

Application No.	Applicant	Parties to exemption
8451-P	United Technologies Corp., San Jose, CA	8451
8451-P	Talley Defense Systems, Inc., Mesa, AZ	8451
8518-P	Gallagher, Inc., Ventura, CA	8518
8519-P	Lykes Brothers Steamship Company, Inc., New Orleans, LA	8519
8931-P	Marsulex, Inc., North York, Ontario, Canada	8931
9271-P	The Atchison, Topeka and Santa Fe Railway Co., Chicago, IL	9271
9331-P	Albright & Wilson Americas, Toronto, Ont., Canada, Toronto, Ont., Canada	9331
9610-P	ACTIV Industries, Inc., Kearneysville, WV	9610
9632-P	Chemical Industries of Northern Greece (SICNG), 541.10 Thessaloniki, Greece	9632
9711-P	Fuji Photo Film USA, Inc., Elmsford, NY	9711
9741-P	Batteries Recovery Services, Inc. (B.R.S.), Medley, FL	9741
9845-P	Marsulex, Inc., North York, Ontario, Canada	9845
10054-P	The Atchison, Topeka and Santa Fe Railway Co., Chicago, IL	10054
10094-P	Air Products and Chemicals, Inc., Allentown, PA	10094
10184-P	Linde Gases of the South, Inc., Houston, TX	10184
10184-P	Linde Gases of the Southeast, Inc., Wilmington, NC	10184
10188-P	Chevron Pipe Line Co., San Francisco, CA	10188
10188-P	Point Arguello Pipeline Co., San Francisco, CA	10188

¹ Request party status and to authorize an alternate type packaging consists of a 2.1 gallon polyethylene container packaged in a fiberboard box.

This notice of receipt of application is for renewal of exemptions and for party to an exemption is published in accordance with Part 107 of the Hazardous Materials Transportation Act (49 U.S.C. 1806; 49 CFR 1.53(e)).

Issued in Washington, DC, on July 21, 1989.

J. Suzanne Hedgepeth,
Chief, Exemptions Branch, Office of
Hazardous Materials Transportation.

[FR Doc. 89-17020 Filed 7-27-89; 8:45 am]

BILLING CODE 4910-60-M

UNITED STATES INFORMATION AGENCY

Culturally Significant Objects Imported for Exhibition

Determination

Notice is hereby given of the following determination: Pursuant to the authority vested in me by the act of October 19, 1965 (79 Stat. 985, 22 U.S.C. 2459), Executive Order 12047 of March 27, 1978 (43 FR 13359, March 29, 1978), and Delegation Order No. 85-5 of June 27, 1985 (50 FR 27393, July 2, 1985), I hereby determine that the objects to be included in the exhibit, "International Impressions: Recent Prints from Belgium's Frans Masereel Center" (see list ¹), imported from abroad for the temporary exhibition without profit within the United States, are of cultural significance. These objects are imported pursuant to loan agreements with the foreign lenders. I also determine that the temporary exhibition or display of the listed exhibit objects at the Georgia Museum of Art in Athens, Georgia, beginning on or about October 21, 1989 to on or about December 3, 1989, is in the national interest.

Public notice of this determination is ordered to be published in the *Federal Register*.

Richard H. Swan,

Acting General Counsel.

Date: July 21, 1989.

[FR Doc. 89-17600 Filed 7-27-89; 8:45 am]

BILLING CODE 5230-01-M

DEPARTMENT OF VETERANS AFFAIRS

Advisory Committee on Readjustment Problems of Vietnam Veterans; Notice of Meeting

The Department of Veterans Affairs (VA) gives notice under Pub. L. 92-463 that a meeting of the Advisory

¹ A copy of this list may be obtained by contacting Ms. Lorie J. Nierenberg of the Office of the General Counsel of USIA. The telephone number is 202-485-8827, and the address is Room 700, U.S. Information Agency, 301 4th Street SW., Washington, DC 20547.

Committee on Readjustment Problems of Vietnam Veterans will be held August 9 and 10, 1989. This is a regularly scheduled meeting for the purpose of reviewing VA and other relevant services to Vietnam veterans and to formulate Committee recommendations and objectives. The meeting on Wednesday, August 9, 1989, will be held in the Omar Bradley Conference Room at VA Central Office, 810 Vermont Avenue NW., Washington, DC 20420. The following day's meeting will be held in Room 119 at VA Central Office.

The meeting on August 9 will begin at 9 a.m. and conclude at 4 p.m. The day's agenda will consist of internal Committee planning and work activities to include special task group reports, subcommittee assignments, plans for future objectives and field visits, and review of Committee organization and role. The meeting on August 10 will begin at 8 a.m. and conclude at 4 p.m. The second day's agenda will consist of a report on the interagency liaison activities and service availability regarding recently separated military personnel, an update on the new National Center for Post-Traumatic Stress Disorder, an update on Readjustment Counseling Service with particular attention to contract programs, and a discussion on the coordination of treatment and compensation of PTSD. Both days' meetings will be open to the public up to the seating capacity of the room.

Due to limited seating capacity of the room, those who plan to attend or who have questions concerning the meeting should contact Arthur S. Blank, Jr., M.D., Director, Readjustment Counseling Service, Department of Veterans Affairs, (phone number: 202-233-3317/3303).

Due to delays in administrative processing, this notice provides less than 15 days advance notice to the public.

Dated: July 25, 1989.

By direction of the Secretary.

Sylvia Chavez Long,

Committee Management Officer.

[FR Doc. 89-17760 Filed 7-27-89; 8:45 am]

BILLING CODE 5320-01-M

Sunshine Act Meetings

Federal Register

Vol. 54, No. 144

Friday, July 28, 1989

This section of the FEDERAL REGISTER contains notices of meetings published under the "Government in the Sunshine Act" (Pub. L. 94-409) 5 U.S.C. 552b(e)(3).

FEDERAL RESERVE SYSTEM

TIME AND DATE: 10:00 a.m., Wednesday, August 2, 1989.

PLACE: Marriner S. Eccles Federal Reserve Board Building, C Street entrance between 20th and 21st Streets, NW., Washington, DC 20551.

STATUS: Closed.

MATTERS TO BE CONSIDERED:

1. Personnel actions (appointments, promotions, assignments, reassignments, and salary actions) involving individual Federal Reserve System employees.
2. Any items carried forward from a previously announced meeting.

CONTACT PERSON FOR MORE INFORMATION:

Mr. Joseph R. Coyne, Assistant to the Board; (202) 452-3204. You may call (202) 452-3207, beginning at approximately 5 p.m. two business days before this meeting, for a recorded announcement of bank and bank

holding company applications scheduled for the meeting.

Dated: July 25, 1989.

Jennifer J. Johnson,

Associate Secretary of the Board.

[FR Doc. 89-17762 Filed 7-25-89; 4:51 pm]

BILLING CODE 6210-01-M

FEDERAL DEPOSIT INSURANCE CORPORATION

Agency Meeting

Pursuant to the provisions of the "Government in the Sunshine Act" (5 U.S.C. 552b), notice is hereby given that at 9:21 a.m. on Friday, July 21, 1989, the Board of Directors of the Federal Deposit Insurance Corporation met in closed session to consider (1) matters relating to an assistance agreement pursuant to section 13(c) of the Federal Deposit Insurance Act; and (2) matters concerning the Corporation's corporate activities.

In calling the meeting, the Board determined, on motion of Director C. C. Hope, Jr. (Appointive), seconded by Director Robert L. Clarke (Comptroller

of the Currency), concurred in by Chairman L. William Seidman, that Corporation business required its consideration of the matters on less than seven days' notice to the public; that no earlier notice of the meeting was practicable; that the public interest did not require consideration of the matters in a meeting open to public observation; and that the matters could be considered in a closed meeting by authority of subsections (c)(2), (c)(4), (c)(8), (c)(9)(A)(ii), and (c)(9)(B) of the "Government in the Sunshine Act" (5 U.S.C. 552b(c)(2), (c)(4), (c)(8), (c)(9)(A)(ii), and (c)(9)(B)).

The meeting was held in the Board Room on the sixth floor of the FDIC Building located at 550—17th Street, NW., Washington, DC.

Dated: July 25, 1989.

Federal Deposit Insurance Corporation.

Robert E. Feldman,

Deputy Executive Secretary.

[FR Doc. 89-17785 Filed 7-26-89; 8:45 am]

BILLING CODE 6714-01-M

Corrections

Federal Register

Vol. 54, No. 144

Friday, July 28, 1989

This section of the FEDERAL REGISTER contains editorial corrections of previously published Presidential, Rule, Proposed Rule, and Notice documents. These corrections are prepared by the Office of the Federal Register. Agency prepared corrections are issued as signed documents and appear in the appropriate document categories elsewhere in the issue.

FEDERAL COMMUNICATIONS COMMISSION

[Report No. 1787]

Petitions for Reconsideration and Clarification of Actions in Rule Making Proceedings

Correction

In notice document 89-17084 beginning on page 30601 in the issue of Friday, July 21, 1989, make the following correction:

On page 30601, in the 3rd column, in the 1st paragraph, in the 13th line, "[insert date of 16 days after FR pub date]" should read "August 7, 1989".

BILLING CODE 1505-01-D

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Food and Drug Administration

21 CFR Part 310

[Docket No. 80N-0357]

RIN 0905-AA06

Hair Grower and Hair Loss Prevention Drug Products for Over-the-Counter Human Use

Correction

In rule document 89-15955 beginning on page 28772 in the issue of Friday, July 7, 1989, make the following corrections:

1. On page 28772, in the 2nd column, in the second complete paragraph, in the 10th line, "1989" should read "1990".

2. On page 28774, in the first column, in the last line, "is" should read "in".

BILLING CODE 1505-01-D

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Food and Drug Administration

21 CFR Parts 314 and 320

[Docket No. 85N-0214]

RIN 0905-AB63

Abbreviated New Drug Application Regulations

Correction

In proposed rule document 89-16024 beginning on page 28872 in the issue of Monday, July 10, 1989, make the following corrections:

§ 314.127 [Corrected]

1. On page 28933, in the third column, in § 314.127(h)(2)(i)(C), in the second and fourth lines, "parental" should read "parenteral".

§ 320.1 [Corrected]

2. On page 28938, in the third column, in the section heading reading "329 § 320.1 Definitions.", remove "329".

BILLING CODE 1505-01-D

DEPARTMENT OF TRANSPORTATION

Research and Special Programs Administration

49 CFR Parts 192, 193, and 195

[Docket No. PS-108, Amdt. No. 192-64, 193-6, and 195-41]

RIN 2137-AB68

Incorporation by Reference of Portions of American Petroleum Institute Standard 1104, Seventeenth Edition, 1988

Correction

In rule document 89-15435 beginning on page 27881 in the issue of Monday, July 3, 1989, make the following correction:

Appendix A to Part 193 [Corrected]

On page 27882, in the third column, in amendatory instruction 4, in the fourth line, "188" should read "1988".

BILLING CODE 1505-01-D



Friday
July 28, 1989

Part II

Department of Labor

**Occupational Safety and Health
Administration**

**29 CFR Part 1910
Powered Platforms for Building
Maintenance; Final Rule**

DEPARTMENT OF LABOR**Occupational Safety and Health Administration****29 CFR Part 1910**

[Docket No. S-700 A]

RIN 1218-AA33

Powered Platforms for Building Maintenance**AGENCY:** Occupational Safety and Health Administration (OSHA).**ACTION:** Final rule.

SUMMARY: The Occupational Safety and Health Administration (OSHA) is amending its Standard for Powered Platforms for Building Maintenance, 29 CFR 1910.66, Subpart F, to allow the use of alternative stabilization systems. The standard had allowed only stabilization systems which provided continuous positive means of engagement between the platform and the building facade. Such systems had proven to be infeasible for application to many new buildings with discontinuous vertical facades. In addition, the amendment updates existing requirements using performance-oriented language, expands the scope to include coverage of interior installations (atriums) and includes requirements for emergency planning, employee training and personal fall protection for employees using powered platforms.

EFFECTIVE DATE: January 24, 1990.

ADDRESS: In compliance with 28 U.S.C. 2112(a), the Agency designates for receipt of petitions for review of the standard, The Associate Solicitor for Occupational Safety and Health, Office of the Solicitor, Room S-4004, U.S. Department of Labor, 200 Constitution Avenue NW., Washington, DC 20210.

FOR FURTHER INFORMATION CONTACT: Mr. James F. Foster, U.S. Department of Labor, Occupational Safety and Health Administration, Room N3649, 200 Constitution Ave., NW., Washington, DC 20210, (202) 523-8148.

SUPPLEMENTARY INFORMATION:**I. Background**

A powered platform is a suspended, manned platform that is installed on a building and is used to maintain the building facade. It is part of an installation which consists of the working platform, suspension means, fall arrest systems and the requisite operating and control devices.

The previous OSHA powered platform standard (29 CFR 1910.66), adopted in 1971, required that all platforms be stabilized by direct

attachment to continuous guide rails in the building facade, whenever the building height is greater than 130 feet (39.6 m) in height. For structures less than 130 feet (39.6 m) in height, continuous guide rails were not required, but the platform had to be equipped with building face rollers and angulated suspension wire ropes, which would cause the platform to exert pressure against the building facade. The purpose of these requirements was to stabilize the platform while it is in use by absorbing wind forces and horizontal forces caused by personnel movement on the platform.

During the years immediately following the promulgation of the OSHA standard, most high rise buildings were designed with straight building facades. This design adapted readily to the continuous guiderail requirement. In recent years, however, architects have also been designing buildings with multiple vertical planes, setbacks and complicated corner arrangements. These design changes may be the result of aesthetic considerations or an effort to conserve energy. Energy costs, for example, have led to building designs with fewer and smaller windows, projecting awnings to reduce cooling needs and recessed windows to provide insulation from outside temperatures.

These changes in building design have often made it difficult, infeasible, or costly to use continuous guide rails on many building facades. As a result, the new designs for high rise buildings have been responsible for the development of new types of stabilization systems for powered platforms. These new systems have provided employers the opportunity to select appropriate stabilization equipment that is capable of providing equivalent safety for workers and significant cost savings.

The previous OSHA powered platform standard did not address or allow this developing technology, and OSHA had received a significant number of requests for variances from the standard. These requests addressed the use of alternate stabilization systems on newly designed single and multiple faced buildings, and allowed for employee fall protection and platform related training. However, while these requests were often successful, the OSHA variance process is a regulatory procedure that can result in delays, and which must be pursued for each project. A compliance directive, OSHA Instruction STD 1-3.3, was issued by OSHA in November 1982 to allow intermittent stabilization in some circumstances, but it is limited in scope and cannot address the rapid changes in

building design and related platform stabilization methods.

A need existed, therefore, to update the OSHA standard to address alternate stabilization systems for the purpose of providing industry with alternate methods of adapting to the new building designs. At the same time, an updated standard would have to continue to provide employers with an equivalent level of safety and to improve safety where possible in other areas of powered platform work. For these reasons, OSHA began the rulemaking process for amending the OSHA standard covering powered platforms.

II. History of Regulation

The previous OSHA standard for powered platforms (29 CFR 1910.66) was promulgated in 1971 from a national consensus standard (American National Standards Institute (ANSI) A120.1-1970) under section 6(a) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 655(a).

In the response to the need for employers to select alternate stabilization systems to the system required in the OSHA standard, OSHA published an Advance Notice of Proposed Rulemaking (ANPR) in the Federal Register on February 11, 1983 (48 FR 6368). The ANPR solicited data and views regarding the appropriate content and scope of an amendment to 29 CFR 1910.66. Information was sought on alternate stabilization systems and the need to revise or add other provisions in this section. Also, the ANPR addressed a number of issues pertinent to the standard. First, is there a need for the development of performance criteria in addressing hazards associated with stabilization systems? Second, what should OSHA require in the identification, design, maintenance and use of alternate stabilization systems? Third, what are the best methods for the training of employees in the inspection and operation of powered platforms? Fourth, should more comprehensive criteria be developed for fall protection systems? Fifth, should appropriate changes be made in the standard to reflect changes in industry practice and changes in related provisions of OSHA's General Industry Standard? Sixth, what limitations should be placed on operating powered platforms under severe weather conditions?

The ANPR invited interested persons to submit written comments on the issues raised in the ANPR by March 14, 1983. The comment period was extended to May 16, 1983 (48 FR 14005) in response to commenters who requested

additional time to make their submissions. Thirty written comments were received in addition to seven requests for extending the comment period. Commenters recommended that OSHA use performance criteria in addressing alternate stabilization systems; require training of employees in the operation of powered platforms; notify building owners of installation deficiencies and amend the current standard to reflect changes in related OSHA's General Industry Standards and ANSI standards. Also, information and data were received in response to the specific issues raised in the ANPR.

On January 22, 1985, OSHA published (50 FR 2890) a proposed amendment of its powered platform standard. The Notice of Proposed Rulemaking (NPRM) invited interested persons to submit written comments on the proposed standard and to file objections and requests for a public hearing. The original date for the close of the comment period was set for March 25, 1985, but was subsequently extended, at the request of commenters, to June 3, 1985 (50 FR 15756).

OSHA reopened the comment period on June 26, 1985 to permit the filing of written comments on the Preliminary Regulatory Impact Assessment (PRIA), which had not been available for public review during the earlier comment period. Written comments on the PRIA were to be received by August 1, 1985 (50 FR 27307). Forty-nine written comments were received, including nine requests for a hearing. These comments identified seven primary issues:

1. Should the equipment that is used to maintain the elevated interior of buildings (atriums) be addressed in a separate standard, or should the proposal be revised to address atriums?
2. Is there a need for a limit on the horizontal movement of an intermittently stabilized platform?
3. Should OSHA modify the proposed requirement that a secondary suspension system be used in conjunction with horizontal lifelines, if vertical lifelines are not selected for employee fall protection?
4. Should the proposed formula for calculating the safety factor of the suspension wire rope be amended, if the efficiency of the rope termination is taken into account?
5. Should OSHA retain the proposed electrical requirements, such as a voltage drop limit and a circuit disconnect switch, now addressed in the National Electric Code, but which is not addressed in OSHA's electrical standards under 29 CFR Part 1910, Subpart S?

6. Should OSHA expand its requirements for the protection of platform members if heat producing processes or corrosive substances are used on the platform?

7. Should OSHA require that written work procedures be provided for employee training?

In addition to these primary issues, OSHA requested information and suggestions on a number of other issues. These issues addressed intermittent and button guide stabilization systems, supported equipment, davit sockets and weight limits, wire rope terminations and inspections, cable stabilization, platform passage and roll, roof carriage stability and personal fall arrest systems. All of these issues are reviewed in the Summary and Explanation of the Final Rule (Section IV).

In response to the hearing requests, OSHA published a notice of informal hearing, listing these issues, on November 22, 1985 (50 FR 48222). The informal hearing was convened by Judge Leonard N. Lawrence on February 19, 1986, pursuant to section 6(b)(3) of the Act (29 U.S.C. 655(b)(3)) and 29 CFR Part 1911. The hearing included testimony from 25 witnesses. Judge Lawrence established a post-hearing period for the submission of additional comments and briefs extending through April 13, 1986. In response to requests from several hearing participants to extend the time to file additional data and evidence, Judge Lawrence extended the time to receive post-hearing data, evidence and briefs through May 23, 1986.

The entire record, including 112 exhibits and 928 transcript pages, was certified by Judge Lawrence on April 5, 1986, in accordance with 29 CFR 1911.17. Copies of materials in the record, as well as an index of the record, may be obtained from the OSHA Docket Office, Room N-2634, Frances Perkins Building, 200 Constitution Avenue NW., Washington, DC 20210.

The final standard is based on a full consideration of the entire record of this proceeding including materials discussed or relied on in the proposal, the record of the informal hearing, and all written comments and exhibits received.

III. New Issues

A. Portable Suction Cups

During the post-hearing comment period, OSHA received a suggestion (EX. 50) that OSHA should investigate the use of portable suction cups (glazier type) as an alternate means of stabilizing a powered platform. Although the suggested alternative was

received by OSHA very late in the rulemaking process, OSHA considered it to be an interesting concept and sought by letter comments (EX. 112) from all hearing participants on its possible use, so that OSHA would have a basis to reopen the rulemaking and offer guidelines on the method, if appropriate.

A significant number of commenters (EX. 48, 52, 54, 59, 68, 69, 78, 80, 85) opposed the use of glazier type portable suction cups for platform stabilization. These commenters were concerned that the suction cups would require extreme surface cleanliness; could be applied only to smooth hard surfaces such as glass and granite; and might not safely support the loads imposed on them.

In addition, they expressed concern that the building curtain wall or glass area would not be designed to sustain the imposed loading; the vacuum could not be maintained over a long period of time; and the location of the suction cups on the building would be determined by the operator rather than on the basis of an engineering stabilization system.

One commenter (EX. 54) stated that he could not support the use of suction cups without extensive testing. Even if such tests proved that the cups would support the loads, he believed it was essential that the operator be trained in their care and use to insure that the cups were kept clean enough to maintain a holding effect at the building face. Also, if the cups should lose their vacuum, they could fall and injure operators on the platform.

In support of the use of suction cups, one commenter (EX. 60) believed that these cups could be applied to existing buildings, provided the glass or building curtain wall could support the imposed loads.

Another supporting commenter (EX. 50, 86) stated that although the stabilization device had not been extensively studied, he believed that an engineered system for platform stabilization, using suction cups, was feasible with existing technology. He believed that a properly engineered system would provide equivalent platform stabilization and result in substantial installation and operating cost savings. This commenter noted that suction cups are only one of many other devices or systems which could be utilized for platform stabilization. The others include permanent magnets, electromagnets in the building, a vacuum system and regenerative adhesives.

OSHA has not directly addressed the use of suction cups as stabilization devices in the final rule, since there is

insufficient evidence and data for a standard on these devices at this time and since notice and comment on this specific issue was not provided. OSHA notes however that the final rule, requires that all equipment installations, including stabilizing components such as suction cups, would be designed by a professional engineer, paragraph (f)(1)(i). Therefore, a stabilization method, such as suction cups, would be acceptable if designed by a professional engineer and equivalent to existing stabilization methods listed in the standard (f)(5)(i)(F). OSHA intends, as noted in Appendix A, item 11, that one acceptable method of demonstrating the equivalency of a stabilization method is to provide an engineering analysis by a registered professional engineer. Such an engineering analysis would address the equivalency of a proposed stabilization method in its function, ease and method of use, durability and adaptability to the work environment. In addition, the analysis would determine the capability of the building and the stabilizer devices to meet the required loading and other relevant safety criteria.

B. Level-Sensing Devices

During the informal hearing period, a commenter (TR 2/20, p. 26) recommended that OSHA require a level sensing device on the platform. This device would sense an out-of-level condition (more than five degrees) on a two-point suspended platform, and discontinue power to the hoist causing this condition until the platform is brought to a level condition by the use of the opposite hoist unit.

This commenter claimed there have been a number of incidents in New York City where a platform has gotten out of level, causing it to become jammed in the mullion track. This condition necessitated a rescue of the operators from the stranded platform. No injury or accident data was provided to OSHA to support the need for this device.

A New York State official (EX. 87), in a post hearing comment, stated that there was only one notable incident (with no injury) which led to the inclusion of the level-sensing device requirement in the New York safety standards. New York is currently considering whether it should change its requirement for out-of-level criteria on platforms from five degrees to ten degrees.

Several individuals (TR 2/20, pp. 70, 109, 369) who gave testimony at the hearing disagreed with the need for requiring a level-sensing device on a two-point suspended powered platform. They contended that since employee

operation is the primary reason for out-of-level platforms, if employees are properly trained in platform operation and in the handling of emergencies this would prevent the occurrence of an out-of-level condition. Since a mercury switch is used in the device, they noted that the device would be extremely sensitive to any platform vibration or swaying, and that this vibration or swaying would cause the switch to go on and off continuously. This on and off operation could cause the hoist motors to operate on starting currents which can eventually contribute to a motor burnout. A motor burnout could place the operators in jeopardy, since they would be stranded on the platform until rescued.

A platform manufacturer (TR 2/20, p. 369) testified that his company's experience with these devices in New York has convinced him that these devices are unreliable, costly and a major source of maintenance service calls.

From the hearing testimony presented, OSHA did not receive sufficient evidence of an employee hazard due to out-of-level platforms to warrant the need for a standard requirement on this issue. In fact, the commenters pointed out that the device itself can present unique hazards for employees when it is used. OSHA believes that employee training in the operation of a powered platform, as required in paragraph (i)(1)(i), and the perception by employees of an out-of-level platform would prompt them to take the necessary action to prevent a hazardous condition from occurring.

IV. Summary and Explanation of Final Rule

The final standard revising 29 CFR 1910.66 follows the language and format of the proposal, except for a number of changes based on OSHA's review of the entire rulemaking record. The rulemaking record includes the written comments, hearing testimony, data and comments submitted during the hearing and post-hearing period.

Following is a discussion of the requirements in the amended powered platform standard. This preamble discusses only those provisions which were addressed by public comment or testimony. For those proposed provisions for which no post-proposal submissions were received, and which are unchanged from the proposed rule, the preamble references the specific page in the Notice of Proposed Rulemaking of January 22, 1985 (50 FR 2890) where a discussion of the provision can be found. The numbers in brackets refer to specific references in

the comments to the January 22, 1985 proposal, the February 19, 1986 hearing Exhibits (EX.), and hearing transcript page numbers, e.g. (TR 2/19, p. 100).

OSHA defines the scope of this standard in paragraph (a). In most major respects, OSHA has retained the scope of the previous powered platform standard and of the proposal. Thus, § 1910.66 continues to cover powered platform installations for building maintenance which are permanently dedicated to maintaining a specific structure or group of structures. OSHA has expanded the previous scope to include powered platforms used to perform maintenance on elevated interiors of buildings (atriums), as well as on building exteriors.

OSHA proposed to continue to limit this standard to permanent installations. Temporary suspended scaffolds are presently covered by 29 CFR 1910.28(g) and a proposed revision of that standard is scheduled for the coming year. For this reason OSHA did not raise the issue of whether to incorporate coverage of temporary scaffold installations into § 1910.66.

During this rulemaking, however, some participants questioned continuation of separate standards. One major concern recited was that permanent and temporary installations use similar equipment and employees face similar hazards and, therefore, these installations should be regulated by the same standard (see EX. 9-30, 9-37), and testimony of Lee B. Herzog (TR 2/20, p. 195). Additional comments noted specific deficiencies in 29 CFR 1910.28(g), such as not providing scaffold stabilization when a scaffold is moving between work stations. (See Lawrence R. Stafford, EX. 9-28, TR 2/20, p. 87; Kurt W. Daigel, EX. 9-22; TR 2/20, p. 342.)

On the other hand, other participants noted potential problems in combining temporary scaffolds and permanent platform installations in one standard. Safety concerns were raised by both union and industry groups. Window Cleaners Local #16 (EX. 84) and the Scaffold Industry Association (EX. 9-40) contended that inclusion of the temporary units in the proposal would impose requirements on these units that would, in effect, reduce the number in use. The union claimed that such a reduction would reduce the number of jobs for employees operating these temporary units. Economic concerns were cited by Joseph Puccinelli of Safeway Steel Products (TR 2/20, p. 276) and the Window Cleaning Contractors Association (TR 2/20, p. 474), who speculated that if the more expensive requirements of § 1910.66 were imposed

on temporary units, this would result in less frequent building maintenance and losses for companies performing maintenance.

OSHA appreciates the concerns and suggestions presented by commenters and hearing participants during this rulemaking proceeding on the subject of temporary suspended scaffolds. OSHA has summarized the comments received on this subject, and has presented them here to provide a public record of the concerns expressed by the interested parties. However, as noted previously, temporary suspended scaffolds are presently covered in § 1910.28(g) and a proposed revision of this standard is scheduled for the coming year. Comments on temporary units received in the present rulemaking will be more properly addressed at the time of that proposed revision. Addressing those comments in this rulemaking would delay both rulemakings because of the need to evaluate differing technical and economic issues. Paragraph (a) has been reworded to clarify the exclusion of temporary suspended scaffolds from coverage by this standard.

In the Notice of Hearing of November 22, 1985 (50 FR 48222), OSHA requested comment on whether the coverage of platform installations used to maintain the elevated interior of buildings (atriums) should be addressed in a separate standard or whether the proposed paragraph (b)(1) which applied only to "exterior maintenance" should be revised to address atrioms. This question was addressed by a number of commenters (EX. 9-10, 9-25, 9-31 9-35, 9-45; 14-1, 14-3; 15-4, 15-8, 15-13, 15-18; 50) and hearing participants (TR 2/19, pp. 50, 170, 171, 178, 203, 229, 239; TR 2/20, pp. 31, 85, 86, 98, 315, 334, 459, 474).

The Tennessee Valley Administration (TVA) (EX. 14-3) supported the need for a separate standard to address atrioms, since these installations generally had unique structural configurations which presented problems in platform rigging, suspension, stability and operational procedures. This commenter also noted that the securing of vertical life lines and emergency rescue procedures in this interior environment had to be separately addressed.

The Window Cleaning Contractors Association (TR 2/20, p. 459) concurred with TVA in that atrioms generally have designs which pose special problems for building maintenance that should be addressed in a separate standard.

Lerch, Bates and Associates (TR 2/19, p. 178) also favored a separate standard for atrioms. This commenter observed that interior installations are generally not self-powered or subjected to wind forces.

OSHA Consultant David E. Hoberg (TR 2/29 pp. 50, 170) recommended that the proposed paragraph (b)(1) be revised to include the coverage of atrioms under this standard. He pointed out that the equipment and operating methods for interior and exterior installations are similar and are used by the same employees in maintaining a building. He further stated that with the absence of wind forces, work station tie-in devices would be sufficient for platform stability and would eliminate the need for continuous or intermittent restraints in atrium installations.

The California Department of Industrial Relations (EX. 9-45) agreed with Mr. Hoberg that exterior and interior platform installations were closely related, and that atrium installations should be addressed in the proposal.

Kurt W. Daigel (TR 2/20, p. 334) of the New York State Department of Labor and Lawrence R. Stafford (TR 2/20, p. 85, 86) also favored the revision of the proposed paragraph to include atrium coverage, provided that the platform installation is designed by a professional engineer. In addition, they recommended that adequate operating instructions and emergency rescue procedures for an atrium installation be addressed in the proposal.

OSHA agrees with the commenters and those testifying at the hearing that the standard should address permanent platform installations used in atrioms. First, there are more significant similarities in the equipment and operations used at the interiors and exteriors of buildings. Second, the proposed standard's provisions easily address atrium installations, with minor exceptions. Third, including protection of employees working in atrioms against similar powered platform hazards is appropriate and avoids the unnecessary delay in providing specific coverage for these workers. Employee training requirements in the standard would address the difference in work procedures for exterior and interior work. Paragraph (a), therefore, now extends this standard to permanent exterior and interior installations.

In response to the need expressed for emergency rescue requirements, paragraph (e)(9) adequately provides requirements for both interior and exterior building maintenance, including atrioms. Further, since the building and equipment installations are required to be designed by a professional engineer under paragraphs (e)(1)(i) and (f)(1)(i), OSHA believes that concerns expressed about unique atrium structural problems affecting employee safety are adequately addressed.

Proposed paragraph (a) stated that this section did not apply where building maintenance is performed at heights 35 foot (10.1 m) or below. The 35 foot (10.1 m) exclusion was based on Section 101 of the ANSI A120 draft standard—November 1981. OSHA now recognizes, however, that this exclusion by ANSI was meant to avoid requiring that buildings which are less than 35 foot (10.1 m) in height have a permanent powered platform installation. OSHA does not require that a building owner install a permanent powered platform installation for building maintenance. However, if such a platform is installed, then this standard would apply to the total height of the building, including the initial 35 foot (10.1 m). OSHA believes that employees should be protected from hazards at all levels where the platform is used. OSHA, therefore, is deleting the 35 foot (10.1 m) exclusion in the standard.

One participant (TR 2/20, p. 458, 459) believed that temporary suspended scaffolds can be used safely on buildings up to 300 feet (91.5 m), and suggested that OSHA not require permanent powered platform installations below 300 feet (91.5 m). In addition, this commenter believed that powered platforms installations are costly and cannot be justified at the lower levels.

The issue of when permanent powered platforms installations should be required was not raised by OSHA in the proposal, and OSHA finds that there is insufficient evidence to suggest how such a requirement for permanent installations would be triggered. In addition, OSHA believes that the building owner is in the best position to determine the type of building maintenance equipment he or she should use based on considerations of feasibility, aesthetics, costs, safety and other relevant factors.

OSHA notes that both the scope and application language remain essentially unchanged from the proposal. However, OSHA has partly transposed the contents of these paragraphs as proposed. Thus, OSHA proposed that the "application" of this standard be limited to permanently dedicated exterior installations. OSHA has determined that this criterion more properly defines the "scope" of the standard, with the inclusion of interior installations.

Also, OSHA had proposed the "scope" of this standard be limited to maintenance performed in excess of 35 feet (10.1 m). The "scope" also described the building maintenance tasks. Upon review, OSHA determined, as noted

above, that the 35 foot (101.1 m) limitation be deleted. The description of building maintenance tasks remains in the "scope" in paragraph (a) of the standard.

Paragraph (b)(1) states that the standard applies to all permanent installations completed 180 days after the effective date of this standard. This paragraph clarifies proposed paragraph (b)(3) which addressed new installations.

OSHA notes that paragraph (b)(1) does not prevent an employer from adhering to the requirements of the standard for an installation completed during the 180 day period.

An equipment manufacturer (EX. 9-43) noted that 180 days may not be adequate, since it may take a year or more to complete a building. James W. Fortune (TR 2/20, p. 317), who testified for OSHA stated, however, that the proposal properly addresses new construction.

This provision is consistent with the six months exclusion in the ANSI A120 draft standard January 1986 (EX. 15-8). In addition, OSHA observes that there has been adequate notice in the Federal Register of the proposed changes to the present regulation, and ample time for review has been given to all parties so they can adjust to the proposed changes.

Paragraph (b)(1) also states that the standard applies to all major modifications to existing installations completed after the 180 day period.

This provision was supported by Brian L. Gartner (TR 2/20, p. 169) and Thomas J. O'Shea (TR 2/20, p. 317) who agreed that major replacements or modifications to existing platform installations which affect the building and/or platform equipment should comply with the standard. They believe it was incumbent on building owners to apply the latest safety standards to these major modifications.

OSHA also notes that the ANSI A120 draft standard January—1986 (EX 15-8) requires that major changes to those portions of the building that provide primary support for the platform equipment should be accomplished in such a manner as to meet requirements of current safety standards.

OSHA is in agreement with the need for applying the requirements of this standard to major modifications of existing installations and is including this application in the Final Rule under paragraph (b)(1). Major modifications would include work similar to that involved when a new building or facility is built or when a new wing or floors are added to an existing building. Major modifications would not include work involving window replacements or other

building facade and roof changes which do not affect the suspension or stabilization of the platform equipment.

Several commenters (EX. 9-34, 9-37, 9-43) supported the need to exempt existing platform installations from the revised standard, as in proposed paragraph (b)(2). OSHA agrees that the design of many existing buildings and platform equipment may prohibit complete compliance with the revised standard. Also many of these existing installations may already be designed to meet the stabilization requirements listed in OSHA Instruction Standard 1-3.3 of November 1, 1982.

OSHA, however, has determined it is necessary that existing installations at least comply with paragraphs (g), (h), (i) and (j) as well as Appendices C and D. Paragraph (g) addresses the inspections and tests to be conducted on powered platforms. Paragraph (h) addresses powered platform maintenance. Paragraph (i) addresses platform operations (employee training and platform use) which is not covered in the unrevised standard. Paragraph (j) addresses personal fall protection for employees on all types of working platforms, while the existing standard only addresses personal fall protection for employees on two-point working platforms. Appendix C, referenced in paragraph (j), addresses personal fall protection. Appendix D addresses building and equipment requirements for installations purchased and used after August 27, 1981, but before July 23, 1990, and carries forward the requirements of paragraphs a, b, c, and d of the standard. These paragraphs cover building and equipment design, construction and inspection. The discussion of the testimony and comments received on paragraphs (g), (h), (i), (j), Appendix C and Appendix D is found in the preamble sections addressing these paragraphs.

OSHA had proposed in paragraph (c) that the employer be required to obtain a certification from the building owner that the powered platform installation meets paragraphs (e), (f), (g) and (h), of the standard. The reason for this proposed requirement was OSHA's recognition that in many cases the employer is a contractor who provides employees to perform building maintenance using powered platforms installed by the building owner. The structural integrity and operational safety of those platforms, their anchorages, and related equipment such as hoists depends on their design, installation and maintenance. The building owner will have the knowledge to evaluate whether the platform installations were designed, installed

and maintained in compliance with this standard. If the building owner is also the employer of the employees who perform the building maintenance no burden would be created by the proposed requirement that the employer obtain a certification from the building owner. If however, as in the majority of cases, the building owner does not employ the maintenance workers, concern was expressed that the building owner's reluctance to issue a certification would be unfair and ineffective (TR 2/20, pp. 461, 426). Under the proposal only the employer of the maintenance workers could be cited for the failure to obtain a certification. Little incentive would be provided in the standard to encourage the building owner to certify: his options would be to contract with employers who were willing to take their chances and work on uncertified platforms, or where feasible to use temporary platforms.

OSHA recognizes that it is the building owner who has the information to design his building to conform to these standards. The Agency therefore has determined that in order to advance the remedial purposes of the Act that the standard will require that the building owner be responsible for assuring the employer that his building and equipment conform to specified requirements of the standard.

OSHA also has reduced the scope of the required certification rather than, as in the proposal, requiring the certification to broadly attest to total compliance with provisions of paragraphs (e), (f), (g) and (h). The provision now requires certification that the platform installation meets the critical design criteria set out and that it be designed and installed under the supervision of a registered professional engineer. These design criteria are not amenable to evaluation by the employer who is not the building owner, since compliance or non compliance is concealed from view or even close inspection. Since most of the design requirements are expressed in the standard as performance criteria, and the performance can be evaluated only by sophisticated tests and calculations, OSHA is also concerned about Agency capability to inspect for hidden defects.

As stated above, the requirement in paragraph (c)(1) does not reference each provision which it covers. Rather, the relevant subject areas, such as load capabilities, stability factors, horizontal forces and the design of carriages, hoisting machines, wire ropes, stabilization systems and electrical equipment, are stated. OSHA believes that the provisions to be covered by the

assurance requirement are easily identifiable in the standard. To assist the public in identifying major design criteria, however, OSHA is describing the provisions which it intends to cover by subject matter immediately below.

Load requirements apply to both building and equipment design. The major provisions deal with building anchors, stabilizer ties and guide buttons in (e)(2)(iii); (A)(5), (A)(6) and (B)(6). Building load factors cover occupant loads, (f)(1)(ii), as does the counterpart equipment provision, (e)(1)(iv). Paragraph (f)(3) contains load requirements for hoist motors, (i)(M), and transportable outriggers, (ii) (F) and (H); paragraph (f)(4) specifies load capabilities for hoisting machines, (v), and the winding drum attachment, (viii). Load factors for suspended unit components are contained in paragraph (f)(5); for platforms and wire ropes, (f)(5)(v)(I), and platforms and attachments in (f)(5)(vi)(F), and wire rope connections in (f)(7)(i).

Stability factors for designated equipment are set apart in paragraph (f) of the standard. They cover carriage stability, (f)(3)(i) (G) and (G)(i), anchorages for outriggers, (f)(3)(ii)(C), lateral stability of outriggers, (f)(3)(ii)(E), and stability of davits, (f)(3)(iii)(A) and of units not suspended at the ends, (f)(5)(i)(D). Platform roll, which affects stability, is covered in paragraph (f)(5)(ii)(C).

Design requirements linked to specified forces apply to buildings and equipment. Thus, an angulation force of at least 10 pounds (44.4 N) must be maintained when angulated roping permitted for the top 75 feet of the building is used (e)(2)(ii). The force required to push a manually propelled carriage or to rotate a davit shall not exceed 40 pounds per person (44.8 N), (f)(3)(i)(C) and (f)(3)(iii)(D).

Design requirements related to carriages are set apart in paragraph (f)(3)(i) of the standard. They cover traversing speed, (i)(B), protective devices and interlocks, (i)(F), resistance to overturning, (G)(2), interlocks for the tie-down device, (G)(3), and breaking systems, (H), and (H)(1).

Primary and secondary brake requirements for hoisting machines are listed in paragraphs (f)(4)(ix), (ix)(A), (ix)(B)(1) and (ix)(B)(2). In addition, requirements for hoisting machines are listed for arresting overspeed descent, (f)(4) and limiting platforms speed, (f)(5)(ii)(G).

Design factors and material requirements for suspension wire rope are set apart in paragraphs (f)(7) (ii) and (iii).

The maintenance of continuous contact of the platform with the building facade is required with intermittent stabilization systems, (e)(2)(iii)(A), and angulated roping systems, (e)(2)(iii)(C).

In addition to the basic requirement that powered platform electrical wiring and equipment design must comply with Subpart S (§§ 1910.302-1910.308), design criteria in paragraphs (e) and (f) include the following provisions: limiting service voltage dropage to five percent at any power circuit outlet, (e)(11)(ii), and an independent equipment power circuit, (e)(11)(iii). Electrical components must be designed for exterior use, (f)(8)(ii); cables protected against overextension damage; (f)(8)(iii); controls included to protect against overloads, three phase reversal and phase failure, (f)(8)(iv); controls operative only under limited circumstances, (f)(8)(vi) (A) and (B); power to be interrupting automatically when wire rope slackens, (f)(8)(vi)(C); prevent unsafe upward and downward travel with directional switches, (f)(8)(vii); supply emergency stop switches for remote controlled roof-powered platforms, (f)(8)(viii); and supply overload devices for cables in constant tension, (f)(8)(ix).

