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**Safety Standards for Scaffolds Used in
the Construction Industry; Final Rule**

DEPARTMENT OF LABOR**Occupational Safety and Health Administration****29 CFR Part 1926**

[Docket No. S-205]

RIN 1218-AA40

Safety Standards for Scaffolds Used in the Construction Industry

AGENCY: Occupational Safety and Health Administration, U.S. Department of Labor.

ACTION: Final rule.

SUMMARY: The Occupational Safety and Health Administration (OSHA) hereby revises the construction industry safety standards which regulate the design, construction, and use of scaffolds. The final rule updates the existing scaffold standards and sets performance-oriented criteria, where possible, to protect employees from scaffold-related hazards such as falls, falling objects, structural instability, electrocution and overloading.

In particular, the final rule has been updated to address types of scaffolds—such as catenary scaffolds, step and trestle ladder scaffolds, and multi-level suspended scaffolds—not covered by OSHA's existing scaffold standards. In addition, the final rule allows employers greater flexibility in the use of fall protection systems to protect employees working on scaffolds and extends fall protection to erectors and dismantlers of scaffolds to the extent feasible. Another area that the final rule strengthens is training for workers using scaffolds; the conditions under which such employees must be retrained are also specified in the final rule. Finally, the language of the rule has been simplified, duplicative and outdated provisions have been eliminated, overlapping requirements have been consolidated, and the performance orientation of the rule has been enhanced to allow employers as much flexibility in compliance as is consistent with employee protection.

DATES: Effective dates. This standard will become effective on November 29, 1996, except for § 1926.453(a)(2), which will not become effective until an Office of Management and Budget (OMB) Control number is received and displayed for this "collection of information" in accordance with the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). OSHA will publish a document in the Federal Register announcing the effective date of § 1926.453(a)(2).

Incorporation by reference. The incorporations by reference of certain publications listed in this final rule are approved by the Director of the Federal Register as of November 29, 1996.

Compliance date: Employers are required to comply with the provisions of paragraphs (e)(9) and (g)(2) of § 1926.451, which address safe access and fall protection, respectively, for employees erecting and dismantling supported scaffolds starting on September 2, 1997.

Comments. Written comments on the paperwork requirements of this final rule must be submitted on or before October 29, 1996.

ADDRESSES: 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, N.W., Washington, D.C. 20210.

Suggestions and information regarding the drafting of non-mandatory Appendix B, "Criteria for Determining the Feasibility of Providing Fall Protection and Safe Access for Workers Erecting or Dismantling Supported Scaffolds" should be submitted to the Docket Officer, Docket S-205, U.S. Department of Labor, Room N-2625, 200 Constitution Avenue, NW., Washington, D.C. 20210.

FOR FURTHER INFORMATION CONTACT: Ms. Anne C. Cyr, Occupational Safety and Health Administration, Office of Information and Public Affairs, Room N-3647, U.S. Department of Labor, 200 Constitution Avenue, N.W., Washington, D.C. 20210, Telephone: (202) 219-8148.

SUPPLEMENTARY INFORMATION:**I. Background**

Congress amended the Contract Work Hours Standards Act (40 U.S.C. 327 *et seq.*) in 1969 by adding a new section 107 (40 U.S.C. 333) to provide employees in the construction industry with a safer work environment and to reduce the frequency and severity of construction accidents and injuries. The amendment, commonly known as the Construction Safety Act (CSA), significantly strengthened employee protection by authorizing the promulgation of construction safety and health standards for employees of the building trades and construction industry working on federal and federally-financed or federally-assisted construction projects. Accordingly, the Secretary of Labor issued Safety and Health Regulations for Construction in

29 CFR part 1518 (36 FR 7340, April 17, 1971).

The Occupational Safety and Health Act of 1970 (the OSH Act) (29 U.S.C. 651 *et seq.*) authorized the Secretary of Labor to adopt established federal standards issued under other statutes, including the CSA, as occupational safety and health standards. Accordingly, the Secretary of Labor adopted the Construction Standards, which had been issued under the CSA, as OSHA standards (36 FR 10466, May 29, 1971). The Safety and Health Regulations for Construction were subsequently redesignated as 29 CFR part 1926 (36 FR 25232, December 30, 1971). Standards addressing scaffolds, §§ 1926.451 and 1926.452, were adopted in subpart L of part 1926 as OSHA standards as part of this process.

Various amendments were made to subpart L during the first two years of the OSH Act. The amendments revised scaffold provisions that addressed planking grades, wood pole scaffold construction, overhead protection, bracket scaffold loading, and plank spans. Also, substantive provisions concerning pump jack scaffolds, height of catch platforms, and guardrails were added (37 FR 25712, December 2, 1972).

Based on concerns regarding the effectiveness of the existing scaffold standards, OSHA began a complete review of subpart L in 1977. The Agency consulted the Advisory Committee on Construction Safety and Health (ACCSH) several times regarding draft revisions to subpart L. The transcripts of these meetings are part of the public record for this rulemaking (Ex. 3-4). OSHA addresses specific recommendations from the ACCSH, as well as those submitted by other rulemaking participants, in the Summary and Explanation section, below.

On November 25, 1986, OSHA issued a notice of proposed rulemaking (NPRM) on scaffolds used in construction (51 FR 42680). The proposal set a period, ending February 23, 1987, during which interested parties could submit written comments or request a hearing. The Agency twice granted requests for more time to submit comments and hearing requests. OSHA first extended the comment and hearing request period to June 1, 1987 (52 FR 5790, February 26, 1987) and then extended that period to August 14, 1987 (52 FR 20616, June 2, 1987). OSHA received 602 comments on the proposal, along with several hearing requests.

On January 26, 1988, OSHA announced that it would convene an informal public hearing on March 22, 1988 to elicit additional information on

specific issues related to scaffolds, fall protection and stairways and ladders (53 FR 2048). The informal public hearing was held on March 22–23, 1988, with Administrative Law Judge Joel Williams presiding. At the close of the hearing, Judge Williams set a period, ending May 9, 1988, for the submission of additional comments and information. OSHA received 31 submissions, including testimony and documentary evidence, in response to the hearing notice. On August 11, 1988, Judge Williams certified the rulemaking record, including the hearing transcript and all written submissions to the docket, thereby closing the record for this proceeding.

In 1988, the American National Standards Institute (ANSI), an organization which sets voluntary consensus standards, approved a revision of ANSI A10.8–1977, *Scaffolding*, updating its safety requirements for the use of scaffolds in construction and demolition operations. Section 6(b)(8) of the OSH Act requires that when an OSHA standard differs substantially from an existing national consensus standard, the Secretary must publish “a statement of the reasons why the rule as adopted will better effectuate the purposes of the Act than the national consensus standard.” In compliance with that requirement, OSHA has reviewed the requirements of this final rule with reference to the corresponding provisions of ANSI A10.8–1988. The Agency discusses the relationship between the provisions of subpart L and corresponding provisions of ANSI A10.8–1988 in the *Summary and Explanation*, below.

On March 29, 1993, OSHA reopened the rulemaking record for subpart L (58 FR 16509) to obtain additional comments and information regarding fall protection and safe means of access for employees erecting and dismantling scaffolds; the use of crossbraces in scaffold systems; and the use of repair bracket scaffolds. The comment period was scheduled to end on May 28, 1993. On May 26, 1993, the Agency extended the comment period (58 FR 30131) to June 29, 1993, in response to a request for additional time to submit comments. OSHA received 46 comments in response to the March 29 notice. Those comments are discussed below in relation to the pertinent provisions of the final rule.

On February 1, 1994, OSHA again reopened the rulemaking record (59 FR 4615) to obtain comments and information regarding scaffold stairways; repair bracket scaffolds; tank builder scaffolds; a NIOSH study of workplace fatalities; and scaffold-related

material incorporated from the proposed part 1910, subpart D rulemaking. The comment period, which ended on March 18, 1994, elicited 46 comments. Those comments are also discussed below in relation to the pertinent provisions of the final rule.

A wide range of employers, businesses, labor unions, trade associations, state governments, and other interested parties contributed to the development of this record. OSHA appreciates these efforts to help develop a rulemaking record that provides a sound basis for the promulgation of revised subpart L.

Based on its review of existing subpart L, OSHA believes that certain provisions in the existing standards are outdated, redundant, or ambiguous. In addition, some types of scaffolds used in construction (e.g., catenary scaffolds) are not clearly addressed by the existing standards, and some provisions cover only certain types of scaffolds when they should apply to all. The final rule eliminates those unnecessary, outdated and redundant provisions (e.g., revised subpart L states the requirement for guardrails once, rather than 19 separate times as in the existing standard).

OSHA is coordinating the revision of part 1926, subpart L, with the ongoing rulemakings initiated to revise the General Industry (part 1910, subpart D) and Shipyard (part 1915, subpart N) scaffold standards, so that those standards will be consistent, where appropriate.

II. Hazards Involved

Scaffold-related incidents resulting in injuries and fatalities continue to occur despite the fact that OSHA has had a scaffold standard (existing subpart L) in place since 1971 (Exs. 1, 2, 3, 42, 43, 44 and 45). However, the Agency believes that compliance with the standard being published today will be better than it has been in the past because this standard has been simplified, brought up to date, and strengthened to provide additional protection.

Although specific accident ratios cannot be projected for the estimated 3.6 million construction workers currently covered by subpart L, the Economic Analysis that accompanies this final rule estimates that, of the 510,500 injuries and illnesses that occur in the construction industry annually, 9,750 are related to scaffolds. In addition, of the estimated 924 occupational fatalities occurring annually, at least 79 are associated with work on scaffolds.

OSHA prepared the following statistical estimates (based on 4.5 million construction workers then covered by subpart L) to support the

1986 proposal for subpart L, based on a review of accident data prepared by the Bureau of Labor Statistics (BLS) (Ex. 3–1). The revised scaffold standards contain a number of provisions designed specifically to address the findings of this analysis.

a. Seventy-two percent of the workers injured in scaffold accidents covered by the BLS study attributed the accident either to the planking or support giving way, or to the employee slipping, or being struck by a falling object. Plank slippage was the most commonly cited cause.

b. About 70 percent of the workers learned of the safety requirements for installing work platforms, assembling scaffolds, and inspecting scaffolds through on-the-job training. Approximately 25 percent had no training in these areas.

c. Only 33 percent of scaffolds were equipped with a guardrail.

The following are recent examples, from the OSHA Integrated Management Information System (IMIS) data, of the types of accidents that continue to injure and kill employees working on scaffolds.

- In July, 1991, two employees were working on a pump jack scaffold doing roofing work. The scaffold became overloaded and broke. The employees fell 12 feet to the ground, resulting in one fatality and one serious injury.

- In August, 1992, two workers were erecting an aluminum pump jack scaffold. As they were raising the second aluminum pole, the pole apparently contacted an overhead power line. The pole being raised was 29 feet 10 inches long and the line was 28 feet 10 inches high. The line was approximately 11 feet from the house. One employee died and the other suffered severe burns and was hospitalized. The surviving employee noted that he thought they had enough room to work around the power lines, which were not de-energized or shielded.

- In July, 1993, a foreman climbed up the frame of a 45 foot high tubular welded frame scaffold to check on an employee who was sandblasting inside a stack at a steam plant. The scaffold was not equipped with guardrails and there was no access ladder. After talking to the employee, the foreman either fell from the unguarded platform or fell while climbing down the scaffold end frame, resulting in his death. There were no witnesses to the fall.

Based on its analysis of the available data and its field experience in enforcing construction standards, the Agency has determined that employees using scaffolds are exposed to a

significant risk of harm. Specifically, scaffold related fatalities still account for approximately 9% of all fatalities in the construction workplace. In addition, the above data indicate that the revised final standard would have prevented many of these accidents more effectively than compliance with the existing scaffold standards. Consequently, OSHA finds that the revision of its scaffold standards for construction is necessary to improve employee protection. OSHA has determined that, as revised, the standard clearly states employers' duties and the appropriate compliance measures.

For additional discussion of incidence rates, significance of risk, and the protectiveness of the final rule, see Section IV, Summary of the Final Economic Analysis.

III. Summary and Explanation of the Final Rule

The following discussion explains how the final rule corresponds to or differs from the proposed scaffold standard and the existing standard, and how the comments and testimony presented on each provision influenced the drafting of the final rule. Except where otherwise indicated, proposed provisions which did not elicit comment have been promulgated as proposed, for reasons stated in the preamble to the proposed rule which is hereby incorporated by reference (51 FR 42680).

Subpart L—Scaffolds. The title of subpart L of OSHA's Construction standards has been changed from "Scaffolding" to "Scaffolds", as proposed. The word "scaffold" is used in the title and throughout the final rule in lieu of the longer word "scaffolding." This change does not affect the scope of subpart L. OSHA did not receive any comments concerning the title of the subpart.

Section 1926.450 Scope, application and definitions applicable to this subpart. Paragraph (a) of § 1926.450 states the scope and application of subpart L. The final rule will apply to all scaffolds used in construction, alteration, repair (including painting and decorating), and demolition operations covered under 29 CFR part 1926, except that crane or derrick suspended personnel platforms will continue to be regulated under § 1926.550(g). Language explicitly excluding these platforms has been added to the final rule. The relationship between § 1926.550(g), which covers these platforms, and subpart L is discussed further in relation to § 1926.451(c)(2) and NPRM Issue 3, below. In addition, aerial lifts are

covered exclusively in § 1926.453, as noted in paragraph (a) of § 1926.450. Proposed paragraph (a) covered *all* scaffolds.

A commenter (Ex. 2-38) recommended that OSHA explicitly exempt personnel platforms suspended by cranes or derricks from this final rule. The commenter stated "[t]his would avoid confusion, both for the Compliance Officer and the employer." As noted above, the Agency recognizes the need for an exemption and has revised paragraph (a) accordingly.

Another commenter (Ex. 2-18), representing the elevator industry, suggested that OSHA revise the scope of proposed subpart L to exclude "False cars used in elevator construction that are equipped with independent safeties that operate on the guardrails * * *". The commenter supported the suggestion as follows: "An elevator false car operates on fixed guiderails * * * equipped with safeties that ride on the guiderails * * * and are operated automatically by the slackening of the hoisting rope. Past OSHRC (Occupational Safety and Health Review Commission) decisions have recognized that a false car is a unique tool and is not a scaffold." The commenter did not cite any specific OSHRC decisions to support its assertion.

OSHA disagrees with this commenter on this point, because the findings in two enforcement cases involving the Otis Elevator Company (12 OSHRC 1470 and 12 OSHRC 1513 (1985)) clearly indicate that the scaffold standards of subpart L cover false cars. In *Otis Elevator Company*, 12 OSHRC 1513 (1985), the final order stated:

The evidence in this case showed that the false cars were used as elevated working space from which employees installed permanent elevator rails. The ability to raise and lower the false cars by means of cables from overhead supports does not remove false cars from the applicability of the scaffold standard, and a false car is found to be a scaffold within the meaning of 29 CFR 1926.452(b)(27).

The Agency notes that elevator false cars fit the definition of a "scaffold" in final rule § 1926.450(b) in that they are temporary elevated work platforms used for supporting employees. Accordingly, there are no apparent grounds for disputing that elevator false cars are properly regulated under part 1926, subpart L. Therefore, OSHA will continue to regulate temporary elevated work platforms, such as false cars and go-devils used in elevator shaft construction, as scaffolds.

The Scaffolding, Shoring and Forming Institute (SSFI) (Ex. 2-367) recommended that OSHA include

"Window cleaning" within the scope of subpart L, because "[w]indow cleaning is a common activity that, for the overwhelming majority of instances, uses transportable suspended scaffolds." In addition, the Scaffold Industry Association (SIA) (Ex. 2-368) suggested that OSHA add "scheduled and unscheduled maintenance (including but not limited to painting and decorating, tuck pointing, sand blasting, water proofing and window cleaning)" to the scope of subpart L, because maintenance is a type of work "regularly performed on scaffolds addressed in this subpart and, therefore, should be included in the scope."

Another commenter (Ex. 2-462) stated that expanding the scope of subpart L to include maintenance would create confusion and "would greatly reduce the safety standard already in place for Powered platforms for exterior building maintenance" (29 CFR 1910.66).

The Agency is not expanding the scope to include building maintenance because building maintenance (such as window cleaning) is a general industry activity, addressed under the appropriate scaffold and powered platform standards of 29 CFR part 1910.

OSHA received a general comment (Ex. 2-29) which noted that § 1910.66 addressed powered platforms used for exterior building maintenance in general industry and urged OSHA to ensure that the corresponding regulatory language in the construction standard for scaffolds was consistent. As discussed above, the Agency agrees, and is coordinating its General Industry, Shipyard and Construction rulemaking activity so that employers in those industries have consistent regulation, to the extent that workplace conditions permit.

Paragraph (b) of § 1926.450 lists and defines all major terms used in subpart L. Proposed terms and definitions which elicited no comments and which have been promulgated unchanged or with only minor editorial revisions are not addressed below. Those terms include "adjustable suspension scaffold", "boatswains' chair", "body belt", "body harness", "brace", "cleat", "coupler", "crawling board", "double pole scaffold", "exposed power lines", "fabricated decking and planking", "float (ship) scaffold", "form scaffold", "hoist", "interior hung scaffold", "ladder stand", "lean-to scaffold", "lower level", "mobile scaffold", "multi-level suspension scaffold", "multi-point adjustable scaffold", "open sides and edges", "overhand bricklaying", "platform", "pole scaffold", "pump jack scaffolds", "roof bracket scaffold", "runner", "self-

contained adjustable scaffold", "shore scaffold", "single-point adjustable suspension scaffold", "single pole scaffold", "step platform and trestle ladder scaffold", "stone setter multi-point adjustable suspension scaffold", "supported scaffold", "suspension scaffold", "tube and coupler scaffolds", "tubular welded frame scaffold", "two-point suspension scaffold", "unstable objects", "vertical pickup", "walkway", and "window jack scaffold".

As proposed, OSHA is revising its definitions for particular types of scaffolds by specifying whether a particular type of scaffold is a "supported" or a "suspension scaffold." OSHA believes that adding this information will make it easier for employers to identify the appropriate general requirements in final rule § 1926.451.

In addition, the Agency has revised subpart L definitions by deleting language that limits the use of a particular type of scaffold. Such substantive limitations are more appropriately placed in regulatory text. Accordingly, for example, OSHA has revised the definition for "bricklayers' square scaffolds" (a scaffold composed of framed wood squares which support a platform, limited to light and medium duty) by deleting the words "limited to light and medium duty". Similarly, OSHA has revised the definition for "coupler" to be "a device for locking together the component tubes of a tube and coupler scaffold", deleting language addressing the material used for the coupler because such requirements are more properly located in §§ 1926.451 or 1926.452.

The following discussion covers the terms for which definitions are being added or revised in this final rule and those proposed terms which elicited comments.

"Bearer (Putlog)." This definition is the same as the definition proposed except that the word "Putlog," an industry-used term, has been added to the definition. A commenter (Ex. 2-29) suggested putlog should be included in the proposed definition "to show a close or synonymous relationship to the term 'bearer'" and because "it is a widely used and understood term." The Agency agrees with the commenter and has revised the proposed definition accordingly.

"Bricklayers' Square Scaffold" is defined in existing § 1926.452(b) and the proposed definition is substantively unchanged in the final rule. The definition deletes the existing § 1926.452(b) requirements that bricklayers' square scaffolds be constructed of "wood" and that the

platform capacity be limited to "light and medium duty." The revised definition recognizes that bricklayers' square scaffolds can be constructed of materials other than "wood" and that their capacity is not limited to "light and medium duty" as long as they can meet the capacity requirements set forth in final rule § 1926.451(a)(1).

A commenter (Ex. 2-23) suggested that OSHA adopt the ANSI A10.8-1977 definition for Bricklayers' Square Scaffold which specifies the use of "wood" and the ability to sustain light to medium loads. As stated above, OSHA believes it would be inappropriate to limit technological advances that would provide for the use of other materials with greater capacities. Therefore, the Agency has not made the suggested revision.

"Carpenters' bracket scaffold." This term means a supported scaffold consisting of a platform supported by brackets attached to building or structural walls. The final rule is identical to the proposal. The SIA (Ex. 2-368) suggested that because different trades (i.e., cement finishers) use this type scaffold, the term be renamed "bracket scaffold" exclusively. OSHA recognizes that this type of scaffold is used by several trade groups. However, OSHA believes that it is widely recognized in the construction industry that "carpenters' bracket scaffolds" are not used only by carpenters. Therefore, the Agency is not making the suggested revision.

"Catenary scaffold." This type of scaffold is not specifically addressed in OSHA's existing rule but is covered in final rule § 1926.452(r). This term refers to a suspension scaffold consisting of a platform supported by two essentially horizontal and parallel ropes which are secured to structural members and may be supported by vertical pickups. The proposed definition has been changed to replace the language "fastened to" with "supported by" and a phrase has been added explaining that horizontal ropes "may be supported by vertical pickups."

One commenter (Ex. 2-23) suggested that OSHA insert the word "wire" between the words "parallel" and "rope."

However, OSHA does not intend to restrict the type of material used for suspension scaffold rope as long as it is "capable of supporting without failure six times the maximum intended load" as set forth in final rule § 1926.451(a)(3).

Two commenters (Exs. 2-23 and 2-368) suggested OSHA replace the words "fastened to" with "supported by" in this definition. OSHA agrees that the suggested words more accurately describe the function of the horizontal

ropes with relation to the platform and is revising the proposed definition accordingly.

In addition, the SIA (Ex. 2-368) suggested that OSHA add the phrase "and may be supported by vertical pickups". OSHA agrees with the commenter. Vertical pick-ups can act as supports for sagging horizontal ropes. Also, because final rule § 1926.452(r)(1) refers to vertical pickups, OSHA believes that it is appropriate to include this phrase in the definitions.

"Chimney hoist." This term is being added to recognize a specific type of multi-point adjustable suspension scaffold used to gain access to worksites inside chimneys.

"Competent person." This term is being added to the final rule as a matter of convenience for users. The definition is identical to that found in § 1926.32.

"Continuous run scaffold (run scaffold)" means a two-point or multi-point adjustable suspension scaffold constructed using a series of interconnected braced scaffold members or supporting structures erected to form a continuous scaffold. This term is being added to recognize this type of system. The Agency notes that the key element here is that the scaffold members must be interconnected so that the erected scaffold acts as a single unit. This would preclude planking across two independent scaffolds without joining them so the resulting scaffold acts as one unit. This system allows erecting a lengthy scaffold without requiring a continuous planked platform, as long as the smaller platform is properly guarded.

"Deceleration device." This term means any mechanism, such as a rope grab, rip stitch lanyard, specially-woven lanyard, tearing or deforming lanyard, automatic self-retracting lifelines/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. The proposed definition, which was effectively identical, has been editorially revised for the sake of clarity.

Three commenters (Exs. 2-13, 2-368 and 2-516) suggested that rope grabs and some self-retracting lifelines are not "deceleration devices" but are actually fall arrest devices. OSHA notes, however, that it is difficult to differentiate clearly between system components, as suggested, because fall arrest (stopping) and energy absorption (braking) are closely related. The Agency also observes that the performance criteria for personal fall arrest equipment address the entire system, not just "fall arresters" or

"energy absorbers". Accordingly, OSHA has not made the suggested change.

"Equivalent." This term is used in the final rule to allow alternative means of complying with the standard. The definition provides that the employer must be able to demonstrate that the alternative means of compliance will provide an equal or greater degree of safety than that attained by using the method or item specified in the standard. The final definition is identical to the proposed definition, except that minor editorial changes have been made for the sake of clarity. The final rule definition is consistent with the corresponding definitions in § 1910.66 and in part 1926, subparts M and X.

The SIA (Ex. 2-368) suggested that OSHA not require the employer to "demonstrate whether or not the scaffold is of 'equal or greater degree of safety' because the employer is too many steps removed from the manufacturer" and because requiring the employer to test for equivalency would create a significant danger that failure would occur. However, the proposed language reflects the Agency's longstanding position that employers who choose to deviate from criteria set in OSHA standards must be able to demonstrate that employee protection has not been adversely affected. The employer has the flexibility to establish equivalence by any effective means, including information available from equipment suppliers and taking into account the specific circumstances of the work to be done.

"Eye" or "eye splice" means a loop with or without a thimble at the end of a wire rope. This term is being added to the final rule to clarify the Agency's intent that this type of connection is an acceptable way to connect wire ropes without significantly affecting their strength or capacities. The term is used in final rule § 1926.451(d) (8) and (9).

"Fabricated frame scaffold" means a supported or suspended frame scaffold consisting of platform(s) supported on fabricated end frames with integral posts, horizontal bearers, and intermediate members. This is the term for the type of scaffold presently identified as "tubular welded frame scaffold." OSHA has determined that the current term is too restrictive because the words "tubular" means round and "welded" means that metal components are involved. The provisions of final rule § 1926.452(c), Fabricated frame scaffolds, are not subject to such limitations. They address fabricated frames and related scaffold components whether the component parts are square or round, or

made of metal, plastic, wood, or some other material. The final rule definition is identical to that in the proposed rule.

Two commenters (Exs. 2-13 and 2-320) suggested using the existing term "tubular welded frame" and one commenter (Ex. 2-23) suggested using the term "Fabricated tubular frame (Tubular welded frame scaffold)" instead of the proposed term. However, as explained above, OSHA does not intend to restrict this term to "tubular" or "welded" components.

"Failure." This term is used in performance-oriented paragraphs such as §§ 1926.451 (a)(1) and (a)(3), which address scaffold capacity. Because the word might otherwise be interpreted to mean only breakage or a physical separation of scaffold components, the final rule definition clearly indicates that load refusal (the point where the ultimate strength of a component is exceeded) is also considered to be failure. This is the point where structural members lose their ability to carry loads although they have not broken or separated. The term is the same as the term defined in Subpart X of Part 1926, Ladders and Stairways. The definition for "failure" in the final rule is the same as proposed.

One commenter (Ex. 2-40) suggested that the term "ultimate strength" was not clearly defined. Another commenter (Ex. 2-38) suggested deleting the last sentence of the proposed definition (Load refusal is the point where the ultimate strength is exceeded) to avoid confusion between "ultimate strength" and "overloading without breaking." As OSHA stated above, "ultimate strength" may be exceeded without component parts breaking or separating. Therefore, the Agency believes the suggested changes are unnecessary.

"Guardrail system." This term refers to perimeter protection composed of vertical barriers which are erected to prevent employees from falling. The final rule definition is essentially identical to the proposed definition. This term replaces the definition of "guardrail" in the existing rule, which appeared at § 1926.452(b)(10). The old definition was rail secured to uprights and erected along the exposed sides and ends of platforms. OSHA believes that this definition did not adequately reflect the manner in which top rails, midrails and other intermediate members, and toeboards combine to provide effective fall protection. The final rule definition of guardrail clearly indicates that the entire system, including top rail, midrail (or other intermediate protection), and uprights, is covered when guardrails are addressed in final rule § 1926.451(e). The definition of guardrail system used

in the proposed rule stated that a guardrail system was "a vertical barrier erected to prevent employees from falling from an open side or edge of a scaffold platform or walkway". The proposed definition also distinguished between "Type I guardrails", which were capable of providing fall protection without the use of personal fall arrest systems, and "Type II guardrails", which would need to be supplemented by personal fall arrest systems (as explained below, OSHA has not maintained this distinction in the final rule).

The SIA (Ex. 2-368) suggested replacing the word "prevent" with the word "protect" in the proposed definition of "guardrail system". According to standard dictionary meanings of both words, "prevent" more accurately describes the function of the guardrail system, which is to keep the employee from going past the perimeter of the scaffold in the first place. Therefore, the Agency is not making the suggested change.

Three commenters (Exs. 2-13, 2-53 and 2-370) recommended that OSHA retain the guardrail rules in the existing scaffold standard and eliminate the concept of "Type I" and "Type II" from the proposed definition of guardrail systems. The commenters suggested that the old rule's definition of guardrail protection would provide more fall protection than the definition used in the proposed rule. For reasons discussed further below, OSHA finds that the final rule's requirements for guardrail systems, which are essentially identical to those in the proposed rule, provide more protection than the requirements in the existing rule. However, OSHA has deleted the discussion of "Type I" and "Type II" guardrails from the final rule for the sake of clarity and has added specific criteria for guardrails to final rule § 1926.451(g).

"Horse scaffold" means a supported scaffold consisting of a platform supported by construction horses. Horse scaffolds made of metal are sometimes known as trestle scaffolds. The proposed definition was similar except that it did not include the term "trestle scaffold." The SIA (Ex. 2-368) suggested revising the definition to specify that horse scaffolds "may be constructed of wood, metal, or a combination of both. The metal horses may be referred to as 'trestle horses'." Under OSHA's performance-oriented approach to subpart L, an employer may use any construction materials (e.g., wood or metal) that enable the scaffold to comply with the capacity requirement set forth in § 1926.451(a)(1). However,

the Agency agrees that it would be useful to indicate that some horse scaffolds constructed of metal are known as trestle scaffolds. OSHA has revised the definition accordingly.

"Ladder jack scaffold." The final rule definition, which is identical to that in the proposed rule, states that this type of scaffold is a supported scaffold consisting of a platform supported by brackets attached to ladders.

A commenter (Ex. 2-23) stated that the capacity of this type of scaffold should be limited to "light duty" and that the words "light duty" should be included in this definition. As discussed above, OSHA believes it is inappropriate for definitions to include substantive requirements. In any event, the Agency has determined that a ladder jack scaffold which complies with the capacity criteria of § 1926.451(a)(1) and the other pertinent subpart L requirements will be considered acceptable. Accordingly, OSHA has not made the suggested change.

"Landing." This new term, which has been added to ensure that the requirements of final rule § 1926.451(e)(4) are clearly understood, refers to a platform at the end of a flight of stairs.

"Large area scaffold" means a pole scaffold, tube and coupler scaffold, systems scaffold, or fabricated frame scaffold erected over substantially the entire work area, for example; A scaffold erected over the entire floor area of a room. The Agency has added this term and definition, along with final rule § 1926.452(d), to provide a reference point in the standard for this widely used type of scaffold.

"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. A vertical lifeline is sometimes known as a dropline. A horizontal lifeline is sometimes known as a trolley line. This definition, which was not part of the proposed rule, has been added for the sake of clarity. The definition in part 1926, subpart M, Fall Protection, is consistent with the definition in final subpart L. The proposed terms "dropline" and "trolley line", along with their definitions, have been deleted as separate definitions and have been incorporated into this final rule definition.

One commenter (Ex. 2-57) stated that a "trolley line" was a "horizontal lifeline" and suggested that OSHA set

"strength requirements." While final rule subpart L does not set numerical load requirements for "horizontal lifelines", criteria for such equipment are provided in § 1926.502(d), subpart M, as referenced by a note to final rule § 1926.451(g)(3).

"Masons' adjustable supported scaffold." OSHA proposed this term, which was not defined in existing subpart L, so employers who used "self-contained adjustable scaffolds" in masonry operations would have a clear reference point in revised subpart L. The final rule is identical to the proposed rule definition.

One commenter (Ex. 2-23) suggested replacing the parenthetical reference to self contained adjustable scaffolds with the definition for such scaffolds in ANSI A10.8-1977. However, to limit redundancy and confusion, OSHA does not believe that this term should be defined by the format suggested by the commenter.

"Masons' multi-point adjustable suspension scaffold." This term replaces the term "Masons' adjustable multiple-point suspension scaffold" in the existing standard. The term means a two-point or multi-point adjustable suspension scaffold designed and used for masonry operations. The final rule definition is the same as that proposed.

One commenter (Ex. 2-23) suggested OSHA adopt the definition for this term from ANSI A10.8-1977, which contains the language "continuous platform." However, it is not OSHA's intent to limit this type of scaffold to a single "continuous platform." All types of multi-point suspension scaffolds covered by subpart L may consist of more than one platform. Multi-point scaffolds are not limited by the number of suspension wires, platforms, or the location of attachment of the suspension wires to the platform or platforms (Example: A multi-point scaffold may consist of one platform suspended by four wires or it may consist of two platforms suspended by four wires). Additionally the definition suggested by the commenter did not include the words "masonry operations." OSHA is including the words "masonry operations" in this definition so it applies specifically to such scaffolds used in the masonry trade.

"Maximum intended load" means the total load of all persons, equipment, tools, materials, transmitted loads, and other loads reasonably anticipated to be applied to a scaffold or scaffold component at any one time. This term replaces the existing terms "maximum rated load" and "workload". The term addresses the types of loads which are to be included when determining the

maximum load. OSHA has been concerned that the word "rated" in the existing term "maximum rated load" does not clearly express how the safety factor of four (existing rule paragraph 1926.451(a)(7)) or six (existing rule paragraph 1926.451(a)(2)) is to be incorporated into the determination of the maximum load. The final rule definition and final rule § 1926.451(a)(1) clearly indicate that the maximum intended load is determined without regard to safety factors. Once the maximum intended load is determined, the employer *then* applies the pertinent safety factor to determine the requisite strength for the system in question.

The final rule definition is the same as in the proposed rule except the word "employees" has been replaced with the word "persons". The SIA (Ex. 2-368) suggested this change because "[p]ersons other than employees might be on a scaffold thus overloading it." OSHA agrees that the weight of all "persons" needs to be considered when calculating the maximum intended load.

One commenter (Ex. 2-23) suggested that OSHA add the closely related term "scaffold load rating" which includes definitions for the words "heavy-duty loading," "medium-duty loading," "light-duty loading" and "special loading." The Agency provides examples of appropriate measures for "heavy-duty," "medium-duty" and "light-duty" scaffold in non-mandatory Appendix A of final rule subpart L. Accordingly, the Agency believes the appropriate information is available and no further changes are necessary.

Two comments (Exs. 2-13 and 2-320) suggested replacing the proposed term and definition of maximum intended load with the term "Maximum Rated Load." The commenters suggested that the term "Maximum Rated Load" takes into account safety factors established by the designer or manufacturer.

OSHA agrees that the term "Maximum Rated Load" does include built-in safety factors. As stated above, by not including the words "safety factor" in this definition or replacing the proposed term with "Maximum Rated Load," which implies built-in safety factors, OSHA clearly indicates that the minimum safety factor of 4:1 as set forth in final rule § 1926.451(a)(1) applies. The Agency believes it is appropriate to take into account the "expected" burden as well as the burden a scaffold "can" support without failure.

"Needle beam scaffold" means a suspension scaffold supported by needle beams. The final rule definition is the same as the proposed definition. One commenter (Ex. 2-23) suggested

that OSHA limit the use of this type of scaffold to "light-duty". However, as discussed earlier, the Agency does not intend to limit the capacity of a scaffold as long as it meets the pertinent requirements of § 1926.451(a). OSHA has provided examples of measures that would enable a scaffold to comply with these requirements in non-mandatory Appendix A.

"Outrigger." This term means the structural member of a supported scaffold used to increase the base width of a scaffold in order to provide support and stability for the scaffold. The terms, "outrigger beam" and "outrigger scaffold" are new definitions provided to explain the difference between these three similar terms. The final rule differs from the proposal, which defined outrigger as "the structural member of a supported scaffold used to increase the base width of a scaffold in order to provide greater stability for the scaffold." The wording change was made in response to a comment from the SIA (Ex. 2-368), suggesting that OSHA replace the word "greater" with the words "support and increased." OSHA agrees that the suggested wording more accurately expresses the Agency's intent.

"Personal fall arrest system." This term, which replaces the proposed term "body belt/harness system", refers to a system used to arrest the fall of an employee from a working level. It consists of an anchorage, connectors, and a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. The final rules on fall protection (part 1926, subpart M) and powered platforms (§ 1910.66) also define "personal fall arrest system" in this manner. The final rule definition is essentially the same as that proposed for "body belt/harness systems", and the phrase "personal fall arrest systems" appears in the final rule wherever the phrase "body belt/harness systems" was used in the proposed rule. A commenter (Ex. 2-13) suggested that the definition be reworded to indicate clearly that lifelines and deceleration devices are not always included as a part of a body belt/harness system. OSHA agrees and has clarified this point in the revised definition.

OSHA has deleted the proposed term "platform unit" and has incorporated the proposed definition language into final rule § 1926.451(b)(1)(i), which addresses the construction of scaffold platforms.

"Power operated hoists." This new term refers to hoists which are powered by other than human energy. The final rule language differs from the proposed

language, which used the term "mechanically-powered hoists". OSHA has revised the terms "mechanically powered" and "manually powered" hoists to read "power operated hoists and manually operated hoists", because the Agency has determined that the language should be consistent with ANSI A10.8-1988, paragraph 6.

"Qualified." This term is being added to the final rule as a matter of convenience for users. The definition is identical to that found in § 1926.32.

"Rated load." This new term addresses the maximum load that a hoist is allowed to lift. The discussion of final rule § 1926.451(a)(1), below, addresses the use of this term.

"Repair bracket scaffold." This new term has been added to address the type of scaffold addressed by final rule § 1926.452(x). This term is discussed below in conjunction with the discussion of that paragraph.

"Scaffold." This term refers to a temporary elevated platform (supported or suspended) and its supporting structure, including points of anchorage, used for supporting employees or materials or both. The definition also clearly indicates that crane or derrick suspended personnel platforms are not scaffolds. The Agency has added the phrase "including points of anchorage" to the definition of scaffold in the final rule to indicate clearly that points of anchorage are considered to be part of a scaffold.

"Stair tower (Scaffold stairway/tower)." This new term has been added to describe the means of access addressed by final rule § 1926.451(e)(4). This term is addressed in relation to that provision below.

"Stall load." This new term has been added to identify the maximum load that a hoist can lift without stalling or shutting down. The use of this term is discussed in relation to final rule § 1926.451(a)(2), below.

