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AGENDA

Day 1

8:30 - 11:45	Introductions Accident and Cost Overview OSHA standard subpart "M"
11:45 - 12:45	LUNCH
12:45 -4:45	Fall protection covered in other OSHA subparts Summary of Day 1

Day 2

8:30 - 11:45	Hazard Recognition Exercise Equipment Demonstration
11:45 - 12:45	Lunch
12:45 - 4:45	Fall Protection Programs Hazard Recognition Exercise Presentations Summary • Class Evaluations • Certificates

Course Objectives

At the conclusion of this course you will have the basic tools to solve your fall hazard exposures by being able to:

- Recognize fall hazards at your site or facility.
- Conduct a fall hazard assessment.
- Provide solutions and abatement methods for fall hazards.
- Describe and explain the proper components of a fall arrest equipment system.
- Implement a fall protection program.
- Calculate and understand the importance of free fall distances when using fall arrest equipment/systems.

Fall Hazards

Follow-up Activities

- Established or modified a written procedure for my workplace.
- Implemented a training program for the use of fall protection equipment.
- Demonstrated the donning of equipment to a co-worker.
- Put this information into Job Safety Analysis for the applicable sites.

Activity Plan

	Activity	Other people involved	Target Deadline
❑			
❑			
❑			
❑			
❑			
❑			
❑			
❑			

DEPARTMENT OF HEALTH & HUMAN SERVICES Public Health Service

Centers for Disease Control
National Institute for
Occupational Safety & Health
Robert A. Taft Laboratories
4676 Columbia Parkway
Cincinnati OH 45226-1998

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TI Title - the complete English title of the reference.

AU Author(s) - the name(s) of the author(s) of the reference. Author names appear with the last name first followed by initials.

SO Source - the journal publication. Report, book, conference, or symposium in which the reference appeared.

PY Publication Year - the year in which the reference was published.

AB Abstract - a summary, generally 150-300 words of the reference.

DE Descriptors - terms selected from a noncontrolled vocabulary to describe the main concepts of the reference. This field is used primarily for searching the database.

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Bethesda, Maryland (301-496-6193). For information about NIOSHTIC® on CD-ROM, contact Silver Platter Information, Inc., Newton Lower Falls, Massachusetts (617-969-2332 or 800-343-0064) or the Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, Ontario (416-572-2981 or 800-263-8276). If you do not have the equipment necessary to access NIOSHTIC® directly, you may contact your local public or university Library or private information broker in your area. The National Library of Medicine sponsors one such search service, the Toxicology Information Response Center, Oak Ridge, Tennessee (615-576-1746).

If you have any further questions about NIOSHTIC® or the contents of the attached printout, Please feel free to contact the NIOSH Technical Information Branch at the Cincinnati address shown on the reverse side, or call 513-533-8328.

AN: NTIS PB92193713

RN: 00206932

TI: FACE Report: Roofer Helper Dies following a 22-Foot Fall through a Roof Opening in Virginia, October 2, 1991

AU: Anonymous

SO: Division of Safety Research, NIOSH, U.S. Department of Health and Human Services, Morgantown, West Virginia, Report Number FACE-92-03, 6 pages, 1 reference

PY: 1992

AB: The case of a 21 year old roofer helper who died following a fall of 22 feet through a roof opening was investigated. The employer was a roofing and sheet metal contractor which employed 80 workers, including 20 roofer helpers. The employer had a written safety policy, a comprehensive written safety program, and a full time designated safety officer. The contractor had been subcontracted to provide and install roofing materials on an addition to the gymnasium at a middle school. On the day of the accident five workers were placing insulating strips over the panels on the roof deck. The victim, after completing a task, approached the foreman and asked what was to be done at the plywood area. The foreman instructed him to wait because there was a hole in that area. The victim walked toward the plywood as the foreman continued his own task. The victim either intentionally removed the plywood form the opening, lost his balance and fell, or unintentionally displaced the plywood and tripped into the opening. He died about 17 hours later of a fractured skull and cerebral edema. It was recommended that the floor opening be guarded by a standard railing and toe boards or cover capable of supporting the load; and that a verbal and/or written examination be made to reinforce and evaluate the effectiveness of the safety training program.

DE: NIOSH-Publication; NIOSH-Author; Region-3; FACE-92-03; Accident-analysis; Work-practices; Construction-industry; Construction-workers; 1-; Head-injuries; Traumatic-injuries; Roofers

AN: NTIS PB92193614

RN: 00206923

TI: FACE Report: Asphalt Plant Trainee Dies in South Carolina following a 3-Foot Fall into a Drag Slat Conveyor, June 17, 1991

AU: Anonymous

SO: Division of Safety Research, NIOSH, U.S. Department of Health and Human Services, Morgantown, West Virginia, Report Number FACE-91-19, 6 pages, 2 references

PY: 1991

AB: The case of a 24 year old asphalt worker (trainee) who was killed after falling 3 feet into an unguarded drag slat conveyer was investigated. His employer was primarily engaged in highway construction and paving. The employer had a written safety policy, written safety program, and general safety procedures. The victim had worked for the company for 4 days prior to his death. The asphalt facility operator and the trainee were instructed to assist in recalibration of the truck scale by running aggregate through a conveyor. The victim climbed 3 feet onto a support beam for the conveyor frame. The beam was 3 inches wide by 3 feet long, positioned at a 45 degree angle. The beam was located directly above an unguarded opening for the conveyor. The victim was standing on the support operating a handle connected to a gate in the chute, despite warnings from the coworker to get down. The victim slipped and fell feet first into the drag slat conveyor; he was dragged about 10 feet into the conveyor before it could be shut off. He died of multiple body trauma. It was recommended that all exposed moving machinery parts be guarded; that positive acting controls be provided along all conveyor systems; that handle extensions or elevated work platforms be provided at all locations where climbing or standing on equipment is required to gain access; that job safety analyses be conducted for all employees; that employers conduct scheduled and unscheduled safety checks; and that employers review and revise the safety program to include helping workers recognize, understand, and control hazards.

DE: NIOSH: Publication; NIOSH-author; Region-4; FACE-91-19; Accident-analysis; Work-practices; Equipment-design; Construction-materials; Asphalt-industry; Traumatic-injuries

AN: NTIS PB92184027

RN: 00206138

TI: FACE Report: Carpenter Dies following an 11-Foot Fall from a Roof in North Carolina, February 22, 1990

AU: Anonymous

SO: Division of Safety Research, NIOSH, U.S. Department of Health and Human Services, Morgantown, West Virginia, Report Number FACE-90-28, 5 pages, 1 reference

PY: 1990

AB: A 34 year old male carpenter died after falling 11 feet from a garage roof. He worked for a general contractor building a private residence with an attached 26 foot by 39 foot garage. On the morning of the incident, a total of ten workers were laboring at various sites on the project. The victim and a coworker had been assigned to complete boxing up a dormer located on the apex of the garage roof. The two workers positioned themselves on opposite sides of the dormer and started to work. The victim either slipped or tripped, and fell off the edge. He hit his head against the brick veneer garage wall. He died about 24 hours later of severe head injury. It is recommended that employers require the use of safety belts, lifelines, and lanyards when working construction projects; and that a safety program be developed.

DE: NIOSH-Publication; NIOSH-Author; Region-4; FACE-90-28; Accident-analysis; Construction-industry; Occupational-accidents; Construction-workers; Head-injuries; Traumatic-injuries

AN: NTIS PB91227496

RN: 00199721

TI: FACE Report: Window Mechanic Dies in 250-Foot Fall, August 17, 1989

AU: Anonymous

SO: Division of Safety Research, NIOSH, U.S. Department of Health and Human Services, Morgantown, West Virginia, Report Number FACE-89-49, 5 pages

PY: 1990

AB: A 30 year old male window mechanic died when he fell 250 feet through a window opening while attempting to replace the window. The victim was self-employed. He had worked in the glass business for several years prior to going into business for himself approximately 4.5 years ago. The victim and his one employee had gone to a 21 story office building to replace a damaged window on the twenty-first floor. To replace the broken window the victim first had to loosen and remove the bolts which secured the window frame to the structure and then remove the existing inner pane and frame from the opening. In order to reach the bolts at the top of the frame the victim placed a 3 foot high wooden stepladder next to the window. Standing on the second step of this ladder, he attempted to loosen one of the bolts by striking the bolt with a hammer held in his right hand. He missed the bolt and struck the window pane. The window shattered under the impact and the victim and the ladder on which he was standing fell sideways through the window opening to the brick courtyard 250 feet below. It is recommended that fall protection options be considered and selected whenever the potential for serious or fatal falls exist, and that work near a known damaged window be accomplished from the side rather than from directly in front of the window whenever possible.

DE: NIOSH-Publication; NIOSH-Author; FACE-89-49; Region-4; Accident-analysis; Work-practices; Safety-research; Maintenance-workers; Traumatic-injuries

AN: NTIS PB91212779

RN: 00199117

TI: FACE Report: Construction Worker Dies in 36-Foot Fall at Construction Site, January 18, 1989

AU: Anonymous

SO: Division of Safety Research, NIOSH, U.S. Department of Health and Human Services, Morgantown, West Virginia, Report Number FACE-89-20, 4 pages

PY: 1989

AB: A 37 year old male construction worker died after falling 36 feet when the wind blew him from the roof of a structure. The victim was employed by a steel erection firm which had been in operation for 22 years. The company had approximately 20 employees and written safety rules and procedures, but no designated safety officer. At the time of the incident the victim was working as part of a crew on the construction of a 440 foot long by 96 foot wide tunnel at a new steel mill. The victim and a coworker were told to go to the roof of the tunnel and place a temporary cover over the 2 foot wide opening at the ridge using sections of decking weighing about 120 pounds. Neither man used fall protection equipment. The victim was 12 to 14 feet from the edge of the roof as they began to lift and move the decking section. The wind gusted, catching the section and lifting it upwards. The coworker immediately released his hold. The victim still held on as he was carried over the edge of the roof. It was recommended that fall protection equipment be provided and used by all employees whenever there was a potential for serious or fatal falls; that management must see to it that all workers understand the hazards they face; and that hazards posed by the weather should be addressed in all construction operations.

DE: NIOSH-Publication; NIOSH-Author; FACE-89-20; Region-5; Construction-industry; Construction-workers; Traumatic injuries; Accident-analysis; Safety-practices; Personal-protective-equipment.

Merit Rate Experience Exhibit

Policy #: 100000 Rating Period: 1993-1996 Max. Value: $55,000

Claim #	Comp. Award	Comp. Reserve	Medical Paid	Reserve Code	TML
93-10000	0	0	3,790	00	3,790
93-10001	752	752	10	28	1,514
94-10002	8,495	6,841	4,318	75	19,654
94-10003	0	0	936	00	936
96-10004	***9,071***	***18,142***	***14,037***	***26***	***41,250***
Med Only 93			1,766		1,766
Med Only 95			452		452
TOTALS	**$18,318**	**$25,735**	**$25,309**		**$69,362**

TML	- TLL	= Diff.	Diff/TLL	x C%	= T.M.
69,362	47,194	22,168	0.4697	25%	.12
(28,112	***47,194***	***19,082***	***-0.4043***	***25%***	***-.10)***

Manual	Payroll	ELR	LLR	LL	Base Rate	TM Diff	Prem. Rate
5545	$800,000	$9.37	0.6296	$47,194	$28.30	$3.40	$31.70

2,500
x $31.70 (@ +.12)
$63,400

2,500
x $25.47 (@ -.10)
$50,940

2,500
x $14.15 (@ -.50)
$28,300

$63,400
- $50,940
$12,460 Premium Savings without the claim

$63,400
- $28,300
$35,100 Premium Savings in Group Rating

Accident Costs

Direct Costs:

- Medical expenses/payments.
- Compensation paid.

Indirect Costs:

- Production Loss/Service Capability
- Damaged Material/Equipment
- Unhappy Customers
- Schedule Delays
- Clean-up Time/Overtime
- Training New Employees/Outsourcing
- Administrative costs (Claims management)
- Monetary Liabilities
  - OSHA Penalties
  - Civil penalties
  - VSSR

On average, indirect costs exceed direct costs by 4:1 .

Violation of Specific Safety Requirements
(VSSR)

Ohio Revived Code, Section 4121.47 Violation of specific safety rule; order to correct; employer appeal; deposit of penalties.

(A) No employer shall violate a specific safety rule of the administrator of workers compensation or act of the general assembly adopted pursuant to section 4121.13 or 4121.131 of the Revised Code.

(B) Where the industrial commission, in the course of its determination of a claim for an additional award under Section 35 of article II , Ohio Constitution, finds the employer guilty of violating division (A) of the section, it shall, in addition to any award paid to the claimant, issue an order to correct the violation within the period of time the commission fixes. For any violation occurring within twenty-four month of the last violation, the commission shall assess against the employer a civil penalty in an amount the commission determines up to a maximum of fifty thousand dollars for each violation. In fixing the exact penalty, the commission shall base its decision upon the size of the employer as measured by the number of employees, assets, and earnings of the employer.

(C) An employer dissatisfied with the imposition of a civil penalty pursuant to division (B) of the section may appeal the commission's decision to a court of common pleas pursuant to the Rules of Civil Procedure. An appeal operates to stay the payment of the fine pending the appeal.

(D) The administrator shall deposit all penalties collected pursuant to this section in the safety loan program fund established pursuant to section 4121.48 of the Revised Code.

Ohio Supreme Court Opinions

State ex rel. Thompson Building Associates., Inc. v. Industrial Commission

Citation: 83 Ohio St.3d 138, 698 N.E.2d 996 (1998)

Headnote: VSSR – Scaffolding – Cause of accident.

Summary: Claimant was injured in May 1981 when he fell from a scaffold that toppled over. His claim was allowed for fractured right side of the head; severe contusions to the back of the head; fractured low back; and loss of vision in both eyes. In March 1983, claimant applied for additional compensation alleging various VSSRs. Employer maintained that the scaffolding topples as the result a car backing into it the previous day. Ultimately, the Commission granted claimant's application and assessed a 15% VSSR award. The court of appeals denied employer's resulting request for a writ of mandamus.

On appeal to the Supreme Court, employer argued that the Commission failed to specifically identify the cause of the claimant's accident. The court disagreed, noting that the Commission found that the scaffolding was "shaky and unstable," and therefore in violation of all the safety requirements concerning adequate anchoring and support, even before the scaffold was struck by the car. Employer did not argue lack of knowledge about this unsafe condition. In fact, the evidence indicated that employer's foreman had warned his superiors about the unstable scaffold at least twice prior to claimant's injuries. Thus, the judgment of the court of appeals denying the writ of mandamus was affirmed.

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Source: Workers Compensation Journal of Ohio
November/December 1998
Page 93

Standard Number: 1926.20
Standard Title: General safety and health provisions.
SubPart Number: C
SubPart Title: General Safety and Health Provisions

(a) ***Contractor requirements.***

(a)(1) Section 107 of the Act requires that it shall be a condition of each contract which is entered into under legislation subject to Reorganization Plan Number 14 of 1950 (64 Stat. 1267), as defined in 1926.12, and is for construction, alteration, and/or repair, including painting and decorating, that no contractor or subcontractor for any part of the contract work shall require any laborer or mechanic employed in the performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety.

(b) ***Accident prevention responsibilities.***

(b)(1) It shall be the responsibility of the employer to initiate and maintain such programs as may be necessary to comply with this part.

(b)(2) Such programs shall provide for frequent and regular inspections of the job sites, materials, and equipment to be made by competent persons designated by the employers.

1926.32 (f) ***"Competent person"*** means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

(b)(3) The use of any machinery, tool, material, or equipment which is not in compliance with any applicable requirement of this part is prohibited. Such machine, tool, material, or equipment shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

(b)(4) The employer shall permit only those employees qualified by training or experience to operate equipment and machinery.

(c) The standards contained in this part shall apply with respect to employments performed in a workplace in a State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, Guam, Trust Territory of the Pacific Islands, Wake Island, Outer Continental Shelf lands defined in the Outer Continental Shelf Lands Act, Johnston Island, and the Canal Zone.

(d)(1) If a particular standard is specifically applicable to a condition, practice, means, method, operation, or process, it shall prevail over any different general standard which might otherwise be applicable to the same condition, practice, means, method, operation, or process.

(d)(2) On the other hand, any standard shall apply according to its terms to any employment and place of employment in any industry, even though particular standards are also prescribed for the industry to the extent that none of such particular standards applies.

(e) In the event a standard protects on its face a class of persons larger than employees, the standard shall be applicable under this part only to employees and their employment and places of employment.

Standard Number: 1926.21
Standard Title: Safety training and education.
SubPart Number: C
SubPart Title: General Safety and Health Provisions

(a) ***General requirements***. The Secretary shall, pursuant to section 107(f) of the Act, establish and supervise programs for the education and training of employers and employees in the recognition, avoidance and prevention of unsafe conditions in employments covered by the act.

(b) ***Employer responsibility.***

(b)(1) The employer should avail himself of the safety and health training programs the Secretary provides.

(b)(2) The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.

(b)(3) Employees required to handle or use poisons, caustics, and other harmful substances shall be instructed regarding the safe handling and use, and be made aware of the potential hazards, personal hygiene, and personal protective measures required.

(b)(4) In job site areas where harmful plants or animals are present, employees who may be exposed shall be instructed regarding the potential hazards, and how to avoid injury, and the first aid procedures to be used in the event of injury.

(b)(5) Employees required to handle or use flammable liquids, gases, or toxic materials shall be instructed in the safe handling and use of these materials and made aware of the specific requirements contained in Subparts D, F, and other applicable subparts of this part.

(b)(6)(i) All employees required to enter into confined or enclosed spaces shall be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and in the use of protective and emergency equipment required. The employer shall comply with any specific regulations that apply to work in dangerous or potentially dangerous areas.

(b)(6)(ii) For purposes of paragraph (b)(6)(i) of this section, "confined or enclosed space" means any space having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere. Confined or enclosed spaces include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet in depth such as pits, tubs, vaults, and vessels.

- **Record Type:** Interpretation
- **Standard Number:** 1910;1910.12;1926
- **Subject:** Contractors and the criteria for applying the Construction Work Standard.
- **Information Date:** 02/01/1996

February 1, 1996

Mr. Joe O'Connor
INTEC
1 Endicott Avenue
Johnson City, New York 13790

Dear Mr. O'Connor:

This is in response to your letter of May 19, 1995 concerning contractors and the criteria for applying the 29 CFR 1910.12(b) standard. Please accept our apology for the delay in this response.

Section 29 CFR 1910.12(b) defines construction work as "construction, alteration, and/or repair including painting, and decorating." Further, construction work is defined as work not limited to new construction, which includes the repair of existing facilities, and the replacement of structures and their components.

In order for work to be construction work the employer need not be a construction company. The construction industry standard applies "to every employment and place of employment of every employee engaged in construction work The terms "construction", "completion" or "repair" mean all types of work done on a particular building or work site.

At one time, the construction industry was governed by 29 CFR 1910, only if a 29 CFR 1926 standard was not applicable. On June 30, 1993, the applicable 29 CFR 1910 standards were incorporated into the 29 CFR 1926 standards This was done to allow those employees engaged in construction work to be governed by the construction rules and regulations.

We have attached a copy of an interpretative memorandum off of CD-ROM which was mailed to all OSHA Regional Administrators, to further assist you. I hope that we have provided adequate information and explanation to address your concerns. Thank you for your interest in workers safety and health.

Please contact Margo Daniel at (202) 219-8041 #107 if we can be of further assistance.

- **Record Type:** Interpretation
- **Standard Number:** 1926.32;1910.12
- **Subject:** Construction vs. Maintenance.
- **Information Date:** 08/11/1994

August 11, 1994

MEMORANDUM FOR: REGIONAL ADMINISTRATORS
FROM: JAMES W. STANLEY Deputy Assistant Secretary
SUBJECT: Construction vs. Maintenance

OSHA's regulations define "construction work" as "construction, alteration, and/or repair, including painting and decorating." 29 CFR 1926.32(g) and 29 CFR 1910.12(b). They further provide that OSHA's construction industry standards apply "to every employment and place of employment of every employee engaged in construction work." **Id**. at 1910.12(a). In interpreting definitional provisions in these regulations, the Occupational Safety and Health Review Commission and the courts have looked to similar definitional provisions in other federal laws and regulations. For example, OSHA's regulations make specific reference to definitions in the Davis-Bacon Act and regulations promulgated under that Act. The Davis-Bacon Act regulations issued by the Department of Labor broadly define construction work or activity as follows:

(i) The terms "building" and "work" generally include construction activity as distinguished from manufacturing, furnishing of materials, or servicing and maintenance work. The terms include, without limitation, buildings, structures, and improvements of all types, such as bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, excavating,....

(j) The terms construction, completion, or repair mean the following:

(1) all types of work done on a particular building or work at the site thereof.....
29 CFR 5.2(i) and (j).

In order for work to be construction work, the employer need not itself be a construction company. **See, e.g., New England Telephone & Telegraph Co.**, 4 OSHC 1838, 1939 (1976), **vacated on other grounds sub nom. New England Telephone & Telegraph Co. vs. Secretary of Labor** 589 F.2d 81 (1st Cir. 1978).

Further, construction work is not limited to new construction. It includes the repair of existing facilities. The replacement of structures and their components is also considered construction work. For example, in **Pacific Gas & Electric Co.**, 2 OSHC 1962 (1975), the Review Commission held that the replacement of a wooden utility pole is covered by the construction

industry standards. The utility had argued that the replacement of the pole was "maintenance work," rather than "construction work." The Review Commission, however, concluded that pole replacement is "improvement" and, therefore, construction work. Similarly, construction work is typically performed outdoors, rather than at a manufacturing plant. This factor too is another hallmark of construction work. **See, e.g., Cleveland Electric Co. vs. OSHRC** 910 F2d 1333 (6th Cir. 1990).

There is no specified definition for "maintenance", nor a clear distinction between terms such as "maintenance", "repair", or "refurbishment." "Maintenance activities" can be defined as making or keeping a structure, fixture or foundation (substrates) in proper condition in a routine, scheduled, or anticipated fashion. This definition implies "keeping equipment working in its **existing** state, i.e., preventing its failure or decline." However, this definition, (taken from the directive on confined spaces) is not dispositive; and, consequently, determinations of whether a contractor is engaged in maintenance operations rather than construction activities must be made on a case-by-case basis, taking into account all information available at a particular site.

Examples of activity that have been determined to be construction:

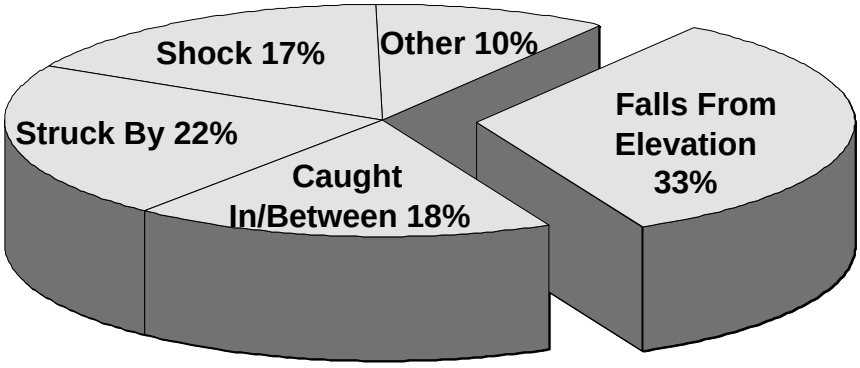
* OSHA has recognized that repair of highways is construction work. **See, e.g., Yonkers Contracting Co.**, 11 OSHC 1994 (1984) (highway contractor cited under construction industry standards in connection with highway rehabilitation project); **Karl Koch Erecting Co.**, 3 OSHC 1223 (1975) (employer cited for violation of construction industry standards in connection with freeway repair project).

* OSHA has consistently taken the position that the repair of railroad track and related structures are construction work. Thus, in **Secretary of Labor vs. Consolidated Rail Corp.**, OSHRC Docket No. 91-3134 (filed Jan. 22, 1992), OSHA cited Conrail for violation of its construction industry standards, alleging that maintenance-of-way activities "involve at least in part, construction, alteration and/or repair...." In **Consolidated Rail Corp.**, 1979 OSAHRC LEXIS 640, 1979 OSHC (CCH) p. 23,392 (1979), OSHA cited a railroad for violation of construction industry standards in connection with replacement of damaged railroad ties on a bridge. **See also Burlington Northern Railroad Co.**, 14 OSHC 1402 (1989) (citation for failing to shore trench). More recently, in a 1993 case settled with the Norfolk Southern Railroad, it was determined that the replacement of thousands of aged and damaged ties and tons of ballast is "improvement and/or repair of track," and consequently such work is construction work. The case also determined that the repair and rehabilitation of railroad tracks, on site, using heavy equipment and workers spread over a large geographical area is also construction work.

In other instances, where an activity cannot be easily classified as construction or maintenance even when measured against all of the above factors, the activity should be classified so as to allow application of the more protective 1910 or 1926 standard, depending on the hazard. In such cases the citation should be issued in the alternative with the emphasis on the more protective standard.

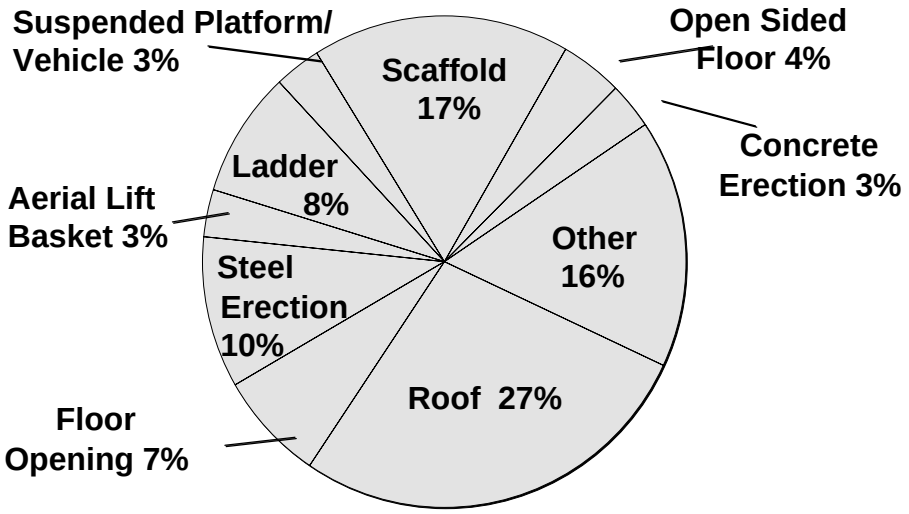
Questions on the above policy should be forwarded to the Office of Construction and Maritime Compliance Assistance, Attention: Roy Gurnham or Dale Cavanaugh, (telephone: (202) 219-8136, extensions 150, 149 respectively).

Total Construction Fatalities 1985-1993

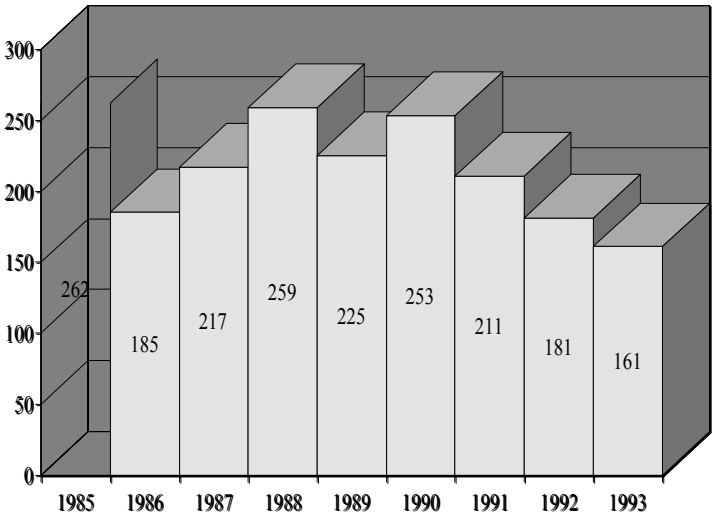


Statistics from "Safety & Health " magazine, September 1994 issue

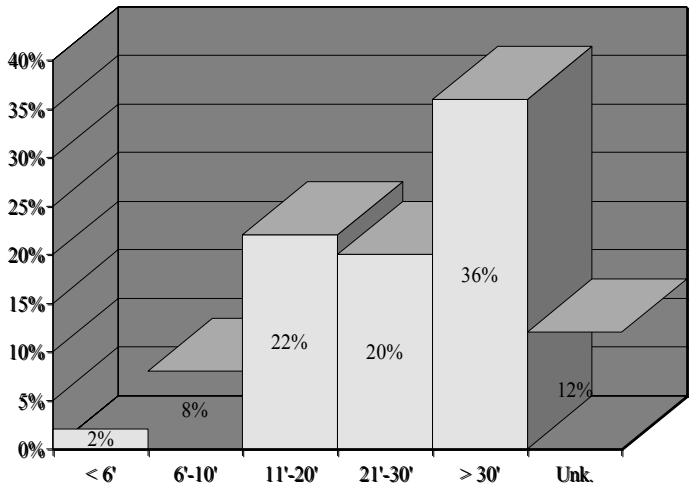
Summary of Activities



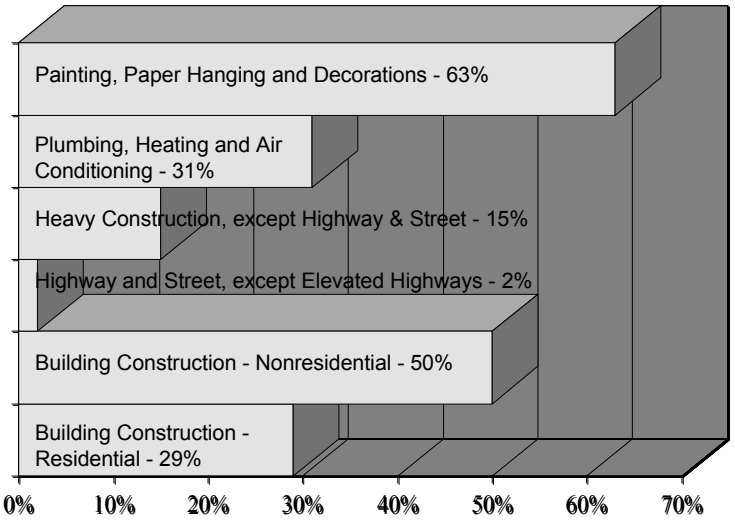
Number of Construction Fatalities Due to Falls



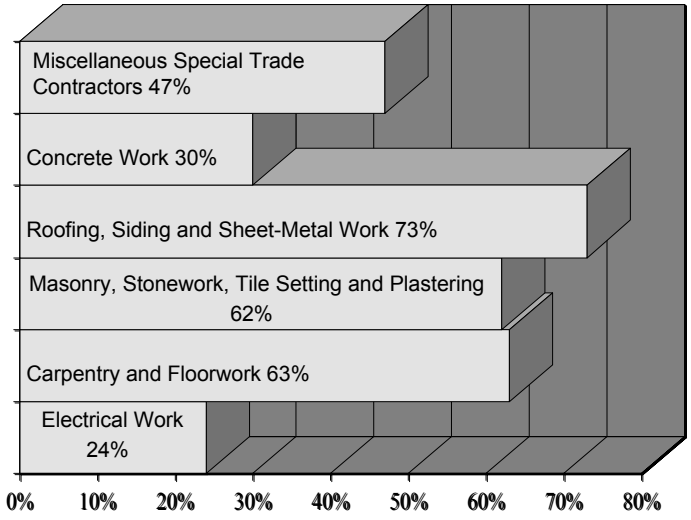
Analysis of Heights For Construction Fatalities



Construction Activity % of Total Fatalities



Construction Activity % of Total Fatalities (Cont'd)



Department of Labor

Occupational Safety and Health Administration

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29 CFR Part 1926

Safety Standards for Fall Protection in the Construction Industry

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Subpart M - Fall Protection

Effective Date: February 6, 1995

1926.500 Scope, application, and definitions applicable to this subpart.

(a) Scope and application.

