

ISSUE NO. 2

Construction Specifications and Work Practices.

In continuing the negotiations, OSHA seeks to clarify the existing standards and determine whether additional provisions need to be included for the construction specifications and work practices for the erection of buildings, bridges, tanks, towers and other structures of different configurations; or if the standards should include only specifications for the safe erection of single- and multi-story buildings. Should it be determined that subpart R is to apply to all types of structures, including those constructed with different structural configurations, OSHA seeks to resolve and determine how the specifications should be expanded to cover these additional types of structural configurations.

The following list includes the specific sub-issue topics that have been raised concerning revisions and additions to the standard in discussions by OSHA and its Advisory Committee on Construction Safety and Health (ACCSH) and by some employer and employee groups who expressed the same concerns:

- Sub-issue 2(a) -- Lateral stability of long limber bridge members
- Sub-issue 2(b) -- Tandem load ("Christmas-tree") lifting
- Sub-issue 2(c) -- The meaning of the term "longspan" and the bridging requirements for installing joists and trusses
- Sub-issue 2(d) -- Two-bolt versus one-bolt attachments for connecting the ends of beams in shear connections
- Sub-issue 2(e) -- Double-connections and two-bolt connections
- Sub-issue 2(f) -- Column stability and column-base attaching requirements
- Sub-issue 2(g) -- Planking and decking the floor below the beams and joists for flooring and roofing systems
- Sub-issue 2(h) -- Safety measures for installed projections on the upper surfaces of beams
- Sub-issue 2(i) -- Work-practice rules for steel erection

Sub-issue 2(j) -- Slippery paint coatings and the safe coefficient of friction (COF) for the upper surfaces of beams.

Sub-issue 2(k) -- Prohibiting work by other trades while the erecting of the temporary steel structure is in progress

Sub-issue 2(l) -- Overhead protection for employees immediately below the overhead connecting operations

Sub-issue 2(m) -- Minimum size (diameter and length) for tag lines

Sub-issue 2(a). Lateral stability of Long Limber Bridge Members.

Through the negotiation process, OSHA seeks to resolve the following concerns over the lateral stability of long limber bridge

members: (1) whether to include in subpart R the specific provisions covering the erection of bridges as contained in the ANSI A10.13-1988 "Standard for Steel Erection," concerning the safe

handling of long limber bridge members; and (2) if this provision should apply to different types of structural configurations, determine: a) how the provision should be revised to cover the stability of long limber members of materials other than steel, and

(b) which are the different types of structural configurations that

should be covered by this provision.

Background

In a memorandum of May 26, 1989 (Ref. 1), to the Advisory Committee on Construction Safety and Health (ACCSH), OSHA attached

a draft issue No. 2 (See attachment, pp 39 - 42, dated 5/25/89) concerning long limber bridge members to be discussed at the next committee meeting of June 14-15, 1989. However, in the meeting of

June 15, 1989 (Ref. 2) the committee members adopted a motion to table discussing all issues concerning subpart R, "... pending a decision by the Secretary of Labor [concerning negotiated rulemaking]." (Ref. 2, Tr. p. 2-86). On August 24, 1989, OSHA again sent a memorandum to the ACCSH (Ref. 3), attaching the draft

issue No. 2, (See attachment, pp 39 - 42, dated 5/25/89) for their

consideration at the next committee meeting of September 14, 1989.

At that meeting of September 14, 1989 (Ref. 4), the ACCSH adopted a motion (Tr. 43-46) revising the draft NPRM sent to them by OSHA and re-named it as an "Appendix-3" document, which contained the ACCSH's recommendations to OSHA for revising subpart R. In their Appendix-3 document (Ref. 4a, p. 2), the ACCSH included a recommendation for a definition of a "Safety Erection Plan." The definition indicated a need for a provision to require that temporary supports such as "... stiffening trusses, or other elements required to assure lateral stability of long limber members during hoisting and after placement shall be indicated."

Given the committee's deliberations in the above meetings, OSHA believes additional information is needed on these specific provisions which address bridge construction and are not part of existing subpart R. The ANSI A10.13 -1989, Steel Erection Safety Requirements for Construction and Demolition (Ref. 5, Par. 11.2.2 - 11.2.5, p. 12), contains provisions addressing these unique aspects of steel erection on bridges, and would require that long limber beams and girders be laterally stable when lifted. While stability may be an intrinsic property of some members, other members such as beams made of long welded sections or "of composite design" may require a means to provide additional stability, such as stiffener trusses. OSHA has been asked to consider adding those requirements so that the employer must determine these needs before construction erection begins and that the determination must be based on an evaluation by a registered professional engineer. To facilitate negotiation and comment, OSHA is presenting a revision of the ANSI provisions addressing the above issues as follows:

(1) The lateral stability of long, limber beams or girders, especially when made of long welded metal plate and metal sections or "of composite design, shall be determined before lifting" the member; "where required, stiffener trusses or other means shall be used to make the beams or girders laterally stable for lifting."

(2) "A girder or truss shall be secured and braced before it is released from the lifting hitch and load falls."

(3) "Trusses and beams shall be braced laterally and progressively during construction to prevent buckling or overturning." The first member shall be braced or guyed against shifting before succeeding members are erected and secured to it. "The total system shall be braced and stabilized by anchoring to the foundation," to anchors buried in the ground, "or by other equivalent methods."

(4) "Girders, trusses, and beams shall be controlled by at least one tag line during hoisting."

#### REFERENCES.

1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of May 26, 1989, to Members of the Advisory Committee on Construction Safety and Health on

"Proposed Revision of Subpart R --Steel Erection" with attachments, including a specific issue No. 2 (pp. 39 - 42, dated 9/25/89).

2. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on June 15, 1989 (p. 2-86).

3. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of Aug 24, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection" with attachments, including specific issue No. 2 (pp. 39 - 42, dated 5/25/89).

4. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on September 14, 1989 (Tr. 43-46).  
4a.

"Appendix 3," Submitted by the ACCSH Work Group for Subpart R -- Steel and/or Other Structural Material Erection (Par. 1926.750 (a)  
"Safety erection plan," p. 2).

5. ANSI A10.13-1989, Steel Erection -- Safety Requirements for Construction and Demolition Operations; American National Standards Institute, Inc. 1430 Broadway, New York, N. Y. 10018.

Sub-issue 2(b). Tandem load ("Christmas-tree") lifting

Through the negotiation process, OSHA seeks to resolve the following concerns over: (1) whether to adopt provisions in subpart

R to regulate the dangers of lifting structural metal members in tandem loads ("christmas-tree lifting"), such as when two or more separately rigged beams or pieces of a load are hoisted in one lift

and on the same hook; and (2) if this provision should apply to different types of structural configurations.

Background

In addition to the restrictions that are indicated in the "Structural Manual for Ironworkers, Manual V-Volume I" (See Ref. 9,

Ex. 4a-4b below), OSHA has received a letter of May 10, 1976 from then general president John H. Lyons (Ref. 1, p. 9) of the International Association of Bridge Structural and Ornamental Iron

Workers (AFL-CIO) Union, to OSHA's Assistant Secretary Morton Corn,

requesting to include provisions in subpart R to regulate the practice of "... christmas-treeing iron." In responding to the request, OSHA sent a memorandum on June 30, 1987 ((Ref. 2), to the

Advisory Committee on Construction Safety and Health (ACCSH), which

attached a draft revision to subpart R (Dated June 25, 1987) to cover the hoisting of tandem (Christmas-tree) loads. At the August

4, 1987, ACCSH meeting (Ref. 3) the committee members discussed the

draft standard, and unanimously recommended that the practice should be addressed in subpart R (Tr. 149, 8/4/87), "... and that no one should be allowed to stand under the load under any circumstances." A commenter at that same ACCSH meeting (Tr. 177, 8/4/87) indicated that as long as proper rigging is used and the overload capacity requirements are observed in abiding by the present rules [per 1926.251(f)] "christmas-treeing" should be allowed, and stated that: "From a practical standpoint, it makes sense to lift six 200-pound members at one time if the same crane can lift one 10,000 [pound] member a second time." "...It's just a

matter of productivity."