"Stilts" mean a pair of poles or similar supports with raised footrests, used to permit walking above the ground or working surface. This term and definition has been added to recognize this type of scaffold, which is used by many trades in the construction industry to allow employees to walk elevated above the ground or working surface. Final rule paragraph § 1926.452(y) addresses the safe use of this type of scaffold both as a scaffold itself, and on other types of scaffolds (large area scaffolds).

"System scaffold" means a scaffold consisting of posts with fixed connection points that accept runners, bearers, and diagonals that can be interconnected at predetermined levels.

This new term has been added to the final rule to recognize the existence and acceptance of this type of scaffold. The definition is identical to the definition for the same term found in ANSI A10.8-1988.

"Tank builders' scaffold" means a supported scaffold consisting of a platform supported by brackets that are either directly attached to a cylindrical tank or are attached to devices that are attached to such a tank. In the February 1, 1994 notice of record reopening (59 FR 4618), OSHA suggested a definition of "tank builders' scaffold" for consideration. That definition was very similar to the final rule definition except that the reopening notice definition did not specifically refer to cylindrical tanks and did specify that the platform was welded to the steel plates of the tank.

The commenters (Exs. 43-19, 43-23, 43-33, 43-34, 43-35, 43-39, 43-40, 43-42, and 43-43) who responded to the proposed definition for tank builders' scaffold stated:

A "tank" is not necessarily a cylinder. The scaffold is used on structures that can be cylindrical, rectangular, conical, spherical, spheroidal, or elliptical. Also, "tanks" are constructed of material other than metal; e.g., fiberglass, wood, etc. Some tanks have vertical walls that are so thin that a bracket could not be welded to it; rather, the bracket would have to be bolted. We would further comment that the bracket is often inserted into a device which is welded to the steel plate. So we would suggest not referencing the bracket being attached to the structure, but rather the bracket being attached to a device that is affixed to the structure.

In addition, eleven commenters (Exs. 43-19, 43-21, 43-23, 43-27, 43-33, 43-34, 43-35, 43-39, 43-40, 43-42, and 43-43) stated that the criteria of an April 4, 1975 variance (40 FR 15139), which addressed tank builder scaffolds, would be adequately addressed by general provisions of the final rule and the definition of "tank builders' scaffold".

The 1975 variance order stated:

The applicants' business, which is part of the tank building industry, involves the erection of relatively large steel plate segments of circumferential rings. Due to the unique nature of the construction involved, special procedures, including special scaffolding, have been developed. For example, as opposed to more conventional scaffolds, tank scaffolds must be highly portable and have a relatively low density of occupancy by [workers]. These scaffolds are raised up the shell of the tank as new rings of steel are added and work is completed at the level below.

Most plate structures are fabricated from standard length plates * * * each approximately 31.416 feet (9.42 m.) long, [with] brackets [normally] welded to them while they are on the ground prior to being

placed into position on the tank wall. Scaffolding and guardrail supports are then attached to these brackets. If the applicants were to comply with [requirements] that [the maximum spacing for supports be no more than 8 feet (2.4 m.) for guardrails or 10 feet (3.0 m.) for planking], they assert it would be necessary to lay out each steel plate into sections with the brackets located approximately 7.854 feet (2.36 m.) apart. Instead, the applicants wish to lay out the plates into three equal sections with brackets located approximately 10' 6" (3.15 m.) apart.

* * * Because the contour of the steel plates of the tank face is curved and the adjacent edge of the scaffold platform is straight, there is an open space between them. As a result, applicants have installed taut wire rope on the scaffold brackets that extends midway between the innermost edge of the scaffold platform and the curved plate structure of the tank face to serve as a safety line in lieu of an inner guardrail assembly.

Since the information submitted to OSHA in relation to the variance addressed scaffolds used on cylindrical steel tanks, the Agency is applying the criteria of the variance only to structures that are approximately cylindrical. The Agency believes that non-cylindrical structures should be addressed on a case-by-case basis under the general provisions of the final rule. OSHA notes that 9 of the 11 commenters (Exs. 43-19, 43-23, 43-33, 43-34, 43-35, 43-39, 43-40, 43-42, and 43-43) mentioned above also stated "[t]ank builders place the scaffold inside of a cylinder, traditionally, to erect the tank." However, the Agency believes that the requirements of the variance, as modified in Appendix A of the final rule, can reasonably be applied to cylindrical tanks that are constructed of materials other than steel. The final rule definition for "tank builders' scaffold" has been worded accordingly.

OSHA has not promulgated specific requirements for tank builders' scaffolds in the final rule because the Agency believes that the requirements for those scaffolds are adequately addressed in the general provisions of the final rule. The Agency notes that it has placed several provisions (some of which have been editorially modified) of the variance in Appendix A for the benefit of employers who use tank builders' scaffolds, and that the introductory text to the Appendix clearly indicates that following the Appendix will be considered to constitute compliance with the requirements of this standard with regard to scaffolds used in the construction of cylindrical tanks. However, employers choosing not to follow the Appendix must still comply with the applicable requirements of § 1926.451, particularly paragraphs (a) and (f).

"Top plate bracket scaffold." This term is being added to the final rule to recognize a type of scaffold which is similar to carpenters' bracket scaffolds and form scaffolds. This type of scaffold consists of a platform supported by brackets that hook over or are attached to the top plate of a wall. Such scaffolds are used in residential construction when employees are setting roof trusses.

OSHA has deleted the following terms, which are defined in the old scaffold standard, from the definition section of the final rule, because those terms are now defined in other subparts or because the final rule no longer uses the terms in question: "heavy duty scaffold," "light duty scaffold," "medium duty scaffold," "midrail," "toeboard," and "working load." In addition, the proposed definitions for "drop lines", and "trolley line" have been deleted from this final rule, since they have been incorporated into the definition of "lifeline".

Under Issue L-12 in the preamble of the proposed rule, OSHA solicited testimony and related information on a suggestion by the ACCSH (Tr. 206, 6-9-87) that definitions for "ramp" and "runway" be added to the standard. The ACCSH indicated that the added definitions would facilitate clear understanding of the requirements in proposed § 1926.451(c)(4) (final rule § 1926.451(e)(4)). As noted under the discussion of the Issue, a member of the ACCSH recommended that the Agency use the definition of ramp developed by the National Safety Council.

The one comment (Ex. 2-593) OSHA received addressing the Issue supported defining the two terms. The commenter did not provide any suggested wording but indicated that the definitions should be "clear and consistent with existing OSHA and ANSI definitions."

In the final rule, OSHA has replaced the proposed term "runway" with the term "walkway", to indicate the Agency's regulatory intent clearly. However, the Agency believes that "ramp" is a commonly understood term and does not require a specific OSHA definition. Accordingly, OSHA has not added a definition for "ramp" to the final rule.

Paragraph 1926.451(a) Capacity

Final rule paragraph (a) sets the minimum strength criteria for all scaffold components and connections. The final rule sets scaffold capacity requirements that are substantively the same as those in existing subpart L, while eliminating ambiguities and apparent inconsistencies. The introductory text of the proposed paragraph, which stated that "the

following requirements applied to all types of scaffolds except as indicated:", has been deleted in the final rule because the Agency has determined that it is too similar to the introductory text of paragraph (a)(1) and, therefore, is unnecessary.

Paragraph (a)(1) requires that each scaffold and scaffold component be capable of supporting, without failure, its own weight and at least 4 times the maximum intended load applied or transmitted to it. Paragraphs (a)(2), (a)(3), (a)(4), (a)(5) and (g) of § 1926.451 provide exceptions to this general rule, and are discussed below. This provision is based on existing § 1926.451(a)(7), which requires that scaffolds and scaffold components "be capable of supporting without failure at least four times the maximum intended load".

The final rule clearly provides that the 4 to 1 factor for a component applies only to the load which is actually applied or transmitted to that component, and not to the total load placed on the scaffold. Existing § 1926.451(a)(7), taken literally, could be read to require that each separate scaffold component be able to support four times the maximum intended load (MIL) of the entire scaffold. For example, the existing provision could be interpreted to require that a crossbrace on a supported scaffold be capable of supporting the same load as a scaffold leg, that is, be sized to support four times the entire MIL regardless of where the load is placed on the scaffold and regardless of the fact that the function of a brace is to prevent sway and not directly to support the MIL. Such an approach was not OSHA's intent. The Agency intended that each component be adequate to meet the 4 to 1 factor, but only for the portion of the MIL applied or transmitted to that component. The MIL for each component depends on the type and configuration of the scaffold system. Final rule paragraph (a)(1), which is effectively identical to the corresponding language in proposed paragraph (a)(1), clearly expresses the Agency's intent. The proposed provision has been editorially revised and reorganized for the sake of clarity. In particular, the exceptions to proposed paragraph (a)(1), which provide different coverage for suspension scaffolds, have been clearly delineated as separate paragraphs (a)(2) through (a)(6) in the final rule.

Paragraph (a)(2) of the final rule requires that direct connections to roofs and floors and counterweights used to balance adjustable suspension scaffolds be capable of resisting at least 4 times the tipping moment imposed by the scaffold operating at either the rated

load of the hoist or at 1.5 (minimum) times the tipping moment imposed by the scaffold operating at the stall load of the hoist, whichever is greater. Proposed paragraph (a)(2) simply required that direct connections to roofs and floors, and counterweights used to support suspension scaffolds, be capable of providing a resisting moment of at least four times the tipping moment. The proposed provision was intended to clarify that the safety factor of four to one also applies to direct connections to floors and roofs and to counterweight systems. These areas are as integral to the scaffold system as the scaffold platform itself. OSHA has revised the proposed provision to account for the need to base the factor of safety for adjustable suspension scaffolds on the rated load of the hoist and the stall load of the hoist.

Several commenters (Exs. 2-8, 2-28, 2-64, 2-367, and 2-516) indicated that the factors of safety for adjustable suspension scaffolds should be based on the rated load of the hoist. Four of those commenters (Exs. 2-28, 2-64, 2-367 and 2-516) and the SIA (Ex. 2-368) recommended that the stall capacity of the hoist be considered in the factors of safety.

One of these commenters (Ex. 2-28) stated that many suspended scaffolds are rigged by inexperienced persons who do not realize that if the scaffold catches on an obstruction, the maximum lifting power (stall load) of the hoist can be developed and transmitted to the counterweights and anchorages. This commenter suggested adding one of the following requirements to proposed § 1926.451(a)(2) as an alternative to four times the tipping moment: (1) or 4,000 pounds, whichever is greater; (2) or 150 % of the maximum pulling power of the hoist, whichever is greater; or 4 times the rated load of the hoist, whichever is greater. The SIA (Ex. 2-368) recommended changing the resisting moment of proposed § 1926.451(a)(2) to "at least 1.5 times the stall capacity of the hoist or four times the maximum intended load, whichever is greater."

Three commenters (Exs. 2-8, 2-28, and 2-516) indicated that Underwriters Laboratories (U.L.) standard 1323 (Standard for Scaffold Hoists) limits the maximum output of a scaffold hoist to 3 times the rated working load of the hoist. One commenter (Ex. 2-64) recommended that OSHA limit the stall load of a hoist to no more than three times the rated load of the hoist. Another commenter (Ex. 2-8) stated that if the safety factor for suspended scaffolds is not based upon the highest rated working load of any component, normally the hoist, failure can occur.

Two commenters (Exs. 2-8 and 2-516) presented examples of the relationship between the stall load of a hoist and the rated load of the same hoist. One commenter (Ex. 2-8) provided the following example:

A typical hoist with a "rated working load" of 1000 lbs. can exert a pulling force of 3000 lbs. if an obstruction is encountered such as a window ledge or air conditioner while ascending. If one designs for a maximum intended load of only 500 lbs. because of a short light scaffold platform or a work cage and the counterweight or suspension system is designed for 4:1 MIL then the ultimate load that the suspension can support is 4×500 lbs. MIL or 2000 lbs. A 3000 lb. hoist pull can cause failure or even wire rope failure if $6 \times$ MIL is used. No one intends to stall a hoist on an obstruction but it does occur. Therefore, a suspended scaffold should be designed for safety factors based upon MIL or rated working load of the hoist whichever is greater.

OSHA agrees that the safety factors for the counterweights, riggings, direct connections to roofs and floors, and suspension ropes of adjustable suspension scaffolds should be related to the rated load of the hoist and the stall load of the hoist, and not be based on the maximum intended load. OSHA agrees with the commenters who stated that failure can result if the factors of safety are based on the maximum intended load. Furthermore, the Agency also agrees with the commenters (Exs. 2-28 and 2-368) who indicated that these factors of safety should be based on 1.5 times the stall load of the hoist.

The Agency notes that the stall load of a hoist is equal to three times the rated load of that hoist. When one applies the 4 to 1 safety factor required ($4 \times$ rated load = $4/3 \times$ stall load) the result would be 1.33 times the stall load. However, while using 1.33 times the stall load would provide the required safety factor, OSHA is using 1.5 times the stall load based on the above comments. The Agency believes that such a requirement reduces the possibility of failure due to improperly installed equipment as well as the dynamic loads that can be developed when an obstruction is encountered. Accordingly, the Agency has changed the final rule language so that it requires a factor of safety of four times the maximum rated load of the hoist or 1.5 times the stall load of the hoist, whichever is greater.

Paragraph (a)(3) of the final rule provides that "[e]ach suspension rope, including its connecting hardware, used on non-adjustable suspension scaffolds shall be capable of supporting, without failure, at least 6 times the maximum intended load applied or transmitted to that rope." This is the same requirement

as the proposed rule except that final rule paragraph (a)(3) applies only to non-adjustable suspension scaffolds, while the requirements for adjustable suspension scaffolds have been placed in final rule paragraph (a)(4), below. The proposed rule did not distinguish between these two types of scaffolds. Proposed paragraph (a)(4)(i) has been redesignated to § 1926.451(f)(11) of the final rule, to consolidate all requirements for wire rope used with suspension scaffolds. In addition, proposed paragraphs (a)(4)(ii) and (iii) have been moved to non-mandatory Appendix A, so that examples of measures that would comply with final paragraph (a) are consolidated in one place.

Paragraph (a)(4) of the final rule provides that "[e]ach suspension rope, including connecting hardware, used on adjustable suspension scaffolds shall be capable of supporting, without failure, at least 6 times the maximum intended load applied or transmitted to that rope with the scaffold operating at either (a) The rated load of the hoist, or (b) 2 (minimum) times the stall load of the hoist, whichever is greater".

This provision addresses adjustable suspended scaffolds and is similar to proposed paragraph (a)(3) except that the proposed paragraph contained the language "maximum intended load applied or transmitted to the rope" instead of "rated load of the hoist (or at least 2 times the stall load of the hoist, whichever is greater)". The proposed rule was based on existing § 1926.451(a)(19).

Three commenters (Exs. 2-8, 2-64, and 2-516) recommended that OSHA use "rated capacity of the hoist" instead of "maximum intended load." This recommendation was based on the belief that the safety factor for adjustable suspended scaffolds should be based on the highest rated work load of any component, normally the hoist. The Agency agrees and has modified the proposed rule accordingly. In addition, the Agency has included language that accounts for the stall load of the hoist in the factor of safety for the same reasons that were discussed in regard to final rule § 1926.451(a)(2), except that the factor to be applied to the stall load has been increased from 1.5 to 2 in order to account for the 6:1 factor of safety applied to suspension ropes. This factor of safety does not include an added margin as does the factor of safety in paragraph (a)(2). One commenter (Ex. 2-516) recommended an 8:1 factor of safety for suspension ropes on adjustable suspension scaffolds. This recommendation was based on several factors that can reduce the effective

strength of a rope: (1) A termination rating of 80% of the wire rope design strength; (2) time-use of the rope; (3) energy applied to the system when the overspeed brake is actuated; and (4) failure of the brake to set or the loss of one end of the platform rigging. The commenter concluded that these factors can reduce the factor of safety from 6:1 to 1.15:1, with failure occurring if anything else goes wrong such as the free end of the platform swinging through its arc.

OSHA notes that this commenter addresses a worst case scenario which would involve violations of other provisions of the final rule. The Agency believes that each of the elements of the scenario will be prevented by compliance with the final rule. For example, final rule § 1926.451(d)(6) requires winding drum hoists to contain not less than four wraps of the suspension rope at the lowest point of scaffold travel, thereby reducing the force applied to the termination at the winding drum. In addition, final rule § 1926.451(d)(12)(v) prohibits the use of U-bolt clips at the point of suspension for any scaffold hoist. Also, final rule § 1926.451(a)(3) requires that suspension rope connections be considered part of the rope and that they be taken into account when determining whether a rope is capable of withstanding without failure at least six times the loads imposed upon it.

Further, final rule § 1926.451(d)(10) requires that a competent person inspect suspension ropes prior to each workshift or after any occurrence which could affect a rope's structural integrity. Paragraph 1926.451(d)(10) also requires that defective or damaged ropes be removed from service. For these reasons, OSHA believes that the final rule adequately addresses the commenter's concerns.

The third commenter (Ex. 2-29) recommended that OSHA include the weight of the scaffold and all its components in calculating maximum intended load. The Agency believes the above described changes made to proposed paragraph (a) resolve the concerns raised by this comment.

Paragraph (a)(5) of the final rule, which was not part of the proposed rule, requires that the stall load of any scaffold hoist not exceed 3 times its rated load. OSHA finds that this requirement is reasonably necessary to prevent accidental overloading of suspension scaffold support systems. OSHA notes that U.L. standard 1323 limits the output force of a scaffold hoist to three times the rated load of the hoist. As far as OSHA has been able to determine, the other laboratories which

test and list scaffold hoists adhere to the requirements of U.L. 1323.

A commenter (Ex. 2-64) recommended that OSHA limit the stall load of scaffold hoists to three times the rated load of the hoist. The Agency agrees that it is appropriate to add the suggested provision, for the reasons described above.

Final rule paragraph (a)(6) requires that scaffolds be designed by a qualified person and constructed and loaded in accordance with that design. The provision also indicates that the non-mandatory Appendix A provides examples of criteria, including design specifications, that will enable the employer to comply with paragraph (a) of this section. Proposed paragraph (a)(1), which focused on supported scaffolds, also referenced Appendix A for acceptable criteria.

Non-mandatory Appendix A provides examples of design and construction measures that employers can use to comply with final rule § 1926.451(a). This Appendix is based on the requirements set by existing §§ 1926.451(c)(1)-(4) and by Tables L-3 through L-19. OSHA has recognized that employers can design and construct scaffolds which satisfy the performance requirements of the final rule without following the specifications set by the existing rule, and drafted both the proposed and final rule § 1926.451(a) accordingly. The Agency believes that the above-cited specifications could assist an employer in complying with the capacity requirements of the final rule, so OSHA has relocated that language to non-mandatory Appendix A.

In Issue 5 of the preamble to the NPRM, OSHA requested comment on whether or not all scaffold units (such as planks and decks) should have their capabilities or grades marked on them. Some commenters (Exs. 2-41, 2-46, 2-51, 2-54, 2-73, 2-367, 2-495, 2-512, 2-516, and 2-534) indicated they favored the requirements for such markings. Two commenters (Exs. 2-495 and 2-534) stated "very few people would know which grade for any species of wood qualifies that plank as scaffold grade." Those commenters recognized that there was a lack of consensus concerning the maximum safe loads on certain plank spans, stating that "[a]t the same time, we believe it may be premature to require that all planks be so marked since agreement on methodology of determining load displacement has not been reached by the engineering profession."

Another commenter (Ex. 2-54) indicated that marks would not wear off platform units because "[i]n most

instances, planks are placed and not moved [and are] generally not rubbed against each other constantly." Another commenter (Ex. 2-516) stated "[i]f it is so worn that the mark is lost, it probably needs retesting anyway."

One commenter (Ex. 2-51) stated that while grade marks would wear off, it seems unlikely "that every plank on an entire job would simultaneously suffer such a fate. We believe that invariably, there would be some plank where grade stamping was legible if grade stamping ever existed."

Another commenter (Ex. 2-41) stated "[k]nowledge of the capacity of each [piece of] equipment is basic to implementation of this proposal."

In addition, the SSFI (Ex. 2-367) pointed out that fabricated plank stages and platforms are currently marked as to their capacity. They stated that this "practice should be continued for fabricated planks, stages, and platforms, as these are designed for unique applications." The commenter also stated "there is no common practice within the industry to have solid sawn lumber marked as to their load capacity." The SSFI recommended "that the solid sawn lumber or laminated veneer be repeatedly and continuously grade[-]stamped along the side edge of the material at the time the plank is initially purchased."

Another commenter (Ex. 2-51) stated that "[s]ince 1980, Timber Products Inspection has been involved in five cases where plank failure has resulted in injury and litigation. In all five cases the planks that failed were purchased as rough Canadian Spruce #1 and better or #2 and better. None of the planks were grade-stamped and one plank was identified as Lodge pole pine instead of spruce."

Another commenter (Ex. 2-35) recommended that OSHA adopt the language of the ANSI A10.8 draft scaffold standard that requires "solid sawn scaffold plank to bear the grade stamp of a grading agency approved by the American Lumber Standards Committee." The commenter also stated "it is essential to assure use of scaffold members of adequate strength and stiffness."

In addition, a commenter (Ex. 2-534) stated:

We are strong advocates of requiring that all plank to be used as scaffold plank be required to be stamped or embossed as "SCAFFOLD PLANK". To most people, all planks look alike. Very few people would know which grade for any species of wood qualifies that plank as scaffold grade unless the grade stamp is explicit for flatwise use as "Scaffold Plank".

* * * There is everything to gain, and nothing to lose, by requiring marks that

communicate to answer the bottom line question, "Is this plank OK as a scaffold plank?"

In addressing Issue 5, the ACCSH recommended (Tr. 6/9/87, pp. 64-65) that all planking and decks, etc., be properly marked as scaffold materials. The Advisory Committee indicated that a performance standard, which would allow employers to determine how they wanted to mark these materials, would be appropriate. Among the options envisioned by the ACCSH to distinguish the materials intended solely for scaffold system use were color-coding systems, stamping, and tagging.

On the other hand, some commenters expressed the view that a marking requirement would be impractical (Exs. 2-15, 2-20, 2-22, 2-368, and 2-390). In addition, commenters (Exs. 2-20, 2-53, 2-55, and 2-390) stated that the requisite costs would be burdensome, and others (Exs. 2-13, 2-15, 2-69, and 2-368) stated that, while manufactured or fabricated planks or platforms were often or usually marked, carrying this over to wooden components was inadvisable, citing anticipated problems with the volume of planks to be marked and the marks wearing off. Several commenters (Exs. 2-20, 2-55, 2-70, and 2-390) pointed out the marks would lend a possibly false sense of security or safety, and some (Exs. 2-20, 2-55, 2-69, and 2-390) added that maintaining the marks would be neither feasible nor economical. One commenter (Ex. 2-70) stated "The user of platform units can calculate the maximum load that can be placed on a scaffold and it is up to management personnel to ensure that the scaffolding is not overloaded. I feel that the marking of platform units does not, in itself, insure a safe scaffolding."

After careful evaluation of the above comments, the Agency has decided not to require marking of platform units. OSHA has determined that, while markings can increase confidence in and use of appropriate platform units, they do not add to the inherent safety of the scaffold. Furthermore, the absence of markings does not establish a lack of quality.

In addition, materials quality is only one of several factors which must be considered when erecting a scaffold platform. Other significant elements include unit size, span, and load applied. A platform unit, whether wood or metal, solid sawn or prefabricated, which is marked as appropriate for use as a plank, may be appropriate for use in one set of conditions but not in another (i.e., longer span or higher load). Similarly, a platform unit which does not have the quality characteristics to allow its use in one situation may be

acceptable for use in another (i.e., shorter span or lighter load) whether or not it is marked. The important consideration in all situations is that the platform be capable of supporting the load with a design factor of four.

OSHA believes the grading rules of recognized independent inspection agencies, such as the American Lumber Standards Committee (ALSC), provide useful information about wood plank selection and use. Planks that are marked and used in accordance with pertinent grading rules of the ALSC or other recognized independent inspection agency will be deemed to meet the four-to-one requirement. Therefore, given the extent to which the private sector has voluntarily adopted plank grading and marking programs, the Agency has concluded that any benefit resulting from the addition of marking requirements would be minimal.

Wood products such as Canadian spruce, which are alleged to be unacceptably inferior in some applications, could have standards developed for their use by a recognized grading agency. OSHA believes there are combinations of thickness, quality, span, loads, and other factors that can be established for all species of wood used for platforms.

Issue 17 of the preamble to the NPRM asked whether the Agency should specify a minimum slippage capacity of 4,000 pounds and a minimum breakage capacity of 16,000 pounds for couplers used on tube and coupler type scaffolds. The SSFI and SIA (Exs. 2-367 and 2-368) opposed such a requirement, stating that "the entire scaffold structure should be required to withstand the specified design loads." They also noted that this special component requirement was unlike other OSHA requirements. The SIA (Ex. 2-368) also stated:

It is redundant and unnecessary to specify a quantitative value for clamp strength since the required safety factors already in existence provide the proper strength for the intended load. There may be cases where the clamps should be of higher value or lower value, depending on usage. Consequently, requiring a numerical value may produce the catastrophe which the proposed rule is trying to avoid in the first place. Existing rules require design by competent individuals, which provides the proper safeguards against abuse and eliminates the need for the proposed rule.

Also, a commenter (Ex. 2-15) indicated that a British standard (BS 1129) recognizing 2800 lb. has been in place for 20 years "with satisfactory results." The commenter stated that most American clamps are built to BS1129, and went on to indicate that

the same 2800 lb. figure is generally sufficient, except for possible heavy-duty applications in a specific configuration. The commenter further felt that specifying a 4,000 lb. minimum slippage capacity would "outlaw" many clamps.

One commenter (Ex. 2-22) stated that both slippage and minimum breakage capacities "should be equivalent to that required on the other parts of the scaffold."

Another commenter (Ex. 2-128) stated "couplers for tube and clamp [scaffolds] should be rated by the manufacturer in accordance with a recognized testing standard [and] certified by an engineer." In addition, a commenter (Ex. 2-13) expounded on the relationship between the torque applied to tighten a coupler and the slippage capacity, and noted that proper torque values needed to be determined by tests or calculations.

The ACCSH (Tr. 6/9/87, pp. 138-147) recommended that OSHA specify both minimum slippage and breakage capacities and should require employers to obtain manufacturer's specifications and/or certifications that a scaffold meets minimum standards. However, the ACCSH did not endorse the suggested 4000 and 16,000 pound limits and did not propose any other limits.

After a careful review of the above comments, OSHA has determined that the capacity provisions set out in final rule § 1926.451(a) will appropriately address the concerns regarding scaffold strength and that additional specifications would be redundant.

Issue 21 of the preamble to the NPRM requested public comment on appropriate field test procedures or certifications for determining the capacity of scaffolds and scaffold components such as planks and ropes. As noted above, existing § 1926.451(a)(7) and proposed § 1926.451(a)(1) require scaffolds to be capable of supporting, without failure, at least four times the maximum intended load. OSHA has recognized, however, that field testing of scaffolds and scaffold components with loads four times greater than the maximum intended load could cause damage that would render the scaffold and scaffold components unusable.

One commenter (Ex. 2-54) mentioned reliance on testing laboratories to ensure that rope and planks meet industry standards. Another commenter (Ex. 2-64) stated that scaffolds' and support systems' rated capacities should be marked when manufactured and that any field testing beyond that set forth in a manufacturer's instructions would be superfluous and could conflict with those instructions.

The SSFI (Ex. 2-367) and the SIA (Ex. 2-368) both stated that field testing of supported scaffolds would permanently damage equipment or render it useless, and that a visual check of the scaffolding before use should ensure safety "as the manufacturer already warrants the appropriate safety factors." The SIA also stated that current testing methods "are not suitable for checking the ultimate capacity of scaffold components." The SIA further stated that for metal components, visual inspection is the only practical method available. For wooden components, the SIA stated that inherent material variables make obtaining repeatable results from a suitable bending test impossible. On the other hand, the SIA recommended that suspension scaffolds be field tested with the intended load.

Two other commenters (Ex. 2-495 and 2-534) agreed with the SIA that it is impossible to obtain repeatable results from a bending test. However, they stated that a minimum threshold design value for flat-wise bending of planks could be derived from available information for flat-wise bending for any specie of plank. Those commenters also stated that field testing would not necessarily permanently damage or render a plank useless. They stated that strength testing of used planks could be accomplished by combining visual inspections with deflection testing using a safe load and deflection testing machines that are currently available.

One commenter (Ex. 2-516) indicated that a reasonable level of load testing for scaffold machinery might be found "somewhere near 1.25 times [the] rated load" and that "any field tests should be a ratio of rated load, not failure load." The commenter assumed different safety factors for moving equipment, suspended scaffold hoists, and fixed structures. The commenter also questioned whether the safety factor referred to in Issue 21 was for static, dynamic, or shock loads, and noted that 4 to 1 is not an engineering safety factor but a gross factor. In addition, the commenter stated:

Any device or mechanism designed for a structural safety factor of four-to-one certainly can be tested at some level less than four-to-one without structural failure. * * * It is difficult to comprehend the rationale of prohibiting testing of a structure using 1½ times rated load for fear it will collapse, when the structure must not collapse at 4 times rated load. There would then be doubt in my mind as to its ability to meet that 4-to-1 criterion.

Also, the commenter (Ex. 2-516) pointed out that any test of wood components should consider the effects of aging material, and he listed a

number of variables for which some testing adjustments would be required. These variables included "fatigue, finish," and "material test scales."

Two commenters (Exs. 2-13 and 2-69) indicated there would be no need for field testing since scaffolds should be designed for their intended load with an added safety factor. In particular, one of those commenters (Ex. 2-13) stated "[t]here are no appropriate field tests for such items as planks and ropes. A simple visual inspection is all that is required by a competent person."

The ACCSH (Tr. pp. 163-174, 6-9-87) recommended that the manufacturer's design specifications be recognized as sufficient for manufactured scaffolds. The ACCSH also recommended that specifications or testing procedures be specified for job-made scaffolds.

After carefully considering the above comments, OSHA has decided not to require field testing of scaffolds. Based on the comments received, the Agency has determined that such testing is not needed and that, given the inspection and capacity requirements, it would be difficult or impossible to implement effectively for the range of materials in question.

Issue 23 of the preamble to the NPRM solicited comments on whether or not the Agency should revise paragraph 1.(b) of proposed non-mandatory Appendix A, which provides for selection of wood scaffold planks according to the grading rules established by a recognized independent inspection agency. In particular, OSHA asked if the language should be more specific and, if so, what that language should be.

Four commenters (Exs. 2-13, 2-22, 2-29, and 2-53) responded that the proposed Appendix A language was adequate. One commenter (Ex. 2-13) added "it should be mandatory that the employer visually check all scaffold planks before they are used." Another commenter (Ex. 2-54) stated that scaffold planks "should have identification" to indicate that they are scaffold grade.

However, a commenter (Ex. 2-534) noted that "it may be premature to require that all planks be so marked since agreement on methodology of determining load displacement has not been reached by the engineering profession."

The SSFI (Ex. 2-367) recommended that scaffold planks be marked, and noted that the most plank failures are inspection related. The SIA (Ex. 2-368) recommended that OSHA revise paragraph (b) of proposed Appendix A to read, in part, as follows:

All solid sawn planking shall be 'SCAFFOLD GRADE' plank and grade stamped as appropriate per the published grading rules of the recognized independent inspection agency and as approved by the Board of Review of the American Lumber Standards Committee. The maximum permissible spans for 2 x 10 inch (nominal 1½" x 9¼" minimum dressed (S4S), 1⅞" x 9½" minimum rough or 2" x 10" minimum rough, solid sawn wood planks shall be as shown in the following table.

Paragraph 1(b) of Appendix A should be expanded and clarified to eliminate the confusion that exists over the use of nominal thickness scaffold grade planks on 10 ft. spans for light trades. This could be achieved by defining a scaffold grade plank in the manner done in Cal-OSHA standards.

Cal-OSHA Section 1637(e) requires what it calls a "structural plank" for scaffold platforms as follows:

"Except as specified in certain other Orders, all planking shall be 2-inch (nominal) material selected for scaffold grade plank as defined in Section 1504 under the heading Lumber—'Structural Plank'."

The ACCSH, in its June 9, 1987 (Tr. pp. 175-180), meeting, recommended that a competent person be responsible for the selection and use of scaffold materials, where scaffolding materials are not certified by the manufacturer.

After carefully considering the above comments, OSHA has decided to modify paragraph 1.(b) of non-mandatory Appendix A to the final rule to provide for identification of scaffold planks by the grade stamp of the recognized lumber grading association or independent lumber grading inspection agency under whose grading rules the planks were selected. OSHA is also modifying proposed Appendix A to provide that the association or agency under which the wood is graded should be certified by the Board of Review, American Lumber Standard Committee as set forth in the American Softwood Lumber Standard of the U.S. Department of Commerce. This added language clearly indicates what constitutes a "recognized" inspection agency.

As a separate matter, OSHA is modifying Appendix A to the final rule to provide that allowable spans of scaffold planks, other than 2 x 10 inch (nominal) or 2 x 9 inch (rough) solid sawn planks which are addressed in the table in paragraph 1 (b), shall be determined in accordance with the National Design Specification For Wood Construction published by the National Forest Products Association or with ANSI A10.8-1988, paragraph 5. OSHA notes that Appendix A is intended to help the employer comply with the scaffolding rules. The Agency believes that the above modifications will facilitate compliance with those rules.

Paragraph (a)(6) of the final rule, which was not part of the proposed rule, requires that scaffolds be designed by a qualified person and must be constructed and loaded in accordance with that design. OSHA believes that a "qualified" person can design a scaffold which satisfies the criteria of § 1926.451(a). This provision also notes that non-mandatory Appendix A contains examples of criteria that will enable employers to comply with paragraph (a) of this section.

Issue 24 of the preamble of the NPRM noted that existing §§ 1926.451(b)(16), (c)(4), (c)(5), (d)(9) and (g)(3) and proposed § 1926.451(b)(18)(i) and §§ 1926.452(a)(10), (b)(10), (c)(6) and (i)(8) require that an engineer design specified scaffold types and/or components that are not built or loaded in accordance with Tables L-4 through L-13 of existing § 1926.451 or proposed § 1926.451 Appendix A, respectively. OSHA asked for comments regarding the extent to which the services of an engineer or of a qualified person would be needed to design scaffolds in accordance with the provisions of Appendix A or to design scaffolds that, while not in accordance with Appendix A, would comply with § 1926.451(a).

Two commenters (Exs. 2-69 and 2-437) responded that employers should be allowed to assess whether individual employees with several years of hands-on experience are capable of designing and modifying scaffolds or an engineer's services are required. Also, a commenter (Ex. 2-22) expressed the view that there was no need for further licensing and determinations because employers are responsible for ensuring that scaffolds meet regulations for capacity and that alterations of scaffold designs are made by qualified individuals. The AGC commenters (Exs. 2-20, 2-55, and 2-390) stated "there are many individuals in the construction industry with many years of experience who are quite capable of scaffold design and modification. Employers should be permitted the flexibility to determine if such individuals are capable or if they should seek the services of an engineer."

Another commenter (Ex. 2-54) noted that not all engineers are capable of designing scaffolds and that a good many people who work with scaffolds do not know all the scaffold limits or strengths. The commenter acknowledged that complicated scaffold designs require the skills of an engineer familiar with the equipment available. However, the commenter added that a competent worker who has followed an engineer's drawings to erect a scaffold can at times recall and use that

experience in another situation requiring a complicated scaffold structure.

In addition, a commenter (Ex. 2-21) stated that no additional specification requiring the use of engineering services was warranted. The commenter explained that "[c]onditions on most construction jobs change daily and can best be handled by qualified foremen or supervisors on the job." Also, a commenter (Ex. 2-31), addressing pumpjack scaffolds specifically, responded that although he was not an engineer himself, he knew at least as much as anyone else about pumpjack scaffolds. He felt that an engineer could be supplanted by someone with recognized expertise but added that he did not believe a specific definition of someone qualified to design a scaffold system could be made.

Both the SSFI (Ex. 2-367) and the SIA (Ex. 2-368) recommended that a "qualified person," as defined in proposed ANSI A10.8, be allowed to design those scaffolds that would not require the services of a registered engineer. They quoted the proposed ANSI definition as follows:

A term describing one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.

The suggested definition is identical to the definition of "qualified" in § 1926.32(l).

Two Saf-t-Green commenters (Exs. 2-14 and 2-15) stated that people other than engineers were capable of designing scaffolds. In particular, one commenter (Ex. 2-15) stated "There are many good, practical scaffold designers who are not engineers. They should not be excluded."

On the other hand, some responses to Issue 24 stated that the services of a registered or professional engineer were needed (Exs. 2-3, 2-9, 2-13, 2-70, 2-128, and 2-516). One such commenter (Ex. 2-13) stated that he backed using registered professional engineers "with the knowledge and training required for [designing] a life support system" and queried where "an equivalent qualified responsible person could be found?" One commenter (Ex. 2-70) offered a brief response, "when in doubt, consult an engineer." Another commenter (Ex. 2-516) responded:

I would rather take my chances with the engineer [-designed scaffold system]. At least he knows some limits. Any other definition lets anyone determine by *themselves* that they are eminently qualified. All it then takes

to be qualified is a big ego, a little knowledge, and a pile of frame scaffold.

A comment from Aluma-Systems, Incorporated (Ex. 2-128) expressed the belief that an engineer's services should be required for all but the simplest of scaffold structures. The commenter indicated that the Province of Ontario requires that a professional engineer design any scaffold which exceeds 15 meters in height (approximately 50 feet), any suspension scaffold where the scaffold consists of more than one platform, or any suspension scaffold where the weight of the platform and its components exceed 363 kg.

In addition, two commenters (Exs. 2-12 and 2-53) responded that the existing regulations were sufficient or adequate. One of the two (Ex. 2-12) stated that there was already sufficient regulation and questioned whether rules could be made to cover all situations.