The Agency believes that this requirement is squarely within the permitted range of regulation. In various regulatory contexts, the Agency has required employers who are not the direct employers of the employees exposed to a particular hazard to warn of defects, take remedial action or provide information to the directly employing employer. For instance, the Hazard Communication standard requires that upstream manufacturers provide information to downstream employers to protect their employees (29 CFR 1910.1200). A similar requirement in the earlier benzene standard was upheld by the Court of Appeals. The Court stated: "(p)lacing the responsibility to warn downstream employees of concealed hazards on those upstream employers who create the hazards and know of the hazards is consistent with the remedial purpose of the Act and is within OSHA's broad authority to prescribe warning labels." *American Petroleum Institute v. OSHA* (581 F. 2d 493, 51 (1978)). cf. *Mourning v. Family Publications Services*, 411 U.S. 356 (1973).

Paragraph (d) establishes terms for definitions used in the standard and commonly recognized in the industry. No comments were received on the following terms: Anemometer, angulated roping, cable, carriage, certification, control, guide shoe, interlock, operating device, primary brake, prime mover, registered professional engineer,

building face roller, rope, speed reducer, stability factor, stabilizer tie, tie-in-guides, transportable outriggers, verify, weatherproof, winding drum hoist. No change is made in these definitions in the Final Rule. The discussion of each of these proposed definitions is found in the preamble of the Notice of Proposed Rulemaking of January 22, 1985 (50 FR 2890) on pages 2909 and 2910. Major clarifying changes have been made to the definitions for "combination cable" and "installation."

Kurt W. Daigel (EX. 9-31, 9-41) recommended that the proposed definition for "babbitted fastenings" be eliminated, since babbitted fastenings are no longer accepted practice. Hoberg (EX. 19B, 19-c; TR 2/19, p. 53) noted the term "babbitted fastenings" should be replaced by the term "speltered sockets" or a more generic term such as "poured sockets," since babbitted fastenings should be prohibited for wire rope used for powered platforms. This commenter observed that babbitted fastenings are used in elevator rope terminations, but such fastenings would be unacceptable if used in a traction hoist because of the wire rope turning in the socket. In addition, Mr. Hoberg noted that babbitted fastenings are rated at 25 percent efficiency while fastenings for wire rope should have at least an 80 percent efficiency.

OSHA notes that the recommendations made by these commenters for the prohibition of babbitted fastenings for hoisting rope is supported in the text "Handbook of Rigging for Construction and Industrial Operations," 3rd edition, by W. Rossmagel, P.E., on page 55, which addresses wire rope fastenings.

OSHA is deleting the proposed definition for "babbitted fastenings" and is adding a definition for the generic term "poured socket" in the Final Rule. This definition is based on a definition of this term on page 28 of the *Wire Rope Manual*, second edition, published by the American Iron and Steel Institute.

Spider Staging Sales Company and Daigel (EX. 9-22, 9-31, 9-41) recommended deletion of the word "exterior" in the proposed definition of building maintenance, claiming the standard should also cover interior maintenance activities as well. The California Department of Industrial Relations (EX. 9-45) suggested that the definition include the terms "scheduled maintenance," which would cover window cleaning activities, and "unscheduled maintenance," which would cover caulking, sandblasting, etc.

Since, as explained above, OSHA is expanding the scope of the standard to

include interior maintenance, it therefore agrees that the definition of "building maintenance" should reflect this change and is deleting the proposed modifying phrase, "exterior."

OSHA is not adding the terms "scheduled maintenance" and "unscheduled maintenance" in the Final Rule since it believes it is unnecessary to show this differentiation in the definition. Windows are washed, stones cleaned, glass replaced—sometimes regularly, and sometimes on an as-needed basis, as determined by inspection.

Daigel (EX. 9-22) and Hoberg (EX. 19B) concurred in suggesting that the definition for "traveling cable" as proposed in paragraph (d)(9) be deleted. They believed that this definition is unnecessary, since the term "cable" is adequately defined in the Final Rule and there is no specific need to define cable types in the standard. OSHA agrees, and the definition for traveling cable is deleted in the Final Rule.

It was suggested that the term "catalog strength" be changed to the term "rated strength" since it is more generic and permits the engineer to adjust for arbitrary catalog listings and installation limits (TR 2/19, p. 53, EX. 19B). OSHA accepts the suggestion of a commenter and is changing the term in the Final Rule.

OSHA is including a definition for "competent person" to substitute for a proposed definition for "qualified person." OSHA notes that the term is meant to identify persons who will conduct equipment and wire rope inspections and persons who will train other employees in the use and inspection of powered platforms. The building owner has the responsibility for the designation of the person he or she deems qualified to conduct equipment and wire rope inspections, while the employer would designate the person that would train other employees in the use and inspection of powered platforms. Because the term "qualified person" is used in Appendix C, and in Part 1926 to refer to formally trained persons, OSHA believes that it is inappropriate and confusing to use "qualified person" as proposed. OSHA had made specific the areas of competence for the "competent person" as suggested by a commenter (EX. 9-20).

It was claimed (EX. 19B) that the proposed definition of "continuous pressure" was awkward and difficult to interpret, because of the use of the terms "device" and "control." OSHA agrees and has changed the definition in the Final Rule.

Daigel (EX. 9-22) suggested deleting the phrase "and for transferring the

platform between these locations" in the proposed definition of "davit." The phrase might imply it is permissible to use a davit for moving a platform horizontally across a building face.

Hoberg (TR 2/19, p. 54, EX. 19B, 19C) noted that the davit definition could also describe a carriage, and that it was important to differentiate between davits, carriages and outriggers to obtain effective compliance with the standard. Mr. Hoberg recommended specific changes in the definition which would conform to the equipment described in the proposal and illustrate the characteristics unique to davits. In addition, this commenter recommended adding two additional definitions: "ground-rig davit" and "roof-rig davit" in the final rule since requirements for these two types were included in the proposal. OSHA agrees with the suggestions made by both commenters and is changing the "davit" definition and adding definitions for ground-rig davit and roof-rig davit in the Final Rule.

The proposed standard had provided a generic definition for equipment tie-ins. OSHA is deleting this definition in the final rule since the specific tie-in used in the proposal is defined under "stabilization tie."

Daigel (EX. 9-31) stated that the proposed definition for "equivalent" was far too broad and should include the phrase "protect against a hazard" to make it more specific. OSHA believes that there may be alternative designs, materials or methods which can contribute to a safe workplace but which may not directly "protect against a hazard." OSHA, therefore, has determined that the definition for "equivalent" remain unchanged in the Final Rule.

Daigel (EX. 9-22) and Hoberg (EX. 19B) suggested that the proposed definition for "ground rigging" be clarified. The proposed definition, as stated, might wrongfully imply that roof-powered platforms may not be used when ground rigging. OSHA concurs with the commenters and is changing the definition in the Final Rule to eliminate this implication.

A commenter (EX. 9-41) suggested that the proposed definition for "guide roller" be changed and made similar to the proposed definition for "guide shoe." OSHA notes, however, that a "guide shoe" is different from a "guide roller" in that it provides a sliding contact between the building guides and the shoe. In addition, comments by Hoberg (EX. 19-B) and the proposed definition in the ANSI A120 draft standard—January 1986 (EX. 15-8) concur in support of the definition as stated in the proposal. OSHA believes a guide roller

is adequately described in the proposed definition and the paragraph, therefore, is unchanged in the Final Rule.

The proposed definitions for "multiple wrap drum hoist" and "single wrap drum hoist" are deleted since these terms are not used in the Final Rule.

The proposed definition for a "hoist machine" has been modified for clarification. The word "powered" is added before the word "device."

The proposed definition for "installation" has been changed to improve clarity. In addition, OSHA is deleting the word "exterior" in the definition since the rule is to apply to exterior and interior building maintenance.

The proposed definition for "intermittent stabilization" specifies the vertical placement of the building anchors on a building face. Hoberg (EX. 19-B) claims there is nothing unique about the verticality, since the anchors are spaced horizontally and vertically, and suggested that the phrase "vertical" be deleted. OSHA accepts the suggestion and the definition is changed in the Final Rule.

The California Department of Industrial Relations (EX. 9-45) recommended that the proposed definition for "lifeline" be broadened to include both horizontal and vertical lifelines. OSHA agrees and is changing the definition in the Final Rule.

It was noted (TR 2/19, p. 54, EX. 19-B) that the term "live load" means "moving and dynamic" in other related regulations and standards. For consistency with other standards, the commenter suggested deleting the word "static" in the title of the proposed definition for "live load." OSHA agrees and is changing the title of the definition in the Final Rule.

A comment from Hoberg (EX. 19-B) was intended to clarify the proposed definition for "obstruction detector." He suggested the substitution of the term "control," which is defined in the proposal, for the term "device." OSHA agrees with this suggestion and is changing the definition in the Final Rule.

The term "operating control" was used in the proposal at (f)(3)(i)(F) and was not defined. OSHA agrees with Hoberg (EX. 19-B) and developed a definition that is added in the Final Rule.

Comments received from the New York State Department of Labor (EX. 9-41), Kurt W. Daigel (EX. 9-31) and Hoberg (EX. 19-B) concurred in the need for clarification of the proposed definition for "outrigger." Because an outrigger is differentiated from a davit in the regulations, Mr. Hoberg suggested

the definitions should be similar so that differences are clear when definition comparisons are made. OSHA agrees with the commenters and the definition for "outrigger" is changed in the Final Rule. In addition, OSHA is substituting the term "working platform," which is defined, for the term "powered platform."

Comments received from Spider Staging Sales Company (EX. 9-43), Daigel (EX. 9-31), and Hoberg (EX. 19-B) regarding the proposed definition for "rated load" reveal a variety of opinions on how this definition should be written. Mr. Daigel would prefer that the definition address only a hoist load, while the Spider Staging Sales Company suggested the definition should address the loading for the powered platform system. Mr. Hoberg noted that there could be serious consequences in the misinterpretation of this term and recommended a series of load term definitions to avoid this problem. OSHA accepts Mr. Hoberg's recommendations, which also address suggestions by Mr. Daigel and Spider Staging Sales Company, and the proposed definition of rated load is replaced in the Final Rule with four separate load definitions. These definitions are used in the Final Rule text.

K.W. Daigel (EX. 9-22) suggested that the proposed definitions for a roof-powered platform and a self-powered platform be simplified through the appropriate use of the word "hoist." OSHA agrees and both definitions are modified in the Final Rule.

Daigel (EX. 9-22) and the New York State Department of Labor (EX. 9-41) suggested that the phrase "protected against injury" be replaced in the proposed definition for "safe surface" with the phrase "protected against falling." OSHA agrees that protection against falling is the major concern for employees who use a building surface to prepare rigging or to gain access to powered platforms. Accordingly, OSHA is changing the definition in the Final Rule.

OSHA is making minor changes to the proposed definition for "secondary brake." The term now focuses on the function, i.e., to arrest the descent of a powered platform in the event of an overspeed condition or in an emergency. In addition, OSHA has dropped proposed language which described other possible reasons for activating secondary brakes in reply to comments (EX. 9-22, 9-31, 9-41).

Although no comment was received on the proposed definition of "stability factor," OSHA believes it is appropriate to explain the criteria used in the stability factor. The stabilizing moment

is the algebraic sum of the moments of force acting on the inboard side of the fulcrum in a platform installation support. The overturning moment is the algebraic sum of the moments of force acting on the outboard side of the fulcrum in a platform installation support. The physical significance of the moment of a force about an axis lies in the fact that it is a measure of the tendency of the force to turn the body on which the force acts about that axis. The definition remains unchanged in the Final Rule.

The New York State Department of Labor (EX. 9-41) and Daigel (EX. 9-31) recommended that the proposed definition for "supported equipment" be revised to show the characteristics distinguishing that term from "suspended equipment." These commenters also recommended that OSHA consider deleting this definition entirely since this type of equipment may not be in use.

OSHA is aware of at least one instance where supported equipment has been built, tested and installed on a building. Such equipment uses building members rather than wire rope for support, and is best applied on sloped surfaces and in atriums. In addition, the draft standard ANSI A120—January 1986 (EX. 15-8) continues to include provisions addressing supported equipment. OSHA has decided to retain the provisions addressing supported equipment in the Final Rule and, as a consequence, is leaving unchanged the proposed definition for supported equipment in the Final Rule. OSHA believes the definition adequately describes the unique characteristics of supported equipment and provides an easy comparison with the definition for suspended equipment.

Daigel (EX. 9-22) claimed that the proposed definition for "suspended equipment" would negate all the effort that has been expended in the industry to preclude horizontal movement of platforms across the building face except when in the uppermost storage position. He also suggested that the definition should be compatible with the definition for a two-point (two suspension wire ropes) suspended scaffold in the OSHA standard 29 CFR 1910.21(f)(34).

OSHA agrees that the definition should be modified to avoid the implication that platforms can be moved horizontally across a building face, but does not agree that the definition should follow the format of 29 CFR 1910.21(f)(34). The proposed definition was intended to be a generic definition for suspended equipment and would cover one point (one suspension wire

rope), two-point (two suspension wire ropes), and four-point (four suspension wire ropes) types of powered platforms.

OSHA addresses the issue of platform horizontal movement in its change of the definition for "suspended equipment" in the Final Rule.

The New York State Department of Labor (EX. 9-41) and Daigel (EX. 9-22) recommended that the proposed definition for "suspended scaffolds" be deleted, since it is covered under the definition for suspended equipment. However, each term is used in a different context at paragraphs (b)(1) and (f)(5)(i), and therefore requires a separate definition. The definition is unchanged from the proposal in the Final Rule.

The New York State Department of Labor (EX. 9-41) stated that the proposed definition for "tail line" could also mean a line between a safety belt and a hanging lifeline. However, in the context of this standard, the tail line is only used in reference to a suspension wire rope and a clarifying change is made in the Final Rule.

The proposed definition for "tie-in device," paragraph (d)(54), is deleted since this term is not used in the Final Rule.

The proposed definition for a "traction drum hoist" did not refer to a traction sheave hoist, which is another basic type of traction hoist. It was suggested (EX. 19-B) that the definition be given the generic title of "traction hoist" and include both traction drum hoist and traction sheave hoist references in the definition text. OSHA agrees with the suggestion and the definition is changed in the Final Rule.

The proposed definition for "transportable equipment" is deleted, since the term is not used in the Final Rule.

It was suggested (TR 2/19, p. 56, EX. 19-B) that the definition for "trolley system" be changed to a definition for a "trolley carriage" for the purpose of providing clarity and consistency in the Final Rule. The commenter noted that carriages and trolley systems are defined as having identical functions, and reasoned there should be safety controls on overhead supported trolleys equal to those provided on underfoot supported carriages. OSHA believes the commenter's suggestion has merit and is changing the definition in the Final Rule. Appropriate changes are also made in the text of the Final Rule to reflect the definition change.

Kurt W. Daigel (EX. 9-22) and the New York State Department of Labor (EX. 9-41) suggested eliminating the term "exterior" in the definition for

"working platform." OSHA agrees, since the application of the proposal is being expanded to include interior maintenance. OSHA also is adding the term "Manned" to be consistent with regulatory text.

Paragraph (e) proposed general requirements for buildings which utilize powered platform installations. No comments were received on paragraphs (e)(1)(ii), (e)(1)(iii), (e)(1)(iv), (e)(2)(iii)(A)(4), (e)(6), (e)(10), (e)(11)(i), (e)(11)(iii), (e)(11)(v), and no change is made in these paragraphs in the Final Rule. The discussion of each of these provisions is found in the preamble of the Notice of Proposed Rulemaking of January 22, 1985 (50 FR 28990) on pages 2896, 2897 and 2898. Proposed provision (e)(2)(iii)(A)(4) is included in paragraph (e)(2)(iii)(A) of the Final Rule.

Paragraph (e)(1) proposed the general requirements which apply to buildings that utilize working platforms.

The California Department of Industrial Relations (EX. 9-45) suggested that the proposed paragraph (e)(1) include a requirement for locating detailed engineering plans at the work site to ensure that proper replacement parts will be provided when needed. The Final Rule addresses the commenter's concern regarding installation repairs in paragraph (e)(10). This paragraph requires that repairs to the building affecting suspended equipment installations not affect the capability of the building to meet the requirements of the standard.

The Spider Staging Sales Company (EX. 9-43) suggested changing the application of proposed paragraph (e)(1) to "building maintenance which utilize suspended systems." In response, OSHA points out that the paragraph addresses specific building requirements in an installation which must be met for compliance. The paragraph does not address building maintenance.

Proposed paragraph (e)(1)(i) required that building attachments and equipment be designed by a registered professional engineer experienced in such design. Hoberg (TR 2/19, p. 49) stated that this was a sound approach, but noted that the design criteria to be used were not included. The commenter observed that in many states an engineer attests to technical compliance with a reference design standard or standards. This was confirmed in at least one state by a submission received from Carl J. Thurnau (EX. 87) of the New York State Department of Labor. In the New York State Advisory Standard #101 for the construction, operation and maintenance of swinging scaffolds, recognized design standards are listed which the state considers acceptable in

applications for approval of suspended scaffolds.

In the ANSI A120 draft standard—January 1986 (EX. 15-8), design criteria are addressed in section 202. In this section, the criteria are based on the limitations (stresses, deflections, etc.) established by nationally recognized standards promulgated by a number of organizations.

OSHA agrees that some guidelines are needed for the design criteria used by the engineer. Following the approach used by the ANSI A120 draft standard—January 1986 (EX. 15-8), OSHA is adding to Appendix A a list of organizations which have established nationally recognized design standards applicable to powered platform installations.

The New York State Department of Labor (EX. 9-41) and Kurt W. Daigel (EX. 9-31) suggested deleting the proposed requirement for building installations in (e)(1)(v) because it was too broad. This requirement stated that the building installation shall allow for the safe use and operation of the equipment. OSHA agrees and has changed the provision of the Final Rule to require that only those affected parts of the building be designed to allow the equipment to be used without exposing employees to hazards.

Proposed paragraph (e)(2)(i) would have required building exteriors to have tie-in guides which are building face components that provide a continuous means of positive engagement between the building and suspended unit. The definition of the term "tie-in guides" states that the guides provide continuous positive engagement between the suspended equipment and the building. For reasons of consistency, OSHA is changing the revision at paragraph (e)(2)(i) in the Final Rule by requiring that building exteriors be provided with tie-in guides and deleting those phrases which are in the definition of the term "tie-in guides."

The proposal, in paragraph (e)(2)(ii), would have allowed tie-in guides to be eliminated if not feasible due to exterior building design, for uppermost elevations. Tie-in guides would have been eliminated from the upper 75 feet (22.9 m) provided angulated roping is employed and continuous contact is maintained by the platform with building face. For the upper 50 feet (15.3 m), no angulated roping or continuous contact would have been required.

Two commenters (EX. 9-23, 9-43) recommended that the tie-in guide exclusion for upper elevations be increased to 130 foot (39.6 m), the same distance as was permitted in proposed paragraph (e)(2)(iii)(c) for elevations above ground level. OSHA believes the

two environmental conditions are not comparable. First, the wind pressure effect on tall buildings is usually greatest at the top corners of a building. Second, the column effect of air on the exterior of a building increases with building heights. This uplifting wind tends to "dam up" under a platform and get between the platform and the building, moving the platform away from the building. For these reasons, OSHA cannot accept the recommendation that the tie-in guide exclusion for upper elevations be increased to 130 foot (39.6 m).

Kurt W. Daigel (EX. 9-22) and Hoberg (EX. 19B) concurred in suggesting that OSHA should reword this exclusion to require that there should be continuous contact between the platform and the building face at the 50 foot (15.3 m) upper-most elevations. This suggestion addresses the objection to the upper 50 foot (15.3 m) exclusion by Leonard Nork (TR 2/20, p. 23) who stated that employees can be subjected to hazards at elevated building heights due to the windy conditions if tie-in guides are not used.

Other commenters (EX. 9-31, 9-41, 15-8) and hearing participants (TR 2/19 p. 182; 2/20-311, 334) supported the upper 75 foot (22.9 m) exclusion. James W. Fortune (TR 2/19, p. 182) and Douglas A. Greenaway (EX. 15-8) also believed that the upper 75 foot (22.9 m) exclusion should be reworded to require a minimum angulation force of 10 pounds (44.4 N) on the building face.

In response to these comments, OSHA agrees that an exception to continuous positive engagement of the working platform the building should be made in such a manner so as not to increase the risk to employees when they are working near roof top elevations. Accordingly, if tie-in guides are excluded at the uppermost elevations, there is a real need to provide an alternate method of platform stabilization because of the wind forces which can occur at these elevations. The platform stabilization required for the upper 50 foot (15.3 m) should be no less than is required at the upper 75 foot (22.9 m) level. Therefore OSHA is deleting the reference to 50 foot (15.3 m), retaining the 75 foot (22.9 m) exclusion as proposed and adding the requirement for a minimum angulation force of 10 pounds (44.4N) in the Final Rule. This revision from the proposal is requiring a continuous contact between the platform and the building face, if the platform is not stabilized with tie-in guides for the upper 75 foot (22.9 m) level. In addition, OSHA is deleting the word "continuous" in the Final Rule,

since the word is contained in the definition of tie-in guides and therefore is redundant.

Proposed paragraph (e)(2)(iii) is being modified in the final rule for clarity and for consistency with other related provisions. First, as in the previous paragraph the word "continuous" is deleted since this word is already contained in the definition of tie-in guides. Second, the phrase "required in (e)(2)(i)" is added to show the relationship of this exclusion provision to the original requirement. Third, a reference to paragraphs (e)(2)(iii) (A), (B) and (C) is added to complete the reference to three guide systems—anyone of which is required if tie-in guides are not used.

Requirements for powered platform installations using intermittent stabilization systems were proposed in paragraph (e)(2)(iii)(A). A considerable number of commenters (EX. 9-22, 9-23, 9-25, 9-28, 9-29, 9-31, 9-34, 9-35, 9-37, 9-41; EX. 15-4, 15-8, 15-13; 19B; 38; 50; 88) and hearing witnesses (TR 2/19, pp. 58, 153, 174, 230; TR 2/20, pp. 23, 115, 311, 333) addressed this provision. The three primary issues raised were the proposed 14-inch (355.6 mm) limit on platform displacement, the wind velocity of 40 miles per hour (64.3 km/hr) as a design criteria, and the related lateral displacement tables in Appendix C.

Daigel (TR 2/20, p. 333), Thomas J. O'Shea (TR 2/20, p. 311), and James W. Fortune (TR 2/19, p. 230) claimed that the 14-inch (355.6 mm) limit on platform displacement was based on the faulty premise that normal platform movement in excess of 14 inches (355.6 mm) would cause a worker to fall. They contended that normal wind forces will move a 2,000-pound (89.6 kg) platform very slowly along the face of a building because of the platform weight and the frictional forces which are in opposition to these wind forces. In addition, they claimed the platform would remain level and tend to right itself during this movement. Only high winds, they continued, have a significant effect on platform stabilization, and this is the main reason for using stabilizer ties.

Daigel (TR 2/20, p. 333) also pointed out that under normal operating conditions, in the absence of winds, the platform may displace in excess of 14 inches (355.6 mm) laterally, due to variables such as worker movement on the platform, building face roller condition and contact, and differences in actuation of the platform hoist controls.

Lawrence R. Stafford (EX. 15-4), Thomas J. O'Shea (EX. 15-13), and Hoberg (TR 2/19, p. 58) noted that the rate of platform displacement and a

worker's reaction time would determine a worker's stability on a platform. Since these criteria are so variable, they contended that assigning numerical limits for platform displacement for the purpose of assuring worker stability is not feasible and should be omitted. These same commenters observed that the designer of the building installation can limit the horizontal displacement of a platform for a specific building through proper vertical spacing of the building anchors, platform weight and stabilizer tie length.

Hoberg (EX. 19-B) recommended that OSHA should delete the 14-inch (355.6 mm) limit on platform displacement, and require instead that the intermittent stabilization system be designed to prevent sudden horizontal movement of the platform. It is the sudden movement of the platform, Hoberg contended, that is more likely to cause a worker to lose his or her stability on the platform.

OSHA is appreciative of this new data submitted by the commenters and witnesses relative to the 14-inch (355.6 mm) proposed limit on platform displacement. This new data, which indicated that the proposed limit would not achieve OSHA's intended purpose, had not been considered in the study (EXH. 2) prepared for OSHA on intermittent stabilization. After considering the new data, OSHA is deleting this proposed requirement and substituting performance language which requires the system to be capable of preventing sudden platform horizontal movement. The Agency believes that this provision addresses the hazard more effectively.

Several commenters (EX. 9-23, 9-25, 9-28, 9-37, 9-41) and persons who testified at the hearing (TR 2/20, pp. 23, 311) objected to the 40 miles per hour (64.3 km/hr.) velocity criterion in the proposed requirement (e)(2)(iii)(A). These commenters believed that workers should not be required to work on a platform when exposed to winds even approaching this velocity. However, it was not OSHA's intention that this criterion be used as a limit on worker exposure. The 40 miles per hour (64.3 km/hr) velocity criterion was intended to serve as the design basis for the proposed 14-inch limit (355.6 mm) on platform displacement. Since OSHA is not promulgating the proposed displacement limit, the 40 miles per hour (64.3 km/hr) criterion also is eliminated in the Final Rule.

OSHA also is eliminating the tables proposed for inclusion in Appendix C in the Final Rule. They were intended to provide guideline data to building installation designers on lateral displacement in an intermittent

stabilization system. James W. Fortune (TR 2/19, p. 174), Thomas J. O'Shea (TR 2/20, p. 311), and Daigel (TR 2/20, p. 311) noted during the public hearing that these tables should be deleted for several reasons. First, the introduction of wind velocity variables in the tables in excess of 25 miles per hour (40.2 km/hr) implied that workers would be permitted to work on a platform in these wind exposures. Second, building installation designers would develop their own designs for intermittent stabilization systems specifically suited to each building and would not utilize the guidelines presented in Appendix C. Third, if OSHA should decide to delete the 14-inch (355.6 mm) displacement limit in the proposal, the tables would be unnecessary. Since OSHA has agreed that the limit on platform displacement is to be eliminated in the Final Rule, the tables in Appendix C are also deleted.

OSHA had proposed that the maximum vertical interval between building anchors in an intermittent stabilization system be 50 foot (15.3 m). A large number of comments (EX. 14-1; 15-4; 9-13, 9-25, 9-31, 9-41, 9-43; TR 2/19, pp. 60, 185; TR 2/20, pp. 23, 92, 267, 313) were received in response to OSHA's request for comments on this provision in the November 22, 1985 Notice of Hearing (50 FR 48222).

Some commenters, James W. Fortune (TR 2/19 p. 185), Daigel (EX. 9-31) and the New York State Department of Labor (EX. 9-41) suggested that the maximum interval between building anchors should be less than 50 foot (15.3 m) for buildings in excess of 500 foot (153 m) in height because of the generally higher wind velocities at those elevations.

Thomas J. O'Shea (TR 2/20, p. 313) and Lawrence R. Stafford (EX. 15-4) believed there was no engineering justification to reduce the anchor interval to a specific distance at the higher elevations in the regulation. They contended that this spacing should be decided by a competent professional engineer based on an evaluation of the entire system, platform size, wind design values for the site, and the profile of the facade.

The Travelers Insurance Company (EX. 14-1), Daigel (EX. 9-31), and Lawrence R. Stafford (TR 2/20, p. 92) recommended that the proposed 50 foot (15.3 m) interval be reduced to 40 foot (12.2 m) regardless of the building height. Lawrence R. Stafford noted that New York State has had excellent experience with the 40 foot (12.2 m) limit.

Another group of commenters, Hoberg (EX. 19-B, TR 2/19, p. 60), Acme

Fabricators (EX. 9-13), Spider Staging Sales (EX. 9-43), and Richard W. Hoffman (TR 2/20, p. 207) recommended that the building anchor interval be limited to three floors or 50 foot (15.3 m), whichever is less. These commenters argued that the three floor limit has worked out quite well in their experience and is acceptable to most architects. In addition, if a floor limit is not introduced it is possible that in some buildings with eight feet six inch floors (2.6 m), the proposed provision permitting a maximum of 50 foot (15.3 m) would allow building anchors every four floors. Therefore, it is conceivable for some buildings to have building anchors every four floors and on other buildings every three floors. These commenters concluded that for uniformity and safety, ease of installation, operation and design, the three floor limit of not greater than 50 foot (15.3 m) was recommended.

OSHA agrees with the latter group of commenters and is changing the proposed requirement in the Final Rule accordingly. OSHA believes that because of the variability of conditions which exist at each building site, it is appropriate that this provision establish a set of minimum criteria for spacing of anchors allowing the necessary flexibility to deal with the particular conditions encountered. Due to the various site conditions that have been identified such as the wind environment at various elevations, the platform length and weight, and the facade profile, the responsible architect or engineer should have the latitude to consider these variables in locating the appropriate building anchors. If a tall building requires additional building anchors, or if certain conditions along a building edge require a building anchor at every floor, the provision should allow the architect or engineer to address each situation. Furthermore, OSHA believes that in a time of crisis, a worker will look for a building anchor at a given floor level rather than at a distance that is irregularly spaced with respect to the building facade panels.

Finally, the change in the Final Rule for the building anchor interval to a three floor limit is consistent with current OSHA Instruction STD 1-3.3 of November 12, 1985 (EX. 102), which addresses intermittent stabilization systems.

Other requirements for building anchors are also changed from the proposal. Hoberg (EX. 19-B, 19-C) suggested that the proposed provision requiring the anchors to be in vertical rows be modified, since some buildings have different spacings at different

elevations as part of the architectural design. This commenter also believed that it is an unsafe practice to use the building anchors to move the platform horizontally across the face of the building, and suggested OSHA address this practice in the provision. Lee B. Herzog (EX. 9-29) noted that the proposal would imply that four stabilizer attachments are required for a platform using a four wire rope suspension system. This commenter suggested changing the provision to require that only two stabilizer attachments need be used for this type of system.

OSHA agrees with the commenters and has changed provisions (e)(2)(iii)(A)(2) and (e)(2)(iii)(A)(3) in the Final Rule to reflect their suggestions.

Hoberg (EX. 19-B, 19-C) suggested that OSHA also address the hazard which could occur if building anchors were to cut or entangle lifelines, wire ropes or cables. This commenter noted that the catching of suspension wire ropes and life-lines on external anchors was an almost universal complaint among workers using these systems he contacted. OSHA agrees and is addressing this hazard in a new paragraph (e)(2)(iii)(A)(4) in the Final Rule.

The required capability of intermittent stabilization system components was also at issue. The proposal required intermittent stabilization system components to be capable of supporting, without failure, at least four times the maximum intended load applied or transmitted to the components.

Daigel (EX. 9-31) and Thomas J. O'Shea (TR 2/20, p. 213) recommended that OSHA also address the loading requirement on each building anchor. These commenters believed that the minimum load for each anchor should be 600 pounds (2668 N) based on their field observations of these systems.

Hoberg (EX. 19B, 19c) supported the need for addressing anchor loading requirements. This commenter recommended, however, that the minimum anticipated load on a single building anchor should be 300 pounds (1334 N). This recommendation was based on criteria that included a platform end area of 10 square feet (0.9 m²) enclosed with steel mesh, a wind force from a 100 miles/hour (160.8 km/hr.) wind, a four to one safety factor and the sharing of the wind load by two building anchors. Mr. Hoberg believed that only those building anchor arrangements in which one anchor must withstand all of the load should have a greater capability factor than where two anchors can share the load.

OSHA agrees that the 300 pound (1334 N) minimum anticipated loading per anchor is adequate if both anchors share the load, and this requirement is included in paragraph (e)(2)(iii)(A)(5) in the Final Rule. For installations, where both anchors do not share the load, paragraph (e)(2)(iii)(A)(6) addresses those instances.

Hoberg (EX. 19c) suggested that OSHA require the building anchors and stabilizer ties to have the capability of withstanding anticipated wind loads if a platform should be stranded on a building face due to some mechanical or electrical failure. In addition, he suggested that a single anchor should have the capability to sustain these wind loads if the anchors have different spacing than the suspension wire ropes.

OSHA believes these suggestions have merit and is including them in the Final Rule in paragraph (e)(2)(iii)(A)(6).

Several commenters, Lawrence R. Stafford (EX. 15-4), Thomas J. O'Shea (EX. 15-13), and Daigel (EX. 15-14) supported the proposed paragraph which would have prohibited the use of ground rigged platforms on intermittent stabilization systems. They claimed a feasible system has not been developed which will provide the necessary stabilization of the platform. OSHA's proposed prohibition also was based on the Agency's belief that "on a ground rigged platform, the stabilizer ties cannot be attached to the building anchors during the first ascent to the roof" (50 FR 2897, January 22, 1985).

Many other commenters (EX. 9-13, 9-23, 9-34, 9-37; 19B) and hearing witnesses (TR 2/19, p. 184; TR 2/20 pp. 306, 309), however, recommended that such platforms not be prohibited based on their experience and observations.

Powered Platforms Company (EX. 9-23), Acme Fabricators Company (EX. 9-13), and Joseph Puccinelli (TR 2/20, p. 306) claimed that special provisions can be made to provide stabilizers at each floor level as a ground rigged platform ascended. James W. Fortune (TR 2/19 p. 184) provided OSHA with a drawing of a building in California in which stabilization was provided for a ground rigged platform and contended that employee work procedures, similar to those used for roof rigged platforms, could be used in deploying the intermittent ties. Robert W. Hursh (EX. 101) also provided OSHA with sketches and analysis of a similar ground rigged platform arrangement. Hoberg (EX. 19B) claimed that the proposed prohibition is based on the assumption that the ropes or platforms cannot be restrained except by a worker on the platform, and that this assumption is incorrect. This

commenter noted that access panels in the building face would allow the suspension wire rope to be restrained to the building anchors prior to the ascent of a ground rigged platform.

Based on the new data provided by the commenters which show that ground rigged platforms can be stabilized intermittently, OSHA agrees to eliminate the prohibition in the Final Rule. Stabilization of the ground rigged platform during its ascent, however, is required under paragraph (f)(5)(v)(H).

In addition, the Final Rule contains other provisions which will also ensure that the use of ground rigged platforms on intermittent stabilization systems will not present a hazard to employees. First, under paragraph (e)(1)(i) and (f)(1)(i), the building and equipment components are to be designed by a registered professional engineer. Second, under paragraph (c), the employer is required to obtain a certification from the building owner that the installation meets the requirements of this standard. Third, under paragraph (i)(1)(iii), employees must be trained in the operating procedures peculiar to ground rigged platforms with intermittent stabilization systems.

Requirements for powered platform installations using button guide stabilization systems are set out in paragraph (e)(2)(iii)(B). These systems include a guide track mounted on the platform and guide buttons mounted on the building face which engage the track during ascent and descent. Lawrence R. Stafford (EX. 9-35; TR 2/20, p. 153), Daigel (EX. 9-22, 9-31; TR 2/20, p. 334), and the Window Cleaning Contractors Association (EX. 9-20) objected to the inclusion of this alternate stabilization system in the standard. These commenters claimed that there were certain problems with these systems, such as lifelines catching on the buttons and button misalignment due to the variance in building construction. Other problems that were claimed included possible button breakage due to guide track hang-up and hand injuries from handling the guide tracks mounted on the platform.

James W. Fortune (EX. 43; TR 2/19, pp. 176, 186) and Hoberg (EX. 19B, 19C; TR 2/19, pp. 57, 163) supported the use of a button guide stabilization system as an alternate stabilization system. In response to the objections raised against these systems, these two commenters noted that the problems noted were a function of improper design, improper suspension of safety lines and inadequate training of employees. These commenters claimed to have observed a number of button guide stabilization

systems which have operated satisfactorily. Hoberg (EX. 19B) recommended that several provisions be added to this section which address the problems of lifelines, button breakage and alignment, and guide track operation.

OSHA agrees with these commenters, for the reasons stated, that this alternate stabilization system should be retained in the standard. OSHA also is including the relevant provisions recommended by Hoberg in the Final Rule and these are identified as paragraphs (e)(2)(iii)(B)(1), (e)(2)(iii)(B)(2), (e)(2)(iii)(B)(3), (e)(2)(iii)(B)(5) and (e)(2)(iii)(B)(6). In summary, OSHA is changing the proposed requirements for button guide stabilization systems under paragraph (e)(2)(iii)(B) in the following manner.

First, the word "continuous" and the last sentence of proposed paragraph (e)(2)(iii)(B) are deleted. The word "continuous" is already contained in the definition of tie-in-guides. The last sentence of this paragraph which addressed guide bar requirements is transferred in the Final Rule to paragraph (f)(5)(vi)(A), which addresses equipment requirements. Second, for purposes of clarity, proposed paragraph (e)(2)(iii)(B)(1) is rewritten as paragraphs (e)(2)(iii)(B)(2) and (3). Their content remains the same. Third, proposed paragraph (e)(2)(iii)(B)(2) is being rewritten as paragraph (e)(2)(iii)(B)(4). The word "bar" is changed to the more descriptive word "track," and OSHA is clarifying the fact that when the guide track initially engages the first building anchor a gap in the continuous engagement will occur. Fourth, the proposed paragraph (e)(2)(iii)(B)(3) is being rewritten as paragraph (e)(2)(iii)(B)(6), since OSHA agrees with Hoberg's (EX. 19B) comment that the proposed provision does not properly address the loading of button guide stabilization system components. This commenter suggested that the paragraph be changed to insure that the anchor and building components be capable of sustaining without damage at least the weight of the platform. If this capability is not provided, then provisions must 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 anchor and building components.

In addition to these specific requirements, OSHA notes that a number of other provisions in the final rule generally address the issues raised with regard to button guide stabilization systems. These provisions include paragraph (e)(1)(i), which addresses design of any building installation by a

registered professional engineer, and paragraphs (i)(1)(i) and (i)(1)(ii), which address the training of employees operating powered platforms.

Requirements for powered platform installations, where the suspended portion of the equipment does not exceed 130 feet (39.6 m) above a safe surface, were set out in proposed paragraph (e)(2)(iii)(c). A number of commenters (EX. 9-22, -23, -28, -34, -35; 15-8, -14; 88) and persons who gave hearing testimony (TR 2/19, pp. 96, 103; TR 2/20, pp. 23, 333) addressed this provision. The primary issues raised were the 14-inch (355.6 mm) limit on platform displacement and the wind velocity criteria of 40 miles per hour (64.3 km/hr).

Daigel (EX. 9-22, 15-14, TR 2/20, p. 333) raised the same objections to the 14-inch (355.6 mm) limit on platform displacement in proposed paragraph (e)(2)(iii)(C) as he had on this same limit in proposed paragraph (e)(2)(iii)(A).

Hoberg (EX. 19B) also recommended that OSHA delete the proposed 14-inch (355.6 mm) limit on platform displacement, since it is the rate of displacement and not the displacement distance that would affect a worker's stabilization in a suspended platform. Since the rate of displacement is so variable and the assignment of a numerical limit is not feasible, this commenter suggested that OSHA require that the installation be designed to prevent sudden movement of the platform. After considering this new data presented by the commenters on the proposed 14-inch (355.6 mm) limit, OSHA finds that platform displacement is due to many factors and thus OSHA is deleting this requirement in the Final Rule and substituting performance language for controlling the platform displacement.

Several commenters (EX. 9-23, 9-34, 9-35; 15-14) and a hearing participant (TR 2/20, p. 23) objected to the 40 miles per hour (64.3 km/hr) wind velocity criterion in the proposed requirement (e)(2)(iii)(c). These commenters believed it is an unsafe practice to require employees to work on a platform when exposed to winds of this velocity. OSHA is deleting the velocity criterion in the Final Rule for the same reasons that were given in the deletion of this same criterion in proposed paragraph (e)(2)(iii)(A).

Hoberg (EX. 19B, 88; TR 2/19, p. 96) and Douglas A. Greenaway (EX. 15-8) recommended that OSHA retain the requirement in the present standard for a minimum angulation force of 10 pounds (44.4 N) as required in the proposed paragraph (e)(2)(iii)(C).

Hoberg stated that such a requirement would ensure there is a force available of given magnitude that can resist the lateral movement of the platform caused by employees walking on the platform. This commenter stated that, from his own experience, such a requirement is feasible even at the bottom of a 130-foot (39.6 m) drop. The 10-pound force (44.4 N), he continued, may be obtained by tie-backs or any other feasible method applicable to the installation.

OSHA agrees with these commenters that the platform should remain in contact with the building facade with a force of not less than 10 pounds (44.4 N), and this provision is retained in the Final Rule. Such a provision will ensure platform stabilization for employees working on platform installations with suspensions of less than 130 feet (39.6 m) without tie-ins to the building facade. Such a provision will also address Leonard Nork's (TR 2/20, p. 23) concern for employee safety on such installations because of the lack of tie-ins.

Since OSHA has decided that the scope of the Final Rule will cover platform installations used in the interiors of buildings (atriums) which have areas requiring maintenance, platform stabilization in this environment is addressed by this standard. Comments received on proposed stabilization provisions for platforms used on building exteriors concluded that employee movement on the platform contributed to platform displacement and an unsafe work surface. Tie-in guides and other equivalent methods are required in the final rule for the purpose of addressing this employee movement on exterior platforms. Hoberg (TR 2/19, p. 17), Daigel (EX. 9-31), and the Tennessee Valley Administration (EX. 14-3) concur in the need for a similar stability requirement for platforms used in atriums. Although a continuous or intermittent tie-in may not be necessary in an atrium because wind conditions are not a factor, they recommended that the platform be tied off at each work station to ensure platform stability. Hoberg noted that a restraint is necessary because of the extensive platform movement that results from employees pushing off from a work surface or from walking on the platform during work activities.

OSHA agrees that a tie-off of the platform at each work station is one method of providing stability in an atrium environment, but it is not the only method. OSHA believes that the building owner should have the option of utilizing stabilization methods

generally used for exterior environments if one of these methods serve his purpose. OSHA, therefore, is providing this flexibility in selecting a stabilization method in paragraph (e)(2)(iv).

Guarding requirements for employees working on roofs while performing exterior building maintenance were proposed in paragraph (e)(3).

Proposed paragraph (e)(3)(i) provided that guarding be provided on the roof perimeter to protect employees from falling while they were performing exterior building maintenance. This guarding was to have met the provisions of Subpart D of 29 CFR 1910. In the Final Rule, paragraph (e)(3)(i) references a specific standard, rather than all of Subpart D, to provide a more specific reference in the current General Industry Standards.