Incorporating some of the committee's recommendations, OSHA

sent a memo dated May 26, 1989 (Ref. 4), which attached copies of the revised issue (No. 3, pp. 42-44) on tandem ("christmas-tree") loads and a revised draft NPRM (pp. 69-88) for subpart R, to the ACCSH members for their consideration and discussion at their next meeting on June 14-15, 1989. However, In the meeting of June 15, 1989 (Ref. 5), due to a unanimous decision to table discussing subpart R, "... pending a decision by the Secretary of Labor [concerning negotiated rulemaking]," the committee made no recommendations on the issue concerning tandem loads ("christmas-tree") lifting (Tr. p. 2-86).

On August 24, 1989 OSHA again sent a memorandum to the ACCSH (Ref. 5), attaching the same draft issue No. 3, together with a draft NPRM for subpart R, for their consideration at the ACCSH meeting of September 14, 1989. At their meeting of September 14, 1989 (Ref. 7), the ACCSH adopted a motion (Tr. 43-46) revising the draft NPRM sent to them by OSHA and re-named it as an "Appendix-3" document (Ref. 7a), which contained the ACCSH's recommendations to OSHA for revising subpart R. However, the Appendix-3 document did not treat the matter of christmas-tree lifting.

From the above deliberations, other sources of information were reviewed by OSHA including the existing standards and other field memoranda. Regarding the existing crane safety standards and other safety rules on crane hoisting operations, OSHA's general provisions for the use of cranes and derricks requires that employers comply with the manufacturers' specifications and limitations applicable to the operation of any and all cranes and derricks, and in 1926.550 (a), the Agency requires that: "... Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determination of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded."

Those provision also cover the rigging equipment by requiring that: (a) "... Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer." In another paragraph in 1926.550(b)(2), OSHA references the ANSI B30.5-1968 (Ref. 8), Safety Code for Crawler, Locomotive and Truck Cranes, Sec. 5-3.3.f, under "Moving the Load," (Ref. 8, pg 19),

which states that "The operator should avoid carrying loads over people." Also, OSHA has specific provisions regarding elevated concrete buckets and precast concrete members in 1926.701(e) and 1926.704(e); and specific provisions for rigging equipment and hooks in 1926.251(f) require the employer to meet the manufacturer's recommendations for safe working loads and the use of hooks.

In addition to the regulatory references, OSHA is aware of several references to manufacturers' documents which were contained in an OSHA field instruction memorandum (Ref. 9) containing the following exhibits: (1) One exhibit (1b), a page from the "Crane User's Manual" of the Construction Industry Manufacturers Association (CIMA) warns: "Never hoist two or more separately rigged loads in one lift, even though the combined load is within rated capacity;" (2) another exhibit (2b), a page from the same CIMA document advises to "[b]e sure everyone is in the clear before swinging or moving in any direction. NEVER swing or position hook or load over ground crew or truck cab;" and other exhibit pages (4a-4b) from the "Structural Manual for Ironworkers, Manual V-Volume I" indicate that tandem loads "... shall only be permitted in extremely unusual and absolutely necessary situations, and "... requiring adequate safety precautions" [possibly by requiring the use of tag lines, spreader attachments, etc., designed and approved by a qualified professional engineer], "... to insure that no employees will be placed in a hazardous position."

Other sources of information have indicated to OSHA that the practice of hoisting tandem loads ("christmas tree lifting") subjects connectors as well as employees on the lower levels to the hazard of being struck by a second suspended beam, such as the following: (1) On 3/11/92, in Raleigh, N. C. (Ref. 10) a rigger was hooking up steel beams onto a "christmas tree lift with bullchokers;" where the crane hook was hooked to one main (longer) load line with several cable slings attached at intervals below the crane hook. The "bullchoker" attachments to the main line were covered by a metal reinforcing "bull-ring." The rigger had hooked up the first two beams of the christmas tree lift and went to hook up the third one while the first two were being raised by the crane. The second beam got caught on the "bull-ring" of a lower



attachment on the main cable causing the beam to slip off and fall across the rigger's legs. They had to use a crane to move the beam off his legs; (2) on 7/2/90, in Austin, Tx. (Ref 11) a connector was crushed between the first beam and the beam above him as he was bent over to disconnect the first choker from the bottom beam of a christmas tree lift on "bull-chokers." The crane operator "had taken his eyes off of the connector for a few seconds, felt the load shift and quickly hit the brake after the load had dropped 7 to 8 feet crushing the connector; and (3) On 4/23/86, in St. Louis, Mo. (Ref. 12), after connecting a series of beams of a christmas tree lift, an employee fell 54 feet when he attempted to disengage a lower empty hook that got caught on the lower flange of the beam he was on. The beam rolled as the hook became disengaged causing the employee to loose his balance and fall.

Based on the different approaches and the events described above, the regulatory wording for the provisions covering tandem (christmas tree) lifting are presented below as a possible guide for purposes of negotiation, as follows:

- (1) No employee shall be permitted under loads of steel or other structural metal members being lifted or tilted into position except only as needed to receive and make the end connections on each member.
  
- (2) Loads shall not be raised, lowered or moved unless the riggers and all other employees are removed from under the load and out of harm's way by controlling the ascent or descent of the load by tag lines or other means.
  
- (3) Two or more separately rigged loads or pieces of a load shall not be hoisted on the same hook or in tandem (one higher than the other) on the same load line, except where safety provisions are made to protect the employees from hazards of being struck by the second or higher pieces.

#### References

1. Letter of May 10, 1976, from the International Association of Bridge Structural and Ornamental Iron Workers Union (AFL-CIO), to OSHA's Assistant Secretary, Morton Corn (p. 9).
2. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of June 30, 1987, to Members of

the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection," including attachments: (1) Copy of a draft Subpart R -- Steel Erection Standard (pp. 1 - 10, dated 6/25/87); and (2) Copy of a draft Subpart R -- Steel Erection Standard (pp. 1 - 7, dated 5/18/87).

3. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on August 4, 1987, pp. 149 & 177.

4. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of May 26, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection," including attachments: (1) Copy of a draft Subpart R -- Steel Erection Standard (pp. 69-88), and (2) "Specific Issues," (pp. 39-65).

5. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on June 15, 1989, p. 2-86.

6. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of Aug 24, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection," including attachments: (1) Draft standard revisions (p. 92, dated 9/14/89) and a copy of a "new draft of issue No. 12," (pp. 1-6, dated 6/2/89); (2) copy of a draft Subpart R -- Steel Erection Standard (pp. 69-88, dated 5/25/89); and (3) "Specific Issues," (pp. 39-64, dated 5/25/89).

7. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on September 14, 1989 (Tr. 43-46).

7a. "Appendix 3," Submitted by the ACCSH Work Group for Subpart R

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- Steel and/or Other Structural Material Erection.

8. ANSI B30.5-1968, Crawler, Locomotive and Truck Cranes ; American National Standards Institute, Inc. 1430 Broadway, New York, N. Y. 10018, p. 19.

9. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Memorandum of Feb. 17, 1988, for: all Area Directors, Region III, et al; subject: "Christmas Treeing-Steel Erection;" includes attached exhibit copy of pages from: Crane Safety Manual, construction Industry Manufacturers Association, Ex.

1a-1d; FMC Operating Safety, Link-Belt Cranes and Excavators, Ex.

2a-2c; Crane Handbook, Ex. 3a-3c; Structural Manual for Ironworkers, Manual V Volume I, Ex. 4a-4b.