In its June 9, 1987, meeting, the ACCSH (Tr. pp. 180-183) recommended that OSHA authorize a competent person, rather than a qualified person, to follow Appendix A for scaffold design, but that a registered professional engineer be required to design scaffolds where conditions are not covered by Appendix A. The Agency notes that a competent person, as defined in § 1926.32(f) and in the final rule for subpart L, is able to detect hazards and has the authority to have hazards corrected. On the other hand, "qualified", as defined in § 1926.32(m) and in the final rule for subpart L, refers to a person who has the ability to solve or resolve safety and health problems.

After carefully considering the above comments, OSHA believes that the proposed rule adequately addressed the conditions under which a scaffold must be designed by an engineer. Accordingly, the above-listed proposed requirements (§ 1926.451(b)(18)(i) [now final rule § 1926.451(d)(3)(i)] and §§ 1926.452(a)(10), (b)(10), (c)(6), and (i)(8)) have been promulgated in the final rule. As discussed below, proposed rules § 1926.452(a)(10) and (b)(10) have been revised to distinguish more clearly between those circumstances where the employer would need the services of a registered professional engineer and those situations where the services of a qualified person, who could refer to non-mandatory Appendix A, would be sufficient.

The Agency believes that there are qualified persons who can properly design scaffolds without reference to Appendix A. The Agency also believes that there will be circumstances where the "qualified person" retained to comply with paragraph (a)(6) will need to be a registered professional engineer.

Paragraph 1926.451(b) Scaffold Platform Construction

Paragraph 1926.451(b) of this final rule provides criteria for the construction of scaffolds. Paragraph (b)(1) requires all platforms, except walkways and those platforms used by employees performing scaffold erection and dismantling operations, to be fully decked or planked. In addition, paragraph (b)(1)(i) requires that platform units be placed so that spaces between units do not exceed 1-inch, except where employers establish that more space is needed. For example, this would be necessary to fit around uprights when using side brackets to extend platform width. Paragraph (b)(1)(ii) provides that, where the exception created by paragraph (b)(1)(i) applies, employers shall place platform units as close together as possible, with the space between the platform and uprights not to exceed 9½ inches. OSHA set 9½ inches as the maximum space allowed, because the minimum width for scaffold units that could be expected to sustain a working load is just over 9½ inches. This provision, which is effectively identical to the provision in the proposed rule, codifies the Agency's longstanding interpretation of existing § 1926.451(a)(4), which addresses guardrails on scaffolds, to require that guardrails be erected as close as possible to the platform planking. Because guardrails normally can be conveniently attached only at the scaffold uprights, OSHA has required the platforms to be sized such that there is no gap between the outermost plank edge and the guardrail. However, most prefabricated end frames do not have a lateral spacing between uprights which can accommodate an integral number of commercially-available planks. In order to comply with the existing rule, some employers have modified the last plank (notched, slanted, or cut it to size). This can lead to a significant reduction in plank strength, and possibly cause tipping of the plank (sideways) if eccentrically loaded. Therefore, to deal with this problem, proposed and final rule paragraph (b)(1) have modified the corresponding requirement of the existing standard by requiring the span between uprights to be planked or decked as fully as possible, but allowing up to 9½ inches between the planking or decking and the guardrail supports. As explained above, 9½ inches is the maximum allowable open space.

One commenter (Ex. 2-29) stated that the 1-inch opening allowed by proposed paragraph (b)(1)(i) would be large enough to "allow many tools and small

materials to fall through", and recommended a maximum space of ¼ inch between units. OSHA, however, finds that such a small maximum space would pose unreasonable compliance burdens, and is retaining the 1-inch maximum.

The SSFI and the SIA (Exs. 2-367 and 2-368) stated that compliance with proposed paragraph (b)(1) would be impossible when erecting or dismantling scaffolds. In particular, the SIA (Ex. 2-368) stated:

For example: On a multi-level supported scaffold where construction work is to be performed only at the top level, lower levels would not be planked. Erectors would only use sufficient planks required to construct the scaffold.

Load requirements limit the number of levels that can be planked on many installations. The additional cost in labor and material would be staggering. In addition, the fatigue factor created by installing full planking from one level to the next would create a greater hazard to the erectors.

The Agency agrees with the SIA comments and acknowledges that a requirement to fully plank under these conditions would unreasonably interfere with the erection and dismantling process. The Agency also agrees that a requirement to fully plank every intermediate platform level, where no work other than scaffold erection or dismantling operations will occur, is overly burdensome. Therefore, OSHA has revised proposed paragraph (b)(1), which already excepted walkways from the requirement for full planking or decking, to add an exception to the final rule to the planking requirements for erection or dismantling operations. In a situation where no work, other than erecting or dismantling the scaffold, is being done at intermediate levels, the final rule requires only that the planking established by the employer as necessary to provide safe working conditions for employees erecting or dismantling the scaffold be used. On the other hand, if scaffold erection or dismantling is being performed from an intermediate level platform that is being or will be used as a work area, that platform must be fully planked in accordance with paragraph (b)(1).

Paragraph (b)(2) of the final rule requires that all scaffold platforms and walkways be at least 18 inches (46 cm) wide, with lesser widths allowed for ladder jack scaffolds, top plate bracket scaffolds, pump jack scaffolds, roof bracket scaffolds, and boatswains' chairs, and for scaffolds in areas shown to be too narrow to accommodate an 18-inch wide surface. Proposed paragraph (b)(2) also required a minimum 18-inch

width, with exceptions for ladder jack scaffolds (12 inches) and boatswains' chairs (any width). The rationale for setting a 12-inch minimum width for ladder jack scaffolds, as discussed in the preamble of the proposal (51 FR 42684-85), was the difficulty of handling one 18-inch wide plank or two 9-inch planks on a ladder, which the Agency considered more hazardous than working on a 12-inch wide plank. In the final rule, OSHA has also included pump jack scaffolds in the exception to paragraph (b)(2) for which a minimum platform width of 12 inches is permitted, based on a commenter's statement (Ex. 2-31) that OSHA's performance criteria for pump jack scaffolds enable employees to work safely on platforms that are 12 inches or 14 inches wide. The commenter also indicated that requiring pump jack scaffold platforms to be at least 18 inches, instead of 12 inches, wide would create "an economic hardship * * * for this very prevalent size aluminum platform." OSHA agrees that pump jack scaffolds with platforms as narrow as 12 inches can satisfy the performance criteria of the final rule and has revised paragraph (b)(2) accordingly.

In addition, the Agency is recognizing top plate bracket scaffolds and adding them to the list of scaffolds which are permitted to have platforms not less than 12 inches in width. As discussed above in the definition section, these are supported scaffolds, similar to carpenters' bracket scaffolds and form scaffolds, which consist of a platform supported by brackets that hook over or are attached to the top plate of a wall. These scaffolds are used in residential construction for setting trusses, usually for high ceiling situations (e.g., cathedral ceilings, atria). The Agency has determined that use of this type of scaffold, even with a 12-inch wide platform, provides greater protection for employees setting trusses than the use of ladders, makeshift scaffolds or walking the top plate. OSHA concludes that it would be less safe to require wider platforms for top plate scaffolds because setting up this type of scaffold would then require handling and positioning an 18-inch wide platform or two nine-inch wide platforms, and handling and positioning larger, heavier brackets, which is usually done from ladders. OSHA finds that this would be more hazardous than working on one 12-inch wide platform equipped with fall protection.

As proposed, OSHA is deleting the requirement that appeared in the existing scaffold rule at § 1926.451(l)(1), which sets the minimum dimensions of

a boatswains' chair at 12 inches by 24 inches, because, with the advent of slings and molded seats, the Agency believes that setting minimum dimensions is overly restrictive. This performance-oriented approach is reflected by the inclusion of language in paragraph (b)(2)(i) which specifically exempts boatswains' chairs from any width requirements.

The SIA (Ex. 2-368) suggested that platforms as narrow as 12 inches wide be allowed in areas where entryways are restricted. Another commenter (Ex. 2-64) suggested that suspension scaffolds designed for special applications (e.g., to fit through manholes) be permitted to be as narrow as 12 inches. OSHA realizes that there may be instances where the nature of the work being performed makes it impossible to make platforms and walkways at least 18 inches wide. Where the employer can establish that such a situation exists, the Agency will accept platforms and walkways that are less than 18 inches wide, provided both that such platforms and walkways are as wide as is feasible *and* that employees are adequately protected from fall hazards by the use of guardrails and/or personal fall arrest systems, as required by paragraph (g).

Final rule paragraph (b)(3) (proposed as paragraph (b)(4)) sets the requirements for the space between the front edge of a platform and the face of the structure where the scaffold is being used. Paragraph (b)(3) requires that, except as provided in paragraphs (b)(3)(i) and (b)(3)(ii), the front edge of all platforms must be no more than 14 inches from the face of the structure, unless the employer implements guardrail systems or personal fall arrest systems that comply with paragraph (g) of the final rule to protect employees from falling between the platform and the structure. Final rule paragraph (b)(3)(i) requires that the front edges of outrigger scaffolds be no more than three inches from the face of the structure, as is required by § 1926.451(g)(4) of OSHA's existing standard. Final rule paragraph (b)(3)(ii) requires that the front edges of scaffolds used for plastering and lathing operations be no more than 18 inches from the face of the structure.

The 18-inch dimension was developed from data collected by Wang Associates (Ex. 5) which show that a shorter distance between the scaffold platform and the wall is not feasible for the operators of plastering and lathing equipment because of interference with the tools used during such operations. However, these same operations cause the employee to stand back from the edge and the hazard of falling is

correspondingly reduced. The SIA (Ex. 2-368) supported the 18-inch provision as being necessary for the types of work covered, while acknowledging that in some cases 14 inches would be adequate.

Final rule paragraph (b)(3) is effectively identical to proposed paragraph (b)(4), except that the proposed provision specified "Type I" guardrails instead of requiring compliance with paragraph (g). OSHA has deleted the designations "Type I" and "Type II" from the final rule for subpart L, as discussed above in relation to the definition of "Guardrail system".

Existing § 1926.451(a)(4) requires guardrails on all open sides and ends of a scaffold platform, but does not specify how far away a scaffold platform may be from a building before the side facing the building is considered to be an "open side." OSHA's existing scaffold rule has often been interpreted to mean that no open space is allowed. However, zero clearance during all phases of construction is not feasible. The 14-inch limit in proposed paragraph (b)(4) recognized that during construction the face of the wall being built often moves out toward the scaffolds. There must be sufficient space at the beginning of work to allow for the installation of insulation, lathing, plaster, masonry units, ledges, facings and other architectural or structural additions. The spacing must be allowed for from the start, because it is not practical to move large scaffolds away from the wall as wall construction progresses outward. When the initial set back distance must be more than 14 inches, the platform can often still be kept within 14 inches of the building by the use of side brackets or extensions on supported scaffolds, and by angulated roping, static lines, or equivalent means on suspension scaffolds.

Two commenters (Exs. 2-41 and 2-465) questioned the use of 14 inches in this provision, suggesting that a maximum of 12 inches be allowed. While OSHA recognizes that the suggested 12-inch spacing could be marginally more protective, the Agency also recognizes that, as discussed above, in many cases an unobstructed working space of at least 14 inches is necessary. OSHA also notes that ANSI A10.8-1988, paragraph 4.5.9, allows up to a 16-inch space for supported scaffolds and a 12-inch space for suspended scaffolds. In support of OSHA's position, the SIA (Ex. 2-368) endorsed the proposed language as the proper solution to the problem, while noting that it would prefer 18 inches. The Agency believes that the 14-inch space appropriately addresses both the safety concerns and

the need to allow necessary room for many of the jobs normally performed from scaffolds.

Final rule paragraph (b)(4) requires each end of a platform unit, unless cleated or otherwise restrained by hooks or equivalent means, to extend over the center line of its support at least six inches (15 cm). This provision is virtually identical to proposed paragraph (b)(5), which was based on existing § 1926.451(a)(14). The use of cleats, hooks, and similar securing devices would also be allowed as alternatives to the six inch extension in the proposed and final rules, because of their ability to restrain movement of platform units.

OSHA received one comment (Ex. 2-40) on this provision, which stressed the importance of securing platform units against movement.

Final rule paragraph (b)(5) (proposed paragraph (b)(6)) addresses the maximum distance platform units may extend over their supports. In particular, paragraph (b)(5)(i) provides that each end of a platform unit 10 feet (3 m) or less in length shall not extend over its support more than 12 inches (30 cm) unless the unit is designed, and installed so that the cantilevered portion of the unit is able to support employees or material without tipping or has guardrails which prevent employee access to the cantilevered end. In addition, paragraph (b)(5)(ii) provides that each platform unit greater than 10 feet in length shall not extend over its support more than 18 inches (46 cm), unless the unit is designed and installed so that the cantilevered portion of the unit is able to support employees without tipping, or that the unit has guardrails which block employee access to the cantilevered end.

OSHA proposed to change the maximum overhang allowed by existing § 1926.451(a)(14) from 12 inches to 18 inches because many planks in use are 10 feet long, and are used to span eight foot distances. OSHA also notes that ANSI A10.8-1988, paragraph 4.17, limits planks from extending more than 18 inches over their supports, without regard to the length of the plank.

OSHA's thinking at the time of the proposal was that the existing requirement was unnecessarily restrictive, and that strict adherence to the existing maximum overhang limit would require platform units to be cut if they extended beyond the 12-inch limit.

Although no comments were received on this provision, OSHA has concluded, upon further consideration of this matter, that the maximum overhang allowed, unless the above specified

measures have been taken, should be limited to 12 inches for planks 10 feet or less in length, and 18 inches for planks greater than 10 feet in length. The Agency concludes that allowing an 18-inch overhang as a matter of course would be unsafe, because the weight of an employee on an 18-inch overhang could easily tip a 10-foot plank.

However, an 18-inch overhang on a plank that is longer than 10 feet would be permissible because the additional weight of the longer platform would offset the weight of the employee on the overhang. In addition, an employer who seeks to use platform units that overhang the supports more than the prescribed distance would be required to satisfy the performance criteria of paragraph (b)(5) of the final rule.

Under final rule paragraph (b)(6), where platform units are abutted to create a long platform, each abutted end shall rest on a separate support surface. Abutted platform units do not rest one on another, but instead are end-to-end. Consequently, one unit does not support the other, and proper support can only be provided by separate support surfaces. This provision is virtually identical to proposed paragraph (b)(7), except that the final rule has deleted the words "butt plate or equivalent means of support", because those words add nothing to the requirement for "separate support." This provision is based on existing § 1926.451(b)(12), which currently applies only to wood pole scaffolds. OSHA has determined that all scaffolds need proper platform support and, accordingly, has promulgated this provision.

The Agency has also added a note to this provision stating that common support members such as "T" sections or hook-on platforms designed to rest on common supports are not prohibited by this provision. The Agency is doing this to prevent confusion since these commonly used support members might be considered not to meet the requirements of this provision.

Final rule paragraph (b)(7) provides that where platforms are overlapped to create a long platform, the overlap shall occur only over supports, and shall not be less than 12 inches (30 cm) unless the platforms are nailed together or otherwise restrained to prevent movement. This provision is virtually identical to proposed paragraph (b)(8) which was based on existing § 1926.451(a)(12).

Final rule paragraph (b)(8) requires that at all points of a scaffold where the platform changes direction, such as turning a corner, any platform that rests on a bearer at an angle other than a right angle shall be laid first and platforms

which rest at right angles over the same bearer shall be laid second, on top of the first platform. This provision is virtually identical to proposed paragraph (b)(9), which was based on existing § 1926.451(b)(13). While this provision in OSHA's existing standard addresses only wood pole scaffolds, OSHA has determined, as with final rule paragraph (b)(6), that the existing requirement is appropriately applied to the construction of all scaffold platforms.

Final rule paragraph (b)(9) provides that wood platforms shall not be covered with opaque finishes, except that platform edges may be covered or marked for purposes of identification. Platforms may be coated periodically with wood preservatives, fire-retardant finishes, and slip-resistant finishes, but the coating may not obscure the top or bottom wood surfaces. This paragraph is intended to ensure that structural defects in platforms are not covered from view by the use of an opaque coating or finish. Hairline cracks can significantly reduce the strength of a wood member, so early detection of structural defects is important. Opaque finishes can cover such cracks and make them difficult to discover. The edges of platform units are excepted from this rule to allow identification marks, grading marks, or other similar type of marks to be placed on the unit edges.

This provision is virtually identical to proposed paragraph (b)(10). The proposal addressed the use of wood preservatives, fire retardant finishes and slip-resistant finishes in a "note", while the final rule has incorporated the pertinent language directly into the regulatory text. In short, those finishes may be used as long as they do not obscure the top or bottom wood surfaces.

Final rule paragraph (b)(10) requires that scaffold components manufactured by different manufacturers not be intermixed unless the component parts fit together without force and the resulting scaffold's structural integrity is maintained by the user. Scaffold components manufactured by different manufacturers shall not be modified in order to intermix them unless the resulting scaffold is determined by a competent person to be structurally sound. OSHA expects that the competent person who evaluates the scaffold will have the appropriate knowledge, skill and experience regarding scaffold systems and components.

This provision is identical to proposed paragraph (b)(11), except that the proposal did not contain the phrase "and the resulting scaffold's structural integrity is maintained by the user". The

SIA (Ex. 2-368) suggested the added language, citing the "latest ANSI A10.8 draft." The Agency acknowledges that a scaffold may lack the requisite structural integrity even though the intermixed components "fit together without force." OSHA agrees that the requirement to maintain structural integrity should be clearly stated in this provision and has revised the final rule accordingly.

One commenter (Ex. 2-29) stated "[m]any, if not all, scaffold manufacturers void any liability if their scaffold components are intermixed * * * A standard requirement should not result in a lesser degree of safety; neither should it encourage an employer to take a course of action that could increase his liability." The SSFI (Ex. 2-367) stated "[i]t would be the Institute's recommendation that scaffold components not be intermixed even though they may re[a]dily fit together without force. Many times the capacity or bracing alignment would not be the same as other types of scaffold, thus creating a hazardous situation." OSHA agrees that an unsafe condition could exist when parts are intermixed, unless adequate precautions are taken, and believes that paragraph (b)(10), as modified, in conjunction with § 1926.451(a), provides for adequate precautions to be taken by the employer to ensure against this eventuality.

Paragraph (b)(11) of the final rule provides that scaffold components made of dissimilar metals shall not be used together unless a competent person has determined that galvanic action will not reduce the strength of any component to a level below that required by § 1926.451(a). This provision, while effectively identical to proposed paragraph (b)(12), differs from §§ 1926.451(c) (1), (2) and (3) of OSHA's existing rule, which prohibit the use together of any dissimilar metals on tube and coupler scaffolds. The proposed rule was intended to extend the prohibition to all scaffolds, because the problem of dissimilar metals causing galvanic action can occur on any scaffold, not just tube and coupler scaffolds. However, the proposed rule was not intended to prohibit all uses of dissimilar metals because there are many combinations which do not produce significant galvanic reactions.

One commenter (Ex. 2-41) expressed skepticism as to the ability of a competent person to discern that galvanic action has not reduced the strength of any component. However, OSHA finds that any competent person, as defined by this subpart, would be able to identify the causes and significance of any deterioration in

scaffold components. In particular, OSHA expects the competent person, who is on site and required to inspect the scaffold, to recognize deterioration due to galvanic reactions, and to take prompt corrective action.

Paragraph 1926.451(c) Criteria for Supported Scaffolds

Final rule § 1926.451(c) sets criteria for the use of supported scaffolds. Paragraph (c)(1) of the final rule requires that supported scaffolds with a height to base width ratio of more than four to one (including outrigger supports, if used) be restrained from tipping by guying, tying, bracing, or equivalent means. That provision is based on existing § 1926.451(e)(1), which covers manually-propelled mobile scaffolds. Any type of supported scaffold can topple if its center-of-gravity is too high, and OSHA has therefore expanded the coverage of this paragraph in the final rule. Final rule paragraph (c)(1)(i) provides that guys, ties, and braces shall be installed at locations where horizontal members support both inner and outer legs. In addition, paragraph (c)(1)(ii) requires, as follows:

(1) Guys, ties, and braces shall be installed according to the scaffold manufacturer's recommendations or at the closest horizontal member to the 4:1 height and be repeated vertically at locations of horizontal members every 20 feet (6.1 m) or less thereafter for scaffolds 3 feet (0.91 m) wide or less and every 26 feet (7.9 m) or less thereafter for scaffolds greater than 3 feet (0.91 m) wide;

(2) The top tie, guy or brace of a completed scaffold shall be placed no further than the 4:1 height from the top; and

(3) Such guys, ties and braces be installed at each end of the scaffold and at horizontal intervals not to exceed 30 feet (9.1 m) (measured from one end [not both] towards the other).

This provision of the final rule is essentially the same as proposed paragraph (b)(13), except that the maximum vertical spacing has been changed to allow for the scaffolds to be supported at their strongest points. Proposed paragraphs (b)(13)(i) and (b)(13)(ii), which specified the horizontal spacing for ties, guys, and braces, were intended to replace existing §§ 1926.451 (b)(4), (c)(12), and (d)(7). These paragraphs of the existing rule required pole scaffolds, tube and coupler scaffolds, and fabricated frame scaffolds to be tied and braced at intervals no greater than 26 feet vertically (25 feet for wood pole scaffolds) and 30 feet horizontally (25 feet for wood pole scaffolds). These paragraphs have been misinterpreted over the years to mean that scaffolds less than 26 feet high by 30 feet long (25 by 25 for wood pole scaffolds) do not

need guys, ties, or braces. Proposed paragraph (b)(13)(ii) was intended to replace the 26- and 25-foot vertical rule and require all scaffolds required by the 4 to 1 rule to have guys, ties, or braces also to have such connections installed at each end of the scaffold and at horizontal intervals not to exceed 30 feet (measured from one end only).

The following are examples of how this requirement is to be applied: (a) If a scaffold is five feet wide, 18 feet high and 50 feet long, no vertical or horizontal ties and braces are required because the height is less than four times the width and the four to one rule does not require connections; (b) if the scaffold is five feet wide, 50 feet high, and 25 feet long, ties and braces are required at least at the 20- and 40-foot levels at both ends of the scaffold (four ties and braces in all); (c) if the scaffold is five feet wide, 50 feet tall, and 70 feet long, ties and braces are required at least at the 20- and 40-foot levels. These would be installed starting from either end, at least at the zero, 30, 60, and 70-foot horizontal distances (eight ties and braces in all).

The SSFI (Ex. 2-367) disagreed with the 20-foot limit for bracing intervals in proposed paragraph (b)(13)(i) and suggested a 20-foot limit for scaffolds 3 feet wide or less, and a 26 foot limit for scaffolds more than 3 feet wide. In addition, this commenter suggested that bracing be at bearing locations or as recommended by the manufacturer. OSHA agrees with this commenter's suggested bracing intervals, because the Agency believes that properly erected scaffolds more than 36 inches wide are more stable than those which are narrower, and has modified this provision of the final rule accordingly. The SIA (Ex. 2-368) stated:

We are in agreement with the proposed wording used to define the location of guys and ties as a function of the scaffold base width dimension. This proposed wording adequately defines where scaffolds must be guyed or tied to achieve proper scaffold stability. To correctly transmit the stabilizing forces through the scaffold, however, the guys or ties must be placed at locations where horizontal members support both the inner and outer legs. Guying or tying a scaffold leg at mid span could buckle the leg and cause an unexpected scaffold failure. To avoid this danger, it is recommended that the tie be placed at the closest horizontal member *above* the 4:1 base to height ratio and repeated vertically at locations of horizontal members every 20 to 26 feet in height thereafter. The top tie shall be placed no further than a 4:1 base to height ratio from the top.

OSHA agrees that guys, ties, and braces should be placed at points of scaffold structural strength, and has

modified this provision of the final rule accordingly. Furthermore, the Agency agrees with the SIA's recommendation that the top tie, guy, or brace be placed no more than the 4:1 height to base ratio from the top of the scaffold, and has modified the provision accordingly. However, OSHA does not agree with the SIA suggestion that guys, ties and braces be installed at the closest horizontal member *above* the 4 to 1 base to height ratio, and has revised the language of this provision to reflect the Agency's finding that these components be installed at the closest horizontal member *to* the 4:1 height, whether above or below, to maximize stability.

In addition, the SIA recommended that OSHA require employers to consider loads due to wind and weather when guying, tying, or bracing is installed, whenever scaffolds are partially or fully enclosed. The Agency notes that these matters are addressed in the general capacity requirements of final rule § 1926.451(a) and in § 1926.451(f)(13), which requires that wind screens not be used unless the scaffold has been secured against the forces imposed.

Another commenter (Ex. 2-38) suggested using the same language as in existing § 1926.451(e)(1), which requires that the height of a manually propelled mobile scaffold not exceed four times the minimum base dimension, "because it is more understandable." Also, a commenter (Ex. 2-40) stated "since the standard does not address the issue of cantilevered work platforms (or their effect on stability), the allowable height to base width ratio of equal to four or less seems high."

Another commenter (Ex. 2-23) recommended a ratio of 3 to 1, but provided no rationale to support its suggestion. OSHA notes that the final rule 4:1 ratio is consistent with the requirement in ANSI A10.8-1988, paragraph 4.31, that free-standing scaffolds with height to base ratios of more than 4:1 be restrained from tipping by guying or other means.

Based on these concerns, in the final rule OSHA has added paragraph (c)(1)(iii), which requires that scaffolds with eccentric loads (such as cantilevered work platforms) be restrained from tipping through the use of ties, guys, braces or outriggers.

Final rule paragraph (c)(2) requires that supported scaffold poles, legs, posts, frames, and uprights bear on base plates and mud sills or other adequate firm foundation. In particular, final rule paragraph (c)(2)(i) requires that such footings be level, sound, rigid, and capable of supporting the scaffold in a

loaded condition without settling or displacement.

In addition, final rule paragraphs (c)(2) (ii) and (iii) provide that unstable objects shall neither be used to support scaffolds or platform units, nor be used as working platforms, respectively. The reason for these requirements is almost self-explanatory: every scaffold must stand on a firm footing if it is to withstand the load that employees, equipment, and materials place on it.

Final rule paragraph (c)(2)(iv) provides that front-end loaders and similar pieces of equipment shall not be used as scaffold supports unless they have been specifically designed by the manufacturer for such use. In addition, final rule paragraph (c)(2)(v) requires that fork-lifts not be used to support scaffold platforms unless the entire platform is attached to the fork and the fork-lift is not moved horizontally while the platform is occupied. Both these requirements relate to the need for solid support for scaffold platforms and reflect the fact that front-end loaders, fork-lifts and other such equipment are not generally designed for this purpose.

Paragraph (c)(2) of the final rule is identical to proposed paragraph (b)(14), except for two provisions, final rule paragraphs (c)(2) (iv) and (v), which have been added based on input generated by responses to Issue 3 of the preamble of the NPRM. Proposed paragraph (b)(14) consolidated existing requirements that scaffold uprights rest upon a stable, firm, level footing.

Issue 3 asked if OSHA should prohibit the use of cranes, derricks, forklifts, front-end loaders, and similar pieces of equipment for the support of scaffold platforms. In addition, OSHA asked what pieces of equipment should be prohibited and what other related provisions would be necessary to ensure employee safety.

Several commenters from the Associated General Contractors of America (AGC) (Exs. 2-20, 2-55, and 2-390) and the ACCSH (Tr. 6/9/87, pp. 40-41) noted that OSHA had undertaken rulemaking regarding the use of cranes and derricks to hoist personnel platforms (NPRM published February 17, 1984, 49 FR 6280). The AGC commenters stated that the proposed regulations for crane suspended work platforms already addressed the concerns raised in Issue 3.

Another commenter (Ex. 2-53) called for the development and issuance of specific crane suspended platform regulations, and one respondent (Ex. 2-29) commented that the current regulations on crane suspended work platforms were acceptable.

On August 2, 1988 (53 FR 29116), OSHA issued a final rule (§ 1926.550(g)) which regulates the use of cranes and derricks to hoist personnel platforms. Therefore, there is no longer a need for subpart L to address that subject.

Regarding the use of front-end loaders, one commenter (Ex. 2-33) responded, in part, that "front-end loaders should not be used to hoist worker-loaded scaffold platforms" and added that the "[u]se of forklifts for this purpose should be limited in accordance with * * * OSHA's General Industry Standards for powered industrial trucks, 29 CFR 1910.178(m)(12)." The same commenter also stated "If large platforms are used in this manner, consideration should be given to requiring bracing of forks to safeguard against tipping or slipping of the truck or its forks."

Another commenter (Ex. 2-70) stated simply "[w]e do not utilize forms of equipment to support platforms." Two other commenters (Exs. 2-367 and 2-368) stated "the practice of using cranes, derricks, fork-lifts, etc., [to support scaffold platforms] is unsafe and should be prohibited."

One commenter (Ex. 2-5), a manufacturer of heavy-duty materials-handling equipment, including forklifts and cranes, stated that "[f]or years, we have made the users of our equipment aware that these are intended solely for the handling of materials and not for personnel." The commenter went on to say their company recommends that "OSHA develop rules prohibiting the use of forklifts, front-end loaders and similar pieces of equipment for the support of scaffold platforms," and provided the following rationale:

This class of equipment depends on a hydraulic cylinder(s) to lift and hold the load[-]engaging means. When new, the cylinder has little leakage past the sealing means, usually packings, but it does have leakage. After use, the leakage increases. This allows the load[-]engaging means to 'drift' downward, possibly endangering personnel on the scaffold platform. Additionally, the load[-]engaging means of a forklift are usually supported on bearings or sliding members and chains. With use, wear occurs at these points. If excellent maintenance is not performed, and worn parts [are not] promptly replaced, sufficient wear can occur which is not evident when handling heavy loads, since their gravitational mass overcomes the friction and keeps the chain tight; however, when supporting a light load such as a scaffold platform, there is insufficient mass to overcome the friction with the load [-]engaging means left suspended when the mechanism is lowered, with a sudden drop of the load [-]engaging means when dislodged. We have knowledge of this happening at least two times at Cape Kennedy when a work platform

was raised by a 15,000 pound[-]capacity forklift of our manufacture. Each time serious injury to the man on the platform occurred.

The ACCSH has recommended (Tr. 6/9/87, pp. 32-48) that OSHA prohibit the use of front-end loaders and other similar earth-moving equipment for scaffold support. ACCSH also recommended that OSHA develop rules allowing the use of forklifts as scaffold platforms only while the equipment is stationary and while proper fall protection is provided.

Several commenters (Exs. 2-13, 2-20, 2-22, 2-24, 2-54, 2-55, and 2-390) favored allowing the use of cranes, derricks, front-end loaders, and forklifts to support scaffold platforms, in general terms. Three other commenters (Exs. 2-29, 2-33, and 2-176) favored allowing the use of forklifts, under specified conditions, to support scaffolds.

Three commenters from the AGC (Exs. 2-20, 2-55, and 2-390) stated that, in certain instances, where access to a work area was difficult and the work assignment was of short duration, using scaffold framing might be more hazardous than using equipment for work platform support. They added that appropriate personal protective equipment could be used for employee safety in these situations.

Another commenter (Ex. 2-22) opposed the contemplated prohibition, stating "[t]here are a variety of field situations in which the use of such devices is the only safe way to handle a particular problem. Not only is there no diminution in the safety level afforded to employees in such situations, but the level of safety may actually be improved."

Also, a commenter (Ex. 2-24) termed the "suggestion that cranes, forklifts, and other equipment could not be used as platform supports" as "totally unrealistic." The commenter provided some alternatives and examples (e.g., long ladders) describing them as involving the use of generally dangerous equipment. The commenter also noted that when using this equipment as scaffold support, additional protective measures would be necessary. These measures would include having the operator at the controls at all times, having railings on platforms used above 10 feet in height, and providing safety training.

The Boston Cement Masons and Asphalt Layers Union (BCMALU) (Ex. 2-54) indicated that the use of this equipment to support scaffold platforms might be practical in certain circumstances. This commenter also added that employers "should note the use of this equipment in their Daily Report and explain why they used it."

A carpentry contractor (Ex. 2-176) said that forklift scaffold(s) with properly constructed scaffold platforms should be permitted, provided they are equipped with proper railings, and added that "[i]f the workers working from the scaffold do not ride up and down, there is no danger of their falling off."

One commenter (Ex. 2-29) stated that "[f]orklift[-]mounted work platforms might also be acceptable provided suitable requirements and restrictions are specified." Another commenter (Ex. 2-13), expressing guarded support of the possible prohibition, stated that since this "equipment is readily available at job sites * * * [it] will continue to be used to support workers at elevated working locations." The same commenter further suggested that a minimum requirement for the safe use of such equipment would be to have a competent engineer responsible for the design and safe use of the resulting scaffold.

After a careful review of the above comments, OSHA finds there is insufficient reason to totally ban the use of forklifts, front-end loaders, and other similar equipment as scaffold supports. OSHA notes that the commenters are in general agreement that all equipment not specifically designed to support scaffold platforms must not be used. Accordingly, the Agency has promulgated new paragraphs (c)(2) (iv) and (v) in the final rule to provide guidance for the safe use of specific equipment as scaffold supports. In particular, the added provision requires that, in the case of fork-lifts, the entire scaffold platform be secured to the forklift. All supported scaffolds, including those supported by forklifts, front-end loaders and similar pieces of equipment, must comply with the applicable requirements of § 1926.451 for capacity, construction, access, use, and fall protection.

Paragraph (c)(3) of the final rule requires that supported scaffold poles, legs, posts, frames, and uprights be plumb and braced to prevent swaying and displacement. This provision, which is identical to proposed paragraph (b)(15), consolidates existing § 1926.451 (a)(15), (b)(1), (c)(6) and (e)(8), all of which require that uprights be secure, plumb, and braced to prevent swaying and displacement of the scaffold.

Paragraph 1926.451(d) Criteria for Suspension Scaffolds

Final rule paragraph (d) sets criteria for the use of suspension scaffolds. Paragraph (d)(1) of the final rule requires that all suspension scaffold

support devices, such as outrigger beams, cornice hooks, parapet clamps, and similar devices, rest on surfaces capable of supporting at least 4 times the loads imposed on them by the scaffold operating at the rated load of the hoist (or at least 1.5 times the loads imposed on them by the scaffold operating at the stall load of the hoist, whichever is greater).

Proposed paragraph (b)(16) required all suspension scaffold support devices such as outrigger beams, cornice hooks, parapet clamps, and similar devices, to rest on surfaces capable of supporting the reaction forces imposed by the scaffold hoist operating at its maximum rated load. Both the proposed and final rule are based on existing § 1926.451(h)(9), which requires that outrigger beams rest on suitable wood bearing blocks. Final rule paragraph (d)(1) differs from the proposed provision regarding the way in which the load to be sustained is expressed. The proposed rule used the term "maximum rated load" instead of the final rule's terms "rated load of the hoist" and "stall load" of the hoist.

Three commenters (Exs. 2-64, 2-367 and 2-516) recommended a 4 to 1 safety factor based on the rated load of the hoist. Another commenter (Ex. 2-41) stated that reaction force should include all forces, not just those from the hoist, and indicated that some safety factor was needed. The Agency agrees that a clarification is warranted here, and has modified the final rule to reflect this input. In addition, the text has been modified to be consistent with final rule §§ 1926.451 (a)(2) and (a)(4). The Agency concludes that this is necessary in order to adequately address the issue of the hoist reaching its stall load when the scaffold strikes an obstruction. OSHA has determined that the hoist stall capacity needs to be greater than the hoist rated capacity so that the rigging system will be able to support the loads imposed by obstructions as well as the load being lifted. This matter is addressed in greater detail above, in relation to final rule § 1926.451(a)(1).

Final rule paragraphs (d)(2), (d)(3) and (d)(4) set requirements for outrigger beams used with suspension scaffolds. Paragraph (d)(2) of the final rule requires that suspension scaffold outrigger beams, when used, be made of structural metal, or equivalent strength material, and be restrained to prevent movement. This is identical to proposed paragraph (b)(17), except as discussed below. The proposal was based on existing § 1926.451(h)(4) and (k)(8).

The SIA (Ex. 2-368) stated that if the intent of proposed paragraph (b)(17) was to prohibit the use of wood outrigger

beams, the Agency should simply say so. The proposed language clearly indicated that outrigger beams must be made of structural metal. However, upon further consideration of this provision, OSHA believes that other materials should be allowed if their strength and other pertinent characteristics are equivalent to those of structural metal. The Agency has therefore revised the proposed rule accordingly. This revision is in line with the Agency's policy to permit alternative materials or practices which provide equivalent protection to employees. Also, OSHA has added the words "when used" to indicate clearly that the provision does not *require* outrigger beams to be used but only applies when outrigger beams are used.

Final rule paragraph (d)(3) sets requirements for the stabilization of outrigger beams. The introductory language of the paragraph requires that outrigger beams be secured directly to the supporting surface or be stabilized using counterweights, except that masons' multi-point adjustable suspension scaffolds shall not be stabilized by counterweights. The rule does not allow counterweights for stabilizing such masons' suspension scaffolds because, with the large loads often placed on masons' multi-point adjustable suspension scaffolds and the large counterweights that would be necessary to anchor such systems, OSHA is concerned that the supporting roof or floor would become dangerously overloaded.

Final rule paragraph (d)(3) is identical to proposed paragraph (b)(18), except for a few minor editorial changes as described below. The final rule clarifies existing §§ 1926.451 (h)(4) and (j)(5), which require simply that outriggers be securely fastened or anchored. Counterweights are not addressed in the existing standard. OSHA has determined that it is necessary to set criteria for counterweights in the final rule, however, because counterweights are often the only way to anchor an outrigger beam without damaging the supporting surface.