Several commenters (EX. 15-23, 57, 87) and persons who gave testimony at the hearing (TR 2/21, pp. 19, 26, 28) addressed paragraph (e)(3)(ii). Raymond Horvath (TR 2/21, p. 19) noted that the referenced Subpart D of Part 1910 in the proposed provision does not address the required horizontal distance of the perimeter roof guard from the face of the building being serviced. This commenter also noted that the ANSI draft standard A120.1—January 1986 (EX. 15-8) requires 12 inches (309 mm) for this horizontal distance, but he believed that this distance is insufficient because many parapet walls are in excess of 12 inches thick. If a builder were strictly to comply with a 12-inch (309 mm) distance in these cases, a guard rail (perimeter roof guard) would require bends or angles, at additional cost, or the guard rail would have to penetrate the top of the parapet.

For feasibility and with due regard to employee safety, Mr. Horvath recommended that the perimeter roof guard be located no less than six inches (152 mm) inboard of the inside face of the parapet wall or roof edge curb of the building being serviced. Further, he recommended that the location of this guard not exceed 18 inches (457 mm) from the exterior building face.

Lawrence R. Stafford (TR 2/21, p. 28) agreed with Mr. Horvath on the 18-inch (457 mm) limit, since any larger dimension could conceivably inhibit the use of davit installations. Mr. Stafford also agreed that bending of a guardrail above a parapet is undesirable, since it would provide a ledge on the inboard side of the guardrail and thus reduce the effective height of the guardrail if a person were to stand on the ledge.

OSHA agrees with these commenters and is modifying the perimeter roof guard provision in the final rule under

(e)(3)(ii) to conform with Mr. Horvath's recommendation, for the purpose of affording feasibility in complying with the perimeter roof guarding requirements.

Powered Platforms Manufacturing Company (EX. 9-23) suggested that proposed paragraph (e)(4), which addresses stops for trackless equipment, require stops only if an event could occur that would cause hazardous conditions for employees. Douglas A. Greenaway (EX. 15-8), in his submission of the ANSI A120 draft standard—January 1986, recommended that equipment stops be required by OSHA for trackless type equipment. Hoberg (EX. 19B, 19C) recommended that OSHA require equipment stops for the purpose of protecting employees from a crushing or shearing hazard if equipment should leave its intended travel areas.

OSHA agrees that a requirement for equipment stops should be included for three reasons. First, if trackless equipment should leave its designated areas, a hazard could result for employees due to a structural failure of the roof when the equipment is moved away from its structural support. Second, since most trackless surfaces are concrete slabs mounted on a roof, equipment dropping from this surface could create a pinch, crush or fall hazard for employees. Third, an employee could be trapped between a wall and the equipment if the equipment moved away from its designated path.

In addition to retaining the requirement for equipment stops (e)(4), in the final rule, OSHA is addressing the crushing and shearing hazard for employees, and removing the redundant proposed phrase "or being positioned."

Acme Fabricators Inc. (EX. 9-13) supported the need to provide safe areas for maintenance and storage of carriages as proposed in paragraph (e)(5). Hoberg (EX. 19B) concurred and also suggested replacing the words "supported equipment" with "suspended equipment" for clarity and for consistency with the definition of trolley carriage, in the Final Rule.

OSHA agrees and the appropriate revisions are made in the Final Rule in paragraph (e)(5).

Several commenters (EX. 15-8, 19B, 57) supported the need for tie-down anchors to be of noncorrosive metal as proposed in paragraph (e)(7). Douglas A. Greenaway (EX. 15-8) would also require inspection of these anchors for compliance with design requirements by a registered professional engineer, followed by an inspection report. Hoberg (EX. 19B) suggested clarifying

language to improve the meaning of the provision.

OSHA agrees to clarify the provision in the Final Rule as suggested by Hoberg. However, OSHA believes that a requirement for an inspection of the anchors would be unnecessary, since the building installation requirements are to be designed by a registered professional engineer under paragraph (e)(1)(i), the employer would have to be assured by the building owner that the installation has met those requirements under paragraph (c) in the Final Rule, and there is no evidence indicating failure of anchors.

James W. Fortune (TR 2/19, p. 196) suggested deleting the requirement for cable stabilization in proposed paragraphs (e)(8)(i) and (e)(8)(ii), since he believed this was a design function. However, a number of commenters (EX. 9-13, 9-31, 9-41; 15-4, 15-8; 19B, 19-C; 57) supported the need for the stabilization of cables and hanging lifelines. Lawrence R. Stafford (EX. 15-4) noted that such stabilization will prevent these cables and lifelines from creating an employee hazard as a result of striking building glass areas. Richard W. Hoffman (EX. 57) commented that strong winds acting on a lifeline can move employees to the leeward side of a platform and severely limit their movements. Daigel (EX. 9-31) recommended deleting the phrase "any other force" in the provision, while Hoberg (EX. 19B) suggested that paragraphs (e)(8)(i) and (e)(8)(ii) be combined because of their similarity.

OSHA agrees that the proposed requirement for cable and lifeline stabilization should be retained in the Final Rule. In addition to the reasons expressed by commenters in support of this requirement, OSHA believes that stabilization will help to further reduce employee hazards by reducing the abrasion of cables and lifelines. The stabilization of cables and lifelines can be provided by any method which limits their displacement by wind or other forces. OSHA also agrees to combine proposed paragraphs (e)(9)(i) and (e)(8)(ii) in the Final Rule into a new paragraph (e)(8)(i) for the purpose of reducing verbiage.

Several commenters (EX. 15-8, 19B, TR 2/20, p. 334) supported the proposed stabilization requirement for tensioned hanging cable in paragraph (e)(8)(iii). Acme Fabricators Inc. (EX. 9-13) also supported the need for this requirement but suggested that stabilization be provided at the more frequent intervals of 200 foot (61 m) rather than the proposed 600 foot (183 m). Swing Stage Inc. (EX. 9-29) questioned the need for this requirement since it believed that

unstabilized tensioned cables might mark a building face but not affect the safety of employees on the platform.

OSHA believes it is necessary for these cables to be stabilized for a number of reasons. First, many of these cables are brought directly over a parapet and can become chafed through movement since they are adjacent to the building face. Second, if these cables become damaged, employees may be exposed to shock hazards from failed power conductors. Third, on high buildings wind forces can be greater on these cables than on the platform itself. Finally, the tensioned cables need to be stabilized so as to prevent the tension from interfering with the overload limiting devices on the hoisting cables.

OSHA cannot support the need for cable stabilization at the more frequent intervals of 200 foot (61 m) rather than the proposed 600 foot (183 m), since there is no evidence that a hazard exists when tensioned cables are stabilized at 600 foot (183 m). The requirement remains unchanged in the Final Rule and is renumbered as paragraph (e)(8)(ii).

A significant number of commenters (EX. 9-25, 9-37, 9-45; 14-3; 15-8; 19B; 65-20) and hearing witnesses (TR 2/19, pp. 55, 63; TR 2/20, pp. 24, 35, 54, 65, 84, 109, 496) recommended that OSHA require a written emergency action plan for employees in lieu of communicating such a plan orally as in proposed paragraph (e)(9). Becor Western Inc. (EX. 9-37) believed the plan should be written to assure that it has been thought out in advance and that the plan has been accurately communicated to employees. Hoberg (2/19, p. 63) noted that few employees remember an oral plan during an emergency and suggested that the written plans be kept at the manned communication facility in the building along with the emergency phone numbers and equipment logs. Leonard Nork (TR 2/20, p. 24) stated that employees should be given a written copy of the emergency action plan for their training to insure proper implementation of the plan. Mr. Nork also suggested that a record be kept of the employee who had been trained in these emergency procedures and the name of the instructor who performed the training. Other commenters (EX. 14-3, 9-45) and a hearing participant (TR 2/20, p. 84) observed that it was especially important to utilize written emergency action plans for building work sites having complicated atriums and exterior facades.

OSHA did not receive any comments which supported the use of oral methods rather than written methods in the

training of employees in an emergency action plan.

OSHA has considered the comments received on this issue and agrees that written emergency action plans are necessary for employees who use powered platforms. The work site of a powered platform may require unusual methods to correct a hazardous situation and employees must be knowledgeable in these methods to prevent further risk or injury. Such knowledge would be difficult for employees to retain over a period of time without reference to a written plan, since many buildings are maintained on three- and six-month cycles. OSHA believes that if employees are made aware of and have ready access to the emergency procedures that would be necessary if they have an accident on a suspended powered platform, they will have a heightened awareness of the need to follow safe procedures and use fall arrest equipment at all times.

Accordingly, OSHA is revising proposed paragraph (e)(9) in the Final Rule. The revision requires employers to develop and implement emergency procedures through the use of written emergency action plans. The plan must explain the procedures to be followed by employees when emergencies occur during platform operations. In addition, the plan is required to explain to employees that they inform themselves about the building emergency escape routes, procedures and alarm systems before they operate a platform to service the building.

OSHA is removing the word "exterior" in the Final Rule as it was proposed in paragraph (e)(11), since the scope of this standard is changed to include interior building maintenance.

The National Conference of States on Building Codes and Standards (NCSBCS) (EX. 9-15) questioned the need for OSHA to address voltage drop for building electrical wiring in paragraph (e)(11)(ii), since it is currently addressed in the National Electrical Code. Lawrence R. Stafford (EX. 15-4) and the Tennessee Valley Administration (EX. 14-3) argued that OSHA should address voltage drop in the standard since the National Electrical Code may change and the desired requirements would be lost. In response to these comments, OSHA notes that the National Electrical Code is no longer referenced in Subpart S (Electrical) of OSHA's General Industry Standards and therefore, the subject of voltage drop was addressed in the proposal. It was the intent of the provision to ensure that proper voltage is available at the electrical outlets to

ensure reliable platform operation. Low voltage may reduce lifting capacity of the hoist and/or may cause overheating. High voltage may increase torque and the lifting capacity beyond the overload limit settings.

Hoberg (EX. 19B, TR 2/19, p. 63) agreed that the proposed provision requiring the voltage drop to be limited to five percent is reasonable. However, he contended that the control of equipment voltage is often beyond the capability of the employer or building owner to correct. This commenter suggested that the voltage drop addressed in the standard should be measured from the building service vault and not from the power circuit outlet. It was his belief that it is only possible to ensure that the building electrical wiring 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.

OSHA agrees and proposed paragraph (e)(11)(ii) is revised in the Final Rule to reflect this change in measurement of the voltage drop.

Paragraph (e)(11)(iii) requires that the equipment power circuit be an independent electrical circuit separate from other equipment used within or on the building. Powered platforms often require nearly all the power available on a roof circuit. Inadvertent use of a power tool or other equipment on a circuit while the platform hoists are using that circuit can trip the overcurrent protection of the circuit, stranding the platform personnel. The National Conference of States on Building Codes and Standards (EX. 9-15) suggested that this requirement be incorporated in the National Electrical Code (NEC) in lieu of the standard. However, OSHA does not control the requirements listed in the NEC and no longer references the NEC in its standard. Therefore, the provision is retained as proposed in the Final Rule.

As proposed, paragraph (e)(11)(iv) would have required that the disconnect switch for the power circuit have the capability of being locked in the "off" position. This provides the employees with the capability of preventing unauthorized operation of the platform. Hoberg (EX. 19B, TR 2/19, p. 64) recommended that the provision should also require that the disconnect switch have the capability of being secured in the "ON" position. He noted that this capability is important during equipment operation when workers are suspended over the side of the building and are not near the disconnect switch. The disconnect switch should then be

secured in the "ON" position so that power cannot be inadvertently interrupted.

The New York State Department of Labor (EX. 87) concurred with Mr. Hoberg. The New York Advisory Standard #101 requires that means be provided so that all switches are locked in the "ON" position while a platform is in use.

OSHA agrees with the commenters and proposed paragraph (e)(11)(iv) is revised in the Final Rule to require a disconnect switch to have the capability to be locked both in the "ON" and "OFF" positions and also requires that the disconnect switch be locked in the "ON" position when the platform is in use.

OSHA requested specific comment on the feasibility of the requirement in proposed paragraph (e)(11)(vi) that electrical service receptacles not be located on the parapet side of the carriage. Several commenters (EX. 9-30, 9-31, 9-41; 19B) and a hearing witness (TR 2/19, p. 54) recommended that this prohibition be deleted for a number of reasons. First, receptacles located on the parapet side are on the side of the roof carriage where the operator is looking while aligning the carriage with the edge of the building. While this aligning is being done, the power cable is in sight and serves as a continuous reminder to the operator not to run over it. Second, receptacles located on the parapet are above the flashing so workers never have to stand in water or shovel out snow to make an electrical connection. This potentially dangerous condition could occur, however, if non-parapet receptacles were used. Third, curbs are required in the standard to prevent roof carriages from traveling outside intended travel areas.

OSHA agrees with these commenters and is deleting this paragraph in the Final Rule. Deletion of this paragraph will also permit the employer and/or owner of the building to locate the receptacles in the optimum location for feasibility and employee safety.

Paragraph (f)(1) introduces the general requirements for equipment used for building maintenance. Since this standard is to apply to exterior and interior building maintenance, the word "exterior" in the proposal is removed in the final rule. No comments were received on proposed paragraphs (f)(3)(i)(B), (f)(3)(i)(D), (f)(3)(i)(F), (f)(3)(i)(G), (f)(3)(i)(K), (f)(3)(i)(L), (f)(3)(i)(N). The discussion of each of these provisions is found in the preamble of the Notice of Proposed Rulemaking of January 22, 1985 (50 FR 2890) on page 2912.

A commenter (EX. 31) and hearing witness (TR 2/23, p. 314) supported the requirement in paragraph (f)(1)(i) that equipment shall be designed by or under the direction of a registered professional engineer. However, another commenter (EX. 9-28) and hearing participant (TR 2/20, p. 331) claimed that this requirement as proposed was not complete, since the proposed definition of equipment only referred to the platform. These commenters believed that the entire equipment installation should be engineered to assure compatibility with the building on which it is installed. An equipment installation, in their opinion, would include carriages, davits and outriggers. OSHA agrees with these commenters, and is changing the requirement in the Final Rule for paragraphs (f)(1) and (f)(1)(i) to address all equipment in powered platform installations. In addition, OSHA notes that for equipment installations, guidelines for the design criteria are needed by the engineer. OSHA is adding to Appendix A a list of organizations which have established nationally recognized design standards applicable to powered platforms. The basis for this list was discussed above under paragraph (e)(1)(i) in this preamble.

Several commenters (EX. 9-17, 9-31, 9-34) recommended that the minimum live load of 250 pounds (11.2 kg) for each occupant of a platform proposed in paragraph (f)(1)(ii) be revised to include the weight of the occupants and any tools and materials used on the platform. Douglas A. Greenaway (EX. 15-8), recommended that OSHA retain the requirement for occupant loading as proposed.

In response to the commenters, OSHA notes that the common load capacities of equipment made in the United States are in increments of 250 pounds (11.2 kg), starting at 500 pounds (22.4 kg). In addition, the average adult male does not weigh more than 180 pounds (8.1 kg) and adding tools, equipment and materials per occupant would probably only raise the load to approximately 210 pounds (9.4 kg). The live load factor raises this to 250 pounds (11.2 kg), which is a conservative total. The provision, therefore, is unchanged in the Final Rule.

A number of commenters (EX. 9-35, 9-43, 15-8, 19B) and a hearing testifier (TR 2/19, p. 65) recommended that the minimum storage wind design load proposed in paragraph (f)(1)(iii) be changed from forces generated by a 75 mile per hour (33.5 m/s) wind to forces generated by a 100 mile per hour (44.7 m/s) wind. Lawrence R. Stafford (EX. 9-

35), Hoberg (EX. 19B), and Spider Staging Sales Company (EX. 9-43) noted that 100 mile per hour winds are not uncommon on some building roofs and many local building codes require higher loads. In addition, many modern buildings do not have the wind protection for exposed equipment that the older flat-topped buildings have. OSHA agrees with these commenters and further observes that wind damage to equipment may put employees at risk from equipment failure during later operations. This provision is revised in the Final Rule to address forces generated by a 100 mile per hour (44.7 m/s) wind.

Paragraph (f)(1)(iv) as proposed had required equipment installations exposed to wind during operation to have the capability of withstanding forces generated by winds of 60 miles per hour (26.9 m/s). This provision was based on a proposed limitation on employee exposure to 40 miles per hour (17.9 m/s) winds while operating a continuous positively engaged platform. Since OSHA has agreed with previous commenters that employees should not be exposed to winds in excess of 25 miles per hour (11.2 m/s) while operating a platform, the 60 miles per hour (26.9 m/s) proposed requirement can be reduced appropriately. Therefore, OSHA is in agreement with several commenters (EX. 9-31, 9-35, 9-41, 15-8) who have recommended that the proposed 60 miles per hour (26.9 m/s) requirement be changed to 50 miles per hour (22.4 m/s) in paragraph (f)(1)(iv).

Bolted connections were required to be self-locking or secured to prevent loosening by vibration in proposed paragraph (f)(2). Hoberg (EX. 19B) noted that the only reliable methods to prevent loosening of connections by vibration are design and torque. By contrast, he noted that lock nuts and other devices can prevent loss of the connections by vibration. This commenter suggested that the provision be revised to address loss rather than loosening by vibration. OSHA agrees and this provision is so changed in the Final Rule.

The California Department of Industrial Relations (EX. 9-45) suggested that OSHA require that fasteners and platform components be made of materials suitable for exterior maintenance and galvanically compatible with one another, under paragraph (f)(2). It was also suggested (EX. 19B) that OSHA also require that the equipment comply with recognized standards for design and construction under paragraph (f)(2). In response to these commenters, OSHA notes that

provision (f)(1)(i) requires that the equipment be designed by a registered professional engineer experienced in such design. It can be expected that such a qualified person would be familiar with the materials and standards for such equipment installations. In addition, a list of recognized standards applicable to this equipment has been provided in Appendix A. The paragraph (f)(2), therefore, has not been changed in the Final Rule.

Proposed paragraph (f)(3) listed a number of methods for suspending equipment, and also permitted equivalent methods of suspension. Hoberg (EX. 19B) recommended the deletion of the trolley system method since it is redundant. OSHA agrees, since the listed carriage method would also include trolley carriages, and the deletion is made in the Final Rule.

Two commenters (EX. 9-31, 9-41) suggested deleting the term "equivalent methods" and would have OSHA use the variance process to address nonlisted methods of suspension. OSHA believes that the proposed provision adequately places the responsibility on the employer for proving to OSHA that any new suspension method is equivalent to the listed methods, without using the variance process. Also, this provision, as proposed, will not inhibit an employer from developing new suspension methods. It remains unchanged in the Final Rule.

A number of commenters (EX. 9-31, 9-35, 9-37, 9-43; 19B) objected to the wording in the proposed introductory paragraph (f)(3)(i) for carriage requirements which included a description of how a carriage may be used. They stated there is an implication that it is the only way it can be used. In addition, there was the implication that if all elements noted in the description were not included on an installation, a violation of the regulation would exist. It was recommended (EX. 19B) that the provision be replaced with a more suitable introduction for carriage requirements. OSHA agrees that the proposed wording in the introductory paragraph may unnecessarily imply a limit on the use of a carriage, and therefore has changed the wording in the Final Rule.

Proposed paragraph (f)(3)(i)(A) required that the horizontal movement of a carriage be controlled to ensure safe operation. Hoberg (TR 2/19, p. 66) stated that this provision does not address the shear or crush hazard for employees due to a moving carriage when one operator has his or her attention directed to alignment, and the

other operator is watching the cable or aiding in the alignment. The commenter recommended that the carriage have a control to interrupt power should an operator be caught between a wall or parapet and the machine. OSHA agrees that such a hazard can occur and is adding this requirement in paragraph (f)(3)(i)(E) in the Final Rule to address this hazard.

The maximum allowable horizontal force necessary for an employee to move a manually propelled carriage is addressed in paragraph (f)(3)(i)(C). OSHA agrees with comments which noted there are a number of hazards for employees pushing carriages at applicable elevated areas. These hazards include pinching, falling, tripping, and strain on the worker during the pushing operation. These hazards are further compounded by a work surface which may be slippery due to rain, ice and snow, or sloped due to drainage requirements. OSHA had proposed a limitation of 100 pounds (44.8 N) for the maximum allowable force needed for horizontal movement. Leonard Nork (TR 2/20, pp. 24, 56) objected to the use of any manually propelled carriage because of the surface hazards faced by employees. This commenter also believed that if manually propelled carriages were used, the 100 pounds (44.8 N) force should be reduced since it discriminated against female and older employees who generally do not possess the necessary strength to move such carriages. Hoberg (TR 2/19, pp. 66, 106, EX. 19B) also questioned the 100 pound (44.8 N) limit. In his review of Human Factors data (data utilized in the designing of equipment for human use) and their application to pushing a manually propelled carriage, he calculated that the limit should be changed from a 100 pound (44.8 N) force to a 40 pound (17.7 N) force. Hoberg's calculations were based on data developed by Stover H. Snook (1978) for industrial workers, which is illustrated in *Human Factors Engineering and Design*, fifth edition, published in 1982 by McCormick and Sanders, figure 7-24, page 210, and verified by Hoberg's own experience in designing roof carriages.

The proposed limit of a 100 pounds (44.8 N) horizontal force was based on the ANSI A120 draft standard—November 1981. In a review of current relevant Human Factors data, OSHA did not locate any information which supported the 100 pound (44.8 N) limit. OSHA agrees that the Human Factors data, as referenced by Hoberg (TR 2/19, pp. 66, 106) in his comments supporting a 40 pounds (17.7 N) limit, are applicable

to the work done by employees pushing a manually propelled carriage on a smooth level surface.

Importantly, the published data supporting this limit in the text referenced above are readily obtainable by the registered professional engineer in developing his criteria for a platform installation. In the Final Rule, therefore, OSHA is changing the 100 pounds (44.8 N) limit on the horizontal force required of employees in pushing a carriage to a 40 pounds (177.9 N) limit.

Paragraph (f)(3)(i)(E) addresses requirements for traversing controls of a powered roof carriage. Lee B. Herzog (EX. 9-29) and Hoberg (EXH. 19B) each recommended that this provision should require an emergency stop device for interrupting power to the carriage drive motors. These commenters gave several reasons for this recommendation. First, during alignment with roof indicators to ensure proper placement of the carriage with respect to the building tie-in guides, it is not uncommon for a second employee to be on the other side of the carriage, unseen by the operator, helping to direct the carriage movement. Second, roofs often are noisy, due to the noise from chiller fans, pumps and other running equipment; and warnings often cannot be heard. Third, large carriages may weigh as much as 40 tons (36,363 kg), have several drive motors, and have the capability of moving in either direction. Fourth, these carriages generally operate in very tight areas, especially when moving into a garage. In this type of working environment, these commenters believed it is essential that the employee who is not operating the carriage have access to an overriding stop button opposite the control end of the carriage, which will stop the carriage if a shear or crush hazard exists. OSHA agrees with these commenters and the emergency stop devices are required in the Final Rule.

Paragraph (f)(3)(i)(G)(1) addresses the stability factor of a carriage against overturning during horizontal traversing. Lee B. Herzog (EX. 9-29) and Hoberg (EX. 19B, 19c) recommended that the stability factor include the effects of wind forces as well as the effects of impact which were already included in the proposal. The commenters observed that if a platform is carried outside the wheelbase of a carriage, it could overturn. Since the load of a platform is carried by the carriage at the suspension points overhead, whenever the carriage strikes a curb the resulting impact can severely affect the stability of the carriage. The crush and pinch hazards for employees which could result from this impact were addressed in the

proposed paragraph. These commenters noted, however, that the wind forces on such a suspended platform can also greatly reduce the stability of the carriage and introduce crush and pinch hazards for employees, and they believed that these wind forces should also be addressed in this provision.

OSHA agrees and the effect of wind on carriage stability is addressed in the Final Rule in paragraph (f)(3)(i)(G)(1).

Several comments were received on the stability factor of a carriage during the operation of a system as addressed in proposed paragraph (f)(3)(i)(G)(2), which would have required a stability factor of four against overturning. Acme Fabricators Company (EX. 9-13) supported the proposed stability factor. Richard W. Hoffman (EX. 9-30) believed the stability factor should be three rather than four. Hoberg (EX. 19B) noted, however, that under certain conditions the stability factor of four in the proposal can be seriously exceeded at hoist motor stall, and the carriage can overturn. His concern was that the proposed provision addressed operating loads, but did not address the greatest source of overturning force, motor torque, which is addressed in the present regulation. He suggested that OSHA retain the present requirements for roof carriage stability, § 1910.66(c)(3) (ii) and (iii), and also prohibit the use of flowing counter weights. These weights have been used to achieve proper stability, but have resulted in fatalities.

OSHA agrees that the regulation should ensure that the suspended equipment and the hoists do not pull the carriage over the side. The installation should be so designed that no source of force, such as motor torque, can upset the carriage, and flowing counter weights should not be necessary to achieve stability.

In the Final Rule, new paragraphs (f)(3)(i)(M) and (f)(3)(i)(G)(2) replace proposed paragraph (f)(3)(i)(G)(2). The new paragraphs are a clarification of the present requirements under § 1910.66(c)(3) (ii) and (iii) relating to stability factors for carriages. Paragraph (f)(3)(i)(G)(2) addresses the overturning criteria and the design stresses which may not be exceeded in the installation. Paragraph (f)(3)(i)(M) addresses the forces imposed on the hoist motors by the installation.

In a number of platform installations, the carriage system's stability is provided by a tie-down device secured to the building structure. This stability option was not addressed in the proposal and OSHA requested comments on the feasibility and utility of this option in the Notice of Hearing

(50 FR 48222). A number of commenters (EX. 9-29, 9-31, 9-41; 15-4) and a hearing witness recommended that OSHA address this option in the standard. James W. Fortune (TR 2/19, p. 198) noted that the carriage tie-downs are normally utilized in conjunction with rubber tired roof carriages running on concrete runways. Mr. Fortune noted that the purpose of the tie-down is to give the carriage system the required safety factor against overturning, without having to add excessive amounts of counterweights. Mr. Fortune and the other commenters also recommended that the tie-down be equipped with an interlock that will not permit vertical platform movement unless the interlock is engaged. OSHA agrees with these commenters and a provision on tie-downs is included in the Final Rule as paragraph (f)(3)(i)(G)(3).

In the proposal, at paragraph (f)(3)(i)(I), an automatic brake or locking system was required for preventing unintentional traversing of power traversed carriages. Spider Staging Sales Company (EX. 9-43), Douglas A. Greenaway (EX. 15-8), and Hoberg (EX. 19B) suggested that the intent of the provision would be better served if OSHA issued a more general requirement. In addition, Hoberg (EX. 19B) suggested that power assisted carriages should also be included in this provision.

OSHA agrees that an automatic brake or lock would not be the only acceptable means of preventing the carriage from traversing unintentionally. However, from a performance point of view, OSHA can accept only equivalent means that are used to prevent the carriage from inadvertent movement which could injure an employee. The provision is changed in the Final Rule by eliminating the specific requirement, and it is also renumbered as paragraph (f)(3)(i)(H).

For the same reasons, proposed paragraph (f)(3)(i)(j) which addressed the means to prevent unintentional traversing of manually propelled carriages is also changed in the Final Rule. Any equivalent means which will prevent inadvertent movement of the carriage is acceptable, and this revised paragraph is renumbered as paragraph (f)(3)(i)(I).

Proposed paragraph (f)(3)(i)(K) is unchanged in the Final Rule and renumbered as paragraph (f)(3)(i)(j).

Proposed paragraph (f)(3)(i)(L) is unchanged in the Final Rule and renumbered as paragraph (f)(3)(i)(K).

Proposed paragraph (f)(3)(i)(M) is unchanged in the Final Rule and renumbered as paragraph (f)(3)(i)(L).

OSHA is deleting from the Final Rule the provisions addressing trolley systems which had been proposed as (f)(3)(ii), (f)(3)(ii)(A) and (f)(3)(ii)(B) because they are redundant with other provisions.

A number of commenters (EX. 9-13, 9-23, 9-37; 15-8, 15-22 and a hearing witness (TR 2/19, p. 193) supported the proposed height limits for transportable outriggers when used with a ground rigged platform, paragraph (f)(3)(ii). The Acme Fabricators Company (EX. 9-13) and Douglas A. Greenway (EX. 15-8) agree that an outrigger installation with points of suspension in excess of 130 foot (39.6 m) and below 300 foot (91.5 m) should provide continuous positive means of engagement for the platform. Some commenters (EX. 9-31, 9-41) suggested that the 300 foot (91.5 m) limit should be 150-200 foot (45.8 m) because of the possible exposure by employees during the rigging operations to wind gusts in excess of 25 miles per hour (40.2 km/hr.). OSHA has not received any accident data or other evidence which supports the need for reducing the 300 foot (91.5 m) limit. In addition, OSHA does not expect employers to put employees at risk by rigging in high winds and in violation of operating wind limits (paragraph (i)(2)(v)). The suspension height limits, therefore, are unchanged in the Final Rule.

In the Notice of Informal Hearing (50 FR 48222) published on November 22, 1985, OSHA requested comments on whether it should permit the 300 foot (91.5 m) limit on the outrigger installations, provided some mechanical means is provided to raise and lower cables, life lines and wire rope. OSHA received a diversity of comments on this issue. Hoberg (TR 2/19, p. 241) suggested that no more than 40 pounds (177.9 N) of manual effort should be required of employees to raise or lower lines whether or not they are mechanically assisted. James W. Fortune (TR 2/19, p. 189) noted that California regulations require mechanical assistance for employees in rigging installations over 130 foot (39.6 m) in height. This commenter believed these regulations had some merit since working conditions can be hazardous for employees in handling lines over a parapet.

Other commenters (EX. 9-20, 9-23, 15-22), however, have experienced no problems for employees in handling lines in these installations for suspension heights up to 300 foot (91.5 m). Designed Equipment Corporation (EX. 15-22), for example, stated that lengths of electrical cable used at 300 foot (91.5 m) heights weigh less than 100

pounds (45.3 kg), and employees have not experienced any difficulty in handling these cables.

OSHA believes employers should be concerned with the effort required of their employees to lift electrical cables and lines when rigging for an outrigger installation. The need for mechanical assistance in this operation for employees would vary considerably depending on the weight of the line or cable, the height of the parapet, the condition of the work surface, and the age and physical condition of the specific employee involved in the operation. Sufficient Human Factors data is not available for OSHA to specify a limit on the weight of cable and lines an employee may raise from ground level without mechanical assistance, and therefore, such a limit is not included in the Final Rule.

Paragraph (f)(3)(ii)(A) sets the suspension height limits for transportable outriggers at 300 foot (91.5 m), and references the tie-in guides in paragraph (e)(2) of the standard. The reference to the tie-in guide systems provides options for the employer in selecting the means for stabilizing the platform.

Several commenters (EX. 9-25, 9-31, 9-35, 9-41; 15-8; 19B) recommended that OSHA eliminate the proposed requirement which addressed the storage of ground rigged platforms on the face of a building after each day's use. Leonard Nork (EX. 9-25) stated that such platforms are difficult to tie in safely overnight and are subject to unpredicted overnight storms. Another commenter (EX. 19B) agreed and noted that this practice would require anchorages to be designed for storm loads; prevent inspections of suspension ropes, cables and lifelines before use; and promote exiting of platforms by employees at elevated levels without fall arrest equipment. OSHA agrees with the commenters that platform storage on a building face can impose additional hazards on employees.

The requirements for disengagement of ground rigged working platforms which prohibit the practice of storing ground rigged platforms on the face of a building after each day's use are listed below under paragraph (f)(5)(iv)(B). Proposed paragraph (f)(3)(iii)(B) which would have permitted this practice is revised and renumbered to be (f)(3)(ii)(B) in the Final Rule.

Spider Staging Sales Company (EX. 9-43) and Hoberg (EX. 19B) have stated that if an anchorage for an outrigger is to be verified as to its suitability for use as an outrigger anchorage, then it should be so designed. However, they noted

that the proposed paragraph (f)(3)(iii)(C) did not include a design reference. OSHA agrees with the commenters that a clarification is warranted, and is including the design reference in the Final Rule. In addition, this paragraph is renumbered as (f)(3)(ii)(C).

No comments were received on proposed paragraph (f)(3)(iii)(D), and this paragraph is renumbered as (f)(3)(ii)(D) in the Final Rule. The discussion of this provision is found on page 2899 in the preamble of the Notice of Proposed Rulemaking of January 22, 1985 (50 FR 2890).

OSHA proposed in (f)(3)(iii)(E) that a transportable outrigger be designed to prevent roll-over. Several commenters (EX. 19C, 9-37, 9-43) and a hearing witness (TR 2/19, p. 68) stated that the accidental lateral load addressed in the provision is difficult to determine in advance, but suggested a reasonable load be stated in the provision. One commenter (TR 2/19, p. 68) observed that the greatest potential source of roll-over is the hoist. He noted that the worst condition to be considered is when the outriggers are incorrectly spaced. Under this condition, the suspension ropes angle towards the center of the platform and this angle increases as the platform ascends. As a result, the hoist generates a roll-over force as the outriggers are drawn together. This commenter recommended that the outriggers be designed to prevent roll-over from a force of at least 70 percent of the rated load of the hoist.

OSHA agrees with the commenter's recommendation for lateral load in this lateral stability requirement, and this is included in the Final Rule. In addition, the paragraph is renumbered (f)(3)(ii)(E).

No comments were received on proposed paragraph (f)(3)(iii)(G). However, OSHA is replacing the word "capacity" in the paragraph with the word "load" to ensure consistency with the definition of the "hoist rated load." In addition, the paragraph is renumbered as (f)(3)(ii)(F). No comments were received on proposed paragraph (f)(3)(iii)(G), and the paragraph is renumbered as (f)(3)(ii)(G).

A number of commenters (EX. 9-35, 9-45; 15-8) strongly suggested that OSHA add requirements for outrigger tiebacks. The California Department of Industrial Relations (EX. 9-45) noted that such tieback requirements have been in Section 3292(f) of California's General Industry Safety Orders since 1965 (EX. 104). This commenter stated that the cost of providing tieback anchorage is incidental during the construction of the building, especially when one considers the safety benefits gained from having

such anchorages. Lawrence R. Stafford (EX. 9-35) suggested that OSHA follow the ANSI A120 draft standard—January 1986 (EX. 15-8) which requires that the tieback be a wire rope with a minimum diameter of $\frac{1}{8}$ -inch (8.0 mm).

OSHA agrees with these commenters that tiebacks for transportable outriggers are necessary, since they would provide a back-up system in case the counterweights become displaced. Although the tiebacks alone may not keep a scaffold from tipping, they will keep the system from falling to the ground. Standpipes, vents, other piping systems, and electrical conduits are not acceptable points of anchorage because they are often made of materials that cannot support the loads that would be imposed on them if a counterweight system were to fail.

To address the use of transportable tiebacks in the Final Rule, OSHA is adding two provisions—paragraphs (f)(3)(ii)(H) and (I). Paragraph (f)(3)(ii)(H) requires that the tieback rope be strong enough to sustain the same load sustained by the suspension rope. Performance language is used rather than specifying the tieback rope diameter. In addition, this paragraph requires that the tieback rope be secured to a verified building anchorage. A verified anchorage, as defined in paragraph (d), is one that is accepted by a registered professional engineer. Paragraph (f)(3)(ii)(I) describes how the tieback rope is to be installed on the installation.

Paragraph (f)(3)(iii) covers requirements for davits used to support working platforms. Paragraph (f)(3)(iii)(A) requires that all davit systems have a stability factor of four against overturning.

OSHA agrees with the comments of a commenter (EX. 19B) that the requirements for davits used on "roof rigged systems" and "ground rigged systems" should be clarified. The Final Rule sets out the specific requirements for davits used on "roof rigged systems" in paragraph (f)(3)(iii)(B) and for "ground rigged systems" in paragraph (f)(3)(iii)(C). To further clarify the application of the various requirements, OSHA has also defined "roof rigged davits" and "ground rigged davits."

Lawrence R. Stafford (EX. 9-35) and Douglas A. Greenaway (EX. 15-8) suggested that proposed paragraph (f)(3)(iv)(C)(1) be revised by replacing the term "guarded area" with the term "safe surface" which is defined in the proposal. In addition, they suggested that the access or egress to and from a platform not require a worker to climb over a building's parapet or guard railing.

OSHA believes that both of these suggestions have merit, and is including them in the Final Rule under renumbered paragraph (f)(3)(iii)(B)(1).

No comments were received on proposed paragraph (f)(3)(iv)(C)(2), and this paragraph is renumbered as (f)(3)(iii)(B)(2) in the Final Rule.

A number of commenters (EX. 15-8; 9-35, 9-37, 9-45) and a hearing witness (TR 2/19, p. 189) supported the proposed height limits for davits when used with ground rigged platforms in proposed paragraph (f)(3)(iv)(D)(1). Powered Platforms Manufacturing Company (EX. 9-23) and Becor Western (EX. 9-37) agreed with OSHA that a davit installation with points of suspension in excess of 130 foot (39.6 m) and below 300 foot (91.5 m) should provide continuous means of engagement for the platform.

At the other end of the comment spectrum, several commenters (EX. 9-7, 9-13; 15-22) have suggested that OSHA place no limit on the height at which davits can be used with ground rigged platforms. These commenters claimed that a davit system usage should be limited solely by the capability of the davit based on its design. California's Department of Industrial Relations (EX. 9-45), however, argued that a 300 foot (91.5 m) limit is necessary because davit installations are labor intensive and require special knowledge and training for proper rigging and safe use. In addition, California noted that these concerns increase with higher installations, as do electrical problems associated with long flexible cords. Douglas A. Greenaway (EX. 15-8) also promoted a 300 foot (91.5 m) limit for davits used with ground-rigged platforms.

After considering all the comments received on height limits for proposed paragraph (f)(3)(iv)(D)(1), OSHA has determined that the proposed limits should not be deleted and is retaining the proposed limits in the Final Rule in paragraph (f)(3)(iii)(C)(1).

In the Notice of Hearing (50 FR 48224) published on November 22, 1985, OSHA requested comments on whether it should require mechanical means to raise and lower cables, life lines and wire rope when the point of suspension exceeds 130 foot (39.6 m). Hoberg (EX. 19B) recommended that no more than 40 pounds (177.9 N) of manual effort should be required of employees to raise or lower lines, whether or not they are mechanically assisted. Designed Equipment Corporation (TR 2/21 p. 9), however, noted that in their experience employees have not had any problems in raising or lowering 300 foot (91.5 m) of electric cable.

This discussion on the manual effort required of employees to raise or lower lines and cables over a building parapet for a davit installation is similar to the previous discussion on outrigger installation under paragraph (f)(3)(ii)(A). OSHA's conclusion following that previous discussion also applies to paragraph (f)(3)(iii)(C)(1). Sufficient Human Factor data is not available for OSHA to specify a limit on the weight of cables and lines an employee may raise or lower from ground level without mechanical assistance, and therefore, such a weight limit is not included in the Final Rule.

OSHA is revising proposed paragraph (f)(3)(iv)(D)(1) to clarify the suspension height limits for davits and to reference the tie-in guides on paragraph (e)(2) of the standard. The reference to the tie-in guide systems provides options for the employer in selecting the means for stabilizing the platform. In addition, the paragraph is renumbered as paragraph (f)(3)(iii)(C)(1).

A commenter (EX. 19B) noted that the word "horizontal" is redundant and should be deleted from proposed paragraph (f)(3)(iv)(D)(2). OSHA agrees and the word is deleted in the Final Rule in renumbered paragraph (f)(3)(iii)(C)(2).

Proposed paragraph (f)(3)(iv)(E)(1), which addresses a davit rotation locking device, was based on provision 305.1(d)(1) of the ANSI A120 draft standard—November 1981. The current ANSI A120 draft standard—January 1986 no longer includes the provision. Several commenters (EX. 9-23, 9-29, 9-43) and a hearing witness (TR 2/19, p. 191) recommended that this provision be deleted from the standard. James W. Fortune (TR 2/19, p. 191) commented that requiring the davits to be locked would also require an employee to climb back and forth over a parapet, and on and off a powered platform each time a platform was to be deployed or retracted—a dangerous practice. Swing Stage Inc. (EX. 9-29) stated that the preferred practice is to strike a balance between ease of rotation and sufficient resistance to turning so that the davit remains in its working position. This commenter urged that the locking requirements be dropped in the absence of any evidence of a safety hazard resulting from the lack of a rotation lock.

OSHA agrees and the provision is deleted in the Final Rule. In addition to the comments in support of the deletion, OSHA notes that the stabilization provisions under paragraph (e)(2) will limit any employee risk due to any movement of the davit while it is in the working position.

The horizontal force necessary for an employee to move a rotatable davit was to be limited to 100 pounds (444.8 N) by proposed paragraph (f)(3)(iii)(E)(2). Several commenters (EX. 15-8; 9-31, 9-41) suggested that OSHA eliminate the force requirement and substitute a requirement that the davit be provided with bearings to permit easy rotation. Hoberg (TR 2/19, P. 159) disagreed and stated that bearings are not as important as keeping the davit socket base in a vertical position. If the socket base is at an angle from a vertical position, he contended, it becomes much more difficult for an employee to push a platform uphill to get it over a parapet.

Several commenters (EX. 9-25, 9-35; 19B) claimed the 100 pounds (444.8 N) was excessive, especially for women and older employees. Leonard Nork (EX. 9-25) supported Hoberg (EX. 19B) who recommended that OSHA use performance language which addresses the ability of employees to rotate the davit within Human Factors data limits. For this provision, Hoberg (EX. 19B) suggested that OSHA use a 40 pound (177.9 N) limit. Hoberg (EX. 19B) used the same arguments in support of the 40 pound (177.9 N) limit for a force to be employed in moving a carriage under paragraph (f)(3)(i)(C).

In addition to the comments expressed, OSHA recognizes a risk to employees in allowing them to exert a 100 pound (444.8 N) horizontal force on a davit when they are in close proximity to the edge of a parapet. OSHA, therefore, is changing the 100 pound (444.8 N) limit to 40 pounds (177.9 N) in the final rule under renumbered paragraph (f)(3)(iii)(D). OSHA's reasons for supporting the change to 40 pounds (177.9 N) in paragraph (f)(3)(i)(C) for carriages also apply to the change being made in this provision.