10. 3/12/93, A telephone complaint (Complaint No. 074247305) from

an employee in Raleigh, NC. to OSHA's Office of Construction Standards. (Note: The employee's complaint was forwarded to the local OSHA Area Office in Raleigh, NC.). The employee (a

"rigger")

of Southern Rigging, Inc., complained about safety discrepancies including a "christmas treeing" accident on 3/11/92, which occurred

at a job location "near the intersection of Leesville-School Road and the Leesville Rd., in Raleigh, N.C." 11. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), "OSHA

Investigative Summary Reports (Austin, TX), OSHA-170 NR: 14397442, 7/02/90."

12. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), "OSHA Investigative Summary Reports, (St. Louis, MO), "OSHA-170 NR: 14424352, 4/23/86.

Sub-issue 2(c). The meaning of the term "longspan" and the bridging requirements for installing joists and trusses.

Through the negotiation process, OSHA seeks to resolve the following concerns over the meaning of its use of the term "longspan" : (1) whether the provisions requiring bridging should apply to all joists or trusses spanning 40 feet (12.2 m) or longer between the joist's bearing points, and not just to the Steel Joist Institute's (SJI) "Longspan Steel Joists" that are 40 feet or longer; or (2) should the overall length of the joist be considered, such as in cantilevered joists, for purposes of determining both the attaching and bridging requirements; and (3) if this provision should apply to different types of joist configurations, determine which are the specific configurations (For example: Open web joists and (solid web) beam joists that span 40 feet or more in length, heavy timber and glue-laminated joists, wood joists and trusses, precast concrete members, etc.) that should be covered by this provision.

#### Background

The term "longspan" is found in existing 1926.751(c)(2), which requires that a center row of bridging be installed for "...longspan joists or trusses, 40 feet or longer." Although OSHA believes the standard was intended to cover all joists that are 40 feet or longer, some employers have interpreted the use of this term to mean the standard covers only those joists listed in a commercially known catalog of a type of joists known as the "SJI-Longspan joists" design series. That design includes all "SJI Longspan Steel Joists" for clear spans to 96 feet and the "Deep Longspan Steel Joists" for clear spans to 144 feet, as listed in the SJI-1992, catalog of "Standard Specifications, Load Tables And Weight Tables For Steel Joists And Joist Girders" (Ref 1, pg. 29).

In responding to a request to revise the joists standard contained in a previous letter of May 10, 1976 from then general president John H. Lyons (Ref. 2, p. 2 - 3) of the International Association of Bridge Structural and Ornamental Iron Workers (AFL-CIO) Union, to OSHA's Assistant Secretary Morton Corn, OSHA sent a

memorandum on June 30, 1987 (Ref. 3), to the Advisory Committee on

Construction Safety and Health (ACCSH). Attaching to the memorandum were copies of OSHA's proposed draft changes to the joists section (Dated: June 25, 1987, pp. 7 & 8; and June 18, 1987,

pp. 5 & 6) to be discussed at the next ACCSH meeting. At the August 4, 1987, ACCSH (Ref. 4) meeting, the ACCSH's ad hoc study group on steel erection agreed that the bridging requirement should

apply to all joists of that length, "... 40 feet and over, [and] the standard should apply to [all] and not just a trade brand of joists (Tr. 150)." A commenter at that same ACCSH meeting (Tr. 171, 8/4/87), commented on the need to bolt the bar joists connections in order to maintain alignment of the temporary structure. He indicated that if the welding machine was not ready

"... you might get over two or three bays [without any welding being done] and someone would shake the building," the whole bay would spread and all the joists would come down. He indicated that

by allowing "welding or equivalent" in lieu of bolting, OSHA was "... permitting the joist manufacturers to go back to what we had 20 years ago, [ie: sending all joists to the worksite without bolt

holes]." For those stated reasons the commenter recommended that OSHA "eliminate the word welded" from the standard (Tr. p. 171). He also indicated that the standard should cover trusses separate from the paragraph covering the bridging requirements for joists. He stated that trusses are tied with purlins and joists with bracing, and because some trusses can have an unsupported length of

80 to 100 feet, he thought that "joists should be addressed separately from trusses and not in the same sentence [Ref. 4, Tr. p 171]."

At a subsequent ACCSH meeting of March 29, 1988 (Ref. 5) the committee discussed further the issue of joists concerning whether

to require that the one row of bolted bridging should be the row that is nearest the center of the joist, and that the number and location of the rows of bridging should be determined by a competent person (Tr. 307-311). Incorporating some of the committee's recommendations in a revised issue on "Longspan" joists, OSHA sent a memorandum dated May 26, 1989 (Ref. 6) attaching copies of the issue and a draft standard to be discussed

at the next ACCSH meeting on June 14-15, 1989. However, In the

meeting of June 15, 1989 (Ref. 7), the committee tabled the discussions on subpart R, "... pending a decision by the Secretary of Labor [concerning negotiated rulemaking]," (Tr. p. 2-86).

On August 24, 1989 OSHA again sent a memorandum to the ACCSH (Ref. 8), attaching the same draft issue No. 3, together with a draft standard for subpart R, for their consideration at the ACCSH meeting of September 14, 1989. At their meeting of September 14, 1989 (Ref. 9), the ACCSH adopted a motion (Tr. 43-46) revising the draft standard sent to them by OSHA and re-named it as an "Appendix-3" document (Ref. 9a), which contained the ACCSH's recommendations to OSHA for revising subpart R. In the Appendix-3 document the ACCSH again recommended that the standard require "... open-web steel joists (all S.J.I. series) spanning 40 feet (12.2 m) or longer," to have at least one row of bolted bridging near the center of the joist, and that "... a qualified person shall determine when additional rows of bridging are required and shall so indicate in the safety erection plan."

Based on the previous requests and the ACCSH committee's deliberations in the above meetings, OSHA seeks to review the entire requirement in existing 1926.751(c) to provide coverage for adequate bracing of the joists as well as for bracing of the temporary structure where the joists are placed. The following paragraphs were revised and re-numbered by OSHA from the ACCSH's recommendations contained in the "Appendix 3" (Ref.6) and are submitted for purposes of discussion as follows:

1926.753 Structural assembly.

(a) General requirements. (1) During the final placing

of solid-web structural members, the load shall not be released from the hoisting line until the members are secured with not less than two bolts, or the equivalent, at each connection to keep the members from rolling and to withstand anticipated loads without structural side-sway and failure. Bolts shall be drawn up wrench-tight.

(2) The sequence of permanently fastening and bracing shall be such as to maintain the stability of the structural frame at all times during construction. However, at no time shall there be more than four floors or 48 feet (14.6 m) of unfinished bolting or welding above the foundation or uppermost permanently secured floor.

(3) Open-web steel joists shall not be placed on any structural steel or other structural framework unless such framework is safely bolted, welded, or otherwise permanently secured.

(4) In steel and other structural metal framing, where open-web steel joists are utilized, and columns are not framed in at least two directions with steel and/or other structural members, a joist shall be field-bolted at all columns to provide lateral stability during construction.

(5) During the installation of each open-web steel joist (including but not limited to all Steel Joist Institute (SJI) series joists) that spans 40 feet (12.2 m) or longer between its end bearing points, at least one row of bolted bridging near the center of the joist shall be installed to provide lateral stability during construction. Such bridging shall be installed on each joist prior to slacking of the hoisting line supporting the joist.

(6) For all lengths of joists, a qualified person shall determine if additional rows of bridging are required to provide lateral stability (prior to slacking of the hoisting line) and shall so indicate in the safety erection plan.

(7) All open-web steel joists shall be bolted at their bearing points before the installation of bridging (other than the bridging required in (5) above, as determined by a competent person) or the landing of any construction loads onto the joists.

(8) When landing construction loads onto the joists, the loads shall be distributed so that the load capacity of any joist is not exceeded.

(9) Where loads are landed on the floor or any point of a structure under construction other than on open-web joists, all connections shall be fully fitted-up and tightened or welded and substantial supports provided to safely sustain such added weight.

(10) Tag lines shall be used for controlling the loads.