Paragraph (d)(3)(i) provides that direct connections shall be evaluated by a competent person who affirms, based on that evaluation, that supporting surfaces can support the anticipated loads. In addition, the paragraph requires masons' multi-point adjustable suspension scaffold connections to be designed by an engineer experienced in such scaffold design. OSHA anticipates that compliance with these provisions will ensure that roof or floor decks are capable of supporting the loads to be imposed.

Final rule paragraphs (d)(3)(ii) through (d)(3)(v) require that counterweights be made of non-flowable material; be specifically designed for use as scaffold counterweights; be secured to outrigger beams to prevent accidental displacement; and not be removed from an outrigger beam until the scaffold is disassembled, respectively. These requirements are necessary to ensure that counterweights are used only for their intended purpose and are not displaced or removed prematurely.

Final rule paragraphs (d)(3)(vi) through (d)(3)(x) set requirements for securing outrigger beams. In particular, outrigger beams not stabilized by direct connections to the supporting surface shall be secured by tiebacks (paragraph (d)(3)(vi)). Tiebacks must be as strong as the suspension ropes (paragraph (d)(3)(vii)), be secured to a structurally sound anchorage (paragraph (d)(3)(ix)), and be installed perpendicular to the structure unless opposing angle tiebacks are installed (paragraph (d)(3)(x)). In addition, paragraph (d)(3)(viii) requires that outrigger beams be placed perpendicular to their bearing support, with the exception described more fully below.

With regard to proposed paragraph (b)(18)(i) (paragraph (d)(3)(i) in the final rule), a commenter (Ex. 2-40) stated "we believe that improper connections are almost always responsible for the failure of scaffolds. Therefore, criteria for torsion strength evaluation of bolted (direct) connections should be included in the standard." OSHA believes that the corresponding requirement in final rule paragraph (d)(3)(i) for evaluation of direct connections by a competent person will provide adequate assurance that those connections are designed and made appropriately, because the competent person must have the ability to identify any problems with the direct connections and the authority to have any problems corrected.

Proposed paragraph (b)(18)(ii) (paragraph (d)(3)(ii) in the final rule) required that counterweights be made of non-flowable solid material. That, in effect, prohibited the practice of using sandbags or water-filled buckets as counterweights. The reason for the prohibition is that counterweights are easily displaced and may leak. Final rule paragraph (d)(3)(ii) is virtually identical, except that the word "solid" has been deleted, because that term is redundant with the term "non-flowable", and a sentence has been added that explicitly prohibits the use of sand, gravel and other similar material as counterweights.

A commenter (Ex. 2-41) stated that the proposed paragraph would cause confusion, inquiring whether, if five 70 pound weights are considered "solid," 350 one pound weights also would be considered "solid"? The Agency would consider five 70 pound weights as meeting this requirement, because objects of this weight would be unwieldy and less prone to dislocation. However, 350 one pound weights would not meet this requirement because their light weight would make them more prone to being dislocated, thus possibly compromising their effectiveness as a counterweight. OSHA has added the sentence "Sand, gravel, and similar materials that can be easily dislocated shall not be used" to indicate more clearly what materials are not allowed for use as counterweights.

Paragraph (d)(3)(iii) of the final rule requires that counterweights be specifically designed for use as counterweights. This provision, which was not part of the proposed rule, has been added in response to input received regarding Issue 26 in the preamble of the NPRM. That Issue asked if OSHA should require that counterweights be designed for no other purpose than to counterweight the system, thereby prohibiting the use of construction materials, such as concrete masonry units, rolls of felt, etc., as counterweights.

One commenter (Ex. 2-22) opposed requiring that counterweights be designed for no other purpose than to counterweight the system. This commenter stated that such a requirement would be unnecessarily costly. This commenter also stated "So long as the material used meets the objective of the safety requirement, there is no need to cause the expenditure of money on specific materials that do not enhance the safety of the employee * * *"

Several commenters (Exs. 2-13, 2-29, 2-43, 2-53, 2-54, 2-64, 2-367, 2-368 and 2-465) supported a requirement that counterweights be specifically designed for no other purpose than to counterweight the system. These commenters also supported a ban on the use of construction material as counterweights. The SIA (Ex. 2-368) added that such a requirement would be practical, feasible, of negligible cost and would prevent accidents which occur when construction materials used as counterweights are removed for other purposes.

Another commenter (Ex. 2-13) stated:

Counterweights should be designed for their specific use and permanently marked with their weight otherwise they are worthless. Construction material, of any

kind, should be banned for use as counterweights. There is no assurance that proper counterweighting is being accomplished with construction materials. Also, the material could be removed for use by others, thus providing an unstable condition.

Two commenters (Exs. 2-64 and 2-367) stated that there should be a requirement that counterweights be identified or marked. The SSFI (Ex. 2-367) recommended that "each counterweight be identified as to its weight" and should also "have the ability to be fastened directly to the outrigger system." Another commenter (Ex. 2-64) wanted counterweights to be "clearly marked with their actual weight (stamped, painted, etc.), so that workers will use the proper amount of weight."

In addition, a commenter (Ex. 2-8) stated "[c]onstruction materials should not be use[d]. We have seen masons remove block used as counterweight."

Also, the ACCSH (Tr. pp. 188-190, 6-9-87) recommended that counterweights be designed for no other purpose than to counterweight the system. One member stated "Certainly OSHA should require counterweights be designed for no other purpose. It seems to me that the same day I first read this question I received from OSHA a copy of 'Fatal Facts' that involved this very issue."

After carefully considering the above comments and the ACCSH recommendation, OSHA has determined that it is reasonably necessary to require that counterweights be designed for no other purpose than to counterweight the system, and to prohibit the use of construction materials as counterweights. In addition, OSHA has determined that it is appropriate to require the marking of counterweights with their weights because that information is needed for the proper design, selection and installation of counterweights.

Proposed paragraph (b)(18)(iii), which required that counterweights be connected to outrigger beams by mechanical means, is identical to final rule paragraph (d)(3)(iv), except that the phrase "to prevent accidental displacement" has been added to the final rule to clarify the Agency's regulatory intent. The BCMALU (Ex. 2-54) recommended that the Agency clarify the reason for this provision. The Agency agrees and has revised the provision accordingly.

Proposed paragraph (b)(18)(iv) required that counterweights not be removed from a scaffold until the scaffold is disassembled. Final rule paragraph (d)(3)(v) is identical to the proposed paragraph, except that the

final rule specifies that the counterweights may not be removed from the "outrigger beam", rather than from the "scaffold." One commenter (Ex. 2-41) pointed out that counterweights used with suspension scaffold outrigger beams are not placed on the scaffold, as stated in the proposed rule, but are installed on the outrigger beam above. The Agency agrees, and has revised the provision accordingly.

Proposed paragraph (b)(18)(v) required outrigger beams to be secured by tiebacks equivalent in strength to the suspension ropes. This provision was intended to provide a backup system in case the counterweights became displaced. Although tiebacks alone may not keep a scaffold from tipping, they will keep the system from falling to the ground and from causing a progressive failure of nearby scaffolds and scaffold sections. The intent of the proposed paragraph has been carried forward in final rule paragraphs (d)(3)(vi) and (vii), which require the use of tiebacks when direct connections are not used, and require tieback strength equivalent to that of the suspension ropes, respectively.

The SSFI and the SIA (Ex. 2-367 and 2-368) noted that outrigger beams which are bolted to the structure become part of the structure and do not require tiebacks. The Agency agrees that only counterweighted outrigger beams need to be secured with tiebacks and has incorporated appropriate language into paragraphs (d)(3)(vi) and (d)(3)(vii) accordingly.

In addition, final rule paragraph (d)(3)(viii) requires that outrigger beams be placed perpendicular to the face of the structure, except that, where the employer establishes that such placement is prevented by obstructions, the outrigger shall be placed as near to the perpendicular as possible and shall be secured using opposing angle tiebacks. This provision has been added as a partial response to a commenter (Ex. 2-41) who stated that requiring tiebacks to be installed parallel to the centerline of the beam, as required by proposed paragraph (b)(18)(vii), is only safe when the beam is perpendicular to the edge. OSHA agrees with this comment because a non-perpendicular beam/tieback arrangement creates a pendulum effect that could endanger employees. However, the SIA (Ex. 2-368) has pointed out that there may be circumstances where obstructions prevent the outrigger beam from being placed perpendicular to the edge. The SSFI and the SIA (Exs. 2-367 and 2-368) suggested that, in such cases, opposing angle tiebacks be required.

OSHA agrees that opposing angle tiebacks are appropriate where obstructions prevent perpendicular placement of outriggers, and has revised the final rule language accordingly.

Proposed paragraphs (b)(18)(vi) and (vii) required that tiebacks be secured to structurally sound anchorages and that they be parallel to the outrigger beam. Those provisions correspond to final rule paragraphs (d)(3)(ix) and (x). OSHA has revised this language, drawing on examples in the preamble of the NPRM, to provide more specific direction regarding what constitutes a structurally sound anchorage.

Three AGC commenters (Exs. 2-20, 2-55 and 2-390) stated that the OSHA interpretation of what is considered an acceptable point of anchorage (51 FR 42686) was too strict and that the Agency should permit the use of any available roof structural anchor points since they are only accommodating a back-up or secondary support system. The Agency disagrees with this position because the secondary support system must be capable of providing adequate support in the event of rigging failure. The revised final rule paragraph specifically identifies structural members of the building or structure as appropriate anchor points, and identifies standpipes, vents, other piping systems, and electrical conduit, as structural elements that do not provide appropriate anchorages.

Proposed paragraph (b)(18)(vii) required that tiebacks be installed parallel to the centerline of the beam. The proposed language has been revised in final rule paragraph (d)(3)(x) to recognize that opposing angle tiebacks are acceptable alternative means of installation. In addition, OSHA has replaced the proposed term "parallel", with the term "perpendicular" for the sake of clarity.

A commenter (Ex. 2-29) stated "since tieback anchorages are not always available exactly where needed, perhaps the wording of these requirements should be revised to allow tiebacks to be at an angle, e.g., not to exceed 10 degrees from the centerline of the outrigger * * *." OSHA acknowledges that anchorages are not always conveniently located and that there may be circumstances where it is necessary to install the tieback at an angle. However, OSHA believes that when this is done, it is also necessary to require an opposing angle tieback to be used so that the pivot radius of the beam is minimized. Consequently, single tiebacks installed at an angle are not allowed by the final rule.

Paragraph (d)(4) of the final rule specifies the construction requirements

for outrigger beams used with suspension scaffolds. This provision requires that suspension scaffold outrigger beams be: provided with stop bolts or shackles at both ends; securely fastened together with the flanges turned out when channel iron beams are used in place of I-beams; installed with all bearing supports perpendicular to the beam center line; and set and maintained with the web in a vertical position. In addition, when an outrigger beam is used, the shackle or clevis with which the suspension rope is attached to the outrigger beam shall be placed directly over the hoisting machine, i.e., over the center line of the stirrup. (These requirements are found in paragraphs (d)(4)(i) through (d)(4)(v).)

These requirements are effectively identical to those in proposed paragraph (b)(19). The SIA (Ex. 2-368) recommended that OSHA drop the word "single" from proposed paragraph (b)(19)(v) because this requirement applied to all outrigger beams, not just to "single outrigger beams". The Agency agrees, and has revised this provision of the final rule accordingly.

Final rule paragraph (d)(5) sets requirements for suspension scaffold support devices other than outrigger beams. These devices include cornice hooks, roof irons, parapet clamps, or similar devices. Under this provision, those devices must be: made of steel, wrought iron, or materials of equivalent strength; supported by bearing blocks; secured against movement by tiebacks installed at right angles to the face of the building or structure unless opposing angle tiebacks are installed and secured to a structurally sound point of anchorage on the building or structure (sound points of anchorage include structural members, but do not include standpipes, vents, other piping systems, or electrical conduit); and tiebacks shall be equivalent in strength to the strength of the hoisting rope.

Final rule paragraph (d)(5) is identical to proposed paragraph (b)(20), except that some minor editorial changes have been made for the sake of clarity. In particular, OSHA has revised proposed paragraph (b)(20)(i), which specified "mild steel, wrought iron, or equivalent materials," by deleting the word "mild" and changing "equivalent materials" to "materials of equivalent strength." These revisions are based, in part, on input from a commenter (Ex. 2-41), who indicated that the term "mild steel" is not defined in readily available sources. The other change was made to indicate clearly that the strength of the specified materials was the characteristic by which 'equivalence' would be gauged.

Proposed paragraph (b)(20)(iii) required the use of tiebacks, installed at right angles to the face of the structure wherever possible; secured to a structurally sound portion of the building; and equivalent in strength to the hoisting rope. As stated in the preamble to the NPRM (51 FR 42686), vents, standpipes, 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 the support device were to fail. OSHA has revised the proposed provision so that final rule paragraph (d)(5)(iii) allows opposing angle tiebacks, as well as tiebacks at right angles, and has incorporated the NPRM preamble list of unacceptable anchorage points to facilitate compliance. In addition, the Agency has relocated the requirement for tieback strength equivalent to that of the hoisting rope to a separate provision (final rule paragraph (d)(5)(iv)).

Two commenters (Exs. 2-64 and 2-368) suggested a requirement that devices covered by proposed paragraph (b)(20) be marked to indicate their capacity. OSHA has not done so because the Agency believes that such markings are not necessary given the capacity requirements set in final rule § 1926.451(a).

Paragraph (d)(6) of the final rule specifies the minimum length of suspension rope to be used with different kinds of hoists. In particular, winding drum hoists are required to have at least four wraps of suspension rope at the lowest point of scaffold travel. All other types of hoists are required to have suspension rope long enough to lower scaffolds to the level below, without having the rope end pass through the hoist, or to have the rope end configured or provided with means so that the end does not pass through the hoist.

This provision, which is identical to proposed paragraph (b)(21), elicited one comment. The BCMALU (Ex. 2-54) recommended that OSHA require that the rope be long enough to allow the scaffold to be lowered to the lowest point on the job-site without the rope passing through the hoist or that the scaffold be initially set up at the highest point at which it will be used on that job-site. OSHA believes that the proposed provision adequately addressed the issue of rope run-through and, accordingly, has not made the suggested revision in the final rule.

Final rule paragraph (d)(7) states "The use of repaired wire rope as suspension rope is prohibited." This provision differs from proposed paragraph (b)(22),

which stated "The repairing of wire suspension rope is prohibited." The proposed requirement was based on OSHA's view that there is no way to determine the strength capacity of a repaired wire rope without the danger of over-stressing the repair and thus rendering the rope unsafe for use on scaffolds. The Agency recognizes that the proposed rule did not clearly state OSHA's intent. The act of repairing wire suspension rope is not in itself hazardous. OSHA is, however, concerned that repaired rope not be used to suspend a scaffold. Accordingly, OSHA has revised this provision to prohibit the use of repaired wire rope as suspension rope.

Paragraph (d)(8) of the final rule provides that wire suspension ropes shall not be joined together except through the use of eye splice thimbles connected with shackles or coverplates and bolts. This is virtually identical to proposed paragraph (b)(23). This provision, which was not in OSHA's existing scaffold standard, reflects OSHA's determination that the specified measures are the only acceptable ways to connect wire ropes without significantly affecting rope strength.

The SSFI and the SIA (Exs. 2-367 and 2-368) suggested revision of the proposed text to read "wire suspension ropes shall not be joined together except through the use of eyesplice thimbles connected with shackles or cover plates and bolts." OSHA agrees that the suggested phrase "through the use of eye splice thimbles connected" expresses the Agency's intent more effectively than the proposed phrase "by eyesplicing" and has revised the language of the final rule accordingly. The SIA further indicated that this requirement should apply only to wire suspension ropes used with manual hoists. However, the Agency concludes that final rule paragraph (d)(8) is applicable to the joining of all wire suspension rope, not just that which is used with manual hoists, because compliance with that provision is necessary to ensure that the wire ropes on *all suspended scaffolds* are rigged properly. Therefore, OSHA is not making the suggested change.

Paragraph (d)(9) of the final rule provides that the load end of wire suspension ropes shall be equipped with proper size thimbles and secured by eye splicing or equivalent means. This provision is identical to proposed paragraph (b)(24), which was based on existing § 1926.451(h)(10) and existing § 1926.451(j)(7).

Final rule paragraph (d)(10) requires that ropes be inspected for defects by a competent person prior to each

workshift and after every occurrence which could affect a rope's integrity. In addition, paragraph (d)(10) provides that wire rope shall be replaced if the rope has any physical damage which impairs its function and strength; any kinks that might impair the tracking or wrapping of rope around the drum(s) or sheave(s); six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay; abrasion, corrosion, scrubbing, flattening or peening causing loss of more than one-third of the original diameter of the outside wires; evidence of any heat damage resulting from a torch or any damage caused by contact with electrical wires; or evidence that a secondary brake has been activated during an overspeed condition and engages the suspension rope (paragraphs (d)(10) (i) through (vi)).

Proposed paragraph (b)(25) provided simply that "Defective or damaged ropes shall not be used as suspension ropes or drop lines." The proposed language was based on existing § 1926.451(w)(5), which prohibits damaged ropes from being used on float or ship scaffolds. The danger of a broken line is a problem not confined to float or ship scaffolds, so OSHA has extended this provision in the final rule to cover all suspended scaffolds.

The one comment (Ex. 2-38) on the proposed provision pointed out that guidelines indicating when rope would be considered to be defective should be provided. The Agency agrees that employers need to know what OSHA means by "defective or damaged rope". Accordingly, final rule paragraph (d)(10) incorporates the language of ANSI A10.8-1988, paragraph 6.7.10, because OSHA finds that those consensus provisions represent good industry practice.

Paragraph (d)(11) of the final rule requires that swaged attachments or spliced eyes on wire suspension ropes not be used unless they are made by the wire rope manufacturer or a qualified person. This provision is essential to ensure the strength and integrity of such attachments as eyes and is identical to proposed paragraph (b)(26).

Paragraph (d)(12) of the final rule requires that, when wire rope clips are used on suspension scaffolds, there shall be a minimum of 3 wire rope clips installed, with the clips a minimum of 6 rope diameters apart; employers shall follow the manufacturer's recommendations when installing clips, retightening clips after initial loading, and inspecting and retightening clips at the start of each workshift; U-bolt clips (a variety of wire rope clip) shall not be used at the point of suspension for any

scaffold hoist; and when U-bolt clips are used, the U-bolt shall be placed over the dead end of the rope, and the saddle shall be placed over the live end of the rope.

Proposed paragraph (b)(27) simply stated "When wire rope clips are used on suspension scaffolds, they shall be retightened after initial loading and shall be inspected and retightened periodically thereafter". OSHA believed at the time of the proposal that such performance language conveyed the requirements necessary to ensure that clips were installed and retightened properly.

Two commenters (Exs. 2-23 and 2-54) recommended that OSHA specify the minimum number of clips required. In particular, one commenter (Ex. 2-23) recommended a minimum of 3 clips spaced at least 6 rope diameters apart, with the U-bolt over the dead end of the wire rope. This commenter added that the clips must not be staggered.

The SIA (Ex. 2-368) recommended that the clips be tightened to the manufacturer's recommended torque. Another commenter (Ex. 2-64) suggested that only "J" type clamps be used on suspension scaffold lines and that the clips be inspected and retightened at the start of each workshift thereafter.

The Agency agrees that more specific requirements are needed so that employers know how to install and retighten wire rope clips. OSHA believes that the requirements of ANSI A10.8-1988, paragraph 6.7.11.3, appropriately address the concerns raised by commenters, and has incorporated those provisions into paragraph (d)(12) of the final rule. In addition, the Agency agrees that a minimum of 3 clips spaced at least 6 rope diameters apart is necessary for safe rigging when wire rope clips are being used. OSHA notes that several drawings in ANSI A10.8-1988 which depict the proper rigging of suspension scaffolds show three wire rope clips on the suspension ropes.

Final rule paragraph (d)(13) requires that suspension scaffold power-operated hoists and manually operated hoists be of a type tested and listed by a qualified testing laboratory. This is virtually identical to proposed paragraph (b)(28), except that OSHA has revised the proposed terms "mechanically powered" and "manually powered" hoists to read "power operated hoists and manually operated hoists" in the final rule. This revision brings paragraph (d)(13) into line with the language of ANSI A10.8-1988, paragraph 6. This provision consolidates existing provisions

§§ 1926.451 (h)(2), (i)(3), (j)(2), and (k)(1).

Paragraph (d)(14) of the final rule requires that gasoline-powered equipment and hoists not be used on suspension scaffolds. This provision is similar to proposed paragraph (b)(29), except that the final rule now prohibits all gasoline-powered equipment or hoists, not just gasoline powered hoists.

The proposed provision was based on existing § 1926.451(k)(2) which allows units to be either electrically or air motor driven. OSHA has determined that gasoline hoists pose unacceptable fire hazards, given the confined area of a suspended scaffold and the difficulties employees would face trying to escape the scaffold if the hoist was incapacitated and on fire.

The BCMALU (Ex. 2-54) strongly recommended that OSHA prohibit the use of all gasoline-powered equipment and hoists on suspension scaffolds because of the high potential for fire. The commenter cited an example of an accident in which two employees were severely burned using a gasoline-powered water blaster. The Agency agrees with this concern and has revised the provision in the final rule accordingly.

Paragraph (d)(15) of the final rule requires that gears and brakes of power operated hoists used on suspension scaffolds be enclosed. This is virtually identical to proposed paragraph (b)(30), except a change in terminology has been made ("mechanically powered" to "power operated"), consistent with the changes made and discussed above under paragraph (d)(13). The proposed rule was based on existing § 1926.451(k)(3).

Final rule paragraph (d)(16) provides that, in addition to the normal operating brake, suspension scaffold power operated hoists and manually operated hoists shall have a braking device or locking pawl which engages automatically when a hoist makes either of the following uncontrolled movements: an instantaneous change in momentum or an accelerated overspeed. This provision is different from proposed paragraph (b)(31), which required a brake or pawl to automatically engage "when the normal speed of descent of the hoist is exceeded." The proposed provision was based on existing § 1926.451(k)(4) but differed from the existing standard in that it applied to manual as well as to powered hoists.

One commenter (Ex. 2-8) stated that OSHA should modify the proposed provision to specifically address an instantaneous change in momentum and an accelerated overspeed. OSHA agrees

that the suggested revision is appropriate, noting that ANSI A10.8-1988, paragraph 6.3.4.1 addresses both instantaneous stopping type secondary brakes and deceleration type secondary brakes. The Agency has revised the final rule's language accordingly.

The SSFI and the SIA (Exs. 2-367 and 2-368) recommended that OSHA apply this requirement only to powered hoists. OSHA disagrees with these commenters, noting that, as written, the provision requires a braking device (for powered hoists) or a locking pawl (for less sophisticated or manual hoists). The Agency concludes that these precautions are necessary on all suspension scaffold hoists and, accordingly, has not made the suggested revision.

Paragraph (d)(17) of the final rule provides that "Manually operated hoists shall require a positive crank force to descend." This is the same requirement as proposed paragraph (b)(32), except the term "manually operated hoists" replaces the proposed term "manually-powered hoists" for the same reasons as discussed above in relation to final rule paragraphs (d)(13) and (d)(15).

Issue 27 in the preamble to the NPRM sought comments regarding proposed § 1926.451 (b)(32) (paragraph (d)(17) of the final rule) which addresses means of preventing "free-running" of hoists during descent. OSHA's view was that compliance with the proposed paragraph would preclude this dangerous condition.

One commenter (Ex. 2-31), whose remarks related solely to pumpjack scaffolds, stated that "[u]nder ordinary circumstances, free[-]running does not occur during descent of a pumpjack."

The ACCSH recommended requiring a positive crank force to lower a scaffold (Tr. 190-191, 6/9/87). The SSFI (Ex. 2-367) and the SIA (Ex. 2-368) commented that the proposed provision would preclude the use of a "boat winch" type system. The SIA further noted that, to their knowledge, free-running hoists are "rare in the marketplace." They added that the requirement was feasible and practical and would involve negligible additional cost. NIOSH (Ex. 2-40) agreed with the proposed provision. The BCMALU (Ex. 2-54) stated that although a positive crank force might be slower than a free-running hoist, it would be safer which "is the name of the game, safety."

One commenter (Ex. 2-29) stated that a positive crank force should be required for hoists used to lower manually-powered scaffolds. Another commenter (Ex. 2-53) stated that the proposed requirement is needed. In addition, a commenter (Ex. 2-64) stated

that a positive crank force is essential unless the descent speed can be controlled by some other means.

After carefully considering the above comments and the ACCSH's recommendation, OSHA has determined that this requirement is necessary to eliminate the dangerous condition of "free-running" hoists during descent and to ensure employee safety.

Final rule paragraph (d)(18) provides that two-point and multi-point suspension scaffolds shall be tied or otherwise secured to prevent them from swaying, as determined necessary based on an evaluation by a competent person. This paragraph requires, in addition, that window cleaners' anchors not be used for the purpose of preventing swaying. This prohibition is based on the fact that window cleaners' anchors are not designed for the load that could be imposed. This provision was not part of the proposed rule.

Issue 7 in the preamble of the NPRM asked if the existing § 1926.451(i)(9) and proposed § 1926.452(p)(5) requirement that employers secure two-point adjustable suspension scaffolds to prevent swaying should be extended to cover all suspended scaffolds.

Six commenters (Exs. 2-13, 2-22, and 2-43, 2-471, 2-494, and 2-516) expressed some measure of support for the idea of extending this provision to cover all suspended scaffolds.

One commenter (Ex. 2-13) stated as follows:

All exterior scaffolds should be stabilized at each work location or provide a method of stabilization as described in OSHA 1910.66 [powered platform standard for General Industry] or by Intermittent Stabilization, as contained in OSHA STD 1-3.3. In addition, all new buildings over 35 feet in height should be provided with a permanent engineered methods or means of rigging.

The vast majority of suspended scaffold accidents that do occur are due to deficient rigging.

A later comment from the same individual (Ex. 2-494) stated "[w]ith prior planning, there are ways that all scaffolds can be stabilized * * * Unstabilized scaffolds are a hazard to the occupants, other workers, and pedestrians below."

Another commenter (Ex. 2-471) stated as follows:

Any shear wall, with the technology available since November 1982, as described in OSHA Instruction STD 1-3.3, can be made safe by the installation and the use of Intermittent Stabilization Building Anchors, to prevent a suspended scaffold from being displaced by wind forces.

Merely providing perimeter protection and separate safety lines will *not* prevent the scaffold and its occupants from being blown about, being upset, or violently contacting

the structure being serviced, all of which could cause death or injury.

Two commenters (Exs. 2-64 and 2-368) stated that it is neither possible nor practical to tie in all suspended scaffolds. They stated that there are many job situations (e.g., sheer or glass walls, or no wall at all) where stabilization would not work because there are no points where tie-ins can be made. OSHA acknowledges that there are circumstances where suspension scaffolds used in construction have no structure against which to be secured. The present rulemaking takes into account the likelihood that "permanent engineered methods" or "intermittent stabilization building anchors" will not be in place during construction operations. The applicability of § 1910.66 and OSHA STD. 1-3.3 is limited because they apply to post construction scaffold activities (such as window washing and light building maintenance).

The BCMALU (Ex. 2-54) simply expressed support for the existing requirement that two-point suspension scaffolds be secured to prevent swaying.

Three commenters from the AGC (Exs. 2-20, 2-55, and 2-390) said that single-point suspension scaffolds do not have a tendency to sway. They explained that "[s]waying generally occurs on two-point suspensions because of uncoordinated movements by two or three employees working on the platform as well as the fact that larger platforms permit movement by employees. This is not the case in single-point suspensions."

Another commenter (Ex. 2-29) stated that "[s]ingle-point boatswains' platforms should not be included [under this provision] * * * since this would greatly restrict their use."

OSHA agrees with the AGC commenters that single-point scaffolds should not be covered by this provision because, by their nature, they do not have a tendency to sway. Single-point scaffolds generally consist of a seat or a small cage which prevents employee movement and scaffold swaying, and therefore, do not pose the same hazard as multi-point scaffolds.

One commenter (Ex. 2-41) stated "based on much research, it is my opinion that the primary purpose for suspended scaffold restraint on a platform which has no open sides is to prevent the walking-working surface from becoming unstable during normal work activities. The restraint also closes the open side during work activities * * *" In addition, the SIA (Ex. 2-368) noted that "[w]here the work platform is provided with guardrails on all sides

and workers are protected by * * * safety lines, the protection should be adequate." Another commenter (Ex. 2-516) noted that "[t]here may be limited situations where suspended scaffolds for construction cannot be tied into the building or structure. However, this is not a reason for not having [fall] protection. Any suspended platform not tied in then definitely needs guardrails on all four sides."

In response to Issue 7, the ACCSH recommended (Tr. 79-87, June 9, 1987) that, where determined necessary by a competent person, all suspended platforms be secured to prevent swaying. The Advisory Committee indicated that the expertise of the competent person would enable the employer to determine the situations where it was appropriate to secure suspended scaffolds against swaying.

After careful consideration of the comments received, OSHA has decided not to require the use of tie-ins to protect single-point suspended scaffolds from swaying. As noted above, this type of scaffold generally consists of a seat or small cage which limits employee movement and swaying. However, the Agency does agree with the ACCSH that the expertise of a competent person will enable the employer to determine when it is appropriate to secure two-point and multi-point suspended scaffolds and has worded the final rule accordingly.

In addition, Issue 18 in the preamble of the NPRM asked if there should be a height limit above which single and two-point adjustable suspension scaffolds may not be used, and if so, what the height should be, and why.

Four commenters (Exs. 2-20, 2-55, 2-69, and 2-390) responded by asking "what type of equipment could be used above the limit that would be safe, practical, feasible and economical?" One commenter (Ex. 2-69) added that the hoist lifting capacity is the only height limitation for this type of scaffold. Another commenter (Ex. 2-13) agreed with that point and stated that OSHA should not try to limit the working height of suspension scaffolds. Two other commenters (Exs. 2-22 and 2-64) simply agreed that there should not be a height limitation. One of those commenters (Ex. 2-22) added that following "the safety standards" eliminates unsafe conditions.

Some Issue 18 commenters (Exs. 2-41, 2-54, 2-312) felt that the height of a suspended scaffold was not a problem. One commenter (Ex. 2-41) stated that a "height limit in construction should not be a factor in the safe use of equipment." As an example, he observed that "single-point scaffolds

have been used in 950 foot elevator shafts for elevator installation * * * The BCMALU (Ex. 2-54) indicated that a greater height would make workers more aware of hazards and thus more cautious. The commenter also stated "[i]t seems most employers and employees are more safety conscious in high places and careless at 5 to 10 feet from the ground." In addition, he commented that he did not see how OSHA could restrict use of this equipment because there are situations where these types of scaffolds are the only equipment that can be used. Also, a commenter (Ex. 2-312) stated that "[w]e have outfitted chimney workers for years so they could work on chimneys that stood 800 to 1000 feet in height. Never a single accident reported." The commenter explained that descent devices and the chair board systems use "one friction principle" and for these, more rope means more friction with which to slow descent. In addition, the commenter recommended that subpart L require that all rope [for these suspended scaffolds] be continuous length of line, without splices. The commenter further noted that this requirement would limit the height somewhat.

The SSFI and the SIA (Exs. 2-367 and 2-368) expressed opposition to a height limitation for suspended scaffolds and recommended that "the equipment should be designed by competent persons who will take into consideration all the hazards involved, thereby providing safe equipment for the specific job function." In addition, the SIA (Ex. 2-368) stated that suspended scaffolds are practical and feasible at any height when properly installed and used, and that the height limitation "would be the ability of the hoist(s) to raise and lower the work platform." Another commenter (Ex. 2-465) stated that this equipment should be designed by a competent person "who is thoroughly familiar with the hazards involved." That commenter also stated that suspended scaffolds are the most feasible and safest methods to use for work on smoke stacks, towers, and water tanks.

At its meeting of June 9, 1987, the ACCSH responded to Issue 18 by reiterating the position they previously adopted under Issue 7 regarding two-point suspended scaffolds. (Issue 7 is discussed above in reference to paragraph (d)(18) of the final rule.) While the ACCSH did not favor adopting a height limitation for single- and two-point adjustable suspended scaffolds, they did recommend that these types of scaffolds be secured to prevent swaying where necessary, as

determined by a competent person (Tr. 6/9/87, pp. 148-150). One ACCSH member stated "I would move that if swaying is prohibited, as discussed in Question Number 7, that no height limit for suspended scaffolds need be included."

Based on the input received, OSHA has determined that suspended scaffolds which comply with the pertinent requirements of subpart L will be safe regardless of the height at which they are used. Therefore, the Agency has not added a height limitation to the final rule.

Final rule paragraph (d)(19) (proposed § 1926.451(b)(3)) requires that single function emergency escape and rescue devices not be used as working platforms. This paragraph also provides that the prohibition does not apply to systems which are designed to function both as working platforms and as emergency systems.

Proposed paragraph (b)(3) simply prohibited the use of emergency descent devices as working platforms because such devices are not normally designed for repeated in-place use. However, as stated in the preamble to the NPRM (51 FR 42685), the proposed provision was not intended to preclude the use of scaffold systems which have as an additional feature the capacity to function as an emergency descent device.

The proposed provision generated a number of comments (Exs. 2-8, 2-27, 2-29, 2-87 and 2-312) which recommended that OSHA define "emergency descent device." Most of these commenters interpreted the regulatory language as prohibiting all emergency descent devices from being used as work platforms despite the clarification provided in the preamble. Therefore, OSHA has revised the final rule to indicate clearly that only devices whose sole function is to provide emergency escape and rescue are not to be used as working platforms.

Paragraph 1926.451(e) Access

Final rule paragraph (e) sets the requirements for safe access to scaffolds. This paragraph clarifies the requirements of existing § 1926.451(a)(13), which requires only that "an access ladder or equivalent safe access shall be provided." The introductory text states that employers must provide scaffold access which complies with paragraph (e) for each affected employee. It also specifies that the access requirements for employees erecting or dismantling supported scaffolds are prescribed in paragraph (e)(9).

Proposed paragraph (c) began with a note which stated that the proposed paragraph did not apply to employees erecting or dismantling scaffolds. In the preamble to the NPRM (51 FR 42687), OSHA stated that requirements for safe access "often are not feasible until a scaffold has been erected and properly braced." OSHA relied on the same rationale for the proposed exemption of erectors and dismantlers from the fall protection requirements of proposed paragraph (e).

OSHA received no comments on this proposed exemption directly. However, many of the comments on Issue 8, which requested input regarding the need to exempt employees erecting and dismantling scaffolds from the fall protection requirements of proposed paragraph (e) (promulgated as paragraph (g) of this final rule) stated that employees erecting and dismantling scaffolds should not be exempted from protection. In particular, as discussed below in relation to final rule paragraph (g), commenters stated that it was often feasible to provide fall protection for employees erecting or dismantling scaffolds.

Given the evidence that employers can often protect erectors and dismantlers from fall hazards, OSHA concluded that it was also appropriate to consider if there are circumstances where safe access can be provided for those employees. Accordingly, the Agency reopened the subpart L rulemaking record to solicit input regarding the proposed exemption (58 FR 16509, March 29, 1993). In particular, OSHA sought comments about employers' ability to provide safe access for erectors and dismantlers, the hazards that could be created by efforts to provide safe access, and the criteria to be satisfied by employers seeking to qualify for an exception from the proposed requirements for safe access.

Three commenters (Exs. 34-8, 34-22, and 34-29) supported an access requirement for scaffold erectors and dismantlers. One commenter (Ex. 34-8) said that its support depended on adding the words "or equivalent means" to such a requirement. OSHA notes that both proposed § 1926.451(c)(1) and final rule § 1926.451(e) contain the words "or equivalent means." That commenter also stated that in utility boiler installations "ladders and/or stairways are incorporated into scaffolding. Planking and ladders, where feasible, are used to support erection or dismantling. New access can be provided by cutting out sections of the boiler wall, but the cost for it in some areas may be prohibitive." The commenter added that safe access can

be provided on supported scaffolds 100% of the time in non-boiler installations.

Another commenter (Ex. 34-22) stated that where safe access cannot be provided, fall protection can be used. In addition, a commenter (Ex. 34-29) responded that safe access is practically always feasible, and presented ladders, lifts, and crane personnel baskets as examples. OSHA agrees that safe access can be provided for erectors and dismantlers in most instances through the use of various types of equipment, including (but not limited to) ladders, scaffold stairs, manlifts, and fall protection equipment. However, the Agency notes that the use of a ladder or fall protection equipment would require a significant degree of scaffold stability, which may not be present in an incomplete scaffold. Additionally, the safe use of stair towers, manlifts or crane personnel platforms is dependent on site conditions and the availability of the equipment and additionally requires the employer to comply with the regulations covering that equipment.

Scaffold Consultants (Ex. 34-5) described a hypothetical situation involving a scaffold 100 feet long by 50 feet high and planked on all levels. They raised the following points:

1. How many ladders are to be installed? If there is a ladder in the middle of the scaffold, certainly an erector will not walk 50 feet to a ladder and then back another 50 feet to relocate.

2. Ladders cannot be installed on the interior of the scaffold because of the continuous, fully planked decking.

3. If more than one ladder is to be installed, then it would of necessity be on the outside of the scaffold, forcing the erector to go outside the scaffold on each succeeding level, exposing the worker to a fall potential. Traditionally, each ladder section is installed after that level of scaffold has been completed, and the worker no longer has need to return to a lower level. You cannot install a ladder section for the next level up until the scaffold frames, bracing and planking have been erected.

The code already states (1926.451(a)(13)) that an access ladder or equivalent safe access shall be provided.

OSHA notes that providing safe access for erectors and dismantlers does not necessarily mean that all levels of a scaffold must be fully planked. In addition, the Agency cannot specify the number of ladders or other means of access that must be provided in all cases, because of the wide range of situations being addressed by this standard.