(1) This subpart sets forth requirements and criteria for fall protection in construction workplaces covered under 29 CFR part 1926. **Exception**: The provisions of this subpart do not apply when employees are making an inspection, investigation, or assessment of workplace conditions prior to the actual start of construction work or after all construction work has been completed.

(2) Section 1926.501 sets forth those workplaces, conditions, operations, and circumstances for which fall protection shall be provided except as follows:
(i) Requirements relating to fall protection for employees working on scaffolds are provided in Subpart L of this part.
(ii) Requirements relating to fall protection for employees working on certain cranes and derricks are provided in Subpart N of this part.
(iii) Requirements relating to fall protection for employees performing steel erection work are provided in 1926.105 and in Subpart R of this part.
(iv) Requirements relating to fall protection for employees working on certain types of equipment used in tunneling operations are provided in Subpart S of this part.
(v) Requirements relating to fall protection for employees engaged in the construction of electric transmission and distribution lines and equipment are provided in Subpart V of this part.
(vi) Requirements relating to fall protection for employees working on stairways and ladders are provided in Subpart X of this part.

(3) Section 1926.502 sets forth the requirements for the installation, construction, and proper use of fall protection required by part 1926, except as follows:
(i) Performance requirements for guardrail systems used on scaffolds and performance requirements for falling object protection used on scaffolds are provided in Subpart L of this part.
(ii) Performance requirements for stairways, stairrail systems, and handrails are provided in Subpart X of this part.
(iii) Additional performance requirements for personal climbing equipment, lineman's body belts, safety straps, and lanyards are provided in Subpart V of this part.
* (iv) Section 1926.502 does not apply to steel erection activities. (Note: Section 1926.104 sets the criteria for body belts, lanyards and lifelines used for fall protection in steel erection activities. Paragraphs (b), (c) and (f) of 1926.107 provide definitions for the pertinent terms).
* (4) Section 1926.503 sets forth requirements for training in the installation and use of fall protection systems, except in relation to steel erection activities.

(b) Definitions.

"Anchorage" means a secure point of attachment for lifelines, lanyards or deceleration devices.

"Body belt (safety belt)" means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

"Body harness" means straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

"Buckle" means any device for holding the body belt or body harness closed around the employee's body.

"Connector" means a device which is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabiner, or it may be an integral component of part of the system (such as a buckle or dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

"Controlled access zone (CAZ)" means an area in which certain work (e.g., overhand bricklaying) may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is controlled.

"Dangerous equipment" means equipment (such as pickling or galvanizing tanks, degreasing units, machinery, electrical equipment, and other units) which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment.

"Deceleration device" means any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

"Deceleration distance" means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

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

"Failure" means load refusal, breakage, or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.

"*Free fall*" means the act of falling before a personal fall arrest system begins to apply force to arrest the fall.

"Free fall distance" means the vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

"Guardrail system" means a barrier erected to prevent employees from falling to lower levels.

"Hole" means a gap or void 2 inches (5.1 cm) or more in its least dimension, in a floor, roof, or other walking/working surface.

"Infeasible" means that it is impossible to perform the construction work using a conventional fall protection system (i.e., guardrail system, safety net system, or personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.

"Lanyard" means a flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

"Leading edge" means the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A leading edge is considered to be an "unprotected side and edge" during periods when it is not actively and continuously under construction.

"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.

"Low-slope roof" means a roof having a slope less than or equal to 4 in 12 (vertical to horizontal).

"Lower levels" means those areas or surfaces to which an employee can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.

"Mechanical equipment" means all motor or human propelled wheeled equipment used for roofing work, except wheelbarrows and mopcarts.

"Opening" means a gap or void 30 inches (76 cm) or more high and 18 inches (48 cm) or more wide, in a wall or partition, through which employees can fall to a lower level.

"Overhand bricklaying and related work" means the process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, requiring the mason to lean over the wall to complete the work. Related work includes mason tending and electrical installation

incorporated into the brick wall during the overhand bricklaying process.

"Personal fall arrest system" means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. As of January 1, 1998, the use of a body belt for fall arrest is prohibited.

"Positioning device system" means a body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.

"Rope grab" means a deceleration device which travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/level locking, or both.

"Roof" means the exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily become the top surface of a building.

"Roofing work" means the hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

"Safety-monitoring system" means a safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.

"Self-retracting lifeline/lanyard" means a deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

"Snaphook" means a connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snaphooks are generally one of two types:

(1) The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or

(2) The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection. As of January 1, 1998, the use of a non-locking snaphook as part of personal fall arrest systems and positioning device systems is prohibited.

"Steep roof" means a roof having a slope greater than 4 in 12 (vertical to horizontal).

"Toeboard" means a low protective barrier that will prevent the fall of materials and equipment to lower levels and provide protection from falls for personnel.

"Unprotected sides and edges" means any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is

no wall or guardrail system at least 39 inches (1.0 m) high.

"Walking/working surface" means any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.

"*Warning line system*" means a barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.

"Work area" means that portion of a walking/working surface where job duties are being performed.

1926.501 Duty to have fall protection.

(a) ***General.***
(1) This section sets forth requirements for employers to provide fall protection systems. All fall protection required by this section shall conform to the criteria set forth in 1926.502 of this subpart.
(2) The employer shall determine if the walking/working surfaces on which its employees are to work have the strength and structural integrity to support employees safely. Employees shall be allowed to work on those surfaces only when the surfaces have the requisite strength and structural integrity.

(b)(1) ***Unprotected sides and edges.*** Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8 m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems.

(2) ***Leading edges.*** (i) Each employee who is constructing a leading edge 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems. ***Exception:*** When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.
Note: There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the above-listed fall protection systems. Accordingly, the employer has the burden of establishing that it is appropriate to implement a fall protection plan which complies with 1926.502(k) for a particular workplace situation, in lieu of implementing any of those systems.
(ii) Each employee on a walking/working surface 6 feet (1.8 m) or more above a lower level where leading edges are under construction, but who is not engaged in the leading edge work, shall be protected from falling by a guardrail system, safety net system, or personal fall arrest system. If a guardrail system is chosen to provide the fall protection, and a controlled access zone has already been established for leading edge work, the control line may be used in lieu of a guardrail along the edge that parallels the leading edge.

(3) ***Hoist areas.*** Each employee in a hoist area shall be protected from falling 6 feet (1.8 m) or more to lower levels by guardrail systems or personal fall arrest systems. If guardrail systems, [or chain, gate, or guardrail] or portions thereof, are removed to facilitate the hoisting operation (e.g., during landing of materials), and an employee must lean through the access opening or out over the edge of the access opening (to receive or guide equipment and materials, for example), that employee shall be protected from fall hazards by a personal fall arrest system.

(4) ***Holes.*** (i) Each employee on walking/working surfaces shall be protected from falling through holes (including skylights) more than 6 feet (1.8 m) above lower levels, by personal fall arrest systems, covers, or guardrail systems erected around such holes.
(ii) Each employee on a walking/working surface shall be protected from tripping in or stepping into or through holes (including skylights) by covers.
(iii) Each employee on a walking/working surface shall be protected from objects falling through holes (including skylights) by covers.

(5) ***Formwork and reinforcing steel.*** Each employee on the face of formwork or reinforcing steel shall be protected from falling 6 feet (1.8 m) or more to lower levels by personal fall arrest systems, safety net systems, or positioning device systems.

(6) ***Ramps, runways, and other walkways.*** Each employee on ramps, runways, and other walkways shall be protected from falling 6 feet (1.8 m) or more to lower levels by guardrail systems.

(7) ***Excavations.*** (i) Each employee at the edge of an excavation 6 feet (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, or barricades when the excavations are not readily seen because of plant growth or other visual barrier;
(ii) Each employee at the edge of a well, pit, shaft, and similar excavation 6 feet (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, barricades, or covers.

(8) ***Dangerous equipment.*** (i) Each employee less than 6 feet (1.8 m) above dangerous equipment shall be protected from falling into or onto the dangerous equipment by guardrail systems or by equipment guards.
(ii) Each employee 6 feet (1.8 m) or more above dangerous equipment shall be protected from fall hazards by guardrail systems, personal fall arrest systems, or safety net systems.

(9) ***Overhand bricklaying and related work.*** (i) Except as otherwise provided in paragraph (b) of this section, each employee performing overhand bricklaying and related work 6 feet (1.8 m) or more above lower levels, shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems, or shall work in a controlled access zone.
(ii) Each employee reaching more than 10 inches (25 cm) below the level of the walking/working surface on which they are working, shall be protected from falling by a guardrail system, safety net system, or personal fall arrest system.
Note: Bricklaying operations performed on scaffolds are regulated by subpart L - Scaffolds of this part.

(10) ***Roofing work on Low-slope roofs.*** Except as otherwise provided in paragraph (b) of this section, each employee engaged in roofing activities on low-slope roofs, with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected

from falling by guardrail systems, safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, or warning line system and personal fall arrest system, or warning line system and safety monitoring system. Or, on roofs 50-feet (15.25 m) or less in width (see Appendix A to subpart M of this part), the use of a safety monitoring system alone [i.e. without the warning line system] is permitted.

(11) ***Steep roofs.*** Each employee on a steep roof with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems with toeboards, safety net systems, or personal fall arrest systems.

(12) ***Precast concrete erection***. Each employee engaged in the erection of precast concrete members (including, but not limited to the erection of wall panels, columns, beams, and floor and roof "tees") and related operations such as grouting of precast concrete members, who is 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems, unless another provision in paragraph (b) of this section provides for an alternative fall protection measure.

***Exception*:** When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.

Note: There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the above-listed fall protection systems. Accordingly, the employer has the burden of establishing that it is appropriate to implement a fall protection plan which complies with 1926.502(k) for a particular workplace situation, in lieu of implementing any of those systems.

(13) ***Residential construction.*** Each employee engaged in residential construction activities 6 feet (1.8 m) or more above lower levels shall be protected by guardrail systems, safety net system, or personal fall arrest system unless another provision in paragraph (b) of this section provides for an alternative fall protection measure.

Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.

Note: There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the above-listed fall protection systems. Accordingly, the employer has the burden of establishing that it is appropriate to implement a fall protection plan which complies with 1926.502(k) for a particular workplace situation, in lieu of implementing any of those systems.

(14) ***Wall openings.*** Each employee working on, at, above, or near wall openings (including those with chutes attached) where the outside bottom edge of the wall opening is 6 feet (1.8 m) or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches (1.0 m) above the walking/working surface, shall be protected from falling by the use of a guardrail system, a safety net system, or a personal fall arrest system.

(15) ***Walking/working surfaces not otherwise addressed.*** Except as provided in 1926.500(a)(2) or in 1926.501 (b)(1) through (b)(14), each employee on a walking/working surface 6 feet (1.8 m) or more above lower levels shall be protected from falling by a guardrail system, safety net system, or personal fall arrest system.

(c) Protection from falling objects. When an employee is exposed to falling objects, the employer shall have each employee wear a hard hat and shall implement one of the following measures:

(1) Erect toeboards, screens, or guardrail systems to prevent objects from falling from higher levels; or,

(2) Erect a canopy structure and keep potential fall objects far enough from the edge of the higher level so that those objects would not go over the edge if they were accidentally displaced; or,

(3) Barricade the area to which objects could fall, prohibit employees from entering the barricaded area, and keep objects that may fall far enough away from the edge of a higher level so that those objects would not go over the edge if they were accidentally displaced.

1926.502 Fall protection systems criteria and practices.

(a) ***General.*** (1) Fall protection systems required by this part shall comply with the applicable provisions of this section.
(2) Employers shall provide and install all fall protection systems required by this subpart for an employee, and shall comply with all other pertinent requirements of this subpart before that employee begins the work that necessitates the fall protection.

(b) ***Guardrail systems.*** Guardrail systems and their use shall comply with the following provisions:
(1) Top edge height of top rails, or equivalent guardrail system members, shall be 42 inches (1.1 m) plus or minus 3 inches (8 cm) above the walking/working level. When conditions warrant, the height of the top edge may exceed the 45-inch height, provided the guardrail system meets all other criteria of this paragraph.
Note: When employees are using stilts, the top edge height of the top rail, or equivalent member, shall be increased an amount equal to the height of the stilts.
(2) Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working surface when there is no wall or parapet wall at least 21 inches (53 cm) high.
(i) Midrails, when used, shall be installed at a height midway between the top edge of the guardrail system and the walking/working level.
(ii) Screens and mesh, when used, shall extend from the top rail to the walking/working level and along the entire opening between top rail supports.
(iii) Intermediate members (such as balusters), when used between posts, shall be not more than 19 inches (48 cm) apart.
(iv) Other structural members (such as additional midrails and architectural panels) shall be installed such that there are no openings in the guardrail system that are more than 19 inches (.5 m) wide.
(3) Guardrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds (890 N) applied within 2 inches (5.1 cm) of the top edge, in any outward or downward direction, at any point along the top edge.
(4) When the 200 pound (890 N) test load specified in paragraph (b)(3) of this section is applied in a downward direction, the top edge of the guardrail shall not deflect to a height less than 39 inches (1.0 m) above the walking/working level. Guardrail system components selected and constructed in accordance with the Appendix B to subpart M of this part will be deemed to meet this requirement.
(5) Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members shall be capable of withstanding, without failure, a force of at least 150 pounds (666 N) applied in any downward or outward direction

at any point along the midrail or other member.
(6) Guardrail systems shall be so surfaced as to prevent injury to an employee from punctures or lacerations, and to prevent snagging of clothing.
(7) The ends of all top rails and midrails shall not overhang the terminal posts, except where such overhang does not constitute a projection hazard.
(8) Steel banding and plastic banding shall not be used as top rails or midrails.
(9) Top rails and midrails shall be at least one-quarter inch (0.6 cm) nominal diameter or thickness to prevent cuts and lacerations. If wire rope is used for top rails, it shall be flagged at not more than 6-foot intervals with high-visibility material.
(10) When guardrail systems are used at hoisting areas, a chain, gate or removable guardrail section shall be placed across the access opening between guardrail sections when hoisting operations are not taking place.
(11) When guardrail systems are used at holes, they shall be erected on all unprotected sides or edges of the hole.
(12) When guardrail systems are used around holes used for the passage of materials, the hole shall have not more than two sides provided with removable guardrail sections to allow the passage of materials. When the hole is not in use, it shall be closed over with a cover, or a guardrail system shall be provided along all unprotected sides or edges.
(13) When guardrail systems are used around holes which are used as points of access (such as ladderways), they shall be provided with a gate, or be so offset that a person cannot walk directly into the hole.
(14) Guardrail systems used on ramps and runways shall be erected along each unprotected side or edge.
(15) Manila, plastic or synthetic rope being used for top rails or midrails shall be inspected as frequently as necessary to ensure that it continues to meet the strength requirements of paragraph (b)(3) of this section.

(c) ***Safety net systems.*** Safety net systems and their use shall comply with the following provisions:
(1) Safety nets shall be installed as close as practicable under the walking/working surface on which employees are working, but in no case more than 30 feet (9.1 m) below such level. When nets are used on bridges, the potential fall area from the walking/working surface to the net shall be unobstructed.
(2) Safety nets shall extend outward from the outermost projection of the work surface as follows:

Vertical distance from working level to horizontal plane of net	Maximum required horizontal distance of outer edge of the working surface
Up to 5 feet.....	.....8 feet
More than 5 feet, up to 10 feet	.....10 feet
More than 10 feet ..	.....13 feet

(3) Safety nets shall be installed with sufficient clearance under them to prevent contact with the surface or structures below when subjected to an impact force equal to the drop test specified in paragraph (c)(4) of this section.

(4) Safety nets and their installations shall be capable of absorbing an impact force equal to that produced by the drop test specified in paragraph (c)(4)(i) of this section.

(i) Except as provided in paragraph (c)(4)(ii) of this section, safety nets and safety net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. The drop-test shall consist of a 400 pound (180 kg) bag of sand 30 + or - 2 inches (76 + or - 5 cm) in diameter dropped into the net from the highest walking/working surface at which employees are exposed to fall hazards, but not from less than 42 inches (1.1 m) above that level.

(ii) When the employer can demonstrate that it is unreasonable to perform the drop-test required by paragraph (c)(4)(i) of this section, the employer (or a designated competent person) shall certify that the net and net installation is in compliance with the provisions of paragraphs (c)(3) and (c)(4)(i) of this section by preparing a certification record prior to the net being used as a fall protection system. The certification record must include an identification of the net and net installation for which the certification record is being prepared; the date that it was determined that the identified net and net installation were in compliance with paragraph (c)(3) of this section and the signature of the person making the determination and certification. The most recent certification record for each net and net installation shall be available at the jobsite for inspection.

(5) Defective nets shall not be used. Safety nets shall be inspected at least once a week for wear, damage, and other deterioration. Defective components shall be removed from service. Safety nets shall also be inspected after any occurrence which could affect the integrity of the safety net system.

(6) Materials, scrap pieces, equipment, and tools which have fallen into the safety net shall be removed as soon as possible from the net and at least before the next work shift.

(7) The maximum size of each safety net mesh opening shall not exceed 36 square inches (230 cm) nor be longer than 6 inches (15 cm) on any side, and the opening, measured center-to-center of mesh ropes or webbing, shall not be longer than 6 inches (15 cm). All mesh crossings shall be secured to prevent enlargement of the mesh opening.

(8) Each safety net (or section of it) shall have a border rope for webbing with a minimum breaking strength of 5,000 pounds (22.2 kN).

(9) Connections between safety net panels shall be as strong as integral net components and shall be spaced not more than 6 inches (15 cm) apart.

(d) ***Personal fall arrest systems.*** Personal fall arrest systems and their use shall comply with the provisions set forth below. Effective January 1, 1998, body belts are not acceptable as part of a personal fall arrest system. Note: The use of a body belt in a positioning device system is acceptable and is regulated under paragraph (e) of this section.

(1) Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.
(2) Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.
(3) Dee-rings and snaphooks shall have a minimum tensile strength of 5,000 pounds (22.2 kN).
(4) Dee-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.
(5) Snaphooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snaphook by depression of the snaphook keeper by the connected member, or shall be a locking type snaphook designed and used to prevent disengagement of the snaphook by the contact of the snaphook keeper by the connected member. Effective January 1, 1998, only locking type snaphooks shall be used.
(6) Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:
(i) directly to webbing, rope or wire rope;
(ii) to each other;
(iii) to a dee-ring to which another snaphook or other connector is attached;
(iv) to a horizontal lifeline; or
(v) to any object which is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.
(7) On suspended scaffolds or similar work platforms with horizontal lifelines which may become vertical lifelines, the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.
(8) Horizontal lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a safety factor of at least two.
(9) Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds (22.2 kN).
(10)(i) Except as provided in paragraph (d)(10)(ii) of this section, when vertical lifelines are used, each employee shall be attached to a separate lifeline.
(ii) During the construction of elevator shafts, two employees may be attached to the same lifeline in the hoistway, provided both employees are working atop a false car that is equipped with guardrails; the strength of the lifeline is 10,000 pounds [5,000 pounds per employee attached] (44.4 kN); and all other criteria specified in this paragraph for lifelines have been met.
(11) Lifelines shall be protected against being cut or abraded.
(12) Self-retracting lifelines and lanyards which automatically limit free fall distance to 2 feet (0.61 m) or less shall be capable of sustaining a minimum tensile load of 3,000 pounds (13.3 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(13) Self-retracting lifelines and lanyards which do not limit free fall distance to 2 feet (0.61 m) or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(14) Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses shall be made from synthetic fibers.

(15) Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed, and used as follows:

(i) as part of a complete personal fall arrest system which maintains a safety factor of at least two; and

(ii) under the supervision of a qualified person.

(16) Personal fall arrest systems, when stopping a fall, shall:

(i) limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt;

(ii) limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness;

(iii) be rigged such that an employee can neither free fall more than 6 feet (1.8 m), nor contact any lower level;

(iv) bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07 m); and,

(v) have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet (1.8 m), or the free fall distance permitted by the system, whichever is less.

Note: If the personal fall arrest system meets the criteria and protocols contained in Appendix C to subpart M, and if the system is being used by an employee having a combined person and tool weight of less than 310 pounds (140 kg), the system will be considered to be in compliance with the provisions of paragraph (d)(16) of this section. If the system is used by an employee having a combined tool and body weight of 310 pounds (140 kg) or more, then the employer must appropriately modify the criteria and protocols of the Appendix to provide proper protection for such heavier weights, or the system will not be deemed to be in compliance with the requirements of paragraph (d)(16) of this section.

(17) The attachment point of the body belt shall be located in the center of the wearer's back. The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.

(18) Body belts, harnesses, and components shall be used only for employee protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.

(19) Personal fall arrest systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected and determined by a

competent person to be undamaged and suitable for reuse.
(20) The employer shall provide for prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.
(21) Personal fall arrest systems shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service.
(22) Body belts shall be at least one and five-eighths (1 5/8) inches (4.1 cm) wide.
(23) Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists except as specified in other subparts of this Part.
(24) When a personal fall arrest system is used at hoist areas, it shall be rigged to allow the movement of the employee only as far as the edge of the walking/working surface.

(e) ***Positioning device systems.*** Positioning device systems and their use shall conform to the following provisions:
(1) Positioning devices shall be rigged such that an employee cannot free fall more than 2 feet (.9 m).
(2) Positioning devices shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds (13.3 kN), whichever is greater.
(3) Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.
(4) Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of this system.
(5) Connecting assemblies shall have a minimum tensile strength of 5,000 pounds (22.2 kN)
(6) Dee-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.
(7) Snaphooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snaphook by depression of the snaphook keeper by the connected member, or shall be a locking type snaphook designed and used to prevent disengagement of the snaphook by the contact of the snaphook keeper by the connected member. As of January 1, 1998, only locking type snaphooks shall be used.
(8) Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:
(i) directly to webbing, rope or wire rope;
(ii) to each other;
(iii) to a dee-ring to which another snaphook or other connector is attached;
(iv) to a horizontal lifeline; or
(v) to any object which is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.
(9) Positioning device systems shall be inspected prior to each use for wear, damage, and other deterioration, and

defective components shall be removed from service.
(10) Body belts, harnesses, and components shall be used only for employee protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.

(f) ***Warning line systems.*** Warning line systems [See 1926.501(b)(10)] and their use shall comply with the following provisions:
(1) The warning line shall be erected around all sides of the roof work area.
(i) When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge.
(ii) When mechanical equipment is being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than 10 feet (3.1 m) from the roof edge which is perpendicular to the direction of mechanical equipment operation.
(iii) Points of access, materials handling areas, storage areas, and hoisting areas shall be connected to the work area by an access path formed by two warning lines.
(iv) When the path to a point of access is not in use, a rope, wire, chain, or other barricade, equivalent in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or the path shall be offset such that a person cannot walk directly into the work area.
(2) Warning lines shall consist of ropes, wires, or chains, and supporting stanchions erected as follows:
(i) The rope, wire, or chain shall be flagged at not more than 6-foot (1.8 m) intervals with high-visibility material;
(ii) The rope, wire, or chain shall be rigged and supported in such a way that its lowest point (including sag) is no less than 34 inches (.9 m) from the walking/working surface and its highest point is no more than 39 inches (1.0 m) from the walking/working surface;
(iii) After being erected, with the rope, wire, or chain attached, stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds (71 N) applied horizontally against the stanchion, 30 inches (.8 m) above the walking/working surface, perpendicular to the warning line, and in the direction of the floor, roof, or platform edge;
(iv) The rope, wire, or chain shall have a minimum tensile strength of 500 pounds (2.22 kN), and after being attached to the stanchions, shall be capable of supporting, without breaking, the loads applied to the stanchions as prescribed in paragraph (f)(2)(iii) of this section; and
(v) The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.
(3) No employee shall be allowed in the area between a roof edge and a warning line unless the employee is performing roofing work in that area.
(4) Mechanical equipment on roofs shall be used or stored only in areas where employees are protected by a

warning line system, guardrail system, or personal fall arrest system.

(g) ***Controlled access zones.*** Controlled access zones [See 1926.501(b)(9) and 1926.502(k)] and their use shall conform to the following provisions.

(1) When used to control access to areas where leading edge and other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access.

(i) When control lines are used, they shall be erected not less than 6 feet (1.8 m) nor more than 25 feet (7.7 m) from the unprotected or leading edge, except when erecting precast concrete members.

(ii) When erecting precast concrete members, the control line shall be erected not less than 6 feet (1.8 m) nor more than 60 feet (18 m) or half the length of the member being erected, whichever is less, from the leading edge.

(iii) The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.

(iv) The control line shall be connected on each side to a guardrail system or wall.

(2) When used to control access to areas where overhand bricklaying and related work are taking place:

(i) The controlled access zone shall be defined by a control line erected not less than 10 feet (3.1 m) nor more than 15 feet (4.5 m) from the working edge.

(ii) The control line shall extend for a distance sufficient for the controlled access zone to enclose all employees performing overhand bricklaying and related work at the working edge and shall be approximately parallel to the working edge.

(iii) Additional control lines shall be erected at each end to enclose the controlled access zone.

(iv) Only employees engaged in overhand bricklaying or related work shall be permitted in the controlled access zone.

(3) Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:

(i) Each line shall be flagged or otherwise clearly marked at not more than 6-foot (1.8 m) intervals with high-visibility material.

(ii) Each line shall be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches (1 m) from the walking/working surface and its highest point is not more than 45 inches (1.3 m) [50 inches (1.3 m) when overhand bricklaying operations are being performed] from the walking/working surface.

(iii) Each line shall have a minimum breaking strength of 200 pounds (.88 kN).

(4) On floors and roofs where guardrail systems are not in place prior to the beginning of overhand bricklaying operations, controlled access zones shall be enlarged, as necessary, to enclose all points of access, material handling areas, and storage areas.

(5) On floors and roofs where guardrail systems are in place, but need to be removed to allow overhand bricklaying work or leading edge work to take place, only that portion of the

guardrail necessary to accomplish that day's work shall be removed.

(h) ***Safety monitoring systems.*** Safety monitoring systems [See 1926.501(b)(10) and 1926.502(k)] and their use shall comply with the following provisions:
(1) The employer shall designate a competent person to monitor the safety of other employees and the employer shall ensure that the safety monitor complies with the following requirements:
(i) The safety monitor shall be competent to recognize fall hazards;
(ii) The safety monitor shall warn the employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner;
(iii) The safety monitor shall be on the same walking/working surface and within visual sighting distance of the employee being monitored;
(iv) The safety monitor shall be close enough to communicate orally with the employee; and
(v) The safety monitor shall not have other responsibilities which could take the monitor's attention from the monitoring function.
(2) Mechanical equipment shall not be used or stored in areas where safety monitoring systems are being used to monitor employees engaged in roofing operations on low-slope roofs.
(3) No employee, other than an employee engaged in roofing work [on low-sloped roofs] or an employee covered by a fall protection plan, shall be allowed in an area where an employee is being protected by a safety monitoring system.
(4) Each employee working in a controlled access zone shall be directed to comply promptly with fall hazard warnings from safety monitors.

(i) ***Covers.*** Covers for holes in floors, roofs, and other walking/working surfaces shall meet the following requirements:
(1) Covers located in roadways and vehicular aisles shall be capable of supporting, without failure, at least twice the maximum axle load of the largest vehicle expected to cross over the cover.
(2) All other covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.
(3) All covers shall be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees.
(4) All covers shall be color coded or they shall be marked with the word "HOLE" or "COVER" to provide warning of the hazard.
Note: This provision does not apply to cast iron manhole covers or steel grates used on streets or roadways.

(j) ***Protection from falling objects.*** Falling object protection shall comply with the following provisions:
(1) Toeboards, when used as falling object protection, shall be erected along the edge of the overhead walking/working surface for a distance sufficient to protect employees below.
(2) Toeboards shall be capable of withstanding, without failure, a force of at least 50 pounds (222 N) applied

in any downward or outward direction at any point along the toeboard.
(3) Toeboards shall be a minimum of 3 1/2 inches (9 cm) in vertical height from their top edge to the level of the walking/working surface. They shall have not more than 1/4 inch (0.6 cm) clearance above the walking/working surface. They shall be solid or have openings not over 1 inch (2.5 cm) in greatest dimension.
(4) Where tools, equipment, or materials are piled higher than the top edge of a toeboard, paneling or screening shall be erected from the walking/working surface or toeboard to the top of a guardrail system's top rail or midrail, for a distance sufficient to protect employees below.
(5) Guardrail systems, when used as falling object protection, shall have all openings small enough to prevent passage of potential falling objects.
(6) During the performance of overhand bricklaying and related work:
(i) No materials or equipment except masonry and mortar shall be stored within 4 feet (1.2 m) of the working edge.
(ii) Excess mortar, broken or scattered masonry units, and all other materials and debris shall be kept clear from the work area by removal at regular intervals.
(7) During the performance of roofing work:
(i) Materials and equipment shall not be stored within 6 feet (1.8 m) of a roof edge unless guardrails are erected at the edge.
(ii) Materials which are piled, grouped, or stacked near a roof edge shall be stable and self-supporting.
(8) Canopies, when used as falling object protection, shall be strong enough to prevent collapse and to prevent penetration by any objects which may fall onto the canopy.

(k) ***Fall protection plan.*** This option is available only to employees engaged in leading edge work, precast concrete erection work, or residential construction work (See 1926.501(b)(2), (b)(12), and (b)(13)) who can demonstrate that it is infeasible or it creates a greater hazard to use conventional fall protection equipment. The fall protection plan must conform to the following provisions.
(1) The fall protection plan shall be prepared by a qualified person and developed specifically for the site where the leading edge work, precast concrete work, or residential construction work is being performed and the plan must be maintained up to date.
(2) Any changes to the fall protection plan shall be approved by a qualified person.
(3) A copy of the fall protection plan with all approved changes shall be maintained at the job site.
(4) The implementation of the fall protection plan shall be under the supervision of a competent person.
(5) The fall protection plan shall document the reasons why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety nets systems) are infeasible or why their use would create a greater hazard.
(6) The fall protection plan shall include a written discussion of other

measures that will be taken to reduce or eliminate the fall hazard for workers who cannot be provided with protection from the conventional fall protection systems. For example, the employer shall discuss the extent to which scaffolds, ladders, or vehicle mounted work platforms can be used to provide a safer working surface and thereby reduce the hazard of falling.