References

1. Steel Joist Institute, catalog of "Standard Specifications, Load Tables And Weight Tables For Steel Joists And Joist Girders - 1992," 1205 48th Ave. North, Suite A, Myrtle Beach, S.C. 29577.
2. Letter of May 10, 1976, John H. Lyons, General President, International Association of Bridge Structural and Ornamental Iron Workers (AFL-CIO), to Assistant Secretary Morton Corn.
3. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of June 30, 1987, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection," attaching a copy of a draft Subpart R -- Steel Erection Standard (pp. 1-10).
4. Advisory Committee on Construction Safety and Health, Transcript of meeting held on August 4, 1987, (Tr. 149 & 177).
5. Advisory Committee on Construction Safety and Health, Transcript of meeting held on March 29, 1988, (Tr. 307-311).
6. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of May 26, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection," including attachments: (1) Copy of a draft Subpart R -- Steel Erection Standard (pp. 69-88), and (2) "Specific Issues," (pp. 39-65).
7. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on June 15, 1989, p. 2-86.
8. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of August 24, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection," including attachments: (1) Copy of a draft Subpart R -- Steel Erection Standard (pp. 69-88), and (2) "Specific Issues," (pp. 39-65).
9. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on September 14, 1989 (Tr. 43-46, "Appendix 3"), (paragraphs 1926.752 (a), (b), (c), (d), (e), and (f)).
- 9a. "Appendix 3," Submitted by the ACCSH Work Group for Subpart R - Steel and/or Other Structural Material Erection (Par. 1926.752 (a) - (g)).



Sub-issue 2(d). Two-bolt versus one-bolt attachments for connecting the ends of beams in shear connections.

Through the negotiation process, OSHA seeks to resolve the following concerns: (1) whether one-bolt attachment in shear connections is equivalent to the required two-bolt attachment in through-bolt connections; and (2) if this provision should apply to different types of configurations, determine which specific configurations (For example: steel beams, joists, trusses, etc.) should be covered by this provision.

#### Background

An existing OSHA standard in 1926.751(a) requires that "the load shall not be released from the hoisting line until the members are secured with not less than two bolts drawn up wrench-tight, or the equivalent, at each end connection." Regarding this requirement, an employer in Massachusetts (Ref. 1) has requested that OSHA allow the use of beam connections with only one bolt in "shear-connections." The employer indicated such connections would be equivalent to the required two-bolt connection (Ref. 1), provided such connections are limited to 3/4-inch, "which would be good for 6.6 kips of weight," or heavier bolts and done as specified in paragraph 8.4 of ANSI A10.13 -1978 (Ref. 2, Par. 8.4, p. 10), such that: "If only one bolt is used at each end, this bolt shall be in the top hole and pulled up tight with a hand wrench so that the beam will not tend to roll when walked on." OSHA notes, that the 1989 revision of the ANSI A10.13-1989 (Ref. 3) no longer contains the provision for the one bolt to be used in the top hole. Instead, it provides that members be secured with "not less than two bolts, or equivalent, at each connection to keep members from rolling and to sustain anticipated loads." (See Ref. 3, Sec. 9.4, p. 11).

At the August 4, 1987 meeting of the ACCSH (Ref. 4, Tr. 156-157) the issue of shear connections and the advantages involved were discussed. One committee member indicated that in his mind there was no advantage, "... other than just the time required to put another bolt in," and that "we should, in the interest of safety require the two bolts in shear connections" ( Tr.156). Subsequently, at the ACCSH meeting of March 29, 1988 (Ref. 5), a

committee member again suggested that the requirement for attaching of solid web structural members with not less than two bolts "... during the final placing," should be changed to remove the word "final," and require that the member must be secured during the installation process. (Ref. 5, Tr. 303-304). Incorporating some changes from the committee's deliberations, OSHA sent a memorandum (Ref. 6) dated May 26, 1989 which attached copies of a revised issue No. 5 on the subject of shear-connections to the ACCSH members for their consideration at the next ACCSH meeting of June 14-15, 1989. However, at that June 15, meeting (Ref. 7) the committee tabled the discussion on subpart R (Tr. 2-86) "... pending a decision by the Secretary of Labor [concerning negotiated rulemaking]."

On August 24, 1989 OSHA again sent a memorandum to the ACCSH (Ref. 8), attaching the same draft issue No. 5, together with a draft revision for subpart R, for their consideration at the ACCSH meeting of September 14, 1989. Although the issue of shear-connections was not discussed at the meeting of September 14, 1989 (Ref. 9), the ACCSH workgroup adopted the draft subpart R document which contained the requirement to use two bolts at all beam connections (Ref. 9a). The document which was revised and "... developed using the labor management [ACCSH's workgroup] proposal," was labeled "Appendix 2." The same document then was re-labeled to "Appendix 3" (Ref. 9a), which was submitted to the record as "...the work group's recommendation report to the full committee." (Ref. 9, Tr. 43).

Considering that another two commenters from Massachusetts had suggested that the use of one bolt shear-connections be limited to beams of up to 25 and 30 foot in length respectively (Ref. 1a and 1b), OSHA seeks to discuss what limits should be put on this type of connection that is being used by those employers in Massachusetts. If one-bolt "shear-connections" are allowed, what should be the allowed criteria of the bolt specifications and the length of the members that can be attached by one bolt; and if the one-bolt "shear-connections" are allowed, at what point should the second bolt be installed?

#### References

1. Letter of August 14, 1981, from: Mr. John D. Murphy,

President, Dorel Steel Erection; 33 Fayette Street; North Quincy, Massachusetts 02171; to: U.S. Department of Labor, Occupational Safety and Health Administration (OSHA); Attn: Ed Wells at Waltham, MA. Enclosures:

1a. Letter, undated, from: James B. Conley, Business Agent, Local

7 of the International Association of Bridge, Structural and Ornamental Iron Workers (AFL-CIO) Union, to: Doral Steel Erection

Corp. 33 Fayette St., North Quincy, MA; Attn: John D. Murphy.

1b. Letter of August 12, 1986, from Mr. Paul R. Aylward, One D Street, South Boston, MA., to: Mr. Jack D. Murphy, Dorel Steel at Quincy, MA.

1c. Letter of August 13, 1986, from: James F. Stearns IV, President L. Antonelli Steel Erection Co., Inc. of Quincy, MA, to:

Dorel Steel Erection Corporation, 17 Fayette St., Quincy, MA.

2. American National Standard, ANSI A10.13-1978, Steel Erection --

Safety Requirements; American National Standards Institute, Inc. 1430 Broadway, New York, N. Y. 10018.

3. American National Standard, ANSI A10.13-1989, Steel Erection --

Safety Requirements; American National Standards Institute, Inc. 1430 Broadway, New York, N. Y. 10018.

4. Advisory Committee on Construction Safety and Health, Transcript of meeting held on August 4, 1987, (Tr. 149 & 177).

5. Advisory Committee on Construction Safety and Health, Transcript of meeting held on March 29, 1988, (Tr. 303-304).

6. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of May 26, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection," including attachments: (1) Copy of a draft Subpart R -- Steel Erection Standard (pp. 69-88), and (2) "Specific Issue" No. 5, (pp. 46-48).

7. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on June 15, 1989, p. 2-86.

8. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of August 24, 1989, to Members of

the Advisory Committee on Construction Safety and Health concerning

"Proposed Revision of Subpart R --Steel Erection," including a copy of a draft specific issue No. 5 (pp. 46 - 48).

9. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on September 14, 1989 (Tr. 42 and

43);

and

9a. "Appendix 3," Submitted by the ACCSH Work Group for Subpart R

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- Steel and/or Other Structural Material Erection, paragraph  
1926.752 (a).

FIGURE 1. CONNECTIONS

1A-SHEAR CONNECTION

1B-THROUGH BOLT CONNECTION

Sub-issue 2(e). Double-connections and two-bolt connections.