An employer would have been required by the proposal (paragraph (f)(3)(iv)(F)(1)) to provide a means of transport for a transportable davit if it weighed more than 75 pounds (34 kg). This proposed weight limit was based on an evaluation of comments received in response to the ANPRM (48 FR 30-6371). Two commenters (EX. 9-13; 15-8) and two hearing witnesses (TR 2/19, p. 110; TR 2/20, p. 103) suggested that OSHA require all davits, regardless of weight, be provided with a means of transport, since many davits weigh between 70 and 100 pounds (31.7 kg and 45.3 kg). Lawrence R. Stafford (2/20-103) stated that the costs for providing the means of transporting all davits would be small compared to the cost of injuries sustained by employees. No accident data or costs were provided to support

this claim. Hoberg (EX. 19B, TR 2/19, p. 70, TR 2/19, p. 110) recommended, however, that an employee should not be required to carry a davit or part of a davit weighing more than 40 pounds (18 kg). If the davit weighed more than 40 pounds (18 kg) per person for a two-man team, he recommended that transporting means be provided, and that the center of gravity of the davit be kept below 36 inches (914 mm) during transport.

The recommendation by Mr. Hoberg is based on Human Factors data developed by Stover H. Snook (1978) and illustrated in *Human Factors Engineering and Design*, fifth edition, published in 1982 by McCormick and Sanders, Fig. 7-23, p. 209, and also verified by Hoberg's own experience in designing davits. Mr. Hoberg noted that since most maintenance operations have two employees working together, davits or parts of davits weighing over 80 pounds (36 kg) should have a means of transport which two employees can use. It was Mr. Hoberg's opinion that the regulation should not penalize engineering ingenuity if the owner wishes to use a davit that comes in 25 or 30 pound (11.3 kg or 13.6 kg) sections and eliminates the need for providing transporting means.

Mr. Hoberg gave several reasons for recommending a 36-inch (914 mm) height limit for the center of gravity of a davit while being transported. First, he noted that the real problem in transporting the davit is not the weight, but the weight distribution. Some davits are 14 feet (4.3 m) long, and weigh 150-190 pounds (67.5 kg-85.5 kg) with the center of gravity above the head of the employees when the davit is held upright while transported. If the transporting means, such as a cart, were to strike a roof crack, the davit could easily fall if it were held upright, becoming a hazard to employees.

OSHA has considered all the comments and Human Factors data presented and concludes that there is insufficient data to support a requirement that all davits be provided with a means for transport. Since Human Factors data supports an 80 pound (36 kg) weight limit for two persons, OSHA is changing the proposed 75 pound (34 kg) weight limit to 80 pounds (36 kg). *Human Factors Engineering and Design*, which contains Human Factors data, is a recognized text and is readily available to engineers who design davits. In addition, OSHA is adding in the Final Rule, under renumbered paragraph (f)(3)(iii)(E)(1) the requirement that the center of gravity of the davit shall be at or below 36 inches (914 mm) above a

safe surface during transport. Since many building parapets are 42 inches (1066 mm) high, the limit on the center of gravity height will also reduce the likelihood of loss of the davit over the parapet.

Several commenters (EX. 9-13, 9-31, 9-41; 15-4) suggested that the proposed paragraph (f)(3)(iv)(F)(2) be changed to allow davits to be inserted into sockets horizontally before being raised to a vertical position. Other commenters (EX. 19B, TR 2/19, p. 190) supported a requirement which allows davits to be inserted or removed at a position of not more than 35 degrees above the horizontal.

Acme Fabricators Inc. (EX. 9-13) stated that positioning of a davit other than from the horizontal would require lifting of the davit, with the possibility of employees sustaining injury or losing control of the davit. Hoberg (EX. 19B) believed that the elevation of the pivot point in respect to the worker's position is the critical factor when planning for the safe use of the heavy davits.

Because of a typographical error in the proposal, the proposed requirement would have permitted the insertion of a davit into its socket at a position of more than 35 degrees above the horizontal. The provision should have read, "not more than 35 degrees above the horizontal." OSHA is adding the word "not" in the Final Rule and renumbering the paragraph (f)(3)(iii)(E)(2).

This change, OSHA believes, properly addresses the comments received on this provision, and also affords the equipment designer the option of designing the davit for insertion and removal from a horizontal position up to and including a position which is 35 degrees above the horizontal.

No comments were received on proposed paragraph (f)(3)(iv)(F)(3) and this paragraph has been renumbered as (f)(3)(iii)(E)(3).

A number of commenters (EX. 9-31, 9-41; 15-8; 19B) recommended that OSHA change the requirement that a hoist be capable of preventing any overspeed descent of the load in proposed paragraph (f)(4)(ii) to a requirement that the hoist be capable of arresting such overspeed descent. Daigel (EX. 9-31) noted that the overspeed descent is arrested rather than prevented by the hoist. OSHA agrees and this change is made in the Final Rule.

No comments were received on proposed paragraph (f)(4)(ii)(A), which lists the acceptable power sources for hoists, and it is rephrased but unchanged in the Final Rule under paragraph (f)(4)(iii).

A number of commenters (EX. 9-31, 9-41, 9-43; 15-8; 19B) and hearing witnesses (TR 2/19, p. 70; TR 2/20, p. 497) addressed the proposed paragraph (f)(4)(ii)(B) which prohibited the use of gasoline engines as prime movers for any hoisting machine. Becor Western Inc. (TR 2/20, p. 497) recommended that OSHA change the word "gasoline" to a generic term such as "internal combustion" since diesel and propane engines have similar fire hazards. Spider Staging Sales Company (EX. 9-43) recommended that OSHA should not consider any flammable energy source as an acceptable power source.

Hoberg (TR 2/19, p. 20) believed that flammable liquids of any kind should be prohibited from the elevated work platform because of the limited egress. Also, he noted there would be a loss of support when the aluminum of most platforms became heated if a fire occurred as well as the danger of igniting the overhead ropes.

OSHA agrees that the provision should address all flammable energy sources because of the hazards in their use that may be faced by employees. However, since paragraph (f)(4)(iii) has identified the only acceptable power sources, OSHA believes there is no need to identify the unacceptable power sources. In paragraph (f)(4)(iv), OSHA is prohibiting the carrying of flammable liquids on the platform.

A commenter (EX. 19b) suggested that proposed paragraph (f)(4)(iii), which addressed the capability of a hoist to raise or lower a load be shortened for clarity.

OSHA agrees and this clarification is made in the Final Rule in paragraph (f)(4)(v).

Spider Staging Sales Company (EX. 9-43) and Hoberg (EX. 19B) recommended that the prohibition against the use of friction type speed reducers in hoisting machines be deleted in proposed paragraph (f)(4)(iv). They believed that this prohibition is contradictory, since friction type hoists are permitted and friction type brakes are used to stop the hoists.

OSHA agrees and this provision is deleted in the Final Rule.

Douglas A. Greenaway (EX. 15-8) supported proposed paragraph (f)(4)(v), which requires that the moving parts of a hoisting machine be guarded. However, paragraph (f)(4)(vi) references § 1910.212(a) (1) and (2) instead of § 1910.219 as proposed. OSHA believes these paragraphs are a more specific reference for the guarding of hoisting machines than § 1910.219, which primarily addresses the guarding of machines with power transmission belt systems.

Proposed paragraph (f)(4)(vi) required that hoisting drums and sheaves be compatible for use with the required rope size. Becor Western (EX. 9-37) suggested that OSHA include the ratio of the pitch diameter of the sheave or drum (D) to the nominal diameter of the rope (d), and recommended a ratio of sixteen to one. Another commenter (EX. 19B, 19C) recommended that OSHA modify the proposed requirement to include performance language rather than require a specific ratio be met.

OSHA agrees with this commenter that a specific ratio for this purpose has not been established in the industry because of the many variables involved such as sheave and hoist diameter, wire rope diameter, loading, etc. OSHA is, therefore, using performance language in the Final Rule to address the issue of compatibility and size in paragraph (f)(4)(vii).

Proposed paragraph (f)(4)(vii) required that the wire rope attachment in a winding drum be capable of developing four times the rated capacity of the hoist. Daigel (EX. 9-31) suggested that the provision include a requirement that the wire rope portion of the attachment shall develop at least 90 percent of the wire rope breaking strength. He noted that a poor and inefficient connection could result if the wire rope portion of the attachment is not given proper consideration.

In response, OSHA notes that in proposed paragraph (f)(7)(i), the suspension wire rope and connections (terminations) used must meet the specifications recommended by the hoisting machine manufacturer. Consequently, the manufacturer would be expected to specify connections which would be compatible with its equipment. OSHA is, therefore, retaining proposed paragraph (f)(4)(vii) as written in the Final Rule in paragraph (f)(4)(viii), except the word "load" is substituted for the word "capacity." This change in wording is to assure consistency with the definition of the rated load of the hoist.

Becor Western (EX. 9-37) recommended that OSHA delete the word "radial" in proposed paragraph (f)(4)(viii), which addressed the frictional contact between the wire rope and a traction drum or sheave. Becor Western stated that equivalent methods have been developed by manufacturers which are completely reliable and which do not depend on radial forces for reliable frictional contact.

Hoberg (EX. 19B) suggested deleting this whole provision. He noted that if the word "radial" is deleted, the remaining phrase "continuous force" would apply equally to winding drums,

since these drums require "continuous force" for frictional contact.

OSHA has considered the comments presented and agrees that the word "radial" is misleading and incorrect in its proposed context. If the word "radial" is deleted, the balance of the requirement would have no special relevance to traction hoists. OSHA is deleting this provision in the Final Rule.

A commenter (EX. 19B, TR 2/19, p. 71) observed that proposed paragraph (f)(4)(ix) would mean that the primary and secondary braking systems could be used together to stop and hold 25 percent over the rated hoist load. He stated that the real needs are for each brake system to stop and hold what the hoist is capable of lifting, and for assured independent braking action.

Douglas A. Greenaway (EX. 15-8) supported the above commenter's statement on the necessary capability of each system.

OSHA notes that the rated load of the hoist is defined as the operating load allowed by the manufacturer. The hoist can actually lift more than its rated load. OSHA, therefore, agrees with the commenters that this provision should address each braking system's ability to stop and hold 125 per cent of the lifting capacity of each hoist rather than the rated load of each hoist.

Daigel (EX. 9-31), William Ayres (EX. 91), Hoberg (EX. 19B) and Douglas A. Greenaway (EX. 15-8) noted that OSHA had not included the function of the primary braking system in proposed paragraph (f)(4)(ix)(A). They suggested that the primary braking system be required to engage automatically when power to the prime mover is removed.

OSHA agrees that the primary braking system should not be manually actuated after the hoist motor is stopped, but should automatically set when power to the prime mover is interrupted for any reason. In the Final Rule, OSHA is adding the function of the primary braking system to the provision which is renumbered as (f)(4)(ix)(A).

In the Notice of Hearing (50 FR 48222) OSHA requested comments on suggestions made by a pre-hearing commenter (EX. 9-31) to expand the secondary brake provisions in proposed paragraph (f)(4)(ix)(B). The commenter (EX. 9-31) claimed that the proposed provisions were inadequate.

The first pre-hearing comment would have required that the secondary brake actuate only under prescribed emergency conditions. Hoberg (TR 2/19, p. 71) believed that this suggested requirement is counter to the concept of a secondary-emergency back-up brake being the stop of last resort, and that the

brake should stop the hoist and its load under any condition, known or unknown. He argued that a "prescribed emergencies" exemption should not be permitted in the regulation.

The second pre-hearing comment would have required that the secondary brake act on a specific component of a winding drum, traction drum or traction-sheave hoist. James W. Fortune (TR 2/19, p. 195) and Hoberg (TR 2/19, p. 71) agreed that this suggested addition should not be included in the criteria for secondary brakes. These commenters stated that any brake always acts on a specific component of equipment whether it is intended or not, and without a definition of the component, the statement is meaningless. In addition, they indicated that as a performance regulation, the regulation should say what is to be done, not how to do it.

The third pre-hearing comment would have required that the secondary brake not fail to operate because of outside contamination. Hoberg (TR 2/19, p. 72) argued that this brake criteria should not be included in the Final Rule for a number of reasons. First, the addition is redundant since the proposed requirement that the brakes stop and hold the hoist and its load has no implicit or explicit exemption for contamination, temperature, height of building or any other criterion. Second, since the term "contamination" is not defined, it can mean the brake must operate if submerged in water and frozen; if packed in hot sand; if covered with hot grease—or any other imaginable contaminant. Third, the suggested addition has the implication that reasonable care and maintenance is not necessary to insure proper operation of these brakes.

The fourth pre-hearing comment would have required that the brake actuation impose no more than a specified amount of loading on hoisting system components. Hoberg (TR 2/19, p. 73) disagreed that this criteria should be added to the secondary brake provision. He believed that the specified amount of loading could be addressed in his recommended change to proposed paragraph (f)(4)(ix) that the hoist stop and hold what it can lift. In addition, he believed that the loading issue is also addressed in the requirement of proposed paragraph (f)(1)(i) that equipment be designed by a registered professional engineer.

The fifth pre-hearing comment would have required that the secondary brake not be bypassed or prevented from operating by any other device.

Cliff Theve (TR 2/20, p. 180) objected to this addition because it would

prohibit the use of a hoisting machine with a controlled descent feature or a speed governor for emergency descent of a platform without power. He argued that hoisting machines of this type have been built and used safely for a number of years in the industry. Other reasons given by Mr. Theve not to include this additional criteria were: One, a controlled descent feature in a hoist is a quicker safer alternative to hand cranking by workers who are stranded and/or injured on an elevated platform; two, his own company has a ten-year history in the manufacture and sale of this type of hoist without a worker injury or accident; and three, the controlled descent feature does not prevent the secondary brake from becoming actuated if the primary brake fails and the platform reaches an overspeed condition.

Several other commenters (EX. 14-2, 14-4, 14-5) who are users of hoists with controlled descent features also objected to any prohibition of this type of hoist. In their experience, the controlled descent feature had not been the cause of hoist failures and had been effective in providing a safe descent when necessary.

OSHA has considered all the comments presented and is not adding the five additional criteria to proposed paragraph (f)(4)(ix)(B). Based in the record of this Rulemaking, OSHA has determined that these criteria are either redundant, unreasonable or inappropriate for secondary brake regulation. OSHA is renumbering the provision as paragraph (f)(4)(ix)(B)(1).

In the submission of the ANSI A120 draft standard—January 1986 by Douglas A. Greenaway (EX. 15-8), the secondary brake criteria included a provision which required the secondary brake, when activated, to stop and hold the platform within a vertical distance of 24 inches (609.6 mm). OSHA believes that a specific limit on this stopping distance is necessary to assure adequate fall protection for employees, and is adding this provision in the Final Rule as paragraph (f)(4)(ix)(B)(2).

Several commenters (EX. 9-29, 19B, 91) argued that the proposed requirement for lubrication of a hoisting machine in paragraph (f)(4)(x) was too broad. According to these commenters, a strict interpretation of this provision would mean lubrication of all parts, whether needed or not. Swing Stage Inc. (EX. 9-29) noted that there are many modern materials which provide years of reliable service without conventional lubrication and many components are stationary without any need for lubrication.

OSHA agrees with these commenters and is revising the lubrication provision to address only those components in a hoisting machine which require lubrication in paragraph (f)(4)(x).

Werner Company Inc. (EX. 9-34) suggested that the load reference in proposed paragraph (f)(5)(i)(A) be more clearly defined. This commenter believed that the intended load should include the weight of the users and any material on the platform. OSHA agrees with this commenter and is changing the phrase "maximum intended load" to be "maximum intended live load" in the Final Rule. The term "live load" is defined in the standard.

Werner Company Inc. (EX. 9-34) has questioned whether the terms "suspended unit," "unit weight" and "live load" in proposed paragraph (f)(5)(i)(B) are referring to the platform itself or the total system. In response, OSHA states that the term "suspended unit" is referring to the platform itself. The load rating plate provides information which is used to prevent the loading of a platform in excess of its maximum intended load. The load rating plate addressed in the proposed paragraph is required to state the "unit weight" and the "live load rating" of the platform. For consistency with the definitions used in the Final Rule, the term "live load rating" is changed to "rated load" in the Final Rule at (f)(5)(i)(C).

Douglas A. Greenaway (EX. 15-8) and Hoberg (EX. 19C) agreed that proposed paragraph (f)(5)(i)(C) is incomplete. These commenters believed that the paragraph should address both the position of the live load and the stability factor ratio that is to be used in maintaining continuous stability of the suspended unit. OSHA agrees with these commenters that the use of a 1.5 to 1 stability factor against upset and the need to address the position of the live load in the suspended unit is necessary in the Final Rule. OSHA addresses these issues in paragraph (f)(5)(i)(D).

Several commenters (EX. 9-22, 9-31, 9-35) suggested deleting proposed paragraph (f)(5)(i)(E)(3), which addressed button guide systems. The same arguments for deletion of these systems were presented earlier when commenters addressed proposed paragraph (e)(2)(iii)(B). OSHA did not find the arguments presented for deletion persuasive then and retained paragraph (e)(2)(iii)(B), and is doing likewise for proposed paragraph (f)(5)(i)(E)(3) by retaining it in the Final Rule as (f)(5)(i)(F)(3).

In paragraph (f)(5)(i)(F)(1), OSHA proposed that a suspended unit shall be

provided with a guardrail system and a four inch (102 mm) high toeboard. OSHA is revising the toeboard provision to provide equivalent protection and consistency with OSHA's proposed Construction Standard addressing the use of scaffolds (Notice of Proposed Rulemaking (51 FR 42708) published on November 25, 1986. The revised toeboard provisions which will also be considered in OSHA's proposed revision of Subpart D of Part 1910, are added as (f)(5)(i)(G) (5), (6), (7) and (8).

Several commenters (EX. 9-35, 9-37) suggested that OSHA revise proposed paragraph (f)(5)(i)(F)(2) to include a 42 inch (106.6 cm) high limit for the top guardrail on the ends and outboard side of the platform. Also, Spider Staging Sales Company (EX. 9-43) suggested that the top guardrail have the capability of withstanding a 200 pound (890 N) force rather than a 100 pound (445 N) force. OSHA's proposed requirements for a 36-inch (91.4 cm) top guardrail with a capability of withstanding a 100 pound (445 N) force are consistent with proposed related OSHA scaffold standards for construction (51 FR 42708) and reflect the fact that this type of guardrail is intended to be supplemented by personal fall arrest systems.

This consistency of approach in OSHA's fall protection standards for powered platforms and scaffolds is based on the use of two types of guardrail systems. The first type is capable by itself of providing adequate fall protection for employees. The second type of guardrail system is one which is used primarily as an edge delineator and to prevent misstepping. Personal fall arrest systems must be worn with the second type of guardrail system because of the reduced strength characteristics (100 pounds (445 N) force) and lower top rail heights (36 inches (91.4 cm)) of this type of system.

Since this powered platform standard requires employees to be protected by personal fall arrest systems (paragraph j), as the primary means of fall protection, guardrails on the platform need not be strong enough to prevent falls. Accordingly, the standard provides for the second type of guard rail system to be used on powered platforms. Proposed paragraph (f)(5)(i)(F)(2), therefore, is unchanged in the Final Rule.

Two commenters (EX. 9-31, 9-43) recommended that OSHA increase the capability of the midrail in a guardrail system from a 75-pound (333 N) force as proposed in paragraph (f)(5)(i)(F)(3) to the same force as the top rail. Again, since OSHA is proposing that a personal fall arrest system be used for employees,

the midrail in this guardrail system is primarily part of the edge delineation and need not have the greater strength. Accordingly, the paragraph is unchanged in the Final Rule.

OSHA proposed in paragraph (f)(5)(i)(F)(4) that the material used between the toeboard and top guardrail on a platform contain no opening large enough to allow the passage of a ball two inches (51 mm) in diameter. The New York State Department of Labor (EX. 9-41) recommended that this provision be changed to agree with the New York State requirement of three-quarters of an inch (19 mm). Hoberg (EX. 19B) was concerned that a two-inch (51 mm) opening would allow employees to pass a lifeline through these openings which could be hazardous if the platform suspension ropes should fail. This commenter suggested a one-inch (25.4 mm) opening.

OSHA has considered these comments and the need for the openings in the material to be small enough to prevent potential falling objects from passing through. OSHA, therefore, has rewritten this provision as a performance requirement in paragraph (f)(5)(i)(G)(4) in the Final Rule, which is also consistent with related proposed OSHA construction standards on scaffolds.

In the Notice of Hearing (50 FR 48225), OSHA solicited comment on the proposed requirement in paragraph (f)(5)(ii)(A) that a 12-inch (305 mm) wide passage be provided at or past any obstruction on the platform. A number of commenters (EX. 9-20, 9-35, 9-37, 9-43, 9-45; 15-4, 15-8; 88-6) and hearing witnesses (TR 2/19, pp. 23, 111, 197; TR 2/20, pp. 64, 78, 154, 187, 369, 497) addressed this provision.

Leonard Nork (2/20-64) suggested that the passage be increased to 18 inches (457 mm), otherwise some workers might climb on the midrail or top guardrail to pass by any obstruction on the platform. A number of commenters (EX. 15-4, 15-8; 9-35, 9-45) and hearing witnesses (TR 2/19, p. 197; TR 2/20, pp. 154, 187, 497), however, supported OSHA's 12-inch (305 mm) proposed requirement. Becor Western (TR 2/20, p. 497), for example, noted that a 12-inch space (305 mm) is more than adequate for platform occupants, while an 18-inch (457 mm) space would have an economic impact since it would require a 36-inch (914 mm) wide platform or undesirable counterweights due to a relocation of the hoist.

Spider Staging Sales Company (EX. 9-43; TR 2/20, p. 369) observed that OSHA should be more concerned with a safe passage past an obstruction on the platform and not physical dimensions.

Hoberg (EX. 88-6) supported the 12-inch (305 mm) passage, but suggested that OSHA also be concerned with other hazards at the obstruction location such as moving parts and the potential of inadvertent operation of hoisting machine controls.

OSHA notes that proper training of employees, as required by paragraph (i)(1)(ii), will inform employees of obstruction hazards and machine guarding, as required by paragraph (f)(4)(vi), and will help to prevent employee exposure to hazards when passing obstructions on the platform. Based on the record of this rulemaking, OSHA has decided to retain the 12-inch (305 mm) provision in the Final Rule under paragraph (f)(5)(ii)(A).

OSHA proposed in paragraph (f)(5)(ii)(B) that any opening in a platform flooring be capable of preventing the passage of a one-inch (25 mm) diameter ball. If the opening were larger, a metal screen capable of rejecting a one-inch (25 mm) ball would need to be placed under the opening.

OSHA received a variety of opinions from commenters (EX. 9-13, 9-41, 9-43; 15-8; 19B; 87; 91) on the proper size of the opening in the flooring. The New York State Department of Labor (EX. 9-43) recommended that OSHA match the New York regulations on platforms, which call for an opening which would prevent the passage of a three-quarter inch (19 mm) ball. Spider Staging Sales Company (EX. 9-43) and Douglas A. Greenaway (EX. 15-8) supported OSHA's proposed opening dimension. Hoberg (EX. 19-B) expressed concern that the one-inch (25 mm) opening criteria would allow employees to pass life lines and cables through the openings, and suggested that a nine-sixteenths of an inch (14 mm) criteria be used.

Following a review of the comments on this provision, OSHA has concluded that a performance requirement should be used in paragraph (f)(5)(ii)(B) to address the identified hazards instead of a specific size opening. In this requirement, the flooring shall contain no opening that would allow the passage of lifelines, cables and potential falling objects. This performance requirement addresses the potential failure of a personal fall arrest system if life lines should be passed through a platform floor and the suspension system should fail, and the hazard to other employees from objects falling through the platform openings.

OSHA had proposed in paragraph (f)(5)(ii)(C) that the means of suspension for a platform shall limit the roll about its longitudinal axis to a maximum of 15

degrees from a horizontal plane. R. D. Werner (EX. 9-34) suggested that OSHA change the maximum limit to five degrees since he believed that the 15 degree maximum was too large due to the additional loading that would be introduced into the platform as a result of such a platform roll.

A number of commenters and hearing witnesses (EX. 15-4, 15-8; TR 2/19, pp. 75, 197) supported the 15 degree maximum limit on platform roll. Lawrence R. Stafford (EX. 15-4) noted that every two-point suspended platform will roll since it is suspended at its center of gravity, and that to reduce the roll limit below 15 degrees one would have to change the center of gravity or add weight, either of which would be objectionable. In addition, this commenter noted that a reduced roll limit would virtually outlaw the use of many traction hoists since the mass of the hoist is above the platform deck and not under the platform deck as is the case with most drum type hoists. James W. Fortune (TR 2/19, p. 197) noted that the proper location of building face rollers would help to limit any platform roll. In addition, Mr. Fortune noted that the 15 degrees is a maximum roll limit and it is unlikely that platforms would be designed to reach this limit.

OSHA has considered all the comments received and has decided to retain the proposed paragraph (f)(5)(ii)(C) in the Final Rule. Properly designed suspension means and the use of proper stabilization methods used can limit the platform roll to a 15 degree maximum limit. Most platforms are built to the Underwriters Laboratory Standard, UL 1322, "Fabricated Scaffold Stages and Planks". This standard states that the platform shall withstand, without failure or visible damage to the structure, a load equal to three times the rated load of the platform, when one side rail is raised so that the decking is at an angle of 15 degrees to the horizontal. In addition, most employees would find it difficult to work on a platform with a platform surface at an angle of greater than 15 degrees from the horizontal plane, and would endeavor to return the work surface to a normal position. Finally, OSHA has not received any accident data that would support a change from the 15 degree roll limit.

Hoberg (EX. 19B) recommended that OSHA delete the words describing the different types of cable in proposed paragraph (f)(5)(ii)(D) since they were redundant. OSHA agrees and the words are deleted in the Final Rule.

Douglas A. Greenaway (EX. 15-8) and Hoberg (EX. 19B) recommended that OSHA clarify proposed paragraph

(f)(5)(ii)(F) which addressed the interruption of the power supply on a platform. They noted that the provision should make it clear that the requirement provides for the interruption of the power supply for all hoist motors at each operating station on the platform. OSHA agrees that a clarification is warranted and the change is made in the Final Rule.

Some commenters (EX. 9-13, 9-35, 9-43) recommended that OSHA lower the maximum platform speeds limited by proposed paragraph (f)(5)(ii)(G). OSHA proposed maximum rated speeds of 50 and 75 feet per minute (0.3 ms and 0.4 ms) with single and multi-speed hoists, respectively. Lawrence R. Stafford (EX. 9-35) suggested that OSHA limit the platform speed to 20 feet per minute (0.12 m/s) when intermittent stabilization is used. Spider Staging Sales Company (EX. 9-43) suggested that OSHA limit the platform speed to 35 feet per minute (0.21 m/s) when continuous stabilization is used because of the potential hangup of the platform in the guides. Douglas A. Greenaway (EX. 15-8), supported OSHA's proposed platform speeds.

In response to the comments, OSHA notes that the proposed platform speeds are maximum rated speeds and not speeds which must be met for all conditions of stabilization. Also, the proposed maximum speeds are not required speeds for either roof-powered or platform-powered platforms. The need for higher platform speeds often occurs on very tall buildings, employing continuous guides, when it is desirable to reduce the ascent time for efficiency reasons. The registered professional engineer who is responsible for the design of the equipment in the installation (paragraph (f)(1)(i)) would determine the proper platform speed that is suitable for the stabilization system and building site. OSHA, therefore, is retaining the proposed provision in the Final Rule.

Proposed paragraph (f)(5)(ii)(I) required fire extinguishers to be installed on working platforms. Spider Staging Sales Company (EX. 9-43) believed that the requirement for fire extinguishers on platforms would be ineffective. This commenter claimed that the extinguishers would be stolen and were potentially dangerous if they dropped from the platform. Acme Fabricators Incorporated (EX. 9-13) and California's Department of Industrial Relations (EX. 9-45) supported OSHA's proposed requirements for extinguishers.

OSHA agrees with the latter commenters that a fire extinguisher should be installed on a powered

platform. Employees need to have the capability of protecting themselves from fires involving combustible materials, flammable materials or electrical equipment which might occur on an elevated platform. If extinguishers are stolen or dropped because of poor installation or usage, these are conditions which employers can correct through training and monitoring of the worksite, and these conditions are not valid reasons for not installing extinguishers. OSHA is retaining the proposed paragraph (f)(5)(ii)(I) in the Final Rule.

Daigel (EX. 9-31) suggested that OSHA replace the term "self-locking" with the term "self-latching" in proposed paragraph (f)(5)(ii)(J) which addressed platform access gates. OSHA agrees that the term "self-latching" is a more appropriate term because the gates are closed with a latch rather than a lock. A self-latching provision would ensure that the access gates do not open inadvertently and expose employees to a fall hazard.

OSHA is making this change in the Final Rule and transferring this provision to paragraph (f)(5)(ii)(J).

Paragraph (f)(5)(ii)(K), as in the proposal, requires a guardrail system or ladder handrails if the access to or the egress from a platform is 48 inches (1.2 m) above a safe surface. This guarding requirement is consistent with the related OSHA General Industry Standard, § 1910.23(a)(1), which addresses employee protection when working on open sided floors, platforms and runways. Support for the requirement was received from Lawrence R. Stafford (EX. 9-35). OSHA is retaining this proposed provision in the Final Rule.

Several commenters (EX. 15-8; 9-31, 9-35, 9-41) recommended that OSHA revise proposed paragraph (f)(5)(ii)(L) which addressed platforms containing overhead structures which would restrict emergency access from the platform, and which would have required such platforms to have a secondary wire rope suspension system or a suspension by four wire ropes. Daigel (EX. 9-31) noted that the actual intent of the provision was to prevent the use of vertical lifelines by employees when working on platforms with overhead structures. Employees using such vertical life lines would be exposed to the hazard from the overhead structure if the suspension wire rope should fail. Douglas A. Greenaway (EX. 15-8), concurred with Mr. Daigel and also recommended that the platform occupant be secured to a fall arrest system employing a horizontal life line,

and that the platform also be equipped with a secondary wire rope system or be suspended by four wire ropes as stated in the proposal.

OSHA believes that the recommendations addressing proposed paragraph (f)(5)(ii)(L) have merit. For employee protection, it is important to clarify and emphasize the necessary measures to be taken to avoid risks to employees working on platforms with overhead structures. The use of horizontal life lines for employees, and the suspension methods listed in the proposal, together provide the means to address these risks. OSHA is revising proposed paragraph (f)(5)(ii)(L) in the Final Rule to reflect the above comments.

Becor Western (EX. 9-37) and Hoberg (EX. 19 B) agreed that OSHA should remove the prohibition in proposed paragraph (f)(5)(ii)(L) which stated that the secondary wire rope tail line cannot hang below the platform. This provision was based on Section 307.5.10(c) of the ANSI A120 draft standard—November 1981. Mr. Hoberg noted that the prohibition would require that the secondary rope be gathered in or below the platform with a powered tensioning device. Powered Platform Manufacturing Company (EX. 9-23) also agreed that the prohibition on the tail line should be deleted.

OSHA has concluded that the prohibition should be removed since no evidence has been provided to show that a freely hanging tail line presents a hazard for employees. This conclusion is also supported by the change in the latest ANSI draft standard A120—January, 1986 which no longer includes this prohibition. The removal of this prohibition will also remove the need for employers to install tension devices to avoid piling of the rope above the platform.

Paragraph (f)(5)(ii)(M) requires the use of vertical lifelines on two point suspended platforms, however, if a secondary suspension system is used in conjunction with horizontal lifelines anchored to the platform, vertical lifelines need not be used for fall arrest protection on such working platforms. This provision is unchanged from the proposal.

In the Notice of Hearing (50 FR 48225), OSHA solicited comment on this requirement. In response to this notice, some commenters (EX. 9-24, 9-31, 9-41, 9-45) claimed that horizontal lifelines are used because of the limitations that exist in the use of vertical lifelines on tall buildings. For example, the use of long lifelines can result in abraded lifelines due to excessive rigging and handling; can require special rescue

efforts if a suspension wire rope fails; and can cause employees to be pulled off the platform if a strong wind force bears on the lifeline.

In response to the comments on the limitations of vertical lifelines, OSHA makes the following observations. First, all lifelines are subject to routine inspection by users, paragraph (g)(5)(ii), to detect any condition, such as abrasion, which might affect their continued capability of protecting employees from falls and necessitating removal. Second, when lifelines exceed 200 foot (61 m), paragraph (e)(8) requires that lines be stabilized to restrict their displacement by wind or any other force. This provision would address concerns expressed by commenters regarding broken windows and employees being pulled off platforms because of wind. In addition, employees would be prohibited from working on platforms when the wind velocity on the platform exceeds 25 miles per hour (40.2 km/hr). Also, OSHA has not received any accident data which has shown that employees have been pulled off platforms because of wind forces on vertical lifelines. Third, proposed paragraph (i)(1)(ii)(C), would require employees to be trained in emergency action plan procedures. Such training would include employee instruction on procedures to follow in the event the employees were suspended from a vertical or horizontal lifeline. Finally, as discussed further below, if the employer does not want to use a vertical lifeline for any reason, the standard provides the option of using a horizontal lifeline system with a secondary suspension system.

OSHA also received a number of comments from hearing witnesses (TR 2/19, p. 192, TR 2/20, pp. 105, 156) and other commenters (EX. 9-3, 9-24, 9-43) who objected to the required use of a secondary suspension system in conjunction with horizontal lifelines on two-point suspended working platforms. Lawrence R. Stafford (TR 2/20, p. 105) stated that this provision would eliminate the use of davits and outriggers because of the additional weight of storing the secondary rope on the platform, and the lack of a physical location to hang the secondary rope. This commenter noted that this would result in the use of more roof carriages and larger and heavier building roofs to accommodate these carriages. The same commenter stated that it would also be impractical to use secondary suspension systems with selfpowered platforms.

Hoberg (EX. 88-4) disagreed that the additional weight of a secondary wire rope on a platform would inhibit the use of davits and outriggers. He noted that

the total weight of two 500 foot (153 m) secondary lines would be approximately 170 pounds (77 kg) and would only have a minor effect on very long platforms. Since the Final Rule would not address existing installations in the use of davits and outriggers, he stated that properly designed davits and outriggers would have the capability of supporting secondary lines and power winders.

James W. Fortune (EX. 43-2, TR 2/20, p. 162) and Hoberg (EX. 88-4) also disagreed with the previous commenter that secondary systems cannot be used on self-powered platforms. These commenters concurred that there were a number of buildings in the United States that were utilizing secondary suspension systems on such platforms, some with dual-wired traction hoists and dual-eyed movable davits.

A significant number of commenters (EX. 15-20, 19 B, 43-2, 88-4, 99) and hearing witnesses (TR 2/19, pp. 27, 76, 128, 240; TR 2/20, pp. 162, 272, 496) supported the use of a secondary suspension system with a horizontal lifeline on a two-point suspended working platform. Hoberg (TR 2/19, pp. 27, 128) stated that if one of the two suspended wire ropes should fail, an employee attached to a horizontal lifeline would be subjected to a pendulum effect and a free fall the length of the platform plus the length of the body belt lanyard. Such a fall could result in serious injury or death. From his own experience (EX. 99), and from a review of OSHA accident data (EX. 100-7), Mr. Hoberg noted that the forces resulting from such a fall have been severe enough to cause failure of the belt lanyard attachment and the death of the employees. It was Mr. Hoberg's (EX. 99) belief that the centrifugal forces resulting from the failure of one out of two suspension ropes could also cause the failure of the remaining suspension rope and/or its support. Mr. Hoberg concluded that the potential injury that an employee might endure, if a suspension wire rope failed while using a fall arrest system containing a horizontal lifeline, warranted the use of a secondary suspension system.

When questioned at the hearing, a number of witnesses (TR 2/20, pp. 156, 344, 496) who had objected to the use of secondary suspension systems in their comments responded that they had not considered the pendulum effect and free fall resulting from a failure of one of two suspension wire ropes.

After reviewing the comments and the hearing testimony, OSHA is retaining the proposed paragraph (f)(5)(ii)(M) in the Final Rule. This conclusion is based on a number of reasons. First, the

primary purpose of the provision is to provide an employee with an adequate personal fall arrest system when working on a two-point suspended platform. An independent vertical lifeline, as part of the fall arrest system, should be the first choice in achieving this protection. However, if a vertical lifeline is not used, then a horizontal lifeline anchored to the platform and a secondary suspension system would be the other available option. The secondary suspension system is necessary to provide fall arrest in the event one of the two suspension ropes should fail. Second, the provision would only apply to new installations which must all be designed by a registered professional engineer for a specific building site. Third, secondary suspension systems have been used in the industry for a number of years. Fourth, employers are not limited in the type of secondary suspension systems they may employ. As noted by Hoberg (TR 2/19, p. 76), an employer may use another set of suspension ropes, a nontensioned independent rope equipped with an automatic auxiliary over-speed brake, or a tensioned combination cable also used as a traveling cable. Although OSHA is retaining proposed paragraph (f)(5)(ii)(M), it is changing some of the terms used in the paragraph to achieve consistency with other provisions in the Final Rule.

Under (f)(5)(ii)(N) in the Final Rule, OSHA is clarifying the reference to the traveling cable system in the proposal. The phrase "traveling cable system" in the proposal is replaced with the phrase "cable connected to the platform" in the Final Rule. OSHA is also clarifying several other terms in the proposal.

A number of provisions, (f)(5)(iv)(A), (f)(5)(v)(B), (f)(5)(v)(D), and (f)(5)(v)(F) which address single point and ground rigged platforms, as well as intermittently stabilized platforms, are set out in the Final Rule and are unchanged from the proposal.

Proposed paragraph (f)(5)(iii)(A) permitted employers to have the option of providing a separate vertical life line as part of a fall arrest system for each employee on a single point suspended platform. A number of commenters and hearing witnesses (EX. 9-23, 9-31, 9-41; 19 B; TR 2/19, pp. 77, 132) recommended that OSHA delete this option on this type of platform. Daigel (EX. 9-31) stated that this option is deficient since a failure of the primary suspension rope would cause the platform to fall and injure other employees below. Hoberg (TR 2/19, pp. 77, 132) agreed and noted that such a failure could also cause an

overhead device, used for stability on this platform, to strike an employee on the platform or hook the vertical lifeline. This commenter also stated that the employee should be secured to a horizontal lifeline anchored to the platform, in lieu of a vertical lifeline, to arrest any fall from the platform.

OSHA agrees with these commenters and is revising the proposed requirement in the Final Rule. In addition, OSHA is deleting proposed paragraph (f)(5)(iii)(B) since paragraph (f)(5)(iii)(B) in the Final Rule addresses all single point suspended platforms.

Hoberg (EX. 19B) recommended that OSHA delete proposed paragraph (f)(5)(iii)(C) since this provision required that single point suspended working platforms be either continuously engaged to a building guide or intermittently secured. Hoberg noted that these requirements are also listed in proposed paragraph (f)(5)(i)(E). OSHA agrees to this deletion in the Final Rule.

Several commenters and hearing witnesses (EX. 9-25, 9-35, 9-43; TR 2/19, p. 158; TR 2/20, pp. 25, 39, 107) recommended that OSHA delete the provision in proposed paragraph (f)(5)(iv)(B) that would have allowed a platform to be secured in a suspended position against a building face after each day's use. Leonard Nork (EX. 9-25; TR 2/20, p. 25) stated that this current practice is contributing to a number of unsafe conditions and procedures. First, it is very difficult, if not impossible, to secure a suspended platform overnight against the face of many buildings built in recent years. Second, such platforms can be subjected to sudden overnight storms which can cause a great amount of damage to the platform and the building. Third, employees are subjected to fall hazards due to the difficulties of access and egress to and from such suspended platforms.

OSHA had requested comment on the feasibility and adequacy of this requirement in the Notice of Proposed Rulemaking (50 FR 2914). OSHA agrees with these commenters, and is changing proposed paragraph (f)(5)(iv)(B) in the Final Rule to disallow the practice of storing a platform overnight against the building face.

OSHA is deleting proposed paragraph (f)(5)(iv)(C) which addressed two stabilization methods to be used with ground-rigged platforms. These stabilization methods are regulated by paragraph (f)(5)(i)(E) in the general requirements for suspended platforms. That provision permits the use of any of four stabilization methods (continuous, intermittent, button guide and angulated

roping) or their equivalent with ground-rigged platforms.

Lawrence R. Stafford (EX. 9-35) and Daigel (EX. 9-31) objected to allowing the use of button guide stabilization systems with ground rigged platforms. Similar objections were raised by these commenters on proposed paragraph (e)(2)(iii)(B) which permits the use of button guide stabilization systems. These objections were addressed by OSHA in the discussion of proposed paragraph (e)(2)(iii)(B) above and which explained why button guide stabilization was retained in that provision of the Final Rule. For the same reasons, OSHA is retaining the use of button guide stabilization systems for ground rigged platforms.

Section (f)(5)(v) regulates intermittently stabilized platforms. Several commenters (EX. 9-22, 9-31, 9-35; 19 B) and a hearing witness (TR 2/19, p. 113) suggested that OSHA not require in proposed paragraph (f)(5)(v)(A) that stabilizer ties be adjustable in length. The stabilizer ties were proposed to be adjustable to affect the predetermined angulation of the suspension wire rope by changing the tie length, as necessary. These commenters noted however, that the length of the stabilizer tie is set by the design of each installation and adjustability is not required. Hoberg (TR 2/19, p. 113) noted that there are acceptable methods of tie-in, using a stabilizer tie, that are not adjustable. This commenter stated that OSHA should not require an adjustable tie since there are other methods which can be utilized.

OSHA agrees with these commenters and is revising proposed paragraph (f)(5)(v)(A) in the Final Rule to provide this flexibility. In addition, this paragraph is renumbered as (f)(5)(v)(E).