(7) The fall protection plan shall identify each location where conventional fall protection methods cannot be used. These locations shall then be classified as controlled access zones and the employer must comply with the criteria in paragraph (g) of this section.

(8) Where no other alternative measure has been implemented, the employer shall implement a safety monitoring system in conformance with 1926.502(h).

(9) The fall protection plan must include a statement which provides the name or other method of identification for each employee who is designated to work in controlled access zones. No other employees may enter controlled access zones.

(10) In the event an employee falls, or some other related, serious incident occurs, (e.g., a near miss) the employer shall investigate the circumstances of the fall or other incident to determine if the fall protection plan needs to be changed (e.g. new practices, procedures, or training) and shall implement those changes to prevent similar types of falls or incidents.

1926.503 Training requirements.

The following training provisions supplement and clarify the requirements of 1926.21 regarding the hazards addressed in subpart M of this part.

(a) ***Training Program.*** (1) The employer shall provide a training program for each employee who might be exposed to fall hazards. The program shall enable each employee to recognize the hazards of falling and shall train each employee in the procedures to be followed in order to minimize these hazards.

(2) The employer shall assure that each employee has been trained, as necessary, by a competent person qualified in the following areas:

(i) The nature of fall hazards in the work area;

(ii) The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used;

(iii) The use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection to be used;

(iv) The role of each employee in the safety monitoring system when this system is used;

(v) The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs;

(vi) The correct procedures for the handling and storage of equipment and materials and the erection of overhead protection; and

(vii) The role of employees in fall protection plans;

(viii) The standards contained in this subpart.

(b) ***Certification of training.*** (1) The employer shall verify compliance with paragraph (a) of this section by preparing a written certification record. The written certification record shall contain the name or other identity of the employee trained, the date(s) of the training, and the signature of the person who conducted the training or the signature of the employer. If the employer relies on training conducted by another employer or completed prior to the effective date of this section, the certification record shall indicate the date the employer determined the prior training was adequate rather than the date of actual training.

(2) The latest training certification shall be maintained.

(c) ***Retraining.*** When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by paragraph (a) of this section, the employer shall retrain each such employee. Circumstances where retraining is required include, but are not limited to, situations where:

(1) Changes in the workplace render previous training obsolete; or

(2) Changes in the types of fall protection systems or equipment to be used render previous training obsolete; or

(3) Inadequacies in an affected employee's knowledge or use of fall

protection systems or equipment indicate that the employee has not retained the requisite understanding or skill.

Appendix A to Subpart M

Determining Roof Widths
Non-Mandatory Guidelines for Complying with 1926.501 (b) (10).

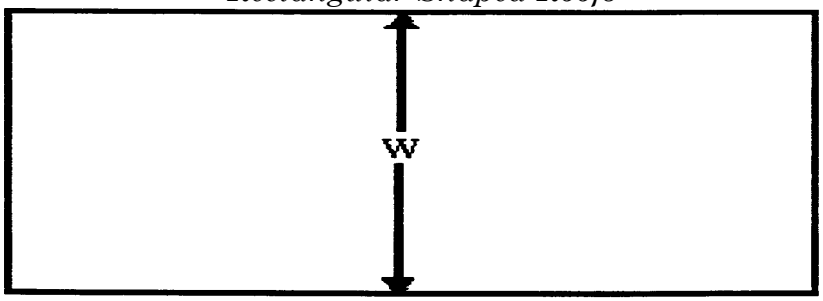
(1) This Appendix serves as a guideline to assist employers complying with the requirements of 1926.501(b)(10). Section 1910.501(b)(10) allows the use of a safety monitoring system alone as a means of providing fall protection during the performance of roofing operations on low-sloped roofs 50 feet (15.25 m) or less in width. Each example in the appendix shows a roof plan or plans and indicates where each roof or roof area is to be measured to determine its width. Section views or elevation views are shown where appropriate. Some examples show "correct" and "incorrect" subdivisions of irregularly shaped roofs divided into smaller, regularly shaped areas. In all examples, the dimension selected to be the width of an area is the lesser of the two primary dimensions of the area, as viewed from above. Example A shows that on a simple rectangular roof, width is the lesser of the two
primary overall dimensions. This is also the case with roofs which are sloped toward or away from the roof center, as shown in Example B.

(2) Many roofs are not simple rectangles. Such roofs may be broken down into subareas as shown in Example C. The process of dividing a roof area can produce many different configurations. Example C gives the general rule of using dividing lines of minimum length to minimize the size and number of the areas which are potentially less than 50 feet (15.25 m) wide. The intent is to minimize the number of roof areas where safety monitoring systems alone are sufficient protection.

(3) Roofs which are comprised of several separate, non-contiguous roof areas, as in Example D, may be considered as a series of individual roofs. Some roofs have penthouses, additional floors, courtyard openings, or similar architectural features; Example E shows how the rule for dividing roofs into subareas is applied to such configurations. Irregular, non-rectangular roofs must be considered on an individual basis, as shown in Example F.

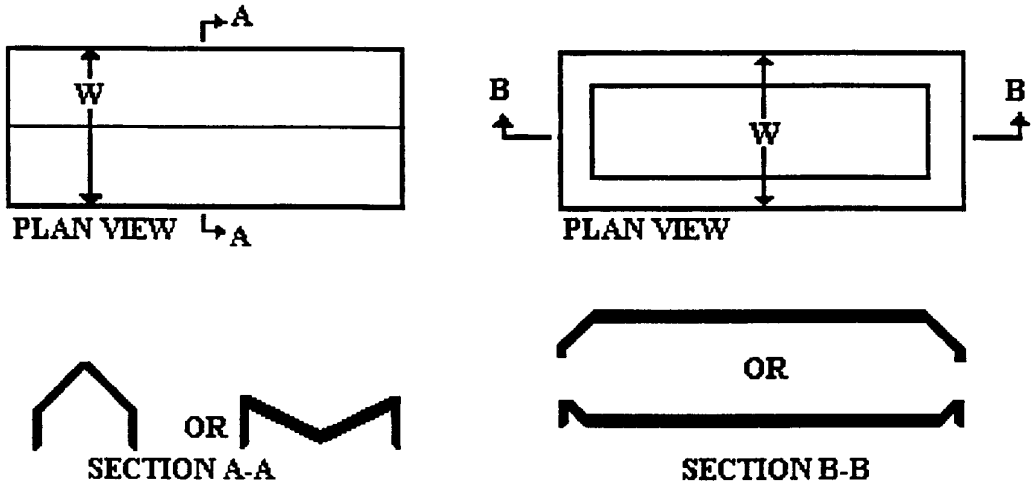
Example A

Rectangular Shaped Roofs



Example B

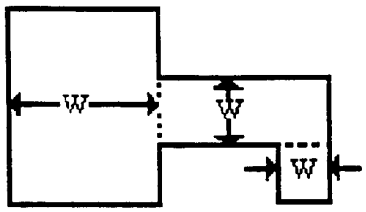
Sloped Rectangular Shaped Roofs



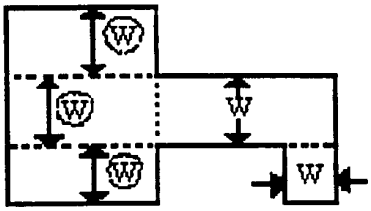
Example C

Irregularly Shaped Roofs With Rectangular Shaped Sections

Such roofs are to be divided into sub-areas by using dividing lines of minimum length to minimize the size and number of the areas which are potentially less than or equal to 50 feet (15.25 meters) in width, in order to limit the size of roof areas where the safety monitoring system alone can be used [1926.502(b)(10)]. Dotted lines are used in the examples to show the location of dividing lines. W denotes incorrect measurements of width.



CORRECT



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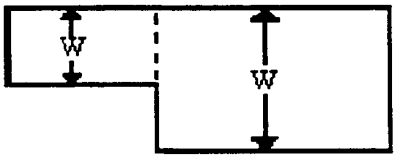

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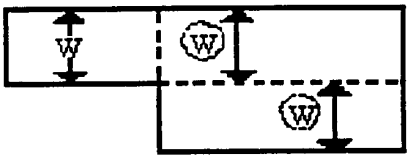

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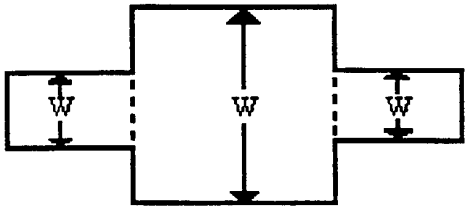

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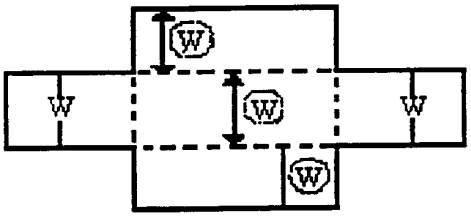
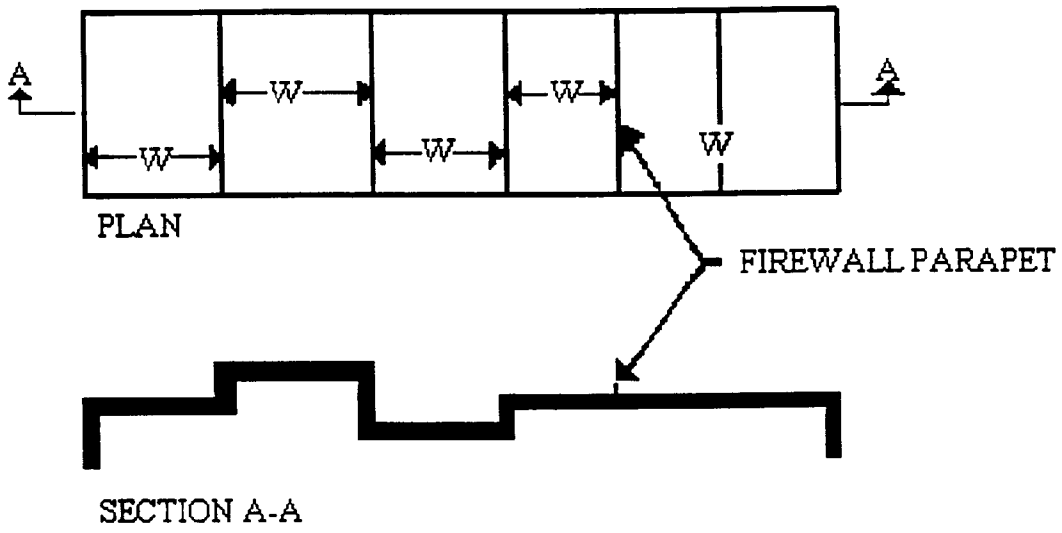
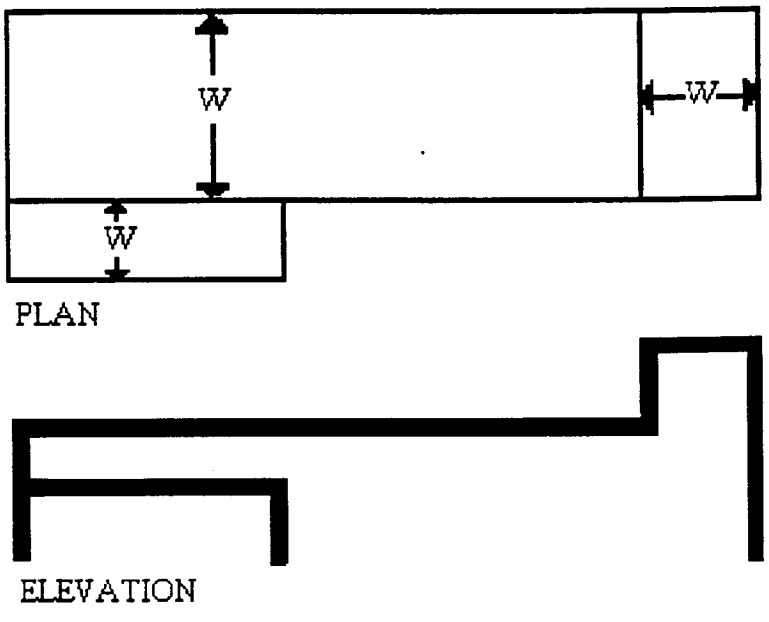


INCORRECT

Example D

Separate, Non-Contiguous Roof Areas

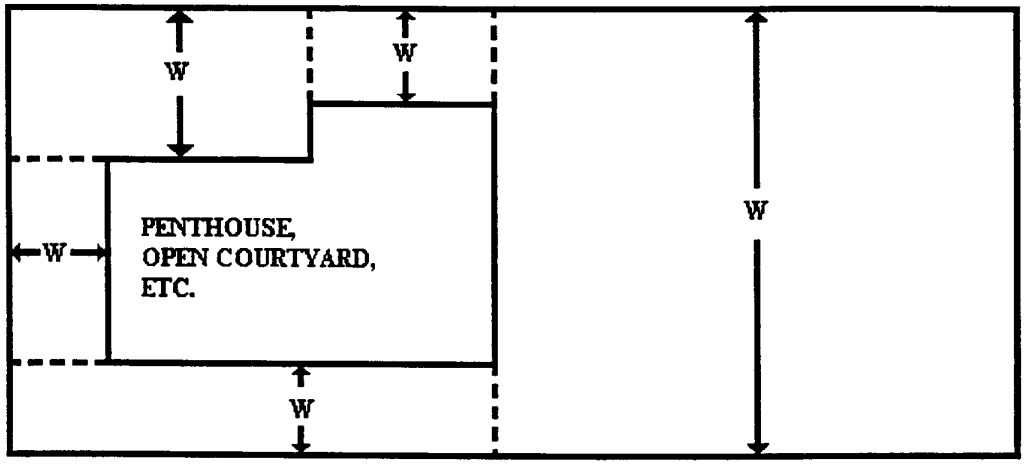




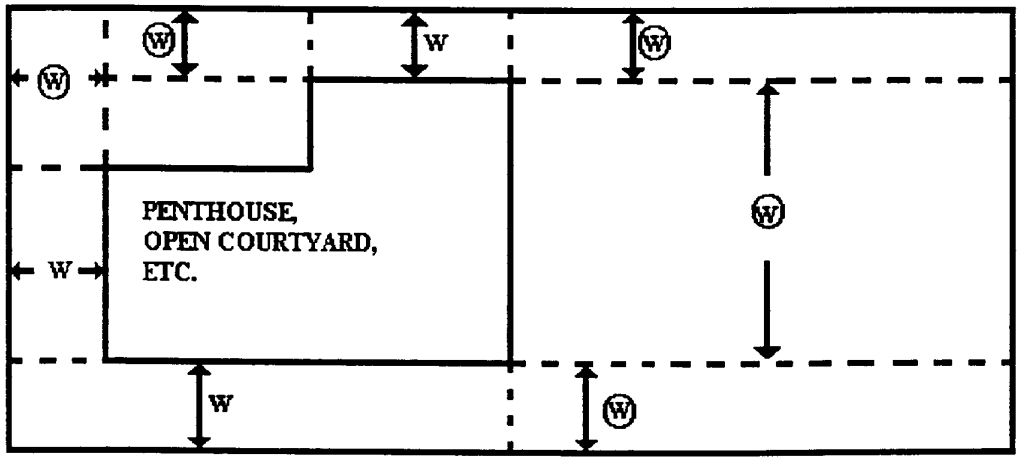
Example E

Roofs With Penthouses, Open Courtyards, Additional Floors, etc.

Such roofs are to be divided into sub-areas by using dividing lines of minimum length to minimize the size and number of the areas which are potentially less than or equal to 50 feet (15.25 meters) in width, in order to limit the size of roof areas where the safety monitoring system alone can be used [1926.502(b)(10)]. Dotted lines are used in the examples to show the location of dividing lines. W denotes incorrect measurements of width.



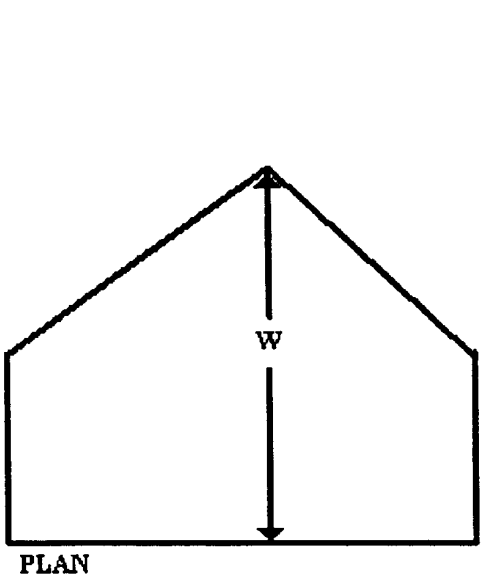
Correct

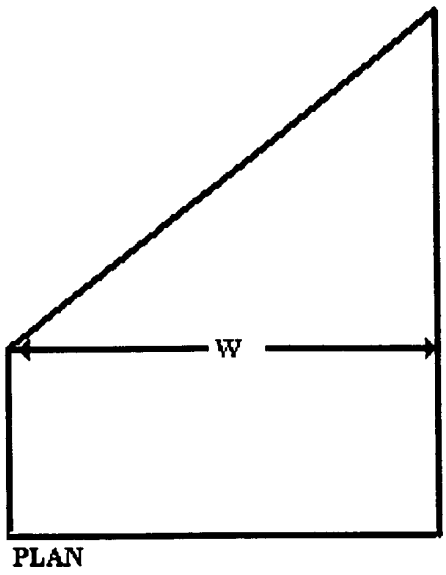


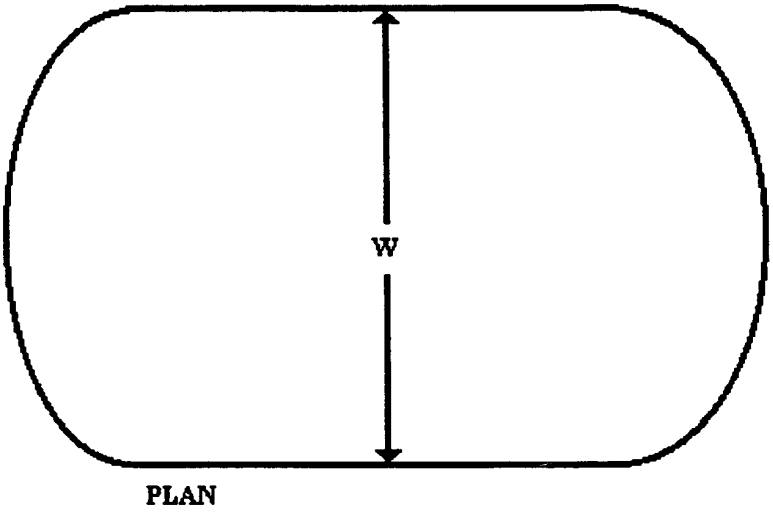
Incorrect

Example F

Irregular, Non-Rectangular Shaped Roofs







Appendix B to Subpart M

Guardrail Systems
Non-Mandatory Guidelines for Complying with 1926.502(b)

The standard requires guardrail systems and components to be designed and built to meet the requirements of 1926.502(b)(3), (4), and (5). This Appendix serves as a non-mandatory guideline to assist employers in complying with these requirements. An employer may use these guidelines as a starting point for designing guardrail systems. However, the guidelines do not provide all the information necessary to build a complete system, and the employer is still responsible for designing and assembling these components in such a way that the completed system will meet the requirements of 1926.502(b)(3), (4), and (5). Components for which no specific guidelines are given in this Appendix (e.g., joints, base connections, components made with other materials, and components with other dimensions) must also be designed and constructed in such a way that the completed system meets the requirements of 1926.502.

(1) For wood railings: Wood components shall be minimum 1500 lb-ft/in(2) fiber (stress grade) construction grade lumber; the posts shall be at least 2-inch by 4-inch (5 cm x 10 cm) lumber spaced not more than 8 feet (2.4 m) apart on centers; the top rail shall be at least 2-inch by 4-inch (5 cm x 10 cm) lumber, the intermediate rail shall be at least 1-inch by 6-inch (2.5 cm x 15 cm) lumber. All lumber dimensions are nominal sizes as provided by the American Softwood Lumber Standards, dated January 1970.

(2) For pipe railings: posts, top rails, and intermediate railings shall be at least one and one-half inches nominal diameter (schedule 40 pipe) with posts spaced not more than 8 feet (2.4 m) apart on centers.

(3) For structural steel railings: posts, top rails, and intermediate rails shall be at least 2-inch by 2-inch (5 cm x 10 cm) by 3/8-inch (1.1 cm) angles, with posts spaced not more than 8 feet (2.4 m) apart on centers.

Appendix C to Subpart M

Personal Fall Arrest Systems
Non-Mandatory Guidelines for Complying with 1926.502(d)

I. *Test methods for personal fall arrest systems and positioning device systems.*

(a) *General.* This appendix serves as a non-mandatory guideline to assist employers comply with the requirements in 1926.502(d). Paragraphs (b), (c), (d) and (e) of this Appendix describe test procedures which may be used to determine compliance with the requirements in 1926.502 (d)(16). As noted in Appendix D of this subpart, the test methods listed here in Appendix C can also be used to assist employers comply with the requirements in 1926.502(e) (3) and (4) for positioning device systems.

(b) *General conditions for all tests in the Appendix to 1926.502(d).*

(1) Lifelines, lanyards and deceleration devices should be attached to an anchorage and connected to the body-belt or body harness in the same manner as they would be when used to protect employees.

(2) The anchorage should be rigid, and should not have a deflection greater than 0.04 inches (1 mm) when a force of 2,250 pounds (10 kN) is applied.

(3) The frequency response of the load measuring instrumentation should be 500 Hz.

(4) The test weight used in the strength and force tests should be a rigid, metal, cylindrical or torso-shaped object with a girth of 38 inches plus or minus 4 inches (96 cm plus or minus 10 cm).

5) The lanyard or lifeline used to create the free fall distance should be supplied with the system, or in its absence, the least elastic lanyard or lifeline available to be used with the system.

(6) The test weight for each test should be hoisted to the required level and should be quickly released without having any appreciable motion imparted to it.

(7) The system's performance should be evaluated taking into account the range of environmental conditions for which it is designed to be used. (8) Following the test, the system need not be capable of further operation.

(c) *Strength test.* (1) During the testing of all systems, a test weight of 300 pounds plus or minus 5 pounds (135 kg plus or minus 2.5 kg) should be used. (See paragraph (b)(4) of this section.)

(2) The test consists of dropping the test weight once. A new unused system should be used for each test.

(3) For lanyard systems, the lanyard length should be 6 feet plus or minus 2 inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body belt or body harness.

(4) For rope-grab-type deceleration systems, the length of the lifeline above the centerline of the grabbing mechanism to the lifeline's anchorage point should not exceed 2 feet (0.61 m).

(5) For lanyard systems, for systems with deceleration devices which do not automatically limit free fall distance to 2 feet (0.61 m) or less, and for systems with deceleration devices which have a connection distance in excess of 1 foot (0.3 m) (measured between the centerline of the lifeline and the attachment point to the body belt or harness), the test weight should be rigged to free fall a distance of 7.5 feet (2.3 m) from a point that is 1.5 feet (.46 m) above the anchorage point, to its hanging location (6 feet below the anchorage). The test weight should fall without interference, obstruction, or hitting the floor or ground during the test. In some cases a non-elastic wire lanyard of sufficient length may need to be added to the system (for test purposes) to create the necessary free fall distance.

(6) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to 2 feet (0.61 m) or less, the test weight should be rigged to free fall a distance of 4 feet (1.22 m). (7) Any weight which detaches from the belt or harness has failed the strength test.

(d) *Force test* - (1) *General.* The test consists of dropping the respective test weight once as specified in paragraph (d)(2)(i) or (d)(3)(i) of this section. A new, unused system should be used for each test.

(2) *For lanyard systems.* (i) A test weight of 220 pounds plus or minus 3 pounds (100 kg plus or minus 1.6 kg) should be used. (See paragraph (b)(4) of this appendix).

(ii) Lanyard length should be 6 feet plus or minus two inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body belt or body harness.

(iii) The test weight should fall free from the anchorage level to its hanging location (a total of 6 feet (1.83 m) free fall distance) without interference, obstruction, or hitting the floor or ground during the test.

(3) *For all other systems.* (i) A test weight of 220 pounds plus or minus 3 pounds (100 kg plus or minus 1.6 kg) should be used. (See paragraph (b)(4) of this appendix)

(ii) The free fall distance to be used in the test should be the maximum fall distance physically permitted by the system during normal use conditions, up to a maximum free fall distance for the test weight of 6 feet (1.83 m), except as follows:

(A) For deceleration systems which have a connection link or lanyard, the test weight should free fall a distance equal to the connection distance (measured between the centerline of the lifeline and the attachment point to the body belt or harness).

(B) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to 2 feet (0.61 m) or less, the test weight should free fall a distance equal to that permitted by the system in normal use. (For example, to test a system with a self-retracting lifeline or lanyard, the test weight should be supported and the system allowed to retract the lifeline or lanyard as it would in normal use. The test weight would then be released and the force and deceleration distance measured).

(4) A system fails the force test if the recorded maximum arresting force exceeds 1,260 pounds (5.6 kN) when using a body belt, and/or exceeds 2,520

pounds (11.2 kN) when using a body harness.
(5) The maximum elongation and deceleration distance should be recorded during the force test.
(e) *Deceleration device tests.* (1) *General.* The device should be evaluated or tested under the environmental conditions, (such as rain, ice, grease, dirt, type of lifeline, etc.), for which the device is designed.
(2) *Rope-grab-type deceleration devices.*
(i) Devices should be moved on a lifeline 1,000 times over the same length of line a distance of not less than 1 foot (30.5 cm), and the mechanism should lock each time.
(ii) Unless the device is permanently marked to indicate the type(s) of lifeline which must be used, several types (different diameters and different materials), of lifelines should be used to test the device.
(3) *Other self-activating-type deceleration devices.* The locking mechanisms of other self-activating-type deceleration devices designed for more than one arrest should lock each of 1,000 times as they would in normal service.

II. *Additional non-mandatory guidelines for personal fall arrest systems.* The following information constitutes additional guidelines for use in complying with requirements for a personal fall arrest system.
(a) *Selection and use considerations.*
(1) The kind of personal fall arrest system selected should match the particular work situation, and any possible free fall distance should be kept to a minimum. Consideration should be given to the particular work environment. For example, the presence of acids, dirt, moisture, oil, grease, etc., and their effect on the system, should be evaluated. Hot or cold environments may also have an adverse effect on the system. Wire rope should not be used where an electrical hazard is anticipated. As required by the standard, the employer must plan to have means available to promptly rescue an employee should a fall occur, since the suspended employee may not be able to reach a work level independently.
(2) Where lanyards, connectors, and lifelines are subject to damage by work operations such as welding, chemical cleaning, and sandblasting, the component should be protected, or other securing systems should be used. The employer should fully evaluate the work conditions and environment (including seasonal weather changes) before selecting the appropriate personal fall protection system. Once in use, the system's effectiveness should be monitored. In some cases, a program for cleaning and maintenance of the system may be necessary.
(b) *Testing considerations.* Before purchasing or putting into use a personal fall arrest system, an employer should obtain from the supplier information about the system based on its performance during testing so that the employer can know if the system meets this standard. Testing should be done using recognized test methods. This Appendix contains test methods recognized for evaluating the performance of fall arrest systems. Not all systems may need to be individually tested; the performance of

some systems may be based on data and calculations derived from testing of similar systems, provided that enough information is available to demonstrate similarity of function and design.

(c) *Component compatibility considerations.* Ideally, a personal fall arrest system is designed, tested, and supplied as a complete system. However, it is common practice for lanyards, connectors, lifelines, deceleration devices, body belts and body harnesses to be interchanged since some components wear out before others. The employer and employee should realize that not all components are interchangeable. For instance, a lanyard should not be connected between a body belt (or harness) and a deceleration device of the self-retracting type since this can result in additional free fall for which the system was not designed. Any substitution or change to a personal fall arrest system should be fully evaluated or tested by a competent person to determine that it meets the standard, before the modified system is put in use.

(d) *Employee training considerations.* Thorough employee training in the selection and use of personal fall arrest systems is imperative. Employees must be trained in the safe use of the system. This should include the following: application limits; proper anchoring and tie-off techniques; estimation of free fall distance, including determination of deceleration distance, and total fall distance to prevent striking a lower level; methods of use; and inspection and storage of the system. Careless or improper use of the equipment can result in serious injury or death. Employers and employees should become familiar with the material in this Appendix, as well as manufacturer's recommendations, before a system is used. Of uppermost importance is the reduction in strength caused by certain tie-offs (such as using knots, tying around sharp edges, etc.) and maximum permitted free fall distance. Also, to be stressed are the importance of inspections prior to use, the limitations of the equipment, and unique conditions at the worksite which may be important in determining the type of system to use.

(e) *Instruction considerations.* Employers should obtain comprehensive instructions from the supplier as to the system's proper use and application, including, where applicable:

(1) The force measured during the sample force test;

(2) The maximum elongation measured for lanyards during the force test;

(3) The deceleration distance measured for deceleration devices during the force test;

(4) Caution statements on critical use limitations;

(5) Application limits;

(6) Proper hook-up, anchoring and tie-off techniques, including the proper dee-ring or other attachment point to use on the body belt and harness for fall arrest;

(7) Proper climbing techniques;

(8) Methods of inspection, use, cleaning, and storage; and

(9) Specific lifelines which may be used.

This information should be provided to employees during training.

(f) *Rescue considerations.* As required by 1926.502(d)(20), when personal fall arrest systems are used, the employer must assure that employees can be promptly rescued or can rescue themselves should a fall occur. The availability of rescue personnel, ladders or other rescue equipment should be evaluated. In some situations, equipment which allows employees to rescue themselves after the fall has been arrested may be desirable, such as devices which have descent capability.

(g) *Inspection considerations.* As required by 1926.502(d)(21), personal fall arrest systems must be regularly inspected. Any component with any significant defect, such as cuts, tears, abrasions, mold, or undue stretching; alterations or additions which might affect its efficiency; damage due to deterioration; contact with fire, acids, or other corrosives; distorted hooks or faulty hook springs; tongues unfitted to the shoulder of buckles; loose or damaged mountings; non-functioning parts; or wearing or internal deterioration in the ropes must be withdrawn from service immediately, and should be tagged or marked as unusable, or destroyed.

(h) *Tie-off considerations.* (1) One of the most important aspects of personal fall protection systems is fully planning the system before it is put into use. Probably the most overlooked component is planning for suitable anchorage points. Such planning should ideally be done before the structure or building is constructed so that anchorage points can be incorporated during construction for use later for window cleaning or other building maintenance. If properly planned, these anchorage points may be used during construction, as well as afterwards.

(i) Properly planned anchorages should be used if they are available. In some cases, anchorages must be installed immediately prior to use. In such cases, a registered professional engineer with experience in designing fall protection systems, or another qualified person with appropriate education and experience should design an anchor point to be installed.

