom landing the clear area shall be not smaller than the area enclosed by the guardrails on the floors above, and any wall in front of the down-running side of the belt shall be not less than 48 inches from the face of the belt. This space shall not be encroached upon by stairs or ladders.

(ii) ***Location of lower pulley.*** The lower (boot) pulley shall be installed so that it is supported by the lowest landing served. The sides of the pulley support shall be guarded to prevent contact with the pulley or the steps.

(iii) ***Mounting platform.*** A mounting platform shall be provided in front or to one side of the uprun at the lowest landing, unless the floor level is such that the following requirement can be met: The floor or platform shall be at or above the point at which the upper surface of the ascending step completes its turn and assumes a horizontal position.

(iv) ***Guardrails.*** To guard against persons walking under a descending step, the area on the downside of the manlift shall be guarded in accordance with subparagraph (8) of this paragraph. To guard against a person getting between the mounting platform and an ascending step, the area between the belt and the platform shall be protected by a guardrail.

(11) ***Top arrangements*** —

(i) ***Clearance from floor.*** A top clearance shall be provided of at least 11 feet above the top terminal landing. This clearance shall be maintained from a plane through each face of the belt to a vertical cylindrical plane having a diameter 2 feet greater than the diameter of the floor opening, extending upward from the top floor to the ceiling on the up-running side of the belt. No encroachment of structural or machine supporting members within this space will be permitted.

(ii) ***Pulley clearance.***

(*a*) There shall be a clearance of at least 5 feet between the center of the head pulley shaft and any ceiling obstruction.

(*b*) The center of the head pulley shaft shall be not less than 6 feet above the top terminal landing.

(iii) ***Emergency grab rail.*** An emergency grab bar or rail and platform shall be provided at the head pulley when the distance to the head pulley is over 6 feet above the top landing, otherwise only a grab bar or rail is to be provided to permit the rider to swing free should the emergency stops become inoperative.

(12) ***Emergency exit ladder.*** A fixed metal ladder accessible from both the "up" and "down" run of the manlift shall be provided for the entire travel of the manlift. Such ladders shall meet the requirements in subpart D of this part.

(13) ***Superstructure bracing.*** Manlift rails shall be secured in such a manner as to avoid spreading, vibration, and misalinement.

(14) ***Illumination —***

(i) ***General.*** Both runs of the manlift shall be illuminated at all times when the lift is in operation. An intensity of not less than 1-foot candle shall be maintained at all points. (However, see subparagraph (6)(iii) of this paragraph for illumination requirements at landings.)

(ii) ***Control of illumination.*** Lighting of manlift runways shall be by means of circuits permanently tied in to the building circuits (no switches), or shall be controlled by switches at each landing. Where separate switches are provided at each landing, any switch shall turn on all lights necessary to illuminate the entire runway.

(15) ***Weather protection.*** The entire manlift and its driving mechanism shall be protected from the weather at all times.

(c) ***Mechanical requirements —***

(1) ***Machines, general —***

(i) ***Brakes.*** Brakes provided for stopping and holding a manlift shall be inherently self-engaging, by requiring power or force from an external source to cause disengagement. The brake shall be electrically released, and shall be applied to the motor shaft for direct-connected units or to the input shaft for belt-driven units. The brake shall be capable of stopping and holding the manlift when the descending side is loaded with 250 lb on each step.

(ii) ***Belt.***

(*a*) The belts shall be of hard-woven canvas, rubber-coated canvas, leather, or other material meeting the strength requirements of paragraph (b)(3) of this section and having a coefficient of friction such that when used in conjunction with an adequate tension device it will meet the brake test specified in subdivision (i) of this subparagraph.

(*b*) The width of the belt shall be not less than 12 inches for a travel not exceeding 100 feet, not less than 14 inches for a travel greater than 100 feet but not exceeding 150 feet and 16 inches for a travel exceeding 150 feet.

(*c*) A belt that has become torn while in use on a manlift shall not be spliced and put back in service.

(2) ***Speed —***

(i) ***Maximum speed.*** No manlift designed for a speed in excess of 80 feet per minute shall be installed.

(ii) [Reserved]

(3) ***Platforms or steps —***

(i) ***Minimum depth.*** Steps or platforms shall be not less than 12 inches nor more than 14 inches deep, measured from the belt to the edge of the step or platform.

(ii) ***Width.*** The width of the step or platform shall be not less than the width of the belt to which it is attached.