Proposed paragraph (f)(5)(v)(C) which addresses the hazards associated with storing stabilizer ties on the platform has been modified and included in paragraph (i)(2)(vii) in the Final Rule. The modification incorporates Hoberg's (TR 2/19, p. 60, EX. 19C) suggestion that the provision address the hazards associated with the ties becoming entangled in the machinery. Proposed paragraph (f)(5)(v)(D) addressed the requirement that the hoist power supply be interrupted if the platform contacts the stabilizer tie during its ascent. This provision is retained, clarified and renumbered as (f)(5)(v)(C).

Powered Platforms Manufacturing Company (EX. 9-23) recommended that OSHA delete proposed paragraph (f)(5)(v)(E) which prohibited intermittently stabilized platforms from extending beyond the building corner.

This commenter stated that if the stabilization system is designed properly to allow for proper suspension rope tie-in, continuous contact with the building face and expected wind loading, there is no reason that a platform cannot extend beyond the building corner.

OSHA agrees that this provision is too restrictive and makes the following observations. First, it is expected that the registered professional engineer designing an intermittent stabilization system (paragraph (f)(1)(i)) for a platform that extends beyond the building corners would address specific criteria such as proper suspension rope tie-in, continuous contact and expected wind loading. Second, intermittent stabilization provisions under paragraph (e)(2)(iii)(A) in the Final Rule require that the platform be kept in continuous contact with the building facade. Third, employee training provisions in paragraph (i)(1)(i) in the Final Rule require employees to be proficient in the operation and safe use of the particular powered platforms to be operated. Fourth, platforms on buildings with unusual corner arrangements may require extensions for employees to perform maintenance beyond or around building corners.

OSHA, therefore, is deleting the prohibition against intermittently stabilized platforms from extending beyond building corners.

Several commenters (EX. 9-31, 9-35, 9-41, 9-43) recommended that the proposed requirement for upper and lower building face rollers in proposed paragraph (f)(5)(v)(F) be deleted. These commenters stated that experience with intermittent stabilization systems has shown that upper and lower building face rollers do not make platforms more stable. However, they do contribute to more weight and cost. Hoberg (EX. 19B) suggested that OSHA require that rollers not be placed at the anchor placing if exterior anchors are used on the building face.

Based on the information provided by the commenters, OSHA is deleting the requirement for upper and lower building face rollers in the Final Rule. OSHA believes Mr. Hoberg's suggestion has merit and is including his suggestion in the Final Rule under renumbered paragraph (f)(5)(v)(D). OSHA also notes that the basic requirement for building face rollers for all suspended equipment remains in paragraph (f)(5)(i)(E).

OSHA had proposed a 10-foot (3.0 m) required distance between building face rollers in paragraph (f)(5)(v)(G). Powered Platforms Manufacturing Company (EX. 9-23) stated that the distance was excessive and that a six-

foot (1.8 m) distance is sufficient for stabilization. Daigel (EX. 9-22) supported the 10-foot (3.0 m) requirement, but recognized there would be a number of building designs in which this would be unattainable. For example, this commenter noted that when a platform is encompassed in an interior building corner, a 10-foot (3.0 m) distance may not be available to the designer.

OSHA has considered the views of the commenters and has decided to delete the provision. This has been done in recognition of the fact that the distance between face rollers is affected by a number of variables at each specific building site. The registered professional engineer, under paragraph (f)(1)(i), is expected to design the equipment to meet the OSHA requirement at paragraph (e)(2)(iii)(A) for stabilization at each building site. The engineer, therefore, would select the appropriate distance between face rollers to ensure stabilization.

Proposed paragraph (f)(5)(v)(H) is renumbered as (f)(5)(v)(A) in the Final Rule.

Hoberg (EX. 19 C; 2/19, p. 61) recommended that OSHA maintain consistency with the building section of the Final Rule at paragraph (e)(2)(iii)(A) and require that the platform shall be in constant contact with the building face. OSHA agrees, and is adding this provision at paragraph (f)(5)(v)(F).

A commenter (EX. 19C) suggested that OSHA ensure that the attachment and removal of a stabilizer tie not require the platform to be moved horizontally. OSHA believes this suggestion has merit since these ties are not meant to be used for repositioning a platform on a building face. In addition, such a repositioning operation could expose employees to a pinch point hazard in the attachment and removal of a stabilizer tie. OSHA is incorporating this provision under paragraph (f)(5)(v)(G) in the Final Rule.

In his comments and hearing testimony, Hoberg (EX. 19C; TR 2/19, p. 61, 100) recommended that OSHA require that the platform-mounted equipment and suspension wire rope shall not be structurally damaged by the loads from the stabilizer tie or its building anchor when the stabilizer tie is attached to the suspension wire rope. In addition, it was recommended that the wire rope and platform-mounted equipment shall have the capability of withstanding a load that is at least twice the ultimate strength of the stabilizer tie. It was Mr. Hoberg's belief that the stabilizer tie should not be the cause of a wire rope or platform-mounted

equipment failure which could endanger the personnel using the platform.

OSHA agrees that this issue is a matter of concern and should be addressed in the Final Rule. The registered professional engineer, who is responsible in paragraphs (e)(1)(i) and (f)(1)(i), for the design of the installation must consider the possible failure of the suspension wire rope and platform-mounted equipment and the need to avoid this occurrence. OSHA addresses this issue in the Final Rule under paragraph (f)(5)(v)(H).

Requirements for powered platform installations using button guide stabilized systems were proposed in paragraph (f)(5)(vi). Lawrence R. Stafford (EX. 9-35; 15-4; TR 2/20, p. 113) objected to the inclusion of this alternate stabilization system in the standard. This commenter stated that there were certain problems with these systems, such as button breakage and guardrail damage due to guide track hangup, and possible hand injuries from handling the guide tracks mounted on the platform. Mr. Stafford believed that these systems must be engineered to work properly. Daigel (TR 2/20, p. 357) agreed with Mr. Stafford that these systems have to be engineered to be effective and also noted that New York State does not preclude the use of these systems.

James W. Fortune (TR 2/19, p. 235) stated that in his experience with button guide systems, the guide track does not present a hazard for employees. In addition, he noted that button guide systems developed by his company have operated satisfactorily.

Hoberg (EX. 19B) recommended that OSHA require that the platform and its attachments in a button guide stabilization system not be structurally damaged by the loads imposed on it by the guide track. OSHA agrees and is adding this provision at paragraph (f)(5)(vi)(F).

In response to the comments received on this alternate stabilization system, OSHA observes that the Final Rule is requiring in paragraphs (e)(1)(i) and (f)(1)(i) that a registered professional engineer be responsible for the design of these installations. This requirement should address the problems associated with improper design that result in button breakage and guide track hangups. In addition, any problems associated with the operation of these systems are addressed in paragraph (i)(1)(i) which requires employees to be trained in the particular platform to be operated.

In large part, OSHA is retaining the button guide stabilization system as

proposed. A few provisions have been renumbered and some word changes have been made.

In the Notice of Hearing (50 FR 48222), OSHA requested comments on a recommendation made by some pre-hearing commenters that requirements for supported equipment be deleted, as listed in paragraphs (f)(6)(i), (ii) and (iii). Lawrence R. Stafford (EX. 15-4) and Daigel (EX. 15-14) reiterated their pre-hearing comments that these requirements be deleted, and stated that supported systems have not been fully proven and should not be a part of the standard.

The ANSI A120 draft standard—January 1986, submitted by Douglas A. Greenaway (EX. 15-8), continued to list the requirements for supporting equipment that were listed in the earlier ANSI A 120 draft standard—November 1981. These requirements served as the basis for the requirements listed in the proposal.

Hoberg (EX. 19B) stated that supported platform systems do exist and have been in operation for some time. This commenter recommended that OSHA continue to retain these requirements in the Final Rule.

In response to commenters who have objected to the placement of the supported systems requirements in the proposal, OSHA has not received any information which has shown installation deficiencies or hazards to employees for supported installations which are in use. In addition, proposed paragraphs (e)(1)(i) and (f)(1)(i) would require that all future supported installations be designed by a registered professional engineer experienced in such design.

OSHA, therefore, has determined that there should not be any unnecessary restriction on the means available to employers for elevating and lowering powered platforms, and is retaining the proposed requirements for supported equipment in paragraphs (f)(6)(i), (ii), (iii) and (iv) in the Final Rule. Paragraph (f)(6)(i) requires that supported equipment maintain a vertical position relative to the building facade without the use of friction. Paragraph (f)(6)(ii) requires that means be employed to provide climbing traction for the supported equipment. Paragraph (f)(6)(iii) requires the use of launch guide mullions to align drive wheels. Paragraph (f)(6)(iv) requires that supported platforms shall comply with certain requirements of suspended platforms.

In the Notice of Hearing (50 FR 48222) OSHA requested specific comments on proposed paragraph (f)(7)(i) which required suspension wire ropes and

connections to meet the specifications recommended by the hoisting machine manufacturer. Pre-hearing commenters (EX. 9-17, 9-19) have suggested that OSHA list the types of connections that can be used, and require the connections to have the capability of developing at least 80 percent of the rated breaking strength of the wire rope. The wire rope connection capability is presently a requirement in ANSI A120-1970.

Douglas A. Greenaway (EX. 15-8) and Hoberg (EX. 19B) supported OSHA's proposed requirements in paragraph (f)(7)(i), which do not list the types of connections. In addition, Mr. Hoberg recommended that combination cable should also be a component that must meet the specifications of a hoisting machine manufacturer, since it is also used to suspend equipment.

OSHA has considered the comments received and in the Final Rule is revising paragraph (f)(7)(i) in the following manner. First, combination cable is added to the provision as a component that must meet the specifications recommended by the hoist manufacturer. Second, in response to the prehearing commenters, OSHA is adding a requirement that the wire rope connections be capable of developing at least 80 percent of the rated breaking strength of the wire rope. Third, OSHA has decided not to provide a listing of rope connections since such information is available in industrial catalogs. Also, any such listing would imply that only the listed connections are acceptable to OSHA.

In the Notice of Hearing (50 FR 48222), OSHA requested specific comments on proposed paragraph (f)(7)(ii), which provided the formula to be used in calculating the safety factor of the suspension wire rope and which is contained in the existing standard. A pre-hearing commenter (EX. 9-17) suggested that the formula be amended to take into account the efficiency of the termination by adding the efficiency (E) of the wire rope termination to the numerator as follows:

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

where, "F" is the factor of safety; "S" is the manufacturer's catalog strength of one suspension rope; "N" is the number of suspension ropes under load; and "W" is the maximum static load at any point of travel.

Although the commenter admitted that this change would require a reduction in the working load of the platform to

maintain the required 10:1 safety factor, he believed this would provide a much more accurate factor of safety. In a post-hearing comment, this commenter (EX. 30) stated that introducing the terminal efficiency factor into the formula would take into account the strength of the total rope system.

Hoberg (EX. 19B, 88-5; TR 2/19, p. 78) stated that this formula may be incorrectly considered an "engineering factor" of safety, as opposed to a "design factor," if the termination efficiency is included. An engineering factor of safety, in his view, would include terminal efficiency, bending efficiency and any other engineering consideration. In addition, Mr. Hoberg noted that the term "factor of safety" in the proposed formula was used in establishing minimum requirements for the wire rope itself and not for the wire rope assembly which includes terminal efficiency and bending efficiency. In order to eliminate confusion, Mr. Hoberg recommended that OSHA change the term "factor of safety" to "design factor," as the American Iron and Safety Institute had done in its *Wire Rope Manual*, Second Edition, 1981, page 77.

Douglas A. Greenaway (EX. 15-8) supported the use of the term "design factor" in this provision.

Lawrence R. Stafford (EX. 15-4) claimed that if OSHA introduced the terminal efficiency factor into the formula, this action would doom all existing platform type hoists since larger size ropes would be needed.

OSHA agrees that the term "factor of safety" is inappropriate for the formula in proposed paragraph (f)(7)(ii). This formula is used to calculate the capability of the suspension wire rope to support, without failure, its working load. The formula is only a ratio of the rated strength of the wire rope to the rated working load, and should be more appropriately identified as a "design factor."

The formula is not intended to provide an engineering safety factor for the total rope system, which would necessarily include a number of other engineering criteria. OSHA, therefore, is changing paragraph (f)(7)(ii) in the following manner. First, the term "design factor" replaces the term "factor of safety." Second, the term "rated strength" replaces the term "catalog strength" since it is more generic and permits the engineer to adjust for arbitrary catalog listings. The term "rated strength" is defined in the Final Rule. Third, the term "rated working load" replaces the term "maximum static load" and the phrase "on all ropes" is added for clarification.

"Rated working load" is also defined in the Final Rule.

Several commenters (EX. 9-17, 9-19; 15-8; 19B; 30; 91) believed that proposed paragraph (f)(7)(iii) was too restrictive in requiring that suspension ropes shall be of improved plow steel or equivalent. The Mac Whyte Company (EX. 9-17, 9-30) stated that improved plow steel should be the minimum grade acceptable to OSHA, since there are many equipment designs that required higher strength ropes to maintain the design factor. OSHA agrees with these commenters that the proposed provision should be clarified to permit the use of wire rope that is of a higher strength than improved plow steel. OSHA, therefore, is revising the proposed provision in the Final Rule by requiring the grade of suspension wire rope to be at least improved plow steel or equivalent rather than improved plow steel or equivalent.

No comments were received on proposed paragraph (f)(7)(iv), however, OSHA is changing the term "factor of safety" to "design factor" for consistency with paragraph (f)(7)(ii).

Proposed paragraph (f)(7)(v) prohibited the use of more than two reverse bends in each suspension wire rope. Daigel (EX. 9-31) suggested that reverse bends in a wire rope be prohibited with respect to wire rope lay length. Hoberg (EX. 19B) agreed and suggested that, based on accepted standards, more than one reverse bend in six wire rope lays should be prohibited.

OSHA understands that the reason for caution in using reverse bends in wire rope is because undue stresses are introduced into the rope if adequate wire rope lay length is not allowed for the rope to relax before reverse bending. OSHA, therefore, is changing this provision in the Final Rule to permit no more than one reverse bend in six wire rope lays.

One commenter (EX. 9-19) suggested that OSHA add two other requirements: First, that the diameter of the sheave used to accomplish the change in direction of the wire rope must be the same as the diameter required for the hoisting sheaves and drums; and second, that a reference be added as to the minimum drum and sheave diameter to be used for any application.

In response, OSHA notes that paragraph (f)(4)(vii) addresses the issue of drum and sheave diameters in performance language in the hoisting section of the standard. OSHA believes that the drum and sheave diameters to be used for a specific application would be more properly determined by the engineer responsible for the design of

the installation. Paragraph (f)(4)(vii), therefore, does not include any reference to drum and sheave diameters in the Final Rule.

Two commenters (EX. 9-13, 15-8) and one hearing witness (TR 2/19, p. 193) supported OSHA's requirements in proposed paragraph (f)(7)(vi)(A) relative to rope tags. Acme Fabricators (EX. 9-13) stated that the information on the tag is very useful for safety reasons. For example, it is important that the date the wire rope was installed appear on the tag as well as the size and manufacturer of the rope. From this information, an employer will have knowledge of the age of the rope and can replace the rope with a rope of the same specifications from the same manufacturer, when necessary. This provision remains unchanged in the Final Rule, except the term "rated strength" replaces the term "catalog strength" in renumbered paragraph (f)(7)(vi)(E). The term "rated strength" is defined in paragraph (d).

Proposed paragraphs (f)(7)(vi) (B) and (C), which address rope tag requirements, remain unchanged from the proposal, and are renumbered as paragraphs (f)(7)(vii) and (f)(7)(viii).

Proposed paragraphs (f)(7)(vii) and (f)(7)(ix) are also unchanged from the proposal and are renumbered as paragraphs (f)(7)(ix) and (f)(7)(xi). Paragraph (f)(7)(ix) requires a sufficient wire rope length when a winding drum hoist is used, and paragraph (f)(7)(xi) prohibits the lengthening or repairing of suspension wire ropes.

Becor Western Inc. (EX. 9-37) and Douglas A. Greenaway (EX. 15-8) supported proposed paragraph (f)(7)(viii), which requires a sufficient wire rope length when traction and sheave type hoists are used. Becor Western Inc. (EX. 9-37) also suggested that OSHA change the phrase "lowest point of vertical travel" in the paragraph to read "lowest possible point of vertical travel," and eliminate the unnecessary verbiage following the word "feet." This commenter believed this change was necessary to achieve consistency with proposed paragraph (f)(7)(vii). OSHA agrees and the provision is changed in the Final Rule and renumbered as paragraph (f)(7)(x).

Paragraph (f)(7)(x) prohibits the use of babbitted fastenings for suspension wire rope. The reasons for this prohibition are contained in a discussion above which addresses the deletion of the term "babbitted fastenings."

Concerning paragraph (f)(8)(i), also unchanged from the proposal, Hoberg (TR 2/19, p. 79) had suggested that OSHA require that an independent ground lead be connected to the platform frame and hoist. In response,

OSHA notes that in Subpart S, electrical, there are generic grounding requirements under § 1910.304(f)(5)(v) which would cover the platform frame and hoist.

Paragraph (f)(8)(ii) covering design and location of electrical runway conductor systems remains unchanged in the Final Rule and was supported during the rulemaking (EX. 15-8).

Daigel (EX. 9-31) suggested that OSHA delete proposed paragraph (f)(8)(iii) which required cables to be protected from damage due to striking the building, because other provisions cover this hazard.

OSHA agrees that paragraph (e)(8), which addresses cable stabilization, is meant to prevent the cable from being damaged by striking the building, and is deleting the redundant part of paragraph (f)(8)(iii) in the Final Rule.

Proposed paragraph (f)(8)(iv) is deleted in the final rule because it is redundant with paragraph (f)(5)(ii)(D).

Spider Staging Sales Company (EX. 9-43) and Hoberg (EX. 19B, C) noted that the protective devices for phase reversal and phase failure, addressed in proposed paragraph (f)(8)(v), are a polyphase phenomenon and are not required on single phase equipment. Accordingly, it was suggested that the term "three phase reversal" be substituted to clarify this provision. OSHA agrees and is setting this requirement in paragraph (f)(8)(iv) in the Final Rule.

Paragraph (f)(8)(v), which requires the operator to follow predetermined procedures established by the control system, remains unchanged from the proposal.

Paragraph (f)(8)(vii)(A) in the proposal has been revised and redesignated in the Final Rule as (f)(8)(vi)(A). Daigel (EX. 9-31) questioned the need for requiring a tie-down (mechanical retainment) for carriages which are counter-weighted with a four to one stability factor against overturning as proposed. Richard W. Hoffman (EX. 9-30) questioned the need for mechanical retainment of trackless carriages at an established operating point. This commenter believed that the only function of this requirement was to prevent horizontal traversing of the carriage when the platform is over the side of the building.

OSHA agrees that a carriage with the required stability factor against overturning does not need a tie-down anchor, and is revising the provision accordingly in the Final Rule. OSHA does believe, however, that all carriages, trackless or not, should be

required to have a tie-down anchor if sufficient counterweight is not provided.

Daigel (EX. 9-31) suggested that OSHA delete proposed paragraph (f)(8)(vii)(B) which addressed the electrical operating device for power-operated carriages. This commenter noted that paragraph (f)(3)(i)(F) in the carriage section of the standard addresses a similar hazard. OSHA agrees, and paragraph (f)(8)(vii)(B) as proposed is deleted in the Final Rule.

Several commenters (EX. 15-8; 9-30, 9-43) recommended that OSHA change its overload protection requirements to permit down travel when excess suspension wire rope tension is encountered. Richard W. Hoffman (EX. 9-30) noted that if an excess load is applied to the wire rope when a platform is on the rise, it should be possible to lower the platform to clear any obstruction.

Also, Daigel (EX. 9-30) has suggested that OSHA clarify the conditions now listed in the present standard under which the load limiting device will be utilized. This commenter suggested that OSHA require that the overload protection be utilized when the load is in excess of 125 percent of the rated load of the platform than when the tension in a hoisting rope exceeds 150 percent of its normal tension based on the rated load divided by the number of suspension ropes.

OSHA believes these comments have merit and is revising proposed paragraph (f)(8)(vii)(C) in the Final Rule to reflect the changes suggested by the commenters. In addition, OSHA is renumbering this paragraph to be (f)(8)(vi)(B).

OSHA proposed in paragraph (f)(8)(vii)(D) that an automatic detector be provided that will interrupt power to the hoisting motors and apply the primary brakes if any suspension wire rope becomes slack. Hoberg (EX. 19B, 19C; TR 2/19, pp. 79, 122, 123) and Douglas A. Greenaway (EX. 15-8) supported this provision. Hoberg noted, however, that this is the most commonly removed safety device because it is nearly impossible to move the platform to a new station if it is necessary to ground rig or store the platform. As soon as the platform sets down, the motors stop, and there is no wire rope slack available. This commenter, therefore, suggested that a constant pressure bypass switch provision be made available during rigging operations.

OSHA believes the suggestion proposed by Mr. Hoberg has merit and this is included in the Final Rule. In addition OSHA is rephrasing the paragraph for clarification and

renumbering the paragraph to be (f)(8)(vi)(C).

Several commenters (EX. 9-30; 15-8; 19B, 19C) recommended that OSHA apply the requirements addressing directional limit switches to self-powered platforms. Richard W. Hoffman (EX. 9-30) stated that these requirements are as pertinent to self-powered equipment as they are to roof powered equipment. In addition, Daigel (EX. 9-31) recommended that OSHA delete the phrase "if required by the configuration of the building" in the requirement addressing lower directional switches. Mr. Daigel believed that some form of lower limit protection is required for all powered platforms.

OSHA accepts the recommendations presented by the commenters and is revising these proposed provisions in the Final Rule. In addition, the paragraphs are combined in one paragraph in (f)(8)(vii). OSHA notes that the lower directional limit switch requirements are especially important when platforms are used over skylights and atriums.

A commenter (EX. 9-35) suggested that OSHA require emergency stop switches on all platforms, and not just on remote controlled, roof powered manned platforms, as required in proposed paragraph (f)(8)(ix). No accident data or other justification was provided by this commenter to support this suggestion. OSHA is retaining proposed paragraph (f)(8)(ix) in the Final Rule without change and is renumbering the paragraph to be (f)(8)(viii).

Hoberg (EX. 19C) recommended that OSHA require that an overload device be provided for cables which are in constant tension. This commenter stated that this requirement is necessary to prevent the tensioned cables from affecting the operation of the load limiting device required under proposed paragraph (f)(8)(vii)(C), or affecting the platform roll limiting requirement which affects stability under proposed paragraph (f)(5)(ii)(C). This commenter also stated that it was important that the setting of these overload devices be coordinated with the overload settings of other devices so as not to affect their proper function. In addition, the commenter noted that the overload device should be designed to interrupt equipment travel in the down direction when the tension limit is reached.

OSHA believes this recommendation has merit and is adding a provision in the Final Rule as paragraph (f)(8)(ix).

Paragraph (g) covers inspection and testing requirements. Daigel (EX. 9-31) suggested that OSHA add the word "initial" before the word "service" in

proposed paragraph (g). OSHA accepts this suggestion as an aid in clarifying when field testing must be done. This commenter further suggested that the phrase "no installation shall be subjected to a load in excess of 125 percent of its rated load" be added to this paragraph. The purpose of this addition is to forestall possible damage to an installation during initial testing and avoid exposure of employees to risks which might be incurred during subsequent operation of the installation. OSHA agrees with this commenter and his concerns about the hoist and is adding a modified phrase in the Final Rule to limit testing loads for hoists to 125 percent of their rated load.

Becor Western Inc. (EX. 9-37) recommended that OSHA add the phrase "at intervals specified by the manufacturer/ supplier" after the word "person" in paragraph (g)(2)(ii).

OSHA agrees with this commenter that such an addition to the requirement would contribute to a safer working environment for employees. Manufacturers and their agents, such as suppliers, can provide useful information to the employer/owner on inspection procedures as well as proper inspection intervals for the equipment they have supplied. In addition, this requirement would be consistent with the reference to manufacturer procedures required in proposed paragraph (g)(3). The addition to paragraph (g)(2)(ii) is made in the Final Rule. OSHA is substituting the term "competent person" for the term "qualified person" in paragraphs (g)(2)(i) and (g)(2)(ii) for the reasons noted earlier in the discussion on definitions of these terms.

Leonard Nork (TR 2/20, pp. 26, 59) and Acme Fabricators Inc. (EXH. 9-13) recommended that OSHA require that a recordkeeping program be provided by employers for the inspection of platform installations in proposed paragraphs (g)(2)(i) and (ii). It was their belief that these records be kept for the use of all concerned parties involved in the safety of the installation.

OSHA revised many of its existing recordkeeping requirements in 29 CFR Part 1910 in a Final Rule published in the Federal Register (51 FR 34552) on September 29, 1986. This rulemaking revision was in response to the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.), which set goals for the phased reduction of Federal information gathering activities. In this rulemaking, OSHA replaced provisions which required more detailed written records with provisions that would require a "certification record" to

distinguish the new form of documentation from the records previously required. The certification record contains the date the work was performed, the signature of the person who performed the work, and an identifier for the equipment or installation which was tested or inspected. For the purpose of maintaining a consistency with this certification record procedure used in other OSHA standards, and in response to the commenters, OSHA is requiring in paragraph (g)(2)(iii) that a certification record be kept by the building owner for the inspections and tests required in paragraphs (g)(2)(i) and (ii). OSHA believes, based on the past use of certification records, that such records provide useful information without an unnecessary recordkeeping burden. OSHA also notes that paragraphs (c)(1) and (c)(2) require the building owner to assure the employer on a continuing basis that the installation meets the major design and structural requirements of this standard.

OSHA requires, in paragraph (g)(2)(iv), that platforms be inspected for visible defects before every use and after each occurrence that could affect the platform's structural integrity. Several commenters (EX. 32, 87, 91) supported this requirement and it remains unchanged in the Final Rule, except the word "powered" is replaced with the word "working" since "working platform" is defined in the Final Rule.

Acme Fabricators Inc. (EX. 9-13) and Thomas J. O'Shea (TR 2/20, p. 314) supported the maintenance inspection requirements proposed in paragraph (g)(3). Other commenters and a hearing witness (EX. 9-37, 9-45; 87; TR 2/20, p. 26) recommended that OSHA include a requirement that a detailed maintenance log be kept for each inspection. California's Department of Industrial Relations (EX. 9-45) stated that a formalized record of maintenance kept on the site provides a uniform means of determining the maintenance status of the equipment to assure safe operations.

As noted previously in this document, OSHA has developed a method which requires building owners to provide a "certification record" for inspections and tests which are required to be performed. OSHA intends to use this certification requirement to ensure that maintenance inspections required in (g)(3)(i) are completed by the building owner. This certification requirement will not prohibit a building owner from maintaining additional records for his or her own use. The wording in proposed paragraph (g)(3) addressing certification is changed in paragraph (g)(3)(ii) of the

Final Rule to provide consistency with other certification provisions in the standard.

OSHA had intended to continue to require maintenance inspections to be performed at least every 30 days in proposed paragraph (g)(3), at the same frequency as required by paragraph (e)(3) of the present standard. The discussion on this frequency was found in the preamble to the Notice of Proposed Rulemaking in the Federal Register on January 22, 1985 (50 FR 2903). However, the language of proposed paragraph (g)(3), as published, appeared to allow periods of greater than 30 days. This was not OSHA's intention. As the preamble explained, the frequency was to remain the same as in the existing standard. Therefore, paragraph (g)(3) should have stated that the inspection and test of each platform shall be made every 30 days, except where the cleaning cycle is less than 30 days such inspections and tests shall be made prior to each cleaning cycle. OSHA is changing the proposed wording of paragraph (g)(3) in the Final Rule to correct this error in the maintenance inspection frequency. In addition, OSHA is substituting the term "competent person" for the term "qualified person" in paragraph (g)(3)(i) for the reasons noted in the definition section of this document.

OSHA proposed in paragraph (g)(4)(i) the inspection and testing of governors and secondary brakes at intervals not exceeding 12 months. Becor Western Inc. (EX. 9-37) suggested that OSHA require inspections "at intervals specified by the manufacturer/supplier" after the word "tested," but not to exceed 12 month intervals.

OSHA agrees with this commenter that the suggested addition would improve the working environment for employees. Manufacturers and suppliers provide employers with important information on proper inspection intervals and procedures for the equipment that has been provided. The addition to paragraph (g)(4)(i) is made in the Final Rule.

No comments were received on proposed paragraphs (g)(4)(ii), (iii) and (iv) and these are retained in the Final Rule.

OSHA is substituting the term "competent person" for the term "qualified person" in paragraph (g)(4)(v) for the reasons noted in the definitions section of this document.

Hoberg (TR 2/19, p. 80; EX. 19C) recommended that OSHA require a daily test be made of the secondary brake governor and actuating device before each day's use. This commenter

believed it was important that this be done to make sure that this equipment would operate properly if an emergency should occur. Harry Fisher (TR 2/19, p. 121) believed that this recommendation would be too restrictive for winding drum equipment where the brake and governor device are enclosed within the drum and not easily accessible. This commenter noted, however, that there are provisions on the drum of such equipment for inspection of the brake drum to make sure that the brake itself is free to move.

OSHA believes that the recommendation made by Mr. Hoberg has merit. Two recent investigations (EX. 100-1, 100-7) by OSHA of powered platform accidents have illustrated the need for this requirement. In each accident, secondary brakes did not function in an emergency situation and this resulted in the death of two employees. If a test of the secondary brake governor and activating device had been performed before use and appropriate corrective measures taken, the deaths might have been prevented. OSHA, therefore, is requiring at paragraph (g)(4)(vi) that a daily test be conducted of the secondary brake governor and actuating device before use. For equipment where this test is not feasible, as suggested by Harry Fisher (TR 3/20, p. 368), a visual inspection of this equipment will be required before use to ensure that the brake can function when necessary.

In the Notice of Hearing (50 FR 48222) OSHA requested comments on the proposed inspection and replacement requirements for suspension wire rope located in paragraph (g)(5). In addition, OSHA also requested comments on the related issue of suspension wire rope maintenance and inspection records.

Several commenters and a hearing witness (EX. 9-37, 15-8, 87; TR 2/19, p. 81) responded on the issue of wire rope maintenance and use. Hoberg (TR 2/19, p. 81) stated that in his opinion there were few properly installed and lubricated wire ropes that experienced fatigue or wear. This commenter also observed that there were many wire ropes left on roofs with little environmental protection for long periods of time before they were used.

Becor Western Inc. (EX. 9-37) and Carl J. Thurnau (EX. 87) supported requirements for wire rope maintenance and use. These commenters recommended requirements for proper wire rope storage to prevent damage or deterioration; proper installation to avoid crushing, nicks or sharp bends; and the following of unreeling and

lubricating provisions recommended by the wire rope manufacturer.

OSHA agrees with these commenters that the subject of wire rope maintenance and use should be addressed by OSHA. If the wire rope is not maintained and used properly, it will have reduced capability to suspend equipment and reduced ability to operate properly with the equipment. These factors can immediately increase the risk for employees using powered platforms. OSHA is not assigning specific requirements for wire rope maintenance and use because of the variety of suspension wire rope applications, and the need for the employer to follow the wire rope manufacturer's recommendations in these applications. In addition, OSHA notes that the New York State Department of Labor Standard 101 (EX. 87) requires suspension wire rope to be maintained in accordance with manufacturer's recommendations. OSHA, therefore, for the reasons stated, is requiring that the employer shall follow procedures recommended by the wire rope manufacturer in the maintenance and use of wire rope in paragraph (g)(5)(i) of the Final Rule.

On the subjects of wire rope inspection and replacement, OSHA received a significant number of comments on the issues of inspection frequency, who should inspect wire ropes, wire rope replacement criteria and inspection records.

On the first issue of inspection frequency, a number of commenters (EX. 87; TR 2/19, p. 81; 2/20, p. 491) supported the monthly inspection of suspension wire rope in proposed paragraph (g)(5). A number of other commenters (EX. 9-17, 9-37; 15-8; 87; TR 2/19, pp. 80, 193; TR 2/20, p. 491) suggested that OSHA also require a visual inspection of the wire rope before every use. Becor Western Inc. (TR 2/20, p. 491) believed it was essential that employees using the wire rope be trained to discover gross damage to the wire rope, which may be an immediate hazard, before using the platform.

OSHA agrees that a visual inspection of the wire rope for defects has merit. An OSHA fatality investigation involving a powered platform (EX. 100-7) revealed that the primary cause of the fatality was the failure of the suspension wire rope which had not been inspected on a regular basis. OSHA, therefore, is requiring in paragraph (g)(5)(ii) that a visual examination is to be made of a suspension wire rope by a competent person before every use. The term "competent person" is substituted for the term "qualified person" in paragraphs (g)(5)(ii) and (g)(5)(iii) for the

reasons noted in the definitions section of this document.

On the second issue, who should do the inspection of wire rope, Becor Western Inc. (TR 2/20, p. 491) and Hoberg (TR 2/19, p. 81) stated that a wire rope inspector should have the experience and training to judge the capability of the wire rope to continue to suspend equipment.

OSHA agrees, since the results of the monthly inspection are used to determine the need to replace the wire rope. This inspector would determine whether the wire rope has sufficient integrity to support the platform with the desired design factor until the next inspection is performed. OSHA, therefore, is requiring in paragraph (g)(5)(iii) of the Final Rule that a competent person conduct the monthly inspection of the suspension wire rope.

On the third issue, wire rope replacement, OSHA received many comments (EX. 9-25, 9-37; 15-8; 30; 87; 88; TR 2/19, p. 81, 159, 193; TR 2/20, pp. 41, 491) on whether the suspension wire rope should be replaced at a regular interval, or be replaced based on the condition of the wire rope at the time of inspection. This latter method was proposed in paragraph (g)(5). Leonard Nork (EX. 9-25, TR 2/20, p. 41) suggested that OSHA require wire rope to be replaced on an 18-month interval, rather than rely only on replacement criteria used during an inspection. This commenter believed it was the only way to ensure that deficient wire ropes would be replaced on a regular basis.

Some commenters (EX. 87; TR 2/19, p. 81; TR 2/20, p. 491) suggested that OSHA require wire rope replacement at a specified interval, in addition to relying on the results of regular inspections of the wire rope. Hoberg (EX. 88) suggested that a wire rope might continue in use after a specified interval had passed if a qualified person inspected the wire rope and found it in good condition.

Other commenters (EX. 9-37; 15-8; 30; TR 2/19, pp. 159, 193; TR 2/20, p. 491) rejected the use of a specified interval and supported OSHA's provision in proposed paragraph (g)(5) which states that the need for replacement shall be determined by regular inspection and based on the condition of the wire rope inspected. Becor Western Inc. (EX. 9.37) noted that it would be difficult to establish a proper wire rope replacement interval because of the variety of factors which affect wire rope at each worksite, such as environment, maintenance and usage. This commenter believed that a daily inspection by the operators of the platform, a thorough monthly inspection by a qualified

person, and the use of proper replacement criteria during the inspection would be the best program for determining the need for wire rope replacement.

In addition, Becor Western Inc. (EX. 9-37) recommended that OSHA transfer the wire rope replacement criteria, which were proposed for inclusion in the non-mandatory Appendix A, to the standard itself. This commenter stated that OSHA should list the criteria in the standard that would serve as the minimum conditions for replacing the wire rope during an inspection.

OSHA has considered all the comments on the issue of wire rope replacement and has determined that the proposed method in paragraph (g)(5) of replacing wire rope is the preferred method, and is retained in the Final Rule. This method provides for daily and monthly inspections by qualified persons and the use of criteria for determining the need to replace the wire rope. This determination is based on several reasons.

First, in addition to the proposed monthly inspection, OSHA is requiring in paragraph (g)(5)(ii) that the wire rope be inspected before every use for gross deficiencies. This inspection will provide an early alert on any wire rope deterioration.

Second, OSHA is requiring in paragraph (g)(5)(iii) that the monthly inspection be conducted by a competent person. This requirement will enhance the quality of the inspection conducted since the replacement of the rope is a decision based on the replacement criteria and the judgment and experience of the inspector. Replacement of the wire rope in this method is focused on the capability of the wire rope to suspend equipment, and not an arbitrary replacement interval.

Third, the selection of a specific rope replacement interval for all wire rope would be arbitrary and without any supporting data to justify the selected interval. The life of a wire rope on a worksite is greatly affected by such variables as exposure to the environment, proper handling, storage, usage and maintenance. In addition, the use of a mandatory replacement interval may cause some employers to rely more on this as a means of wire rope replacement control, and less on a regular inspection by a competent person during the intervening period. Also, if an inspection by a competent person shows the wire rope to be sound, it would be unnecessary and costly to discard the wire rope because a mandatory replacement time has been reached.

OSHA is requiring in paragraph (g)(5)(i) that the employer shall follow procedures recommended by the wire rope manufacturer in the maintenance and use of the wire rope. The adherence to these manufacturer's recommendations by the employer would have a noticeable effect on the life of the wire rope, and would be a major factor affecting wire rope replacement.

Since OSHA is requiring in paragraph (g)(iv) that the wire rope be replaced based on the condition found during an inspection of the wire rope, it is appropriate that the minimum conditions for replacement be listed in the standard rather than the Appendix. The listing of these minimum criteria does not prevent the employer from using more stringent criteria in determining the need for replacing wire rope during an inspection. OSHA, therefore, is transferring the wire rope replacement criteria from Appendix A to paragraph (g)(5)(iv)(A).

A number of comments were received on the wire rope replacement criteria listed in proposed Appendix A. Some commenters (EX. 9-19, 15-8, 19B, 30) and a hearing witness (TR 2/20, p. 493) suggested that wire ropes should be removed if four randomly distributed broken wires are found in three lays or if two broken wires are found in one strand of three lays. Hoberg (EX. 19B) recommended that Table 1 in proposed Appendix A be clarified to show that replacement criteria can be either three wires in one strand or six wires in one rope lay. The MacWhyte Company (EX. 30) also noted that wire rope classification, as shown in Table 1, is not a factor in the criteria for wire rope replacement according to the *Wire Rope Users Manual*, Second Edition, 1981. This criteria is listed on page 57 (Table 13) of the Manual published by the American Iron and Steel Institute.

OSHA has considered all the comments and related available information and determined that three broken wires in one strand, or six broken wires in one rope lay, is a sufficient condition for replacement of a wire rope, regardless of its classification. Table 1 in Appendix A is being deleted, and the information from that table is renumbered as paragraph (g)(5)(iv)(A).

No comments were received on two other listed conditions for wire rope removal, which included rope distortion from crushing or kinking and evidence of heat damage. These conditions are listed in paragraphs (g)(5)(iv)(B) and (C) of the Final Rule.

The reduction of the original wire rope diameter was listed as a criterion for

wire rope removal in proposed Appendix A. Hoberg (EX. 19B) suggested that for the measurement to be meaningful the diameter measurement of the wire rope should be done while it is under a specified load and compared against previous measurements of the original rope diameter under the same load. However, the Manual points out that even using these criteria may not always indicate the need for removal. The Manual lists the various conditions which may reduce rope diameter (Manual, page 53). Each safety related listed condition, such as abrasion, corrosion, loosening of rope lay and inner wire breakage has been separately identified by OSHA as an independent reason for removing the rope (§ 1910.66(g)(5)(iv)). Further, some reasons for rope diameter reduction are not safety related. Therefore, as recommended by the Manual, OSHA has omitted the reduction of wire rope diameter as a criterion for determining wire rope replacement. Therefore, the listed criteria in the Final Rule and the wire rope inspector's knowledge and experience should provide a sufficient basis for making the proper decision in replacing wire rope.

No comments were received on other wire rope replacement criteria listed in the proposed Appendix A, such as rusting, corrosion and pitting. OSHA is retaining these criteria and these are listed in paragraphs (g)(5)(iv)(D) and (F).

Two broken wires in the vicinity of end attachments was listed as a criterion for wire rope replacement in proposed Appendix A. Hoberg (EX. 19B) recommended that wire rope be replaced if a wire break occurred within 18 inches (460.8 mm) of the end attachments. From his experience, this commenter believed that a wire break in this area of the wire rope is significant since it is an indicator of severe stress conditions existing near the termination. OSHA also notes that the present phrase "in the vicinity of the end attachments" does not provide an inspector with a defined area of inspection for wire breaks.

OSHA, therefore, believes this comment has merit and is including the instance of a wire break occurring within 18 inches (460.8 mm) of the end attachments as a condition for wire rope removal. This criterion is listed in paragraph (g)(5)(iv)(E).

Proposed Appendix A lists core failure as another criterion for wire rope removal. Hoberg (EX. 19B) suggested that protrusion of the wire rope core be considered as evidence of core failure. This suggestion is supported by a statement on page 55 of the Manual.

OSHA accepts this suggestion and is modifying the criterion accordingly in paragraph (g)(5)(iv)(G).

Another condition for wire rope removal listed in the proposal, a valley break, is retained as paragraph (g)(5)(iv)(H). A "valley break" is a break in a wire located in one of two adjacent strands in a wire rope.

Hoberg (EX. 19B) noted that a wire rope is subjected to a significant amount of abrasion during its use, and suggested that the wire rope be replaced if the outer wire of the rope has lost one-third of the original diameter. This suggestion is supported by a statement on abrasion of wire rope on page 52 of the Manual.

OSHA recognizes the need to address severe abrasion of the wire rope as one of the criterion for replacement, and is including this in the Final Rule as a condition for wire rope removal. This condition is listed in paragraph (g)(5)(iv)(I).

On the fourth issue, inspection records, the California Department of Industrial Relations (EX. 9-45) and Becor Western Inc. (EX. 9-37, TR 2/20, p. 492) suggested that OSHA require written, dated and signed reports of the wire rope conditions found during monthly inspections, and that these reports be kept on file. California's Department of Industrial Relations stated that detailed records of wire rope inspections are necessary for efficient preventive maintenance practices.

OSHA agrees that a record of the wire rope monthly inspection is necessary to ensure its completion on a regular basis. As noted previously in this document, OSHA has developed a method which requires building owners to provide a "certification record" for inspections which are required to be performed. OSHA intends to use this certification requirement to ensure that wire rope inspections required in paragraph (G)(5)(iii) are completed by the building owners. OSHA, therefore, is requiring a certification record for each monthly inspection in paragraph (g)(5)(v) of the Final Rule.