(ii) In other cases, the Agency recognizes that there will be a need to devise an anchor point from existing structures. Examples of what might be appropriate anchor points are steel members or I-beams if an acceptable strap is available for the connection (do not use a lanyard with a snaphook clipped onto itself); large eye-bolts made of an appropriate grade steel; guardrails or railings if they have been designed for use as an anchor point; or masonry or wood members only if the attachment point is substantial and precautions have been taken to assure that bolts or other connectors will not pull through. A qualified person should be used to evaluate the suitable of these "make shift" anchorages with a focus on proper strength.

(2) Employers and employees should at all times be aware that the strength of a personal fall arrest system is based on its being attached to an anchoring system which does not reduce the strength of the system (such as a properly dimensioned eye-bolt/snap-hook
anchorage). Therefore, if a means of

attachment is used that will reduce the strength of the system, that component should be replaced by a stronger one, but one that will also maintain the appropriate maximum arrest force characteristics.

Tie-off using a knot in a rope lanyard or lifeline (at any location) can reduce the lifeline or lanyard strength by 50 percent or more. Therefore, a stronger lanyard or lifeline should be used to compensate for the weakening effect of the knot, or the lanyard length should be reduced (or the tie-off location raised) to minimize free fall distance, or the lanyard or lifeline should be replaced by one which has an appropriately incorporated connector to eliminate the need for a knot.

(4) Tie-off of a rope lanyard or lifeline around an "H" or "I" beam or similar support can reduce its strength as much as 70 percent due to the cutting action of the beam edges. Therefore, use should be made of a webbing lanyard or wire core lifeline around the beam; or the lanyard or lifeline should be protected from the edge; or free fall distance should be greatly minimized.

(5) Tie-off where the line passes over or around rough or sharp surfaces reduces strength drastically. Such a tie-off should be avoided or an alternative tie-off rigging should be used. Such alternatives may include use of a snap-hook/dee ring connection, wire rope tie-off, an effective padding of the surfaces, or an abrasion-resistance strap around or over the problem surface.

(6) Horizontal lifelines may, depending on their geometry and angle of sag, be subjected to greater loads than the impact load imposed by an attached component. When the angle of horizontal lifeline sag is less than 30 degrees, the impact force imparted to the lifeline by an attached lanyard is greatly amplified. For example, with a sag angle of 15 degrees, the force amplification is about 2:1 and at 5 degrees sag, it is about 6:1. Depending on the angle of sag, and the line's elasticity, the strength of the horizontal lifeline and the anchorages to which it is attached should be increased a number of times over that of the lanyard. Extreme care should be taken in considering a horizontal lifeline for multiple tie-offs. The reason for this is that in multiple tie-offs to a horizontal lifeline, if one employee falls, the movement of the falling employee and the horizontal lifeline during arrest of the fall may cause other employees to fall also. Horizontal lifeline and anchorage strength should be increased for each additional employee to be tied off. For these and other reasons, the design of systems using horizontal lifelines must only be done by qualified persons. Testing of installed lifelines and anchors prior to use is recommended.

(7) The strength of an eye-bolt is rated along the axis of the bolt and its strength is greatly reduced if the force is applied at an angle to this axis (in the direction of shear). Also, care should be exercised in selecting the proper diameter of the eye to avoid accidental disengagement of snap-hooks not designed to be compatible for the connection.

(8) Due to the significant reduction in the strength of the lifeline/lanyard (in some cases, as much as a 70 percent reduction), the sliding hitch knot

(prusik) should not be used for lifeline/lanyard connections except in emergency situations where no other available system is practical. The "one-and-one" sliding hitch knot should never be used because it is unreliable in stopping a fall. The "two-and-two," or "three-and-three" knot (preferable) may be used in emergency situations; however, care should be taken to limit free fall distance to a minimum because of reduced lifeline/lanyard strength.

(i) *Vertical lifeline considerations.* As required by the standard, each employee must have a separate lifeline [except employees engaged in constructing elevator shafts who are permitted to have two employees on one lifeline] when the lifeline is vertical. The reason for this is that in multiple tie-offs to a single lifeline, if one employee falls, the movement of the lifeline during the arrest of the fall may pull other employees' lanyards, causing them to fall as well.

(j) *Snap-hook considerations.* (1) Although not required by this standard for all connections until January 1, 1998, locking snaphooks designed for connection to suitable objects (of sufficient strength) are highly recommended in lieu of the nonlocking type. Locking snaphooks incorporate a positive locking mechanism in addition to the spring loaded keeper, which will not allow the keeper to open under moderate pressure without someone first releasing the mechanism. Such a feature, properly designed, effectively prevents roll-out from occurring.

(2) As required by 1926.502(d)(6), the following connections must be avoided (unless properly designed locking snaphooks are used) because they are conditions which can result in roll-out when a nonlocking snaphook is used:

(i) Direct connection of a snaphook to a horizontal lifeline.

(ii) Two (or more) snaphooks connected to one dee-ring.

(iii) Two snaphooks connected to each other.

(iv) A snaphook connected back on its integral lanyard.

(v) A snaphook connected to a webbing loop or webbing lanyard.

(vi) Improper dimensions of the dee-ring, rebar, or other connection point in relation to the snaphook dimensions which would allow the snaphook keeper to be depressed by a turning motion of the snaphook.

(k) *Free fall considerations.* The employer and employee should at all times be aware that a system's maximum arresting force is evaluated under normal use conditions established by the manufacturer, and in no case using a free fall distance in excess of 6 feet (1.8 m). A few extra feet of free fall can significantly increase the arresting force on the employee, possibly to the point of causing injury. Because of this, the free fall distance should be kept at a minimum, and, as required by the standard, in no case greater than 6 feet (1.8 m). To help assure this, the tie-off attachment point to the lifeline or anchor should be located at or above the connection point of the fall arrest equipment to belt or harness. (Since otherwise additional free fall distance is added to the length of the connecting means (i.e. lanyard)). Attaching to the working surface will often result in a free fall greater than 6 feet (1.8 m). For instance, if a 6 foot

(1.8 m) lanyard is used, the total free fall distance will be the distance from the working level to the body belt (or harness) attachment point plus the 6 feet (1.8 m) of lanyard length. Another important consideration is that the arresting force which the fall system must withstand also goes up with greater distances of free fall, possibly exceeding the strength of the system.

(l) *Elongation and deceleration distance considerations.* Other factors involved in a proper tie-off are elongation and deceleration distance. During the arresting of a fall, a lanyard will experience a length of stretching or elongation, whereas activation of a deceleration device will result in a certain stopping distance. These distances should be available with the lanyard or device's instructions and must be added to the free fall distance to arrive at the total fall distance before an employee is fully stopped. The additional stopping distance may be very significant if the lanyard or deceleration device is attached near or at the end of a long lifeline, which may itself add considerable distance due to its own elongation. As required by the standard, sufficient distance to allow for all of these factors must also be maintained between the employee and obstructions below, to prevent an injury due to impact before the system fully arrests the fall. In addition, a minimum of 12 feet (3.7 m) of lifeline should be allowed below the securing point of a rope grab type deceleration device, and the end terminated to prevent the device from sliding off the lifeline. Alternatively, the lifeline should extend to the ground or the next working level below. These measures are suggested to prevent the worker from inadvertently moving past the end of the lifeline and having the

(m) *Obstruction considerations.* The location of the tie-off should also consider the hazard of obstructions in the potential fall path of the employee. rope grab become disengaged from the lifeline.

Tie-offs which minimize the possibilities of exaggerated swinging should be considered. In addition, when a body belt is used, the employee's body will go through a horizontal position to a jack-knifed position during the arrest of all falls. Thus, obstructions which might interfere with this motion should be avoided or a severe injury could occur.

(n) *Other considerations.* Because of the design of some personal fall arrest systems, additional considerations may be required for proper tie-off. For example, heavy deceleration devices of the self-retracting type should be secured overhead in order to avoid the weight of the device having to be supported by the employee. Also, if self-retracting equipment is connected to a horizontal lifeline, the sag in the lifeline should be minimized to prevent the device from sliding down the lifeline to a position which creates a swing hazard during fall arrest. In all cases, manufacturer's instructions should be followed.

Appendix D to Subpart M

Positioning Device Systems
Non-Mandatory Guidelines for Complying with 1926.502(e)

I. *Testing Methods For Positioning Device Systems.*
This appendix serves as a non-mandatory guideline to assist employers comply with the requirements for positioning device systems in 1926.502(e). Paragraphs (b), (c), (d) and (e) of Appendix C of subpart M relating to 1926.502(d) - Personal Fall Arrest Systems - set forth test procedures which may be used, along with the procedures listed below, to determine compliance with the requirements for positioning device systems in 1926.502(e)(3) and (4) of Subpart M.

(a) *General.* (1) Single strap positioning devices shall have one end attached to a fixed anchorage and the other end connected to a body belt or harness in the same manner as they would be used to protect employees. Double strap positioning devices, similar to window cleaner's belts, shall have one end of the strap attached to a fixed anchorage and the other end shall hang free. The body belt or harness shall be attached to the strap in the same manner as it would be used to protect employees. The two strap ends shall be adjusted to their maximum span.
(2) The fixed anchorage shall be rigid, and shall not have a deflection greater than .04 inches (1 mm) when a force of 2,250 pounds (10 kN) is applied.
(3) During the testing of all systems, a test weight of 250 pounds plus or minus 3 pounds (113 kg plus or minus 1.6 kg) shall be used. The weight shall be a rigid object with a girth of 38 inches plus or minus 4 inches (96 cm plus or minus 10 cm).
(4) Each test shall consist of dropping the specified weight one time without failure of the system being tested. A new system shall be used for each test.
(5) The test weight for each test shall be hoisted exactly 4 feet (1.2 m above its "at rest" position), and shall be dropped so as to permit a vertical free fall of 4 feet (1.2 m).
(6) The test is failed whenever any breakage or slippage occurs which permits the weight to fall free of the system.
(7) Following the test, the system need not be capable of further operation; however, all such incapacities shall be readily apparent.

II. *Inspection Considerations.*
As required in 1926.502 (e)(5), positioning device systems must be regularly inspected. Any component with any significant defect, such as cuts, tears, abrasions, mold, or undue stretching; alterations or additions which might affect its efficiency; damage due to deterioration; contact with fire, acids, or other corrosives; distorted hooks or faulty hook springs; tongues unfitted to the shoulder of buckles; loose or damaged mountings;

non-functioning parts; or wearing or internal deterioration in the ropes must be withdrawn from service immediately, and should be tagged or marked as unusable, or destroyed.

Appendix E to Subpart M

Sample Fall Protection Plan
Non-Mandatory Guidelines for Complying with 1926.502(k)

Employers engaged in leading edge work, precast concrete construction work and residential construction work who can demonstrate that it is infeasible or creates a greater hazard to use conventional fall protection systems must develop and follow a fall protection plan. Below are sample fall protection plans developed for precast concrete construction and residential work that could be tailored to be site specific for other precast concrete or residential jobsite. This sample plan can be modified to be used for other work involving leading edge work. The sample plan outlines the elements that must be addressed in any fall protection plan. The reasons outlined in this sample fall protection plan are for illustrative purposes only and are not necessarily a valid, acceptable rationale (unless the conditions at the job site are the same as those covered by these sample plans) for not using conventional fall protection systems for a particular precast concrete or residential construction worksite. However, the sample plans provide guidance to employers on the type of information that is required to be discussed in fall protection plans.

Sample Fall Protection Plans

Fall Protection Plan For Precast/Prestress Concrete Structures

This Fall Protection Plan is specific for the following project:
Location of Job: _____
Erecting Company: _____
Date Plan Prepared or Modified: _____
Plan Prepared By: _____
Plan Approved By: _____
Plan Supervised By: _____

The following Fall Protection Plan is a sample program prepared for the prevention of injuries associated with falls. A Fall Protection Plan must be developed and evaluated on a site by site basis. It is recommended that erectors discuss the written Fall Protection Plan with their OSHA Area Office prior to going on a jobsite.

I. Statement of Company Policy

(Company Name) is dedicated to the protection of its employees from on-the-job injuries. All employees of (Company Name) have the responsibility to work safely on the job. The purpose of this plan is: (a) To supplement our standard safety policy by providing safety standards specifically designed to cover fall protection on this

job and; (b) to ensure that each employee is trained and made aware of the safety provisions which are to be implemented by this plan prior to the start of erection.

This Fall Protection Plan addresses the use of other than conventional fall protection at a number of areas on the project, as well as identifying specific activities that require non-conventional means of fall protection. These areas include:

a. Connecting activity (point of erection).
b. Leading edge work.
c. Unprotected sides or edge.
d. Grouting.

This plan is designed to enable employers and employees to recognize the fall hazards on this job and to establish the procedures that are to be followed in order to prevent falls to lower levels or through holes and openings in walking/working surfaces. Each employee will be trained in these procedures and strictly adhere to them except when doing so would expose the employee to a greater hazard. If, in the employee's opinion, this is the case, the employee is to notify the foreman of the concern and the concern addressed before proceeding.

Safety policy and procedure on any one project cannot be administered, implemented, monitored and enforced by any one individual. The total objective of a safe, accident free work environment can only be accomplished by a dedicated, concerted effort by every individual involved with the project from management down to the last employee. Each employee must understand their value to the company; the costs of accidents, both monetary, physical, and emotional; the objective of the safety policy and procedures; the safety rules that apply to the safety policy and procedures; and what their individual role is in administering, implementing, monitoring, and compliance of their safety policy and procedures. This allows for a more personal approach to compliance through planning, training, understanding and cooperative effort, rather than by strict enforcement. If for any reason an unsafe act persists, strict enforcement will be implemented.

It is the responsibility of (name of competent person) to implement this Fall Protection Plan. (Name of Competent Person) is responsible for continual observational safety checks of their work operations and to enforce the safety policy and procedures. The foreman also is responsible to correct any unsafe acts or conditions immediately. It is the responsibility of the employee to understand and adhere to the procedures of this plan and to follow the instructions of the foreman. It is also the responsibility of the employee to bring to management's attention any unsafe or hazardous conditions or acts that may cause injury to either themselves or any other employees. Any changes to this Fall Protection Plan must be approved by (name of Qualified Person).

II. Fall Protection Systems to Be Used on This Project

Where conventional fall protection is infeasible or creates a greater hazard at the leading edge and during initial connecting activity, we plan to do this work using a safety monitoring system and expose only a minimum number of employees for the

time necessary to actually accomplish the job. The maximum number of workers to be monitored by one safety monitor is six (6). We are designating the following trained employees as designated erectors and they are permitted to enter the controlled access zones and work without the use of conventional fall protection.

Safety monitor:
Designated erector:
Designated erector:
Designated erector:
Designated erector:
Designated erector:
Designated erector:

The safety monitor shall be identified by wearing an orange hard hat. The designated erectors will be identified by one of the following methods:

1. They will wear a blue colored arm band, or
2. They will wear a blue colored hard hat, or
3. They will wear a blue colored vest.

Only individuals with the appropriate experience, skills, and training will be authorized as designated erectors. All employees that will be working as designated erectors under the safety monitoring system shall have been trained and instructed in the following areas:

1. Recognition of the fall hazards in the work area (at the leading edge and when making initial connections-point of erection).
2. Avoidance of fall hazards using established work practices which have been made known to the employees.
3. Recognition of unsafe practices or working conditions that could lead to a fall, such as windy conditions.
4. The function, use, and operation of safety monitoring systems, guardrail systems, body belt/harness systems, control zones and other protection to be used.
5. The correct procedure for erecting, maintaining, disassembling and inspecting the system(s) to be used.
6. Knowledge of construction sequence or the erection plan.

A conference will take place prior to starting work involving all members of the erection crew, crane crew and supervisors of any other concerned contractors. This conference will be conducted by the precast concrete erection supervisor in charge of the project. During the pre-work conference, erection procedures and sequences pertinent to this job will be thoroughly discussed and safety practices to be used throughout the project will be specified. Further, all personnel will be informed that the controlled access zones are off limits to all personnel other than those designated erectors specifically trained to work in that area.

Safety Monitoring System

A safety monitoring system means a fall protection system in which a competent person is responsible for recognizing and warning employees of fall hazards. The duties of the safety monitor are to:

1. Warn by voice when approaching the open edge in an unsafe manner.
2. Warn by voice if there is a dangerous situation developing which cannot be seen by another person involved with product placement, such as a member getting out of control.
3. Make the designated erectors aware they are in a dangerous area.
4. Be competent in recognizing fall hazards.
5. Warn employees when they appear to be unaware of a fall hazard or are acting in an unsafe manner.
6. Be on the same walking/working surface as the monitored employees and within visual sighting distance of the monitored employees.
7. Be close enough to communicate orally with the employees.
8. Not allow other responsibilities to encumber monitoring. If the safety monitor becomes too encumbered with other responsibilities, the monitor shall (1) stop the erection process; and (2) turn over other responsibilities to a designated erector; or (3) turn over the safety monitoring function to another designated, competent person. The safety monitoring system shall not be used when the wind is strong enough to cause loads with large surface areas to swing out of radius, or result in loss of control of the load, or when weather conditions cause the walking-working surfaces to become icy or slippery.

Controlled Access Zone System

A controlled access zone means an area designated and clearly marked, in which leading edge work may take place without the use of guardrail, safety net or personal fall arrest systems to protect the employees in the area. Control zone systems shall comply with the following provisions:

1. When used to control access to areas where leading edge and other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access. When control lines are used, they shall be erected not less than 6 feet (l.8 m) nor more than 60 feet (18 m) or half the length of the member being erected, whichever is less, from the leading edge.
2. The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.
3. The control line shall be connected on each side to a guardrail system or wall.
4. Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:
5. Each line shall be flagged or otherwise clearly marked at not more than 6-foot (1.8 m) intervals with high-visibility material.

6. Each line shall be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches (1 m) from the walking/working surface and its highest point is not more than 45 inches (1.3 m) from the walking/working surface.

7. Each line shall have a minimum breaking strength of 200 pounds (.88 kN).

Holes

All openings greater than 12 in. x 12 in. will have perimeter guarding or covering. All predetermined holes will have the plywood covers made in the precasters' yard and shipped with the member to the jobsite. Prior to cutting holes on the job, proper protection for the hole must be provided to protect the workers. Perimeter guarding or covers will not be removed without the approval of the erection foreman.

Precast concrete column erection through the existing deck requires that many holes be provided through this deck. These are to be covered and protected. Except for the opening being currently used to erect a column, all opening protection is to be left undisturbed. The opening being uncovered to erect a column will become part of the point of erection and will be addressed as part of this Fall Protection Plan. This uncovering is to be done at the erection foreman's direction and will only occur immediately prior to "feeding" the column through the opening. Once the end of the column is through the slab opening, there will no longer exist a fall hazard at this location.

III. Implementation of Fall Protection Plan

The structure being erected is a multistory total precast concrete building consisting of columns, beams, wall panels and hollow core slabs and double tee floor and roof members.

The following is a list of the products and erection situations on this job:

Columns

For columns 10 ft to 36 ft long, employees disconnecting crane hooks from columns will work from a ladder and wear a body belt/harness with lanyard and be tied off when both hands are needed to disconnect. For tying off, a vertical lifeline will be connected to the lifting eye at the top of the column, prior to lifting, to be used with a manually operated or mobile rope grab. For columns too high for the use of a ladder, 36 ft and higher, an added cable will be used to reduce the height of the disconnecting point so that a ladder can be used. This cable will be left in place until a point in erection that it can be removed safely. In some cases, columns will be unhooked from the crane by using an erection tube or shackle with a pull pin which is released from the ground after the column is stabilized.

The column will be adequately connected and/or braced to safely support the weight of a ladder with an employee on it.

Inverted Tee Beams

Employees erecting inverted tee beams, at a height of 6 to 40 ft, will erect the beam, make initial connections, and final alignment from a ladder. If the employee needs to reach over the side of the beam to bar or make an adjustment to the alignment of the beam, they will mount the beam and be tied off to the lifting device in the beam after ensuring the load has been stabilized on its bearing. To disconnect the crane from the beam an employee will stand a ladder against the beam. Because the use of ladders is not practical at heights above 40 ft, beams will be initially placed with the use of tag lines and their final alignment made by a person on a manlift or similar employee positioning systems.

Spandrel Beams

Spandrel beams at the exterior of the building will be aligned as closely as possible with the use of tag lines with the final placement of the spandrel beam made from a ladder at the open end of the structure. A ladder will be used to make the initial connections and a ladder will be used to disconnect the crane. The other end of the beam will be placed by the designated erector from the double tee deck under the observation of the safety monitor.

The beams will be adequately connected and/or braced to safely support the weight of a ladder with an employee on it.

Floor and Roof Members

During installation of the precast concrete floor and/or roof members, the work deck continuously increases in area as more and more units are being erected and positioned. Thus, the unprotected floor/roof perimeter is constantly modified with the leading edge changing location as each member is installed. The fall protection for workers at the leading edge shall be assured by properly constructed and maintained control zone lines not more than 60 ft away from the leading edge supplemented by a safety monitoring system to ensure the safety of all designated erectors working within the area defined by the control zone lines.

The hollow core slabs erected on the masonry portion of the building will be erected and grouted using the safety monitoring system. Grout will be placed in the space between the end of the slab and face shell of the concrete masonry by dumping from a wheelbarrow. The grout in the keyways between the slabs will be dumped from a wheelbarrow and then spread with long handled tools, allowing the worker to stand erect facing toward the unprotected edge and back from any work deck edge.

Whenever possible, the designated erectors will approach the incoming member at the leading edge only after it is below waist height so that the member itself provides protection against falls.

Except for the situations described below, when the arriving floor or roof member is within 2 to 3 inches of its final position, the designated erectors can then proceed to their position of erection at each end of the member under the control of the safety monitor. Crane hooks will be unhooked from double tee members by designated erectors under the direction and supervision of the safety monitor.

Designated erectors, while waiting for the next floor or roof member, will be constantly under the control of the safety monitor for fall protection and are directed to stay a minimum of six (6) ft from the edge. In the event a designated erector must move from one end of a member, which has just been placed at the leading edge, they must first move away from the leading edge a minimum of six (6) ft and then progress to the other end while maintaining the minimum distance of six (6) ft at all times.

Erection of double tees, where conditions require bearing of one end into a closed pocket and the other end on a beam ledge, restricting the tee legs from going directly into the pockets, require special considerations. The tee legs that are to bear in the closed pocket must hang lower than those at the beam bearing. The double tee will be "two-lined" in order to elevate one end higher than the other to allow for the low end to be ducked into the closed pocket using the following procedure.

The double tee will be rigged with a standard four-way spreader off of the main load line. An additional choker will be attached to the married point of the two-legged spreader at the end of the tee that is to be elevated. The double tee will be hoisted with the main load line and swung into a position as close as possible to the tee's final bearing elevation. When the tee is in this position and stabilized, the whip line load block will be lowered to just above the tee deck. At this time, two erectors will walk out on the suspended tee deck at midspan of the tee member and pull the load block to the end of the tee to be elevated and attach the additional choker to the load block. The possibility of entanglement with the crane lines and other obstacles during this two lining process while raising and lowering the crane block on that second line could be hazardous to an encumbered employee. Therefore, the designated erectors will not tie off during any part of this process. While the designated erectors are on the double tee, the safety monitoring system will be used. After attaching the choker, the two erectors then step back on the previously erected tee deck and signal the crane operator to hoist the load with the whip line to the elevation that will allow for enough clearance to let the low end tee legs slide into the pockets when the main load line is lowered. The erector, who is handling the lowered end of the tee at the closed pocket bearing, will step out on the suspended tee. An erection bar will then be placed between the end of the tee leg and the inside face of the pocketed spandrel member. The tee is barred away from the pocketed member to reduce the friction and lateral force against the pocketed member. As the tee is being lowered, the other erector remains on the tee which was previously erected to handle the other end. At this point the tee is slowly lowered by the crane to a point where the tee legs can freely slide into the pockets. The erector working the lowered end of the tee must keep pressure on the bar between the tee and the face of the pocketed spandrel member to very gradually let

the tee legs slide into the pocket to its proper bearing dimension. The tee is then slowly lowered into its final erected position.

The designated erector should be allowed onto the suspended double tee, otherwise there is no control over the horizontal movement of the double tee and this movement could knock the spandrel off of its bearing or the column out of plumb. The control necessary to prevent hitting the spandrel can only be done safely from the top of the double tee being erected.

Loadbearing Wall Panels: The erection of the loadbearing wall panels on the elevated decks requires the use of a safety monitor and a controlled access zone that is a minimum of 25 ft and a maximum of 1/2 the length of the wall panels away from the unprotected edge, so that designated erectors can move freely and unencumbered when receiving the panels. Bracing, if required for stability, will be installed by ladder. After the braces are secured, the crane will be disconnected from the wall by using a ladder. The wall to wall connections will also be performed from a ladder.

Non-Loadbearing Panels (Cladding): The locating of survey lines, panel layout and other installation prerequisites (prewelding, etc.) for non-loadbearing panels (cladding) will not commence until floor perimeter and floor openings have been protected. In some areas, it is necessary because of panel configuration to remove the perimeter protection as the cladding is being installed. Removal of perimeter protection will be performed on a bay to bay basis, just ahead of cladding erection to minimize temporarily unprotected floor edges. Those workers within 6 ft of the edge, receiving and positioning the cladding when the perimeter protection is removed shall be tied off.

Detailing

Employees exposed to falls of six (6) feet or more to lower levels, who are not actively engaged in leading edge work or connecting activity, such as welding, bolting, cutting, bracing, guying, patching, painting or other operations, and who are working less than six (6) ft from an unprotected edge will be tied off at all times or guardrails will be installed. Employees engaged in these activities but who are more than six (6) ft from an unprotected edge as defined by the control zone lines, do not require fall protection but a warning line or control lines must be erected to remind employees they are approaching an area where fall protection is required.

IV. Conventional Fall Protection Considered for the Point of Erection or Leading Edge Erection Operations

A. Personal Fall Arrest Systems

In this particular erection sequence and procedure, personal fall arrest systems requiring body belt/harness systems, lifelines and lanyards will not reduce possible

hazards to workers and will create offsetting hazards during their usage at the leading edge of precast/prestressed concrete construction.

Leading edge erection and initial connections are conducted by employees who are specifically trained to do this type of work and are trained to recognize the fall hazards. The nature of such work normally exposes the employee to the fall hazard for a short period of time and installation of fall protection systems for a short duration is not feasible because it exposes the installers of the system to the same fall hazard, but for a longer period of time.

1. It is necessary that the employee be able to move freely without encumbrance in order to guide the sections of precast concrete into their final position without having lifelines attached which will restrict the employee's ability to move about at the point of erection.

2. A typical procedure requires 2 or more workers to maneuver around each other as a concrete member is positioned to fit into the structure. If they are each attached to a lifeline, part of their attention must be diverted from their main task of positioning a member weighing several tons to the task of avoiding entanglements of their lifelines or avoiding tripping over lanyards. Therefore, if these workers are attached to lanyards, more fall potential would result than from not using such a device.

In this specific erection sequence and procedure, retractable lifelines do not solve the problem of two workers becoming tangled. In fact, such a tangle could prevent the lifeline from retracting as the worker moved, thus potentially exposing the worker to a fall greater than 6 ft. Also, a worker crossing over the lifeline of another worker can create a hazard because the movement of one person can unbalance the other. In the event of a fall by one person there is a likelihood that the other person will be caused to fall as well. In addition, if contamination such as grout (during hollow core grouting) enters the retractable housing it can cause excessive wear and damage to the device and could clog the retracting mechanism as the lanyard is dragged across the deck. Obstructing the cable orifice can defeat the device's shock absorbing function, produce cable slack and damage, and adversely affect cable extraction and retraction.

3. Employees tied to a lifeline can be trapped and crushed by moving structural members if the employee becomes restrained by the lanyard or retractable lifeline and cannot get out of the path of the moving load. The sudden movement of a precast concrete member being raised by a crane can be caused by a number of factors. When this happens, a connector may immediately have to move a considerable distance to avoid injury. If a tied off body belt/harness is being used, the connector could be trapped. Therefore, there is a greater risk of injury if the connector is tied to the structure for this specific erection sequence and procedure.

When necessary to move away from a retractable device, the worker cannot move at a rate greater than the device locking speed typically 3.5 to 4.5 ft/sec. When moving toward the device it is necessary to move at a rate which does not permit cable slack to build up. This slack may cause cable retraction acceleration and cause a worker to lose their balance by applying a higher than normal jerking force on the body when the cable suddenly becomes taut after building up momentum. This

slack can also cause damage to the internal spring-loaded drum, uneven coiling of cable on the drum, and possible cable damage.

The factors causing sudden movements for this location include:

(a) Cranes
(1) Operator error.
(2) Site conditions (soft or unstable ground).
(3) Mechanical failure.
(4) Structural failure.
(5) Rigging failure.
(6) Crane signal/radio communication failure.

(b) Weather Conditions
(1) Wind (strong wind/sudden gusting) - particularly a problem with the large surface areas of precast concrete members.
(2) Snow/rain (visibility).
(3) Fog (visibility).
(4) Cold - causing slowed reactions or mechanical problems.

(c) Structure/Product Conditions.
(1) Lifting Eye failure.
(2) Bearing failure or slippage.
(3) Structure shifting.
(4) Bracing failure.
(5) Product failure.

(d) Human Error.
(1) Incorrect tag line procedure.
(2) Tag line hang-up.
(3) Incorrect or misunderstood crane signals.
(4) Misjudged elevation of member.
(5) Misjudged speed of member.
(6) Misjudged angle of member.

4. Anchorages or special attachment points could be cast into the precast concrete members if sufficient preplanning and consideration of erectors' position is done before the members are cast. Any hole or other attachment must be approved by the engineer who designed the member. It is possible that some design restrictions will not allow a member to be weakened by an additional hole; however, it is anticipated that such situations would be the exception, not the rule. Attachment points, other than on the deck surface, will require removal and/or patching. In order to remove and/or patch these points, requires the employee to be exposed to an additional fall hazard at an unprotected perimeter. The fact that attachment points could be available anywhere on the structure does not eliminate the hazards of using these points for tying off as discussed above. A logical point for tying off on double tees

would be using the lifting loops, except that they must be cut off to eliminate a tripping hazard at an appropriate time.

5. Providing attachment at a point above the walking/working surface would also create fall exposures for employees installing their devices. Final positioning of a precast concrete member requires it to be moved in such a way that it must pass through the area that would be occupied by the lifeline and the lanyards attached to the point above. Resulting entanglements of lifelines and lanyards on a moving member could pull employees from the work surface. Also, the structure is being created and, in most cases, there is no structure above the members being placed.

(a) Temporary structural supports, installed to provide attaching points for lifelines limit the space which is essential for orderly positioning, alignment and placement of the precast concrete members. To keep the lanyards a reasonable and manageable length, lifeline supports would necessarily need to be in proximity to the positioning process. A sudden shift of the precast concrete member being positioned because of wind pressure or crane movement could make it strike the temporary supporting structure, moving it suddenly and causing tied off employees to fall.

(b) The time in manhours which would be expended in placing and maintaining temporary structural supports for lifeline attaching points could exceed the expended manhours involved in placing the precast concrete members. No protection could be provided for the employees erecting the temporary structural supports and these supports would have to be moved for each successive step in the construction process, thus greatly increasing the employee's exposure to the fall hazard.