(iii) ***Distance between steps.*** The distance between steps shall be equally spaced and not less than 16 feet measured from the upper surface of one step to the upper surface of the next step above it.

(iv) ***Angle of step.*** The surface of the step shall make approximately a right angle with the "up" and "down" run of the belt, and shall travel in the approximate horizontal position with the "up" and "down" run of the belt.

(v) ***Surfaces.*** The upper or working surfaces of the step shall be of a material having inherent nonslip characteristics (coefficient of friction not less than 0.5) or shall be covered completely by a nonslip tread securely fastened to it.

(vi) ***Strength of step supports.*** When subjected to a load of 400 pounds applied at the approximate center of the step, step frames, or supports and their guides shall be of adequate strength to:

(*a*) Prevent the disengagement of any step roller.

(*b*) Prevent any appreciable misalinement.

(*c*) Prevent any visible deformation of the steps or its support.

(vii) ***Prohibition of steps without handholds.*** No steps shall be provided unless there is a corresponding handhold above or below it meeting the requirements of paragraph (c)(4) of this section. If a step is removed for repairs or permanently, the handholds immediately above and below it shall be removed before the lift is again placed in service.

(4) ***Handholds —***

(i) ***Location.*** Handholds attached to the belt shall be provided and installed so that they are not less than 4 feet nor more than 4 feet 8 inches above the step tread. These shall be so located as to be available on the both "up" and "down" run of the belt.

(ii) ***Size.*** The grab surface of the handhold shall be not less than $4^{1}/_{2}$ inches in width, not less than 3 inches in depth, and shall provide 2 inches of clearance from the belt. Fastenings for handholds shall be located not less than 1 inch from the edge of the belt.

(iii) ***Strength.*** The handhold shall be capable of withstanding, without damage, a load of 300 pounds applied parallel to the run of the belt.

(iv) ***Prohibition of handhold without steps.*** No handhold shall be provided without a corresponding step. If a handhold is removed permanently or temporarily, the corresponding step and handhold for the opposite direction of travel shall also be removed before the lift is again placed in service.

(v) ***Type.*** All handholds shall be of the closed type.

(5) ***Up limit stops —***

(i) ***Requirements.*** Two separate automatic stop devices shall be provided to cut off the power and apply the brake when a loaded step passes the upper terminal landing. One of these shall consist of a split-rail switch mechanically operated by the step roller and located not more than 6 inches above the top terminal landing. The second automatic stop device may consist of any of the following:

(*a*) Any split-rail switch placed 6 inches above and on the side opposite the first limit switch.

(*b*) An electronic device.

(*c*) A switch actuated by a lever, rod, or plate, the latter to be placed on the “up” side of the head pulley so as to just clear a passing step.

(ii) ***Manual reset location.*** After the manlift has been stopped by a stop device it shall be necessary to reset the automatic stop manually. The device shall be so located that a person resetting it shall have a clear view of both the “up” and “down” runs of the manlift. It shall not be possible to reset the device from any step or platform.

(iii) ***Cut-off point.*** The initial limit stop device shall function so that the manlift will be stopped before the loaded step has reached a point 24 inches above the top terminal landing.

(iv) ***Electrical requirements.***

(*a*) Where such switches open the main motor circuit directly they shall be of the multipole type.

(*b*) Where electronic devices are used they shall be so designed and installed that failure will result in shutting off the power to the driving motor.

(*c*) Where flammable vapors or combustible dusts may be present, electrical installations shall be in accordance with the requirements of subpart S of this part for such locations.

(*d*) Unless of the oil-immersed type controller contacts carrying the main motor current shall be copper to carbon or equal, except where the circuit is broken at two or more points simultaneously.

(6) ***Emergency stop —***

(i) ***General.*** An emergency stop means shall be provided.

(ii) ***Location.*** This stop means shall be within easy reach of the ascending and descending runs of the belt.

(iii) ***Operation.*** This stop means shall be so connected with the control lever or operating mechanism that it will cut off the power and apply the brake when pulled in the direction of travel.

(iv) ***Rope.*** If rope is used, it shall be not less than three-eights inch in diameter. Wire rope, unless marlin-covered, shall not be used.

(7) ***Instruction and warning signs —***

(i) ***Instruction signs at landings or belts.*** Signs of conspicuous and easily read style giving instructions for the use of the manlift shall be posted at each landing or stenciled on the belt.