Through the negotiation process, OSHA seeks to resolve the following concerns: (1) whether to include a definition for the term "double-connection" and a provision to cover the specific method of attaching steel members by double-connecting or joining the members with the same bolts and using a common bolt hole pattern; (2) determine what safe means or methods should be used to prevent the steel members from parting during the process of double-connecting; and (3) if this provision should apply to different types of structural configurations, determine which specific configurations (For example: steel beams, joists, etc.) should be covered by this provision.

#### Background

In a letter of May 10, 1976, then General President John A. Lyons from the Association of Bridge, Structural and Ornamental Iron Workers Union (AFL-CIO) (Ref. 1), asked OSHA to revise the existing requirement in 1926.751(a) to cover the process involved in making "double-connections." The Union requested the Agency to consider requiring erectors using the double-connecting method of attaching steel members to use a specific safe method that would prevent the steel members from parting and causing the connecting employees to fall. In addition, at the August 4, 1987 meeting of the ACCSH (Ref. 2, Tr. 151-152), a member of the ACCSH's ad hoc study group on steel erection agreed that the subject of "... double connections deserved special priority consideration." He indicated that the bolts should not be withdrawn when making double connections and that "... we do feel that at least one bolt should be snugged up tight at all times" (Tr. 152).

At the March 29, 1988, ACCSH meeting (Ref. 3, Tr. 188) a member representing the Union repeated the request for coverage, stating there had been "probably about 60 iron workers killed [while making double-connections] since the request [for such a rule] was submitted in 1976." At the same meeting (Ref. 3) John J.

McMahon, Executive Director of the Institute of Ironworking Industry introduced an exhibit of a model of a double-connection and other supporting documents. One document that was introduced, titled "Double Connections--Problems and Safe Design Alternatives"

(Ref. 4), contained examples of alternative fabrication methods that may be used in making double-connections. Those examples in

the document, however, depicted one-bolt connections being used [as a temporary substitute] where OSHA requires that "... the load shall not be released from the hoisting line until the members are secured with not less than two bolts drawn up wrench tight, or the equivalent, at each end connection." To represent this requirement OSHA has altered one of the examples in the document (Fig. 2), which is shown below, depicting the required method of joining the members by using two bolts.

Incorporating some of the committee's recommendations, OSHA sent a memo dated May 26, 1989 (Ref. 5), which attached copies of the revised issue No. 6 on double connections and a revised draft NPRM for subpart R, to the ACCSH members for their consideration and discussion at the next meeting on June 14 and 15, 1989. In the meeting of June 15 (Ref. 6), however, the committee members adopted a motion to table discussing subpart R, "... pending a decision by the Secretary of Labor [concerning negotiated rulemaking]," and the draft issue on double connections was not discussed at that meeting (Ref. 6, Tr. 2-86).

OSHA notes that, although the existing OSHA rules do not address "double-connecting" as a specific method for connecting and joining steel members on steel frames, the standard in 1926.751(a) requires that: "During the final placing of solid web structural members, the load shall not be released from the hoisting line until the members are secured with not less than two bolts, or equivalent at each connection and drawn up wrench tight." OSHA also notes that the ANSI A10.13-1989 (Ref. 7) provides that "When double[-]connections are involved, the structural detailer and fabricator shall be consulted concerning the provisions for a seat lug or flange length extension on one of the beams, and a corresponding [one] bolt hole..." and "...a wrench or driftpin shall not be used as a substitute for the bolts," (Ref. 7, pg. 11, Sects. 9.5-.6).

On August 24, 1989 OSHA again sent a memorandum to the ACCSH

(Ref. 8), attaching the same draft issue No. 6, together with a draft proposed revision (NPRM) for subpart R, for their consideration at the ACCSH meeting of September 14, 1989. At that

meeting of September 14, 1989 (Ref. 9), the ACCSH work group incorporated some of their desired changes in the draft NPRM document and labeled it "Appendix 2." In the same motion, the document then was revised and renumbered to "Appendix 3" (Ref. 9A),

as the final document of "the work group's recommendation report to

the full [ACCSH] committee." (Ref. 9, Tr. 42-43). For purposes of

discussion and negotiation, OSHA has reworded both the definition and the Appendix-3 provision for double-connecting as presented below. OSHA notes that "metals" was substituted for "materials" in

the original ACCSH definition, to read as follows:

Double-connection means a method of joining more than two pieces of steel and/or other structural [metals] using the same bolts, such as a connection joining two beams to opposite

sides of a floor girder.

Similarly, for purposes of discussion and negotiation, a revised version of the provision for double-connecting that was contained in the ACCSH's Appendix-3 document is presented below. OSHA notes the ACCSH proposed provision has been revised to require

that the steel members must remain secured with not less than two bolts drawn up wrench-tight, or the equivalent, at each end connection. Therefore, the following wording for a provision on double connecting is presented using a two-bolts connection instead

of the one-bolt recommended by the ACCSH. (See Figure 2 below).

(b) Double connecting. When making a double-connection using

clipped end-plates, Tee seats, or other similar connections, there shall be at least two bolts fastening the first two members at all times, with the nuts drawn up wrench-tight during the erection of additional members.



## References

1. Letter of May 10, 1976, John H. Lyons, General President, International Association of Bridge Structural and Ornamental Iron Workers (AFL-CIO), to Assistant Secretary Morton Corn.
2. Advisory Committee on Construction Safety and Health, Transcript of meeting held on August 4, 1987 (pp. 150-151).
3. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on March 29, 1988 (Tr. 188).
4. John J. McMahon, Executive Director, Institute of Ironworking Industry, report: "Double Connections -Problems and Safe Design Alternatives." Unpublished.
5. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of May 26, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection," including a Copy of a draft Subpart R -- Steel Erection Standard and a specific Issues No. 6. (pp. 49-51).
6. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on June 15, 1989, p. 2-86.
7. American National Standard, ANSI A10.13-1989, Steel Erection -- Safety Requirements; American National Standards Institute, Inc. 1430 Broadway, New York, N. Y. 10018.
8. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of August 24, 1989, to Members of the Advisory Committee on Construction Safety and Health concerning "Proposed Revision of Subpart R --Steel Erection," including a copy of a draft specific issue No. 6 (pp. 49 - 51).
9. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on September 14, 1989 (Tr. 42 and 43).
- 9a. "Appendix 3," Submitted by the ACCSH Work Group for Subpart R - Steel and/or Other Structural Material Erection, paragraph 1926.752 (i).

FIGURE 2. DOUBLE CONNECTIONS

TWO BOLTS  
REQUIRED

EXAMPLE 2A. CLIPPED END PLATE CONNECTION

TWO BOLTS  
REQUIRED

EXAMPLE 2B. STIFFENED TEE SEAT

Sub-issue 2(f). Column stability and column-base attaching requirements.

Through the negotiation process, OSHA seeks to resolve the following concerns: (1) whether to adopt the provisions in the ANSI A10.13-1989 standard for steel erection section addressing the attachment of columns to the base plates and guying or bracing of columns before the lifting-falls are unhitched; or (2) whether to require that a competent person, with the help of the engineering plans, determine what guying, bracing, or other measures are required for both the stability of the structure and to prevent the problem of having unstable columns topple over when employees climb on the columns.

#### Background

Regarding column-base attachments, OSHA has been asked to consider adopting the provisions in the ANSI A10.13-1989 (Ref. 1, Par. 9.7, p. 11) standard for steel erection section addressing the attachment of columns to the base plates, and guying or bracing of columns before the lifting-falls are unhitched. These provisions, which address the hazard of improperly secured columns toppling over before they are fully connected to other supporting members of the frame, are not part of existing subpart R. This measure of protection is especially important when employees are climbing on the columns, either by the use of ladders and climb-assist devices or by shinnying up (assisted by climb-assist devices) on the columns themselves.