Regarding access for employees erecting or dismantling suspended scaffolds, two commenters (Exs. 34-32 and 34-39) stated that access is not

required because suspended scaffolds are usually erected at ground level and the rigging is performed at the roof level. Another commenter (Ex. 34-8) stated that OSHA should consider deleting the proposed exemption as it relates to suspended scaffolds. OSHA agrees that if a scaffold is erected at ground level and rigging is performed at the roof level, employees are deemed to have safe access to and from the scaffold. However, erection and rigging not performed in this manner require safe access to be provided, in accordance with final rule paragraph (e).

Five commenters (Exs. 34-31, 34-32, 34-37, 34-39, and 34-43) opposed, in general, an access requirement for erectors and dismantlers. One commenter (Ex. 34-43) stated that the means of access would have to be removed from a scaffold before dismantling can proceed. In addition, four commenters (Exs. 34-9, 34-10, 34-12, and 34-17) stated that, while sectional ladders attached at the ends of the scaffold can be used for access once adequate support is available, portable ladders on the work platform may create a greater hazard. Furthermore, three commenters (Exs. 34-32, 34-37, and 34-39) stated that providing such access is not practicable on supported scaffolds on the grounds that not all scaffolds require an attached access and when one is required "it is installed after the lift is installed," and "it is not available for the erectors."

In particular, the SIA (Ex. 34-37) stated that supported scaffold erectors access the scaffold as the erection/dismantling process progresses in either direction. Although acknowledging that erectors also access the scaffold from structures or ladders when convenient, the SIA added that access systems cannot be installed until the scaffold is structurally sound, which they stated does not occur in most cases until the scaffold is complete. OSHA finds, however, that there are many circumstances where outriggers, braces, ties, guys, and similar equipment can be used as the erection or dismantling processes proceed in order to secure, stabilize, or reinforce the lower levels of the scaffold so that safe access can be provided to these completed levels.

OSHA realizes that there may be instances where safe access cannot be provided to the actual level where employees are erecting or dismantling supported scaffolds. However, the Agency has determined that it is necessary and appropriate to provide these employees with safe access to and egress from the levels that have been completed.

Another commenter (Ex. 34-11) wrote that most jobs would not meet the requirements of proposed § 1926.451(c) without an exemption for erectors and dismantlers. This commenter called for a study to determine what procedures are needed to provide safe access. OSHA finds, however, that the rulemaking record provides the necessary support for promulgation of access requirements for these employees and, accordingly, has not adopted this commenter's suggestion. OSHA intends to monitor the effectiveness and compatibility of final rule paragraphs (e) and (g) carefully for the next several years, to make sure they are providing the necessary protection for construction workers. Based on the results of that monitoring, the Agency will determine if any further action is warranted.

Several commenters responded to OSHA's request for information about any hazards that would be created through efforts to comply with proposed paragraph (c). One commenter (Ex. 34-8) stated "[i]n utility boiler installations hazards may outweigh benefits. Employees may attempt to use a ladder that is not properly secured. Would have to install more access doors and this is not always feasible. In other applications of supported scaffold problems are not anticipated."

Four commenters (Exs. 34-9, 34-10, 34-12 and 34-17) stated:

Use of ladders, etc. to provide access to levels that are in the process of being dismantled would increase the potential to falls. This is [due] to the fact that the scaffold would no longer be stable enough to support the access equipment properly. The levels of scaffold [that] have been completely erected or not yet dismantled should retain the permanent access equipment intended to provide access throughout the length of intended service. The risks involved during the erection and dismantling process can be lessened by strict adherence to all procedures.

As discussed above, OSHA has determined that safe access can be provided to levels that have been completely erected or to levels that remain intact during dismantling operations.

Three commenters (Exs. 34-32, 34-37 and 34-39) stated "[t]hese hazards cannot be eliminated during scaffold erection." In addition, two of the commenters (Exs. 34-32 and 34-39) stated "[t]he erector travels both horizontally and vertically and may not be in the vicinity of an access system when descent is necessary. He may not be able to get safely to the access area if, for instance, planks have been moved. Most scaffolds are not fully

planked and planks are moved as erection progresses.”

On the other hand, two commenters (Exs. 34-11 and 34-29) said that providing safe access for erectors and dismantlers would not create hazards.

One commenter (Ex. 34-8) stated that employers should have their scaffolds evaluated by a competent person and that OSHA should consider erection and dismantling processes and procedures, accident statistics, and the type of work to be done on the scaffold before determining in a given situation that safe access is feasible.

Four commenters (Exs. 34-9, 34-10, 34-12 and 34-17) stated “[c]ertainly the potential for greater risk should be the greater consideration. The circumstance that bears the most consideration is ‘at what point is the scaffold capable of supporting a ladder or other access device’. At the point that this occurs permanent access ladders will be able to be attached to provide access.” Those commenters also stated that an employer seeking exemption should be able to demonstrate that compliance with proposed paragraph (c) would create a greater hazard, be technologically infeasible, or be economically infeasible.

Three commenters (Exs. 34-32, 34-37, and 34-39) stated that providing a means of access to a scaffold under construction should not be required because scaffold erectors are trained to safely climb scaffolds and because worker access to a completed scaffold may be directly from the structure itself. The commenters further stated this would make adding an access system expensive and unnecessary. Those commenters also contended that a requirement to prove infeasibility would be expensive and time consuming, and is not supported by accident data.

In response to comments asserting a lack of accident data to support imposing burdens on employers whose employees erect or dismantle scaffolds, NIOSH (Ex. 34-40) stated “[t]he lack of ‘accident statistics’ to scaffold erectors is likely to be due to insufficient detail in injury surveillance data, and not necessarily to a lack of injuries.” In addition, NIOSH reviewed the accident data (Ex. 21) and concluded that “[t]he fatality rate for scaffold erectors during scaffold erection and dismantling exceeds that for the entire U.S. construction industry.” A review of construction accident reports shows that 10-20% of scaffold deaths and injuries occur during erection and dismantling; OSHA finds that many of these will be prevented by the final rule’s fall protection requirements for these

operations (see the Benefits Chapter of the Economics Analysis for this rule).

The Agency notes that the Occupational Safety and Health Review Commission has held (Hoffman Construction Company, 6 OSHRC 1274, January 4, 1978) that the safe access requirement of the existing standard (29 CFR 1926.451(a)(13) does not become operative until the scaffold is completed or use is imminent, and, therefore, does not apply to scaffold erection and dismantling operations.

OSHA has determined that although scaffold erectors and dismantlers are exposed to significant access-related hazards, requiring employers to provide safe access for erectors and dismantlers in all cases would often create a greater hazard or be infeasible. For example, commenters have described factors (e.g., instability of scaffold and lack of adjacent support) which can preclude the provision of safe access. The Agency agrees that there are some situations where an exemption from final rule paragraph (e) would be appropriate. However, other commenters have indicated that employers who carefully evaluate their scaffold operations can provide safe access or at least minimize employee exposure to hazards during these operations. Therefore, OSHA finds that it is appropriate for employers to be able to obtain relief from the access requirements when such relief has been determined, on a case by case basis, to be necessary. Accordingly, the Agency has added final rule paragraph (e)(9), discussed below, which requires (paragraph (e)(9)(i)) that employers have a competent person assess pertinent workplace conditions and decide what means of access is appropriate to use to protect the safety of erectors and dismantlers on any particular job.

Final rule paragraph (e)(1) provides that access to and between scaffold platforms more than two feet (0.6 m) above or below the point of access shall be by portable ladders, hook-on ladders, attachable ladders, scaffold stairways, stairway-type ladders (such as ladder stand), ramps, walkways, integral prefabricated scaffold access, or equivalent means, or by direct access from another scaffold, structure, personnel hoist, or similar surface. In addition, the final rule requires that crossbraces not be used as a means of access. This provision is identical to proposed paragraph (c)(1), except for some minor changes in terminology made in order to be consistent with existing industry terms, and the inclusion of scaffold stairways as another acceptable means of access. The final rule consolidates and updates existing § 1926.451(e)(5), which requires

that ladders or stairways be provided and used on mobile scaffolds; existing § 1926.451(q)(3), which requires that connecting runways with substantial guardrails be used for access to plasterers’, decorators’, and large area scaffolds; and existing § 1926.451(y)(9), which requires that ladders be used for pumpjack scaffold access.

The SSFI and the SIA (Exs. 2-367 and 2-368) recommended the inclusion of scaffold stair/towers (scaffold stairways) as a recognized acceptable means of access. The Agency acknowledges that scaffold stairways are used regularly for scaffold access and agrees that those stairways should be addressed by subpart L. Accordingly, OSHA has incorporated regulatory text addressing scaffold stairways into final rule paragraph (e)(4), discussed below.

Paragraph (e)(2) of the final rule sets requirements for portable, hook-on and attachable ladders. A note to this paragraph indicates that additional requirements for the proper construction and use of portable ladders are contained in subpart X of this part—Stairways and Ladders—of the construction standards.

In particular, final rule paragraph (e)(2)(i) provides that portable, hook-on, and attachable ladders shall be positioned so as not to tip the scaffold.

In addition, final rule paragraphs (e)(2)(ii)-(vi) provide that hook-on and attachable ladders shall have bottom rungs positioned not more than 24 inches (61 cm) above the scaffold supporting level; have rest platforms at 35 foot (10.7 m) maximum vertical intervals on all supported scaffolds more than 35 feet (10.7 m) high; be specifically designed for use with the manufactured type of scaffold to be used; have a minimum rung length of 11-1/2 inches (29 cm); and have uniformly spaced rungs with a maximum spacing between rungs of 16-3/4 inches, respectively. Proposed paragraph (c)(2) was effectively identical, except that the maximum interval between rest platforms has been increased in the final rule from 20 feet to 35 feet and the maximum rung spacing has been increased from 12 inches to 16-3/4 inches, as discussed below.

Issue 28 in the preamble of the NPRM requested public comment on whether landing platforms should be required at 35-foot maximum intervals as required by existing § 1926.451(e)(5), or at 20-foot maximum intervals as required by proposed § 1926.451(c)(2)(iii). Three commenters (Exs. 2-13, 2-38, and 2-54) responded in support of the proposed rule’s 20-foot maximum. One commenter (Ex. 2-13) favored the 20-

foot interval because it would "allow a person to catch one's breath." He added that he could personally appreciate this requirement as he has climbed ladders for years. In addition, a commenter (Ex. 2-38) stated that "[l]adders should be offset with landings every 20 feet to prevent falling more than 20 feet." Another commenter (Ex. 2-54) responded that the interval in the proposed rule "would make it so workers were not always huffing and puffing and place less strain on ladders and how many workers might be on it at the same time."

On the other hand, a commenter (Ex. 2-22) responded that the 35-foot height was "an acceptable level for the safety of employees and * * * a practical field requirement." Another commenter (Ex. 2-53) stated "[l]anding platforms should be required at 35 foot intervals. No need to change regulations." The SSFI and SIA (Exs. 2-367 and 2-368) stated that the proposed change to the 20-foot height was too restrictive and unnecessary. In particular, the SIA (Ex. 2-368) stated that, since most of the scaffolds which require access from the base have work platforms less than 28 feet from their base, "the 20 foot interval requirement would place a rest platform too close to the work platform and would be unnecess[ar]y." This commenter added that there are no accident statistics to justify changing the height requirement from 35 ft. to 20 ft.

The ACCSH (Tr. 191-195, 6-9-87) discussed Issue 28 and recommended that OSHA adopt the proposed 20-foot requirement. One member stated "[b]ecause employees are often carrying tools or equipment, the 20-foot requirement is reasonable." OSHA proposed to require landing platforms at 20-foot maximum intervals in an attempt to be consistent with existing §§ 1910.27 (d)(1)(ii), (d)(2) and (d)(5) of the general industry standards.

After a careful review of the evidence in the record as a whole, OSHA finds that requiring landing platforms at 20-foot intervals is not supported by evidence that such a change is needed for employee safety. In addition, evidence was submitted to show that many scaffolds already have work platforms only a few feet higher than the 20-foot level and further that establishing a new height, i.e., 20 feet, would interfere with widely accepted field practice. Accordingly, the final rule retains the 35-foot maximum intervals for landing platforms, because it adequately protects the safety of employees who are accessing scaffolds.

The SSFI (Ex. 2-367) took "strong objection" to proposed paragraph (c)(2)(vi), which required that there be a

maximum spacing between rungs of 12 inches, because portable, hook-on, and attachable ladders have been produced for many years with uniformly spaced rungs that do not meet this requirement. The commenter recommended that OSHA replace this requirement with a requirement that rungs be uniformly spaced within each section.

The proposed paragraph was based on existing § 1910.26(a)(1)(iii), which prescribes maximum rung spacing for portable metal ladders used in general industry. The Agency notes that prior to the proposal there were no existing OSHA construction regulations addressing hook-on or attachable ladders, and the proposal was intended to recognize that these types of ladders are acceptable means of access.

OSHA agrees with the commenter that the rungs should be uniformly spaced to prevent misstepping. In addition, OSHA believes that the 16¾ rung spacing allowed on integral prefabricated scaffold access frames (end frames) (final rule § 1926.451(e)(6)(v)) should be applied to hook-on and attachable ladders as well, since these ladders are commonly used with end frames and this will provide uniform rung spacing for this application. OSHA has revised the language of the final rule paragraph (c)(2)(vi) accordingly.

Paragraph (e)(3) of the final rule sets requirements for stairway-type ladders. In particular, paragraphs (e)(3)(i) through (v) require that stairway-type ladders be positioned so that the bottom step is not more than 24 inches (61 cm) above the scaffold supporting level; be provided with rest platforms at 12 foot (3.7 m) maximum vertical intervals; have a minimum step width of 16 inches (41 cm) (except for mobile scaffold stairway-type ladders, which are permitted to have a minimum step width of 11½ inches); and have slip-resistant treads on all steps and landings. These provisions are identical to the corresponding provisions in proposed paragraph (c)(3), except that an exception has been added in a new final paragraph (e)(3)(iii) to the minimum rung width in proposed paragraph (c)(3)(iii). This change has been made to recognize that a minimum step width of 11½ inches is acceptable for mobile scaffold stairway-type ladders, as discussed below.

Proposed paragraph (c)(3)(iii), which was based on § 1910.29(a)(3)(ii), required a minimum step width of 16 inches. The SIA (Ex. 2-368) stated that it is necessary to distinguish between stairway-type ladders and mobile scaffold stairway-type ladders where the stairway-type ladder is a secondary feature of the platform. The commenter

noted that reduced step width is necessary on this type of equipment due to space constraints, and pointed out that the reduced step width is consistent with normal ladder minimum widths. OSHA agrees, noting that this type of equipment has been demonstrated to be safe over decades of use, and has revised the final rule accordingly.

Final rule paragraph (e)(3)(iv) requires slip-resistant treads on all stairs and landings. This rule is based on general industry rule § 1910.29(a)(3)(iv), which requires the steps to be fabricated from slip-resistant treads.

Final rule paragraph (e)(4), which has been added based on the response to the NPRM and the February 1, 1994 notice of reopening (59 FR 4615), sets requirements for scaffold stairway towers used for access to scaffolds and other elevated work surfaces. OSHA has determined that compliance with the provisions described below will enable employees to use scaffold stairways safely.

The SSFI and the SIA (Exs. 2-367 and 2-368) suggested that OSHA recognize scaffold stairway/towers as acceptable means of access. They noted that reference to these types of access units had been omitted from the proposal even though they are in common use and are a safe method of obtaining access to scaffold units. Both commenters recommended that OSHA revise the rule to add requirements for inside and outside handrails; 19-inch minimum length landing platforms; 19-inch minimum width for stair units; and slip-resistant surfaces for treads and landings.

In addition, a commenter (Docket S-041, Ex. 3-414) to the Notice of Proposed Rulemaking for part 1910 subpart D (Walking and Working Surfaces) stated:

As in the case of guardrails, the stair rails section is based on the use of this product in permanently installed locations in buildings or industrial structures. It does not consider stair rails used in conjunction with scaffold applications.

Scaffold suppliers utilize step units which have been fabricated specifically to be used as access to scaffold platforms. These step units are manufactured with hand rails which are sold as a component of these step units. The OSHA standard should state that these fabricated step units are acceptable for scaffold access. This will eliminate the confusion of the compliance officers in attempting to enforce permanent stair rail standards for scaffold access components.

On February 1, 1994, OSHA reopened the subpart L rulemaking record (59 FR 4615) to solicit comments and suggestions regarding the regulation of scaffold stairways, chimney bracket scaffolds and tank builders' scaffolds. In

particular, the Agency requested input on the provisions suggested by commenters. In addition, although OSHA did not intend subpart X to apply to stair towers, the Agency was interested in determining if, in fact, any of the provisions from part 1926, subpart X or from proposed part 1910, subpart D, would be appropriate requirements for scaffold stair towers.

The Agency was interested in receiving more input on the need for specific regulations for scaffold stairways, chimney bracket scaffolds and tank builders' scaffolds, with special emphasis on fall protection requirements, including requirements for handrails and guardrail systems for the unprotected sides and edges of stairway landings. The provisions of final paragraph (e)(4) are the product of specific questions raised in the February 1 notice and OSHA's review of the responses to those questions.

Two commenters (Exs. 43-24 and 43-32) recommended that the Agency adopt the suggested provisions, although the first of these two commenters suggested that existing products that do not comply be accepted. Several other commenters (Exs. 43-6, 43-11, 43-13, 43-14, 43-22, 43-26, and 43-37) supported the adoption of various modified versions of the suggested provisions. For example, suggested minimum heights above the tread nose for handrails (or stairrails) ranged from 27 inches (68.6 cm) to 36 inches (91 cm).

A number of commenters (e.g., Exs. 43-4, 43-6, 43-9, 43-10) contended that for many years scaffold stairways have been designed and used in the same manner as they currently are, and have always provided a safe and effective means of access. These commenters opposed the promulgation of any provisions that would alter the criteria under which scaffold stairways are currently designed and used. Most of these commenters also reported that they know of no accidents that have occurred due to the use of scaffold stairways.

In addition, many commenters (Exs. 43-13, 43-14, 43-24, 43-26, 43-37, and 43-44) specifically opposed applying either the requirements of subpart X or the general industry standards (§ 1910.25 and § 1910.28) to scaffold stairways. These and other commenters mentioned above indicated that such an application would, in effect, "outlaw" scaffold stairways since they cannot meet the requirements of subpart X due to the fact that scaffold stairways must be designed and constructed to fit within the confines of 5 foot (1.5 m) by 7 foot (2.1 m) or 5 foot (1.5 m) by 10 foot

(3.0 m) scaffold bays. As a result, according to these commenters, many employers would simply stop using most scaffold stairways, and would rely instead on other means of access that are not as safe as scaffold stairways. However, one commenter (Ex. 43-8) recommended that scaffold stairways covered by subpart L be consistent with subpart X and the general industry standards. Another commenter (Ex. 42-33) supported standardizing the existing stairway standard's requirements, including hand clearances, end rail projections, type of surface, and guarding of the open sides of landings.

Scaffold stairways can provide a safe and effective means of access, and the Agency has no intention of prohibiting the use of all existing scaffold stairways. However, the Agency does believe that some provisions governing the construction and use of scaffold stairways must be included in final subpart L, and that the provisions should be as consistent as possible with subpart X and the general industry standards, in order to ensure the safety of the employees who use scaffold stairways. Accordingly, OSHA has promulgated the provisions discussed below.

The introductory language of final rule paragraph (e)(4) requires that these units be positioned so that the bottom step is not more than 24 inches (61 cm.) above the scaffold supporting level.

Final rule paragraph (e)(4)(i) requires that a stairrail consisting of a top rail and a midrail be provided on each side of each scaffold stairway. Furthermore, final paragraph (e)(4)(ii) requires that the top rail of each stairrail system shall be capable of serving as a handrail, unless a separate handrail is provided.

Six commenters (Exs. 43-6, 43-11, 43-14, 43-26, 43-37, and 43-44) indicated that inside and outside handrails should incorporate midrails. Several commenters (Exs. 43-8, 43-13, 43-14, 43-24, 43-26, and 43-37) stated that scaffold stairways should incorporate handrails, stairrails and midrails. One commenter (Ex. 43-45) stated that scaffold stairways should have stairrail systems with midrails. Another commenter (Ex. 43-22) stated that inside and outside handrails should be constructed so that they function as both stairrails and handrails.

OSHA agrees that handrails, stairrails, and midrails are necessary for adequate employee protection. However, the Agency also believes that adequate protection can be provided when top rails of stairrail systems are capable of serving as adequate handrails. Paragraph (e)(4)(ii) of the final rule recognizes the capability of top rails to

serve as handrails, but also requires that a separate handrail be provided when top rails are not capable of serving as a handrail.

Final rule paragraph (e)(4)(iii) requires that handrails, and top rails that serve as handrails, provide a handhold for employees grasping them to avoid falling. This provision is identical to § 1926.1052(c)(9), except for the explicit inclusion of top rails. Monsanto (Ex. 43-45) stated that handrails should have the shape and dimension necessary to provide a firm handhold, but provided no specific shapes or dimensions that would meet that suggested requirement. OSHA agrees that handrails must be shaped and sized in such a manner that a proper handhold is provided.

Final rule paragraph (e)(4)(iv) requires that stairrail systems and handrails be surfaced in a manner that prevents injury to employees from punctures or lacerations, and to prevent snagging of clothing. This provision is essentially the same as § 1926.1052(c)(8). Monsanto (Ex. 43-45) suggested that stairrail systems "be free of projection and/or puncture/abrasion hazards." OSHA agrees that handrails should not present such hazards, and the final rule's language reflects this concern.

Final rule paragraph (e)(4)(v) requires that the ends of stairrail systems and handrails be constructed in a manner that does not constitute a projection hazard. This provision is essentially identical to § 1926.1052(c)(10).

Final rule paragraph (e)(4)(vi) requires that scaffold stairway handrails, and top rails that are used as handrails, have a minimum clearance of 3 inches (7.6 cm) between the handrail or top rail and other objects. This provision is essentially the same as § 1926.1052(c)(11). As mentioned above, one commenter (Ex. 42-33) stated that hand clearances for scaffold stairways should be the same as those for stairways covered by subpart X. OSHA agrees with this commenter and notes that inadequate hand clearances can render handrails essentially useless.

Final rule paragraph (e)(4)(vii) requires that stairrails be no less than 28 inches (71 cm) or more than 37 inches (94 cm) from the upper surface of the stairrail to the surface of the tread, in line with the face of the riser at the forward edge of the tread. This provision differs from the stairrail height requirements of subpart X, which was never intended to apply to scaffold stairways. Paragraph (e)(4)(vii) of the final rule is based on the following comments.

One commenter (Ex. 43-11) suggested stairrail height ranging from 27 inches (68.6 cm) to 37 inches (94 cm) vertically

above the nose of each step. Another commenter (Ex. 43-20) recommended a range of 22 inches (56 cm) to 41 inches (104 cm). One other commenter (Ex. 43-45) recommended stairrail systems "no less than 36 inches (91 cm) high." However, several other commenters (Exs. 43-6, 43-13, 43-14, 43-26, and 43-37) recommended that stairrails be no less than 28 inches (71 cm) and no more than 37 inches (94 cm) above the nose of each step.

OSHA notes that § 1926.1052(c)(3) requires that stairrail systems installed before March 15, 1991, be no less than 30 inches (76.2 cm) high, and that those installed after March 15, 1991, be no less than 36 inches (91.4 cm) high. The Agency recognizes that this subpart X requirement may not have been appropriate for stairrails on some scaffold stairtowers, because the construction of stairtowers differs significantly from that of stairtowers addressed by subpart X. In particular, stairtowers are fashioned from scaffold components, must fit within the framing of scaffold units, and rise more steeply than other stairways. As a practical matter, the steeper the stairway, the closer the stairrail will be to the stair surface. Therefore, OSHA has concluded that it is appropriate and adequately protective for stairtower stairrails to be at least 28 inches, rather than 30 inches, high. Accordingly, a requirement that employers retrofit scaffold stairtowers with 30-inch high stairrails, or that employers phase in 30-inch high stairrails at some future time, would be unreasonable. OSHA believes that existing equipment and designs can comply with the 28-inch height requirement and should continue to be allowed in use. In addition, OSHA observes that stairtowers with 28-inch high stairrails are safer than ladders and that requirements to retrofit or redesign stairtowers could lead cost-averse employers to use ladders instead of stairtowers.

Final rule paragraph (e)(4)(viii) requires that scaffold stairways be provided with landing platforms that are at least 18 inches wide and at least 18 inches (45.7 cm) long at each level. This provision provides adequate protection for employees without impeding the use of most scaffold stairways now in use.

Several commenters (Exs. 43-6, 43-13, 43-20, 43-22, 43-24, and 43-33) who addressed the issue of landing platforms supported requiring landing platforms at least 19 inches (48.3 cm) wide at every level. Three other commenters (Exs. 43-14, 43-26, and 43-37) recommended that landing platforms at least 18 inches (45.7 cm)

wide be required at each level. Four of those commenters (Exs. 43-6, 43-14, 43-26, and 43-37) also suggested adding to such a provision the alternative of providing a platform at least 30 inches long (76.2 cm) in the direction of travel at "every 14 feet (4.5 m) maximum of stair elevation." Those commenters stated that this would "allow the continued use of frame scaffolds spaced 6½ feet (2.1 m) vertically and system scaffolds which are based upon 7 foot (2.25 m) maximum vertical bearer spacing."

In addition, two commenters (Exs. 43-11 and 43-45) recommended a minimum landing width of 24 inches (61 cm). Another commenter (Ex. 43-22) recommended that "landing platforms extend the entire width of the scaffold instead of only one-half the width as they do now."

OSHA believes that employee safety mandates that a landing meeting the requirements and specifications of this provision must be provided on stairtowers. The Agency also believes that landings must be as wide as the stairway itself (at least 18 inches (45.8 cm)) in the direction in which the stairway is measured and at least 18 inches long in the other direction as well.

Final rule paragraph (e)(4)(ix) requires that each scaffold stairway be at least 18 inches (45.8 cm) wide between stairrails. Several commenters (Exs. 43-6, 43-8, 43-11, 43-13, 43-14, 43-20, 43-22, 43-24, 43-26, 43-32, and 43-37) supported a minimum stair width of 19 inches (48.2 cm). However, the record provides no basis for OSHA to require that stairs be wider than their landings. In addition, 18 inches is the minimum width allowed for normal scaffolds.

Final rule paragraph (e)(4)(x) requires that treads and landings have slip-resistant surfaces. This provision is consistent with existing § 1926.1052(a)(7), which requires that slippery conditions on stairways be eliminated before the stairways are used to reach other levels.

Several commenters (Exs. 43-6, 43-8, 43-11, 43-13, 43-14, 43-20, 43-22, 43-24, 43-26, 43-32, 43-37, and 43-44) supported a requirement that treads and landings have slip-resistant surfaces. The Agency agrees with those commenters, and notes that scaffolds are often used in conditions that can create slippery surfaces.

Final rule paragraph (e)(4)(xi) requires that scaffold stairways be installed between 40 degrees and 60 degrees from the horizontal. Existing § 1926.1052(a)(2) requires that stairs be installed at between 30 degrees and 50 degrees from horizontal. OSHA believes

that a minimum and a maximum angle must be specified in order to adequately protect employees from fall hazards. However, the Agency believes that compliance with existing § 1926.1052(a)(2) will not be feasible for stairways regulated under subpart L, because scaffold stairways must fit into the confines of scaffold framing.

Six commenters (Exs. 43-6, 43-13, 43-14, 43-24, 43-37, and 43-44) opposed the specification of a minimum and a maximum angle from the horizontal for scaffold stairways. However, five of these commenters (Exs. 43-6, 43-13, 43-14, 43-37, and 43-44) provided suggested values in case OSHA should decide to specify a minimum and a maximum angle anyway. Four (Exs. 43-6, 43-13, 43-14, and 43-37) of those commenters suggested a minimum angle of 40 degrees and a maximum angle of 55 degrees since the stairs must fit into 7-foot (2.25 m) or 10-foot (3.2 m) bays with landing platforms. The fifth commenter (Ex. 43-44) recommended angles of 35 degrees and 55 degrees. Three (Exs. 43-6, 43-14, and 43-37) of those commenters stated that once the angle approaches 80 degrees, the stairway becomes a ship's ladder. Another commenter (Ex. 43-11) agreed with that concept but placed the angle at 60 degrees.

One commenter (Ex. 43-11) recommended that the limits be set at 40 degrees and 80 degrees, while another commenter (Ex. 43-22) recommended a maximum angle of 50 degrees but provided no minimum value. Another commenter (Ex. 43-32) recommended a minimum angle of 30 degrees and a maximum angle of 50 degrees in order to make subpart L consistent with subpart X.

OSHA has determined that scaffold stairways installed in the range of 40 degrees to 60 degrees from the horizontal will provide safe employee access and will still be capable of fitting into the confines of the scaffold frames. Paragraph (e)(4)(xi) of the final rule reflects this determination.

Final rule paragraph (e)(4)(xii) requires that guardrails meeting the requirements of 1926.451(g)(4) be provided on the open sides and ends of each landing.

OSHA asked in the February 1, 1994 reopening notice if guardrails installed on scaffold stairways should comply with both subpart M (fall protection) and this subpart L.

One commenter (Ex. 43-8) recommended that such guardrails meet the requirements of subpart M for the sake of consistency. Another commenter (Ex. 43-13) suggested that only the

provisions of subpart L should apply. Two other commenters (Exs. 43-14 and 43-37) opposed any requirement for guardrails on landing platforms, unless work was to be performed from them, on the grounds that "(n)o hazard or accident data supports this requirement."

OSHA believes that employees on landing platforms must be adequately protected from fall hazards while on a landing whether they are working from the landing or not. However, the Agency recognizes that providing guardrails that meet the requirements of subpart M would be inappropriate for use on scaffolds and scaffold stair towers because they are built to other requirements. Instead, OSHA has determined that scaffold guardrails, as required in subpart L, are appropriate because employers build scaffold stairways using scaffold components, which are designed for 36 to 45-inch high guardrails. In addition, the Agency notes that scaffold stairways have been in use for many years and that guardrail systems that comply with subpart L have provided adequate safety for employees using these stairways. Accordingly, final rule paragraph (a)(4)(xii) requires guardrails between 36 and 45 inches in height to be used on the open sides and ends of each landing.

Final paragraph (e)(4)(xiii) requires riser heights within each flight of scaffold stairs to be uniform within 1/4 inch.

Four commenters (Exs. 43-8, 43-32, 43-44, and 43-45) recommended that OSHA require uniform riser height for all steps within each flight of stairs. Six commenters (Exs. 43-6, 43-11, 43-13, 43-14, 43-24, and 43-37) responded that a uniform riser height within 1/4 inch (0.6 cm) is possible to achieve, except for the first step and the last step where variations in decking thickness and the use of screw jacks at ground level make achieving this degree of uniformity difficult. OSHA believes that a uniform riser height within 1/4 inch (0.6 cm) for all steps in each flight of stairs is necessary in order to minimize the possibility that employees will slip, trip, and fall while they are on the stairs.

OSHA recognizes that there are situations where the level of the ground or of the structure to which the stair tower is connected will cause the spacing of the top or bottom step of the stairway system to deviate from uniformity with the other steps by more than 1/4 inch. The Agency has determined that such deviation will not compromise employee safety, so long as the stair tower otherwise complies with the requirements of paragraph (e)(4).

Final paragraph (e)(4)(xiv) requires that tread depth be uniform, within 1/4 inch, for each flight of stairs. This provision is consistent with existing § 1926.1052(a)(3), which requires tread depth uniformity in other types of stairs used in construction.

Monsanto (Ex. 43-45) supported requirements providing for uniformity of riser height and tread depth within each flight of stairs. OSHA believes that tread depth uniformity, within 1/4 inch, as required in existing subpart X, is also appropriate for scaffold stairways. Uniform tread depth reduces the possibility that employees will slip and fall due to uneven footing.

Final rule paragraph (e)(5) sets requirements for ramps and walkways used to access scaffolds. Final rule paragraph (e)(5)(i) provides that ramps and walkways six (6) feet (1.8 m) or more above lower levels shall be provided with guardrail systems in accordance with the provisions of part 1926, subpart M—Fall Protection. In addition, final rule paragraph (e)(5)(ii) provides that ramps and walkways shall not exceed a slope of one (1) vertical to three (3) horizontal (20 degrees above the horizontal). Finally, final rule paragraph (e)(5)(iii) also requires that if the slope of a ramp or walkway is steeper than one (1) vertical in eight (8) horizontal, the ramp or walkway must have cleats not more than fourteen (14) inches (35 cm) apart which are securely fastened to the planking to provide secure footing.

The corresponding proposed paragraph simply required that ramps and runways be provided with guardrails in accordance with the provisions of proposed §§ 1926.501 and 1926.502 (Subpart M). As discussed above in relation to the final rule term "ramps", OSHA has replaced the term "runways" with the term "walkways", since the term "walkway", unlike the term "runways", is defined in this final rule.

A commenter (Exs. 2-37 and 2-103) stated "[r]amps and walkways are used extensively * * * as a means of egress to an elevated surface. Ramps are also used for material handling equipment. Since no standard angle of elevation is addressed, an extreme angle of elevation and slippery surfaces would result in fall-type accidents and muscle strains." The commenter also stated that inadequately guarded walkways pose fall hazards. The commenter recommended language that would address the angle of elevation of ramps and would require cleats on ramps with slopes steeper than one (1) vertical in eight (8) horizontal to provide a safe foothold.

OSHA recognizes the need to indicate clearly what would be an appropriate slope for ramps used as access to scaffolds and has incorporated this language into the final rule as paragraphs 1926.451(e)(5)(ii) and (iii).

The Agency notes that final rule § 1926.451(f)(8) requires that employees be prohibited from working on scaffolds covered with snow, ice, or other slippery material except as necessary for removal of such material. OSHA considers scaffold access ramps and walkways to be part of the scaffold and will also apply § 1926.451(f)(8) to those ramps and walkways.

Final rule paragraph (e)(6) sets requirements for integral prefabricated scaffold access frames. Final rule paragraph (e)(6)(i) provides that such frames shall be specifically designed and constructed for use as ladder rungs. Also, final rule paragraph (e)(6)(ii) requires that the frames have a rung length of at least 8 inches (20 cm). Final rule paragraph (e)(6)(iii) prescribes that rungs less than 11 1/2 inches in length shall be used for access only and not as work platforms unless fall protection, or a positioning device, is used. In addition, final rule paragraphs (e)(6)(iv) through (vi) require that integral prefabricated scaffold access frames be uniformly spaced within each frame section; provided with rest platforms at 35 foot (10.7 m) maximum vertical intervals on all supported scaffolds more than 35 feet (10.7 m) high; and have a maximum spacing between rungs of 16 3/4 inches (43 cm), respectively. In addition, final rule paragraph (e)(6)(vi) provides that non-uniform rung spacing caused by joining end frames together is allowed, provided the resulting spacing does not exceed 16 3/4 inches (43 cm). These provisions are similar to those in proposed paragraph (c)(5).

Regarding the proposed introductory text, the SSFI (Ex. 2-367) recommended using the words "access frames" instead of the word "rung." OSHA agrees that the suggested language more clearly states the Agency's regulatory intent and has revised this paragraph in the final rule accordingly.

Paragraph (e)(6)(i) of the final rule is identical to proposed paragraph (c)(5)(i) except that the Agency has editorially revised the provision to express OSHA's intent more clearly. OSHA recognizes that the proposed language could have been misinterpreted to require only that the access frames be designed as scaffold rungs, with no requirement for them to be constructed in accordance with that design. OSHA anticipates that these rungs will be designed and constructed through consultation between the manufacturer and the end

user in order to satisfy the pertinent requirements of the final rule.

Final rule paragraph (e)(6)(ii) requires a minimum rung length of eight inches. In addition, final rule paragraph (e)(6)(iii) prohibits the use of rungs less than 11½ inches long as work platforms, unless affected employees are using personal fall arrest systems or positioning devices that comply with § 1926.502 (paragraphs (d) and (e), respectively). These two provisions evolved from proposed (c)(5)(ii), which required a minimum rung length of 11½ inches (29 cm). Morgen Manufacturing Company (Ex. 2-303) commented that scaffolds with integral prefabricated scaffold rungs which are only eight inches long also "provide safe access [to a work platform] equivalent to that of a ladder." Further, the commenter stated that the 8-inch rungs "provide surer footing and a better climb than does or can a ladder."

Another commenter (Ex. 2-23) stated that all ladders should have a minimum rung length of 12 inches in order to avoid confusion.

To evaluate this point, Issue L-6 of the hearing notice asked if OSHA should revise proposed § 1926.451(c)(5)(ii) to allow rung lengths less than 11½ inches where the rungs were used for access only. The SIA (Ex. 10; Tr. 3/22/88, p. 159) supported the 11½-inch width requirement explaining "[i]t's our understanding that the 11½-inch width was required * * * to allow the workman to stand on a rung with both feet * * * [A]n 8-inch rung would not be wide enough." Similarly, the SSFI (Ex. 5a-19) commented that its members would not support reducing "the minimum rung width from 11½ inches to * * * eight inches." They added that practical usage indicates that 11½-inch ladder rungs are appropriate.

Bristol Steel and Iron Works, Inc. (Ex. 13) stated that scaffold rungs that were less than 11½ inches long were acceptable "if they provide safe access equivalent to that of a ladder."

Morgen Scaffold's notice of intention to appear at the hearing (Ex. 5a-10), testimony at the hearing (Tr. 20-32, 3-22-88), and post-hearing comments (Ex. 15), stated that OSHA should either revise the proposed rule as provided in Issue L-6 or grandfather the existing Morgen scaffolds to permit continued use of the 8-inch integral rung system.