(c) The use of a cable strung horizontally between two columns to provide tie off lines for erecting or walking a beam for connecting work is not feasible and creates a greater hazard on this multi-story building for the following reasons:

(1) If a connector is to use such a line, it must be installed between the two columns. To perform this installation requires an erector to have more fall exposure time attaching the cable to the columns than would be spent to make the beam to column connection itself.

(2) If such a line is to be installed so that an erector can walk along a beam, it must be overhead or below him. For example, if a connector must walk along a 24 in. wide beam, the presence of a line next to the connector at waist level, attached directly to the columns, would prevent the connector from centering their weight over the beam and balancing themselves. Installing the line above the connector might be possible on the first level of a two-story column; however, the column may extend only a few feet above the floor level at the second level or be flush with the floor level. Attaching the line to the side of the beam could be a solution; however, it would require the connector to attach the lanyard below foot level which would most likely extend a fall farther than 6 ft.

(3) When lines are strung over every beam, it becomes more and more difficult for the crane operator to lower a precast concrete member into position without the member becoming fouled. Should the member become entangled, it could easily

dislodge the line from a column. If a worker is tied to it at the time, a fall could be caused.

6. The ANSI A10.14-1991 American National Standard for Construction and Demolition Operations - Requirements for Safety Belts, Harnesses, Lanyards and Lifelines for Construction and Demolition Use, states that the anchor point of a lanyard or deceleration device should, if possible, be located above the wearer's belt or harness attachment. ANSI A10.14 also states that a suitable anchorage point is one which is located as high as possible to prevent contact with an obstruction below should the worker fall. Most manufacturers also warn in the user's handbook that the safety block/retractable lifeline must be positioned above the D-ring (above the work space of the intended user) and OSHA recommends that fall arrest and restraint equipment be used in accordance with the manufacturer's instructions.

Attachment of a retractable device to a horizontal cable near floor level or using the inserts in the floor or roof members may result in increased free fall due to the dorsal D-ring of the full-body harness riding higher than the attachment point of the snaphook to the cable or insert (e.g., 6 foot tall worker with a dorsal D-ring at 5 feet above the floor or surface, reduces the working length to only one foot, by placing the anchorage five feet away from the fall hazard). In addition, impact loads may exceed maximum fall arrest forces (MAF) because the fall arrest D-ring would be 4 to 5 feet higher than the safety block/retractable lifeline anchored to the walking-working surface; and the potential for swing hazards is increased. Manufacturers also require that workers not work at a level where the point of snaphook attachment to the body harness is above the device because this will increase the free fall distance and the deceleration distance and will cause higher forces on the body in the event of an accidental fall.

Manufacturers recommend an anchorage for the retractable lifeline which is immovably fixed in space and is independent of the user's support systems. A moveable anchorage is one which can be moved around (such as equipment or wheeled vehicles) or which can deflect substantially under shock loading (such as a horizontal cable or very flexible beam). In the case of a very flexible anchorage, a shock load applied to the anchorage during fall arrest can cause oscillation of the flexible anchorage such that the retractable brake mechanism may undergo one or more cycles of locking/unlocking/locking (ratchet effect) until the anchorage deflection is dampened. Therefore, use of a moveable anchorage involves critical engineering and safety factors and should only be considered after fixed anchorage

Horizontal cables used as an anchorage present an additional hazard due to amplification of the horizontal component of maximum arrest force (of a fall) transmitted to the points where the horizontal cable is attached to the structure. This amplification is due to the angle of sag of a horizontal cable and is most severe for small angles of sag. For a cable sag angle of 2 degrees the horizontal force on the points of cable attachment can be amplified by a factor of 15.

It is also necessary to install the retractable device vertically overhead to minimize swing falls. If an object is in the worker's swing path (or that of the cable) hazardous situations exist: (1) due to the swing, horizontal speed of the user may be

high enough to cause injury when an obstacle in the swing fall path is struck by either the user or the cable; (2) the total vertical fall distance of the user may be much greater than if the user had fallen only vertically without a swing fall path.

With retractable lines, overconfidence may cause the worker to engage in inappropriate behavior, such as approaching the perimeter of a floor or roof at a distance appreciably greater than the shortest distance between the anchorage point and the leading edge. Though the retractable lifeline may arrest a worker's fall before he or she has fallen a few feet, the lifeline may drag along the edge of the floor or beam and swing the worker like a pendulum until the line has moved to a position where the distance between the anchorage point and floor edge is the shortest distance between those two points. Accompanying this pendulum swing is a lowering of the worker, with the attendant danger that he or she may violently impact the floor or some obstruction below.

The risk of a cable breaking is increased if a lifeline is dragged sideways across the rough surface or edge of a concrete member at the same moment that the lifeline is being subjected to a maximum impact loading during a fall. The typical 3/16 in. cable in a retractable lifeline has a breaking strength of from 3000 to 3700 lbs.

7. The competent person, who can take into account the specialized operations being performed on this project, should determine when and where a designated erector cannot use a personal fall arrest system.

B. Safety Net Systems

The nature of this particular precast concrete erection worksite precludes the safe use of safety nets where point of erection or leading edge work must take place.

1. To install safety nets in the interior high bay of the single story portion of the building poses rigging attachment problems. Structural members do not exist to which supporting devices for nets can be attached in the area where protection is required. As the erection operation advances, the location of point of erection or leading edge work changes constantly as each member is attached to the structure. Due to this constant change it is not feasible to set net sections and build separate structures to support the nets.

2. The nature of the erection process for the precast concrete members is such that an installed net would protect workers as they position and secure only one structural member. After each member is stabilized the net would have to be moved to a new location (this could mean a move of 8 to 10 ft or the possibility of a move to a different level or area of the structure) to protect workers placing the next piece in the construction sequence. The result would be the installation and dismantling of safety nets repeatedly throughout the normal work day. As the time necessary to install a net, test, and remove it is significantly greater than the time necessary to position and secure a precast concrete member, the exposure time for the worker installing the safety net would be far longer than for the workers whom the net is intended to protect. The time exposure repeats itself each time the nets and

supporting hardware must be moved laterally or upward to provide protection at the point of erection or leading edge.

3. Strict interpretation of 1926.502(c) requires that operations shall not be undertaken until the net is in place and has been tested. With the point of erection constantly changing, the time necessary to install and test a safety net significantly exceeds the time necessary to position and secure the concrete member.

4. Use of safety nets on exposed perimeter wall openings and opensided floors, causes attachment points to be left in architectural concrete which must be patched and filled with matching material after the net supporting hardware is removed. In order to patch these openings, additional numbers of employees must be suspended by swing stages, boatswain chairs or other devices, thereby increasing the amount of fall exposure time to employees.

5. Installed safety nets pose an additional hazard at the perimeter of the erected structure where limited space is available in which members can be turned after being lifted from the ground by the crane. There would be a high probability that the member being lifted could become entangled in net hardware, cables, etc.

6. The use of safety nets where structural wall panels are being erected would prevent movement of panels to point of installation. To be effective, nets would necessarily have to provide protection across the area where structural supporting wall panels would be set and plumbed before roof units could be placed.

7. Use of a tower crane for the erection of the high rise portion of the structure poses a particular hazard in that the crane operator cannot see or judge the proximity of the load in relation to the structure or nets. If the signaler is looking through nets and supporting structural devices while giving instructions to the crane operator, it is not possible to judge precise relationships between the load and the structure itself or to nets and supporting structural devices. This could cause the load to become entangled in the net or hit the structure causing potential damage.

C. Guardrail Systems

On this particular worksite, guardrails, barricades, ropes, cables or other perimeter guarding devices or methods on the erection floor will pose problems to safe erection procedures. Typically, a floor or roof is erected by placing 4 to 10 ft wide structural members next to one another and welding or grouting them together. The perimeter of a floor and roof changes each time a new member is placed into position. It is unreasonable and virtually impossible to erect guardrails and toe boards at the ever changing leading edge of a floor or roof.

1. To position a member safely it is necessary to remove all obstructions extending above the floor level near the point of erection. Such a procedure allows workers to swing a new member across the erected surface as necessary to position it properly without worrying about knocking material off of this surface.

Hollow core slab erection on the masonry wall requires installation of the perimeter protection where the masonry wall has to be constructed. This means the

guardrail is installed then subsequently removed to continue the masonry construction. The erector will be exposed to a fall hazard for a longer period of time while installing and removing perimeter protection than while erecting the slabs.

In hollow core work, as in other precast concrete erection, others are not typically on the work deck until the precast concrete erection is complete. The deck is not complete until the leveling, aligning, and grouting of the joints is done. It is normal practice to keep others off the deck until at least the next day after the installation is complete to allow the grout to harden.

2. There is no permanent boundary until all structural members have been placed in the floor or roof. At the leading edge, workers are operating at the temporary edge of the structure as they work to position the next member in the sequence. Compliance with the standard would require a guardrail and toe board be installed along this edge. However, the presence of such a device would prevent a new member from being swung over the erected surface low enough to allow workers to control it safely during the positioning process. Further, these employees would have to work through the guardrail to align the new member and connect it to the structure. The guardrail would not protect an employee who must lean through it to do the necessary work, rather it would hinder the employee to such a degree that a greater hazard is created than if the guardrail were absent.

3. Guardrail requirements pose a hazard at the leading edge of installed floor or roof sections by creating the possibility of employees being caught between guardrails and suspended loads. The lack of a clear work area in which to guide the suspended load into position for placement and welding of members into the existing structure creates still further hazards.

4. Where erection processes require precast concrete stairways or openings to be installed as an integral part of the overall erection process, it must also be recognized that guardrails or handrails must not project above the surface of the erection floor. Such guardrails should be terminated at the level of the erection floor to avoid placing hazardous obstacles in the path of a member being positioned.

V. Other Fall Protection Measures Considered for This Job

The following is a list and explanation of other fall protection measures available and an explanation of limitations for use on this particular jobsite. If during the course of erecting the building the employee sees an area that could be erected more safely by the use of these fall protection measures, the foreman should be notified.

A. Scaffolds are not used because:

1. The leading edge of the building is constantly changing and the scaffolding would have to be moved at very frequent intervals. Employees erecting and dismantling the scaffolding would be exposed to fall hazards for a greater length of time than they would by merely erecting the precast concrete member.

2. A scaffold tower could interfere with the safe swinging of a load by the crane.

3. Power lines, terrain and site do not allow for the safe use of scaffolding.

B. Vehicle mounted platforms are not used because:

1. A vehicle mounted platform will not reach areas on the deck that are erected over other levels.
2. The leading edge of the building is usually over a lower level of the building and this lower level will not support the weight of a vehicle mounted platform.
3. A vehicle mounted platform could interfere with the safe swinging of a load by the crane, either by the crane swinging the load over or into the equipment.
4. Power lines and surrounding site work do not allow for the safe use of a vehicle mounted platform.

C. Crane suspended personnel platforms are not used because:

1. A second crane close enough to suspend any employee in the working and erecting area could interfere with the safe swinging of a load by the crane hoisting the product to be erected.
2. Power lines and surrounding site work do not allow for the safe use of a second crane on the job.

VI. Enforcement

Constant awareness of and respect for fall hazards, and compliance with all safety rules are considered conditions of employment. The jobsite Superintendent, as well as individuals in the Safety and Personnel Department, reserve the right to issue disciplinary warnings to employees, up to and including termination, for failure to follow the guidelines of this program.

VII. Accident Investigations

All accidents that result in injury to workers, regardless of their nature, shall be investigated and reported. It is an integral part of any safety program that documentation take place as soon as possible so that the cause and means of prevention can be identified to prevent a reoccurrence.

In the event that an employee falls or there is some other related, serious incident occurring, this plan shall be reviewed to determine if additional practices, procedures, or training need to be implemented to prevent similar types of falls or incidents from occurring.

VIII. Changes to Plan

Any changes to the plan will be approved by (name of the qualified person). This plan shall be reviewed by a qualified person as the job progresses to determine if additional practices, procedures or training needs to be implemented by the competent person to improve or provide additional fall protection. Workers shall be notified and trained, if necessary, in the new procedures. A copy of this plan and all approved changes shall be maintained at the jobsite.

Sample Fall Protection Plan for Residential Construction

(Insert Company Name)

This Fall Protection Plan Is Specific For The Following Project:

Location of Job: _____
Date Plan Prepared or Modified: _____
Plan Prepared By: _____
Plan Approved By Plan Supervised By: _____

The following Fall Protection Plan is a sample program prepared for the prevention of injuries associated with falls. A Fall Protection Plan must be developed and evaluated on a site by site basis. It is recommended that builders discuss the written Fall Protection Plan with their OSHA Area Office prior to going on a jobsite.

I. Statement of Company Policy

(Your company name here) is dedicated to the protection of its employees from on-the-job injuries. All employees of (Your company name here) have the responsibility to work safely on the job. The purpose of the plan is to supplement our existing safety and health program and to ensure that every employee who works for (Your company name here) recognizes workplace fall hazards and takes the appropriate measures to address those hazards.

This Fall Protection Plan addresses the use of conventional fall protection at a number of areas on the project, as well as identifies specific activities that require non-conventional means of fall protection. During the construction of residential buildings under 48 feet in height, it is sometimes infeasible or it creates a greater hazard to use conventional fall protection systems at specific areas or for specific tasks. The areas or tasks may include, but are not limited to:

a. Setting and bracing of roof trusses and rafters;
b. Installation of floor sheathing and joists;
c. Roof sheathing operations; and
d. Erecting exterior walls.

In these cases, conventional fall protection systems may not be the safest choice for builders. This plan is designed to enable employers and employees to recognize the fall hazards associated with this job and to establish the safest procedures that are to be followed in order to prevent falls to lower levels or through holes and openings in walking/working surfaces.

Each employee will be trained in these procedures and will strictly adhere to them except when doing so would expose the employee to a greater hazard. If, in the employee's opinion, this is the case, the employee is to notify the competent person of their concern and have the concern addressed before proceeding.

It is the responsibility of (name of competent person) to implement this Fall Protection Plan. Continual observational safety checks of work operations and the enforcement of the safety policy and procedures shall be regularly enforced. The crew supervisor or foreman (insert name) is responsible for correcting any unsafe practices or conditions immediately.

It is the responsibility of the employer to ensure that all employees understand and adhere to the procedures of this plan and to follow the instructions of the crew supervisor. It is also the responsibility of the employee to bring to management's attention any unsafe or hazardous conditions or practices that may cause injury to either themselves or any other employees. Any changes to the Fall Protection Plan must be approved by (name of qualified person).

II. Fall Protection Systems To Be Used on This Job

Installation of roof trusses/rafters, exterior wall erection, roof sheathing, floor sheathing and joist/truss activities will be conducted by employees who are specifically trained to do this type of work and are trained to recognize the fall hazards. The nature of such work normally exposes the employee to the fall hazard for a short period of time. This Plan details how (Your company name here) will minimize these hazards.

Controlled Access Zones

When using the Plan to implement the fall protection options available, workers must be protected through limited access to high hazard locations. Before any non-conventional fall protection systems are used as part of the work plan, a controlled access zone (CAZ) shall be clearly defined by the competent person as an area where a recognized hazard exists. The demarcation of the CAZ shall be communicated by the competent person in a recognized manner, either through signs, wires, tapes, ropes or chains.

(Your company name here) shall take the following steps to ensure that the CAZ is clearly marked or controlled by the competent person:

- All access to the CAZ must be restricted to authorized entrants;
- All workers who are permitted in the CAZ shall be listed in the appropriate sections of the Plan (or be visibly identifiable by the competent person) prior to implementation;
- The competent person shall ensure that all protective elements of the CAZ be implemented prior to the beginning of work.

Installation Procedures for Roof Truss and Rafter Erection

During the erection and bracing of roof trusses/rafters, conventional fall protection may present a greater hazard to workers. On this job, safety nets,

guardrails and personal fall arrest systems will not provide adequate fall protection because the nets will cause the walls to collapse, while there are no suitable attachment or anchorage points for guardrails or personal fall arrest systems.

On this job, requiring workers to use a ladder for the entire installation process will cause a greater hazard because the worker must stand on the ladder with his back or side to the front of the ladder. While erecting the truss or rafter the worker will need both hands to maneuver the truss and therefore cannot hold onto the ladder. In addition, ladders cannot be adequately protected from movement while trusses are being maneuvered into place. Many workers may experience additional fatigue because of the increase in overhead work with heavy materials, which can also lead to a greater hazard.

Exterior scaffolds cannot be utilized on this job because the ground, after recent backfilling, cannot support the scaffolding. In most cases, the erection and dismantling of the scaffold would expose workers to a greater fall hazard than erection of the trusses/rafters.

On all walls eight feet or less, workers will install interior scaffolds along the interior wall below the location where the trusses/rafters will be erected. "Sawhorse" scaffolds constructed of 46 inch sawhorses and 2x10 planks will often allow workers to be elevated high enough to allow for the erection of trusses and rafters without working on the top plate of the wall.

In structures that have walls higher than eight feet and where the use of scaffolds and ladders would create a greater hazard, safe working procedures will be utilized when working on the top plate and will be monitored by the crew supervisor. During all stages of truss/rafter erection the stability of the trusses/rafters will be ensured at all times.

(Your company name here) shall take the following steps to protect workers who are exposed to fall hazards while working from the top plate installing trusses/rafters:

- Only the following trained workers will be allowed to work on the top plate during roof truss or rafter installation:

  _____

  _____

  _____

- Workers shall have no other duties to perform during truss/rafter erection procedures;
- All trusses/rafters will be adequately braced before any worker can use the truss/rafter as a support;
- Workers will remain on the top plate using the previously stabilized truss/rafter as a support while other trusses/rafters are being erected;
- Workers will leave the area of the secured trusses only when it is necessary to secure another truss/rafter;

- The first two trusses/rafters will be set from ladders leaning on side walls at points where the walls can support the weight of the ladder; and
- A worker will climb onto the interior top plate via a ladder to secure the peaks of the first two trusses/rafters being set.

The workers responsible for detaching trusses from cranes and/or securing trusses at the peaks traditionally are positioned at the peak of the trusses/rafters. There are also situations where workers securing rafters to ridge beams will be positioned on top of the ridge beam.

(Your company name here) shall take the following steps to protect workers who are exposed to fall hazards while securing trusses/rafters at the peak of the trusses/ridge beam:

- Only the following trained workers will be allowed to work at the peak during roof truss or rafter installation:

_____

_____

_____

- Once truss or rafter installation begins, workers not involved in that activity shall not stand or walk below or adjacent to the roof opening or exterior walls in any area where they could be struck by falling objects;
- Workers shall have no other duties than securing/bracing the trusses/ridge beam;
- Workers positioned at the peaks or in the webs of trusses or on top of the ridge beam shall work from a stable position, either by sitting on a "ridge seat" or other equivalent surface that provides additional stability or by positioning themselves in previously stabilized trusses/rafters and leaning into and reaching through the trusses/rafters;
- Workers shall not remain on or in the peak/ridge any longer than necessary to safely complete the task.

Roof Sheathing Operations

Workers typically install roof sheathing after all trusses/rafters and any permanent truss bracing is in place. Roof structures are unstable until some sheathing is installed, so workers installing roof sheathing cannot be protected from fall hazards by conventional fall protection systems until it is determined that the roofing system can be used as an anchorage point. At that point, employees shall be protected by a personal fall arrest system.

Trusses/rafters are subject to collapse if a worker falls while attached to a single truss with a belt/harness. Nets could also cause collapse, and there is no place to attach guardrails.

All workers will ensure that they have secure footing before they attempt to walk on the sheathing, including cleaning shoes/boots of mud or other slip hazards.

To minimize the time workers must be exposed to a fall hazard, materials will be staged to allow for the quickest installation of sheathing.

(Your company name here) shall take the following steps to protect workers who are exposed to fall hazards while installing roof sheathing:

- Once roof sheathing installation begins, workers not involved in that activity shall not stand or walk below or adjacent to the roof opening or exterior walls in any area where they could be struck by falling objects;
- The competent person shall determine the limits of this area, which shall be clearly communicated to workers prior to placement of the first piece of roof sheathing;
- The competent person may order work on the roof to be suspended for brief periods as necessary to allow other workers to pass through such areas when this would not create a greater hazard;
- Only qualified workers shall install roof sheathing;
- The bottom row of roof sheathing may be installed by workers standing in truss webs;
- After the bottom row of roof sheathing is installed, a slide guard extending the width of the roof shall be securely attached to the roof. Slide guards are to be constructed of no less than nominal 4" height capable of limiting the uncontrolled slide of workers. Workers should install the slide guard while standing in truss webs and leaning over the sheathing;
- Additional rows of roof sheathing may be installed by workers positioned on previously installed rows of sheathing. A slide guard can be used to assist workers in retaining their footing during successive sheathing operations; and
- Additional slide guards shall be securely attached to the roof at intervals not to exceed 13 feet as successive rows of sheathing are installed. For roofs with pitches in excess of 9-in-12, slide guards will be installed at four-foot intervals.
- When wet weather (rain, snow, or sleet) are present, roof sheathing operations shall be suspended unless safe footing can be assured for those workers installing sheathing.
- When strong winds (above 40 miles per hour) are present, roof sheathing operations are to be suspended unless wind breakers are erected.

Installation of Floor Joists and Sheathing

During the installation of floor sheathing/joists (leading edge construction), the following steps shall be taken to protect workers:

- Only the following trained workers will be allowed to install floor joists or sheathing:

  _____

  _____

  _____

- Materials for the operations shall be conveniently staged to allow for easy access to workers;
- The first floor joists or trusses will be rolled into position and secured either from the ground, ladders or sawhorse scaffolds;
- Each successive floor joist or truss will be rolled into place and secured from a platform created from a sheet of plywood laid over the previously secured floor joists or trusses;
- Except for the first row of sheathing which will be installed from ladders or the ground, workers shall work from the established deck;
- Any workers not assisting in the leading edge construction while leading edges still exist (e.g. cutting the decking for the installers) shall not be permitted within six feet of the leading edge under construction.

Erection of Exterior Walls

During the construction and erection of exterior walls, employers shall take the following steps to protect workers:

- Only the following trained workers will be allowed to erect exterior walls:

_____

_____

_____

- A painted line six feet from the perimeter will be clearly marked prior to any wall erection activities to warn of the approaching unprotected edge;
- Materials for operations shall be conveniently staged to minimize fall hazards; and
- Workers constructing exterior walls shall complete as much cutting of materials and other preparation as possible away from the edge of the deck.

III. Enforcement

Constant awareness of and respect for fall hazards, and compliance with all safety rules are considered conditions of employment. The crew supervisor or foreman, as well as individuals in the Safety and Personnel Department, reserve the right to issue disciplinary warnings to employees, up to and including termination, for failure to follow the guidelines of this program.

IV. Accident Investigations

All accidents that result in injury to workers, regardless of their nature, shall be investigated and reported. It is an integral part of any safety program that

documentation take place as soon as possible so that the cause and means of prevention can be identified to prevent a reoccurrence.

In the event that an employee falls or there is some other related, serious incident occurring, this plan shall be reviewed to determine if additional practices, procedures, or training need to be implemented to prevent similar types of falls or incidents from occurring.

V. Changes to Plan

Any changes to the plan will be approved by (name of the qualified person). This plan shall be reviewed by a qualified person as the job progresses to determine if additional practices, procedures or training needs to be implemented by the competent person to improve or provide additional fall protection. Workers shall be notified and trained, if necessary, in the new procedures. A copy of this plan and all approved changes shall be maintained at the jobsite.

OSHA Directives
STD 3-0.1A - Plain Language Revision of OSHA Instruction STD 3.1, Interim Fall Protection Compliance Guidelines for Residential Construction

- **Record Type:** Instruction
- **Directive Number:** STD 3-0.1A
- **Subject:** Plain Language Revision of OSHA Instruction STD 3.1, Interim Fall Protection Compliance Guidelines for Residential Construction
- **Information Date:** 06/18/1999
- **Effective Date:** 6/18/99

ABSTRACT

Purpose:	This Instruction is a plain language re-write of OSHA Instruction STD 3.1, the Agency's interim enforcement policy on fall protection for certain residential construction activities.
Scope:	OSHA-wide
References:	29 CFR Part 1926 Subpart M
Cancellations:	OSHA Instruction STD 3.1, Interim Fall Protection Compliance Guidelines for Residential Construction, dated December 8, 1995.
State Plan Impact:	None
Action Offices:	National, Regional and Area Offices
Originating Office:	Directorate of Construction
Contact:	Garvin M. Branch (202) 693-2345 Directorate of Construction N3621, FPB 200 Constitution Ave., N.W. Washington, DC 20210

By and Under the Authority of
R. Davis Layne
Deputy Assistant Secretary, OSHA

TABLE OF CONTENTS

I. PURPOSE.

A. This Instruction is a plain language re-write of OSHA Instruction STD 3.1, the Agency's interim enforcement policy on fall protection for certain residential construction activities.

B. Fall protection requirements for residential construction are set out in 29 CFR 1926.501(b)(13). In general, that provision requires conventional fall protection for work at or over six feet. However, OSHA Instruction STD 3.1 modifies those requirements. It permits employers engaged in certain residential construction activities to use alternative procedures routinely instead of conventional fall protection. No showing of infeasibility of conventional fall protection is needed before using these procedures. A fall protection plan is required but it does not have to be written nor does it have to be specific to the jobsite. Different alternative procedures are specified for different activities.

II. SCOPE. This Instruction applies OSHA-Wide.

III. CANCELLATION. OSHA Instruction STD 3.1, Interim Fall Protection Compliance Guidelines for Residential Construction, dated December 8, 1995, is cancelled.

IV. REFERENCE. 29 CFR Part 1926 Subpart M.

V. ACTION INFORMATION.

1. Responsible Office. Directorate of Construction.
2. Action Offices. National, Regional, and Area Offices
3. Information Offices. State Plan Offices, Consultation Project Managers

VI. FEDERAL PROGRAM CHANGE. This Notice describes a Federal OSHA program change for which State adoption is not required.

VII. BACKGROUND. On December 8, 1995 OSHA published an interim fall protection compliance policy for fall protection for certain residential construction activities, pending further rulemaking on Subpart M. This Notice is a plain language re-write of that policy; it does not make substantive changes to the policy. The Agency will solicit public comment on fall protection issues in residential construction in an Advance Notice of Proposed Rulemaking on Subpart M. After analyzing those comments, we will re-evaluate this policy.

VIII. AVAILABILITY OF ALTERNATIVE PROCEDURES. Alternative procedures are available to employers who are (1) engaged in residential construction, and (2) doing one of the listed activities.

A. Definition of "residential construction."

1. For purposes of this instruction, an employer is engaged in residential construction where the working environment, materials, methods and procedures are essentially the same as those used in building a typical single-family home or townhouse.

2. Residential construction is characterized by:

   - Materials: Wood framing (not steel or concrete); wooden floor joists and roof structures.
   - Methods: Traditional wood frame construction techniques.

3. In addition, the construction of a discrete part of a large commercial building (not the entire building), such as a wood frame, shingled entranceway to a mall, may fit within the definition of residential construction. Such discrete parts of a commercial building would qualify as residential construction where the characteristics listed above are present.

B. Listed Activities and Alternative Procedures.

There are four groups of residential construction activities for which alternative fall protection plans are available. Each group has its own set of alternative procedures and will be discussed in Sections IX through XII. The groups are:

1. GROUP 1. Installation of floor joists, floor sheathing, and roof sheathing; erecting exterior walls; setting and bracing roof trusses and rafters.

2. GROUP 2. Working on concrete and block foundation walls and related formwork.

3. GROUP 3. This group consists of the following activities when performed in attics and on roofs: installing drywall, insulation, HVAC systems, electrical systems (including alarms, telephone lines, and cable TV), plumbing and carpentry.

4. GROUP 4. Roofing work (removal, repair, or installation of weatherproofing roofing materials such as shingles, tile and tar paper).

C. Questions.

- Do any of these plans have to be written and site specific? No.

- Does the employer have to determine that conventional fall protection is infeasible before being permitted to use an alternative procedure? No.

IX. ALTERNATIVE PROCEDURES FOR GROUP 1: INSTALLATION OF FLOOR JOISTS, FLOOR SHEATHING, AND ROOF SHEATHING; ERECTING EXTERIOR WALLS; SETTING AND BRACING ROOF TRUSSES AND RAFTERS.

The alternative measures for this group are set out in Appendix E to Subpart M. Appendix E requires the employer to implement a Fall Protection Plan. Such a plan must lay out the safest procedures to be followed at the work site to prevent falls. Although the plan need not be in writing, it must be communicated to all employees on site who might be subject to fall hazards.

NOTE: Height Limitation: The Appendix E plan may only be used on structures up to three and a half stories or 48 feet (including basement, two finished levels, attic). The 48' measure is from the base of the building, at the lowest ground level (including any excavation), to the point of greatest height. The following are the required elements of the Plan:

A. General Requirements For Group 1 Activities. Training, Implementation/ Supervision By Designated Individuals, Controlled Access Zones, Plan Administration (required for all Group 1 activities).

1. Training
   Each employee performing work in Group 1 activities must be trained in the requirements of the Plan. The employer must ensure that the employees (1) understand the procedures and follow the instructions of the crew supervisor or foreman; (2) are able to recognize unsafe/hazardous conditions and are to report them to the employer; (3) can recognize when compliance with the Plan would create a greater hazard and are instructed to inform the Competent Person before proceeding when that occurs. Training and retraining violations shall be cited under 29 CFR 1926.503(a) and 1926.503(c). Subsection 1926.503 (b) may not be cited for residential construction.

   NOTE: Any concerns raised by employees at any time during construction must be addressed (determined to be valid or not) before work proceeds.

2. Implementation/Supervision.

   a. Competent Person.
      The employer must designate a Competent Person, who will be charged with implementing the Plan. The Competent Person must continually monitor compliance with the Plan, including the provision of training and the proper use of Controlled Access Zones.

   b. Qualified Person.
      The employer must designate a qualified person to approve any changes to the Plan.

c. Crew Supervisor/Foreman.
The employer must designate a crew supervisor or foreman and charge him or her with the responsibility of immediately correcting any unsafe practice or condition.

3. Controlled Access Zones.

For purposes of this Instruction, a Controlled Access Zone (CAZ) restricts access to a clearly designated area where a Group One activity (installation of floor joists, floor sheathing, roof sheathing; erecting exterior walls; setting and bracing roof trusses and rafters) is taking place. The CAZ must meet the following requirements:

a. Boundaries.
The competent person shall determine the boundaries of the CAZ and clearly mark them with signs, wires, tapes, ropes or chains.

b. Monitor.
The crew supervisor/foreman shall monitor the workers in the CAZ to ensure that they do not engage in unsafe practices.

c. Restricted Access.
Access to the CAZ must be restricted to authorized entrants. An authorized entrant is a worker who has received the training described above. The competent person must identify each entrant as an authorized entrant after the employee has successfully completed the training.

d. Final Check.
Before work begins in the CAZ, the competent person must ensure that all protective measures in the Plan have been implemented.