Douglas A. Greenaway (EX. 15-8) supported proposed paragraph (g)(6) which addressed the testing of a hoist in the lifting direction prior to the lowering of personnel below the top elevation of the building. Lawrence R. Stafford (EX. 9-35) suggested that the provision be eliminated, since he believed this requirement would be fulfilled by the nature of the use of a platform. After consideration of the comments on this provision, OSHA is retaining it in the Final Rule under paragraph (g)(6).

A number of hearing testifiers (TR 2/20, pp. 314, 370; TR 2/21, p. 18) and a

commenter (EX. 87) supported proposed paragraph (h)(1) which required equipment that affected safe operation to be maintained in proper working order. Harry Fisher (TR 2/20, p. 370) noted that in his experience, the lack of maintenance and training were the major causes of accidents.

OSHA is retaining this requirement in paragraph (h)(1) in the Final Rule.

Paragraphs (h)(2)(i) and (h)(2)(ii) required the cleaning of parts which are affected by dirt or other contaminants, and are basically unchanged from the proposal. In proposed paragraph (h)(2)(i), the phrase "and free from dirt" is redundant and OSHA has deleted this phrase in the Final Rule.

Douglas A. Greenaway (EX. 15-8), supported proposed paragraphs (h)(3) (i), (ii) and (iii) which addressed periodic resocketing of wire rope fastenings. OSHA is retaining these requirements in paragraphs (h)(3) (i), (ii) and (iii) in the Final Rule. The term "babbitted fastenings" is replaced with the term "poured sockets." The reason for this change is given in the explanation for deleting the definition for "babbitted fastenings" earlier in this document.

In the Notice of Hearing (50 FR 48222), OSHA requested comments on a recommendation made by a pre-hearing commenter that the proposed requirement for periodic reshackling of suspension wire ropes (paragraph (h)(4)) be deleted. This commenter had stated that the periodic reshackling requirement would be more appropriate to the elevator industry, since the wire ropes used for elevators were more subject to failure due to more frequent operation of the equipment it suspended.

Leonard Nork (EX. 9-25) suggested that the interval between reshackling be decreased from 24 months to 18 months. No justification was given for this suggested change in frequency.

James W. Fortune (TR 2/19, p. 194) and Hoberg (TR 2/19, p. 82) recommended that OSHA retain the proposed requirement in the Final Rule. Mr. Fortune stated that the shackles are exposed to the elements, corrosion and caustic chemicals. In addition, he said that it was difficult to ascertain the condition of the wire rope inside the shackle.

OSHA agrees that reshackling of the suspension wire rope is necessary at a designated interval to maintain a reasonable level of safety for platform occupants. OSHA, therefore, is retaining this requirement in the Final Rule at paragraph (h)(4).

No comments were received on proposed paragraph (h)(5) which addressed the maintenance of roof

systems. OSHA is retaining this provision in paragraph (h)(5) in the final rule.

Douglas A. Greenaway (EX. 15-8) supported proposed paragraphs (h)(6) and (h)(7) which addressed the maintenance of building face guiding members and the prohibition against making a safety device inoperative. OSHA is retaining both provisions in paragraphs (h)(6) and (h)(7) in the Final Rule.

Several hearing witnesses (TR 2/19, p. 83; TR 2/20, pp. 26, 102, 314) and a commenter (EX. 87) supported proposed paragraph (i)(1)(i) which required that employees be proficient in the operation, safe use and inspection of the particular platform they are operating. Lawrence R. Stafford (TR 2/20, p. 102) stated that it should be mandatory that each employer ensure that his or her employees use the equipment as it has been designed to be used.

OSHA is retaining this requirement in paragraph (i)(1)(i) in the Final Rule. The requirement to train all employees who work on powered platforms in their safe operation and inspection does not specify frequency of training. OSHA did not specify frequency because of the varying patterns of employment in the industry, with some employees working constantly for contractors doing building maintenance and others doing occasional maintenance on buildings their employers own. OSHA expects that employers will evaluate the need for refresher training based on the difference in equipment and buildings and the amount of time elapsed since the last training session.

The word "powered" in proposed paragraphs (i)(1)(i) (i)(1)(ii), (i)(1)(ii)(B), (i)(1)(iii) and (i)(1)(iv) is changed to "working" in the Final Rule since the term "working platform" is defined in the standard.

A significant number of commenters (EX. 9-20, 15-8, 15-12; 38-3; 86-2; 88-6; 89) and hearing witnesses (TR 2/20, pp. 269, 278, 322, 370, 462, 494; TR 2/21, pp. 8, 17, 79) supported proposed paragraph (i)(1)(ii)(A) which required employee training in recognizing and preventing safety hazards associated with individual work tasks. The Window Cleaning Contractors Association (EX. TR 2/20, p. 462) and Becor Western Inc. (EX. TR 2/20, p. 494) each have developed training programs for employees which are now being used. Lee Herzog (TR 2/21, p. 17) stated that Canada has an employee training program for platform operators organized by manufacturers and distributors, in conjunction with a trade school. The Scaffold Industries Association (EX. 86-2) was developing a

training program for its member companies at the time of the hearing.

Harry Fisher (TR 2/20, p. 370) of Spider Staging Sales Company stated that in his experience one of the major causes of platform accidents was the lack of training of the employee prior to the accident.

OSHA agrees that training of employees is as important as any other aspect of the standard for powered platforms. In Appendix A, paragraph 10 of the Final Rule, OSHA provides guidelines for employee training programs. Specific training requirements for their employees are to be determined by each employer.

OSHA is retaining paragraph (i)(1)(ii)(A), which addresses training, in the Final Rule.

Proposed paragraph (i)(1)(ii)(B) addresses the need for employee training in recognizing and preventing safety hazards on the particular type of platform being used. A large number of commenters (EX. 15-3, 15-8, 15-18, 37-2, 49-1, 87) and hearing witnesses (TR 2/20, pp. 36, 469; TR 2/21, pp. 12, 13, 17, 148) supported the need for this requirement. Leonard Nork (TR 2/20, p. 36) noted that employees must be trained in the use of different equipment they will be using because of the variations in equipment, stabilization methods and worksite conditions. Douglas A. Greenaway (EX. 15-8), emphasized that the equipment should be used only by persons who have been instructed and trained in its use. Carl J. Thurnau (EX. 87) submitted a copy of the New York State Department of Labor regulations which address the standard conditions for the operation and maintenance of this equipment. One of the conditions requires a person who operates a powered platform to be thoroughly instructed in its use and control.

In addition, OSHA notes that lack of employee training in a specific platform installation was one of the major causes in at least four different powered platform accidents (EX. 97, 98, 100-3, 100-4). These accidents resulted in the death of two employees and in serious injuries to five other employees. In response to the comments received and the pertinent accident data, OSHA is retaining proposed paragraph (i)(1)(ii)(B) in the Final Rule.

Paragraph (i)(1)(ii)(C) required that employees be trained in emergency action plan procedures. Brian L. Gartner (EX. 37-2) and Lee B. Herzog (EX. 58) strongly supported the need for this requirement. Mr. Gartner believed that teaching an employee to be prepared for an emergency on an elevated powered

platform is as important as teaching him his operating work procedures. Mr. Herzog provided information on the difficulty encountered by firemen in attempting to rescue untrained workers who were stranded on an elevated powered platform.

OSHA agrees with these commenters and is retaining proposed paragraph (i)(1)(iii)(C) in the Final Rule.

Several commenters and hearing witnesses (EX. 9-1, 15-8; TR 2/20, p. 463, TR 2/21, p. 8) supported proposed paragraph (i)(1)(iii) which requires that a qualified person shall train employees in the operation and inspection of a platform. Douglas A. Greenaway (EX. 15-8), endorsed the need for employees to receive instruction by a qualified person in the use and control of a powered platform. Jacquelyn Kopp (TR 2/20, p. 463) suggested that this qualified person could be the building engineer, the foreman or the employer. Pedus Building Services (EX. 9-1) suggested that the instructor (qualified person) have no less than five years of work experience.

OSHA is in agreement with these commenters that employees should receive instructions only from a person who has had the proper experience and training. The proper selection of instructors for this purpose is critical in the safety training of employees and should be given due consideration by the employer. OSHA, however, does not believe it should specify the number of years of experience an instructor should have to be considered qualified. The term "competent person" is substituted for the term "qualified person" in paragraph (i)(1)(iii) for the reasons noted in the definitions section of this document.

In the Notice of Hearing (50 FR 48222), OSHA requested specific comment on proposed paragraph (i)(1)(iv) which required that written work procedures be provided for employee training. OSHA was seeking information on whether employers can use other methods of employee training in lieu of written work procedures as the core of the training program.

A significant number of commenters (EX. 14-1, 14-13, 15-4, 15-18, 86-2, 87, 88-6) and hearing witnesses (TR 2/19, pp. 83, 238, 248; TR 2/20, pp. 314, 324, 463, 502) overwhelmingly supported the need to require written work procedures for operator training. The Travelers Insurance Company (EX. 14-1) noted that its experience in reviewing employee training programs has shown that those programs which include written work procedures are far superior to those that do not have such procedures.

Daigel (TR 2/19, p. 238) noted that the complexity of current building exteriors and atriums requires designs by professional engineers, and detailed instructions for employees who are to maintain the facades of these buildings through the use of powered platforms. He claimed such detailed instructions are necessary to properly train employees in the rigging and operation of platforms used on new buildings with complex exteriors and atriums.

The Tennessee Valley Administration (EXH. 14-3) noted that written operating procedures, if properly prepared, provide continuity and consistency to the training effort. Related to this comment, Thomas J. O'Shea (TR 2/20, p. 314) stated that written procedures are important in the training of initial and future operators of powered platforms, since this training method insures training uniformity in an industry that experiences a high turnover in instructors and building managers who are responsible for the training.

A number of commenters (EXS. 15-18, 87) and hearing witnesses (TR 2/19, p. 248, TR 2/20, p. 463) stated that many of the manufacturers of this equipment provide operating manuals which employers can use as a basis for training their employees. Some manufacturers (TR 2/20, p. 502, EX. 9-13) conduct free operator training programs, using written work procedures, for employers who purchase their equipment. For example, Becor Western (EX. 55), a hoist manufacturer, conducts training programs for employees who use their equipment. This company, which utilizes written instructions in its training program, claimed that no one who had ever gone through their training program had ever been involved in an accident involving their equipment. A platform manufacturer, Spider Staging Sales Company (EX. 87), provides its customers with a written operating and maintenance plan for the equipment. An employer can utilize such a written plan in developing his own work procedures for training his employees.

Several employer organizations recommended the use of written work procedures for training. First, the Window Cleaning Contractors Association (TR 2/20 p. 463) strongly supported the need for written instructions in employee training. This Association stated that these instructions should be available to employees at all times should any question arise as work progresses on the job site. The Association also noted that the manufacturer can supply much of the information needed to develop these instructions. Second, the Scaffold Industries Association (EX. 86) is

currently completing a core training program involving written procedures, which will be available to all members. The training program can then be supplemented as necessary by employers to suit their own training needs.

Hoberg (EX. 88-6) and the Window Cleaning Contractors Association (TR 2/20, p. 463) suggested the use of pictorial instructions when necessary. These commenters believed this type of instruction would be useful in communicating with employees having a language disability, and with those employees who must be familiar with a variety of rigging, operating and inspecting procedures for different building installations.

No objections were raised by any commenter or hearing witness to the use of written work procedures in employee training.

After consideration of the many comments received supporting the requirement for written work procedures, OSHA is in agreement with the commenters that this proposed provision should be retained. In addition to the reasons given by the commenters, OSHA has a number of other concerns which support the need for this requirement.

First, employees cannot be reasonably expected to remember work procedures for the rigging, operation and inspection of platforms with different stabilization systems that are used on a variety of building exteriors and interiors, each of which are only maintained two or three times a year.

Second, in some areas of the United States, where the literacy rate and the language facility for operators is low, it is absolutely necessary to provide appropriate communication materials in a training program for such operators. Pictorial instructions, in lieu of written instructions, may be very useful in these areas.

Third, the elevated work environment of a powered platform operator, by its very nature, can be very hazardous if the operator does not receive and have ready access to detailed instructions in the safe operation of the equipment, and is prepared to handle emergencies when they occur. The record indicates that a lack of proper training has directly contributed to the death of at least one platform operator. An OSHA investigation (EX. 100-4) of a powered platform fatality and the injury of another employee revealed that lack of proper training was a major factor in causing the accident.

Fourth, the potential is great for serious injury or death to other

employees and public individuals below the platform due to unsafe practices or equipment failure.

OSHA, therefore, is retaining the requirement that the employer provide written work procedures at paragraph (i)(1)(iv) and is adding the requirement that employees be trained in these work procedures at paragraph (i)(1)(ii)(D). In addition, OSHA is permitting the use of pictorial methods of instruction, in lieu of written work procedures, if the training of employees is improved through the use of this method.

OSHA is transferring the training requirement for personal fall arrest systems from proposed Appendix D to the training section of the standard itself, under paragraph (i)(1)(ii)(E). This was done to consolidate all the training requirements in one section of the standard. USTAG (EX. 8-33) supported the proposed requirement for employee training in personal fall arrest systems and recommended minor clarifications to the provision. OSHA agrees with these recommendations and these have been included in paragraph (i)(1)(ii)(e).

A large number of commenters (EXS. 9-13, 15-8, 15-18) and hearing witnesses (TR 2/20, pp. 26, 55, 495, 500; TR 2/21, pp. 9, 17) have suggested various means by which OSHA should require written certification from the employer that an employee has satisfactorily completed his or her training. Becor Western (TR 2/20, p. 500) and Douglas A. Greenaway (EX. 15-8) have suggested that a certificate should be given to an employee by whoever performs the training. Leonard Nork (TR 2/20, p. 26) suggested that a record be kept of the date each employee was trained and the responsible instructor. Acme Fabricators Inc. (EX. 9-13) suggested that the employer be responsible for showing visible evidence that his or her employees have attended the necessary training sessions.

OSHA believes that the commenters' suggestions have merit. There is a definite need to insure that employees have been properly trained before working on elevated platforms, since equipment failures and improper operating practices can be hazardous. A record of such training is an important part of any employee training program. The record serves as a basis for determining the proficiency of operators on the platforms they are using for maintenance, as required in paragraph (i)(1)(i).

For consistency with other "certification record" requirements used in this standard, OSHA is requiring in paragraph (i)(1)(v) that the employer certify in writing that an employee has received training in the safe operation

and inspection of a particular powered platform. The certification record would not prohibit employers from maintaining additional training records for their own use. Employers can comply with this requirement in such a way which least disrupts their operation. The employer may choose any method deemed to demonstrate compliance with the training requirements as long as it provides the identity of the person trained, the signature of the employer or person who conducted the training, and the date the training was completed.

Paragraph (i)(2)(i) addresses the loading of powered platforms. The R. D. Werner Company Inc. (EX. 9-34) noted that the phrase "not be loaded in excess of their maximum intended load ratings" was ambiguous and needed clarification. This commenter suggested that the load ratings be defined to include the load of the users and any material on the platform.

OSHA agrees, and is changing the provision to require that platform not be loaded in excess of the rated load. Paragraph (i)(2)(ii) in the proposal prohibited employees from working on platforms covered with "slippery materials, and it remains unchanged in the Final Rule.

In the Notice of Hearing (50 FR 48222); OSHA requested specific comment on proposed paragraph (i)(2)(iii) which required that platform members, including wire and synthetic rope, be shielded when a heat producing process or a corrosive substance is used for maintenance purposes.

A number of commenters (EX. 9-34, 9-43; 19B, 19C) and a hearing witness (TR 2/20, p. 263) stated that the provisions were insufficient to address the hazards for employees when using a heat producing process or corrosives. R. D. Werner Company, Inc. (EX. 9-34) and Richard W. Hoffman (TR 2/20, p. 263) recommended that employers should follow the recommendations of qualified persons, such as the manufacturer of the platform and the producer of the corrosive substance, to protect the platform members and rope from damage. R. D. Werner Company, Inc. (EX. 9-34) also recommended that if a wire rope is contacted by a heat producing process, it should be considered permanently damaged and should not be used to support platforms. Spider Staging Sales Company (EX. 9-43) and Hoberg (EX. 19B) strongly suggested that the platform be washed down with a neutralizing solution if acids or corrosives are used.

OSHA is in agreement with these commenters that additional measures are required to address the hazards posed to platform occupants when they

use corrosives and heat producing processes. Most of the platforms built today are made of aluminum. Acids and corrosives have a tendency to degrade the heat treatment of the aluminum. This degradation greatly weakens the aluminum and makes it subject to failure. It is necessary, therefore, to take the necessary precautions to protect the platform members as well as the wire rope.

OSHA, therefore, is revising the proposed paragraph (i)(2)(iii) in the following manner:

First, employers will be required to follow the recommendations of acid or corrosive substance producers and the platform manufacturers to protect the platform members and wire rope from damage. If these recommendations are not available, the employer may obtain equivalent information from other available sources. In addition, the employer shall be required to wash down platforms with neutralizing solutions if exposed to acids or corrosives.

Second, in addition to protecting components of a platform and the wire or synthetic ropes when using a heat producing process, the employer shall not use ropes which have been contacted by a heat producing process to support a platform.

Paragraphs (i)(2)(iii) and (i)(2)(iv) in the Final Rule address these points.

Proposed paragraph (i)(2)(iv)(A) prohibited any work activity on a platform when the wind velocity at the platform level exceeded 40 miles per hour (64.3 km/hr). A number of commenters (EX. 9-31, 9-35, 9-37, 87) recommended that OSHA change this limitation to 25 miles per hour (40.2 km/hr). Leonard Nork (TR 2/20, p. 26) stated that the 40 miles per hour (64.3 km/hr) limitation is excessive, unsafe, and unnecessary.

OSHA has considered these comments in conjunction with other changes made to the proposal on the subject of wind velocity at paragraphs (e)(2)(iii)(A) and (e)(2)(iii)(C). The proposed 40 miles per hour (64.3 km/hr) velocity limitation was intended to serve as the design basis for the proposed 14-inch limit (355.6 mm) on platform displacement. Since this 14-inch (355.6 mm) limitation is eliminated in the Final Rule, the associated wind velocity of 40 miles per hour (64.3 km/hr) has also been eliminated.

Accordingly, OSHA is reducing and combining the verbiage in proposed paragraphs (i)(2)(iv)(A) and (B) by prohibiting work activity on all platforms, regardless of stabilization method, if the wind velocity exceeds 25

miles per hour (40.2 km/hr). The 25 mile per hour (40.2 km/hr) prohibition was supported by commenters (EX. 2-14, 2-22, 2-26, 2-28) who responded to questions raised on this subject in OSHA's Advance Notice of Proposed Rulemaking (48 FR 6368). In addition, the 25 mile per hour prohibition is also supported in the ANSI A120 draft standard—January 1986 (EX. 15-8). OSHA is permitting an exception to this limit on wind velocity of 25 miles per hour (40.2 km/hr) when the occupants are returning the platform to storage. Proposed paragraphs (i)(2)(iv)(A) and (B) are eliminated and replaced with renumbered paragraph (i)(2)(v) in the Final Rule.

Proposed paragraph (i)(2)(v) required that an anemometer be provided on the building to give information of on-site wind velocities prior to using the platform.

R. D. Werner Company, Inc. (EX. 9-34) stated that it was necessary for OSHA to define the location of the anemometer on the building, such as the roof, mid-height or ground level.

Some commenters (EX. 9-30, 19B) and hearing witnesses recommended that a portable (hand held) anemometer be used by platform occupants rather than relying on an anemometer located on the building. Richard W. Hoffman (EX. 9-30) stated that it was important to measure the wind velocity at the actual worksite while on the platform, while Hoberg (TR 2/19, p. 127) noted that roof-mounted anemometers cannot be relied on to give accurate wind velocity readings for each building face.

Leonard Nork (TR 2/20, p. 42) stated that, in the absence of building anemometers, employees have been using portable (hand held) anemometers on platforms in New York City.

OSHA has considered the comments addressing the issue of anemometers and makes a number of other observations. First, for employees to avoid working in winds in excess of 25 miles per hour (40.2 km/hr), it is necessary for them to have information on wind velocities just prior to and during their work periods on the platform. An anemometer on the roof of a building may have little or no correlation to the wind conditions on any given face of the building. It may record a much higher or much lower wind velocity than what is occurring at a work station area on the building face.

Second, due to current building designs which include irregular shapes and multi-roofs, one building face and elevation area could be virtually wind-free while at another nearby building face the wind could be quite strong.

Third, employers cannot rely only on local wind forecasts as a true measure of the wind velocity at a specific worksite.

Fourth, an anemometer mounted on a platform would provide employees with wind velocity information before and during any work activity on a building face.

OSHA, therefore, has concluded that proposed paragraph (i)(2)(v) should be changed and is requiring that an anemometer may be permanently mounted on the platform or it may be a portable (hand held) anemometer which is temporarily mounted on the platform during the working period. In addition, the phrase "on exterior installations" is added since an anemometer would not be required for interior installations (atriums).

Proposed paragraph (i)(2)(v) is replaced with renumbered paragraph (i)(2)(vi) in the Final Rule.

Paragraph (i)(2)(vii), which addresses the removal of unnecessary tools, materials and debris on a platform is changed from proposed paragraph (i)(2)(vi). As noted previously, paragraph (i)(2)(vii) incorporates the provision proposed in paragraph (f)(5)(v)(c).

Proposed paragraph (j) required employees to be protected by personal fall arrest systems and referenced an Appendix to the standard which covered fall arrest systems (originally proposed as Appendix D). Comments (EX. 14-1, 14-7, 15-4; TR 2/19, pp. 49, 198, 242; TR 2/20, p. 496, TR 2/21, p. 146) were received by OSHA on paragraph (j) and comments on similar issues were received on the proposed Appendix D. OSHA is addressing all of these issues in its response to comments received on the proposed Appendix D which follows. In addition, "Appendix D" in the proposal is redesignated as "Appendix C" in the Final Rule.

A new paragraph (k) is being added to establish an effective date of January 24, 1990. Paragraph (b) of the standard provides for different application of § 1910.66 to new and existing installations, depending on whether the installations are completed within 180 days of the effective date.

Appendices

The final standard contains four appendices. Two of the appendices, A and B, provide guidelines to assist employers and employees to implement provisions of the standard. Appendix C and D, however, set out mandatory provisions. Appendix C sets out the requirements for personal fall arrest systems, and Appendix D sets out the requirements for powered platform installations which exist or are

completed no later than 180 days following the effective date of the standard, and which were installed after the effective date of the unamended standard (August 27, 1971, 36 FR 10466).

OSHA notes that none of the statements in Appendices A and B should be construed as imposing a mandatory requirement on employers that is not otherwise imposed by the standard. In addition, these appendices are not intended to detract from any obligation that the standard imposes.

Appendix A

Some of the guideline data in proposed Appendix A have been changed or new data have been added in the final rule. These changes and additions were based on public comments that were received or information that has become available to OSHA since the proposal was issued.

Paragraph 1 describes the content of Appendix A and the options the employer has in complying with the standard.

Paragraph 2 (assurance) was added to provide additional information for employers to comply with the requirements of paragraph (c) in the Final Rule which required the owner of the installation to provide the employer with specific information.

Paragraph 3 (design requirements) was added to list some of the design criteria that a professional engineer would use in designing an installation as required in paragraphs (e)(1)(i) and (f)(1)(i) in the Final Rule.

Hoberg (EX. 19B, 106) suggested that the guide sizes listed for both internal and external tie-in guides in the proposal are too large for standard installations and should be changed in the Final Rule to a minimum of one inch (25 mm) deep, two inches (50 mm) wide, with a three-quarter inch (19 mm) throat. Spider Staging Sales Co. (EX. 9-43) also suggested that a reduction in guide sizes was warranted.

OSHA accepts this suggestion and is changing these items in Appendix A in the Final Rule and renumbering them as Paragraph 4.

Hoberg (EX. 19B) also recommended that OSHA should point out in Appendix A that a poor design of continuous tie-in guides frequently is the cause of a hazardous situation in the use of these units. OSHA believes this suggestion has merit and is including a reference to this design problem in Paragraph 4 of Appendix A of the Final Rule.

No comments were received on paragraph 5 of Appendix A and this remains unchanged in the Final Rule.

Paragraph 6, covering stabilizer tie lengths, is added in the Final Rule. Daigel (EX. 9-31) and Hoberg (TR 2/19, p. 60) agreed that a stabilizer tie should be long enough to affect the predetermined angulation of the suspension cables, but that OSHA should not, as proposed, consider the specific length alone to be an important factor in maintaining platform stability. OSHA accepts their recommendation that the Agency should emphasize the need for a stabilizer tie that is easily installed, and yet short enough not to become entangled in parts of the platform.

Based on testimony and comment, OSHA agrees that Appendix A should not list unique or specific materials and products. Building owners and employers should have the option of selecting any type of stabilization system which meets the performance criteria and suits their needs. Accordingly, OSHA is replacing specific terms for components and materials with generic terms in Paragraph 7 and other portions of Appendix A.

General maintenance guidelines proposed in paragraph 8 of Appendix A are retained in the Final Rule under paragraph 9.

Becor Western Inc. (EX. 9-39) recommended that OSHA use mandatory language in the training guidelines provided in proposed Appendix A. For example, this commenter recommended that OSHA require employers to use on-the-job training and formal classroom training rather than have them consider the use of these training methods in meeting the training requirement.

In response, OSHA notes that in paragraph (i)(1)(ii), employers are required to train their employees in the safe operation of platforms. The Appendix provides guidelines which can be used by the employer in meeting this performance requirement. In this way, the employer has the option of selecting methods which are most suitable for training employees in meeting the performance requirement in the specific workplace.

Becor Western Inc. (EX. 9-39) also recommended that OSHA add a requirement that the employer provide a certificate of training for employees completing a training program. Without this certificate, an employee would not be permitted to operate a platform.

OSHA notes, in response, that in paragraph (i)(1)(i) it is required that a platform be operated only by persons who are proficient in the operation, safe use and inspection of the particular powered platforms to be operated. The employer is then required to certify that

each employee has been trained. These requirements are utilized, in lieu of a requirement for a training certificate, to meet the goals of the Paperwork Reduction Act.

OSHA, therefore, is retaining the proposed training guidelines under item 10 in Appendix A of the Final Rule. In addition, the training guidelines are emphasizing the need to include employee instruction in handling emergencies at the workplace.

Guidelines for determining equivalency in the suspension and securing of powered platforms are retained in item 11 of Appendix A.

Appendix B

Appropriate changes are made in the text of Figures 2 and 3 of Appendix B to ensure consistency with relevant sections of the standard.

Appendix C

Paragraph (j) of the powered platform standard, § 1910.66(j), requires employees on powered platforms to be protected by personal fall arrest systems, meeting the requirements of Appendix C, Section I of this standard.

Appendix C, Section I establishes mandatory criteria and test methods for personal fall arrest systems. Section II sets out test methods which may be used to show compliance with certain criteria in Section I. Section III of the Appendix provides non-mandatory guidelines for employers to use in complying with the proposed criteria.

Appendix C is technologically feasible because it requires the use of personal fall protection systems that are already in use by many window washer and exterior building maintenance contractors. The performance criteria for personal fall protection components and systems are criteria that are well-established for manufacturers of this equipment.

OSHA has received a number of comments and testimony on the proposed Appendix. The following discussion summarizes this body of comments and testimony relative to Appendix C and identifies the changes to the proposal which have been made in this final rule and gives OSHA's reasons for the changes. It should be noted that this Appendix (Appendix C) had been proposed as Appendix D.

All comments and testimony received on the fall protection Appendix supported requirements that would protect employees on powered platforms from fall hazards. Two commenters recommended a separate standard (EXS. 8-14, 8-21), but supported the requirements in the proposed Appendix. Although OSHA

has placed fall protection requirements in a separate appendix, this in no way indicates that the fall protection requirements are less important than others pertaining to powered platform workers. The reasons for placing these requirements in an Appendix to the final rule relate to OSHA's intention to develop a generic fall protection equipment standard for general industry in the future. These reasons are discussed further in the summary and explanation of the scope and application paragraph of Appendix C (paragraph (a)) below.

One participant (EX. 9-31) questioned whether proposing to place the fall protection rules in an Appendix would limit rulemaking participation by equipment designers and manufacturers. It should be noted, however, that the trade association representing manufacturers of personal fall protection equipment, other equipment manufacturers, and the U.S. Technical Advisory Group on Personal Equipment for Protection Against Falling, ISO/TC94/SC4, all participated in this rulemaking by providing comments and testimony on proposed Appendix D. Therefore, OSHA believes that substantial public participation has taken place. Further, although OSHA plans to develop a separate "generic" standard for personal fall protection equipment (see Item 1539 (RIN: 1218-AA48) of the Semi-Annual Regulatory Agenda (52 FR 40527, October 26, 1987)), the Agency has determined that it is necessary at this time to provide requirements and performance criteria for personal fall protection equipment used on powered platforms to protect employees from fall hazards while working from these platforms, because of the significant risks of fall hazards faced by such employees.

OSHA has considered alternative approaches suggested by participants. The United States Technical Advisory Group, an advisory group representing Government and private interests on personal equipment for protection against falling, ISO/TC94/SC4 (USTAG) recommended a "substitute" appendix which, unlike the proposed appendix that only specified significant design criteria and overall "system" requirements, would define components and subsystems of personal fall arrest systems, and recommended that specific requirements be provided for these, as well as for the complete system (EX. 8-33). While OSHA does not object to this approach in theory, it cannot be accomplished until requirements and standards for all such components and subsystems have been developed and

validated. The USTAG did not recommend the actual requirements and test methods for components in their "substitute" appendix. There are no American National Standards, or other national consensus standards which include requirements for all the components and subsystems recommended for inclusion by the USTAG.

OSHA believes that it is not necessary to establish detailed requirements and test methods for all components and subsystems of a fall protection system in order to provide employee safety. The requirements set forth in Appendix C establish the performance criteria for the overall system as the employee would use it. OSHA believes that this will assure employee safety without addressing the specifics of all components. It should be noted that OSHA's approach in Appendix C does not preclude the future development of requirements for components, which could be accomplished by voluntary standards writing bodies. OSHA's systems approach is consistent with the approach currently taken in existing voluntary standards for personal fall protection equipment.

Paragraph (a) of Section I, scope, states that this section includes the requirements for personal fall arrest systems required for use by all employees using powered platforms. OSHA has determined that the provisions in Appendix C, Section I, contain appropriate requirements for personal fall arrest systems used by employees working on powered platforms, based on the record of this rulemaking. As noted earlier, however, the Agency is also currently developing a "generic" proposed rule which will provide criteria for such fall arrest systems wherever they are used in general industry. The comments and data on fall arrest systems which were submitted to the record of the powered platforms rulemaking are also being used in the development of the generic rule. OSHA anticipates that the provisions on personal fall arrest systems in Appendix C, Section I, of the powered platforms standard will be consistent with the proposed requirements for those systems in the proposed generic rule.

Ultimately, OSHA intends to apply the generic rule to all uses of personal fall arrest systems in general industry, including powered platforms. Accordingly, the rulemaking on the generic rule will raise the issue of whether Appendix C, Section I, should be superseded by the generic

requirements. One of the reasons for placing the fall arrest system requirements for powered platforms in a mandatory appendix instead of in the text of the standard itself was to facilitate its replacement in the future. Should OSHA later decide to apply the generic rule, the deletion of the appendix would not involve detailed reworking of the regulatory text in the powered platforms standard.

Paragraph (b) of Section I sets out definitions for terms used in Appendix C. OSHA is using the term "anchorage" rather than "fixed anchorage" as proposed. The rulemaking considered whether requirements for anchorages should be included in the criteria for personal fall arrest systems. USTAG recommended that the topic of anchorages be the subject of a separate standard for the voluntary standards community to address and for OSHA to then reference (EX. 8-33). At this time there are no separate voluntary standards for anchorages, so OSHA cannot rely on then for a proper and safe anchorage. OSHA disagrees with USTAG's view that an anchorage is not part of the personal fall arrest system, since without an anchorage the equipment will not function to arrest a fall. OSHA notes also that the equipment manufacturer, although usually not directly supplying the anchorage, can specify what anchorage is necessary to have the overall system function properly. Dr. Nigel Ellis in his written testimony (EX. 15-20) agrees with OSHA that the anchorage is part of the personal fall protection system.

Several comments were received on the definition of "body belt" (EXS. 8-14, 8-21, 8-33). All comments suggested deleting a reference to additional optional straps around the rib cage because it would combine two different types of equipment, i.e., body belts and chest-waist harnesses, into one definition. OSHA agrees with these comments and has deleted the reference to the secondary straps.

One comment was received on the definition of "buckle" (EX. 8-33) which suggested that the term was superfluous, and should be addressed in a separate national consensus standard for body support systems. OSHA disagrees since the term is used in the OSHA standard and there is not yet a national consensus standard for body support systems which includes this term. This definition has not been changed in the final standard.

One comment was received on the definition of "competent person" (EX. 8-33) which recommended that such a person must have technical competency

on more than just components. OSHA agrees with this comment and has revised the definition in the final standard to require knowledge in the complete system, its application and its use. The definition is similar to the definition of the same term in the powered platform standard, but is more specific as it relates to fall protection.

OSHA is replacing the proposed term "hardware" with the term "connector." Two comments stated that "hardware" was too broad and one suggested that the term "connector" be used instead (EXS. 8-21, 8-33). OSHA agrees with these suggestions, notes that "connector" connotes the specific function at issue, has deleted the term "hardware," replaced it with the term "connector" and has expanded the definition.

Comments were received on the definition of "deceleration device" (EXS. 8-33, 15-20). It was suggested that this term be eliminated and replaced with three terms, "fall arrester," "energy absorber," and "self-retracting lifeline/lanyard" because the examples listed by OSHA in its proposed definition of deceleration device serve varying combinations of the function of these three suggested components. In particular, it was pointed out that a rope grab may or may not serve to dissipate a substantial amount of energy in and of itself. The distinction that the commenter was making was that some components of the system were "fall arresters" (purpose to stop a fall), others were "energy absorbers" (purpose to brake a fall more comfortably), and others were "self-retracting lifeline/lanyards" (purpose to take slack out of the lifeline or lanyard to minimize free fall). OSHA notes however, that it is difficult to clearly separate all components into these three suggested categories since fall arrest (stopping) and energy absorption (braking) are closely related. In addition, many self-retracting lifeline/lanyards serve all three functions very well (a condition which the commenter labels as a "subsystem" or "hybrid component"). OSHA believes that the only practical way to accomplish what is suggested would be to have test methods and criteria for each of the three component functions. However, at this time, there are no national consensus standards or other accepted criteria for any of the three which OSHA could propose to adopt.

In addition, OSHA's approach in the final standard is to address personal fall arrest equipment on a system basis. Therefore, OSHA does not have separate requirements for "fall

arrestors," "energy absorbers" and "self-retracting lifeline/lanyards" because it is the performance of the complete system, as assembled, which is regulated by the OSHA standard. OSHA's final standard does not preclude the voluntary standards writing bodies from developing design standards for all of the various components and is supportive of this undertaking. OSHA notes that manufacturers may advertise specific attributes of deceleration devices, such as low arresting forces (shock absorbing qualities) and stopping distance (arresting qualities).

OSHA has, however, used the commenters' suggestions to clarify the definition of "deceleration device," as well as, further clarify the test methods applicable to the various assembled systems. This is discussed further below.

Several comments were received on the proposed definition for "deceleration distance" (EXS. 8-14, 8-33, 15-20). Concern was expressed by all commenters that it was only possible to evaluate the stopping distance for the device itself once it was activated. OSHA agrees with these comments and has revised the definition of deceleration distance to exclude lifeline elongation and any free fall distance which occurs before the device is activated. In addition, suggestions for clarification of the definition were accepted.

OSHA has added a definition for "equivalent" to clarify the meaning of this term as used in paragraph (c)(1), which provides for connectors made of equivalent materials to those made of drop forged, pressed or formed steel. "Equivalent" is defined to mean alternative designs, materials or methods to protect against a hazard 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.

Comments received on the proposed definition of "force factor" (EXS. 8-33, 15-20, 8-4, 8-27, 15-10) and testimony presented (2/19-258, 2/21-128, 2/21-140-142, 2/21-38, 39, 44, 45, 46) all suggest that the term "force factor" is confusing, even to systems experts, and that it would not be needed if the factor was incorporated into the test methods. OSHA agrees with these comments and is deleting the term "force factor" from the final standard, but is incorporating the concept in the test methods in Section II.

One comment was received on the proposed definition of free fall (EX. 8-33) suggesting that the phrase "personal

fall arrest system" should be used as well as the definition being further clarified to define when the free fall period ends. OSHA agrees with this suggestion and has revised the definition of free fall accordingly.

A comment was received on the proposed definition of "free fall distance" (EX. 8-33) which provided suggestions for clarification. OSHA agrees with this suggestion and has revised the definition of free fall distance accordingly, so that it is clear which extensions of equipment are excluded.

A commenter (EX. 8-33) pointed out that the proposed definition of body harness neglected to mention the pelvis as an important body support member and suggested a revised definition. OSHA agrees with the suggestion and has revised the definition of body harness accordingly.

USTAG (EX. 8-33) commented that the terms "lanyard," "lifeline," and "tie-off" which are used throughout the proposed standard are not defined and suggested that definitions be added for these terms. OSHA notes that the terms "rope grab" and "self-retracting lifeline/lanyard" which were used in the proposed standard were also not defined. OSHA believes that all these terms should be defined and has added definitions for each of the five terms in the final standard based on USTAG's comments.

Two comments were received on the proposed definition of "personal fall arrest system" (EX. 8-21, 8-33). Both suggested revisions to clarify the definition, and one recommended excluding "anchorages" from the definition. As discussed above, OSHA has determined that inclusion of anchorages in the system is proper. OSHA agrees with the other suggestions for clarification, and has revised the definition of personal fall arrest system accordingly.

USTAG (EX. 8-33, 2/21-39) recommended that a definition for qualified person be added since it is their belief that a qualified person is necessary for designing or selecting horizontal lifelines. Another commenter (EX. 15-20) recommended that a definition of qualified person be added and used in anchorage design. OSHA agrees with these comments and has added the suggested definition, which is consistent with other OSHA definitions.

Many comments (EX. 8-14, 8-21, 8-27, 8-33), and testimony (2/19-253, 259, 2/21-38, 47, 128) were received on "snap-hook." Suggestions were received to better define snap-hooks, distinguishing between locking and non-locking snap-hooks. OSHA agrees with the

suggestions for a more comprehensive definition and has revised the definition of snap-hook accordingly.

USTAG commented (EX. 8-33) that the term "strength factor," like the term "force factor," was useful in theoretical discussion but confusing when used in the standard. OSHA agrees with this comment and has deleted the terms "strength factor" and "force factor" from the definitions and final standard, but has incorporated them into paragraph (d)(1)(iv) by requiring that personal fall arrest systems withstand twice the potential impact load.

USTAG commented (EX. 8-33) that the term "total fall distance" should be revised to make it clear that lanyard extension is included in deceleration distance. OSHA agrees with this comment. However, for clarity, OSHA has decided to use the term "deceleration distance" in the performance requirements and has deleted the term "total fall distance" from the final standard.

Paragraph (c)(1), like the proposal, requires that connectors be drop forged, pressed or formed steel, or equivalent materials. Two comments stated that OSHA should require components to meet specific tests rather than specify design processing and materials (EX. 8-21, 8-33). However, tests have not been submitted which would assure the integrity of the hardware components. Therefore, OSHA is relying on specifications which were taken, in part, from the OSHA Construction Standards (29 CFR 1926.104(e)) on personal fall arrest equipment. OSHA's experience is that these criteria conform to industry practice and that conforming components are reliable. OSHA has limited this requirement to connectors (critical load bearing hardware) and has also allowed these components to be made of equivalent materials. Thus, OSHA believes that the requirement now addresses the proper components and is not overly restrictive since equivalent materials are permitted.

A commenter (EX. 8-33) suggested that paragraph (c)(2) require that hardware meet the ASTM Salt Spray Test Standard to evaluate whether it is corrosion-resistant as required by the provision. OSHA believes, however, that components made of inherently corrosion-resistant materials, such as those cadmium plated, are widely acknowledged and do not need testing. Therefore, OSHA has retained the requirement as proposed, with the exception of changing the term "hardware" to "connectors" for the reasons discussed above (see discussion of connector definition).

Paragraphs (c) (3), (5), (6), and (10) contain, among other criteria, various limits expressed in pounds and kilonewtons. For example, the breaking strength of lifelines and lanyards in tension is required to be a minimum of 5,000 pounds (22.2 kN). These limits are based on the general requirement, taken from the ANSI A10.14-1975 Standard, that a personal fall arrest system have an arresting force not to exceed 10 times gravity. Assuming a worker design weight of 250 pounds (113 kg), the maximum permitted force would be 2,500 pounds (11.1 kN) ($250 \times 10 = 2,500$). Applying a safety factor of at least two for the components of the personal fall arrest system, these components must then have a minimum strength of 5,000 pounds (22.2 kN), which is the basis for the strength requirements in these paragraphs. (The test methods contained in Section II of Appendix C may be used to demonstrate that the assembled personal fall arrest system also maintains a safety factor of at least two.)

In reviewing the strength and force requirements of paragraphs (c)(3), (c)(5), (c)(6), (c)(9), (c)(10), and (d)(1), the reader will note that four of the provisions require a strength of 5,000 pounds (22.2 kN), one provision (paragraph (c)(9)) requires a safety factor of at least two to one, and another provision (paragraph (d)(1)) requires the system limit arresting forces to 900 pounds (4 kN) for body belts and 1,800 pounds (8 kN) for body harnesses.

At a glance, it may appear that there may be some inconsistencies in these requirements. For example, applying a safety factor of two to one to the arresting force limit for harnesses yields 3,600 pounds (16 kN) ($2 \times 1,800$), which is significantly less than the 5,000 pounds (22.2 kN) required for other components, such as lanyards. However, even though the arresting force would not exceed 1,800 pounds (8 kN), the higher strength requirements of 5,000 pounds (22.2 kN) for components of the system are necessary because other factors affect the strength required for these components.