Morgen contended (Ex. 5a-10, p. 2) that its scaffold tower's integral rungs provide a safe and stable footing and handhold for workers using the towers for access to connection points for installation and removal of bracing and accessories. Morgen's post-hearing comments (Ex. 15, p. 3) further

contended that the Morgen integral-rung system was safer than those requiring the use of a ladder and offered the following rationale:

Morgen feels that the tower provides a more secure area from which to install and remove the bracing and accessories than would a ladder. When using a ladder with any type of scaffolding, the worker is generally further from the connection point and must shift his weight off the ladder to install bracing.

At the hearings, Morgen acknowledged that at no time are workers able to put both feet on the same eight-inch rung (Tr. 3/22/88, p. 25). However, Morgen also stated that "the size of the Morgen tower allows the worker to hug the tower, which is more secure than merely standing with both feet on one rung" (Ex. 15, p. 3). Morgen also asserted that worker activities, rather than an arbitrary dimension, should be the main consideration (Ex. 15, p. 7). OSHA believes that the 11½-inch dimension is not an "arbitrary dimension", because this rung size is generally recognized as necessary to provide workers with level footing of sufficient size to enable them to stand on both feet, thus avoiding the need to balance on one foot.

Morgen recognized (Tr. 28) that it is appropriate for employees to use personal fall arrest or positioning devices while transporting or installing scaffold components. Morgen recommends that personal fall arrest systems be used to protect employees when tower inserts are being added "because the worker must keep both hands free to guide the inserts into position" (Ex. 15, p. 6). These same systems can be easily used during other scaffold erection and disassembly procedures.

Morgen also stated (Ex. 15, p. 8) as follows:

Morgen has no objection to the institution of an industry wide requirement for the use of body belts while installing bracing, stiff arms, accessories and planking from integral ladder rungs. Morgen's objection to the language currently proposed is that it singles out Morgen and implies that the Morgen design is not safe. Morgen objects to that characterization and feels that its scaffold is among the safest in the industry. The characteristics which OSHA wants to address, concerning the safe installation of scaffold elements while in the air, are not unique to the Morgen scaffold and do not depend upon a specified rung length.

OSHA agrees that the concerns addressed are not unique to Morgen scaffolds. However, OSHA disagrees with the position that there is no practical difference between an eight-inch rung where an employee can stand

only on one foot and must hug the tower to maintain balance and an 11½-inch rung where both feet may be placed on a single rung. OSHA also notes that § 1926.1053(a)(4)(ii) specifies 11½ inches as the appropriate minimum rung length on portable ladders.

After a careful evaluation of all the comments received, OSHA has determined that rungs which are at least 8 inches long but less than 11½ inches long can be used safely for scaffold access, because while climbing or descending the employee will normally have only one foot on a rung at any given time and the 8 inch rungs will accommodate this. However, employees who are assigned to use such rungs as work platforms must be provided additional protection by the use of personal fall arrest systems, or by positioning device systems, which comply with § 1926.502. This additional safeguard will ensure that employees required to work from rungs less than 11½ inches in width will be adequately protected from falling. This provision of the final rule has been revised accordingly.

Final rule paragraph (e)(6)(iv) is identical to proposed paragraph (c)(5)(iii), except that the term "frame" has been revised in the final rule to read "each frame section," so that the provision clearly addresses situations where end frames are joined together, producing non-uniform spacing in the area where the frames are joined. OSHA was concerned that the proposal could have been misinterpreted to require absolutely uniform spacing for the entire height of the scaffold. That was not OSHA's intent, as evidenced by proposed (c)(5)(v) (final rule paragraph (e)(6)(vi)) which prescribed maximum spacing of rungs, but allowed for non-uniform spacing caused by the joining of end frames.

Proposed paragraph (c)(5)(iv) differed from final rule paragraph (e)(6)(v) in that the proposal required rest platforms at 20-foot intervals instead of 35-foot intervals. This revision is based on the response to Issue 28, as discussed above in relation to final rule paragraph (e)(2)(iii).

Proposed paragraph (c)(5)(v) differed from final rule paragraph (e)(6)(vi) in that the proposal required 16½-inch instead of 16¾-inch maximum spacing of rungs. This change reflects input from the SSFI (Ex. 2-367), which informed OSHA that 16¾ inches is the current industry guideline for rung spacing. In proposing 16½ inches OSHA intended to recognize the large number of frames already in existence without requiring a significant program of frame modification. Therefore, based on the

comment indicating that 16³/₄ inches, not 16¹/₂ inches, is the prevalent spacing, and because the additional one-fourth-inch spacing is not believed to be significant, OSHA has modified the final rule to recognize the 16³/₄ inch spacing limit.

Final rule paragraph (e)(7) provides that all steps and rungs of all ladder and stairway type access shall line up vertically with each other between rest platforms. Proposed paragraph (c)(6) was identical except that the final rule has added the phrase "of all ladder and stairway type access" so that the final rule more clearly expresses the Agency's intent.

Final rule paragraph (e)(8) provides that direct access to or from another surface shall be allowed only when the pertinent surfaces are not more than 14 inches (36 cm) apart horizontally and not more than 24 inches (61 cm) apart vertically. It is identical to proposed paragraph (c)(7) except for the addition of the phrase "to or from another surface" and some other minor editorial changes. The 14-inch dimension was chosen to be consistent with proposed § 1926.451(b)(4) (promulgated as final rule § 1926.451(b)(3)).

The 24-inch dimension is consistent with final rule paragraphs (e)(1), (e)(2)(ii) and (e)(3)(i), as discussed above.

Paragraph (e)(9) of the final rule sets access requirements for employees erecting or dismantling supported scaffolds. The introductory language of paragraph (e)(9) requires employers to comply with final paragraphs (e)(9)(i)–(iv) starting on September 2, 1997. OSHA has delayed implementation of this paragraph (as well as paragraph (g)(2)) so that affected employers have sufficient time to develop and implement the necessary measures. In addition, the delayed implementation allows time for OSHA to complete work on non-mandatory Appendix B, discussed below, which will provide examples of considerations that employers complying with paragraphs (e)(9) and (g)(2) would take into account. Paragraph (e)(9)(i) provides that the means of access for erectors or dismantlers shall be determined by a competent person, based on specific site conditions and the type of scaffold being erected. As discussed in relation to the introductory text of final rule paragraph (e), while the Agency originally proposed to exempt erectors and dismantlers working on supported scaffolds from requirements for safe access, careful review of the record has led OSHA to the conclusion that a competent person is the appropriate individual to decide what the

appropriate means of access for scaffold erectors and dismantlers is on any particular job, based on specific site conditions.

As discussed below in relation to final rule § 1926.451(f)(7) (effectively identical to existing rule § 1926.451(a)(3) and proposed rule paragraph (d)(7)), employers are required to have the erection, dismantling or alteration of a scaffold conducted under the supervision and direction of a competent person who is qualified in the pertinent subject matter.

OSHA is developing non-mandatory Appendix B, which will be added at a later date, to provide examples of criteria for the competent person to consider when evaluating the feasibility and safety of the options for providing safe access. This final rule reserves Appendix B to enable OSHA to provide guidance on the feasibility of providing safe access and fall protection during erection and dismantling. Once that language has been added, access provided in accordance with non-mandatory Appendix B will be considered to meet the requirements of this provision.

Paragraph (e)(9)(ii) of the final rule requires that hook-on or attachable ladders be installed as soon as practical after the scaffold erection has progressed to the point permitting their installation and use. OSHA has included this provision because the rulemaking record (Exs. 34–9, 34–10, 34–12, and 34–17) indicates that sectional ladders can be used for access once adequate support is available.

Paragraph (e)(9)(iii) of the final rule recognizes that the end frames of tubular welded frame scaffolds that meet certain requirements can be safely used as a means of access for scaffold erectors and dismantlers. These requirements are based on section 1637(n)(2)(C) of the California code, as suggested by one of the commenters (Ex. 2–23).

Paragraph (e)(9)(iv) of the final rule provides that crossbracing is not an acceptable means of access on tubular welded frame scaffolds, because crossbraces are designed to provide diagonal stability to the scaffold and are not designed to withstand the forces that could be applied by employees climbing up and down on them. This provision is consistent with ANSI A10.8, section 4.18, and with the general prohibition in final rule paragraph (e)(1), discussed above. This requirement is being repeated here to ensure that the users are aware that the prohibition applies to scaffold erectors and dismantlers as well as to scaffold users. The Agency invites interested

parties to provide OSHA with suggestions and information regarding appropriate guidance for the competent person.

Paragraph § 1926.451(f) Use

Paragraph (f) of the final rule addresses safe work practices for the use of scaffolds and the activities which take place on scaffolds.

Paragraph (f)(1) of the final rule provides that scaffolds and scaffold components shall not be loaded in excess of their maximum intended loads or rated capacities, whichever is less. This is identical to proposed paragraph (d)(1), except for the clarifying phrase "whichever is less." This provision clarifies and consolidates existing §§ 1926.451(h)(1), (i)(8), (j)(1), (s)(6), (t)(4), (w)(1), (x)(3) and (y)(1)(iii). This final rule also complements § 1926.451(a)(1), which requires that scaffolds be capable of supporting four times the maximum intended load without failure. Compliance with this rule ensures that the scaffold's capacity is not exceeded.

A commenter (Ex. 2–64) suggested deleting the term "maximum intended load." OSHA has not done so because, as discussed above in relation to the definition of this term, the Agency believes it is appropriate to take into account the "expected" burden as well as the burden a scaffold "can" support without failure.

Paragraph (f)(2) of the final rule prohibits the use of shore or lean-to scaffolds. The final rule is identical to proposed paragraph (d)(2), which was based on existing § 1926.451(a)(20). Such scaffolds are not properly designed nor properly constructed, and pose a serious threat to anyone working on them. The two commenters (Exs. 2–23 and 2–308) who addressed this provision simply agreed with the continued prohibition of shore and lean-to scaffolds.

Paragraph (f)(3) of the final rule requires that scaffolds and scaffold components be inspected for visible defects by a competent person prior to each work shift and after any occurrence which could affect a scaffold's structural integrity. Final rule paragraph (f)(3) is identical to proposed paragraph (d)(3), which was based on existing §§ 1926.45(i)(7) and (k)(5). Those existing provisions require inspections of certain types of suspension scaffolds. Given the importance of detecting defects in scaffolds and scaffold components, OSHA concludes that all scaffolds need to be inspected at the times specified in the final rule.

Issue 16 requested comment on the proposed frequency of scaffold

inspections for visible defects "prior to each workshift." Two commenters (Exs. 2-13 and 2-69) stated that only certain types of scaffolds can be fully or partially inspected prior to each workshift. Those commenters agreed that two-point suspension scaffolds can be fully inspected, but they indicated that such an inspection could not be done for "tubular welded frame scaffold covering a multi-story building." One of them (Ex. 2-13) added that proposed § 1926.451(d)(3) should specify the types of scaffolds to be completely inspected prior to each workshift and offered suspension and small supported scaffolds as examples. The other (Ex. 2-69) stated that inspecting a multi-story scaffold system could take the majority of the work shift.

OSHA acknowledges that the amount of time needed to perform visual inspection may depend on the type and size of the scaffold being inspected. However, OSHA believes that it is appropriate for the proposed inspection requirement to cover all types of scaffolds, because any scaffold (or scaffold component) can have or develop defects which would pose hazards for employees if allowed to remain in service without being inspected. In addition, OSHA believes that the time to conduct a careful inspection for "visible defects" will involve a reasonable amount of time when considered in relation to the scale of the work in question.

Another commenter (Ex. 2-64) stated that suspended scaffolds ("and associated equipment") should be inspected according to the manufacturer's recommendations. In addition, this commenter provided a copy of the company's recommended inspection schedule for particular suspension scaffold components. This commenter also stated that "improper maintenance was the most frequent cause of product incidents."

One commenter (Ex. 2-43) stated that the "[i]nspection procedures for swing stages are adequate" but that "[w]eekly or monthly inspections on rolling or stationary scaffolds should be mandated." Another commenter (Ex. 2-31) responded that the daily inspections (prior to each workshift) were "appropriate for the pumpjack scaffolding user."

Eight commenters (Exs. 2-15, 2-22, 2-53, 2-70, 2-367, 2-368, 2-407, and 2-465) supported specifying scaffold inspection frequency, without regard to the type or size scaffold inspected. In particular, a commenter (Ex. 2-22) stated that the inspection frequency should be no more "than once per day or after an occurrence." Another

commenter (Ex. 2-53) was of the opinion that scaffolds and scaffold components should be inspected for visible defects prior to each use. The ACCSH recommended that scaffold inspection should take place prior to use, and added that a competent person should handle the inspection (Tr. 6/9/87, 136-138).

The SIA (Ex. 2-368) also supported having a competent person perform the inspection but stated that a full inspection was not "feasible every time a worker gets on a scaffold." The commenter stated that "[i]nspection is a critical factor in accident prevention" and agreed that the daily inspection, prior to each workshift, was appropriate. The SIA also discussed specific occurrences that might alter the condition of a scaffold, explaining that these "would include unexplained shifting, movement, or malfunction of equipment where [the] scaffold is a mechanical device."

In addition, the SSFI (Ex. 2-367) indicated that the recommendation for daily inspection coincided with the proposed ANSI A10.8 requirements for inspection. They added that a scaffold should be inspected when it "has been altered, either by accident or design."

The BCMALU (Ex. 2-54) supported the inspection of scaffolds and their components but did not indicate a preferred interval for such inspections.

After a careful review of these comments, OSHA has determined that inspections conducted by a competent person before each shift and after any occurrence that would affect the scaffold's integrity will adequately protect employees working on scaffolds and ensure that defects are detected in a timely fashion. Given the variety of scaffolds and situations that arise regarding their use, the Agency believes that specifying the inspection frequency would unnecessarily limit employers' flexibility.

One commenter (Ex. 2-308) stated that all inspection results should be in writing and be signed by a "competent person." This commenter pointed out that the duration of a "workshift" needed to be defined if inspection was required before each shift. OSHA believes that such documentation is unnecessarily burdensome, especially in light of § 1926.451(f)(4) of this final rule, which requires immediate repair, replacement, bracing, or removal from service of any scaffold part that does not meet the strength requirements of § 1926.451 (a) or (g). In addition, the Agency recognizes that the length of workshifts varies and has determined that the protection afforded by this provision is needed whatever the length

of the workshift. Accordingly, OSHA has not added the suggested revisions.

Several commenters (Exs. 2-37, 2-38, and 2-103) stated that there was a need to define "competent person." OSHA notes that a general definition of this individual that applies to all construction work already exists in § 1926.32. Although the definition of competent person in that section applies to all construction work, OSHA believes that it is reasonable to repeat this definition of "competent person" in the final rule, as a matter of convenience for the user. However, the Agency notes that the criteria for a "competent person" depend on the situation in which the competent person is working. For example, a "competent person" for the purposes of this provision must have had specific training in and be knowledgeable about the structural integrity of scaffolds and the degree of maintenance needed to maintain them. The competent person must also be able to evaluate the effects of occurrences such as a dropped load, or a truck backing into a support leg that could damage a scaffold. In addition, the competent person must be knowledgeable about the requirements of this standard. A competent person must have training or knowledge in these areas in order to identify and correct hazards encountered in scaffold work.

Final rule paragraph (f)(4) requires that any part of a scaffold whose strength has been reduced to less than that required by §§ 1926.451(a) shall be immediately repaired or replaced, braced to meet those provisions, where appropriate, or be removed from service until repaired. This paragraph applies whenever a scaffold component, for any reason, lacks the required strength. In particular, under this provision employers must follow through to address problems identified pursuant to paragraph (f)(3) of this section. Proposed paragraph (d)(4) was effectively identical to final rule paragraph (f)(4), except that the proposal required action only when a competent person determined that the strength of a part had been compromised, and provided only for bracing of a part or its removal from service. This provision of the final rule thus clarifies and consolidates existing §§ 1926.451 (a)(8) and (o)(6). The proposed paragraph also recognized bracing as an acceptable means of compliance because OSHA foresaw circumstances where the removal of a damaged component could be extremely difficult or hazardous due to its location. However, provision for replacement of a damaged component was inadvertently left out of the

proposal. OSHA has included it in the final rule so that the text clearly expresses the Agency's intent.

Final rule paragraph (f)(5) provides that scaffolds shall not be moved horizontally while employees are on them, except that mobile scaffolds may be moved if the provisions of § 1926.452(w) for mobile scaffolds are followed, and then only if they have been designed by a registered professional engineer specifically for such movement. Final rule paragraph (f)(5) is very similar to the proposed paragraph (d)(5) except that "laterally" has been changed to "horizontally" for the sake of clarity. In addition, the proposed exception did not include scaffolds designed by registered professional engineers specifically for such movement. The proposed rule was intended to consolidate and reconcile existing §§ 1926.451(a)(3) (any scaffold movement must be conducted under the supervision of a competent person), (e) (6)-(8) (criteria for moving mobile scaffolds) and (p)(1) (needle beam scaffolds shall not be moved while in use).

Two commenters (Exs. 2-13 and 2-367) suggested that the Agency prohibit, in all instances, the moving of mobile scaffolds when employees are on them, but gave no specific rationale for their comments. The Agency is not acting on these suggestions because it has determined that the provisions of final rule paragraph § 1926.451(f)(7) requiring a competent person to supervise and direct any movement of a scaffold, and the requirements of § 1926.452(w), which specifically address the movement of mobile scaffolds, will provide adequate protection for employees. In addition, the Agency believes that making employees climb up and down the scaffold every time it is moved could actually expose them to greater risk of falling than remaining on a scaffold that is being moved under the direction of a competent person in accordance with the requirements of § 1926.452(w).

The SIA (Ex. 2-368) recommended that OSHA add another exception for some suspension scaffolds which are designed to be moved horizontally while occupied. The commenter cited as an example scaffolds used for the construction of bridges and other similar steel structures where it is impossible to move the scaffold at the ground level. The final rule allows this type of scaffold to be moved horizontally if the scaffold has been designed for such movement by a registered professional engineer.

Paragraph (f)(6) of the final rule addresses the use of scaffolds near

exposed and energized power lines. In particular, this paragraph requires employers to maintain clearance between power lines and scaffolds, including any conductive materials on the scaffold. The minimum clearance for all uninsulated lines and for insulated lines of more than 300 volts is 10 feet. The minimum clearance for insulated lines of less than 300 volts is 3 feet. In addition, final rule paragraph (f)(6)(i) provides that scaffolds and materials may be closer to power lines than specified above only where necessary to do the work, and only after the utility company or electrical system operator has been notified of the need to work closer and the utility company or electrical system operator has deenergized the lines, relocated the lines, or installed protective coverings to prevent accidental contact with the lines.

The final rule provisions in paragraph (f)(6) are very similar to those in proposed paragraph (d)(6), except that the final rule addresses materials used on scaffolds; provides an exception for situations where the employer has contacted the utility company to have power lines de-energized, relocated or covered to prevent accidental contact; and sets three feet, rather than two feet, as the minimum clearance between scaffolds and insulated lines of less than 300 volts. OSHA has also editorially revised this provision for the sake of clarity.

The first two changes noted above were made based on input received in response to Issue L-5 of the hearing notice (53 FR 2051). First, the ACCSH (Tr. 6/9/87, p. 204) suggested that OSHA revise proposed § 1926.451(d)(6) to reflect concern that conductive material handled on a scaffold might contact exposed and energized lines even if the scaffold itself did not. To this end, the ACCSH recommended that the introductory language of proposed § 1926.451(d)(6) read as follows:

Scaffolds shall not be erected, used or moved in such a way that they or any conductive material handled on them can come closer to exposed and energized power lines than as follows: * * *

The Edison Electric Institute (EEI) testified (Tr. 190, 3-22-88) in favor of the suggested language, stating "[w]e also support your contention that any conductive extension or persons moving on that scaffold, the platform, should also comply [with] 10 feet."

Second, a commenter (Ex. 2-103) suggested that the Agency require employers to notify the power company when scaffolds are to be erected near energized power lines and request that

the power company de-energize the line or provide protective covering to prevent accidental contact.

In Hearing Notice Issue L-5, OSHA indicated its expectation that adding the suggested language would provide primary employee protection from electrical shock hazards. The Agency further indicated that proposed paragraph (d)(6) would apply if the affected employer could not obtain assurances from the utility company that the lines had been de-energized or adequately protected from contact.

The SIA testified (Tr. 158, 3-22-88) that the suggested Issue L-5 wording was too vague and recommended that specification-type language, rather than performance-oriented terminology, "may be more practical and enforceable when you are dealing with exposure of this type." The SIA further stated:

We certainly do have the hazard there, particularly in people erecting the scaffolds and people working on them. There's a great problem when people go out to erect a scaffold around a building, there is high voltage wire close by. The question has always been, well how close can we get to it? Based on California in their table in some instances they say 6 feet. Some people say that is too close and I don't know but I think that is really something you need to address to get input from people who are experts in that area (Tr. 169).

EEI testified (Ex. 11; Tr. 180, 3/22/88) that OSHA should promulgate the proposed ten-foot minimum clearance between a scaffold and energized and exposed power lines; that the installation of protective devices on the power lines be done by "trained utility line technicians"; that the ten foot proximity rule should apply to "any conductive extension or persons" on a scaffold (Tr. 190-191); and that the Hearing Notice Issue L-5 language regarding protective coverings for energized lines was "not a safe standard * * *"

In addition, EEI supported requiring employers to notify utilities before erecting scaffolds in proximity to energized lines, so that the utilities could determine how to protect scaffold workers. EEI also stated (Tr. 181):

Any final standard must make it clear that the 10 foot or more clearances are to be observed unless the line is deenergized or unless the utility plainly advises the employer that it is safe for the particular condition involved to erect a scaffold in closer proximity to the lines than the 10 feet allowed.

It must also be made clear in the final standard that the utility will have no obligation to be [de]energized or to take steps to protect lines and that, if the utility deems it appropriate to do neither, that the 10-foot clearance distance as a minimum * * * must be observed.

The EEI described the procedures by which employers contact utilities when employees need to work in proximity to energized lines, as follows:

In Wisconsin as part of a one-call system that originated from digging in the ground to avoid contact with buried facilities. We have incorporated notification for all electric facilities. So contractors in Wisconsin who are approaching a job where they detect the presence of overhead conductors can use the one-call system to notify the utility of their intent to work. And within 72 hours the utility comes out and inspects and tells them what they are proposing is reasonable or not. I am sure there are other states with similar provisions (Tr. 187).

In response to a question about how work could proceed when a scaffold must be erected within ten feet of an energized line and the utility refuses to de-energize the line, EEI testified (Tr. 198) that the architects and planners for the structure should consider the line when planning the project. Otherwise, he added, there “* * * would have to be a delay until some appropriate protection or alternate feed for that facility was established.”

Bristol Steel (Exs. 5a-3 and 13) supported focusing attention on the safeguards necessary to address problems associated with power lines, stating that the proposed language to require maintaining a safe distance from power lines or de-energizing the lines to protect employees from the lines was warranted.

The SSFI (Ex. 5a-19) expressed support for the proposed requirement that an appropriate distance be maintained between scaffolds and energized power lines.

The third substantive change made in the final rule to proposed paragraph (d)(6) was the revision of proposed paragraph (d)(6)(iii) to increase the minimum clearance between scaffolds and lines to 3 feet instead of 2 feet. This change was based on the 1990 editions of two national consensus standards, the National Electrical Safety Code (NESC) and the National Electrical Code (NEC).

NESC Rule 234C specifies clearances from the nearest conductive surface to the nearest surface of a building or its projections or its attachments (scaffolds). The required horizontal clearance to buildings is intended to provide adequate working space between the conductors or cables and the building surface to permit workers with small hand tools to conduct maintenance on a building or other structure. Trained workers using specialized maintenance tools would also be provided with adequate clearance.

Specifically, NESC Rule 24C3c(2) states the following:

Service-drop conductors shall not be readily accessible, and when not in excess of 750 volts, they shall have a clearance of not less than 3 feet in any direction from windows, doors, porches, fire escapes, or similar locations.

Section 24C3c(2) was added in the 1984 edition of the NESC to be consistent with Article 230-24(c) of the NEC. Article 230 of the NEC covers service conductors.

In the NEC, Article 230-24(c) covers clearances of all overhead service-drop conductors, and simply refers to Article 230-9, “Clearances from Building Openings.” Article 230-9, based on no wind loading, states the following: “Service conductors installed as open conductors or multiconductor cable without an overall outer jacket shall have a clearance of not less than 3 feet from windows, doors, porches, fire escapes, or similar locations.”

With no wind loading, the horizontal clearance from the scaffold to the service conductors must be at least 3 feet. Where wind loading might cause the conductor to be displaced, the original clearance distance must be expanded to assure that at least 3 feet of clearance is maintained between the scaffold and the displaced conductor.

Paragraph (f)(7) of the final rule provides that scaffolds shall only be erected, moved, dismantled, or altered under the supervision and direction of a competent person. That paragraph further provides that the listed activities shall be performed only by experienced and trained employees selected for such work by the competent person. This provision is similar to proposed paragraph (d)(7), which was effectively identical to existing § 1926.451(a)(3).

OSHA received one comment (Ex. 2-23) which recommended the addition of “and direction” between the words “supervision” and “of” because it would otherwise infer that the supervision need not be at the scene directing the work. OSHA believes such direct supervision is necessary, and has revised the final rule to clarify this point. This commenter also suggested that a qualified person rather than a competent person be required by this provision. The commenter defined a qualified person as “a person designated by the employer who by reason of experience or instruction is familiar with the operation to be performed and the hazards involved.” OSHA acknowledges that the proposed language does not clearly address the qualifications of a competent person charged with directing scaffold work.

Therefore, the Agency has revised the language to indicate clearly that the competent person must be “qualified” (as defined in § 1926.32(m)) in the subject matters for which that person has responsibility.

The Agency has also clarified that the actual work be performed by experienced and trained employees, selected by the competent person. This change is based on an ACCSH recommendation (Tr. 88-92, 6-9-87). In particular, a member of the Advisory Committee stated “it needs to be employees that are properly trained and experienced being the only ones allowed to do this kind of work.” OSHA agrees with this recommendation because, unlike other individuals on a finished scaffold, erectors and disassemblers are exposed to the hazards of working on a partially completed structure, and a competent person is needed to select the proper individuals to do this work.

Paragraph (f)(8) of the final rule provides that employees are prohibited from working on scaffolds covered with snow, ice, or other slippery material except as necessary for removal of such materials. This provision is identical to proposed paragraph (d)(8), which was intended to clarify existing § 1926.451(a)(17). The existing standard simply required that “slippery conditions on scaffolds shall be eliminated as soon as possible after they occur.”

The Agency recognizes that the situation addressed by this provision differs from situations where workers could be required to work on scaffolds during storms or high winds, which is addressed by § 1926.451(f)(12) (discussed below). OSHA notes that snow and ice removal can be done from ground level on one level built-up scaffolds (approximately 6 feet) and on suspended scaffolds, since they are usually accessed at ground level. When dealing with a two or more level built-up scaffold, removal of slippery material would be conducted above the 10-foot trigger height requiring normal fall protection precautions. On the other hand, work on scaffolds during storms or high winds poses a much greater risk of falling for workers, especially on tall scaffolds where wind velocity can be much greater than at ground level. In these situations, materials handling, or even normal activities such as walking, are adversely affected to the point where guardrails alone might not be sufficiently protective. Under these circumstances, the Agency intends the competent person to determine if the work can be done safely, and the employer to ensure that those

employees are provided extra protection through the use of personal fall arrest systems or wind screens. This provision is discussed further below.

Paragraph (f)(9) of the final rule requires that, where swinging loads are being hoisted on, to, or near scaffolds such that the loads could contact the scaffold, tag lines or equivalent measures shall be utilized to stabilize the loads. This provision is effectively identical to proposed paragraph (d)(9). The proposed rule was based on § 1910.28(a)(15), which requires tag lines only when loads are being hoisted onto the scaffold. The provision covers all hoisting operations in proximity to scaffolds, because a swinging load can pose a hazard regardless of its destination. OSHA has made a minor editorial revision to the proposed rule for the sake of clarity.

Final rule paragraph (f)(10) requires that support ropes used with adjustable suspension scaffolds have sufficient diameter for functioning of the brakes and the hoist mechanism. As discussed above in relation to final rule § 1926.451(a), OSHA has relocated this provision, which is effectively identical to proposed paragraph (a)(4)(i), to consolidate the requirements for rope used with suspension scaffolds.

Paragraph (f)(11) of the final rule requires that suspension ropes be shielded when a heat-producing process is performed. When acids or other corrosive substances are used on a scaffold, the ropes shall be shielded, treated to protect against the corrosive substances, or shall be of a material which is not adversely affected by the substance being used. This provision is identical to proposed paragraph (d)(10). The proposal was essentially the same as existing § 1926.451(a)(18), which prohibits the use of any heat producing process on scaffolds supported by fiber or synthetic rope and requires that only treated or protected fiber or synthetic ropes be used near corrosive substances. Unlike the existing rule, the revised standard allows the use of heat producing processes, as long as the ropes are shielded. The provisions for protection of scaffolds and their components from corrosive substances and from heat-producing processes are consistent with ANSI A10.8-1988, Sections 4.27 and 4.28, respectively.

Final rule paragraph (f)(12) prohibits work on or from scaffolds during storms or high winds unless a competent person has determined that it is safe for employees to be on the scaffold and these employees are protected by a personal fall arrest system or wind screens. Wind screens shall not be used unless the scaffold is secured against the

forces imposed. The proposed rule (paragraph (d)(11)) was based on general industry regulation § 1910.28(a)(18), which provides that employees shall not work on scaffolds during storms or high winds.

Proposed paragraph (d)(11) prohibited work on scaffolds during storms or when wind speeds exceeded 40-mph, unless body belt or harness systems were used or wind screens were erected. The proposed rule, like the final rule, provided that wind screens could only be used if the scaffold was secured against the forces imposed. Issue 6 of the NPRM requested comments on whether the proposed 40-mph limit was appropriate and on how to measure the wind speed.

Two commenters (Exs. 2-22 and 2-53) supported the proposed 40-mph limit. Two other commenters (Exs. 2-13 and 2-41) stated that 25 mph would be a more appropriate limit. Other commenters (Exs. 2-54 and 2-64) stated that 40 mph is too high a limit, because of the dangers high winds present, but did not suggest an alternative limit. Two commenters (Exs. 2-64 and 2-368) stated that no specific limit should be set because of the variations in wind speed from ground level to higher elevations, and from building side to building side. Several commenters from the AGC (Exs. 2-20, 2-55, 2-70, 2-390, and 2-516) stated that contractors are presently using "good judgement" in determining when work should cease and that there are no statistics to show otherwise.

The SSFI and the SIA (Exs. 2-367 and 2-368) stated that the most recent draft language used in the ANSI A10.8 standard should be used. As adopted, ANSI A10.8-1988, Section 4.22, provides "[w]orkers shall not work on scaffolds during storms or high winds." In particular, the SSFI (Ex. 2-367) stated "[t]here are too many variables for a specific wind speed to be determined by a governmental agency." That commenter also recommended that OSHA use the term "high wind" without specifying a wind speed, and that the Agency let individual workers determine if the work should be performed under those conditions. The SIA (Ex. 2-368) stated "a set limit of mph can be misleading and dangerous in that the wind velocity can be 15 mph or lower, yet the side of the building the men are working on can have gusts in excess of 40 mph. * * * Wind will vary on each side of a building."

The ACCSH (Tr. 65-79, 6/9/87) recommended that the determination of wind hazard should be made by a "competent person." OSHA agrees that designating a competent person to

evaluate wind conditions is the appropriate way to ensure that all the relevant information and the unique aspects of work locations are considered. OSHA believes this is a more appropriate way to address the problem than simply specifying a speed limit without regard to other factors. Accordingly, the Agency has revised the final rule to reflect the ACCSH suggestion to use a competent person and the suggestions to use the ANSI language.

Final rule paragraph (f)(13) provides that debris shall not be allowed to accumulate on platforms, where it could pose a slip, trip, or fall hazard to employees on or below the platform. This provision is identical to proposed paragraph (d)(12), which was based on existing § 1910.28(a)(20). This provision is consistent with ANSI A10.8-1988, Section 4.24.

Final rule paragraph (f)(14) provides that makeshift devices, such as but not limited to boxes and barrels, shall not be used on top of scaffold platforms to increase the working level height of employees. The Agency has concluded that these makeshift devices will not meet the pertinent criteria of this final rule, in terms of strength and stability.

Final rule paragraph (f)(15) prohibits the use of ladders on scaffolds to increase the employee's working level except when the employees are on large area scaffolds and the ladder is used in accordance with the applicable provisions of final rule paragraph (f)(15)(i)-(iv), discussed below.

The corresponding paragraph in the proposal provided simply that ladders and makeshift devices not be used to increase scaffold working heights. This provision was intended to ensure that workers were provided with a secure work platform, and to eliminate the hazard of tipping caused by portable ladders exerting a sideways thrust on scaffold systems. The pertinent provisions are consistent with the corresponding language in ANSI A10.8-1988, Section 4.29.

NPRM Issue 29 requested public comment on the need for the proposed prohibition against the use of ladders on scaffolds. Three commenters (Exs. 2-40, 2-53, and 2-69) favored the use of body/safety belts in such situations. Of these three, both NIOSH (Ex. 2-40) and another commenter (Ex. 2-69) noted that there would be no need to prevent the tipping of a scaffold from sideways thrust exerted by a ladder if the scaffold were secured laterally. Those commenters added that employees working above the guardrail system could be guarded from falls by using a body belt. In addition, NIOSH (Ex. 2-40)

provided examples, noting that tiebacks, guys, or braces would be used to secure a scaffold. NIOSH also suggested that OSHA consider requiring "form scaffolds" to be near the top of concrete forms. The commenter indicated that this would "eliminate the need for workers to be above the scaffold fall protection system." However, NIOSH stated that no data exist to support this recommendation concerning form scaffolds. The other commenter (Ex. 2-53) who supported the use of personal fall arrest systems stated "safety belts must be used" when ladders or other devices are used on top of scaffolds to increase the working level heights of employees.

One commenter (Ex. 2-15) favored the proposed prohibition of the use of ladders or makeshift devices to raise the working level of employees, provided that the prohibition pertains only to scaffolds subject to tipping that do not completely cover an enclosed area. In particular, this commenter stated that the proposed prohibition should not apply to scaffolds built from wall to wall with the entire floor area covered and with a completely decked top (in effect, a large area scaffold) from which several trades could use ladders or small scaffolds to do their work. In addition, two commenters (Exs. 2-1 and 2-54) who addressed proposed paragraph (d)(13), rather than Issue 29, indicated that ladders can be used on large area scaffolds when additional precautions are taken.

One commenter (Ex. 2-64) supported applying the proposed prohibition to suspended scaffolds but did not address other scaffolds. Another commenter (Ex. 2-13) stated that no ladder or makeshift device "should be used to increase the height of a scaffold."

In addition, four commenters (Exs. 2-29, 2-43, 2-367 and 2-368) explicitly and unconditionally supported the proposed prohibition. Two commenters (Exs. 2-29 and 2-43) very briefly stated that the use of ladders and makeshift devices on top of scaffolds to raise working levels should be prohibited. The SSFI (Ex. 2-367) supported the proposed prohibition and stated that the use of ladders and makeshift devices on top of scaffolds makes scaffold systems unstable. The SIA (Ex. 2-368) supported the proposed prohibition and stated that accident statistics "reveal a number of injuries and fatalities due to workers improvising ladders and makeshift devices to obtain greater working heights from scaffolds."

After carefully considering the above comments and the recommendation from the ACCSH, OSHA has determined that the proposed prohibition of the use

of ladders and makeshift devices on top of scaffolds is necessary to ensure employee safety. However, the Agency has also determined that the use of ladders on large area scaffolds is consistent with efforts to ensure employee safety. As noted above in the discussion of the definition for "Large area scaffold", these scaffolds cover substantially the entire work area, and are basically equivalent to working on a floor or large deck of a structure, where ladders can be used safely. Therefore, the final rule prohibits the use of makeshift devices on all scaffolds and prohibits the use of ladders on scaffolds other than large area scaffolds.

Furthermore, the OSHA has determined that the requirements in proposed § 1926.451(d)(13), which addressed the use of both ladders and makeshift devices in one provision, should be separated into two paragraphs so that the final rule clearly expresses the Agency's regulatory intent. The proposed rule has been revised accordingly.

Final rule paragraph (f)(15)(i) provides that when a ladder is placed against a structure which is not a part of the scaffold, the scaffold must be secured against the sideways thrust exerted by the ladder. This provision was suggested by NIOSH and other commenters on Issue 29. In addition, paragraphs (f)(15)(ii) through (iv) require that the platform units be secured to the scaffold to prevent them from moving; that the ladder legs are all on the same platform unit unless other means have been provided to stabilize the ladder against platform unit deflection; and that the ladder legs be secured to prevent them from slipping and being pushed off the platform unit. These provisions are based on suggestions made by commenters on Issue 29, as discussed above.

The Agency believes that compliance with these provisions will prevent the tipping and instability hazards that led OSHA to propose a prohibition against the use of ladders on all scaffolds, and has revised the final rule accordingly.

Final rule paragraph (f)(16) provides that platform units shall not deflect more than 1/60 of the span when loaded. This provision is identical to proposed paragraph (d)(14), and is intended to limit the amount platform units can deflect under load without becoming overstressed and without their ends being pulled from their supports.

Final rule paragraph (f)(17) requires employers to reduce the possibility of welding current arcing through suspension wire rope while employees are performing welding from suspended

scaffolds by insulating the suspended platform and its rigging. OSHA is adding this new provision to protect employees from the electrocution and platform collapse hazards posed by arcing welding current. In particular, the Agency requires that employers rig affected scaffolds with insulated thimbles (paragraph (f)(17)(i)), insulated wire rope (paragraph (f)(17)(ii)), and insulated hoist mechanisms (paragraph (f)(17)(iii)). This paragraph also specifies precautions for grounding the scaffold to the structure on which welding is being performed (paragraphs (f)(17)(iv-vi)). These provisions are consistent with ANSI A10.8-1988, Section 6.2.9.