4. Plan Administration.

a. Employer Enforcement.
The employer is required to enforce the Plan. The crew supervisor/foreman, as well as individuals in the Safety and Personnel Department, must have the right to issue disciplinary warnings to employees, up to and including termination, for failure to follow the requirements of the Plan. Unsafe practices or conditions must be corrected immediately.

b. Changes To The Plan.
-- **Designation of qualified person**: the employer must designate a qualified person to approve changes to the Plan.

-- **Approval required**: changes to the Plan may not be made unless approved by the qualified person.
-- **Plan Review**: the qualified person must review the Plan as the job progresses to determine if additional practices, procedures or training need to be implemented. The employer shall notify and, if necessary, train workers in the new procedures.

c. Accident Investigations/Plan Review.
All accidents resulting in injury to workers shall be reported and investigated. To help prevent further accidents, the investigation must be documented so that the cause and means of prevention can be identified. In the event of a fall or other serious incident, the Plan shall be reviewed to determine if additional practices, procedures, or training need to be implemented.

B. Additional Requirements For Specific Group (1) Activities.

1. Installing Roof Trusses and Erecting Rafters.

a. Walls Up To 8 Feet.
Interior scaffolds must be installed along the interior wall, below the area where the trusses/rafters will be located. This can often be accomplished with "sawhorse" scaffolds constructed of 46 inch sawhorses and 2 x 10 planks.

b. Walls Over 8 Feet.
If using scaffolds and ladders throughout the process would create a greater hazard, the following general requirements and specific procedures apply.

(1). Walls over 8 feet. General requirements.

(a)Falling Objects/Restricted Access.
Once truss/rafter installation begins, workers not involved in that activity shall not stand or walk below or adjacent to the roof opening or exterior walls in any area where they could be struck by falling objects.

(b) Bracing.
Trusses/rafters must be adequately braced before any worker may use them as a support.

(c) Designated, Trained Workers.
The employer must designate the trained workers who will work on the top plate, and those who will work on the peak.

(d) Restricted Duties.
Top plate workers shall have no other duties during truss/rafter erection.

(2) Procedures for working on the top plate.

(a) Installing The First Two Trusses.
The first two trusses/rafters must be set from ladders. The ladders must lean on side walls at points where the walls can support the load imposed by the ladder and worker. After the first two trusses/rafters have been set, a worker will climb a ladder onto the interior top plate to secure their peaks.

(a) Remain On The Top Plate.
Workers will remain on the top plate and use the previously stabilized trusses/rafters as support while the other trusses/rafters are erected.

(3) Procedures for working at the peak.

(a) When Workers May Work On Peaks/Ridge Beam.
Workers detaching trusses from cranes or securing trusses at the peaks may be positioned at the peak of the trusses/rafters. Workers may be stationed on the top of the ridge beam where that is the only feasible way to secure rafters to the ridge beam.

(b) Stable Work Position
Workers at the peak, in the web of trusses, or on top of the ridge beam shall work from a stable position. They must either sit on a ridge seat (or the equivalent) or position themselves in previously stabilized trusses/rafters and lean into, and reach through, the trusses/rafters.

(c) Limited Fall Hazard Exposure.
Workers must not remain on or in the peak/ridge any longer than necessary to complete the task safely.

2. Roof Sheathing Operations. The competent person must determine when the roof system is stable enough to support a conventional fall protection system anchorage. The following provisions apply until the roof system can be used as an anchorage point; at that time personal fall arrest systems must be used.

   a. Qualified Workers.
   Only qualified workers shall install roof sheathing.

b. Secure Footing/Weather.
The employer must ensure that workers remove slip hazards before walking on sheathing. Such measures include removing mud from shoes or boots. When wet weather is present, roof sheathing shall be suspended unless safe footing can be assured. If winds exceed 40 miles per hour, sheathing operations are to be suspended, unless wind breakers are erected.

c. Staging of Materials.
To minimize exposure to fall hazards, materials must be staged so that workers on the roof have quick and safe access to them.

d. Falling Objects/Restricted Access.
Workers not involved in roof sheathing shall not stand or walk below or adjacent to the roof opening or exterior walls where they could be struck by falling objects. The competent person shall clearly designate the restricted area before placement of the first piece of sheathing. The competent person may order a brief halt to the sheathing work to allow other workers to pass through the restricted area, as long as suspending work does not create a greater hazard.

e. Slide Guards.
- **Bottom Row**: The bottom row of roof sheathing may be installed by workers standing in truss webs and leaning over the sheathing. After the bottom row is installed, a slide guard of at least four (4) inches nominal in height shall be securely attached to the roof. It must extend across the full width of the roof.

- **Slide Guard Intervals**: **Roof Pitch Up To (and including) 9 in 12**: Additional slide guards are required at 13 foot intervals as successive rows of sheathing are installed.

- **Slide Guard Intervals**: **Roof Pitch Over 9 in 12**: Additional slide guards are required at four foot intervals.

NOTE: These slideguard requirements, which come from Appendix E, differ from those for Group 4 Activities (roofing work).

3. Installation of Floor Joists and Floor Sheathing.

a. Designated, Trained Workers.
The employer must designate the trained workers who will do this work.

b. Staging of Materials.
To minimize exposure to fall hazards, materials must be staged so that workers have quick and safe access to them.

c. Restricted Access.
While this work is taking place, workers not directly assisting in it shall not be permitted within six (6) feet of the leading edge.

d. Installation Process: Floor Joists/Trusses.
The first floor joist or truss must be rolled into position and secured by workers on the ground, ladders, or sawhorse scaffolds. Successive joists/trusses must be rolled into place. They are then to be secured from a platform. The platform is to be built from a sheet of plywood laid over the previously secured floor joists or trusses.

e. Installation Process: Floor Sheathing.
The first row of floor sheathing must be installed by workers on the ground, ladders, or sawhorse scaffolds. After the first row of sheathing has been installed, workers shall work from the established deck.

4. Erection of Exterior Walls.

a. Designated, Trained Workers.
The employer must designate the trained workers who will do this work.

b. Warning Line.
A painted warning line six (6) feet from the perimeter will be clearly marked before any wall erection activities take place.
NOTE: As discussed above, this work must be done within a CAZ. A crew supervisor/foreman is required to monitor this work and warn anyone who approaches the unprotected edge. The warning line does not replace the monitor; it is an additional safety measure.

c. Staging of Materials.
To minimize exposure to fall hazards, materials must be staged so that workers have quick and safe access to them.

d. Limit Fall Hazard Exposure.
Workers constructing exterior walls shall complete as much cutting of materials and other preparatory work as possible away from the edge of the deck.

NOTE: **Wall openings (more than six feet above the lower level), floor holes and roof holes**: As soon as sheathing has been installed around a floor hole, roof hole, or wall opening that is not going to be sheathed (such as a hole for a doorway, stairwell or skylight), it must be covered, or protected by a guardrail.

X. ALTERNATIVE PROCEDURES FOR GROUP 2: WORKING ON CONCRETE AND BLOCK FOUNDATION WALLS AND RELATED FORMWORK.

This Instruction specifies the alternative procedures for protecting employees working from the top surface of block foundation walls, concrete foundation walls, and related form work. These procedures are:

A. Trained Workers Only.
Only trained workers shall be allowed to work on the top of the foundation wall/form work, and only as necessary to complete the construction of the wall.

B. Adequate Support.
All formwork shall be adequately supported before any worker may work on top of the form work.

C. Bad Weather.
When adverse weather (such as high winds, rain, snow, or sleet) creates a hazardous condition, operations shall be suspended until the hazardous condition no longer exists.

D. Staging of Materials/Equipment.
Materials and equipment for the work shall be conveniently located to the workers on the top of the foundation/formwork.

E. Impalement Hazards.
Materials and other objects which could pose impalement hazards shall be kept out of the area below where workers are working or shall be properly guarded.

XI. ALTERNATIVE PROCEDURES FOR GROUP 3: THIS GROUP CONSISTS OF THE FOLLOWING ACTIVITIES **WHEN PERFORMED IN ATTICS AND ON ROOFS**: INSTALLING DRYWALL, INSULATION, HVAC SYSTEMS, ELECTRICAL SYSTEMS (INCLUDING ALARMS, TELEPHONE LINES, AND CABLE TV), PLUMBING AND CARPENTRY.

This Instruction specifies the procedures for this group. They are:

A. Trained Workers Only.
Only trained workers shall be allowed to work in attics and on roofs, and only as necessary to complete the construction of the system being installed.

B. Staging of Materials.
Materials and equipment for the work shall be located conveniently close to the workers.

C. Impalement Hazards.
Materials and other objects which could pose impalement hazards shall be keep out of the area below where workers are working, or properly guarded.

D. Restricted Access.
While attic or roof work is in progress, workers not involved in such work shall not stand or walk below or adjacent to any openings in the ceiling where they could be struck by falling objects.

E. Bad Weather.
When adverse weather (such as high winds, rain, snow, or sleet) creates a hazardous condition, operations shall be suspended until the hazardous condition no longer exists.

NOTE: The provisions of this Instruction do not apply to interior finishing work when done outside of attics or roofs areas. Subpart M applies to such work with respect to stairways, stairway openings, walkways, floor or window openings, floor holes or other elevated openings or open sides.

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XII. ALTERNATIVE PROCEDURES FOR GROUP 4: ROOFING WORK (REMOVAL, REPAIR, OR INSTALLATION OF WEATHERPROOFING ROOFING MATERIALS SUCH AS SHINGLES, TILE AND TAR PAPER).

Restriction on Application for Roofing Work. The alternative procedures in this Instruction may only be used for this work where: (a) the roof slope is 8 in 12 or less, and (b) the fall distance, measured from the eave to the ground level, is 25 feet or less.

A. General Requirements.

1. Trained Workers Only.
Only workers who have been trained to be proficient in the alternative methods of fall protection shall be allowed onto the roof. In addition, each affected employee shall be trained to ensure specific awareness of the fall hazards associated with work on roofs with rake edges ("rake edges" are inclined roof edges, such as those on the gable end of a building).

2. Slip Hazards
The roof surfaces shall be inspected for slipping hazards. The employer shall either eliminate any such hazards or take effective measures to have workers avoid them. The employer shall have workers wear appropriate footwear to reduce the potential for slipping.

3. Bad Weather.
   When adverse weather (such as high winds, rain, snow, or sleet) creates a hazardous condition, roofing operations shall be suspended until the hazardous condition no longer exists.

4. Roof holes/openings.
   The employer shall have any damaged portions of the roof deck repaired as soon as practicable. Any holes (including skylight openings) or other areas where
5. employees would not have safe footing shall be covered or surrounded by guardrails that comply with the requirements of 1926.502.

6. Ladders/Scaffolds.
   If ladders or scaffolds are used, they shall be erected and maintained in accordance with the requirements of Subparts X and L of OSHA's construction standards. In addition, employees shall be trained in accordance with the requirements of Subparts X & L.

7. Access To Roof.
   Employers shall not allow workers to ascend or descend the roof's slope within 6 feet of the rake edge except where that limitation would prevent the performance of work.

8. Location of Materials.
   Supplies and materials shall not be stored within 6 feet of the rake edge, or three feet where tile roof systems are being installed.

9. Impalement Hazards.
   The area below the eaves and rakes shall be kept clear of materials and other objects which could pose impalement or other hazards, or properly guarded.

B. Safety Monitors and Slide Guards (for roofs with an eave height of up to and including 25 feet).

1. Roof Slope (Any Roof Type): Up to 4 in 12. The employer must use either a safety monitoring system that complies with §1926.502, or roofing slide guards. If slide guards are used, they must be built and installed in accordance with the requirements set out below.

2. Roof Slope (Except Tile or Metal Roofs): Over 4 in 12 (and up to 8 in 12): Slide guards are required.

3. Roof Slope (Tile or Metal Roofs): Up to (and including) 8 in 12: The safety monitoring system may be used instead of slide guards.

4. Roof Slope (Any Roof Type): Over 8 in 12: Alternatives to the requirements of the standards are not available.

5. Eave Height Over 25 feet (Any Slope, Any Roof Type): Alternatives to the requirements of the standards are not available.

C. Slide Guards: Requirements for Materials, Configuration and Installation.

1. Roof Slope: 6 in 12 or less:

    a. Material. All slide guards must be constructed of 2"x 6" (nominal) stock.

    b. Installation. No more than three rows of roofing material (installed across the lower eave) shall be applied before installing the slide guards. The roof jacks (or similar supports) shall be installed using nails long enough to withstand an employee sliding into the guard.

    c. Configuration. The face of the slide guard must be perpendicular (about 90 degrees) to the surface of the roof. There must be continuous slide guards along the eave.

2. Roof Slope: Over 6 in 12 (up to and including 8 in 12):

    a. Material: 2"x 6" stock.

    b. Installation: Continuous slide guards shall be installed along the eave, as described above. Additional slide guards shall be installed below each work area at intervals not to exceed eight feet. They shall be installed using the following procedure: the employee, while standing on the slide guard below, secures the roof jacks for the next slide guard with nails and then installs the planks. The employee then climbs up to the new slide guard to continue the roofing work. This sequence is repeated as work proceeds up the roof.

    c. Configuration: The continuous slide guards at the eave must be at about 90 degrees to the roof surface, as described above. The additional slide guards need not be continuous -- but they must be long enough to protect the work area. They do not have to be at 90 degrees to the roof surface.

    d. Removal: Once the roofing material is installed to the ridge, the employee is to climb down to the next lower slide guard and remove the upper slide guard. The employee repeats this process down the roof until all the slide guards are removed. Only when the roofing job is completed may the slide guards at the eave be removed.

XIII. CITATION POLICY.

If an employer (engaged in residential construction) does not provide conventional fall protection, the compliance officer must determine if STD 3-0.1a provides alternative procedures for the activity in question. If alternative procedures are available, the compliance officer must determine if they have been implemented. If there is a deficiency in the implementation of the alternative procedures, the fall hazard shall be cited as a violation of 1926.501(b)(13). No other provision may be cited for a fall hazard addressed by 1926.501(b)(13). Deficiencies in training required by 1926.20 may also be cited where appropriate.

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Revision Date: June 17, 1999

Free Fall Distance and Clearance Distance Formulas For Shock Absorbing Lanyards

Free Fall Distance:

5’ + L – H = 6’ (Max. OSHA)

(5’ + 6’ – 5’ = 6’)

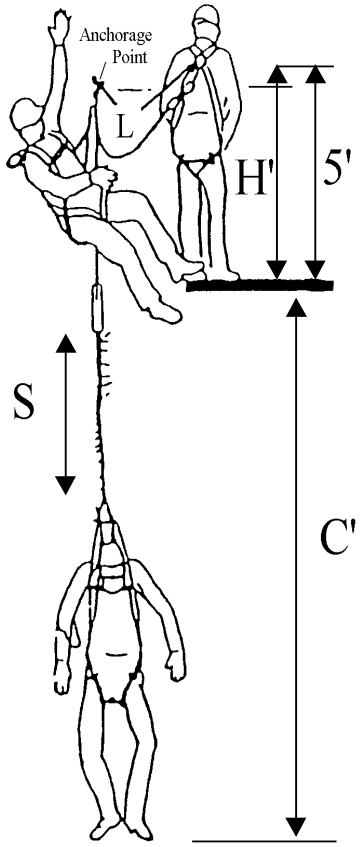
So then, if L = 6’, The minimum anchorage height must be 5’

Clearance Distance:

5’ + L – H + S = C

(5’ + 6’ – 5’ + 3.5’ = 9.5’)

So if H = 5’ and S = 3.5’ and L = 6’ The clearance must be 9.5’ minimum



H = Anchor Point Height
L = Lanyard Length
S = Shock Absorbing Lanyard
5’ = Harness Dee Ring Height

Standards that have their own fall protection requirements

- Scaffolds – Subpart L
- Cranes and Derricks – Subpart N
- Steel Erection - Subpart R
- Tunneling Operation – Subpart S
- Electric Transmission and Distribution Lines – Subpart V
- Stairways and Ladders – Subpart X

Scaffolds

Subpart L

SUBPART L – SCAFFOLDS

The following is a summary of the requirements for scaffolds in construction.

1926.451 General Requirements

(a) Capacity.

- Scaffolds and scaffold components shall be capable of supporting, without failures its own weight and at least 4 times the maximum intended load.
- Each suspension rope, including hardware used on non-adjustable suspension scaffolds shall be capable of supporting without failure at least 6 times the maximum intended load.
- The stall load of any scaffold hoist shall not exceed 3 times its rated load.
- Scaffolds shall be designed by a qualified person and shall be constructed and loaded in accordance with that design.

(b) Scaffold platform construction.

- Each platform on all working levels of scaffolds shall be fully planked or decked between the front uprights and the guardrail supports**.**
- Each platform unit shall be installed so that the space between adjacent units and the space between the platform and the uprights is no more than 1 inch wide, except where the employer can demonstrate that a wider space is necessary.
- Each scaffold walkway shall be at least 18 inches wide.
- The front edge of all platforms shall not be more 14 inches from the face of the work, unless guardrail systems are erected along the front edge and/or personal fall arrest systems are used.
- Each end of a platform, unless cleated or otherwise restrained by hooks or equivalent means, shall extend over the center-line of its support at least 6 inches.
- Each end of a platform 10 feet or less in length shall not extend over its supports more than 12 inches *unless otherwise designated.*
- Each platform greater then 10 feet shall not extend over its support more than 18 inches *unless otherwise designated.*

- On scaffolds where platforms are abutted to create a longer platform, each abutted end shall rest on a separate support surface.

- On scaffolds where platforms are overlapping to create a long platform the overlap shall occur over supports and shall not be less than 12 inches unless the platforms are nailed together or otherwise restrained to prevent movement.

- At all points of a scaffold where the platform changes direction and 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.

- Wood platforms shall not be covered with opaque finishes *unless otherwise designated.*

- Scaffold components manufactured by different manufacturers shall not be intermixed unless the components fit together without force and the scaffolds structural integrity is maintained by the user. Scaffold components manufactured by different manufacturers shall not be modified in order to intermix them unless a competent person determines the resulting scaffold is structurally sound.

- Scaffold components made of dissimilar metals shall not be used together unless a competent person has determined that the galvanic action will not reduce the strength of any component to a level below that which is required by the standard.

(c) Criteria for supported scaffolds.

- Supported scaffolds with a height to base width ratio of more than four to one (4: 1) shall be restrained from tipping by guying, tying, bracing, or equivalent means.

    - 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 or less thereafter for scaffolds 3 feet wide or less and every 26 feet or less thereafter for scaffolds greater than 3 feet wide.

    - The top guy, tie or brace of completed scaffolds shall be placed no higher than 4:1 height from the top. Such guys, ties and braces shall be installed at each end of the scaffold and at horizontal intervals not to exceed 30 feet.

- Supported scaffold poles, legs, posts, frames and uprights shall bear on base plates, mud sills or other adequate firm foundations.

- Supported scaffold poles, legs, posts, frames and uprights shall be plumb and braced to prevent swaying and displacement.

(d) Criteria for suspension scaffolds.

- All suspension scaffold support devices, such as outrigger beams, cornice hooks, parapet clamps and similar devices, shall rest on surfaces capable of supporting at least 4 times the load imposed on them by the scaffold operating at the rated load of the hoist.

- Suspension scaffold outrigger beams, when used**,** shall be made of structural metal or equivalent strength material and shall be restrained to prevent movement.

- Inboard ends of suspension scaffold outrigger beams shall be stabilized by bolts or other direct connections to the floor or roof deck or they shall have their inboard ends stabilized by counterweights, except for masons' multi-point adjustable suspension scaffold outrigger beams which shall not be stabilized by counterweights.

- Suspension scaffold outrigger beams shall be:

  - Provided with stop bolts or shackles at both ends.
  - Securely fastened together with the flanges turned out when channel iron beams am used in place of I-beams.
  - Installed with all bearing supports perpendicular to the center line.
  - Set and maintained with the web in a vertical position.
  - When an outrigger beam is used, the shackle or clevis with which the rope is to the outrigger beam which shall be placed directly over the center line of the stirrup.

- Suspension scaffolds support devices such as cornice hooks, roof hooks, roof irons, parapet clamps, or similar devices shall be:

  - Made of steel, wrought iron, or material of equivalent strength.
  - Supported by bearing blocks.
  - Secured against movement by tiebacks installed at right angles to the face of the building or structure or opposing angle tiebacks shall be installed and secured to a structurally sound point of anchorage on the building or structure.
  - Tiebacks shall be equivalent in strength to the hoisting rope.

- When winding drum hoists are used on a suspension scaffold they shall contain not less than four wraps of the suspension rope at the lowest point of scaffold travel.

- The use of repaired wire rope as suspension rope is prohibited.

- Wire suspension ropes shall not be joined together except through the use of eye splice thimbles connected with shackles or cover plates and bolts.

- 'I'he load end of wire suspension ropes shall be equipped with proper size thimbles and secured by eye splicing or equivalent means.

- Ropes shall be inspected for defects by a competent person prior to each work shift and after every occurrence which could affect a rope's integrity.

- Swaged attachments or spliced eyes on wire suspension ropes shall not be used unless they are made by the wire rope manufacturer or qualified person.

- 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.
    - Clips shall be installed according to the manufacturer's recommendations.
    - Clips shall be re-tightened to the manufacturer's recommendations after the initial loading.
    - Clips shall be inspected and re-tightened to the manufacturer's recommendations at the start of each work shift thereafter.
    - U-bolts 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.

- Suspension scaffold power-operated hoists and manual hoists shall be tested and listed by a qualified testing laboratory.

- Gasoline-powered equipment and hoists shall not be used on suspension scaffolds.

- Gears and brakes of power-operated hoists used on suspension scaffolds shall be enclosed.

- 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.

- Manually operated hoists shall require a positive crank force to descend.

- Two-point and multi-point suspension scaffolds shall be tied or otherwise secured to prevent them from swaying, as determined to be necessary based on an evaluation by a competent person.

- Devices whose file function is to over ride emergency escape and rescue shall not be used as working platforms.

(e) Access.

- When scaffold platforms are more than 2 feet above or below a point of access, portable ladders, hook-on ladders, attachable ladders, stairtowers, ramps, walkwavs, integral prefabricated scaffold access, or direct access from another scaffold, structure, personnel hoist or similar surface shall be used.

    - Portable hook-on and attachable ladders shall be positioned so as not to tip the scaffold.
    - Hook-on and attachable ladders shall be positioned so that their bottom rung is not more than 24 inches above the scaffold supporting level.
    - When hook-on and attachable ladders are used on a supported scaffold more than 35 feet high, they shall have rest platforms at 35-foot maximum vertical intervals.
    - Hook-on and attachable ladders shall be specifically designed for use with the type of scaffold used.
    - Hook-on and attachable ladders shall have a minimum rung length of 10 inches.
    - Hook-on and attachable ladders shall have uniformly spaced rungs with a maximum spacing between rungs of 16 3/4 inches.

- Stairway-type ladders shall:

    - Be positioned such that their bottom step is not more than 24 inches above the scaffold supporting level.
    - Be provided with rest platforms at 12 foot maximum vertical intervals.
    - Have a minimum step width of 16 inches except that mobile scaffolds stairway type ladders shall have a minimum step width of 11 1/2 inches.
    - Have slip-resistant treads on all steps and landings.

- Stair towers shall be positioned such that their bottom step is not more than 24 inches above the scaffold supporting level.

    - A stairrail consisting of a toprail and a midrail shall be provided on each side of each scaffold stairway.
    - The toprail of each stairrail system shall also be capable of serving as a handrail, unless a separate handrail is provided.
    - Handrails. and toprails that serve as handrails shall provide an adequate handhold for employees grasping them to avoid failing.
    - Stairrall systems and handrails shall bc surfaced to prevent injury to employees from punctures or laceration, and to prevent snagging of clothing.
    - The ends of stairrail systems and handrails shall be constructed so that they do not constitute a projection hazard.
    - Handrails and toprails that are used as handrails, shall be at least 3 inches from other objects.
    - Stairrails shall not be less than 28 inches nor more than 37 inches 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.

- A landing platform at least 18 inches wide by at least 18 inches long shall be provided at each level.
- Each scaffold stairway shall be at least 18 inches between stairrails.
- Treads and landings shall have slip-resistant surfaces.
- Stairways shall be installed between 40 degrees and 60 degrees from horizontal.
- Guardrails meeting the standards requirements shall be provided on the open sides and ends of each landing.
- Riser heights shall be uniform, within 1/4 inch. for each flight of stairs.
- Tread depth shall be uniform, within 1/4 inch, for each flight of stairs.

- Ramps and walkways 6 feet or more above lower levels shall have guardrail systems which comply with Subpart M- Fall Protection:

  - No ramp or walkway shall be inclined more than a slope of one (1) vertical to three (3) horizontal (20 degree above horizontal).
  - If the slope of a ramp or a walkway is steeper than one (1) vertical in eight (8) horizontal, the ramp or walkway shall have cleats not more than fourteen (14) inches apart which are securely fastened to the planks to provide footings.

- Integral prefabricated scaffold access frames shall:

  - Be specifically designed and constructed for use as ladder rungs.
  - Have a rung length of a least 8 inches.
  - Not be used as work platforms when rungs are less than 11 ½ inches in length, unless affected employee uses fall protection, or a positioning device which complies with 1926.502.
  - Be uniformly spaced within each frame section.
  - Be provided with rest platforms at 35-foot maximum vertical intervals on all supported scaffolds more than 35 feet high.
  - Have a maximum spacing between rungs of 16 3/4 inches. Non-uniform rung spacing caused by joining end frames together is allowed provided the resulting spacing does not exceed 16 3/4 inches.

- Steps and rungs of ladder and stairway type access shall line up vertically with each other between rest platforms.

- Direct access to or from another surface shall be used only when the scaffold is not more than 14 inches horizontally and not more than 24 inches vertically from the other surfaces

- **Effective August 30, 1997 access for employees erecting and dismantling supported scaffolds shall be in accordance with the following:**

  - The employer shall provide safe means of access for each employee erecting or dismantling a scaffold where the provision of safe access is feasible and does not create a greater hazard. The employer shall have a competent person determine whether it is

feasible or would pose a greater a hazard to provide, and have employees use a safe means of access. This determination shall be based on site conditions and the type of scaffold being erected or dismantled.
- Hook-on or attachable ladders shall be installed as soon as scaffold erection has progressed to a point that permits safe installation and use.
- When erecting or dismantling tubular welded frame scaffolds, end frames with horizontal members that are parallel, level and are not more than 22 inches apart vertically may be used as climbing devices for access provided they are erected in a manner that creates a usable ladder and provides good hand hold and foot space.
- Cross braces on tubular welded frame scaffolds shall not be used as a means of access or egress.

(f) Use.

- Scaffolds and scaffolds components shall not be loaded in excess of their maximum intended loads or rated capacities, whichever is less.

- The use of shore or lean-to scaffolds is prohibited.

- Scaffolds and scaffold components shall be inspected for visible defects be a competent person before each work shift and after any occurrence which could affect a scaffold's structural integrity.

- Any part of a scaffold damaged or weakened so that its strength is less than that required by this standard shall be immediately repaired or replaced, braced to meet those provisions, or removed from service until repaired.

- Scaffolds shall not be move horizontally while employees are on them unless they have been designed by a registered professional engineer specifically for such movement or for mobile scaffolds where the provisions of 1916.452(w) are followed.

- The clearance between scaffolds and power lines shall be as follows:

    - Scaffolds shall not be erected, used, dismantled, altered or moved such that they or any conductive material handled on them might get closer to exposed and energized lines than as follows:

Insulated Lines	Minimum Distance	Alternatives
Less than 300 volts	3 feet	
300 volts to 50kv	10 feet	
More than 50kv	10 feet plus 0.4 inches for each 1 kv over 50 kv	2 times the length of the line insulator, but never less than 10 feet

Uninsulated Lines	Minimum Distance	Alternatives
Less than 50 kv	10 feet	
More than 50kv	10 feet plus 0.4 inches for each 1 kv over 50 kv	2 times the length of the line insulator, but never less than 10 feet

- Scaffolds shall be erected, moved, dismantled, or altered only under the supervision and direction of a competent person qualified is scaffold erection, moving, dismantling or alteration. Such activities shall be performed only by experienced and trained employees selected for such work by the competent person.

- Employees shall be prohibited from working on scaffolds with snow, ice, or other slippery material except as necessary for removal of such materials.

- Where swinging loads are being hoisted onto or near scaffolds such that the loads might contact the scaffold, tag lines or equivalent measures to control the loads shall be used.

- Suspension ropes supporting adjustable suspension scaffolds shall be of a diameter large enough to provide sufficient surface area for the functioning of brake and hoist mechanisms.

- Suspension ropes shall be shielded from heat-producing processes. 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 that will not be damaged by the substance being used.

- Work on or from scaffolds is prohibited during storms or high winds unless a competent person has determined that it is safe for employees to be on the scaffold and those 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 anticipated wind forces imposed.

- Debris shall not be allowed to accumulate on platforms.

- 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.

- Ladders shall not be used on scaffolds to increase the working level height of employees except on large area scaffolds where employees have satisfied the following criteria:

  - When the ladder is placed against a structure which is not part of the scaffold, the scaffold shall be secured against the sideways thrust exerted by the ladder.
  - The platform units shall be secured to the scaffold to prevent their movement.
  - The ladder legs shall be on the same platform or other means shall be provided to stabilize the ladder against unequal platform deflection.
  - The ladder legs shall be secured to prevent them from slipping or being pushed off the platform.

- Platform shall not deflect more than 1/60 of the span when loaded

- To reduce the possibility of welding current arcing through the suspension wire ropes when performing welding from suspension scaffolds, the following precautions shall be taken as applicable:

  - An insulated thimble shall be used to attach each suspension wire rope to its hanging support. Excess suspension wire rope and any additional lines independent from grounding shall be insulated.
  - The suspension wire rope shall be covered with insulating material extending at least 4 feet above the hoist.
  - Each hoist line shall be covered with insulated protective covers.
  - In addition to a work lead attachment required by the welding process, a grounding conductor shall be connected from the scaffold to the structure.
  - If the scaffold grounding lead is disconnected at any time, the welding shall be shut off.
  - An active welding rod or UNINSULATED welding lead shall not be allowed to contact the scaffold or its suspension system.

(g) Fall protection.

- Each employed on a scaffold more than 10 feet above a lower level shall be protected from falling to that lower level.

- The employer shall have it competent person determine the feasibility and safety of providing fall protection for employees erecting or dismantling supported scaffolds. Employers are required to 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.

- Personal fall arrest systems used on scaffolds shall be attached by a lanyard to a vertical lifeline, horizontal lifeline or scaffold structural member.