OSHA observes that comments and testimony presented by USTAG supported lowering the arresting force limits from those contained in the proposal, while at the same time supporting the higher strength limits (as proposed) for components, such as lanyards and snap-hooks. OSHA agrees with USTAG's comments that, even though the arresting force would not exceed 1,800 pounds (8 kN), the higher strength requirements of 5,000 pounds (22.2 kN) for components of the system

are necessary because other factors affect the strength required for these components. For instance, if knots are tied in lanyards or lifelines the strength may be reduced by one-half. Also, if lanyards or lifelines strike the edge of materials or obstructions during fall arrest, the cutting action on these components can be sustained by the larger diameter, stronger ropes that would be required to achieve the higher strength requirement. Similarly, if snap-hooks and dee-rings strike objects during fall arrest, the higher strength will be needed to prevent failure of the components due to loading in other than simple tensile loading (such as shear loading). The rationale for the lower arresting forces in paragraph (d)(1) is discussed below.

One commenter (EX. 8-33), recommended that the tensile strength of lifelines and lanyards, proposed as 5,000 pounds (22.2 kN) breaking strength, be evaluated using Federal Standard 191 Test Method 6015 or 6016. OSHA does not believe that a specific test procedure for breaking strength needs to be specified since all test procedures used by manufacturers and associations for rating breaking strength adequately evaluated these components. Therefore, OSHA has adopted the proposed wording, unchanged, for the final standard in paragraph (c)(3).

Several comments were received on paragraph (c)(4) (EXS. 8-21, 8-24, 8-27, 8-33, 15-20) regarding the strength and method for measuring the strength of self-retracting lifeline/lanyard devices. The comments pointed out that in their experience many self-retracting lifeline/lanyard devices do not sustain the proposed force of 3,000 pounds without the brake slipping. This slipping is a part of the design of the devices to reduce fall arrest forces to a safe level. Thus, OSHA has revised paragraph (c)(4) in the final standard to require the components of self-retracting lifeline/lanyard devices to sustain a load of 3,000 pounds (13.3 kN) with the lifeline or lanyard in the fully extended position. The lower strength requirement of 3,000 pounds (13.3 kN) is based on permitting a very limited free fall distance while maintaining a safety factor of at least two.

USTAG (8-33) recommended that energy absorbers used as separate system components be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN) when fully extended. OSHA agrees with this comment as it applies to rip-stitch lanyards, tearing and deforming lanyards, and self-retracting lifelines and lanyards which do not limit free fall

distance to two feet (0.61 m) or less, and has added this requirement for these deceleration devices as paragraph (c)(5) in the final standard.

Comments and testimony received on proposed paragraph (c)(5) (EXS. 8-33, 15-20, 36, 2/21-52, 75, 76, 91, 143) discussed whether or not 100 percent proof-testing (testing each part before use) of snap-hooks and dee-rings is necessary to assure that the proposed requirement for a tensile strength of 5,000 pounds (22.2 kN) is met. OSHA's intent is to require that snap-hooks and dee-rings not fail to a degree that they will not sustain a load of 5,000 pounds (22.2 kN). Thus, permanent deformation of the components is allowed provided the part can still support the load. Commenters were not concerned with this strength requirement, but rather that heat treating and other manufacturing processes be properly followed. USTAG (8-33, 2/21-39) and a manufacturer of dee-rings and snap-hooks (2/21-75, 76) recommended that 100 percent proof testing of these components at a reduced load, allowing no permanent deformation or loss of function, be added to the strength requirement to assure that the strength requirement is met, since it was their experience that the heat treating and other manufacturing processes used for these parts did not always result in the desired strength of the parts (which when proof tested showed some parts to be only half their intended strength). OSHA agrees with this recommendation and has retained the strength requirement in paragraph (c)(6) as proposed, and added a new requirement in paragraph (c)(7) which requires proof-testing of snap-hooks and dee-rings. Therefore, these components would need to be spotchecked at a strength of 5,000 pounds (22.2 kN) allowing permanent deformation, and 100 percent checked at a strength of 3,600 pounds (16 kN) allowing no permanent deformation or loss of function.

Many comments (EXS. 8-14, 8-21, 8-27, 8-33, 15-10, 15-20, 36) and much testimony (EXS. 2/19-253, 2/21-38, 47, 117, 129, 142) were received on snap-hook design. USTAG, as well as other individual commenters, recommended that only locking snap-hooks be allowed due to the possibility of non-locking snap-hooks becoming accidentally disengaged during use. A number of accidents involving accidental disengagement ("roll-out") were cited in support of this position (EX. 8-33). The Industrial Safety Equipment Association (ISEA) and several other commenters argued that locking snap-hooks would not always prevent "roll-out." In

addition, they pointed out that non-locking snap-hooks can be used safely as long as they are used properly (EX. 36). In particular, it was explained that a non-locking snap-hook must be matched with a dimensionally compatible attachment. Several commenters expressed the opinion that a locking snap-hook may also disengage if used with an incompatible connection. There is no evidence suggesting that locking snap-hooks have accidentally disengaged. In addition, comments and testimony received (EXS. 8-33, 36, 8-27, 2/19-259, 2/21-38, 47, 117, 129, 142) clearly supported a position that locking snap-hooks were superior to non-locking snap-hooks in minimizing "roll-out" accidents.

However, OSHA believes that the record shows that non-locking snap-hooks can be used safely, but only with dimensionally compatible attachments (2/19-254, 259). The use of dimensionally incompatible attachments with non-locking hooks is not acceptable because that practice increases the likelihood that the snap-hook will become disengaged. (A dimensionally compatible combination is one where the diameter of the dee-ring to which a snap-hook is attached is greater than the inside length of the snap-hook measured from the bottom (hinged end) of the snap-hook keeper to the inside curve of the top of the snap-hook, so that no matter how the dee-ring is positioned or moves (rolls) with the snap-hook attached, the dee-ring cannot touch the outside of the keeper so as to depress it open.) By contrast, OSHA believes that locking snap-hooks can be designed to prevent "roll-out" even if connected to incompatible attachments. Therefore, OSHA has added a provision to the final standard in paragraph (c)(8) which requires that snap-hooks have compatible dimensions in relation to the member to which they are connected so as to prevent unintentional disengagement of the snap-hook by depression of the snap-hook keeper by the connected member, or they shall be a locking type snap-hook designed to prevent disengagement of the snap-hook by the contact of the snap-hook keeper by the connected member.

Several comments (EXS. 8-4, 8-27, 8-33, 15-20, 2/21-39) were received on proposed paragraph (c)(6) and (c)(7) concerning horizontal lifelines, and anchorages. These comments were concerned about the difficulty in designing horizontal lifelines which could support 5,000 pounds (22.2 kN) per employee and the lack of a margin of safety in the proposed requirement for anchorage strength. Several of these

commenters recommended that anchorages and horizontal lifelines be selected or designed by a qualified person. USTAG recommended that the strength of anchorages be a minimum of twice the potential dynamic loading force if certified by a qualified person, 5,000 pounds (22.2 kN) strength if not certified. USTAG also recommended that horizontal lifelines be designed by qualified persons. OSHA agrees in principle with these comments and has revised its provisions dealing with horizontal lifelines and anchorages so that a qualified person is involved in the design and use of horizontal lifelines. Paragraph (c)(9) in the final standard requires horizontal lifelines to be designed, installed and used as a part of a complete personal fall arrest system which maintains a safety factor of at least two, under the supervision of a qualified person. Paragraph (c)(10) requires anchorages to be capable of supporting a minimum load of 5,000 pound (22.2 kN) per employee attached, or be designed, installed and used as part of a complete personal fall arrest system under the supervision of a qualified person and maintaining a safety factor of a least two.

USTAG (EX. 8-33) recommended that ropes and straps used in lanyards, lifelines, and strength components of body belts and body harnesses be made from synthetic fibers. This recommendation was made because the strength of natural fiber rope is not reliable or predictable as it ages during use. In addition, the strength deterioration of this type of rope is not obvious nor always detectable during inspection. OSHA's information (EX. 11-2) confirms this recommendation and the Agency has added a new requirement in paragraph (c)(11) of the final standard to address this subject.

A significant volume of testimony and comments was received on proposed paragraph (d) which contains the criteria for system performance.

OSHA proposed in paragraphs I(d)(1)(i) and I (e)(3) of Appendix D (now Appendix C) to allow body belts to be used for up to a six foot (1.8 m) free fall distance and up to a force limit of 10 times the worker's weight (10 gn) or 1,800 pounds (8 kN) whichever is less (50 FR 2890). This was consistent with ANSI A10.14-1975 (EX. 11-1), and a NBS report (EX. 11-2). OSHA noted, however, that the variances and the compliance directive (STD. 1-3.3) issued to allow intermittent stabilization systems for powered platforms required body harnesses to be used, rather than body belts. Also, the draft ISO standard would restrict the use of body belts in

fall arrest systems, and allow only body harnesses (EX. 11-3).

At the time of the proposal, OSHA also cited a study (EX. 11-4) which concluded that body belts should be prohibited because of their injury potential.

Recommended limitations on the use of body belts were also cited. They included two concepts: (1) Imposing a force limit, expressed in pounds, on the use of body belts and (2) allowing body belts to be used only for free falls of up to a specified distance, commonly two feet (0.6 m) (EXS. 11-5, 11-6).

After review of the comments and testimony relating to these issues as discussed further below, OSHA has decided that body belts may be used when the fall arrest system of which they are a part limits maximum arresting force on an employee to 900 pounds (4 kN) (paragraph (d)(1)(i)). Thus, the final rule has reduced the amount of arresting force permitted by half, from 1,800 to 900 pounds (8 kN-4 kN). OSHA believes that the final rule will protect employees against significant injury stemming from the use of body belts and that a total restriction on the use of body belts is unnecessary.

The reasons and evidence for these findings are as follows:

OSHA believes that the proper use of body belts, by trained personnel and subject to the restrictions in this appendix, is safe. Evidence concerning injury potential of using body belts, OSHA believes, relates to the improper use, or use under preventable unsafe conditions. For example, experiments of Dr. Maurice Amphoux were characterized as showing that the use of body belts is damaging, because the loads are concentrated on one strap (see EXS. 2/21-42). These studies found that prolonged suspension could result in injury. However, since OSHA has provided for prompt rescue (paragraph (e)(8)), and in light of other testimony showing the safe use of body belts in such conditions, OSHA believes that no inherent and inevitable damage flows merely from the use of body belts. Testimony from Dr. Nigel Ellis, also supported the proper use of body belts for fall arrest with limitations concerning suspension distance and rescue time (EXS. 2/21-123).

Systematic evidence on the injury potential of body belt use, based on actual use analysis was not available. Since in the past, fall protection has been provided for the most part by the use of body belts rather than harnesses, many participants testified generally on their knowledge of the performance of belts and of the inherent safety of using

belts. Leonard Nork, a representative of two unions whose members use powered platforms, testified that body belts are used just about exclusively in the State of New York on powered platforms (EXS. 3/20-46). Mr. Nork further stated that in over 30 years he did not know of any fatality caused by the use of a body belt (EXS. 3/20-48). Other participants testified of incidents where body belts allegedly caused injury, but first hand knowledge was lacking (EXS. 2/21-123). Mr. Nork also noted that there was worker resistance to the use of body harnesses because they "find them very, very cumbersome."

The Agency agrees with Mr. Nork that the degree of comfort provided by various systems is not relevant if "it can be demonstrated clearly that one system provides a greater measure of safety for workers" (see EXS. 3/20-48). However, the evidence on this record shows that belts can provide equivalent safety to harnesses when properly used, and the standard establishes the condition under which OSHA believes that such safety can be provided.

As stated above, OSHA has determined that body belt use must not exceed certain arrest force limitations. At the time of the proposal, OSHA believed that body belts could be safely used up to a force limit of 10 times the worker's weight or 1,800 pounds (8 kN) whichever is less. OSHA based this proposed limitation on the current ANSI standard (A10.14-1975, EX. 11-2), and an NBS Report (EX. 11-2).

Various participants supported different limitations: The Industrial Safety Equipment Association (ISEA) supported OSHA's proposed arresting force limitations. USTAG recommended that body belts be permitted only for work positioning and climbing protection. Even with such a limitation on use, USTAG recommended that maximum arrest force for body belts not exceed 900 pounds. USTAG stated that "empirical data from impact loading of humans and animals suggests that injury threshold may be in the neighborhood of 10 g's or even lower depending on [many variables]" (EX. 8-33). USTAG cited British standards which restrict the use of body belts to 5 g's for a 180 pound (82 kg) person (the equivalent of 900 pounds (4 kN) of force).

Based on the record, OSHA agrees with USTAG that a maximum arresting force of 1,800 pounds (8 kN) is acceptable when using a body harness but not acceptable when using a body belt. OSHA, therefore, is adopting the USTAG recommendation of a maximum force of 900 pounds (4 kN) as used in paragraphs (d)(1)(i) and (d)(1)(ii) of the

final standard. OSHA notes that USTAG's recommendation applied to the maximum permitted force for positioning systems, not to fall arrest equipment. OSHA believes, however, that there is no reason to distinguish these applications in terms of the permitted force limit.

OSHA also proposed to limit body belt use to a six foot (1.8 m) free fall distance, and has retained this provision in paragraph (e)(3) that requires the rigging of personal fall arrest systems to limit free falls to six feet (1.8 m) or less. OSHA believes that the comments and testimony in the record have not identified free fall distance alone as a causative element in injuries during fall arrest using body belts. Rather, the amount of time an employee is suspended, and the degree of force impacted on a fallen employee appear to be the primary critical causative factors. As stated above, OSHA has addressed both of these critical factors separately in the standard. With the general system limitation on free fall distance set at six feet (1.8 m), an arrest force limitation of 900 pounds (4 kN), and a requirement for prompt rescue, OSHA believes that employees will be protected from injury from the use of body belts.

In addressing the method of expressing arresting force limits, nearly all comments (EXS. 8-4, 8-27, 8-29, 8-32, 8-33) and hearing testimony (EXS. 2/19-259, 2/21-39, 2/21-117, 2/21-118, 2/21-127, 2/21-128) provided their recommendations in terms of pounds (kN) arresting force rather than acceleration of gravity. To avoid confusion, OSHA is also expressing the limits of arresting force in paragraph (d)(1)(i) in terms of pounds (kN) force.

The proposal would have required a personal fall arrest system to bring an employee to a complete stop, with a deceleration distance of 42 inches (1.07 m) or less (proposed (d)(1)(ii)). Comments (EXS. 8-24, 8-14) were received on this proposed requirement. One commenter (EX. 8-24) recommended that the system, "bring an employee to a complete stop within 72 inches plus the length of the lanyard from the original position of the rope grip before a fall occurs. This will allow for a shock absorber to open up to a distance of 60 inches, and for a travel of the rope grip of 12 inches as it closes its grip onto the rope." Another commenter stated, "the 42 inch deceleration distance may be applicable to rope grabs and deceleration devices, but is too restrictive when applied to an entire 'personal fall arrest system.'" This commenter pointed out that stretch of the lifeline alone could exceed 42 inches. OSHA agrees in principle with

these comments and, as previously discussed, has revised the definition of "deceleration distance" so that the 42 inches (1.07 m) of deceleration distance relates only to the operation of the deceleration device itself (by excluding the free fall and lifeline elongation distances). Unobstructed travel of the device or rope grab before it activates would be considered free fall distance. In addition, a shock absorber which opens to an overall length of 60 inches (1.52 m) would not be prohibited, provided the distance during deceleration (while the shock absorber stretches, rips, tears, elongates, etc.), does not exceed 42 inches (1.07 m). OSHA has retained the proposed requirement and editorially revised it as paragraph (d)(1)(iii) of the final standard.

The proposal would have required a personal fall arrest system to contain a "strength factor" of not less than two to one, based on a design weight of 250 pounds (113 kg) per employee (proposed (d)(1)(iii)). As discussed previously under the definition of "strength factor," the term "strength factor" and its use in the proposed standard are unnecessarily confusing (EXS. 8-27, 8-33) and therefore, OSHA has eliminated this term. The intent of this requirement was to require personal fall arrest systems to have a safety factor of at least two in their design. The proposed requirement has been replaced by a new requirement, paragraph (d)(1)(iv), in the final standard, which requires that personal fall arrest systems have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of six feet (1.8 m), or the free fall distance permitted by the system. The strength test in section II includes the necessary test weights and drop distances to assure a strength factor of at least two.

Paragraph (d)(2) states that personal fall arrest systems which meet the tests contained in section II of this appendix would be considered as complying with the proposed provisions (d)(1)(i) through (d)(1)(iv). Two comments (EXS. 8-14, 8-33) were received on this proposed requirement. One commenter suggested that other tests may be substituted if they provide equal protection when it is not possible (such as physical geometry of the systems) to run the tests in section II. USTAG recommended that test procedures in voluntary consensus standards be utilized, or if not available, testing be performed "in accordance with written test procedures of an accredited testing laboratory."

USTAG also suggested that the test required be correlated to specific

requirements in section I and that the test methods be mandatory (EX. 2/21-38).

In addressing the suggestions of USTAG and others, OSHA notes that with the definitions added, and the test methods revised and clarified in the final standard (as discussed below), there is no confusion as to which test methods apply to different types of personal fall arrest systems. Also, as discussed earlier, there are presently no applicable finalized consensus standards which OSHA could reference for testing. Additionally, no submissions to this record concerning written test procedures developed by U.S. laboratories for the types of equipment covered by the OSHA standard were made, and OSHA has no independent knowledge of such test procedures.

OSHA also agrees with the commenter who stated that the reference to test methods in section II for the provisions in paragraphs (d)(1)(i) through (d)(1)(iv) of the final standard should not be restrictive. The standard does not require that the performance criteria in paragraphs (d)(1)(i) through (iv) be met using the test methods in section II; it merely recognizes systems which meet those tests as being in compliance with those paragraphs. Other test methods may be used provided that they demonstrate compliance with the standard. OSHA envisions such methods being developed by a wide range of sources, including consensus groups and testing laboratories. The standard would allow the use of appropriate voluntary standards and test methods for personal fall arrest systems once they are completed. Accordingly, OSHA is retaining paragraph (d)(2) as paragraph (d)(2)(i) in the final standard which states only that personal fall arrest systems which meet the tests contained in section II of this appendix shall be considered as complying with the provisions of paragraphs (d)(1)(i) through (d)(1)(iv). However, the final rule also states that such compliance is assumed only when the system is used by employees having a combined person and tool weight of less than 310 pounds (140 kg). OSHA has added this maximum weight limitation so that the acceptable limits inherent in the specified test methods for strength and force will not be exceeded.

Dr. Nigel Ellis in his comments (EX. 15-20) and testimony (EXS. 2/21-142, 143) expressed concern in relating test weights to human weights. OSHA agrees that the limitations of the test procedures should be clearly stated to eliminate any confusion as to their

applicability to heavy workers and has revised the proposal accordingly by limiting the applicability of the test criteria and protocols to employees having a combined person and tool weight of 310 pounds (140 kg) or less. In addition, OSHA has added paragraph (d)(2)(ii) to the final standard which states that systems used for employees having combined person and tool weights of 310 pounds (140 kg) or greater may be considered as meeting paragraphs (d)(1)(i) through (d)(1)(iv) provided that the criteria and protocols are modified appropriately to provide proper protection for these heavier weights. The test methods in section II of this appendix can be used for evaluating systems for use with heavier weights by increasing the test weights, reducing the permitted arresting force limits, or other appropriate modifications to account for the heavier worker weights, provided the requirements of paragraphs (d)(1)(i) through (d)(1)(iv) are met.

Proposed paragraph (e) contains requirements for the care and use of personal fall arrest systems.

One comment (EX. 8-33) was received on proposed paragraphs (e)(1), (e)(2), and (e)(6). However, all of the comments and testimony received (EXS. 8-14, 8-21, 8-27, 8-33, 15-10, 15-20, 36, 2/19-253, 259, 2/21-38, 47, 117, 129, 142) relative to locking and non-locking snap hooks discussed previously is indirectly applicable to these proposed requirements which would prohibit snap-hooks being connected to loops in webbing lanyards and to each other. USTAG suggested the following substitute provision,

snap-hooks of the non-locking type shall not be engaged to webbing, rope or wire rope; to each other; to a dee-ring to which another snap-hook or other connector is attached; to a horizontal lifeline; or to any object which is incompatibly shaped or dimensioned in relation to the snap-hook such that unintentional disengagement could occur.

OSHA agrees in principle with this suggestion, however, other comments and testimony expressed the viewpoint that compatibility of the dimensions of attachments can also be important when locking snap-hooks are used. Therefore, OSHA is revising proposed paragraphs (e)(1), (e)(2) and (e)(6) to become paragraph (e)(1) in the final standard which requires that unless of a locking-type which would prevent unintentional disengagement, snap-hooks shall not be used for these connections.

Several comments (EXS. 8-2, 8-24) were received which suggested that rope grabs used on horizontal lifelines on scaffolds which might become vertical,

be of a type that would lock in either direction on the lifeline. OSHA agrees with this suggestion and has added a provision in paragraph (e)(2) of the final standard which requires that devices used to connect to a horizontal lifeline which may become a vertical lifeline (such as a horizontal lifeline on a scaffold becoming vertical if the scaffold support at one end fails) be capable of locking in either direction on the lifeline.

Two comments (EXS. 8-21, 8-33) were received on proposed paragraph (e)(3). The intent of the requirement is that the personal fall arrest system be rigged so that an employee will not experience more than six feet (1.8 m) of free fall and be stopped by the system before hitting the ground or other surfaces which may be under the employee. It was suggested that the provision prohibit contact with an "obstruction." OSHA believes, however, that since many objects, such as a wall or a scaffold itself, might be considered "obstructions," adding the recommended language may make use of the personal fall arrest system impracticable because some contact with these objects may be unavoidable. USTAG suggested that this proposed requirement be revised to limit free fall distance to two feet (0.61 m) or less if a body belt or chest-waist harness is used. As discussed above, OSHA does not agree that this further limitation of free fall is necessary because the record does not show that free fall distance by itself will cause injury. Therefore, OSHA is adopting paragraph (e)(3) as proposed in the final standard.

USTAG commented (EX. 8-33) on proposed paragraph (e)(4) suggesting that the provision be revised to read, "Body support components in personal fall arrest systems shall be worn with the connecting subsystem attached to the fall arrest attachment located dorsally, near shoulder level in the case of harnesses, and in the center of the wearer's back in the case of body belts." OSHA agrees with the intent of this suggestion and has revised the provision to require that personal fall arrest systems be worn with the attachment point of the body belt located in the center of the wearer's back, and the attachment point of the body harness located in the center of the wearer's back near shoulder level, or above the wearer's head. This requirement is paragraph (e)(4) of the final standard.

USTAG supported (EX. 8-33) proposed paragraphs (e)(5) and (e)(7) as proposed. No other specific suggestions for revision were received. OSHA is adopting proposed paragraphs (e)(5) and (e)(7), without change because they state fundamental principles of

employee safety desired for personal fall arrest systems. They appear as paragraphs (e)(5) and (e)(6), respectively, in the final standard.

As discussed under proposed paragraph (e)(1), proposed paragraph (e)(6) has been incorporated into paragraph (e)(1) of the final standard.

Two comments (EXS. 8-21, 8-33) were received on proposed paragraph (e)(8) relating to "impact loading." One commenter suggested that vertical lifelines subjected to impact loading of two feet (0.61 m) or less should not be required to be removed from service and inspected by a competent person before reuse. In addition, it was suggested that personal fall arrest systems subjected to impact loading be returned to the manufacturer for inspection, since the commenter felt that the competent person may not be able to assess the extent of damage and suitability for reuse. USTAG supported the provision as proposed, however, and suggested adding an additional sentence to read, "In all cases, the manufacturer's instructions shall not be relaxed."

OSHA disagrees that impact loading of vertical lifelines by impacts caused by free falls of two feet (0.61 m) or less should be exempted since the arresting forces may not be directly related to free fall distance. Depending on the system, an arrest of a two foot (0.61 m) free fall of an employee could result in significant impact loading. OSHA also disagrees that systems need to be returned to the manufacturer for proper evaluation, since, by definition, a competent person is "capable of identifying hazardous or dangerous conditions in any personal fall arrest system or any component thereof, as well as in their application and use with related equipment." OSHA also believes that the USTAG suggestion not to relax manufacturer's instructions is part of the competent person's responsibilities. Accordingly, OSHA is adopting proposed paragraph (e)(8), unchanged, as paragraph (e)(7) of the final standard.

Several comments (EXS. 8-33, 15-20) and testimony (EXS. 2/21-125, 2/21-42) expressed concern about the need for prompt rescue following fall arrest, especially when body belts are used, since prolonged suspension may be harmful to employees. OSHA agrees with these comments and has added paragraph (e)(8) to the final standard which will require assurance from the employer that he/she can provide for prompt rescue of employees in the event of a fall. If an employee is able to self-rescue after a fall, the employer would meet this requirement. The intent of this provision is that the employer evaluate

the potential for fall arrest and that rescue support be provided in a timely manner to avoid long periods of post fall suspension. When it is not possible to evaluate self-rescue capability in advance, prudent employers should assume that employees will need rescue assistance and accordingly be prepared to offer it.

USTAG commented (EX. 8-33) on proposed paragraph (e)(9) of Appendix C supporting the proposed requirement for employee training and offering suggested clarifications to the provision. OSHA agrees with these recommendations, however, it has revised paragraph (e)(9) of Appendix C of the Final Rule to reference the training provisions of paragraph 1910.66(i)(1) and included USTAG's recommendations in Appendix C of the standard. The final rule requires that before an employee uses a specific system, that he/she be trained in the use of that system. If a component is changed, he/she must be instructed on the change.

Proposed paragraph (f) contains a requirement for the inspection of personal fall arrest systems prior to each use. Comments received (EXS. 8-13, 8-33) were supportive of this provision. USTAG suggested that inspection for function, as well as strength, be a criterion for inspections. OSHA agrees with this recommendation and has revised paragraph (f) of the final standard accordingly.

Section II of Appendix C provides test methods for manufacturer and employer use in evaluating whether personal fall arrest systems meet the criteria set out in paragraph (d)(1). Tests have been included for evaluating the strength, the arrest force, and the proper operation of the systems. These test methods are non-mandatory, and other tests may be used to evaluate the system.

USTAG recommended that the tests included in the proposed standard be mandatory. OSHA does not believe that specific tests need to be mandatory, since OSHA believes that as long as the requirements (i.e., for strength, force, maximum fall distance, etc.) in section I of the final standard are properly tested and met, the systems will provide proper protection. The test methods are included as one means of determining the system's ability to meet the requirements. In addition, most employers are not equipped to perform these tests or other appropriate tests. In most cases, sample testing will be performed by equipment manufacturers. OSHA anticipates that most employers will rely on manufacturers of their fall protection systems to provide the

necessary information to assure compliance with the standard.

A number of other comments (EXS. 4-8, 8-24, 8-14, 8-21, 8-33, 15-20, 15-10) and testimony (EXS. 2/19-254, 2/21-38, 44, 118, 130) were received on this section. One commenter expressed concern that the frequency response of the test equipment was not stated in the test procedures and recommended a frequency response of 1,000 Hz. Another commenter recommended that the average forces be used with a frequency response of 1,000 Hz, or alternatively that the peak force be used with a frequency response of 100 Hz. Mr. H. Crawford of the National Engineering Laboratory, East Kilbridge, Glasgow, in his February 13, 1986, letter, cited difficulties with using a frequency response of 1,000 Hz because of resonant frequencies in the test rig (EX. 107). OSHA has reviewed the information on frequency response and has decided to add a frequency response requirement of 120 Hz for load measuring instrumentation to the test procedures. OSHA believes that this frequency response will eliminate difficulties with the test rig and equipment, as well as insure that forces of durations which may be harmful to employees are measured.

USTAG recommended that testing, " * * * be in accordance with test procedures set forth in applicable approved consensus standards written and maintained in a view of this standard and its amendments." As discussed above, at present there are no approved consensus standards for personal fall arrest equipment which OSHA could use or adopt. USTAG also commented that the proposed terms "force factor" and "strength factor" were confusing. As discussed in definitions, above, OSHA has eliminated these terms from the final standard. By so doing, these factors have been incorporated into the test methods of the final standard. In the force test, the force factor of 1.4 has been applied to the test force limits so that the force limits on the human body of 900 pounds (4 Kn) and 1,800 pounds (8 Kn) for body belts and body harnesses in the final standard, as recommended by USTAG, become 1,260 pounds (5.6 Kn) and 2,520 pounds (11.2 Kn) respectively, in the test procedures (which use a rigid test weight). The force factor is essentially a conversion factor which is used to convert the human force limits to equivalent force limits when rigid test weights are used. This factor is necessary to properly relate test forces to forces experienced by humans during fall arrest. In the strength

test, a strength factor of two, which is common industry practice, has been used to determine the test weight and free fall distances the test weight is to be dropped to achieve a strength safety factor of at least two for the various personal fall arrest systems.

Dr. Ellis, in his testimony, recommended replacing the proposed OSHA strength and force tests with a single test using a 300 pound (135 kg) test weight dropped 6 feet (1.8 m) for all personal fall arrest systems except retracting lanyard/lifeline systems designed to limit free fall to two feet (.61 m) or less, where the drop distance would be four feet (1.2 m). A test force limit of 1,800 pounds (8 Kn) was also recommended for body harnesses (body belts were not considered in this suggestion). OSHA explored the possibility of using this suggestion (or a similar approach) at the hearings during questioning of other hearing participants (EXS. 2/21-46, 131, 132, 140-142). Although the goal of a single test was supported, the feasibility and details of such a test were not supported. OSHA believes that the suggested test is not sufficient for demonstrating a strength safety factor of at least two and is overly rigorous in assuring acceptable arresting forces. OSHA does not believe there is sufficient information and test data to use a single test in the final standard. However, because the test limits are now all expressed in pounds force in the final standard (as discussed in paragraph (d) above), use of the 130 pound (59 kg) test weight is not adequate for lanyard system force testing. OSHA believes that a single test weight (220 pounds (100 Kg)) for force testing of all personal fall arrest systems will adequately test the system's capability to protect employees from injury due to fall arrest.

Two commenters (EXS. 8-14, 8-21) suggested that the phrase "worst case" used several places in the test methods be omitted or clarified. The tests are intended to evaluate systems in actual use conditions. Therefore, OSHA has eliminated this phrase from the final test procedures.

In summary, OSHA has been responsive to the comments received on the proposed test methods for personal fall arrest systems by: (a) Clarifying and simplifying the procedures where possible, (b) eliminating the term "force factor" and "strength factor" by including the effects of these factors in the test procedures, thus clarifying the final standard and test procedures, (c) providing force test pass/fail criteria for body belts and body harnesses, (d) reducing the number of test weights

required for testing to two (220 pounds (100 Kg) and 300 pounds (135 Kg)) and (e) adding a provision to address the frequency response time of the load measuring instrumentation (120 Hz) which will further refine the test procedures. OSHA believes that Section II of Appendix C of the final standard now provides clear and definitive test procedures which may be used by or for most employers to evaluate whether personal fall arrest systems comply with the requirements contained in Section I of the final standard.

Section III provides non-mandatory guidelines for personal fall arrest systems which are meant to aid employers in complying with the mandatory provisions of Section I of this Appendix.

A number of comments (EXS. 8-14, 8-21, 8-27, 8-33) were received on the non-mandatory guidelines suggesting clarifications and additional information. USTAG recommended an extensive rewrite of the non-mandatory guidelines to improve their clarity. In addition, USTAG suggested that the discussion of horizontal lifelines be omitted from discussion because the subject is more properly dealt with, in a formal way, by qualified persons. OSHA agrees with the suggestion that horizontal lifelines should be designed and installed under the supervision of a qualified person and has added this to the requirements in Section I, as discussed above in proposed paragraphs (c)(6) and (c)(7). However, OSHA believes that information concerning horizontal lifelines is desirable for inclusion in the non-mandatory guidelines so that employers will realize that there are many factors to consider when a horizontal lifeline is used and that involvement of a qualified person is necessary before one is used. OSHA accepts the comments provided to improve and clarify the non-mandatory guidelines and has revised Section III of the final standard to reflect these comments.

Appendix D

OSHA is republishing certain paragraphs of the unrevised powered platforms standard as Appendix D. These paragraphs are (a), (b), (c) and (d) which address, respectively: definitions; general requirements; Type F and Type T powered platforms; and building and equipment design, construction and installation in the unrevised standard (§ 1910.66 (1987)).

The purpose of Appendix D is to continue to provide coverage of building and equipment installations for powered platforms which exist or are completed up to six months (180 days) after these

amendments are effective, and which were installed after the effective date of the unamended standard (August 27, 1971, 36 FR 10466). The new, amended requirements governing how buildings and equipment are to be designed, constructed and installed for safe powered platform operation apply only to installations completed after six months (180 days) of the effective date of this Final Rule, or July 23, 1990. To preclude a gap in coverage, Appendix D requires that older installations continue to comply with the existing requirements covering this area. OSHA chose the 180 day lag time to give engineers and builders sufficient time to incorporate the new requirements in their designs. No participant questioned the adequacy of this period to incorporate these changes in installations underway. OSHA further noted that the public has had notice of the substance of most unchanged provisions since January 1985, when the NPRM was published. If, however, a new powered platform installation is completed before the 180 day period ends the designing engineer may choose to use the amended standard's requirements for building and equipment safety as his guide. OSHA will allow this option, and will not require the building owner to notify OSHA in advance if he designs and installs powered platforms conforming to the amended standard after the revised standard is effective, but before the grace period has expired.

OSHA believes that continuing coverage of existing building and equipment under relevant provisions of the unrevised standard, now Appendix D, is necessary for employee protection and that these requirements provide adequate design factors for assuring continued structural integrity. OSHA proposed continuing the requirement that existing installations be judged by the unrevised standards, and no objections were received.

As noted later, employees on all powered platforms, regardless of when installed, benefit from the new requirements in the amended standard covering training, inspection, maintenance and personal fall protection.

OSHA notes that paragraph (a), "Definitions" in this Appendix, applies only to this Appendix. The definitions in the amended standard likewise apply to provisions of the amended standard, not to this Appendix. Variance decisions and field compliance directives relating to provisions of the unamended standard included in Appendix D will remain in effect until they are withdrawn or superseded by OSHA.

The format and regulatory text of Appendix D is virtually identical to the unamended standard. The appendix also updates certain references and excludes certain provisions of the unamended standard which are unrelated to building and equipment requirements.

For example, personal fall protection requirements in paragraphs (b)(5)(ii) and (b)(3) in the unamended standard have not been included in Appendix D since these requirements have been superseded by requirements in paragraph (j) and Appendix C of the amended standard. Further, as noted above, all employers whose employees work on powered platforms must also comply with paragraphs (g), (h), (i), (j), and Appendix C of the amended standard regardless of the installation date of the powered platforms. These provisions cover inspections and tests, (g); maintenance, (h); operations (training and use), (i); personal fall protection, (j); and Appendix (c).

V. Summary of the Regulatory Impact Analysis and Regulatory Flexibility Assessment

Introduction

In accordance with Executive Order 12291 (46 FR 13193, February 17, 1981), OSHA assessed the potential impact of this revised standard. Based on the Executive Order criteria, OSHA has determined that this revised standard would not be a "major" action necessitating further economic impact evaluation. Accordingly, OSHA prepared a Regulatory Impact Assessment (RIA) which is available from the OSHA Docket Office.

OSHA has determined that the revised standard will have the net effect of reducing the costs of compliance because it will permit the use of alternative methods of powered platform stabilization. Employers will be allowed to choose the most cost-effective methods of providing the necessary level of employee safety.

The data for this assessment are based upon a December 15, 1983, study by Arthur Young and Co., entitled, "Analysis of Technological and Economic Factors of Proposed Revisions to OSHA Regulations on Powered Platforms" and upon the public comments submitted in response to the ANPR; in response to the NPR; during the public hearings; and during the post-hearing comment period.

Powered Platform Terminology and Technology

Powered platforms and suspension scaffolds are the basic types of powered

suspended work surfaces used to perform such outside building maintenance tasks as window washing, building and window caulking, inspecting building exteriors, etc. A powered platform covered under 29 CFR 1910.66 (Subpart F) is a powered suspended work surface that is permanently dedicated to a specific building and is the property of the building owner. A suspension scaffold covered under 29 CFR 1910.28 (Subpart D) is a powered suspended work surface that is brought to the building and is the property of the window washer and/or the outside building maintenance contractor. The selection of either a powered platform or a suspension scaffold for exterior building maintenance is made by the building developer when the building is initially designed. Although there are approximately 10 times more suspension scaffolds than powered platforms used for window washing and exterior building maintenance, approximately 90 percent of the new high-rise office buildings (60 stories or more) utilize powered platforms because it is often technologically infeasible to use suspension scaffolds on very tall buildings. In addition, powered platforms are safer at very high elevations than are suspension scaffolds because powered platforms are less susceptible to being destabilized by wind than are suspension scaffolds.

OSHA does not require that a powered platform be used on any building. OSHA does require, however, that if a powered platform is used, then the Subpart F requirements must be met.

The existing Subpart F requires all powered platforms to use a continuous track stabilization system that consists of indented mullions or T-rails embedded in the building wall and guide rollers or shoes attached to the platform that lock the platform to the building by remaining in continuous contact with the indented mullions or T-rails. The continuous track stabilization system is the least expensive platform stabilization system to install on buildings of straight vertical steel (aluminum) and glass curtain walls. Architectural styles that feature offsets in walls, however, make continuous track stabilization systems technically infeasible on many of those buildings.

In 1972, the button system stabilization design was developed for powered platforms. In this system, a vertical line of buttons are set into a building wall and the platform contains two vertical bar guides at each end of the platform. As the platform transverse the building, the bar guides

engage the buttons and lock the platform to the building.

In addition, an intermittent tie-in stabilization system was developed for powered platforms. In this system, platform stabilization is provided by lanyards that secure the suspension ropes to anchors set into the building wall. The building anchors are set at fixed intervals (usually from 30 to 50 feet) and the adjustable lanyards are designed to produce enough tension below the tie-in point to secure the platform against the building.

These intermittent tie-in stabilization systems were the subject of several applications for variances from Subpart F. The variance procedures include technical review and public comment concerning the safety of the particular installation requesting the variance. Since the first variance application in 1977, OSHA has granted five variances and there were 23 pending variance applications when OSHA issued a Compliance Directive (OSHA Instruction STD 1-3.3) on November 1, 1982, instructing compliance officers to consider all buildings with straight building faces using intermittent tie-in stabilization systems to be in compliance with Subpart F.

Number of Buildings and Powered Platforms

Although the revised standard affects every building that has a powered platform, not every such building is affected by every provision. In particular, although all buildings are affected by the provisions governing powered platform maintenance, only buildings to be constructed are affected by the new provisions governing powered platform design and installation. OSHA estimates that there are 6,865 existing buildings with 9,600 powered platforms and that 265 new buildings with 370 powered platforms are constructed annually. Of these new buildings, OSHA estimates that under the revised standard, 140 will use the continuous track stabilization system, 115 will use the intermittent tie-in stabilization system, and 10 will use the button stabilization system.

Population at Risk

The population-at-risk are the employees who use powered platforms to service high-rise office buildings. These employees are employed in the two industry sectors of: (1) Window cleaning contractors (a subset of SIC 7349 "Building Cleaning and Maintenance Services, Not Elsewhere Classified"); and (2) caulking building exteriors, sandblasting of building

exteriors, and steam cleaning of building exteriors (subsets of SIC 1799, "Special Trade Contractors, Not Elsewhere Classified" and of other firms in SIC 7349).

OSHA estimates that 8,150 employees of whom 6,900 are window washers and 1,250 are exterior building maintenance workers may work on a powered platform and be at risk from the potential hazard of falling from an elevation.

Benefits

There is no available estimate of the total number of fatalities and injuries associated with falls from powered platforms because the employees who use powered platforms are only a subset of the employees in SIC 7349 and SIC 1799.

In addition, the injuries associated with falls from powered suspended work platforms also include falls from suspension scaffolds. Using the OSHA inspection data from July 1972 through June 1988, there have been 11 reported incidents involving eight fatalities and nine hospitalized injuries associated with falls from powered platforms. In 10 of these 11 reported incidents (six of the fatalities and all nine of the hospitalized injuries), the employee did not wear personal fall protection. Compliance with the revised Subpart F, which requires both fall protection and training in the use of fall protection, would have prevented the six fatalities and nine hospitalized injuries associated with these 10 incidents.

In addition, the revised standard will make it easier for building developers to install powered platforms on certain types of high-rise office buildings and these powered platforms would substitute for suspension scaffolds or single-man controlled descent devices. As all of the public comment and testimony reported that powered platforms are safer work surfaces than are suspension scaffolds or single-man controlled descent devices, any substitution of powered platforms for suspension scaffolds or single-man controlled descent devices will increase employee safety.

Finally, intermittent tie-in and button stabilization systems, if used correctly, are as safe as continuous track stabilization systems. The revised Subpart F would ensure that those employees working on powered platforms with intermittent tie-ins and button stabilization systems will receive the same protection as received by those employees working on powered platforms with continuous track stabilization systems.

Technological Feasibility

The revised standard is technologically feasible because it allows the use of platform stabilization methods that are already being used on existing buildings. The new design and installation requirements apply only to new powered platforms and all of the technical information and equipment necessary to comply with the revised standard is developed and in use.

Cost of Compliance

OSHA used the baseline of existing Subpart F requirements to estimate the cost of compliance savings expected to result from the revised design and installation provisions for future powered platforms. OSHA, however, used the baseline of current industry practices to estimate the cost of compliance with platform maintenance, employee powered platform training, improving the personal fall protection system, and employee training on personal fall protection systems provisions.

As seen in Table A, OSHA estimated that, on an annual basis, compliance with the revised Subpart F will generate net cost savings of \$1,670 million. Building owners will incur savings of \$2.889 million and window washers and exterior building maintenance contractors will incur additional costs of \$1.219 million. Of this \$1.219 million additional cost, \$462,000 will be spent to comply with Subpart F requirements and \$757,000 will be spent to comply with the personal fall protection system requirements in the mandatory Appendix C.