Issue 2 of the NPRM requested comment on the need to regulate welding equipment used on suspended scaffolds and solicited input regarding regulatory text then being considered by the ANSI A10.8 Committee. That text, divided into six items, was effectively identical to the language OSHA has promulgated in paragraph (f)(17).

Four commenters (Exs. 2-20, 2-55, 2-69, and 2-390) stated that this subject should be covered by the welding standards for construction (part 1926, subpart J), since the hazards involved in these operations related directly to welding. The National Constructors Association (NCA) (Ex. 2-53) went further, saying "[t]here is no need to regulate electric welding equipment on scaffolds. NCA member companies do not have any experience that would indicate additional regulations."

One respondent (Ex. 2-8) stated that OSHA needed to define the term "suitable" as used in describing an insulated thimble (Item (a) of Issue 2, promulgated as paragraph (f)(17)(i)), because "[s]omeone might think that putting electric tape on a metal thimble is "suitable" insulation." OSHA agrees that the term "suitable" could be interpreted in a way that would result in inadequate insulation and has adopted regulatory text requiring an "insulated thimble" that provides appropriate protection for the equipment in use.

Another commenter (Ex. 2-13) stated "[t]he only rule that could possibly help prevent accidents from welding on suspended scaffolds is to ground the scaffold. All the scaffold components are conductors and all could possibly be grounded through the suspension ropes. A secondary path, of lesser resistance, could possibly help."

In addition, a commenter (Ex. 2-22) stated that requiring employers to cover each hoist with protective covers made from insulating material (Item (c) of Issue 2, promulgated as paragraph (f)(17)(iii)) would have a prohibitive

cost without having an impact on safety, noting that a "great number" of hoists are used on scaffolds. The commenter added that the provision requiring a grounding conductor to be connected from the unit to the structure (Item (d) of Issue 2, promulgated as paragraph (f)(17)(iv)) may not be practicable "because in actual field situations the machines are constantly and frequently moved." In addition, the commenter stated that the requirement to turn off the welding machine if the unit grounding lead is disconnected at any time (Item (e) of Issue 2, promulgated as paragraph (f)(17)(v)) may be impractical, because "in actual field situations the machine may be 50 or more feet from the scaffold." Another commenter (Ex. 2-29) suggested that "[r]equirements should be more performance-oriented to allow alternative methods to protect the employees working with electric welding equipment on suspended scaffolds."

Several commenters (Exs. 2-43, 2-54, 2-64, 2-367, and 2-368) expressed concern over the hazards of using electric welding equipment on suspended scaffolds and indicated that they favored promulgation of the measures raised in Issue 2. One commenter (Ex. 2-64) noted that OSHA had used the term "unit" instead of the terms "scaffold" or "platform" in Items (d) and (e) of Issue 2 and stated that one of those other terms should be used instead of "unit", for the sake of clarity. OSHA agrees that the term "scaffold" more clearly expresses the Agency's intent.

In addition, the SSFI (Ex. 2-367) and the SIA (Ex. 2-368) stated "the specific recommendations developed by OSHA regarding electric welding equipment are felt to be practical and feasible as several manufacturers are already using or specifying many of the methods outlined within the suggested rules."

Also, on June 9, 1987 (Tr. 26-30), the ACCSH recommended that OSHA regulate electric welding equipment on suspended scaffolds under subpart L. In particular, a member of the Advisory Committee stated "[t]here's a very distinct possibility that you can arc within the suspended cables, burn the cable and drop the scaffold. That's exactly why it needs to be addressed."

Another commenter (Ex. 2-516) expressed concern regarding the protection provided by insulated thimbles, because "[a]n insulated thimble does not prevent the wire rope from hitting the conducting aluminum skin on the structure and closing the loop. It doesn't stop the huge current from burning out the power cord and melting the insulation on the 'hot'

power leads." The commenter also stated that using more than one ground lead can allow current to "get loose", blowing out adjacent electrical systems and damaging platforms and their rigging. In particular, the commenter stated "[p]art of our problem is that the current from welding machines is high enough to cause heat damage in metal. The damage manifests itself as melted metal at the material surface or interface between materials. This damage seriously reduces strength. Strength is needed to keep the platform from falling."

The Agency acknowledges that insulated thimbles, alone, do not prevent arcing, and that grounding must be undertaken with great care to minimize stray currents. OSHA has determined that compliance with the provisions of paragraph (f)(17), taken together, will minimize the hazards of electric arcing during welding operations on suspended scaffolds. The Agency has concluded that it is appropriate to address the hazard of arcing welding current during welding operations on suspended scaffolds in the final rule for scaffolds, rather than in the welding standards, because the precautions in question relate to the scaffold rigging, not to welding procedures, and because placing the pertinent regulatory text in the rule will facilitate compliance.

Paragraph 1926.451(g) Fall Protection.

Paragraph (g) of the final rule sets fall protection requirements for employees working on scaffolds, including criteria for guardrail systems. As discussed above, fall hazards account for a high percentage of the injuries and fatalities experienced by scaffold workers. OSHA has determined that compliance with this paragraph will effectively protect employees from those hazards.

Final rule paragraph (g)(1) sets 10 feet as the threshold height above which fall protection is required and indicates (paragraphs (g)(1)(i)-(vii)) what fall protection measures are required for particular types of scaffolds. In addition, the introductory text references paragraph (g)(2), which addresses the fall protection requirements for employees erecting and dismantling supported scaffolds. Finally, a note has been added at the end of paragraph (g)(1), to indicate clearly that the fall protection requirements for employees installing suspension scaffold support systems on floors, roofs, and other elevated surfaces are set forth in subpart M (Fall protection) of the construction standards.

Proposed paragraph (e)(1), dealing with fall protection, was similar, except

that it explicitly excluded erectors and dismantlers from coverage. As with the proposed access provision (proposed paragraph (c)), OSHA believed at that time that fall protection requirements would only be feasible when a scaffold was fully erected and properly braced. The following paragraphs first discuss the issue of height requirements for fall protection on scaffolds and then describe the issues surrounding fall protection for erectors and dismantlers.

The issue of the appropriate height at which to require fall protection for employees working on scaffolds is complex, involving analyses of accident statistics, economic issues, strongly held opinions, and most importantly, concern for employee protection. OSHA has been involved with this issue since its inception in 1971, when the Agency adopted, under Section 6(a) of the Act, a requirement that scaffolds used in construction require fall protection for employees working at heights greater than 6 feet. By 1972, however, it had become apparent that this height requirement was proving onerous and causing disruption for scaffold users in the construction industry, and the Agency accordingly revised the height requirement to 10 feet (37 FR 25712, December 2, 1972). This change recognized the fact that the relevant consensus standard, ANSI A10.8-1969, Section 3.3 had set the threshold height for scaffold fall protection at 10 feet, and that this had become the industry standard of practice. OSHA's action also underscored the need for consistency in height requirements for general industry and construction unless there are compelling reasons for a different height requirement (the general industry standard's height threshold had already been set at 10 feet, in accordance with the ANSI standard). An example of a situation where a different height requirement is appropriate is the fall protection height requirement for scaffolds used in shipyards (29 CFR 1915). This height threshold differs from that in general industry and construction because shipyard work is less transient and less dynamic than construction work. For example, it is not uncommon for a scaffold to be erected in the shipyard environment and to remain in place for several years as employees work on various vessels that are brought to the scaffold "work station" to be repaired. In addition, shipyard facilities are completed, finished structures, unlike construction sites, where activities and crews change daily. Finally, the 5-foot threshold for fall protection on scaffolds has a long history in this industry: it has been

standard industry practice since well before OSHA was established.

The fall protection height requirement in the final rule continues the height requirement that has been in place in OSHA's construction standards since 1972; this height threshold is also the current recommendation of the relevant ANSI standard, A10.8-1988. OSHA's decision on this issue is based on the Agency's professional judgment and its experience in enforcing this fall protection requirement in the existing scaffold standards, a review of the available accident statistics and studies, and an analysis of the record on this issue. The following paragraphs discuss this information in greater detail.

First, OSHA has been enforcing this limit for almost a quarter of a century and has found that employers working in all areas of construction, from commercial building to the specialty trades, recognize and comply with this limit. In addition, construction workers are familiar with and have been trained to use fall protection on scaffolds at heights of 10 feet and above. Thus, this height requirement reflects current industry practice and is widely observed by employers and employees alike.

Second, the accident data on falls among construction workers suggest that several other areas of construction safety—such as scaffold stability, protection from electrocution hazards, and protection from falling objects while working on scaffolds—may have a greater impact on injuries and fatalities than fall protection height. An unpublished BLS study, entitled *Work Injury Report on Scaffolds*, analyzed work injury reports related to scaffolds submitted from May to November 1978. The study showed that many causes contribute to scaffold-related injuries and fatalities (Ex. 3-1). For example, one-quarter of the accidents related to scaffolds occurred while workers were ascending or descending a scaffold or stepping onto or off a scaffold, and 72 percent of these accidents occurred when the planking or support collapsed or slipped (Ex. 3-1).

A recent OSHA review of the Agency's Integrated Management Information System (IMIS) records of falls in the construction industry in the period from April 1984 to June 1994 provided information regarding 32 fatalities and 60 injuries related to work on scaffolds that occurred during this interval. Of these, only three fatalities and six injuries involved heights in the 6 to 10-foot range.

OSHA received many comments on the height threshold for fall protection for work conducted on scaffolds (Exs. 2-

3, 2-9, 2-13, 2-14, 2-15, 2-21, 2-22, 2-29, 2-31, 2-40, 2-41, 2-43, 2-45, 2-54, 2-57, 2-69, 2-70, 2-367, 2-368, 2-407, 2-465, 2-595, 5a-3, 5a-5, 5a-17, and, 5a-19). These commenters argued either for changing the existing rule's height threshold or for retaining it. Those in favor of a different limit argued for fall protection at all heights (Tr. 115-116, 6-8-87, ACCSH transcript), 4 feet (Exs. 2-14, 2-40, 2-45, 2-54, and 2-465), 5 feet (Ex. 2-29), and 6 feet (Exs. 2-15, 2-57). OSHA's Advisory Committee for Construction Safety and Health (ACCSH) urged the Agency to require fall protection on all scaffolds, regardless of elevation (Tr. 115-116, 6-8-87); however, at least one other rulemaking participant (Ex. 2-594) argued that such a requirement would be unrealistic. OSHA solicited other comments and data on this ACCSH recommendation in Issue L-2 of the hearing notice (53 FR 2050), and received several comments that such a requirement would not be appropriate (Exs. 5a-3, 5a-5, 5a-17, 5a-19). This group of commenters urged OSHA to retain the 10-foot requirement.

Those commenters favoring fall protection heights in the 4- to 6-foot range gave many reasons for their views. For example, one commenter (Ex. 2-14) stated that falls from heights of four to five feet could cause serious injuries "especially if the fall occurs on a hard surface with debris scattered about." According to the Research & Trading Corporation (Ex. 2-45):

[f]our feet is consistent with current [general industry] standards for scaffold guarding [Sec. 1910.23(c)]. Four feet according to the NBS study on nets (NBSIR 85-3271) is the height beyond which a worker is most likely to hit his head when an accidental fall occurs, which is to be prevented if possible. Six feet is useful as a universal compromise for OSHA from its current slew of height requirements. However, it should be no more than six (6) feet.

Another commenter (Ex. 2-29) argued for five feet on the grounds that guarding any height above one section of scaffold, which is about five feet, would be protective. Both the ANSI Z359 committee and Saf-T-Green (Exs. 2-57 and 2-15) favored a 6-foot fall protection threshold. Saf-T-Green reasoned that an even lower limit might be preferable but acknowledged that there is "some validity to the claim that one can jump clear of a small, low rolling tower as it tips if there is no guardrail. However, if the tower does not tip, a guardrail would protect against the employee falling over the edge." Another commenter (Ex. 5a-3) argued that consistency with the fall

protection requirements of subpart M (Fall Protection) would suggest that a 6-foot threshold was appropriate for scaffolds.

Many commenters urged the Agency to retain the 10-foot fall protection threshold for scaffolds (Exs. 2-3, 2-9, 2-13, 2-21, 2-22, 2-39, 2-43, 2-69, 2-70, 2-367, 2-368, 2-407, 2-595, 5a-3, 5a-5, 5a-17, 5a-19). According to these commenters, it is important to establish the height at which fall protection is and is not required (Ex. 2-595) and the 10-foot threshold has proved both protective and cost-effective. For example, one commenter (Ex. 2-41) stated:

. . . My investigations led me to believe that work at over ten foot elevated surfaces was at the very least four times as hazardous as work at grade, and the injuries were far more serious. I did not feel that any data I saw warranted a conclusion that the increased injury was due to anything but [a] higher population working at the [higher] level.

PPG Industries (Ex. 2-43) commented:

PPG has no problem with the 10 foot height as it stands. The problem lies in the design of the equipment and the failure of workers to follow safe practices.

OSHA has carefully analyzed all of the comments and data available in the record and has determined that it is appropriate to maintain the 10-foot fall protection threshold in the final scaffold standard, as proposed. This is also the height requirement recommended by the current national consensus standard, ANSI A10.8-1988. This level differs from the 6-foot threshold for fall protection set in subpart M (Fall Protection) for other walking/working surfaces in construction because scaffolds, unlike these other surfaces, are temporary structures erected to provide a work platform for employees who are constructing or demolishing *other* structures. The same features that make scaffolds appropriate for short-term use in construction, such as ease of erection and dismantling also make them less amenable to the use of fall protection at the time the first level is being erected. For example, there may be no secure place on the first level for the installation of guardrails or personal fall arrest systems. Also there is often no structure adjacent to a scaffold when the first level has been erected that can be used to anchor a personal fall arrest system, because the adjacent structure is in the process of being built or demolished.

This scaffold standard contains many updated and strengthened requirements for safe erection and maintenance of scaffolds. In particular, the final rule

sets clear, performance-oriented requirements for scaffold capacity (§ 1926.451(a)); erection (§§ 1926.451(b), (c) and (d)); access (§ 1926.451(e)); and use (§ 1926.451(f)). The Agency has determined that compliance with the above-noted requirements will prevent many of the fall-related injuries and fatalities that would otherwise result from structural collapse or instability, including those occurring on scaffolds less than 10 feet in height, because properly erected scaffolds will not collapse during use.

In addition, OSHA intends to monitor the extent to which compliance with these revised subpart L requirements for structural integrity effectively protects employees on scaffolds from fall hazards when they are working between six and 10 feet above lower levels. At this time, the data are insufficient to persuade the Agency that the existing 10-foot threshold needs to be changed. OSHA will carefully review and examine its enforcement data over the next several years, together with any investigative reports and other information on incidents that involve fall hazards. The Agency also intends to work closely with NIOSH in performing such data collection and analysis. Should it appear that compliance with this final rule is not providing adequate fall protection for employees working on scaffolds between six and 10 feet above lower levels, the Agency will reevaluate the standards and determine what changes, if any, are warranted.

Paragraphs (g)(1)(i) through (vii) of the final rule specify the types of fall protection to be used on particular types of scaffolds. These provisions are essentially the same as the corresponding proposed provisions, except as discussed below. The proposed and final rule provisions effectively clarify and consolidate the fall protection requirements in existing § 1926.451(a)-(y), § 1926.500(c)(2), and § 1926.1910.29(a)(3)(vii).

Paragraph (g)(1)(i) of the final rule, like proposed paragraph (e)(1)(i), recognizes that personal fall arrest systems, not guardrails, are appropriate for use on boatswains' chairs, catenary scaffolds, float scaffolds, needle beam scaffolds, and ladder jack scaffolds. This provision consolidates the following paragraphs of the existing rule §§ 1926.451(1)(4)—boatswains' chairs; (p)(9)—needle beam scaffolds; (w)(6)—float scaffolds; and § 1926.752(k)—float scaffolds for steel erection. This requirement is being applied to catenary scaffolds and ladder jack scaffolds for the first time.

Paragraph (g)(1)(ii) of the final rule, like proposed paragraph (e)(1)(ii),

requires personal fall arrest systems and guardrail systems for all single-point adjustable suspension scaffolds (except boatswains' chairs), and for all two-point adjustable suspension scaffolds. The requirement to have guardrails and personal fall arrest systems on two-point scaffolds, which carries forward language in § 1926.451(i)(8) of the existing rule, is based on the fact that a guardrail system alone does not provide adequate fall protection when a suspension rope fails and causes the scaffold to tip or hang from only one end. Personal fall arrest system protection is also necessary for single-point systems, because the fall hazard related to suspension rope failure is as serious as it is with the two-point scaffold. However, because personal fall arrest systems would be the primary means of fall protection on single-point and two-point systems, the provision allows a lower minimum strength guardrail system to be used. This approach is consistent with that taken in the proposed rule.

Paragraph (g)(1)(iii) of the final rule provides that "Each employee on a crawling board (chicken ladder) shall be protected by a personal fall arrest system, a guardrail system (with minimum 200 pound top rail capacity), or by a three-fourth inch (1.9 cm) diameter grabline or equivalent handhold securely fastened beside each crawling board." This provision, like proposed paragraph (e)(1)(iii), is essentially the same as paragraph 1926.451(v)(2) of the existing rule, except that the existing rule permits grablines (lifelines) or equivalent handholds if they are securely fastened alongside crawling boards.

Paragraph (g)(1)(iv) of the final rule, like proposed paragraph (e)(1)(iv), provides that employees on self-contained scaffolds be protected by both personal fall arrest systems and guardrail systems when the platform is supported by ropes (as when the scaffold is being raised or lowered on some systems) and by guardrail systems when the platform is supported directly by the scaffold frame.

Paragraph (g)(1)(v) of the final rule, similar to proposed paragraph (e)(1)(v), requires guardrails to be used along scaffold walkways and to be located within 9½ inches horizontally of at least one side of the walkway. OSHA originally proposed that the walkways be located within 8 inches horizontally of the side of the walkway. However, for consistency with final rule § 1926.451(b)(1)(ii), the provision has been revised to allow an open space of up to 9½ inches. The provision that guardrails need only to be provided

along one side applies only when the platform is used solely as a means of access to get from one point on the scaffold to another. If work activities other than access are performed on or from the walkway, then the platform is not considered to be a walkway (see definition of "walkway"), and other provisions of paragraphs (g)(1), as appropriate, would apply.

Paragraph (g)(1)(vi) of the final rule provides that fall protection (i.e., a personal fall arrest system or guardrail) be provided on all open sides and ends of scaffolds from which employees are performing overhand bricklaying operations and/or related work, except those sides and ends next to the wall being laid. This requirement replaces a note that followed proposed paragraph (e)(1)(v), which stated that the fall protection requirements for employees performing overhand bricklaying from supported scaffolds are provided in § 1926.501, Fall protection (subpart M). OSHA has deleted the note from the final rule because the Agency has determined that, except for some system criteria which are referenced from subpart M, it is appropriate to cover all scaffold fall protection in this final rule for scaffolds in construction (subpart L).

Paragraph (g)(1)(vi) of the final rule is consistent with § 1926.501(b)(9), which addresses fall protection for employees performing overhand bricklaying while on elevated surfaces other than scaffolds.

Final paragraph (g)(1)(vii) requires that employees on scaffolds not addressed elsewhere in paragraph (g)(1) be protected either by guardrails or personal fall arrest systems. This provision is essentially the same as the fall protection requirement of proposed paragraph (e)(1), except that the term "body belt/harness systems or Type 1 guardrail systems" has been replaced by "personal fall arrest systems or guardrail systems" for the reasons discussed above.

Paragraph (g)(1) does not apply where there are no "open sides or ends" on the scaffold (see definition in § 1926.451(b)). For the scaffold to be considered completely enclosed, no perimeter face of the scaffold may be more than 14 inches from a wall. The requirements for fall protection will apply at openings such as hoistways, elevator shafts, stairwells, or similar openings in the scaffold platform, or openings in the walls of the structure surrounding the platform.

Proposed paragraph (e)(2) stated that each employee on a platform (except for a self-contained adjustable scaffold or a scaffold type covered by § 1926.452), less than 45 inches (1.1 m) wide, and 4

feet (1.2 m) or more above lower levels, shall be protected from falling to those lower levels by the use of a personal fall arrest system or guardrail system (with minimum 200 pound toprail capacity). Proposed paragraph (e)(2) also provided a blanket exemption for erecting/dismantling activities and referred to the use of a "Type I guardrail system."

This provision, based on existing § 1926.451(a)(4), has been dropped in the final rule because further analysis of the requirement showed that there was no real definable target for the requirement and that 99% of scaffolds would be excluded by the proposed provision.

Paragraph (g)(2) of the final rule addresses fall protection for employees erecting or dismantling supported scaffolds. Based on the rulemaking record, developed through NPRM Issue 8 discussed below, OSHA has determined that it is appropriate to delay the implementation of paragraph (g)(2) until September 2, 1997. The delay will allow affected employers sufficient time to implement the appropriate procedures for addressing the fall protection needs of employees erecting or dismantling scaffolds. In addition, deferring compliance will allow time for the Agency to complete non-mandatory Appendix B, which will provide examples of considerations that a competent person would take into account when evaluating fall protection options for scaffold erectors and dismantlers. As discussed above in relation to final rule paragraph (e)(9), the Agency has also deferred requirements for safe access for scaffold erectors and dismantlers until September 2, 1997.

Final paragraph (g)(2) requires that employers whose employees erect or dismantle supported scaffolds after September 2, 1997 ensure that a competent person determines the feasibility and safety of providing fall protection for such employees. This paragraph further requires that affected employers provide fall protection for employees erecting or dismantling supported scaffolds where the installation and use of such protection is feasible and does not create a greater hazard.

NPRM Issue 8 solicited comments concerning the proposed exemption of employers whose employees perform scaffold erection and dismantling operations from the fall protection requirements of proposed § 1926.451(e)(1). The Agency noted that, while supported scaffolds often do not have a place to which personal fall arrest systems can be properly attached, suspended scaffolds are often located

such that personal fall arrest systems can be used.

On March 29, 1993, based on the response to Issue 8, OSHA reopened the public record for proposed subpart L (58 FR 16509) to obtain more information. The Agency stated that the rulemaking record supported deleting the proposed exemption of suspended scaffolds and indicated that a blanket exemption for supported scaffolds might be inappropriate. In particular, OSHA asked if employers should be required to provide fall protection for employees erecting or dismantling supported scaffolds, except where an employer can demonstrate that providing fall protection was either "impracticable" or "would create a greater hazard." The Agency also sought information about current efforts and the ability to provide fall protection for employees erecting or dismantling scaffolds. In addition, OSHA asked if it was appropriate to require fall protection for those portions of a supported scaffold that have been, or remain, fully assembled, while exempting those areas where erecting or dismantling is underway.

The responses to NPRM Issue 8, and the March 29, 1993, reopening of the record on this Issue fell into two broad groupings. The first group either supported an across-the-board exemption from fall protection requirements for all erectors and dismantlers (Exs. 2-3, 2-9, 2-12, and 2-21); or supported an exemption for erectors and dismantlers of supported scaffolds only (Exs. 2-13, 2-15, 2-30, 2-69, 2-367 and 2-368); or specifically opposed a fall protection requirement for erectors and dismantlers, even with an exception for impracticability or greater hazard, favoring instead trained erectors and dismantlers, a hazard awareness program, controlled access zones, or a standardized procedure for erecting and dismantling scaffolds (Exs. 34-5, 34-9, 34-10, 34-12, 34-17, 34-17, 34-20, 34-31, 34-32, 34-37, and 34-43).

The second group either supported a requirement for fall protection at all times, including during erecting and dismantling (Exs. 2-22, 2-43, 2-45, 2-53, 2-497, 34-4, 34-11, and 34-35) or supported a requirement for fall protection except where the employer demonstrates that it is infeasible, unsafe, or creates a greater hazard during erecting and dismantling operations (Exs. 2-29, 2-54, 2-57, 2-70, 34-2, 34-18, 34-19, 34-22, 34-26, 34-29, 34-34, and 34-46). Each of these arguments is discussed below, along with OSHA's response to the points raised by the commenters.

Commenters that supported the proposed total exemption of erecting and dismantling operations from the fall protection requirements argued (Ex. 2-3) "[t]his is a situation where someone must be exposed in order to do the job * * *"; or felt that fall protection would be detrimental to employee safety (Exs. 2-12 and 2-21). OSHA disagrees with these commenters and notes that the record describes many situations where it is feasible to provide fall protection for erectors and dismantlers.

Commenters that supported a fall protection requirement for erectors and dismantlers of suspended scaffolds, but not supported scaffolds (Exs. 2-13, 2-15, 2-30, 2-69, 2-367, and 2-368) argued that it is feasible and practical to require such protection for suspended scaffolds, but not for supported scaffolds, due to the lack of an appropriate tie-off area, and the possibility of drop lines becoming entangled during climbing and moving procedures which could pull the erector off the supported scaffold. The Agency agrees with these commenters that it is virtually always feasible to provide fall protection for workers erecting or dismantling suspended scaffolds because structures that are capable of supporting a suspended scaffold are also capable of providing a safe anchor point for personal fall protection equipment. On the other hand, OSHA finds that the record does not support an across-the-board exception from the requirements for fall protection for erectors and dismantlers of supported scaffolds.

Another group of commenters opposed a fall protection requirement but emphasized the importance of training in maintaining safety during erecting and dismantling operations. For example, some commenters (Exs. 34-9, 34-10, 34-12, and 34-17) recommended the following:

1. A formal hazard awareness program shall be implemented.
2. Enforce "controlled access zones" allowing only those people trained in the erection and dismantling of scaffolds to be present.
3. Develop and strictly enforce standard procedures for the erection and dismantling of scaffolding. These procedures may include but not be limited to the following:
 - a. Fully planking each level before moving on to the next highest level.
 - b. Fully securing each level with the proper guardrails prior to moving to the next higher level.
 - c. Providing proper access to all completed levels.
 - d. Develop methods for placing components on upper levels without placing unnecessary risks on employees.
 - e. Only those employees actually involved in the erection or dismantling shall be allowed on the scaffolding.

The Agency recognizes the importance of training and hazard awareness programs to employee safety, but finds that these precautions alone are not adequately protective because site conditions change and mistakes are made. The Agency finds that providing appropriate fall protection, whenever it is feasible or will not create a greater hazard, is the best way to ensure that erectors and dismantlers are appropriately protected from fall hazards.

The second group consisted of commenters that supported fall protection for erectors and dismantlers under some (Exs. 2-29, 2-54, 2-57, 2-70, 34-2, 34-19, 34-22, 34-26, 34-29, and 34-46) or all conditions (Exs. 2-22, 2-43, 2-45, 2-53, and 2-497). For example, some commenters argued that if a fall hazard exists, lifelines or some other fall arresting system should be in place. R&TC (Ex. 2-45) stated:

The use of lightweight outrigger scaffold sections with guard rails, which can be pushed up the vertical scaffold poles prior to the new upper level height exposure during erection, seems to be promising as a fall protection means * * * Furthermore, many structures can provide overhead anchorage points for workers during scaffold erection and dismantling without such special scaffold platforms. For these situations, regular lifelines can easily be used for vertical and horizontal movement.

R&TC later added (Ex. 2-497) "[w]hen an overhead anchorage is available, a bucket truck, manlift or other elevating platform can be used to install lifelines without a fall hazard."

Commenters to the Reopening Notice (Exs. 34-4, 34-11, 34-18, and 34-35) also supported a fall protection requirement for erectors and dismantlers.

Some, such as Dynamic Scientific Controls (DSC) (Ex. 34-18) provided input on ways to provide fall protection for erectors and dismantlers. In particular, DSC provided a video showing a scaffold being erected by an employee who uses a retractable lanyard attached to the scaffold for fall protection. DSC stated that this method has been improved by crossbracing the first frame, tying-in to the structure, using the pulley bracket more often for attaching lifelines in order to reduce the lifeline angle to less than 45 degrees, and pinning legs before attaching the lifeline to a higher level. DSC added that using horizontal lifelines within each frame and extending the length of the scaffold can provide protection to workers as well. This commenter noted, however, that any fall arrest system attached to a scaffold should be an engineered system modelled for that

type of scaffold, or should be designed by a skilled professional engineer.

In addition, the United Brotherhood of Carpenters and Joiners (Ex. 34-11) stated that the ability to provide fall protection can be greatly increased through modified erection, engineered attachment points designed into structures, additional scaffold bracing, guying, and outriggering.

Finally, DBI/SALA (Ex. 34-4) offered the following choices for fall protection: "(1) Provide for or suggest a means for a feasible anchor; (2) If the current state of the art doesn't allow scaffolds to be used as anchors, maybe a redesign incorporating outriggers or whatever is required is appropriate."

The Agency agrees that, if fall protection can be provided, it is the employer's responsibility to take the actions necessary to protect employees. However, OSHA has determined, based on the information in the record, that in some situations, it is not possible to provide fall protection for erectors and dismantlers of supported scaffolds.

Two commenters, Dynamic Scientific Controls (DSC) (Ex. 34-18) and the State of Hawaii (Ex. 34-34) commented that the employer should be required to show that fall protection is infeasible or creates a greater hazard for the scaffold erector in order to avoid providing fall protection. Another commenter (Ex. 2-54) added that employers "should note in their Daily reports why they can't take [the] necessary precaution[s]."

OSHA agrees that employers must have valid reasons for not providing fall protection to scaffold erectors and dismantlers, but does not agree that the employer must put these reasons in writing. Compliance officers can substantiate employer claims of infeasibility or greater hazard through on-site observations and discussion with the competent person and other workers.

Many commenters (Exs. 2-29, 2-54, 2-57, 2-70, 34-2, 34-19, 34-22, 34-26, 34-29, and 34-46) supported a fall protection requirement for scaffold erectors and dismantlers, if feasible, or unless it would create a greater hazard. These commenters also provided insight into the potential problems of providing fall protection for erectors and dismantlers, and into the factors that must be considered when determining if fall protection is feasible in a particular situation or if the use of fall protection would create a greater hazard.

For example, the ANSI Z359 Committee (Ex. 2-57) stated:

It is recognized that fall protection may, in general, be difficult or impractical to provide in erection and dismantling of supported scaffolds. This may be due to absence of

suitable anchorages whether independent or integral to the scaffold. However, there are notable exceptions when independent overhead anchorages exist which may be used for vertical or horizontal lifelines. Further, some supported scaffolds can be rigged to provide integral fall protection without undue encumbrance of the work. There is concern that granting a broad exemption from fall protection requirements for supported scaffold erection/dismantling would reduce the protection even where it is today feasible. Such exemptions could also discourage future development of fall protection means to address this subject.

Miller & Long (Ex. 2-70) commented "If there is an area where employees can tie off they should do so."

The Boeing Company (Ex. 34-19) stated that fall protection for erectors and dismantlers could be provided through the use of boom supported elevated work platforms, scissors lifts, forklift platforms, temporary guardrails, fall arrest/restraint systems or other scaffolds.

The Scaffold Training Institute (STI) (Ex. 34-20) indicated that 100% fall protection for erectors is not achievable from a practical standpoint due to a lack of suitable anchorages. The Institute also stated that lifelines would become entangled in pipes, lines, platforms tubes, braces or other obstructions. STI was particularly concerned that snagged lifelines would restrict the motion of employees and could lead to falls for erectors whose work requires that they have freedom of motion in order to carry and to maneuver into place large, bulky components. The commenter added that the use of lanyards and lifelines can lead to increased fall hazards, and that a pendulum effect is created if an erector falls while attached to a lifeline that is anchored several feet away.

Duke Power (Ex. 34-29) stated "[f]all protection harnesses tend to snag on things, butt straps hinder climbing . . . Fall protection also slows people down."

SINCO (Ex. 34-22) stated that the effect on the mobility of employees varies with conditions and the type of fall protection equipment used, but stated that the effect can be limited by proper pre-planning and project management. In addition, both SINCO and Professor Ralph E. Bennett of Purdue University (Ex. 34-26) suggested that the scaffold must be properly tied or braced, with all components pinned together, and, that intermediate plank levels be provided to limit fall height during erection of the uppermost levels.

In addition, SINCO recommended that OSHA require affected employers to satisfy the following criteria for exemption:

- A qualified person has determined that fall protection creates a greater hazard than falling freely to the ground or the closest possible level;
- Tests prove that a scaffold or structure would definitely fail if used as an anchorage;
- There are no other means of fall protection available;
- Employees have been trained in the recognition and avoidance of hazards by use of the employer's prescribed methods of erection; and
- Compliance with the requirement for fall protection is likely to result in a more serious injury compared to the possibility of a life saved . . ."

SINCO observed that a greater hazard may exist if a falling person could pull a scaffold over. However, the commenter added that this hazard would involve more danger to employees on the ground than to employees on the scaffold. They contended that other employees on the scaffold may provide "counter-balance" that would prevent the scaffold from overturning. In addition, SINCO stated that this hazard can be prevented by reinforcing the scaffold's base through the use of outriggers, counterweights, or tie-downs. The commenter added that this hazard can be greatly reduced by requiring erectors to remain inside the frames to decrease any eccentric loading and through the use of shock absorbers.

Dow Chemical Co. (Ex. 34-46) commented that since each worksite is unique, fall hazards must be addressed through preplanning of the work with the aim of eliminating fall hazards and preventing falls. However, the commenter added, where fall hazards cannot be eliminated, a fall protection system should be used if it "provides a more appropriately safe solution". Dow also stated that a lanyard long enough to allow mobility can create tripping hazards and the potential for one worker to "pull another worker from their task." The commenter added that "people on-site must have the latitude to address [these hazards]."

OSHA notes that the Agency's own compliance experience concerning the potential problems of providing 100% fall protection for erectors and dismantlers is consistent with the positions put forth by the commenters. OSHA has determined that it would be useful to provide examples of the factors to be considered by a competent person when deciding what fall protection is appropriate for employees erecting or dismantling supported scaffolds. Accordingly, the Agency has reserved non-mandatory Appendix B, and will be developing informational text that can be added to subpart L at a later date to

serve as a guide to assist employers in evaluating their worksite conditions.

Several commenters (Exs. 34-8, 34-9, 34-10, 34-12, 34-17, 34-22, and 34-26) addressing the topic of fall protection for erectors and dismantlers took no position as to an exception for these workers. However, they indicated that fully planking sections could reduce exposure to fall hazards. One of these commenters (Ex. 34-8) stated that, although full planking and stairway-type ladders would reduce exposure, their use is not always practical. In addition, four of these commenters (Exs. 34-9, 34-10, 34-12, and 34-17) stated that ladders attached at the end of the scaffold would be better because stairway-type ladders greatly reduce employee movement along the length of the scaffold.

Four other commenters (Exs. 34-32, 34-35, 34-37, and 34-39) indicated that such practices would be either infeasible or would create other hazards. The SIA and SSFI (Exs. 34-37 and 34-32) added that planking every level would overload tall scaffolds and that stairways are not needed because erectors do not continually climb up and down. The SIA also said that fully planking every level would require that all equipment be hoisted outside the scaffold, creating additional hazards. Another commenter (Ex. 34-46) stated that a requirement for fully planking sections "would unnecessarily restrict local decisions for safety."

The Agency has determined that, due to the large variety of supported scaffolds and an infinite number of unique site conditions that could affect the feasibility or safety of providing fall protection, neither a blanket exception nor a requirement for 100% fall protection is appropriate for erectors and dismantlers. OSHA agrees with commenters (Exs. 34-8, 34-22, 34-36, and 34-46) that the people on site (competent person) must have the flexibility to address fall hazards for erectors and dismantlers on a site-specific basis. Therefore, OSHA finds that the determination of what fall protection is feasible and can be used safely at a given worksite should be made by a competent person at the worksite. The competent person will need to have the ability and knowledge to decide whether fall protection can be provided for erectors and dismantlers under the specific site conditions, and, if so, what measures are appropriate.

Therefore, the Agency has revised the final rule to reflect this finding, while deferring compliance for one year to allow time for employers to develop and implement the appropriate procedures. In addition, as noted above, the Agency

will be adding non-mandatory Appendix B at a later date, to provide examples of situations where it is feasible to provide fall protection during the erection and dismantling of supported scaffolds and the criteria the competent person would consider when deciding the appropriateness of fall protection during erection and dismantling. Interested parties are invited to provide OSHA with suggestions and information regarding the appropriate guidance for the competent person.

Paragraph (g)(3) of the final rule provides that personal fall arrest systems must comply with the pertinent provisions of § 1926.502(d) and, in addition, must be attached by lanyard to a vertical lifeline, horizontal lifeline, or scaffold structural member. However, when overhead obstructions such as overhead protection or additional platform levels are part of a single-point or two-point adjustable suspension scaffold, then vertical lifelines must not be used, because, in the event of a scaffold collapse, the overhead components would injure an employee who was tied off to a vertical lifeline. This provision is essentially the same as proposed paragraph (e)(3), except that the terms "dropline" and "trolley line" have been replaced by the terms "vertical lifeline" and "horizontal lifeline" to be consistent with the terms used in subpart M of this part—Fall Protection.

Paragraph (g)(3)(i) of the final rule requires that vertical lifelines, when used, be fastened to a fixed safe point of anchorage, be independent of the scaffold, and be protected from sharp edges and abrasion. Based on concern that inadequate anchor points may be used, this paragraph also incorporates the language of the note to proposed § 1926.451(e)(3), which stated that safe points of anchorage include structural members of buildings, but do not include standpipes, vents, other piping systems, electrical conduit, outrigger beams, or counterweights. This is the same requirement as was proposed in paragraph (e)(3)(i) of the NPRM and is consistent with the corresponding language in § 1926.451(i)(8) of the existing rule.

Paragraph (g)(3)(ii) of the final rule states that horizontal lifelines, when used, shall be secured to two or more structural members of the scaffold, and shall not be attached only to the suspension ropes. This is the same requirement as was proposed in paragraph (e)(3)(ii). It is designed to provide protection to the employee in the event of a suspension line failure.