- Guardrail systems installed to meet the requirements of this section shall comply with the following provisions:

  - Guardrail systems shall be installed along all open sides and ends of platforms. Guardrail systems shall be installed before the scaffold is released for use by employees other than erection/dismantling crews.
  - The top edge height of toprails or equivalent member on supported scaffolds manufactured or placed in service after January 1, 2000 shall be installed between 38 inches and 45 inches above the platform surface. The top edge height on supported scaffolds manufactured and placed in service before January 1, 2000, and on all suspended scaffolds where both a guardrail and a personal fall arrest system are required shall be between 36 and 45 inches.
  - When midrails. screens, mesh, intermediate vertical members, solid panels, or equivalent structural members are used, they shall be installed between the top edge of the guardrail system and the scaffold platform.
  - When midrails are used, they shall be installed at a height approximately midway between the top edge of the guardrail system and the platform surface.
  - When screens and mesh are used, they shall extend from the top edge of the guardrail system to the scaffold platform, and along the entire opening between the supports.
  - When intermediate members are used, they shall not be more than 19 inches apart.
  - Each toprail or equivalent member of a guardrail system shall be capable of withstanding, without failure a force applied in any downward or horizontal direction at any point along its top edge of a least 200 pounds for guardrail systems installed on single-point adjustable suspension scaffolds or two-point adjustable suspension scaffolds, and at least 200 pounds for guardrails systems installed on all other scaffolds.
  - When loads specified in the (g)(4)(vii) are applied direction, the top edge shall not be below the height above the platform that is prescribed in paragraph (g)(4)(ii).
  - Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members of a guardrail system shall 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 for guardrail systems with a minimum 100 pound toprail capacity, and at least 150 pounds for a guardrail system with a minimum 200 pound toprail capacity.
  - Suspension scaffolds hoists and non-walk-through stirrups may be used as end guardrails, if the space between the hoist or stirrup and the side guardrail or structure does not allow passage of an employee to the end of the scaffold.
  - Guardrails shall be surfaced to prevent injury to an employee from punctures or lacerations, and to prevent snagging of clothing.
  - The ends of all rails shall not overhang the terminal posts except when such overhang does not constitute a projection hazard to employees.
  - Steel or plastic banding shall not be used as a toprail or midrail.
  - Manila or plastic rope being used for toprails or midrails shall be inspected by a competent person as frequently as necessary to ensure that it continues to meet the strength requirements of paragraph (g) of this section.
  - Cross bracing is acceptable in the place of a midrail when the crossing point of the two braces is between 20 inches and 30 inches above the work platform or as a toprail when

the crossing point of the two braces is between 38 inches and 48 inches above the work platform. The end points at each upright shall be no more than 48 inches apart.

(h) Falling object protection.

- In addition to wearing hardhats, each employee on a scaffold shall be provided with additional protection from falling hand tools, debris and other small objects through the installation of toeboards, screens, or guardrails systems, or through the erection of debris nets, catch platforms or canopy structures that contain or deflect the falling objects.

- Where there is danger of tools, material or equipment falling from a scaffold and striking employees below, the following provisions apply:

  - The area below the scaffold to which objects can fall shall be barricaded and employees shall not be permitted to enter the guarded area.
  - A toeboard shall be erected along the edge of the platforms more than 10 feet above lower levels for a distance sufficient to protect employees below. Where tools, materials or equipment are piled to a height higher than the top edge of the toeboard, paneling or screening extended from the toeboard or platform to the top of the guardrail shall be erected for a distance sufficient to protect employees below.
  - A guardrail system shall be installed with openings small enough to prevent passage of potential falling objects.
  - A canopy structure, debris net or catch platform strong enough to withstand impact forces of the potential failing objects shall be erected over the employees below.

- Canopies, when used for failing object protection, shall comply with the following criteria:

  - Canopies shall be installed between the falling object hazard and the employees.
  - When canopies are used on suspension scaffolds for failing object protection, the scaffold shall be equipped with additional independent support lines equal in number to the number of points supported and equivalent in strength to the strength of the suspension ropes.
  - Independent support lines and suspension ropes shall not be attached to the same points of anchorage.

- Where used, toeboards shall be:

  - Capable of withstanding, without failure, a force of at least 50 pounds applied in any downward or horizontal direction at any point along the toeboard.
  - At least three and one-half inches high from the top edge of the toeboard to the level of the walking/working surface. Toeboards shall be securely fastened in place at the outermost edge of the platform and have not more than 1/4-inch clearance above the walking/working surface. Toeboards shall be solid or with openings not over one inch in the greatest dimension.

1926.452 Additional requirements applicable to specific types of scaffolds.

(a) Pole scaffolds
(b) Tube and coupler scaffolds
(c) Fabricated frame scaffolds
(d) Plasterers', decorators', and large area scaffolds
(e) Bricklayers' square scaffolds
(f) Horse scaffolds
(g) Form scaffolds and carpenters' bracket scaffolds
(h) Roof Bracket scaffolds
(i) Outrigger scaffolds
(j) Pump jack scaffolds
(k) Ladder jack scaffolds
(1) Window jack scaffolds
(m) Crawling boards (chicken ladders)
(n) Step, platform, and trestle ladder scaffolds
(o) Single-point adjustable suspension scaffolds
(p) Two-point adjustable suspension scaffolds (swing stages)
(q) Multi-point adiustable suspension scaffolds, stonesetters'multi-point adjustable suspension scaffolds, and masons' multi-point adjustable suspension scaffolds
(r) Catenary scaffolds
(s) Float (ship) scaffolds
(t) Interior hung scaffolds
(u) Needle beam scaffolds
(v) Multi-level suspended scaffolds
(w) Mobile scaffolds
(x) Repair bracket scaffolds
(y) Stilts

1926.453 Aerial Lifts.

(a) General requirements.

Unless otherwise provided in this section, aerial lifts required for use on or after January 22, 1973 shall be designed and constructed in conformance with the applicable requirements of the America National Standards for "Vehicle Mounted Elevating and Rotating Work Platforms." ANSI A9 2.2 – 1969, including appendix.

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

(b) Specific requirements

(b)(1) *Ladder trucks and tower trucks*. Aerial ladders shall be secured in the lower traveling position by the locking device on top of the truck cab, and the manually operated device at the base of the ladder before the truck is moved for highway travel.

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

- Lift controls shall be tested each day prior to use to determine that such controls are in safe working condition.
- Only authorized persons shall operate an aerial lift.
- Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted.
- Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.
- A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift.
- Note to paragraph (b)(2)(v): As of January 1, 1998, subpart M of this part (1926.502(d)) provides that body belts are not acceptable as part of a personal fall arrest system. The use of a body belt in a tethering system or in a restraint system is acceptable and is regulated under 1926.502(e).
- Boom and basket load limits specified by the manufacturer shall not be exceeded.
- The brakes shall be set and when outriggers are used, they shall be positioned on pads or a solid surface. Wheel chocks shall be installed before using an aerial lift on an incline, provided they can be safely installed.
- An aerial lift truck shall not be moved when the boom is elevated in a working position with men in the basket, except for equipment which is specifically designed for this type of operation in accordance with the provisions of paragraphs (a)(1) and (2) of this section.
- Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Upper controls shall be in or beside the platform within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Controls shall be plainly marked as to their function. Lower level controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.
- Climbers shall not be worn while performing work from an aerial lift.
- The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating value.
- Before moving an aerial lift for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position except as provided in paragraph (b)(2)(viii) of this section.

(b)(3) Electrical tests.
(b)(4) Bursting safety factor
(b)(5) Welding standards.

1926.454 Training

(a) The employer shall have each employee who performs work while on a scaffold trained by a person qualified in the subject matter to recognize the hazards associated with the type of scaffold being used and to understand the procedures to control or minimize those hazards.

(b) The employer shall have each employee who is involved in erecting, disassembling, moving, operating, repairing, maintaining or inspecting a scaffold trained by a competent person to recognize any hazards associated with the work in question.

(c) When the employer has reason to believe that an. employee lacks the skill or understanding needed for safe work involving the erection, use or dismantling of scaffolds, the employer shall retrain each such employee so that the requisite proficiency is regained.

Appendix A - Scaffold Specifications.

Appendix B - Criteria for determining the feasibility of providing safe access and fall protection for scaffold erectors and dismantlers.

Appendix C - List of national concensus standards.

Appendix D - List of training topics for scaffold erectors and dismantlers.

Appendix E - Drawings and illustrations.

Scaffolding, Shoring & Forming Institute

1300 Sumner Avenue
Cleveland, Ohio 44115
(216) 241-7333

AN OPEN LETTER

TO: All Users, owners and Distributors of Ground Based Scaffolding

RE: The Use of Scaffolding as an Anchorage for Personal Fall Arrest Systems

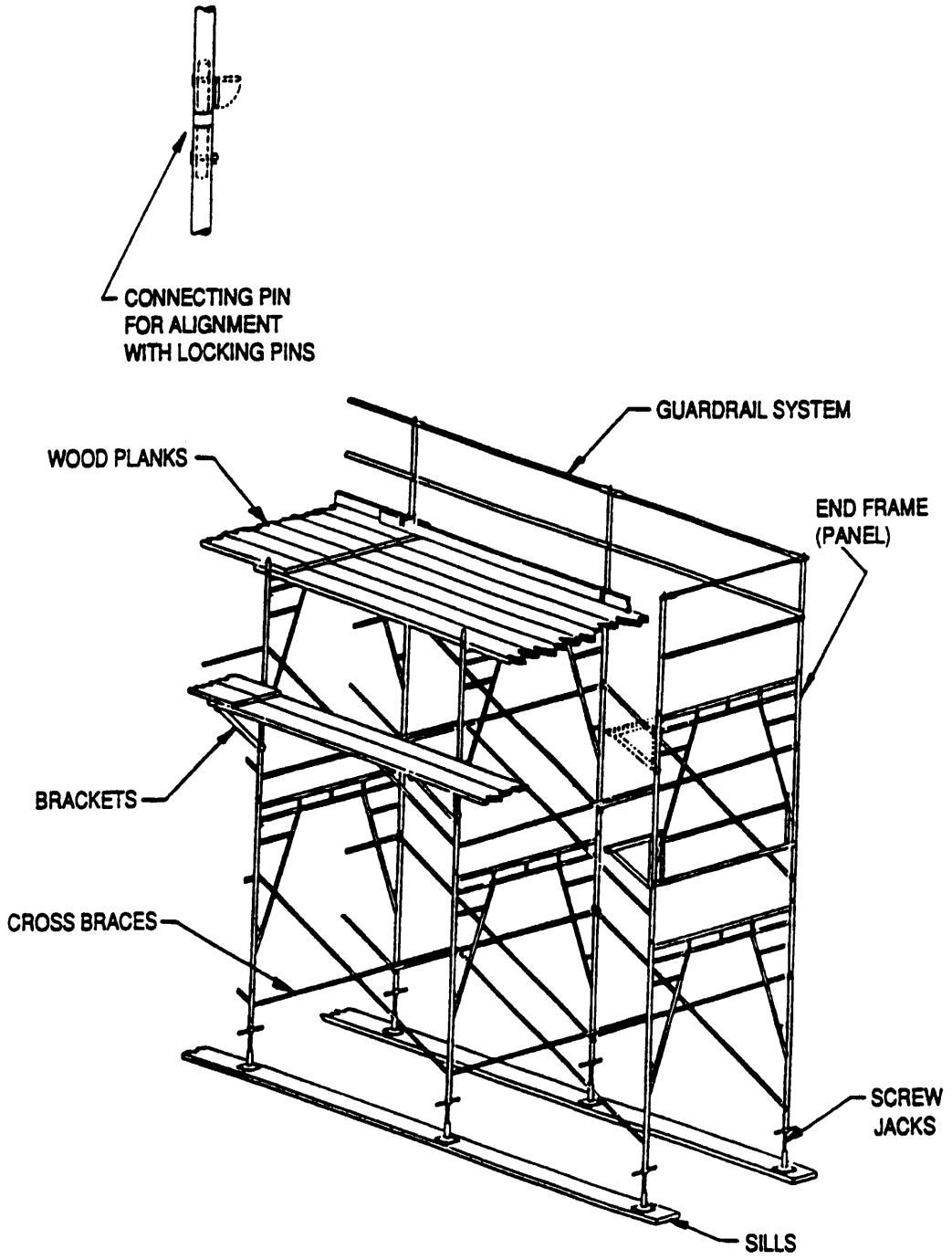
The Scaffolding, Shoring and Forming Institute (SSFI) is an industry association comprised of designers and manufacturers of scaffolding, shoring and forming products. For many years, members of the SSFI have been familiar with, and have been very active in, the engineering and standards development work associated with fall arrest equipment.

The undersigned manufacturers of ground based scaffolds wish to make you aware that the scaffold components which they manufacture have **not** been designed to accept the forces imposed on an anchorage point in an arrested fall. In our experience, we have found that such forces can cause individual components to fail, the entire scaffold to overturn, or both, resulting in *serious injury or death.*

While we continue to search for acceptable alternatives, we want to emphasize that in the interests of the safety of those who work on or around scaffolding we recommend fall arrest anchorage points confined to locations designed for that purpose by qualified persons. If you are already doing so, we are advising you to **IMMEDIATELY** discontinue the practice of using any scaffold components as an anchorage for fall arrest purposes.

A-1 PLANK & SCAFFOLD MFG., INC.	WERNER CO.
BIL-JAX. INC.	PATENT CONSTRUCTION SYSTEMS
SAFWAY STEEL PRODUCTS	SGB CONSTRUCTION SERVICES, INC.
THIEL MANUFACTURING	UNIVERSAL MANUFACTURING CORP
VANGUARD MANUFACTURING	WACO SCAFFOLDING & EQUIPMENT

Fabricated Tubular Frame Scaffold



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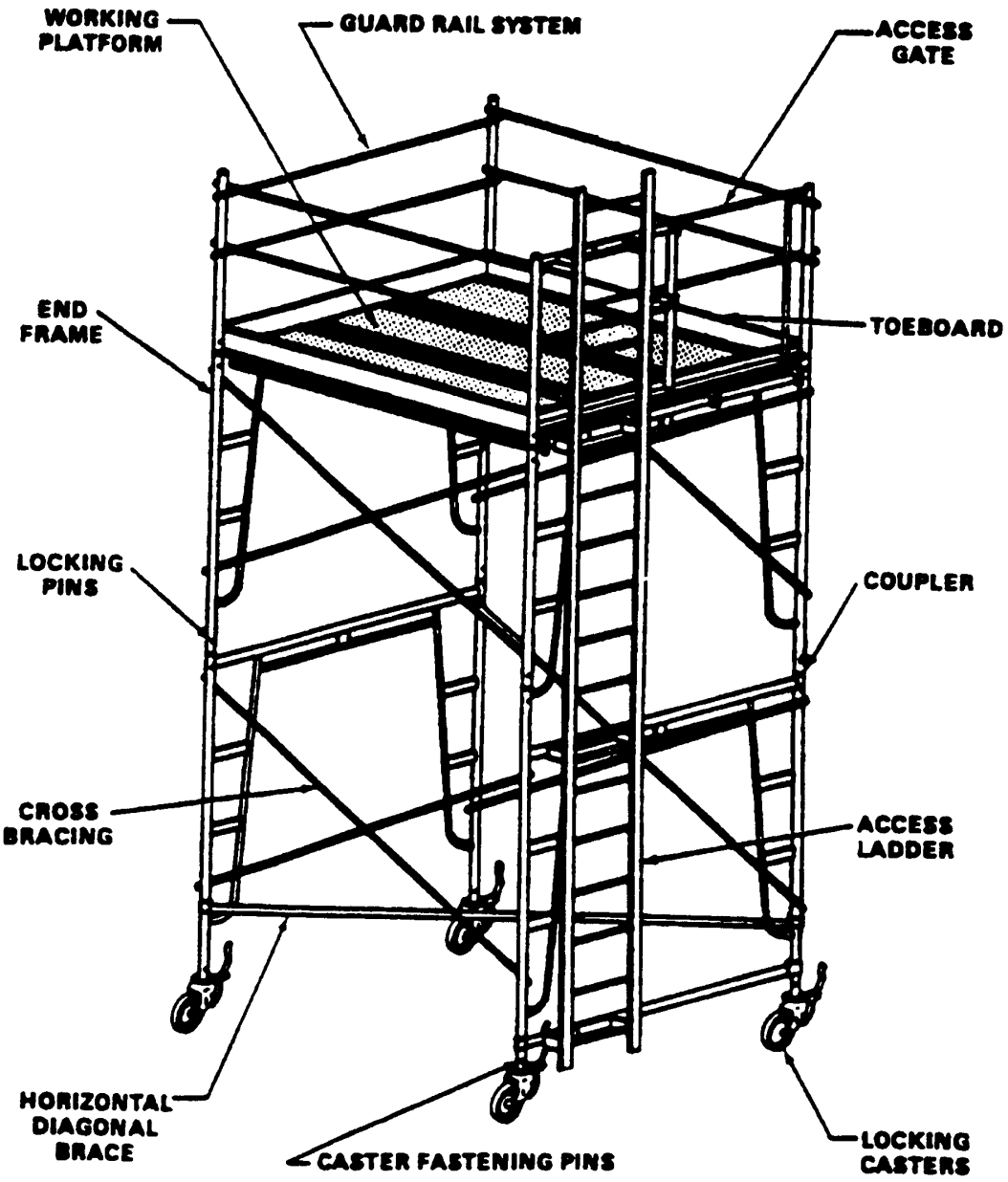
Fabricated Tubular Frame
Manually Propelled
Mobile Scaffold



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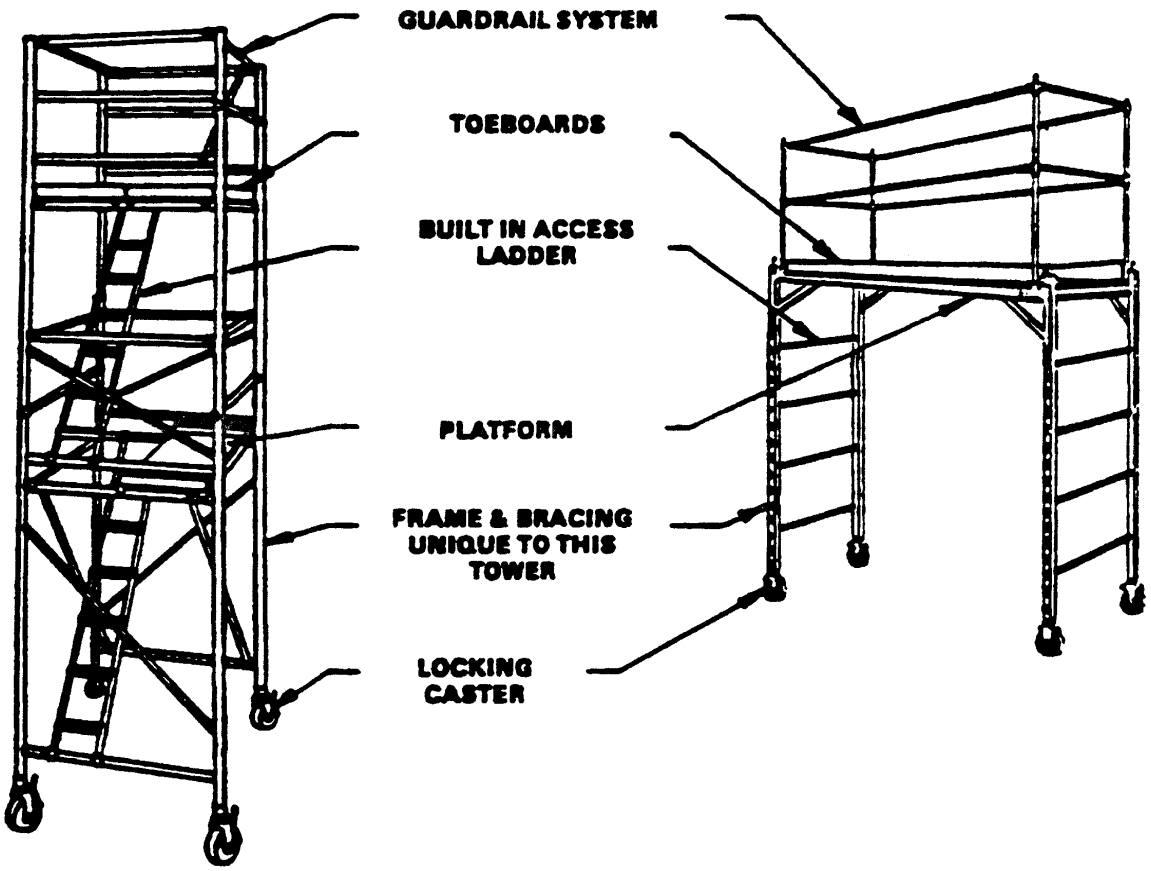
Prefabricated Mobile Tower Unit

This scaffold is normally manufactured as complete units/towers for use as manually propelled mobile scaffold with suppliers identification symbol



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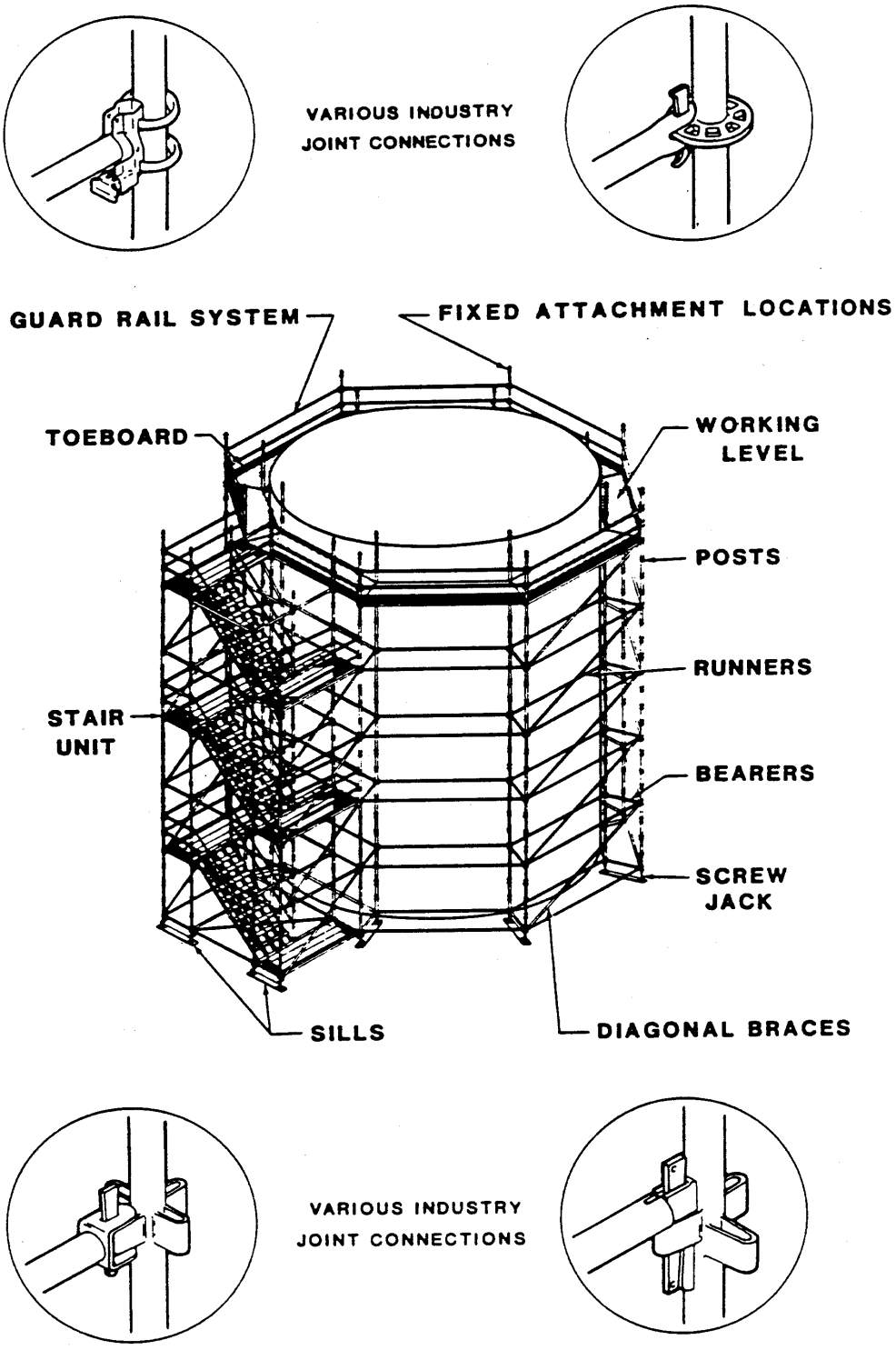
System Scaffold



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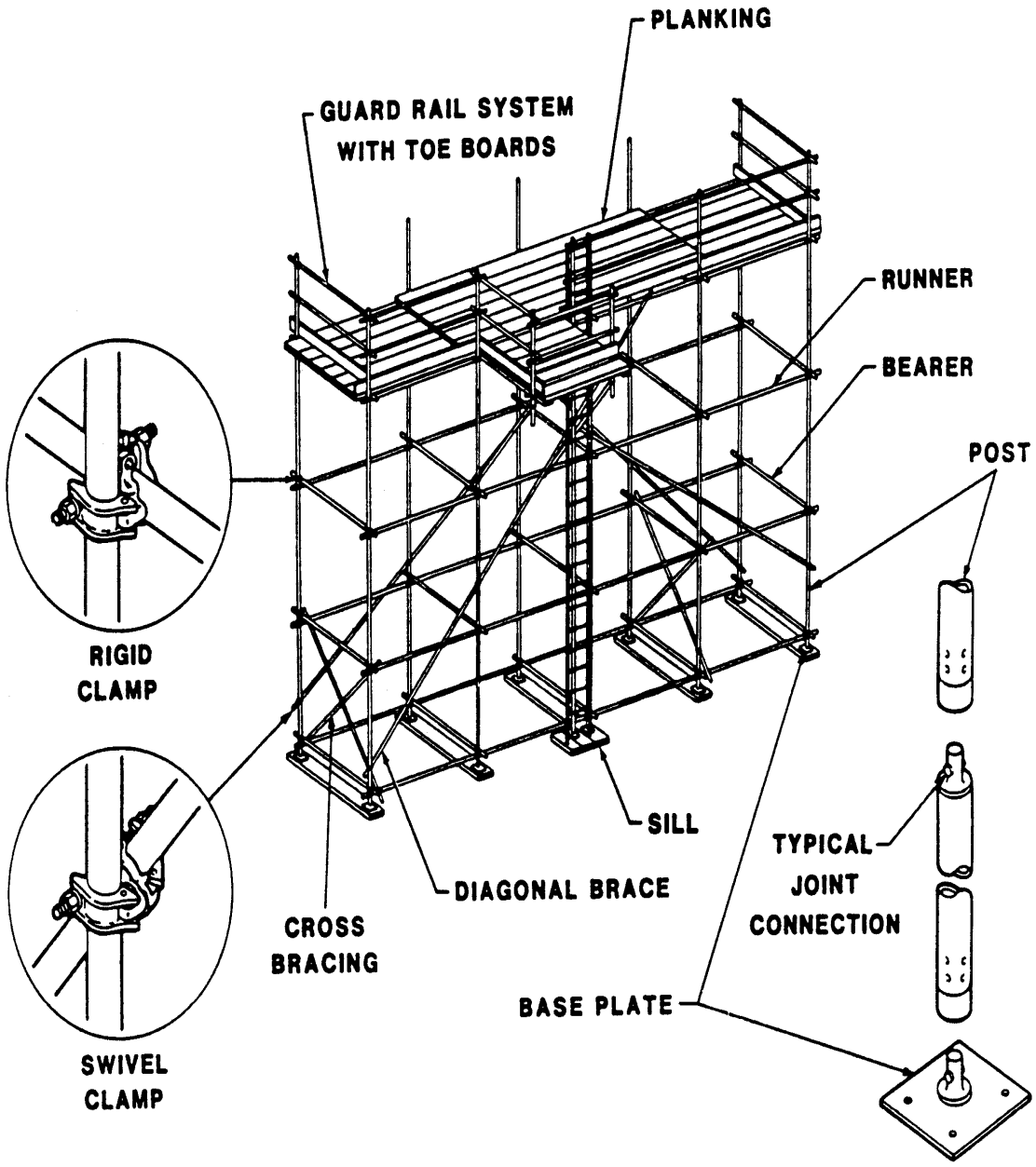
Tube and Coupler Scaffold



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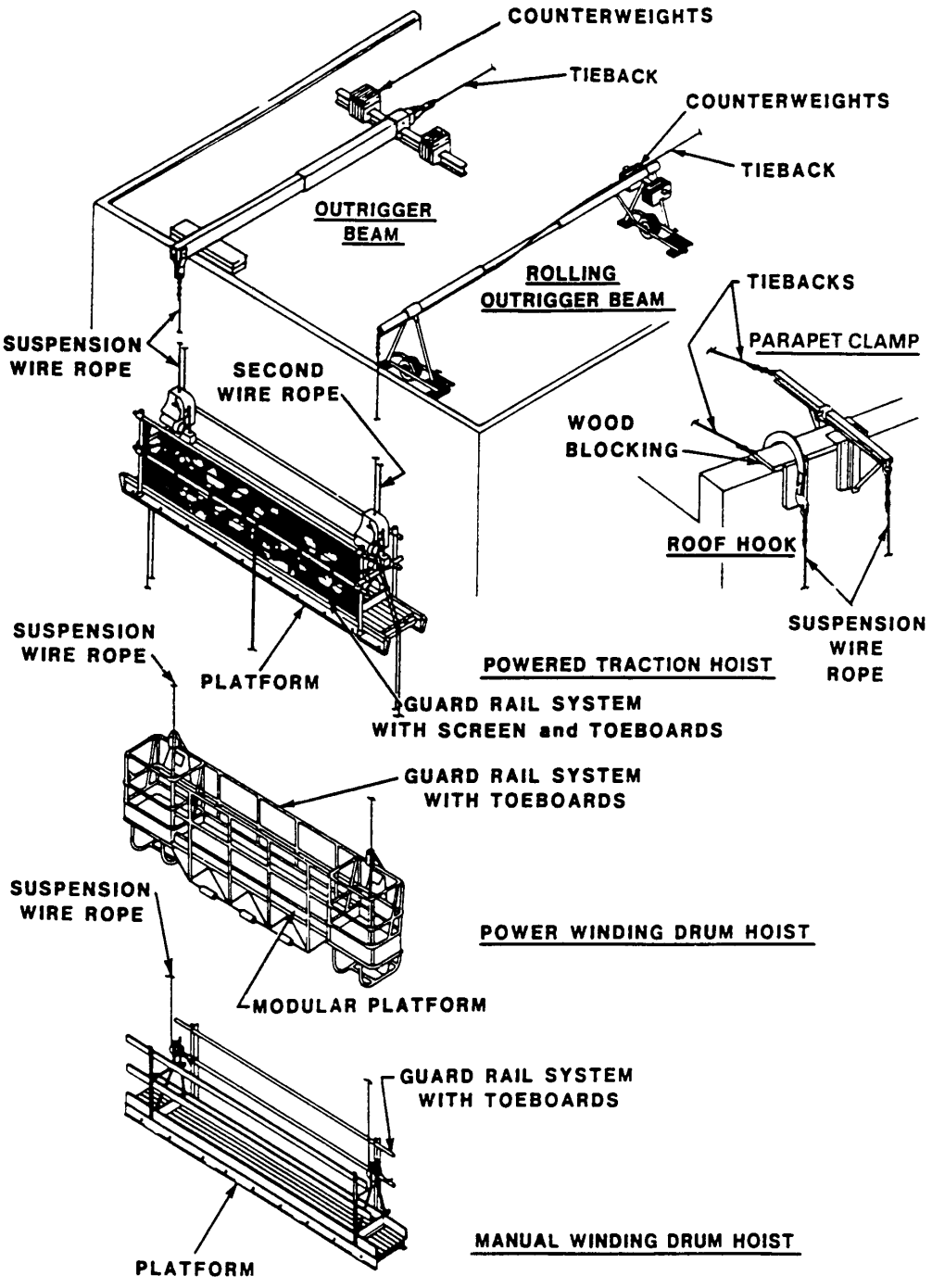
Two Point Suspended Scaffold