In reviewing these concerns, OSHA sent a memorandum dated June 30, 1987 (Ref. 2), to the Advisory Committee on Construction Safety and Health (ACCSH), which attached a draft revision to subpart R (Dated June 25, 1987) to cover the stability of columns (Par. 1926.753(a) (3), p.6). At its August 4, 1987, meeting (Ref. 3) the ACCSH (Tr. 158-160) supported the findings of its ad hoc study group on steel erection, and recommended that when employees are going up on single columns, the nuts on the anchor bolts should be either tightened and/or the columns should be guyed. The committee also indicated it felt that a competent person with the

help of the "engineering plans" (Tr. 158) could determine whether guying, bracing, or other measures would be required to prevent the problem of having unstable columns toppling over when employees climb on the columns.

Incorporating the committee's recommendations, OSHA sent a memo dated May 26, 1989 (Ref. 4), which attached copies of the revised issue No. 7 (pp. 51 & 52, dated 05/25/89) and a revised draft NPRM for subpart R, to the ACCSH members for consideration and discussion at their next meeting on June 14-15, 1989. At the meeting of June 15 (Ref. 5), however, due to the committee's unanimous decision to table discussing subpart R, "... pending a decision by the Secretary of Labor [concerning negotiated rulemaking]," the draft issue No. 7 on column stability was not discussed at the June 15, meeting (Ref. 5 Tr. p. 2-83 to 86).

On August 24, 1989 OSHA again sent a memorandum to the ACCSH (Ref. 6), attaching the same draft issue No. 7 (p. 6, dated 5/25/89) together with a draft proposed revision (NPRM) for subpart R, for their consideration at the ACCSH meeting of September 14, 1989. At that meeting of September 14, 1989 (Ref. 7), the ACCSH work group incorporated some of their desired changes in the draft NPRM document and labeled it "Appendix 2." In the same motion, the document then was revised and renumbered to "Appendix 3" (Ref. 7a), as the final document of "the work group's recommendation report to the full [ACCSH] committee." (Ref. 6, Tr.

42-43). In their Appendix-3 document (Ref. 4a, p. 2), the ACCSH included a paragraph [ 1926.752] (k) recommendation requiring that: "When columns are being set on a base plate or shims, and before the lifting-falls are unhitched, either the nuts on the anchor bolts shall be drawn wrench-tight or additional bolting, temporary guys, or bracing shall be affixed as needed to prevent the columns from toppling over. Additional bolting, guying, temporary guys, or bracing shall be required as determined by a competent person."

Given the committee's deliberations and for purposes of discussion, the paragraph recommended by the ACCSH has been revised by OSHA for regulatory purposes and is presented below.

(1926.752) (d) Columns. (1) When columns are being set on a base plate or shims, and before the lifting-falls are unhitched, either the nuts on the anchor bolts shall be drawn wrench-tight or additional bolting, temporary guys, or bracing

shall be affixed as needed to prevent the columns from becoming unstable.

(2) Prior to any employee climbing the column, additional bolting, guying, temporary guys, or bracing shall be installed to ensure stability as determined by a competent person, and shall be so indicated in the safety erection plan described in paragraph ( ) of this section.

## References

1. American National Standard, ANSI A10.13-1989, Steel Erection  
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Safety Requirements; American National Standards Institute, Inc.  
1430 Broadway, New York, N. Y. 10018 (See Par. 9.7, p. 11).
2. U.S. Department of Labor, Occupational Safety and Health  
Administration (OSHA), memorandum of June 30, 1987, to Members of  
the Advisory Committee on Construction Safety and Health on  
"Proposed Revision of Subpart R --Steel Erection" attaching a  
draft  
proposed Par. 1926.751(a) (3) concerning the erecting and  
removing  
of columns (attachment p. 6, dated 6/25/87).
3. Advisory Committee on Construction Safety and Health,  
Transcripts of meeting held on August 4, 1987, pp. 158 - 160.
4. U.S. Department of Labor, Occupational Safety and Health  
Administration (OSHA), memorandum of May 26, 1989, to Members of  
the Advisory Committee on Construction Safety and Health on  
"Proposed Revision of Subpart R --Steel Erection" attaching a  
draft  
proposed Par. 1926.751(a) (3) concerning the erecting and  
removing  
of columns (attachment p. 51 & 52, dated 6/25/89).
5. Advisory Committee on Construction Safety and Health,  
Transcripts of meeting held on June 15, 1989, p. 2-86.
6. U.S. Department of Labor, Occupational Safety and Health  
Administration (OSHA), memorandum of Aug 24, 1989, to Members of  
the Advisory Committee on Construction Safety and Health on  
"Proposed Revision of Subpart R --Steel Erection" attaching a  
proposed draft standard (NPRM) and a draft issue No. 7 (pp. 51 &  
52, dated 5/25/89).
7. Advisory Committee on Construction Safety and Health,  
Transcripts of meeting held on September 14, 1989 (Tr. 42 and  
43).
- 7a. "Appendix 3," Submitted by the ACCSH Work Group for Subpart R  
-  
- Steel and/or Other Structural Material Erection, paragraph  
1926.752 (k).

Sub-issue 2(g). Planking and decking the floor below the beams and joists for flooring and roofing systems

Through the negotiation process, OSHA seeks to resolve the following concerns: (1) whether or not OSHA should require that all floors be temporarily planked or decked prior to installation of the decking floor beams or joists for the next higher level roofing and decking systems; (2) whether the provisions of existing 1926.750(c) (1) and (2) covering the flooring requirements for the installation of joists of double wood floor and single wood floor types of flooring construction, are currently in use; or should these provisions be deleted?

#### Background

Incorporating some changes from a previous OSHA request to review a draft standard concerning steel erection, the Agency sent a memorandum (Ref. 1) dated June 30, 1987, which included revisions to the flooring section for consideration at the subsequent ACCSH meeting of August 4, 1987. At the August 4, 1987, meeting (Ref. 2) a committee member (Tr. 145) initiated the discussion stating that "... as the proposed flooring section addresses flooring requirements on a general basis, these specific provisions [in 1926.751(c) (1) and (2)] may not be necessary." However, on a subsequent question by the chairman on the position taken by the study group it was unclear what was the committee's final recommendation on whether the provisions "... should be retained in the standard (Tr. 146)."

At the ACCSH meeting of March 29, 1988 (Ref. 3) (Tr. 294 & 298), OSHA asked for information on the extent to which the double wood floor and single wood floor types of flooring construction covered by the provisions of existing 1926.750(c) (1) and (2) are currently in use. Also the committee was asked by OSHA whether or not these two paragraphs should be retained and included in a revised paragraph, 1926.751(d) (1) and (2). The ACCSH response indicated that these two provisions duplicate the existing requirement for temporary planked or decked flooring, and that

such double wood floors are not being used anymore. However, one member suggested that the standard should be left in place (Ref. 3, Tr. p. 298).

Based on the committee's deliberations, OSHA sent a memorandum dated May 26, 1989 (Ref. 4), which attached copies of an issue (issue No. 9) to the ACCSH members for consideration and discussion at their next meeting on June 14-15, 1989. However, at the June 15, meeting (Ref. 5) the committee passed a unanimous decision to table discussing subpart R, "... pending a decision by the Secretary of Labor [concerning negotiated rulemaking]," and the draft issue on flooring was not discussed at the June 15, meeting (Ref 5, Tr. 2-86).

Given the committee's deliberations in the above meetings, OSHA attached the issue No. 9 and a draft NPRM for steel erection in a memorandum of August 24, 1989, to the ACCSH (Ref. 6) for further discussion on the two provisions covering double and single wood flooring. At the next ACCSH meeting of September 14, 1989 (Ref. 7), the ACCSH work group incorporated some of their desired changes in the draft NPRM document and labeled it "Appendix 2." In the same motion, the document then was revised and renumbered to "Appendix 3" (Ref. 7a), as the final document of "the work group's recommendation report to the full [ACCSH] committee." (Ref. 7, Tr. 42-43). In the revisions to the final document (Ref. 7a, pp. 2 & 3), the ACCSH had removed those two provisions from the draft section on [1926.751] "Flooring Requirements for Tiered Structures" and did not include any provisions covering double and single wood flooring.