Regulatory Flexibility and International Trade

In accordance with the Regulatory Flexibility Act of 1980 (Pub. L. 96-353, 94 Stat. 1164 (5 U.S.C. 601 et seq.)), the Assistant Secretary assessed the potential economic impact of the revised standard on small entities and concluded that it will have no significant impact on small entities. OSHA similarly concluded that the revised standard will have no impact on international trade.

Environmental Impact Assessment

The Final Rule and its alternatives have been reviewed in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321, et seq.), the regulations of the Council on Environmental Quality (CEQ) (40 CFR Part 1500), and the Department of Labor's (DOL's) NEPA Procedures (29 CFR Part 11). As a result of this review,

the Assistant Secretary for OSHA has determined that the Final Rule will have no significant environmental impact. The procedures and applications of the proposed provisions do not impact on air, water or soil quality, plant or animal life, the use of land, or other aspects of the environment and therefore will have no significant effect on the environment.

TABLE A—COST OF COMPLIANCE WITH THE REVISED SUBPART F BY INDUSTRY SECTOR AND PROVISION

(In millions of 1987 dollars)

Industry (provision)	Annual cost of compliance
Building Owners	
Alternative Stabilization Systems.....	(3.111)
Maintenance.....	0.216
Tags and Labels.....	0.006
Subtotal Savings.....	(2.889)
Contractors	
Subpart F	
Platform Safety Training.....	0.422
Emergency Action Plan.....	0.004
Anemometer.....	0.036
Subtotal Subpart F Costs.....	0.462
Appendix C	
New Fall Protection Systems.....	0.013
Improve Fall Protection Systems.....	0.400
Fall Protection System Training.....	0.344
Subtotal Appendix C Costs.....	0.757
Contractor Subtotal Costs.....	1.219
Total Net Savings.....	(1.670)

Note: Numbers in parenthesis are cost savings. Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis, 1988.

VI. OMB Approval Under the Paperwork Reduction Act

This section contains a collection of information in paragraphs 1910.66(e)(9), 1910.66(f)(5)(i)(C), 1910.66(f)(5)(ii)(N), 1910.66(f)(7)(vi), 1910.66(f)(7)(vii), 1910.66(f)(7)(viii) and 1910.66(i)(1)(iv) which pertain to the development and implementation of a written emergency action plan, platform load rating, emergency operating device, use, wire rope information and work procedures for training. The Office of Management and Budget (OMB) has reviewed this collection and approved it through May, 1991. The approval number is 1218-0121.

Public reporting burden for this collection of information is estimated to average 8.73 hours (or minutes) per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of

information, including suggestions for reducing this burden, to the Office of Information Management, Department of Labor, Room N1301, 200 Constitution Avenue, NW., Washington, DC 20210; and to the Office of Management and Budget, Paperwork Reduction Project (1218-0121), Washington, DC 20503.

VII. Federalism

This standard has been reviewed in accordance with Executive Order 12612 52 FR 41685 (October 30, 1987) regarding Federalism. This Order requires that agencies, to the extent possible, refrain from limiting State policy options, consult with States prior to taking any actions that would restrict State policy options, and take such actions only when there is clear constitutional authority and the presence of a problem of national scope. The Order provides for preemption of State law only if there is a clear Congressional intent for the Agency to do so. Any such preemption is to be limited to the extent possible.

Section 18 of the Occupational Safety and Health Act (OSH Act), expresses Congress' clear intent to preempt State laws relating to issues with respect to which Federal OSHA has promulgated occupational safety or health standards. Under the OSH Act a State can avoid preemption only if it submits, and obtains Federal approval of, a plan for the development of such standards and their enforcement. Occupational safety and health standards developed by such Plan-States must, among other things, be at least as effective in providing safe and healthful employment and places of employment as the Federal standards.

The Federal standard for powered platforms is drafted so that employees using this equipment in every State would be protected by general, performance-oriented standards. To the extent that there are State or regional peculiarities caused by the climate, building codes, employee diversity or other factors, States with occupational safety and health plans approved under Section 18 of the OSH Act would be able to develop their own State standards to deal with any special problems. Moreover, the performance nature of this standard, of and by itself, allows for flexibility by States and platform operators to provide as much safety as possible using varying methods consonant with conditions in each State.

In short, there is a clear national problem related to occupational safety and health in the powered platform industry. While the individual States, if all acted, might be able collectively to deal with the safety problems involved, most have not elected to do so in the

seventeen years since the enactment of the OSH Act. Those States which have elected to participate under Section 18 of the OSH Act would not be preempted by this regulation and would be able to deal with special, local conditions within the framework provided by this performance-oriented standard while ensuring that their standards are at least as effective as the Federal standard.

VIII. State Plan Applicability

The 25 states with their own OSHA-approved occupational safety and health plans must adopt a comparable standard within six months of this publication date. These states are: Alaska, Arizona, California, Connecticut (for state and local government employees only), Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York (for state and local government employees only), North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington and Wyoming. Until such time as a state standard is promulgated, Federal OSHA will provide interim enforcement assistance, as appropriate, in these states.

List of Subjects in 29 CFR Part 1910

Building maintenance; Inspections; Occupational Safety and Health; Personal fall protection systems; Powered platforms; Safety; Stabilization; Suspended equipment; Training.

Authority

This document was prepared under the direction of Alan C. McMillan, Acting Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Ave, NW., Washington, DC 20210.

Accordingly, pursuant to sections 4(b), 6(b), 8(c), 8(d) and 8(g) of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657), Secretary of Labor's Order No. 9-83 (48 FR 35736), and 29 CFR Part 1911, 29 CFR Part 1910 is amended as set forth below.

Signed at Washington, DC this 14th day of July 1989.

Alan C. McMillan,

Acting Assistant Secretary of Labor.

Part 1910 of Title 29 of the Code of Federal Regulations is amended as follows:

PART 1910—[AMENDED]

1. The authority citation for Subpart F continues to read as follows:

Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655,

657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059) or 9-83 (48 FR 35736), as applicable.

Sections 1910.66, .67, .68 and .70 also issued under 29 CFR Part 1911.

2. By revising § 1910.66 of 29 CFR Part 1910 to read as follows:

§ 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 of this section.

(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 protection anchorages meet the requirements of paragraph (I)(c)(10) of Appendix C.

(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 (44.8 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 m²). 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 platform 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 platform, 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 fall arrest system which meets the requirements of Appendix C, for each employee on such a platform.

(M) A vertical lifeline shall be provided as part of a fall arrest system which meets the requirements of Appendix C, 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 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 receptacle 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 fall arrest system which meets the requirements of Appendix C, 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 accidentally 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 Appendix C, Section I, of this standard, and as otherwise provided by this standard.

(k) *Effective date.* This section is effective January 24, 1990.

(The information collection requirements contained in this section are approved by the Office of Management and Budget (OMB) and listed under OMB control number 1218-0121.)

Appendix A to Section 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. LeJeune 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 #3088 (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.

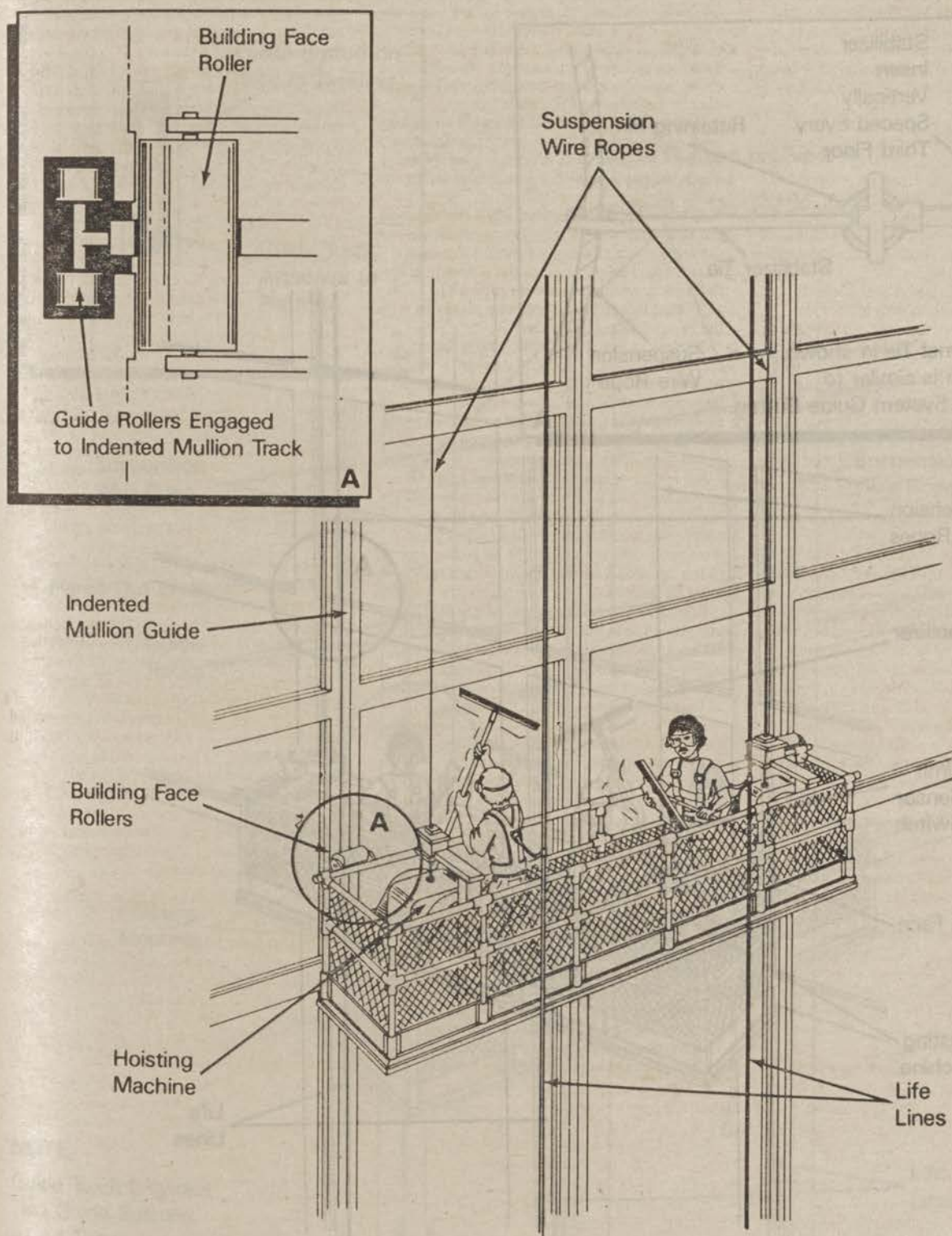
11. *Suspension and Securing of Powered Platforms (Equivalency).* One acceptable method of demonstrating the equivalency of a method of suspending or securing a powered platform, as required in paragraphs (e)(2)(iii), (f)(3) and (f)(5)(i)(F), is to provide an engineering analysis by a registered professional 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 Section 1910.66, Exhibits (Advisory)

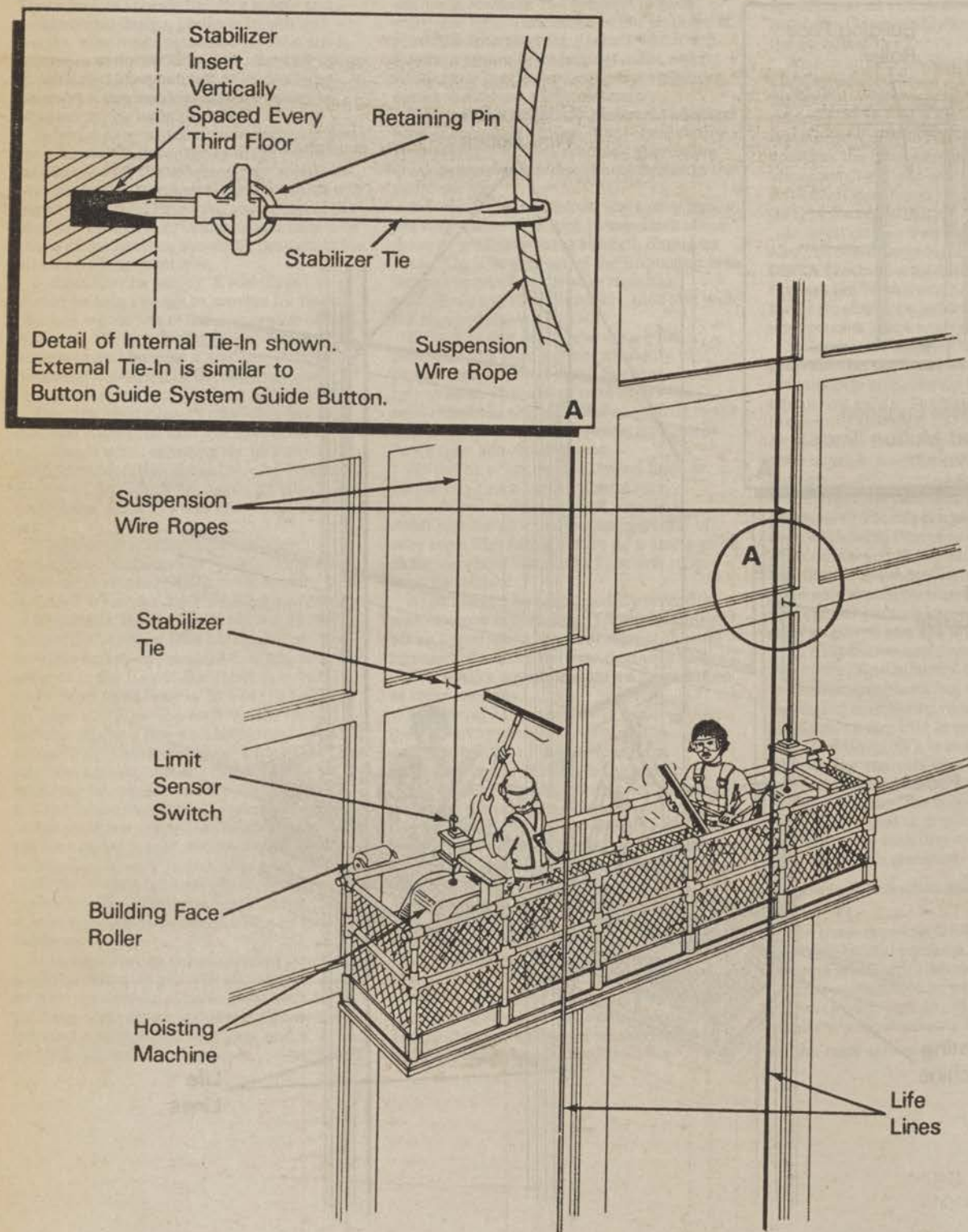
The three drawings in Appendix B illustrate typical platform stabilization systems which are addressed in the standard. The drawings are to be used for reference purposes only, and do not illustrate all the mandatory requirements for each system.

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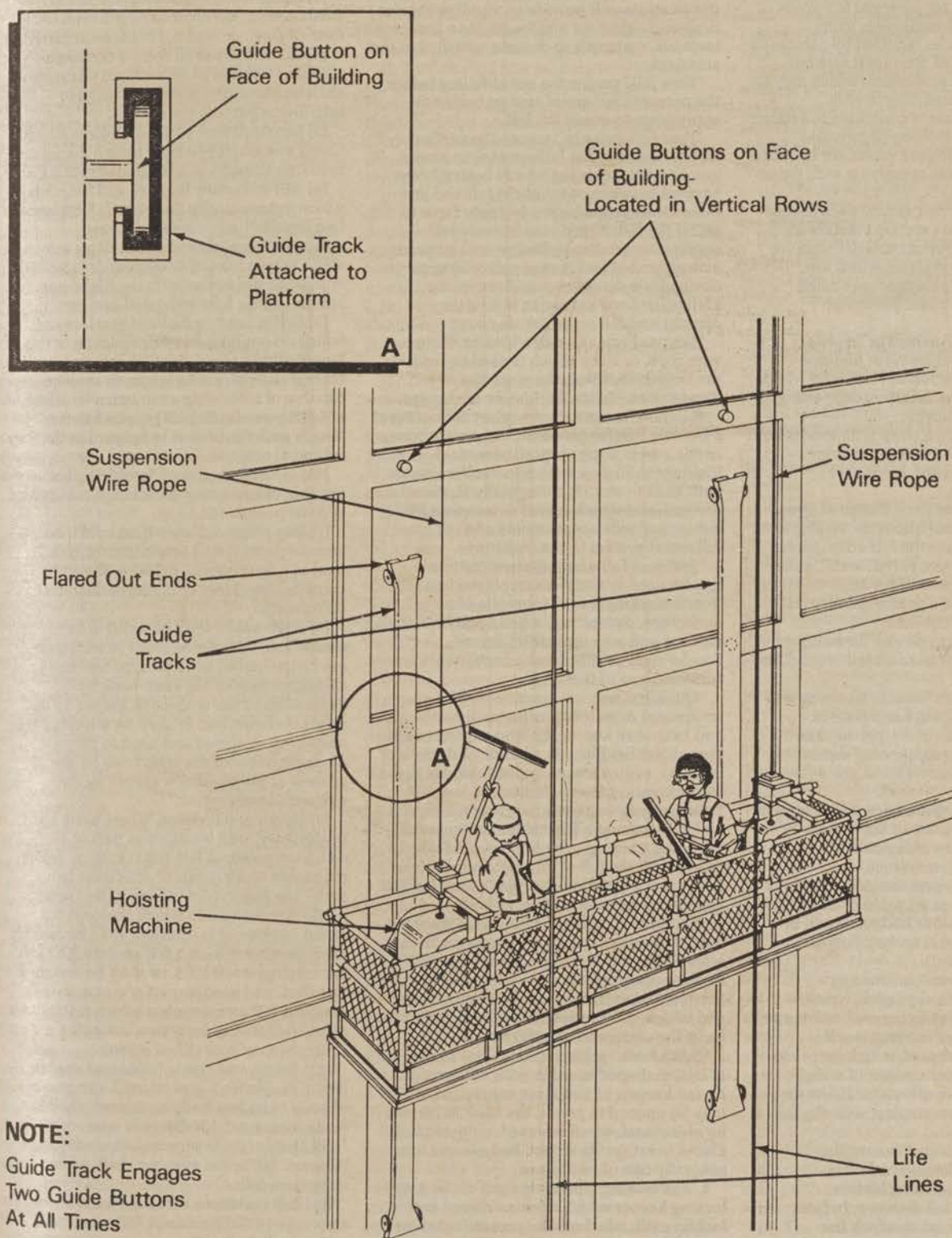
Figure 1. Typical Self-Powered Platform--Continuous External or Indented Mullion Guide System



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



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



Appendix C to Section 1910.66, Personal Fall Arrest System (Section I—Mandatory; Sections II and III—Non-Mandatory)

Use of the Appendix

Section I of Appendix C sets out the mandatory criteria for personal fall arrest systems used by all employees using powered platforms, as required by paragraph (j)(1) of this standard. Section II sets out nonmandatory test procedures which may be used to determine compliance with applicable requirements contained in section I of this Appendix. Section III provides nonmandatory guidelines which are intended to assist employers in complying with these provisions.

I. Personal fall arrest systems—(a) Scope and application. This section establishes the application of and performance criteria for personal fall arrest systems which are required for use by all employees using powered platforms under paragraph 1910.66(j).

(b) Definitions. "Anchorage" means a secure point of attachment for lifelines, lanyards or deceleration devices, and which is independent of the means of supporting or suspending the employee.

"Body belt" means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

"Body harness" means a design of straps which may be secured about the employee in a manner to distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

"Buckle" means any device for holding the body belt or body harness closed around the employee's body.

"Competent person" means a person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as in their application and use with related equipment.

"Connector" means a device which is used to couple (connect) parts of the system together. It may be an independent component of the system (such as a carabiner), or an integral component of part of the system (such as a buckle or dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

"Deceleration device" means any mechanism, such as a rope grab, ripstitch lanyard, specially woven lanyard, tearing or deforming lanyard, or automatic self retracting-lifeline/lanyard, which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on an employee during fall arrest.

"Deceleration distance" means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of

activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

"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.

"Free fall" means the act of falling before the personal fall arrest system begins to apply force to arrest the fall.

"Free fall distance" means the vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, lifeline and lanyard elongation but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

"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.

"Personal fall arrest system" means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

"Qualified person" means one with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project, or product.

"Rope grab" means a deceleration device which travels on a lifeline and automatically frictionally engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/lever locking, or both.

"Self-retracting lifeline/lanyard" means a deceleration device which contains a drum-wound line which may be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

"Snap-hook" means a connector comprised of a hookshaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snap-hooks are generally one of two types:

1. The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection, or
2. The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection.

"Tie-off" means the act of an employee, wearing personal fall protection equipment, connecting directly or indirectly to an anchorage. It also means the condition of an employee being connected to an anchorage.

(c) Design for system components. (1) Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.

(2) Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

(3) Lanyards and vertical lifelines which tie-off one employee shall have a minimum breaking strength of 5,000 pounds (22.2 kN).

(4) Self-retracting lifelines and lanyards which automatically limit free fall distance to two feet (0.61 m) or less shall have components capable of sustaining a minimum static tensile load of 3,000 pounds (13.3 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(5) Self-retracting lifelines and lanyards which do not limit free fall distance to two feet (0.61 m) or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(6) Dee-rings and snap-hooks shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN).

(7) Dee-rings and snap-hooks shall be 100 percent proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

(8) Snap-hooks shall be sized to be compatible with the member to which they are connected so as to prevent unintentional disengagement of the snap-hook by depression of the snap-hook keeper by the connected member, or shall be a locking type snap-hook designed and used to prevent disengagement of the snap-hook by the contact of the snaphook keeper by the connected member.

(9) Horizontal lifelines, where used, shall be designed, and installed as part of a complete personal fall arrest system, which maintains a safety factor of at least two, under the supervision of a qualified person.

(10) Anchorages to which personal fall arrest equipment is attached shall be capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least two, under the supervision of a qualified person.

(11) Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses, shall be made from synthetic fibers or wire rope.

(d) System performance criteria. (1) Personal fall arrest systems shall, when stopping a fall:

(i) Limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt;

(ii) Limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness;

(iii) Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07 m); and

(iv) Shall have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of six feet (1.8 m), or the free fall distance permitted by the system, whichever is less.

(2)(i) When used by employees having a combined person and tool weight of less than 310 pounds (140 kg), personal fall arrest systems which meet the criteria and protocols contained in paragraphs (b), (c) and (d) in Section II of this Appendix shall be considered as complying with the provisions of paragraphs (d)(1)(i) through (d)(1)(iv) above.

(ii) When used by employees having a combined tool and body weight of 310 pounds (140 kg) or more, personal fall arrest systems which meet the criteria and protocols contained in paragraphs (b), (c) and (d) in Section II may be considered as complying with the provisions of paragraphs (d)(1)(i) through (d)(1)(iv) provided that the criteria and protocols are modified appropriately to provide proper protection for such heavier weights.

(e) *Care and use.* (1) Snap-hooks, unless of a locking type designed and used to prevent disengagement from the following connections, shall not be engaged:

- (i) Directly to webbing, rope or wire rope;
- (ii) To each other;
- (iii) To a dee-ring to which another snap-hook or other connector is attached;
- (iv) To a horizontal lifeline; or
- (v) To any object which is incompatibly shaped or dimensioned in relation to the snap-hook such that the connected object could depress the snap-hook keeper a sufficient amount to release itself.

(2) Devices used to connect to a horizontal lifeline which may become a vertical lifeline shall be capable of locking in either direction on the lifeline.

(3) Personal fall arrest systems shall be rigged such that an employee can neither free fall more than six feet (1.8 m), nor contact any lower level.

(4) The attachment point of the body belt shall be located in the center of the wearer's back. The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.

(5) When vertical lifelines are used, each employee shall be provided with a separate lifeline.

(6) Personal fall arrest systems or components shall be used only for employee fall protection.

(7) Personal fall arrest systems or components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection unless inspected and determined by a competent person to be undamaged and suitable for reuse.

(8) The employer shall provide for prompt rescue of employees in the event of a fall or shall assure the self-rescue capability of employees.

(9) Before using a personal fall arrest system, and after any component or system is changed, employees shall be trained in

accordance with the requirements of paragraph 1910.66(i)(1), in the safe use of the system.

(f) *Inspections.* Personal fall arrest systems shall be inspected prior to each use for mildew, wear, damage and other deterioration, and defective components shall be removed from service if their strength or function may be adversely affected.

II. *Test methods for personal fall arrest systems (non-mandatory)*—(a) *General.* Paragraphs (b), (c), (d) and (e), of this Section II set forth test procedures which may be used to determine compliance with the requirements in paragraph (d)(1)(i) through (d)(1)(iv) of Section I of this Appendix.

(b) *General conditions for all tests in Section II.* (1) Lifelines, lanyards and deceleration devices should be attached to an anchorage and connected to the body-belt or body harness in the same manner as they would be when used to protect employees.

(2) The anchorage should be rigid, and should not have a deflection greater than .04 inches (1 mm) when a force of 2,250 pounds (10 kN) is applied.

(3) The frequency response of the load measuring instrumentation should be 120 Hz.

(4) The test weight used in the strength and force tests should be a rigid, metal, cylindrical or torso-shaped object with a girth of 38 inches plus or minus four inches (96 cm plus or minus 10 cm).

(5) The lanyard or lifeline used to create the free fall distance should be supplied with the system, or in its absence, the least elastic lanyard or lifeline available to be used with the system.

(6) The test weight for each test should be hoisted to the required level and should be quickly released without having any appreciable motion imparted to it.

(7) The system's performance should be evaluated taking into account the range of environmental conditions for which it is designed to be used.

(8) Following the test, the system need not be capable of further operation.

(c) *Strength test.* (1) During the testing of all systems, a test weight of 300 pounds plus or minus five pounds (135 kg plus or minus 2.5 kg) should be used. (See paragraph (b)(4), above.)

(2) The test consists of dropping the test weight once. A new unused system should be used for each test.

(3) For lanyard systems, the lanyard length should be six feet plus or minus two inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body belt or body harness.

(4) For rope-grab-type deceleration systems, the length of the lifeline above the centerline of the grabbing mechanism to the lifeline's anchorage point should not exceed two feet (0.61 m).

(5) For lanyard systems, for systems with deceleration devices which do not automatically limit free fall distance to two feet (0.61 m) or less, and for systems with deceleration devices which have a connection distance in excess of one foot (0.3 m) (measured between the centerline of the lifeline and the attachment point to the body belt or harness), the test weight should be rigged to free fall a distance of 7.5 feet (2.3 m)

from a point that is 1.5 feet (46 cm) above the anchorage point, to its hanging location (six feet below the anchorage). The test weight should fall without interference, obstruction, or hitting the floor or ground during the test. In some cases a non-elastic wire lanyard of sufficient length may need to be added to the system (for test purposes) to create the necessary free fall distance.

(6) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to two feet (0.61 m) or less, the test weight should be rigged to free fall a distance of four feet (1.22 m).

(7) Any weight which detaches from the belt or harness should constitute failure for the strength test.

(d) *Force test*—(1) *General.* The test consists of dropping the respective test weight specified in (d)(2)(i) or (d)(3)(i) once. A new, unused system should be used for each test.

(2) *For lanyard systems.* (i) A test weight of 220 pounds plus or minus three pounds (100 kg plus or minus 1.6 kg) should be used. (See paragraph (b)(4), above.)

(ii) Lanyard length should be six feet plus or minus two inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body belt or body harness.

(iii) The test weight should fall free from the anchorage level to its hanging location (a total of six feet (1.83 m) free fall distance) without interference, obstruction, or hitting the floor or ground during the test.

(3) *For all other systems.* (i) A test weight of 220 pounds plus or minus three pounds (100 kg plus or minus 1.6 kg) should be used. (See paragraph (b)(4), above.)

(ii) The free fall distance to be used in the test should be the maximum fall distance physically permitted by the system during normal use conditions, up to a maximum free fall distance for the test weight of six feet (1.83 m), except as follows:

(A) For deceleration systems which have a connection link or lanyard, the test weight should free fall a distance equal to the connection distance (measured between the centerline of the lifeline and the attachment point to the body belt or harness).

(B) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to two feet (0.61 m) or less, the test weight should free fall a distance equal to that permitted by the system in normal use. (For example, to test a system with a self-retracting lifeline or lanyard, the test weight should be supported and the system allowed to retract the lifeline or lanyard as it would in normal use. The test weight would then be released and the force and deceleration distance measured).

(4) A system fails the force test if the recorded maximum arresting force exceeds 1,260 pounds (15.6 kN) when using a body belt, and/or exceeds 2,520 pounds (11.2 kN) when using a body harness.

(5) The maximum elongation and deceleration distance should be recorded during the force test.

(e) *Deceleration device tests*—(1) *General.* The device should be evaluated or tested

under the environmental conditions, (such as rain, ice, grease, dirt, type of lifeline, etc.), for which the device is designed.

(2) *Rope-grab-type deceleration devices.* (i) Devices should be moved on a lifeline 1,000 times over the same length of line a distance of not less than one foot (30.5 cm), and the mechanism should lock each time.

(ii) Unless the device is permanently marked to indicate the type(s) of lifeline which must be used, several types (different diameters and different materials), of lifelines should be used to test the device.

(3) *Other self-activating-type deceleration devices.* The locking mechanisms of other self-activating-type deceleration devices designed for more than one arrest should lock each of 1,000 times as they would in normal service.

III. *Additional non-mandatory guidelines for personal fall arrest systems.* The following information constitutes additional guidelines for use in complying with requirements for a personal fall arrest system.

(a) *Selection and use considerations.* The kind of personal fall arrest system selected should match the particular work situation, and any possible free fall distance should be kept to a minimum. Consideration should be given to the particular work environment. For example, the presence of acids, dirt, moisture, oil, grease, etc., and their effect on the system, should be evaluated. Hot or cold environments may also have an adverse effect on the system. Wire rope should not be used where an electrical hazard is anticipated. As required by the standard, the employer must plan to have means available to promptly rescue an employee should a fall occur, since the suspended employee may not be able to reach a work level independently.

Where lanyards, connectors, and lifelines are subject to damage by work operations such as welding, chemical cleaning, and sandblasting, the component should be protected, or other securing systems should be used. The employer should fully evaluate the work conditions and environment (including seasonal weather changes) before selecting the appropriate personal fall protection system. Once in use, the system's effectiveness should be monitored. In some cases, a program for cleaning and maintenance of the system may be necessary.

(b) *Testing considerations.* Before purchasing or putting into use a personal fall arrest system, an employer should obtain from the supplier information about the system based on its performance during testing so that the employer can know if the system meets this standard. Testing should be done using recognized test methods. Section II of this Appendix C contains test methods recognized for evaluating the performance of fall arrest systems. Not all systems may need to be individually tested; the performance of some systems may be based on data and calculations derived from testing of similar systems, provided that enough information is available to demonstrate similarity of function and design.

(c) *Component compatibility considerations.* Ideally, a personal fall arrest system is designed, tested, and supplied as a

complete system. However, it is common practice for lanyards, connectors, lifelines, deceleration devices, body belts and body harnesses to be interchanged since some components wear out before others. The employer and employee should realize that not all components are interchangeable. For instance, a lanyard should not be connected between a body belt (or harness) and a deceleration device of the self-retracting type since this can result in additional free fall for which the system was not designed. Any substitution or change to a personal fall arrest system should be fully evaluated or tested by a competent person to determine that it meets the standard, before the modified system is put in use.

(d) *Employee training considerations.* Thorough employee training in the selection and use of personal fall arrest systems is imperative. As stated in the standard, before the equipment is used, employees must be trained in the safe use of the system. This should include the following: Application limits; proper anchoring and tie-off techniques; estimation of free fall distance, including determination of deceleration distance, and total fall distance to prevent striking a lower level; methods of use; and inspection and storage of the system. Careless or improper use of the equipment can result in serious injury or death. Employers and employees should become familiar with the material in this Appendix, as well as manufacturer's recommendations, before a system is used. Of uppermost importance is the reduction in strength caused by certain tie-offs (such as using knots, tying around sharp edges, etc.) and maximum permitted free fall distance. Also, to be stressed are the importance of inspections prior to use, the limitations of the equipment, and unique conditions at the worksite which may be important in determining the type of system to use.

(e) *Instruction considerations.* Employers should obtain comprehensive instructions from the supplier as to the system's proper use and application, including, where applicable:

- (1) The force measured during the sample force test;
- (2) The maximum elongation measured for lanyards during the force test;
- (3) The deceleration distance measured for deceleration devices during the force test;
- (4) Caution statements on critical use limitations;
- (5) Application limits;
- (6) Proper hook-up, anchoring and tie-off techniques, including the proper dee-ring or other attachment point to use on the body belt and harness for fall arrest;
- (7) Proper climbing techniques;
- (8) Methods of inspection, use, cleaning, and storage; and
- (9) Specific lifelines which may be used. This information should be provided to employees during training.

(f) *Inspection considerations.* As stated in the standard (Section I, Paragraph (f)), personal fall arrest systems must be regularly inspected. Any component with any significant defect, such as cuts, tears, abrasions, mold, or undue stretching; alterations or additions which might affect its

efficiency; damage due to deterioration; contact with fire, acids, or other corrosives; distorted hooks or faulty hook springs; tongues unfitted to the shoulder of buckles; loose or damaged mountings; non-functioning parts; or wearing or internal deterioration in the ropes must be withdrawn from service immediately, and should be tagged or marked as unusable, or destroyed.

(g) *Rescue considerations.* As required by the standard (Section I, Paragraph (e)(8)), when personal fall arrest systems are used, the employer must assure that employees can be promptly rescued or can rescue themselves should a fall occur. The availability of rescue personnel, ladders or other rescue equipment should be evaluated. In some situations, equipment which allows employees to rescue themselves after the fall has been arrested may be desirable, such as devices which have descent capability.

(h) *Tie-off considerations.* (1) One of the most important aspects of personal fall protection systems is fully planning the system before it is put into use. Probably the most overlooked component is planning for suitable anchorage points. Such planning should ideally be done before the structure or building is constructed so that anchorage points can be incorporated during construction for use later for window cleaning or other building maintenance. If properly planned, these anchorage points may be used during construction, as well as afterwards.

(2) Employers and employees should at all times be aware that the strength of a personal fall arrest system is based on its being attached to an anchoring system which does not significantly reduce the strength of the system (such as a properly dimensioned eye-bolt/snap-hook anchorage). Therefore, if a means of attachment is used that will reduce the strength of the system, that component should be replaced by a stronger one, but one that will also maintain the appropriate maximum arrest force characteristics.

(3) Tie-off using a knot in a rope lanyard or lifeline (at any location) can reduce the lifeline or lanyard strength by 50 percent or more. Therefore, a stronger lanyard or lifeline should be used to compensate for the weakening effect of the knot, or the lanyard length should be reduced (or the tie-off location raised) to minimize free fall distance, or the lanyard or lifeline should be replaced by one which has an appropriately incorporated connector to eliminate the need for a knot.

(4) Tie-off of a rope lanyard or lifeline around an "H" or "I" beam or similar support can reduce its strength as much as 70 percent due to the cutting action of the beam edges. Therefore, use should be made of a webbing lanyard or wire core lifeline around the beam; or the lanyard or lifeline should be protected from the edge; or free fall distance should be greatly minimized.

(5) Tie-off where the line passes over or around rough or sharp surfaces reduces strength drastically. Such a tie-off should be avoided or an alternative tie-off rigging should be used. Such alternatives may include use of a snap-hook/dee ring

connection, wire rope tie-off, an effective padding of the surfaces, or an abrasion-resistance strap around or over the problem surface.

(6) Horizontal lifelines may, depending on their geometry and angle of sag, be subjected to greater loads than the impact load imposed by an attached component. When the angle of horizontal lifeline sag is less than 30 degrees, the impact force imparted to the lifeline by an attached lanyard is greatly amplified. For example, with a sag angle of 15 degrees, the force amplification is about 2:1 and at 5 degrees sag, it is about 6:1.

Depending on the angle of sag, and the line's elasticity, the strength of the horizontal lifeline and the anchorages to which it is attached should be increased a number of times over that of the lanyard. Extreme care should be taken in considering a horizontal lifeline for multiple tie-offs. The reason for this is that in multiple tie-offs to a horizontal lifeline, if one employee falls, the movement of the falling employee and the horizontal lifeline during arrest of the fall may cause other employees to also fall. Horizontal lifeline and anchorage strength should be increased for each additional employee to be tied-off. For these and other reasons, the design of systems using horizontal lifelines must only be done by qualified persons. Testing of installed lifelines and anchors prior to use is recommended.

(7) The strength of an eye-bolt is rated along the axis of the bolt and its strength is greatly reduced if the force is applied at an angle to this axis (in the direction of shear). Also, care should be exercised in selecting the proper diameter of the eye to avoid accidental disengagement of snap-hooks not designed to be compatible for the connection.

(8) Due to the significant reduction in the strength of the lifeline/lanyard (in some cases, as much as a 70 percent reduction), the sliding hitch knot should not be used for lifeline/lanyard connections except in emergency situations where no other available system is practical. The "one-and-one" sliding hitch knot should never be used because it is unreliable in stopping a fall. The "two-and-two," or "three-and-three" knot (preferable), may be used in emergency situations; however, care should be taken to limit free fall distance to a minimum because of reduced lifeline/lanyard strength.

(i) *Vertical lifeline considerations.* As required by the standard, each employee must have a separate lifeline when the lifeline is vertical. The reason for this is that in multiple tie-offs to a single lifeline, if one employee falls, the movement of the lifeline during the arrest of the fall may pull other employees' lanyards, causing them to fall as well.

(j) *Snap-hook considerations.* Although not required by this standard for all connections, locking snap-hooks designed for connection to suitable objects (of sufficient strength) are highly recommended in lieu of the non-locking type. Locking snap-hooks incorporate a positive locking mechanism in addition to the spring loaded keeper, which will not allow the keeper to open under moderate pressure without someone first releasing the mechanism. Such a feature, properly designed, effectively prevents roll-out from occurring.

As required by the standard (Section I, paragraph (e)(1)) the following connections must be avoided (unless properly designed locking snap-hooks are used) because they are conditions which can result in roll-out when a nonlocking snap-hook is used:

- Direct connection of a snap-hook to a horizontal lifeline.
- Two (or more) snap-hooks connected to one dee-ring.
- Two snap-hooks connected to each other.
- A snap-hook connected back on its integral lanyard.
- A snap-hook connected to a webbing loop or webbing lanyard.
- Improper dimensions of the dee-ring, rebar, or other connection point in relation to the snap-hook dimensions which would allow the snap-hook keeper to be depressed by a turning motion of the snap-hook.

(k) *Free fall considerations.* The employer and employee should at all times be aware that a system's maximum arresting force is evaluated under normal use conditions established by the manufacturer, and in no case using a free fall distance in excess of six feet (1.8 m). A few extra feet of free fall can significantly increase the arresting force on the employee, possibly to the point of causing injury. Because of this, the free fall distance should be kept at a minimum, and, as required by the standard, in no case greater than six feet (1.8 m). To help assure this, the tie-off attachment point to the lifeline or anchor should be located at or above the connection point of the fall arrest equipment to belt or harness. (Since otherwise additional free fall distance is added to the length of the connecting means (i.e. lanyard)). Attaching to the working surface will often result in a free fall greater than six feet (1.8 m). For instance, if a six foot (1.8 m) lanyard is used, the total free fall distance will be the distance from the working level to the body belt (or harness) attachment point plus the six feet (1.8 m) of lanyard length. Another important consideration is that the arresting force which the fall system must withstand also goes up with greater distances of free fall, possibly exceeding the strength of the system.

(l) *Elongation and deceleration distance considerations.* Other factors involved in a proper tie-off are elongation and deceleration distance. During the arresting of a fall, a lanyard will experience a length of stretching or elongation, whereas activation of a deceleration device will result in a certain stopping distance. These distances should be available with the lanyard or device's instructions and must be added to the free fall distance to arrive at the total fall distance before an employee is fully stopped. The additional stopping distance may be very significant if the lanyard or deceleration device is attached near or at the end of a long lifeline, which may itself add considerable distance due to its own elongation. As required by the standard, sufficient distance to allow for all of these factors must also be maintained between the employee and obstructions below, to prevent an injury due to impact before the system fully arrests the fall. In addition, a minimum of 12 feet (3.7 m) of lifeline should be allowed below the

securing point of a rope grab type deceleration device, and the end terminated to prevent the device from sliding off the lifeline. Alternatively, the lifeline should extend to the ground or the next working level below. These measures are suggested to prevent the worker from inadvertently moving past the end of the lifeline and having the rope grab become disengaged from the lifeline.

(m) *Obstruction considerations.* The location of the tie-off should also consider the hazard of obstructions in the potential fall path of the employee. Tie-offs which minimize the possibilities of exaggerated swinging should be considered. In addition, when a body belt is used, the employee's body will go through a horizontal position to a jack-knifed position during the arrest of all falls. Thus, obstructions which might interfere with this motion should be avoided or a severe injury could occur.

(n) *Other considerations.* Because of the design of some personal fall arrest systems, additional considerations may be required for proper tie-off. For example, heavy deceleration devices of the self-retracting type should be secured overhead in order to avoid the weight of the device having to be supported by the employee. Also, if self-retracting equipment is connected to a horizontal lifeline, the sag in the lifeline should be minimized to prevent the device from sliding down the lifeline to a position which creates a swing hazard during fall arrest. In all cases, manufacturer's instructions should be followed.

Appendix D to Section 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 unidirectional 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) *Zinc 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, self-closing, self-locking gates shall be provided. Applicable provisions of the American National Standard Safety Requirements for Floor and Wall Openings, Railings and Toeboards, A12.1-1967, shall apply.

(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 metallic 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 $\frac{1}{8}$ -inch diameter ball, or be provided with a screen below the floor to reject a $\frac{1}{8}$ -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 $\frac{1}{8}$ 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 the National Electrical Code, NFPA 70-1971; ANSI C1-1971 (Rev. of C1-1968), except as modified by ANSI A120.1-1970 "American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance." 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 Article 610 of the National Electrical Code, NFPA 70-1971; ANSI C1-1971 (Rev. of C1-1968). 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.

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