Paragraph (g)(3)(iii) of the final rule provides that, when lanyards are connected to horizontal lifelines or structural members on a single-point or two-point adjustable suspension scaffold, the scaffold must be equipped with additional independent support lines and automatic locking devices capable of stopping the fall of the scaffold in the event one or more of the suspension ropes fail. The independent support lines must be equal in number and strength to the suspension ropes. This is the same requirement as proposed paragraph (e)(3)(iii). OSHA believes that in the event of a suspension rope failure, the additional support lines will keep the scaffold from falling.

Paragraph (g)(3)(iv) of the final rule provides that vertical lifelines, independent support lines, and suspension ropes must not be attached to each other, or be attached to or use the same point of anchorage, or be attached to the same point on the scaffold or body belt/harness system. This is essentially the same provision as proposed paragraph (e)(3)(iv), except that the requirements in the final rule also prohibit the attachment of lines and ropes "to the same point on the scaffold or personal fall arrest system." This language reflects the incorporation of the note that accompanied proposed paragraph (e)(3) into paragraph (g)(3)(i) of the final rule, as discussed above.

Issue 19 in the preamble to the proposed rule noted that some single-point adjustable suspension scaffolds which are currently in use have two separate lines (one serves as an independent support line) attached to two separate anchor points; however, both lines are connected to a single point on the body support system. A failure of this single body support mechanism, or body support system, could result in an uncontrolled fall for the employee. OSHA sought comments on the question of whether the final rule should permit the use of such a system. The Agency also asked what criteria would need to be set to ensure that a single mechanism or body support system prevented failures. In addition, OSHA inquired about industry experience with this type of system.

Several commenters (Exs. 2-29, 2-312, 2-367, and 2-368) and the ACCSH (Tr. 6/9/89, pp. 150-151) were in agreement that OSHA should not permit the use of systems of the type described in Issue 19. One commenter (Ex. 2-29) stated simply that "the standard should not allow single-point suspension scaffolds with two separate support lines to be connected to a single point on the body support system."

The SSFI (Ex. 2-367) recommended "that OSHA not permit the use of a lifeline and support line being tied to a single mechanism or body support system. It is our opinion that the lifeline should be an independent anchorage with independent support." Also, the SIA (Ex. 2-368) stated:

We are opposed to the use of systems in which the lifeline and support line connect to a single mechanism or body support system. The primary suspension line and an independent fall arrest system should each be anchored to separate body support devices, so that in the event one line fails, the other will provide protection. The cost would be equal to the cost of the original suspension, but could be negligible in many instances.

After a careful review of the comments, OSHA has determined that the purpose of having separate lines would be defeated if lines were attached to a single point at either end and that point of attachment failed, and the final rule (paragraph (g)(3)(iv)) reflects this determination.

Final rule paragraph (g)(4) sets criteria for guardrail systems used to provide fall protection for employees working on scaffolds. These provisions are consistent with the corresponding language of recently revised subpart M of this part, Fall protection, except as necessary to address the particular circumstances of construction work performed from scaffolds.

Paragraph (g)(4)(i) of the final rule provides that guardrail systems be installed along all open sides and ends of platforms. This requirement is effectively the same as proposed paragraph (e)(4)(i) and existing § 1926.451(a)(4). OSHA has added language which clarifies when guardrails would need to be in place. In the case of suspended scaffolds, guardrails must be installed before any employee is allowed on a hoisted scaffold. In the case of supported scaffolds, installation must occur before employees are permitted to work from the scaffold. When an employee is on a supported scaffold during the scaffold erection process, fall protection is covered by final rule paragraph (g)(2). This clarification is based on language in the State of California Code, Title 8, paragraph 1637(i)(6) which was submitted to the docket by the California Department of Industrial Relations (Ex. 2-23).

Paragraph (g)(4)(ii) of the final rule provides that the top edge height of top rails or equivalent members on supported scaffolds manufactured or placed into service after January 1, 2000 must be between 38 inches (0.97 m) and 45 inches (1.2 m) above the platform

surface. Furthermore, the top edge height of guardrails on supported scaffolds manufactured and placed into service before January 1, 2000 and on all suspended scaffolds where both a guardrail and a personal fall arrest system are required must be between 36 inches (0.9 m) and 45 inches (1.2 m). The final rule also provides that toprail height may exceed 45 inches if the other criteria of paragraph (g)(4) have been satisfied.

In the proposal, paragraph (e)(4)(ii) proposed a toprail height between 38 and 45 inches above the platform surface when the guardrail is the sole means of providing fall protection, and a toprail height between 36 and 45 inches when the guardrail is used in conjunction with a personal fall arrest system. The proposed minimum 36-inch toprail height reflected OSHA's belief that the minimum height requirement for a guardrail used with personal fall arrest systems should be less than that for a guardrail on which employees rely for fall protection.

As discussed in the proposed rule (51 FR 42690), the 38-inch lower limit on guardrail height was proposed in lieu of the 39-inch lower limit on guardrail height allowed by subpart M (Fall protection) to allow for guardrail height differentials caused by scaffold platform unit arrangements. In particular, a frame constructed to hold a toprail 42 inches above a flush-mounted prefabricated deck would be only 40 inches above a scaffold platform made with two-inch solid sawn planks. If the scaffold planks are overlapped to form a long platform, the guardrail height would drop to 38 inches.

In addition, the Agency has determined that employers should have the flexibility, when conditions warrant, to use top rails with heights higher than 45 inches, so long as the other protective criteria of paragraph (g)(4) are satisfied. The language of the proposed rule has been revised to reflect this flexibility. The language of paragraph (g)(4)(ii) of the final rule is consistent with the corresponding language in § 1926.502(b)(1), Fall protection (subpart M).

Issue 12 of the preamble to the proposed rule sought comments on whether OSHA should adopt the language in the 1977 edition of ANSI A10.8-1977, paragraph 3.3, which sets 36 inches above the work platform as the minimum guardrail height and on the effectiveness, feasibility and cost savings of requiring guardrails to be at least 36 inches high. Issue 12 noted that existing § 1926.451(a)(5), which requires that guardrails be "approximately" 42 inches high, has been interpreted over

the years by OSHA to allow a range of 36 inches to 45 inches above the work platform. These interpretations, dating from 1979, are based on OSHA Program Directive #200-67 (Revision 1), issued on October 24, 1978, and later renumbered as OSHA Instruction CPL 2.11A. OSHA notes that the 1988 edition of the pertinent ANSI standard, A10.8-1988, paragraph 4.5.1, accepts top rails that are installed between 36 and 45 inches above lower levels.

OSHA received many comments on the issue of guardrail heights (Exs. 2-9, 2-12, 2-13, 2-20, 2-21, 2-29, 2-41, 2-50, 2-53, 2-54, 2-55, 2-64, 2-69, 2-367, 2-368, 2-390, 2-476, and Tr. 6/9/87, pp 116-121). The comments received ranged from those stating that 36 inches was too low for the bottom of the range, that 36 inches was appropriate, that 45 inches was too high for the top of the allowable range of guardrail heights, and that no change should be made to the range allowed by existing OSHA interpretations (i.e., that allowable heights be between 36 and 45 inches above the work platform). The arguments presented by the commenters are summarized below, along with OSHA's response to these comments and the Agency's reasoning in reaching a final determination on the matter.

Several commenters (Exs. 2-9, 2-20, 2-21, 2-50, 2-53, 2-55, 2-64, 2-69, 2-367, 2-368, 2-390, and 2-476) argued for retention of 36 inches as the minimum guardrail height. The reasons given by these commenters were that "no accident statistics justify changing the current range existing in OSHA standards" (Ex. 2-368), that 36 inches is adequate or reasonable (Exs. 2-21, 2-53 and 2-69), that the height is practical, feasible, and would not incur unmeasurable costs (Ex. 2-64), and that 36 inches is current industry practice (Exs. 2-367 and 2-476). Typical of these comments was the comment of the SIA (Ex. 2-368):

Guardrails on scaffolds are designed as a perimeter warning for workers confined to small working areas. Workers do not attain body motion speeds and momentum that require the drastic changes proposed.

Doctoral papers and NBS studies used as a basis for the proposals do not deal with the "real" world. Dummies propelled against a guardrail do not represent a true comparison of a human being with sense and reflex ability.

Guardrails for scaffolds, whether they be horizontal systems or crossbrace systems have historically been considered a perimeter indication. Work is performed in localized areas where movement is generally restricted from section to section. Workmen are not subjected to the hazard of "momentum" created by body movement over longer distances as in the case in peripheral railings

or balconies and other crowded or congested areas where body weight and force may be accelerated * * *

It is apparent that guardrails of most manufacturers will fall within the proposed 38-inches to 45-inches range. However, there are many in the stream of commerce, and widely used throughout industry, which will not. As an example, the GKN Kwikform scaffold system utilizes a post with guardrail attachment points every 37½". This distance is based on the European standard spacing of one meter [approximately 39 inches]. There is no justification for outlawing the equipment which has been used safely for decades. It is more practical to retain the 36-inches to 45-inches range permitted in the various industry and ANSI standards.

The SSFI (Ex. 2-367) agreed with the SIA, stating as follows:

The majority of scaffold guardrail posts, manufactured in this country since 1950, has been designed and manufactured to ANSI A10.8 Standard of 36" to 42" guardrail heights. The elimination of the lower 36-inch limit would result in the requirement to scrap all these posts and remanufacture new posts.

The cost to replace guardrail units would be very expensive to the user. In 1983, we estimated that there were at least one million guardrail units being used. Retrofit changes at that time were estimated at \$4 per unit or a total of \$4,000,000. Replacement costs at \$10 per unit would equal \$10 million.

In response to this group of commenters, OSHA notes that the absence of accident statistics substantiating the need for higher guardrails reflects on the general inadequacy of occupational injury and illness recording and reporting systems but may well have little or nothing to do with guardrail heights and their relationship with fall hazards. It is OSHA's experience that few accident reports contain the detail that would be necessary to differentiate between the relative protectiveness of guardrail heights of 36 as opposed to 38 or 39 inches. In addition, although guardrails do function as perimeter indicators, they also provide fall protection, and it is this aspect of scaffold guardrails that is of concern in final rule paragraph (g)(4)(ii). Further, although "[d]ummies propelled against a guardrail" (Ex. 2-368) cannot precisely mimic the responses and movement of real workers in the actual work environment, the experiments dismissed by the SIA provide valuable information that cannot be disregarded by OSHA or other safety professionals.

OSHA recognizes the merit of the SIA and SSFI arguments about industry's use of scaffold components (e.g., posts) suitable for 36-inch guardrails (Exs. 2-367 and 2-368), although the Agency also notes that the \$4 to \$10 per scaffold unit cost for retrofit or replacement,

respectively, would not be prohibitive even for the smallest scaffold-using business. Nevertheless, to respond to these concerns, the final rule grandfathers those guardrails manufactured to meet the 36-inch minimum height allowed by OSHA for many years and still accepted by ANSI A10.8-1988. The Agency concludes that allowing the continued use of these guardrails until they are replaced will eliminate any potentially adverse impact of the final rule's determination as regards minimum guardrail heights.

Many commenters (Exs. 2-12, 2-13, 2-29, 2-41, 2-54, 2-407, and Tr. 6/9/87, pp 116-121) share OSHA's concern, as stated in the preamble, that a minimum guardrail height of 36 inches is insufficiently protective. For example, one commenter (Ex. 2-407) stated:

[T]he guardrail height requirement should be set from 38-inches to 45-inches with a midrail. Our experienced opinion has taught us that 36-inches would be very unsafe. Especially for taller person[s]. * * * As the industry has been set at 42" for so many years we feel that the 38" to 45" all inclusive would be satisfactory to cover the 42" which so many people would now have, thus creating no additional expense.

Two other commenters (Exs. 2-29 and 2-41) also expressed concerns about the adequacy of 36 inch high guardrails for tall employees, as did Lawrence Stafford, a member of both the ANSI A10.8 Committee and the SIA, who commented (Ex. 2-13)

I and many other members of S.I.A. do not consider 36-inches as safe for all scaffold uses. Due to the narrow width of the platforms on suspended scaffolds, the outboard sides should be protected by a 42-inch high guardrail.

Arguing in the same vein, a representative of OSHA's Advisory Committee on Construction Safety and Health (June 9, 1987 meeting) stated: "I think, if anything, people are getting bigger, not smaller. To leave something down at 36 inches only increases the hazard to the fellow working on a suspended scaffold where he needs a much as he can get * * *" Another representative said that a 36-inch high guardrail "strikes you in the wrong place * * * He goes over the rail or he backs up to it while he's doing some work, it hits him at the wrong point and he's gone." (Tr. 6/9/87, pp. 116-121).

Based on a review of the comments submitted on this issue, the Agency's experience in enforcing this requirement over the years, and OSHA's professional judgment, the final rule allows employers to position scaffold guardrails in the range of 38 to 45-inches on supported scaffolds, as proposed. This range is also consistent

with the guardrail criteria set in the revised standard (subpart M) for Fall protection. However, OSHA recognizes that plank overlap is a legitimate reason to accept a somewhat lower guardrail height on some scaffolds. Thus, although the record indicates that most scaffolds on the market fall within the 38- to 45-inch range (Ex. 2-368), some scaffolds have been manufactured to meet the 36-inch lower guardrail height limit accepted by ANSI. To allow the manufacturers of these scaffolds the necessary time to redesign their systems, the Agency is grandfathering 36-inch guardrail heights on all scaffolds manufactured and installed before January 1, 2000. These scaffolds may continue to be used throughout their normal service life, as long as they continue to meet the other requirements of subpart L.

Final rule paragraph (g)(4)(iii), which is effectively identical to proposed paragraph (e)(4)(iii), states that, when midrails, screens, mesh, intermediate vertical members (such as balusters), solid panels, or equivalent structural members are used, they are to be installed between the top edge of the guardrail system and the scaffold platform. This is essentially the same requirement as existing § 1926.451(a)(5), except that the existing language mentioned only midrails and provided for the use of midrails "when required." In the final rule OSHA has revised the existing language to reflect the variety of options available and to express the Agency's intent clearly.

Final rule paragraphs (g)(4)(iv) through (vi) (proposed as paragraphs (e)(4)(iv)-(vi)) specify the criteria necessary to ensure that the midrails, screens, mesh, and baluster type protection required by paragraph (g)(4)(iii) will be properly placed and effective. Paragraph (g)(4)(iv) requires that midrails, when used, be installed at a height midway between the top edge of the guardrail system and the platform surface. Paragraph (g)(4)(v) requires that screens and mesh, when used, extend from the top edge of the guardrail system to the scaffold platform, and along the entire opening between the supports. Paragraph (g)(4)(vi) requires that intermediate vertical members (such as balusters or additional rails), when used, be not more than 19 inches (48 cm) apart.

The SSFI and SIA (Exs. 2-367 and 2-368) recommended the addition of the word "approximately" to the midrail height required in paragraph (iv). These commenters argued that, without the flexibility provided by this word, the provision was unnecessarily restrictive and did not properly address varying

platform heights (such as where adjoining platforms overlap) or the height variations allowed for top rails. OSHA agrees that it is appropriate to allow for such variation, and the final provision reflects this suggestion.

Paragraph (g)(4)(vii) of the final rule provides that top rails or equivalent members be capable of withstanding, without failure, a force applied in any downward or horizontal direction at any point along their top edge of at least 100 pounds (445 n) for guardrail systems installed on single-point adjustable suspension scaffolds and on two-point adjustable suspension scaffolds, and at least 200 pounds (890 n) for guardrail systems installed on all other scaffolds.

The strength criteria for guardrail systems on single-point adjustable and two-point adjustable suspension scaffolds differ from the criteria set for guardrails used on other types of scaffolds because of the functions guardrails serve on these types of suspension scaffolds. Fall protection on these suspension scaffolds is provided by a combination of personal fall arrest systems (PFAS) and guardrails, rather than by either guardrails or PFAS alone. Guardrails on single-point adjustable and two-point adjustable suspension scaffolds delineate the scaffold edge, restrain movement, provide handholds, and prevent misstepping. A guardrail system can serve these functions without having the strength that would be needed if the guardrails were the primary means of providing fall protection. Therefore, OSHA has set the minimum capacity for guardrail systems used on single-point and two-point scaffolds at 100 pounds rather than at 200 pounds.

This is the same substantive requirement as was proposed in paragraph (e)(4)(vii); however, the language has been modified as discussed above to replace the proposed terms "Type I" and "Type II" guardrails with the pertinent performance criteria. One commenter (Ex. 2-44) recommended that the force requirements be changed to 100 pounds for Type I top rails and 80 pounds for Type II top rails. OSHA has maintained the proposed strength requirements, i.e., 100 pounds, for all top rails because the Agency believes that they are necessary to prevent employees from breaking through top rails if they fall against them.

Final rule paragraph (g)(4)(viii) provides that when the loads specified in paragraph (g)(4)(vii) are applied in a downward direction, the top edge may not drop below the height above the platform surface prescribed in paragraph (g)(4)(ii). Proposed paragraph

(e)(4)(viii) was identical to the corresponding requirement in the final rule except that the proposal limited deflection to 38 inches on supported scaffolds (Type I guardrails) and 36 inches on suspended scaffolds (Type II guardrails). The parallel final rule provision does not contain the proposed guardrail designations, for the reasons discussed above, and the provision also reflects minor editorial changes.

Paragraph (g)(4)(ix) of the final rule states that midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members must be capable of withstanding, without failure, a force applied in any downward or horizontal direction at any point along the midrail or other member of at least 75 pounds (333 n) for guardrail systems with a minimum 100 pound top rail capacity, and at least 150 pounds (666 n) for guardrail systems with a minimum 200 pound top rail capacity. Except for the changes in guardrail system terminology discussed above, this provision is the same as proposed paragraph (e)(4)(ix).

The 150 pound force requirement is not specified in the existing standard. However, the existing requirements (e.g., § 1926.451(b)(15) et al.) require midrails to be made of 1 x 6-inch lumber (or other material providing equivalent protection). The existing standard also requires midrails to be not more than 8 feet long (§ 1926.451(a)(5)), and to be made of a minimum 1,500 fiber stress construction grade lumber (see § 1926.451(a)(9)). On the average, such wooden midrails can support loads up to approximately 160 pounds before breaking. Therefore, OSHA is replacing the specific reference to 1 x 6-inch lumber with the performance criterion of 150 pounds force. Similarly, OSHA has adopted a performance criterion of 50 pounds for toeboards in final rule paragraph § 1926.451(f)(3).

The only commenter (Ex. 2-44) on this issue recommended that the proposed force requirements be changed to 75 pounds for Type I and 40 pounds for Type II midrails. OSHA has not made this change because the Agency believes that the final rule's strength requirements for midrails are necessary to prevent employees from breaking through midrails or other intermediate members of the guardrail system. In addition, OSHA has not maintained the distinction between Type I and Type II midrails made in the proposal.

Final rule paragraph (g)(4)(x) (proposed paragraph (e)(4)(x)) provides that a separate guardrail section is not required on the ends of suspension scaffolds when the scaffold's support system (stirrup) or hoist prevents

passage of employees. One commenter (Ex. 2-8) suggested that OSHA specify a maximum space of 10 inches between the hoist or stirrup and the side guardrail or structure. Another commenter (Ex. 2-28) suggested that the language of this paragraph be changed from "does not allow passage" to "does not allow normal passage without climbing over the stirrup." OSHA has not made the suggested changes because this requirement is clear as written.

Paragraph (g)(4)(xi) (proposed paragraph (e)(4)(xi)) of the final rule requires that guardrail systems be so surfaced as to prevent injury to an employee from punctures or lacerations, and to prevent the snagging of clothing. This provision is consistent with § 1926.502(b)(6), which sets criteria for guardrails used in construction, other than on scaffolds.

The language of the final rule is effectively identical to that in the proposed rule, except that the proposed rule contained the words "which could cause an employee to fall." OSHA used those words to explain that one reason that guardrail systems should have smooth surfaces is to prevent snagging of clothing. OSHA did not intend by this language to limit protection to those situations where snagging would actually result in a fall. OSHA realizes that other hazards, such as exposure to falling objects, could arise if an employee's clothing snagged on a guardrail surface. In the final rule, OSHA has revised the proposed language accordingly.

The SSFI and SIA (Exs. 2-367 and 2-368) objected to the inclusion of this provision in the final rule. Both commenters stated that the provision would be "impractical in the construction industry because of the different types of equipment used," and would be "unquestionably over-restrictive for the construction industry." The SIA (Ex. 2-368) added "As worded, even the standard guardrail posts could be considered hazardous." OSHA believes that this existing requirement is still needed and is promulgating the proposed provision as editorially revised. The Agency does not intend this provision to be interpreted to mean that guardrail system components have sanded or finished surfaces. Instead, OSHA intends that such surfaces be free of breaks and jagged edges that could cause cuts or lacerations, or snag employee's clothes.

Paragraph (g)(4)(xii) of the final rule, which is effectively identical to proposed paragraph (e)(4)(xii), requires that top rails and mid rails not be so long as to constitute a hazard. This is

identical to the corresponding provision in subpart M, (Fall protection) § 1926.502(b)(7), and is intended to protect employees from projection hazards.

Paragraph (g)(4)(xiii) of the final rule, which is identical to proposed paragraph (e)(4)(xiii), prohibits the use of steel banding and plastic banding as top rails or mid rails. Although such banding can often withstand a 200 pound load, it can tear easily if twisted. In addition, such banding often has sharp edges which can cut a hand if seized. This is identical to the corresponding provision in subpart M (Fall protection), § 1926.502(b)(8).

Paragraph (g)(4)(xiv) of the final rule requires that guardrail systems using manila, plastic or synthetic rope as rails be inspected by a competent person as frequently as necessary to ensure that the guardrails comply with the performance criteria in final rule § 1926.451(g). This provision has been added based on the response to Hearing Notice Issue L-10.

Issue L-10 sought testimony and related information on an ACCSH recommendation (Tr. 212-214, 6/9/87) that the Agency bar the use of manila rope and plastic rope as top rails and mid rails of guardrail systems used on scaffolds. This recommendation reflected ACCSH's concern that manila rope and plastic rope can lose strength quickly when exposed to water and sun.

The SIA (Exs. 5a-16 and 10, Tr. 3/22/99, pp. 160-161) disagreed with this view on the grounds that it should not be necessary to restrict the type of material that can be used because other provisions of the standard spell out system strength requirements for guardrails. Another commenter (Exs. 5a-3 and 13) agreed, noting that, particularly for short-term use, "a rope is handy, adequate, and perfectly safe." This commenter stated that these ropes "should not be barred from use on scaffolds providing they are capable of supporting a 100-pound load (Type II) or a 200-pound load (Type I) applied in any direction without excessive deflection."

Zurn Industries (Ex. 2-81) commented that "plastic rope" should be defined, but did not provide such a definition. Zurn also stated "[t]here are synthetic ropes made of plastic materials that do not sag or lose strength when exposed to water or sun." This commenter also suggested applying performance language to all materials used for guardrails since future technology might provide more advanced types of plastic rope.

After carefully considering the above comments and testimony, OSHA

believes that it is not necessary to prohibit the use of manila, plastic or synthetic rope as guardrails on scaffolds. The Agency realizes that these types of ropes can deteriorate over time from environmental exposure. However, the Agency also realizes that such ropes can have a useful lifespan before significant deterioration occurs. Consequently, OSHA is promulgating final rule § 1926.451(g)(4)(xiv), which allows the use of plastic, manila or synthetic rope only on condition that such ropes be inspected as often as necessary to ensure their integrity. This provision is consistent with the approach taken in § 1926.502(b)(16), which sets generic performance criteria for guardrails used in construction.

Paragraph (g)(4)(xv) of the final rule permits the use of crossbracing in lieu of either a mid rail or a top rail when certain criteria are met. This provision is based on responses to NPRM Issue 13 and the March 29, 1993, reopening of the record. In particular, crossbracing would be accepted in lieu of a top rail when the crossing point is between 38 and 48 inches above the work surface. Also, crossbracing would be accepted in lieu of a mid rail when the crossing point is between 20 and 30 inches above the work surface. In addition, the end points of each upright must be no more than 48 inches apart, which will reduce the slope of the crossbracing and result in a surface that is similar to that of a standard guardrail.

The Agency received over 30 comments in response to Issue 13 and the March, 1993 reopening of the record on the issue of the use of crossbracing in lieu of guardrails (Exs. 2-13, 2-14, 2-20, 2-22, 2-26, 2-29, 2-30, 2-37, 2-43, 2-54, 2-55, 2-128, 2-330, 2-367, 2-368, 2-390, 2-476, 34-1, 34-9, 34-10, 34-11, 34-12, 34-15, 34-17, 34-19, 34-22, 34-29, 34-32, 34-34, 34-35, 34-37, 34-39, 34-43, 34-46, and Tr. 6/9/87, pp. 121-126). These comments are discussed below.

Issue 13 of the NPRM sought comments concerning whether OSHA should accept crossbracing on intermediate levels of supported scaffolds as an alternative to the existing and proposed rules requiring guardrail systems on such levels. The Issue raised the question of whether crossbraces are as effective as guardrail-type systems in preventing falls, and asked for comments on two sets of provisions that had been developed by the SIA and other interested industry groups.

Issue 13 presented the first three alternatives as a group (hereafter Items 1(a)-(c)). Item 1(a) would have allowed crossbracing in lieu of a mid rail if the crossing point was at or between 20 and

32 inches above the work surface. Item 1(b) provided that crossbracing would be allowed in lieu of both midrail and toprail if the crossing point was at or between 30 and 48 inches above the work surface and the end points of the uprights were 54 inches, or less, apart. Item 1(c) would have prohibited the use of crossbracing in lieu of a toprail or midrail on the top level of a scaffold (Issue 13 repeated this suggested provision as Item 2(c)).

Issue 13 also presented a second set of alternatives for crossbracing (hereafter Items 2(a)-(d)). Item 2(a) provided that crossbracing would be allowed in lieu of a toprail if the crossing point was at or between 39 and 49 inches above the work surface and the endpoints of the uprights were 54 inches, or less, apart. Item 2(b) provided that crossbracing would be allowed in lieu of a midrail if the crossing point was at or between 20 inches and 30 inches above the working surface. Item 2(d) would prohibit the use of crossbracing in lieu of both the toprail and midrail on the same scaffold level at the same time.

Commenters to Issue 13 were split into two groups: those supporting (Exs. 2-14, 2-20, 2-22, 2-26, 2-30, 2-53, 2-55, 2-367, 2-368, 2-390, and 2-476) and those rejecting (Exs. 2-13, 2-29, 2-37, 2-43, 2-54, 2-128, and ACCSH) the use of crossbracing in lieu of guardrails.

The ACCSH (Tr. 6/9/87, pp. 121-129) and six commenters (Exs. 2-13, 2-29, 2-37, 2-43, 2-54 and 2-128) opposed OSHA recognizing crossbracing as a substitute for a standard guardrail. One commenter (Ex. 2-13) stated "that there is no substitute for the protection afforded by a constant-height guardrail". The same commenter added that "there is no industry standard to allow a substitution in that the OSHA standards have required guardrail systems since 1971".

On the other hand, those commenters favoring crossbracing argued that crossbracing should be allowed in lieu of the *entire* guardrail system (Exs. 2-14, 2-20, 2-26, 2-30, 2-55, 2-367, 2-368, 2-390, and 2-476), or that crossbracing should be permitted on intermediate levels (Ex. 2-53), or that it should be permitted as a midrail only if the midpoint of the "X" was 20 to 32 inches from the platform (Ex. 2-22).

Specifically, commenters in the group favoring crossbracing argued that requiring guardrails in all situations could result in structural instability (Ex. 2-14), was impractical, increased the likelihood of accidents, could cause problems when attempting to attach guardrails to the scaffold frame, and might raise issues of economic

feasibility (Ex. 2-368). Some of these commenters also argued that available statistics did not support retention of the existing rule's prohibition against the use of crossbracing in lieu of guardrails (Exs. 2-20, 2-55, 2-367, 2-368, and 2-390).

For example, one commenter (Ex. 2-14) stated:

If cross braces and guardrail cannot be placed on the same studs, and only toprails and midrails are used to connect a run of scaffold frames other than the top run, a very hazardous structural situation is created. This is due to the lack of triangulation which crossbraces provide.

The SIA (Ex. 2-368) argued that:

Each time workers completed one level they would have to remove the guardrail posts and rails, install frames and cross braces, plank the next level, install guardrail posts and rails and repeat the procedure at each level.

The increased work would create a greater possibility of accident than that which it proposes to prevent.

The SIA also commented, argued that:

It is impractical and economically unfeasible to require manufacturers to call in all their scaffolds for refurbishing. There is no way the owners of scaffolds would comply nor any way the manufacturer could force them to do so. The result would be a far greater hazard due to alteration of the scaffold frames by persons not qualified to perform the delicate welding required on steel scaffold. It is further impossible when you consider the fact that there are hundreds of thousands of separate owners of scaffold frames manufactured by numerous manufacturers, many of which are no longer in business.

The AGC (Exs. 2-20, 2-55, and 2-390) stated that crossbracing can be used as an effective guardrail, because "studies do not reflect actual field conditions and accident statistics do not reflect the need for the existing standard." OSHA notes, however, that inadequate accident statistics and that lack of detailed annotation about the details of accidents that are reported should not be taken as evidence that no relationship exists.

Based on its review of the above-discussed comments, OSHA decided that more information was needed in order to determine if the Agency should allow the use of crossbracing in lieu of guardrail top rails or midrails. Accordingly, on March 29, 1993, OSHA reopened the public record on subpart L (58 FR 16509) for additional input. In particular, the Agency requested comments regarding the extent to which supplemental rail systems could be used with crossbraces to meet the guardrail requirements of subpart L.

The commenters to the Reopening of the record either agreed with or opposed

the use of crossbracing in lieu of a guardrail in about the same proportions as the earlier commenters. Their comments, which are closely related to those addressed by the earlier commenters on this issue, are only briefly summarized below:

—Those opposed to the use of crossbracing (Exs. 34-1, 34-11, 34-19, 34-22, 34-29, 34-34, and 34-35) argued that crossbraces would not provide protection equivalent to that provided by standard guardrails, because crossbracing lacks the uniform height and consistent spacing between toprails and midrails that are found in guardrail systems and are necessary for adequate protection (Ex. 34-11); because there are variations in attachment heights, distances between crossmembers, and the strength of the attachment points where crossbracing is used (Ex. 34-34); and because the use of crossbraces may promote shortcuts in scaffold erection since employers might fail to measure the points of the crossbracing or to add toeboards (Ex. 34-19). In addition, one commenter stated that crossbraces should be supplemented by midrails and toprails because employees may fall through the triangular void on either side of the intersection of the braces, and added that crossbraces may give a false sense of security (Ex. 34-35), and another (Ex. 34-22) stated that commercial scaffolds are all capable of being fitted with conventional guardrails, and that crossbraces can, at best, only be used to replace either the toprail or midrail, not both.

—Those supporting the use of crossbracing in lieu of guardrails (midrail or toprail) urged OSHA to adopt certain height requirements for the crossing points of the crossbracing. For example, five commenters (Exs. 34-9, 34-10, 34-12, 34-17, 34-37) stated that crossbracing could be substituted for a midrail as the crossing point of the brace is between 20 and 31 inches above the work surface, while others argued that crossbracing could be used in lieu of a toprail or midrail if the crossing point fell in the range of 30 to 48 inches above the working surface. Another group of participants (Exs. 34-9, 34-10, 34-12, and 34-17) were of the opinion that crossbracing substituting for a midrail should have a crossing point in the 20- to 30-inch range. A large number of commenters (Exs. 34-9, 34-10, 34-12, 34-17, 34-32, 34-37, and 34-39) stated that end points of the crossbraces must be no more than 54 inches apart.

Another group of commenters (Exs. 34-5, 34-9, 34-10, 34-12, 34-17, 34-22, and 34-29) provided information on supplemental rail systems, such as those produced by Waco, Safway or Nail. These commenters stated that such systems are feasible and would provide protection equivalent to guardrails that comply with proposed subpart L in certain situations.

Donald Nail (Ex. 34-15) commented as follows:

* * * I have devised a way to enhance scaffold safety. The safety rail which I invented can be conveniently attached to scaffold crossbraces, thus eliminating the excuses of those employers and employees who simply do not want to put them up.

This invention is not currently on the market due to resistance from the scaffold and construction industries. If OSHA regulations were changed to require a guardrail with scaffolding, employer compliance would follow without undue economic hardship. The average cost would be about \$5 (plus the rail) per frame as opposed to current systems averaging \$30.

The basic concept for my automatic guard rail is that you cannot erect a welded-frame scaffold without crossbraces. The automatic guardrail would be permanently attached to the crossbraces with a slide ring on each end of the rail. . . . The guard rail will fold up with the crossbraces when they are taken down for shipping or storage. The crossbraces are easier and quicker to install with the guard rail attached than without, not to mention safer. If the guard rail is permanently attached to the crossbraces the workmen will have installed the guard rails automatically, thereby helping to reduce numerous fatalities and thousands of scaffold injuries each year.

However, commenters opposed to the use of supplemental rail systems (Exs. 34-32, 34-37, and 34-39) argued that the Safway panel can only be installed on walk-through frames that have attachment members on both sides. They added that these systems were designed to be used in cases where crossbracing is not required in every bay.

SIA (Ex. 34-37) commented that the Waco system has not been accepted by industry because: (a) It can only be used on a specific type scaffold frame; (b) It increases the number of pieces three-fold because it also requires two additional rails; (c) It significantly increases the dead load on the scaffold; (d) It has not proved to be economically feasible. The commenter added that Patent Scaffolding Co. has had a similar device consisting of four pieces for 10 years, but that it has not been widely used for the same reasons.

In addition, the SIA contended that the Nails Safety Rails system is not feasible because:

(a) It is a proprietary system which cannot be used universally.

(b) It cannot be used with angle braces which account for 60% of most inventory.

(c) When attached to the crossbrace it becomes permanent (since it is riveted on) and therefore, by its very nature must be used (with the crossbrace) where it would not be required—thus adding considerable more dead load to the scaffold.

(d) It requires another inventory item not usually included in stock.

(e) It requires extra attachments to the scaffold frame.

(f) It creates costly maintenance problems when plaster and cement hinder sliding the rail.

(g) It is not cost effective.

The Agency finds that the supplemental railings discussed above can be used as guardrails in some situations. However, these supplemental systems are not compatible with all scaffolds, and will thus not address the guardrail vs. crossbracing issue. In addition, based on the determination, discussed above, that crossbracing can be used safely in lieu of either a midrail or a toprail, but not both, the Agency finds no reason to mandate the use of these supplemental railings. Employers may still use these railing in situations where they are appropriate to protect employees working on scaffolds from fall hazards.

After carefully reviewing the extensive record on this issue, the Agency has determined that it is appropriate to allow crossbracing in lieu of a midrail or a toprail (but not both). The crossing point heights and crossbrace endpoint distance spelled out in the final rule are based on a combination of those raised in Issue 13 of the NPRM and those specified in the California code and reflect OSHA's evaluation of the record as a whole.

OSHA disagrees that crossbracing can be used in lieu of both the midrail and the toprail of a standard guardrail system. The principal reasons for this determination are that the voids on each side of the intersection of the crossbraces present a serious fall hazard to employees working on scaffolds, and that the uneven height and spacing of crossbraces also contribute to the fall hazard. For example, if OSHA permitted crossbracing in lieu of both a toprail and a midrail, the voids below the crossing point of the crossbrace could be as high as 48 inches. This would be inconsistent with good safety practice and with subpart M of this part (Fall protection), which requires that openings in walls or other vertical surfaces not exceed 30 inches in height unless a guardrail is installed. In addition, Review Commission decisions (see, for example, 10 OSHRC 1937 and 7 OSHRC 1951)

have consistently upheld OSHA's position that crossbracing is not equivalent to a guardrail in the degree of protection provided. Support for the position taken in the final rule also comes from California, where the State Code initially allowed the use of crossbracing in lieu of a guardrail system but was changed in 1976 to limit the use of crossbracing as only a midrail or a toprail, but not both. A review of California's experience shows that permitting the use of crossbracing in lieu of either a midrail or a toprail has not compromised employee safety. Washington State and Arizona both allow such use of crossbracing; OSHA notes that these three states together account for well over 10 percent of all U.S. construction work. In addition, specifics of the California code agree with those in the final rule. For example, California accepts crossbracing as a toprail if the intersection of the "X" occurs at 45 inches (+/- 3 inches). Issue 13 suggested a range of 39 to 49 inches for the height of the crossing point, and the final rule accepts a range of 38 to 48 inches to reflect the lower limit of guardrail height permitted by this final subpart L, and the upper limit permitted by the California code.

In addition, the final rule specifies that the end points of each upright be no more than 48 inches apart, not 54 inches as suggested by many commenters and raised in NPRM Issue 13. This spacing (48 inches) is consistent with the California code and will reduce the slope of the crossbracing and result in a flatter surface that is more consistent with that of a standard guardrail, and will provide equivalent protection.

The Agency has concluded that crossbracing where the crossing point is between 20 and 30 inches can serve safely as a midrail since the use of a standard top rail will provide the uniform height that the Agency has determined is necessary, while the use of a toe board will limit the size of any openings (voids) on either side of the crossing point.

Similarly, OSHA believes that where the crossing point occurs in the 38- to 48-inch range the crossbracing must be supplemented by a midrail. Otherwise, an opening as high as 48 inches could occur, allowing an employee to fall. These conditions would also occur if crossbracing were permitted to be used in lieu of a complete standard guardrail. Accordingly, the final rule contains provisions allowing use of crossbraces as a substitute for either the midrail or toprail, but not both, providing that the crossing point and end point distances specified in the final rule are observed.