(*a*) [Reserved]

(*b*) The instructions shall read approximately as follows:

> Face the Belt.
>
> Use the Handholds.
>
> To Stop—Pull Rope.

(ii) ***Top floor warning sign and light.***

(*a*) At the top floor an illuminated sign shall be displayed bearing the following wording:

> "TOP FLOOR—GET OFF"

Signs shall be in block letters not less than 2 inches in height. This sign shall be located within easy view of an ascending passenger and not more than 2 feet above the top terminal landing.

(*b*) In addition to the sign required by paragraph (c)(7)(ii)(*a*) of this section, a red warning light of not less than 40- watt rating shall be provided immediately below the upper landing terminal and so located as to shine in the passenger's face.

(iii) ***Visitor warning.*** A conspicuous sign having the following legend—AUTHORIZED PERSONNEL ONLY—shall be displayed at each landing.

(d) ***Operating rules —***

(1) ***Proper use of manlifts.*** No freight, packaged goods, pipe, lumber, or construction materials of any kind shall be handled on any manlift.

(2) [Reserved]

(e) ***Periodic inspection —***

(1) ***Frequency.*** All manlifts shall be inspected by a competent designated person at intervals of not more than 30 days. Limit switches shall be checked weekly. Manlifts found to be unsafe shall not be operated until properly repaired.

(2) ***Items covered.*** This periodic inspection shall cover but is not limited to the following items:

> Steps.
>
> Step Fastenings.
>
> Rails.

Rail Supports and Fastenings.

Rollers and Slides.

Belt and Belt Tension.

Handholds and Fastenings.

Floor Landings.

Guardrails.

Lubrication.

Limit Switches.

Warning Signs and Lights.

Illumination.

Drive Pulley.

Bottom (boot) Pulley and Clearance.

Pulley Supports.

Motor.

Driving Mechanism.

Brake.

Electrical Switches.

Vibration and Misalignment.

"Skip" on up or down run when mounting step (indicating worn gears).

(3) ***Inspection record.*** A certification record shall be kept of each inspection which includes the date of the inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the manlift which was inspected. This record of inspection shall be made available to the Assistant Secretary of Labor or a duly authorized representative.

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Subpart G—Occupational Health and Environmental Control

Authority: 29 U.S.C. 653, 655, 657; Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), 6-96 (62 FR 111), 3-2000 (65 FR 50017), 5-2002 (67 FR 50017), 5-2007 (72 FR 31159), 4-2010 (75 FR 55355), or 1-2012 (77 FR 3912), as applicable; and 29 CFR part 1911.

§ 1910.94 Ventilation.

(a) ***Abrasive blasting*** —

(1) ***Definitions applicable to this paragraph*** —

(i) ***Abrasive.*** A solid substance used in an abrasive blasting operation.

(ii) ***Abrasive-blasting respirator.*** A respirator constructed so that it covers the wearer's head, neck, and shoulders to protect the wearer from rebounding abrasive.

(iii) ***Blast cleaning barrel.*** A complete enclosure which rotates on an axis, or which has an internal moving tread to tumble the parts, in order to expose various surfaces of the parts to the action of an automatic blast spray.

(iv) ***Blast cleaning room.*** A complete enclosure in which blasting operations are performed and where the operator works inside of the room to operate the blasting nozzle and direct the flow of the abrasive material.

(v) ***Blasting cabinet.*** An enclosure where the operator stands outside and operates the blasting nozzle through an opening or openings in the enclosure.

(vi) ***Clean air.*** Air of such purity that it will not cause harm or discomfort to an individual if it is inhaled for extended periods of time.

(vii) ***Dust collector.*** A device or combination of devices for separating dust from the air handled by an exhaust ventilation system.

(viii) ***Exhaust ventilation system.*** A system for removing contaminated air from a space, comprising two or more of the following elements

(*a*) enclosure or hood,

(*b*) duct work,

(*c*) dust collecting equipment,

(*d*) exhauster, and

(*e*) discharge stack.

(ix) ***Particulate-filter respirator.*** An air purifying respirator, commonly referred to as a dust or a fume respirator, which removes most of the dust or fume from the air passing through the device.

(x) ***Respirable dust.*** Airborne dust in sizes capable of passing through the upper respiratory system to reach the lower lung passages.

(xi) ***Rotary blast cleaning table.*** An enclosure where the pieces to be cleaned are positioned on a rotating table and are passed automatically through a series of blast sprays.