OSHA believes, however, that additional information is still needed on what types of flooring are presently being used, to aid in its determination of whether or not these two provisions may be deleted without reducing safety. Therefore, OSHA seeks to determine whether or not it should continue to require that, prior to the installation of the joists, the floors below the joists be



temporarily decked or planked or have the flooring installed, per existing 1926.752 (c), which requires: (1) for double wood floors, "... rough flooring shall be completed as the building progresses, including the tier below the one on which floor joists are being installed;" and "(2) For single wood floors or other flooring systems, the floor immediately below the story where the floor joists are being installed shall be kept planked or decked over." If the existing standard is retained, OSHA seeks to determine which other materials and flooring configurations should be covered by this provision.

## References

1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of June 30, 1987, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection," dated June 25, 1987, including a previous draft attachment 1a: "Proposed Revision of Subpart R --Steel Erection," dated June 18, 1987.
2. Advisory Committee on Construction Safety and Health, Transcript of meeting held on August 4, 1987, (Tr. 145-146).
3. Advisory Committee on Construction Safety and Health, Transcript of meeting held on March 29, 1988, (Tr. 294 & 298).
4. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of May 26, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection" attaching a copy of specific issues No. 9 (pp. 55 & 56).
5. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on June 15, 1989, p. 2-86.3.
6. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of August 24, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection" attaching a copy of specific issues No. 9 (pp. 55 & 56).
7. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on September 14, 1989 (Tr. 42 & 43).
- 7a. "Appendix 3," Submitted by the ACCSH Work Group for Subpart R  
-  
- Steel and/or Other Structural Material Erection (pp. 2 & 3).

Sub-issue 2(h). 2(h) -- Safety measures for installed projections (shear connectors) on the upper surfaces of beams.

Through the negotiation process, OSHA seeks to resolve the following concerns: (1) whether OSHA should adopt provisions to regulate the schedule when the shear connectors (such as "Nelson" bolts, reinforcing bars, or similar fixtures that project upward creating a tripping hazard) should be installed relative to other connecting operations; and (2) determine which specific configurations (For example, I-beams, bridge girders, etc.) should be covered by it.

#### Background

OSHA has been asked by the International Association of Bridge, Structural and Ornamental Iron Workers (AFL-CIO) Union, to address the tripping hazards created by the ends of bolts or studs (such as "Nelson" bolts, shear connectors, or any similar fixtures used in composite construction) that project above the flat surface of structural beams or girders (Ref. 1). In response, to the request, OSHA put the question before the ACCSH at its meeting of March 29, 1989 (Ref. 2). The committee's deliberation at that meeting indicated that the U. S. Army Corps of Engineers and most other contractors had stopped using steel members with pre-attached "Nelson" bolts; and, when used, the stud projections had to be guarded by placing wood planks over them (Tr. 314). For purposes of negotiation, OSHA is considering whether or not a new provision should be added to subpart R to read as follows:

(1926.752) (c) Tripping hazards on beams. When employees are required to walk on the upper surfaces of beams that have projecting shear connectors, such as "Nelson" bolts, welded studs, reinforcing bars, or similar fixtures that project upward creating a tripping hazard, the shear connectors shall be field-installed to prevent employees from tripping or falling; or such projections shall be covered with suitable material and in such manner as to provide a walking/working surface at least as stable and free of hazards as the top surface of the metal member would provide without the projections.

References:

1. Letter of May 10, 1976 John H. Lyons, General President, International Association of Bridge Structural and Ornamental Iron Workers (AFL-CIO), Letter to Assistant Secretary Morton Corn.
2. Advisory Committee on Construction Safety and Health, Transcript of meeting held on March 29, 1989 (Tr. 314 - 315).

Sub-issue 2(i). Work-Practice Rules for steel erection.

Through the negotiation process, OSHA seeks to resolve the following concerns: (1) whether to adopt mandatory work practice rules from the similar non-mandatory provisions in the ANSI A10.13-1989, standard for steel erection, which address the work practices of connectors when making the initial attachments on steel frames; and (2) determine to which and how many other materials this provision should apply and what other specific frame configurations (For example: heavy timber and wood frames, precast concrete frames, etc.) should be covered by this provision.

Background

OSHA has been asked to consider revising some of the existing installation and fastening requirements for steel erection to bring them both up to date with industry practice and to improve protection to employees. In response, OSHA has reviewed certain safety provisions in connection with the draft of a proposed revision to the steel erection standard. For purposes of negotiation, OSHA needs to consider whether or not it should adopt the provisions concerning mandatory work practice rules for connectors such as the following, which are restated from similar (non-mandatory) provisions in ANSI A10.13-1989 (Ref. 1, pp. 10-11):

(a) When connectors are working together, only one person shall give signals. That person should make sure that the partner, or others working on the job, are in the clear. Each employee must select a position to avoid being struck by the suspended load.

(b) When connectors are working at the same connecting point, they shall connect one end of the structural member before going out to connect the other end, and then only one connector shall go out to connect the other end.

(c) If connecting lugs are bent, they shall be straightened before hoisting the member.

(d) A piece shall never be cut loose until the required number of bolts have been installed. A wrench or driftpin in the hole shall not be used as a substitute for bolts.

References.

1. American National Standard, ANSI A10.13-1989, Steel Erection -- Safety Requirements; American National Standards Institute, Inc. 1430 Broadway, New York, N. Y. 10018.

Sub-issue 2(j). Slippery paint coatings and the safe coefficient of friction (COF) for the upper surfaces of beams.

Through the negotiation process, OSHA seeks to resolve the following concerns: (1) whether OSHA should adopt provisions to regulate scheduling sequence and method of applying surface coatings and paint finishes on the upper surfaces of beams when the employees are required to walk atop the steel beam's surfaces; and (2) whether OSHA should adopt provisions to cover the hazards of slippery conditions caused by the weather conditions (snow, ice and wetness) or the presence of oil or grease, when employees are required to walk atop the steel beam's surfaces; and (3) determine to which specific configurations (For example, I-beams, round piping, etc) should be covered by it.

### Background

OSHA has received a request in a letter from the International Association of Bridge, Structural and Ornamental Iron Workers (AFL-CIO) Union (Ref. 1) to address slipperiness hazards created by "slick paint on elevated structural members." Their letter also stated that numerous industry representatives have voiced concern over the effect of some paints used on pre-painted structural members on which employees may have to walk during the erection process. In addition, a NIOSH report sponsored by OSHA "Correlation of Subjective Slipperiness Judgements with Quantitative COF Measurements for structural Steel," January 31, 1987 (Ref. 2) contains test results showing marked differences in slipperiness of paint coatings when comparing the coefficient of friction (COF) of shoe soles on painted beam surfaces. OSHA shares this concern over employees having to step on slippery surfaces, which thereby increases their risk of slipping and falling. For purposes of negotiation, OSHA needs to determine whether or not to adopt the following provision, which is based on 1910.68(c)(3)(v), for the steel erection standard:

(1) Walking/working surfaces of framing members which do not have inherent non-slip characteristics (coefficient of friction not less than 0.5) or which are coated with paint that does not have inherent non-slip characteristics (coefficient of friction not less than 0.5), shall be covered before erecting the member with coating having a coefficient of friction of 0.5 or more.

Similarly, OSHA is concerned about slippery conditions caused by the weather or the presence of oil or grease. Consequently, the following wording is presented for purposes of

discussion in considering whether or not to adopt the following provision:

(2) Water, snow, ice, oil, grease, or other slippery material on the walking/working surfaces of framing members shall be removed or other measures taken before employees are required to be on the framing members.

#### References

1. Letter of November 15, 1989, from Stephen D. Cooper, General Organizer, International Association of Bridge Structural and Ornamental Iron Workers (AFL-CIO) Union, to OSHA's C. Culver, Director, Office of Construction, Maritime, and Health Engineering Support.

2. "Correlation of Subjective Slipperiness Judgments with Quantitative COF Measurements for Structural Steel," Jerry L. Purswell and Robert E. Schlegel, The University of Oklahoma, School of Industrial Engineering. An unpublished study jointly funded by the U.S. Department of Labor, Occupational Safety and Health Administration [OSHA's RFP 200-86-2929, Aug. 29, 1986] and the U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health (NIOSH), Jan. 31, 1987. Rev. Jun. 30, 1988.

Sub-issue 2(k). Prohibiting work by other trades while the erecting of the temporary steel structure is in progress.

Through the negotiation process, OSHA seeks to resolve the following concerns: (1) whether there is a need to add a new requirement to the steel erection standard that will prohibit employees, except those essential to the connecting operation, from being in the building or temporary structure while the steel (or other metal) members are being connected in the upper levels.

#### Background

OSHA has been requested to gather information on the need to add a new requirement to the steel erection standard that will prohibit employees, except those essential to the connecting operation, from being in the building/structure while the steel frame members are being connected. The need for a new requirement is an outgrowth of the rulemaking record of the previously issued final rule on lift-slab construction. The lift-slab rule prohibits nonessential employees from being in buildings/structures while lifting operations are in progress unless a registered professional engineer determines that the building/structure has been reinforced sufficiently that if a loss of support occurs at one location that loss will be confined to that location and the building/structure as a whole would remain stable. It was pointed out by commenters to the lift-slab record that employees in structural steel buildings under construction face the same hazards as workers in buildings being erected by the lift-slab construction methods. OSHA announced in the final rule on lift-slab construction that it would gather information to determine whether or not other construction methods exposed workers to a risk that needed further regulation. OSHA, therefore, seeks to determine if there is a need for adding a provision requiring that, employers must either ensure the structural integrity of a building while it is under construction or be prepared to ban all nonessential employees from the building until all the steel (or other metal) has been connected.



Sub-issue 2(1). Overhead protection for employees immediately below the overhead connecting operations.

Through the negotiation process, OSHA seeks to resolve the following concerns: (1) whether the steel erection standard should include a specific requirement to ban employees from the level immediately below (and directly under) the overhead connecting operations or provide overhead protection for other (non-connecting) employees in the area under the connectors; (2) whether there is a need to add a specific strength-value to the existing provisions requiring that planking and decking be capable of supporting, without failure, a load of not less than 50 pounds per square foot.

#### Background

The existing steel erection standard does not contain a requirement for a canopy or overhead protection to protect employees from falling joists, beams and other materials when overhead connecting operations are being performed directly above the non-connecting employees. OSHA believes that while the employer could schedule the connecting work so as to avoid placing the non-connecting employees directly under the tier of beams where connecting work is being performed, some non-connecting work also could be performed under the protection of the temporary planking and decking. Thus the non-connecting employees would be protected by at least one floor level of planking or decking. However, since the strength of the decking is not specified in the existing standard, OSHA seeks to establish the minimum strength-value that should be required for overhead protection, as well as the minimum floor load capacity for floor planking and decking used during the erecting operations.

OSHA notes that in subpart T--Demolition, canopies are required to be capable of supporting a minimum load of 150 pounds per square foot (1926.850(k)) to protect employee entrances to multi-story structures being demolished. OSHA also notes that the strength value of 50 pounds per square foot is the minimum strength value used in the ANSI's (A10.13-1989) provisions for temporary flooring (Ref. 1, Par. 7.6, p. 9). The existing OSHA steel erection standard, however, does not specify the minimum load value of planking and decking. It merely states that a proper thickness must be used. For example, in 1926.750(b) (1) requires that: "... Planking or decking of equivalent strength, shall be of proper thickness to carry the working load;" also, in 1926.752(j) OSHA requires that "All unused openings in floors, temporary or permanent, shall be completely planked over or guarded in accordance with subpart M of this part." However, the existing subpart M, in 1926.500(a) (5), also does not specify an

equivalent strength value, and instead requires that: "Pits and trap-door floor openings shall be guarded by floor opening covers of standard strength ..."

Given the lack of a floor strength value in subpart R, OSHA sent a memo dated May 26, 1989 (Ref. 2), with an attached copy of a revised draft NPRM (05/25/89) which contained a paragraph with the strength value of [1926.751(b) (1) ] "... 50 pounds per square foot," to the ACCSH members. Due to the committee's unanimous decision to table discussing subpart R, "... pending a decision by the Secretary of Labor [concerning negotiated rulemaking]," the draft NPRM with the new strength value added was not discussed at the June 15, meeting (Ref 3, Tr. p. 2-83-86). On August 24, 1989 OSHA again sent a memorandum to the ACCSH (Ref. 4), incorporating the new strength value for temporary flooring (50 pounds per square foot) in an attached draft NPRM for subpart R, for their consideration at the ACCSH meeting of September 14, 1989. The ACCSH at their meeting of September 14, 1989 (Ref. 5, Tr. 43-46, and Ref. 5a, Appendix 3), adopted a revised draft NPRM sent to them by OSHA incorporating a provision that floor planking and decking shall be capable of withstanding "... not less than 50 pounds per square foot." In their Appendix-3 document, the ACCSH also approved other revisions such as, the requirement that "... 3/4-inch (1.9 cm) exterior grade plywood or equivalent wire mesh be used around the columns and where planks or decking do not fit tightly."

Given the committee's deliberations in the above meetings, OSHA believes additional information is needed on what types of temporary flooring, decking, plywood and wire mesh coverings are being used for flooring and for overhead protection. For purposes of discussion and negotiation, OSHA seeks to review the existing overhead canopy requirements in 1926.850(k), the flooring requirements in 1926.751, the 1989 ANSI's (Ref. 1) flooring requirements and the ACCSH recommended changes. The ACCSH's recommended changes (Appendix 3: 1926.751(b) (1), (2), (3), and (4)), have been revised and re-numbered by OSHA to add two additional paragraphs as follows:

(b) Planking and decking. Planking and decking shall meet the following requirements:

(1) Floor planking and decking shall be capable of supporting, without failure, a load of not less than 50 pounds per square foot.

(2) Floor planking and decking shall be laid tightly and secured to prevent movement or displacement.

(3) Exterior-grade plywood 3/4-inch (1.9 cm) thick, or

equivalent strength material, such as wire mesh, shall be used around columns where planks or decking do not fit tightly.

(4) Floor planks shall overlap the bearing support on each end by a minimum of 12 inches (30.4 cm).

(5) Floor planks shall be not less than 2-inch (5 cm) thick full size undressed wood, or equivalent strength material.

(6) Plywood used for decking shall be not less than 3/4-inch (1.9 cm) exterior grade plywood, or equivalent strength material.

#### References.

1. American National Standard, ANSI A10.13-1989, Steel Erection -- Safety Requirements; American National Standards Institute, Inc. 1430 Broadway, New York, N. Y. 10018.
2. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum of May 26, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection" with an attached copy of a draft Subpart R -- Steel Erection Standard (pp. 69-88, dated 05/25/89).
3. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on June 15, 1989, p. 2-86.
4. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), memorandum August 24, 1989, to Members of the Advisory Committee on Construction Safety and Health on "Proposed Revision of Subpart R --Steel Erection," with an attached copy of a draft Subpart R -- Steel Erection Standard (pp. 69-88, dated 05/25/89).
5. Advisory Committee on Construction Safety and Health, Transcripts of meeting held on September 14, 1989 (Tr. 42 & 43).
- 5a. "Appendix 3," Submitted by the ACCSH Work Group for Subpart R -- Steel and/or Other Structural Material Erection (pp. 2 & 3).

Sub-issue 2(m). Minimum Size (Diameter and Length) for Tag Lines.

Through the negotiation process, OSHA seeks to resolve the following issues: (1) whether the steel erection standard should include a provision requiring that a minimum size (diameter and length) tag line must be used when controlling suspended loads.

#### Background

OSHA has found from field experience that there is a need to establish the minimum size (diameter and length) necessary for tag lines to be used when controlling suspended loads. OSHA seeks information to determine what these minimum limits should be.