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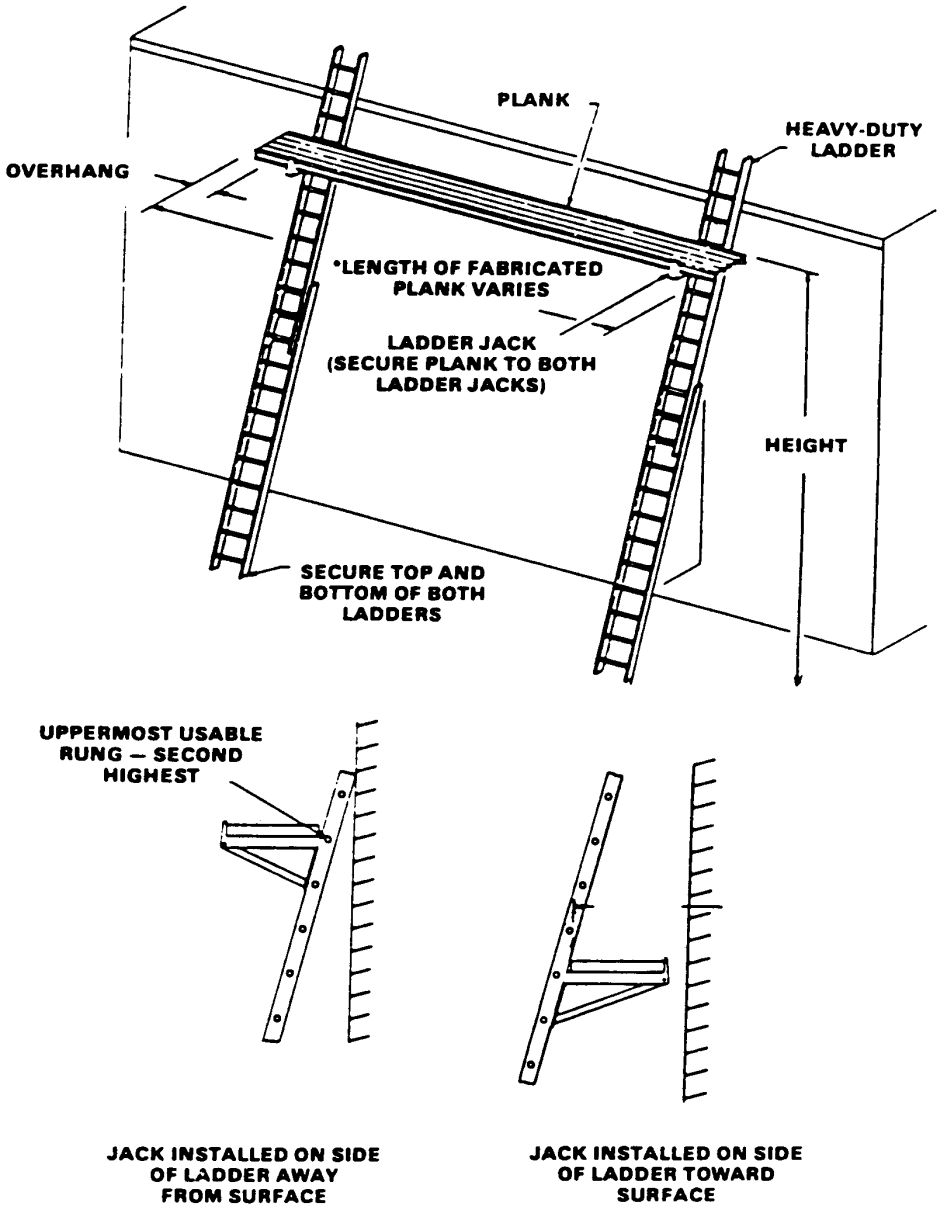
Ladder Jack Scaffold



***See OSHA requirements regarding width, height, spans and types of ladders.**

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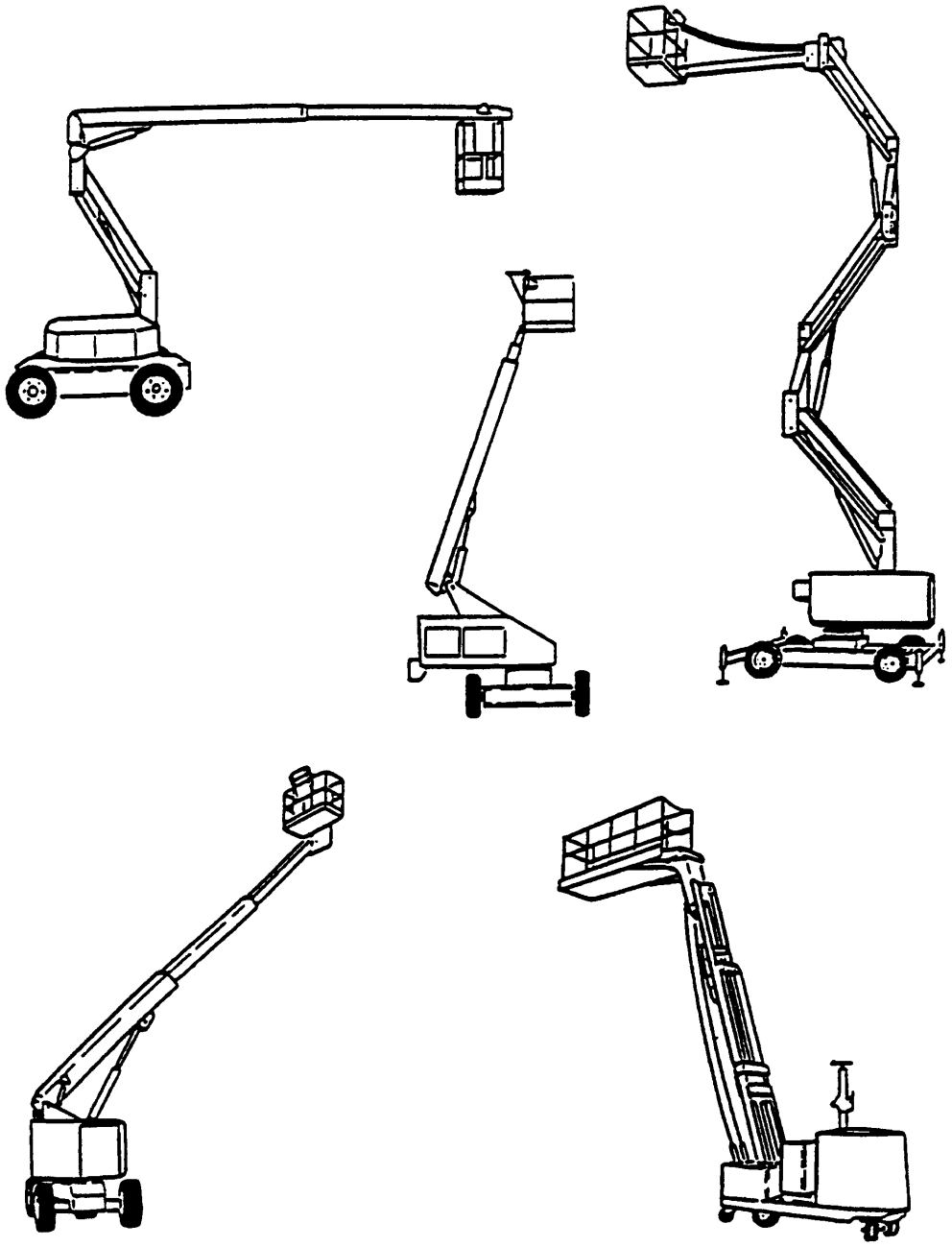
Typical Examples of Boom-Supported Elevating Work Platforms Covered in ANSI/SIA A92.5 Standard



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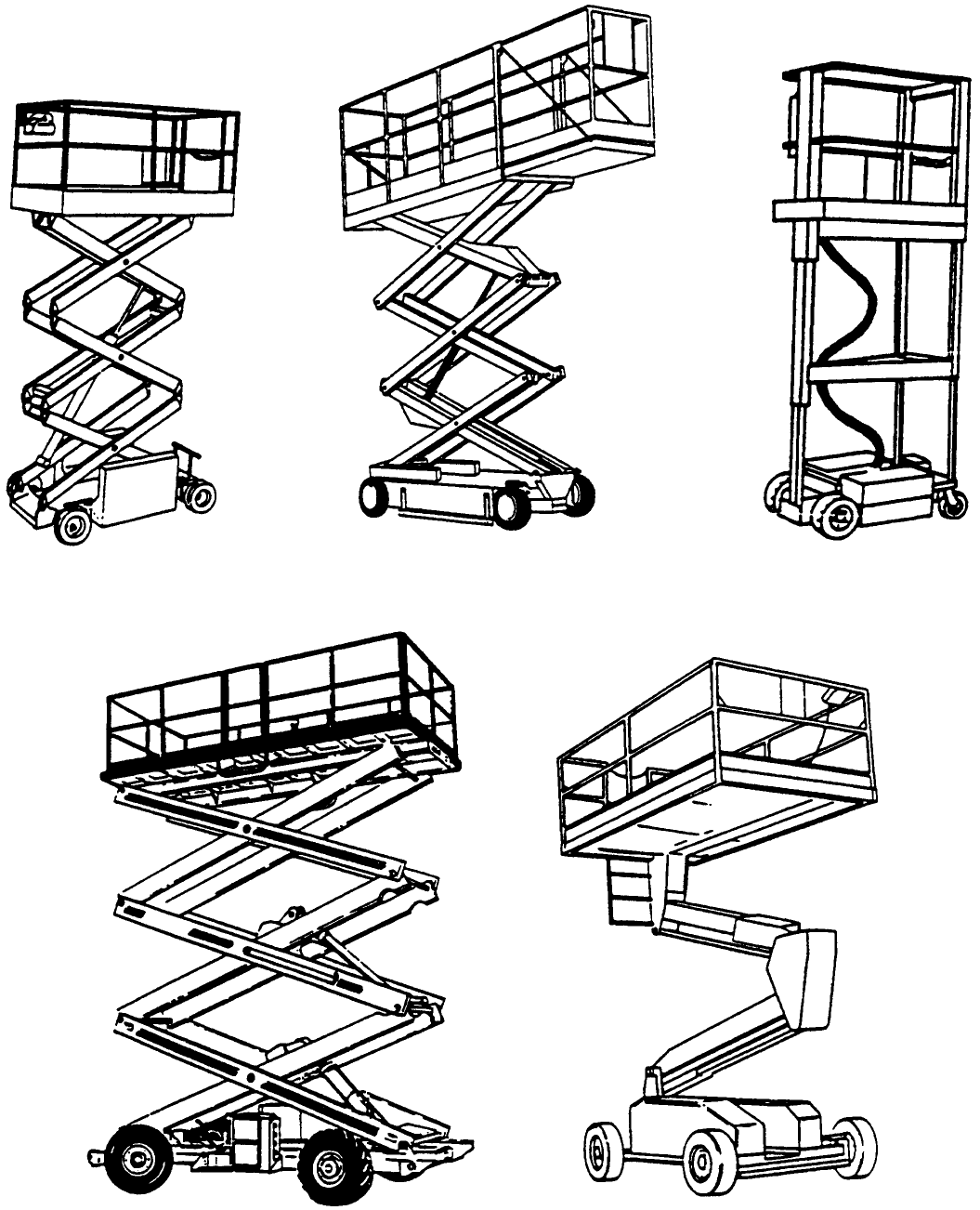
Typical Examples Of Self-Propelled Elevating Work Platforms Covered In ANSI/SIA A92.6 Standard



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EMI Offers Recommendations To OSHA Fall-Protection Rules

In an effort to clarify ambiguous regulations pertaining to fall protection - specifically in regard to aerial work platforms (AWPs), the Equipment Manufacturers Institute (EMI) has developed an interpretive guideline to provide specific guidance to manufacturers and users of AWPS. (EMI is the capital goods trade association whose members manufacture most of the world's elevating work platforms and aerial devices.) The document has been submitted to OSHA's Office of Construction and Engineering for comment and response.

This interpretive guideline is a direct result of an information-sharing meeting sponsored by two EMI Councils, the Manufacturers of Aerial Devices and Digger Derricks Council (MADDDC) and the Manufacturers of Elevating Work Platforms Council (MEWPC), with Anthony D. Brown, Safety Specialist with OSHA's Office of Construction and Engineering. The meeting was held in an effort to help industry better understand current fall-protection requirements and to help OSHA better understand the unique circumstances that apply to AWPs.

Fall Protection in Aerial Lifts

A. Background

Personal fall-protection devices have been required on boom lifts for many years. The original intent was to keep workers from separating from the aerial work platform (AWP) should there be a catapulting action. This policy has worked well; the industry's experience is that proper use of belts and lanyards prevent significant injuries. Additionally, industry accounts show that injuries and death can, by and large, be attributed to wearing no fall-protection device, rather than using the wrong type of fall-protection device. Thus, there is no empirical evidence to suggest a need to change the basic premise in the existing OSHA regulation: "A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift."

However, the advent of OSHA fall-protection regulations in 1995 brought about a sense of confusion among manufacturers, owners, inspectors and users of AWPS. Numerous consultants and "experts" have added to the confusion by focusing on the terminology "free fall" rather than on the need to tether. OSHA has inadvertently added fuel to the fire by inserting the following note in subpart L:

> *Note to paragraph (b)(2)(v): As of January 1, 1998, subpart M of this part (1926502(d)) provides that body belts are not acceptable as part of a personal fall arrest system. The use of a body belt in a tethering system or in a restraint system is acceptable and is regulated under 1926 502(e). (Underlining added for emphasis).*

Because it refers to Subpart M, this note throws the industry back into the "fall protection" maelstrom. In practice, it has invited attempts to meld positioning and/or restraint concepts onto what is a **tethering** need **unique to AWPS.**

C. Proposed actions - OSHA to issue the following letter of interpretation

In regards to aerial lifts covered in subpart L, no additional fall protection beyond the guardrail system is required for a self-propelled AWP as described in ANSI A92.6 and manually propelled AWP as described in ANSI A92.3

A tether must be worn on boom type machines described in ANSI A92.2 and A92.5. These devices are to keep a worker from completely separating from a workbasket should there be a catapulting of the boom which propels the worker upward. The issue is not one of free fall but rather launching.

The tethering device is not to be confused with personal fall arrest, positioning or restraint devices covered in subpart M 1926.502(e). The tether should be of sufficient length to allow free access to the work area with minimal slack. A tethering device consists of a belt or harness and lanyard. Adjustable lanyards or other devices may be used to minimize tether slack. Individual components only, used in the tethering system, shall conform to 1926.502(e).

By Dave Toy,
Equipment Manufacturers Institute (EMI)
Chicago, IL

DRAFT APPENDIX B TO SUBPART L
October 6, 1998

This Appendix B is provided to serve as a guide for evaluating the feasibility of providing safe access and fall protection for employees erecting or dismantling supported scaffolds.

For the purpose of this subpart, scaffold erectors/dismantlers are employees specifically designated by a competent person to erect or dismantle a supported scaffold. These employees should have training related to the proper erection/dismantling techniques, the hazards of working on a partially completed scaffold and the work processes necessary to safely accomplish this task. Non-mandatory Appendix D to Subpart L provides guidance as to the types of training appropriate for employees erecting or dismantling supported scaffolds.

Although not required, the Agency recommends that the employer designate a competent person to develop, as part of the preplanning, an erection/dismantling plan which includes an assessment of fall protection and access needs. This plan should assess whether or not safe access is available or can be provided, and whether fall protection is necessary, and where necessary, whether it is feasible. The plan should be based on a review of site conditions to identify potential fall hazards.

ACCESS

Safe access to supported scaffolds being erected or dismantled should be provided when feasible. The following are examples of situations in which the agency feels that safe access can be provided:

1. Situations where safe access can be provided from another structure. These may include access from the structure being worked on, the use of stair towers, or other similar types of equipment, depending on site conditions.

A competent person should determine that any structure used to provide access is stable and capable of withstanding the additional loads placed on it when used as access and insure that the scaffold will not move relative to the structure. The use of stair towers or other similar types of equipment will require the competent person to determine that the ground or foundation supporting the stair tower is capable of providing the firm footing needed to safely use this type of equipment.

2. Frames designed for climbing can be used to provide safe access.

A competent person should determine if the scaffold being erected/dismantled using these frames is sufficiently stable to allow erectors and dismantlers to climb the scaffold structure without tipping the whole unit. Factors that need to be considered include the need for ties, guys and braces to ensure stability.

3. Hook on or attachable ladders may be used as means of access during erecting and dismantling operations at the discretion of the competent person.

Erectors may climb the scaffold structure itself during erection or dismantling operations. Hook on or attachable ladders must be put in place before the scaffold is released for use. Users must use hook on or attachable ladders or the other means identified in 1926.451 (e).

Since there are many variables which could affect the feasibility of providing safe access for access for scaffold erectors and dismantlers at any given work site, the Agency has decided to provide the employer/competent person with the following criteria to consider when making this determination:

(1) The conventional means of access prescribed in 1926.451 (e), and how their use could prevent performance of work or create a greater hazard for employees;

(2) The use of outriggers, braces, ties, guys, or similar equipment that could be used to secure, stabilize, or reinforce the structure and the scaffold in order to provide adequate support for access equipment;

(3) The use of work procedures that ensure that materials including scaffold components are not loaded on the scaffold in a manner which would hinder access; and

(4) The use of man lifts and similar equipment, while possibly feasible, has the potential of creating a greater hazard. A small miscalculation when raising or lowering the equipment could result in the equipment contacting the partially erected scaffold causing it to collapse. Similarly, poor ground conditions could result in the scaffold foundation being displaced when a manlift is too close to the scaffold or the manlift settling and contacting the scaffold.

FALL PROTECTION

Fall protection should be provided for employees erecting or dismantling supported scaffolds whenever feasible. The feasibility of using fall protection by employees erecting or dismantling supported scaffolds is dependent upon a number of items including, but not limited to, the following: the availability of a suitable anchor point, the ability to keep life lines untangled during the erection/dismantling process, and the ability to keep life lines from being a tripping hazard.

For example, although it may be impossible to provide a personal fall arrest system while building a scaffold that is one bay long by four bays high and which is erected in an open field, such protection may be possible when the same scaffold is erected along side a structure where the system can be rigged from above. However, as the scaffold increases in length, the same personal fall arrest system may not be feasible because of its fixed anchorage and the need for employees to traverse the entire length of the scaffold. Additionally, fall protection may not be

feasible due to the potential for lifelines becoming entangled or creating a tripping hazard for erectors or dismantlers as they traverse the scaffold.

Since there are a very large number of variable conditions which could affect the feasibility of providing fall protection for scaffold erectors and dismantlers at any given work site, the Agency has decided to provide the employer/competent person with the following criteria to consider when making this determination (the competent person may have to consult with a qualified person i.e. professional engineer, manufacturer, etc. in order to obtain the information necessary for items l thru 4 below):

1. Whether there is a structure capable of providing an adequate personal fall arrest system anchor (5000 lbs. capacity or be designed, installed and used in accordance with the following:

Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds, (22.2 kN) per employee attached, or shall be designed, installed, and used as follows: (I) as part of a complete personal fall arrest system which maintains a safety factor of at least two; and (ii) under the supervision of a qualified person. Personal fall arrest systems, when stopping a fall, shall: (I) limit maximum arresting force on an employee to 900 pounds (4 kN) when used as a body belt; @ii) limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness; be rigged such that an employee can neither free fall more than 6 feet (1.8), nor contact any lower level; (iv) bring a employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07m); and, (v) have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet (1.8 m), or the free fall distance permitted by the system, whichever is less.

2. When suitable anchorages are not available for personal fall arrest systems, alternative fall protection should be provided where feasible. When the alternates are not feasible specific erection and dismantling procedures and training should be provided.

3. Whether the use of outriggers, braces, ties, guys, and similar equipment can be used to secure, stabilize, or reinforce the scaffold or the structure so that an adequate anchor can be provided;

WARNING: Scaffold systems should not be used as an anchorage for personal fall arrest systems unless a registered professional engineer competent in this field has evaluated and approved the design and erection procedure, has determined the scaffold can accept the loads imposed on it, and the anchorage is installed in accordance with such approval.

4. Whether or not the addition of outriggers, braces, ties, guys,, additional scaffold, additional stairways, installation of fall arrest equipment, would increase the exposure time for erectors/dismantlers to situations where fall protection/fall arrest means cannot be provided.

5. Ascertain that there is safe access to the anchor point.

6. The pendulum effect of life lines.

7. Determine and implement work procedures that reduce entanglement of lifelines, tripping hazards, or other hazards when the use of personal fall arrest systems is feasible.

8. Whether work procedures can be developed to minimize the likelihood of falls.

9. The use of man lifts and similar equipment, has the potential of creating a hazard. A small miscalculation when raising or lowering the equipment could result in the equipment contacting the partially erected scaffold causing it to collapse. Similarly, poor ground conditions could result in the scaffold foundation being displaced when a manlift is too close to the scaffold.

GENERAL WORK PRACTICES

1. Restrict access to leading edge locations to only trained and experienced employees.

2. Erectors and dismantlers should have no other duties during erection and dismantling processes.

3. All scaffolds should be adequately braced before being used.

4. Erectors/dismantlers should remain on structurally sound and stable portions of the scaffold while erecting or dismantling other portions of the scaffold.

5. Employees not involved in erection or dismantling should be kept clear of the area where scaffolds are being erected or dismantled.

6. Materials should be staged to minimize fall hazards and to permit safe access.

7. Determine whether erection/dismantling operations should be suspended during strong winds or inclement weather.

Record Type: Interpretation
Standard Number: 1926.451(g)(2); 1926.451(e)(9)
Subject: Fall protection and access for scaffold erecting and dismantling.
Information Date: 12/04/1997

December 4, 1997

MEMORANDUM FOR: REGIONAL ADMINISTRATORS

FROM: EMZELL BLANTON, JR.
ACTING DEPUTY ASSISTANT SECRETARY

SUBJECT: Construction Scaffold Standard:
Appendix B
Enforcement of 1926.451(e)(9) and (g)(2)

Appendix B to Subpart L is still being developed. When completed, it will provide a non-mandatory set of guidelines that a competent person would take into account when evaluating access and fall protection options for erectors and dismantlers of supported scaffolds. To help develop these guidelines, OSHA asked the Advisory Committee on Construction Safety and Health (ACCSH) for assistance. In response, ACCSH established a workgroup that has been meeting with representatives of interested scaffold groups. The work of that committee is presently in draft form and is not yet ready for general distribution.

Nevertheless, enforcement of the .451 (e)(9) access requirement and the .451 (g)(2) fall protection requirement began on September 2, 1997, when these provisions became effective. However, until Appendix B has been issued, all such enforcement actions must be reviewed by the Directorate of Construction (DOC) before citations are issued. This will allow such citations to be compared for consistent National enforcement. Thus, any worksite condition in violation of these standards must first be carefully reviewed for a possible infeasibility or greater hazard defense by the employer. OSHA must be prepared to make a rebuttal showing that compliance is feasible and does not pose a greater hazard. If, after such review, the Area Director believes that the basis for a citation exists, a brief summary of the case file material relating to the proposed citation(s) must be forwarded by e-mail to Mr. Roy Gurnham of DOC for concurrence prior to issuance. Mr. Gurnham's e-mail address is gurnham-roy@dol.gov.

Pending completion of Appendix B, the following policies, in effect since July of 1992 and February of 1996, respectively, shall be used to determine whether there is a violation of the standard requiring personal fall arrest systems for employees erecting or dismantling supported scaffolds. First of all, the employer must provide fall protection unless the employer can successfully show a greater hazard or the infeasibility of using such protection. OSHA

recognizes that there are situations where fall protection cannot feasibly be provided or where there is a greater hazard in providing fall protection than in not providing it; however, if such a situation does not exist, the employer is required to provide it. Appendix B is intended to indicate commonly found factors where infeasibility or greater hazard may exist. For example, although it may be impossible to provide body harness systems on a scaffold that is one bay by four bays high and which is located in an open field, such protection may be possible when that same scaffold increases in length, the same body harness system may not be feasible if there is only a single anchorage point available and employees must transverse the entire length of the scaffold.

With respect to the question of whether scaffolds can be used as anchorage points for personal fall arrest systems, DOC understands that the Scaffold Industry Association and the Scaffolding, Shoring and Forming Institute are concerned that scaffolds and scaffold components have not been designed to accept the forces imposed by employee falls. OSHA would agree that during the erection and dismantling process the typical scaffold cannot comply with all of the criteria of 29 CFR 1926.502(d)(15) which, among other things, requires the anchorage [i.e., the scaffold, if it is the tie-off point for the fall arrest system] to be capable of supporting at least 5,000 pounds per employee attached. Nevertheless, under present Commission law relating to the infeasibility defense, employers must provide protection for their employees to the extent possible even if the criteria referenced in 29 CFR 1926.502(d)(15)(i) and (ii) should be used if in the judgement of the competent person, the partially erected or dismantled scaffold can provide reasonable protection, should there be a fall.

The general policy outlined above also applies to situations where OSHA believes that a citation should be proposed for failure to provide access to a support scaffold during erection or dismantling.

Cranes & Derricks

Subpart N

OSHA Regulations (Standards - 29 CFR)
Part 1926 Subpart N - Cranes, Derricks, Hoists, Elevators, and Conveyors

…. 1926.550
Hammerhead tower cranes.
(c)(1) Adequate clearance shall be maintained between moving and rotating structures of the crane and fixed objects to allow the passage of employees without harm.

(c)(2) Each employee required to perform duties on the horizontal boom of hammerhead tower cranes shall be protected against falling by guardrails or by a personal fall arrest system in conformance with subpart M of this part.

(c)(3) Buffers shall be provided at both ends of travel of the trolley.
(c)(4) Cranes mounted on rail tracks shall be equipped with limit switches limiting the travel of the crane on the track and stops or buffers at each end of the tracks.
(c)(5) All hammerhead tower cranes in use shall meet the applicable requirements for design, construction, installation, testing, maintenance, inspection, and operation as prescribed by the manufacturer.

…..1926.550(g)

(g) *Crane or derrick suspended personnel platforms-* (1) *Scope, application and definitions-*
(i) *Scope and application.* This standard applies to the design, construction, testing, use and maintenance of personnel platforms, and the hoisting of personnel platforms on the load lines of cranes or derricks.
(g)(1)(ii) *Definitions*. For the purposes of this paragraph (g), the following definitions apply:
(g)(1)(ii)(A) "Failure" means load refusal, breakage, or separation of components.
(g)(1)(ii)(B) "Hoist" (or hoisting) means all crane or derrick functions such as lowering, lifting, swinging, booming in and out or up and down, or suspending a personnel platform.

(g)(1)(ii)(C) "Load refusal" means the point where the ultimate strength is exceeded.
(g)(1)(ii)(D) "Maximum intended load" means the total load of all employees, tools, materials, and other loads reasonably anticipated to be applies to a personnel platform or personnel platform component at any one time.
(g)(1)(ii)(E) "Runway" means a firm, level surface designed, prepared and designated as a path of travel for the weight and configuration of the crane being used to lift and travel with the crane suspended platform. An existing surface may be used as long as it meets these criteria.

(g)(2*) General requirements*. The use of a crane or derrick to hoist employees on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous or is not possible because of structural design or worksite conditions.

(g)(3) *Cranes and derricks – (i) Operational criteria.*
(g)(3)(i)(A) Hoisting of the personnel platform shall be performed in a slow, controlled, cautious manner with no sudden movements of the crane or derrick, or the platform.
(g)(3)(i)(B)Load lines shall be capable of supporting, without failure, at least seven times the maximum intended load, except that where rotation resistant rope is used, the lines shall be capable of supporting without failure, at least ten times the maximum intended load. The required design factor is achieved by taking the current safety factor of 3.5 (required under 1926.550(b)(2) and applying the 50 per cent derating of the crane capacity which is required by 1926.550(g)(3)(i)(F)of this section.
(g)(3)(i)(C) Load and boom hoist drum brakes, swing brakes, and locking devices such as pawls or dogs shall be engaged when the occupied personnel platform is in a stationary position.
(g)(3)(i)(D) The crane shall be uniformly level within one percent of level grade and located on firm footing. Cranes equipped with outriggers shall have them all fully deployed following manufacturer's specifications, insofar as applicable, when hoisting employees.
(g)(3)(i)(E) The total weight of the loaded personnel platform and related rigging shall not exceed 50 percent of the rated capacity for the radius and configuration of the crane or derrick.
(g)(3)(i)(F) The use of machines having live booms (booms in which lowering is controlled by a brake without aid from other devices which slow the lowering speeds) is prohibited.

(g)(3)(ii) *Instruments and components.*
(g)(3)(ii)(A) Cranes and derricks with variable angle booms shall be equipped with a boom angle indicator, readily visible to the operator.
(g)(3)(ii)(B) Cranes with telescoping booms shall be equipped with a device to indicate clearly to the operator, at all times, the boom's extended length or an accurate determination of the load radius to be used during the lift shall be made prior to hoisting personnel.
(g)(3)(ii)(C) A positive acting device shall be used which prevents contact between the load block or overhaul ball and the boom tip (anti-two-blocking device), or a system shall be used which deactivates the hoisting action before damage occurs in the event of a two-blocking situation (two-block damage prevention feature).
(g)(3)(ii)(D) The load line hoist drum shall have a system or device on the power train, other than the load hoist brake, which regulates the lowering rate of speed of the hoist mechanism (controlled load lowering.) Free fall is prohibited.

(g)(4) *Personnel Platforms. - (i) Design criteria.*
(g)(4)(i)(A) The personnel platform and suspension system shall be designed by a qualified engineer or a qualified person competent in structural design.
(g)(4)(i)(B) The suspension system shall be designed to minimize tipping of the platform due to movement of employees occupying the platform.

(g)(4)(i)(C) The personnel platform itself, except the guardrail system and personnel fall arrest system anchorages, shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load. Criteria for guardrail systems and personal fall arrest system anchorages are contained in subpart M of this Part.

(g)(4)(ii) *Platform specifications.*

(g)(4)(ii)(A) Each personnel platform shall be equipped with a guardrail system which meets the requirements of Subpart M, and shall be enclosed at least from the toeboard to mid-rail with either solid construction or expanded metal having openings no greater than 1/2 inch (1.27 cm).

(g)(4)(ii)(B) A grab rail shall be installed inside the entire perimeter of the personnel platform.
(g)(4)(ii)(C) Access gates, if installed, shall not swing outward during hoisting.
(g)(4)(ii)(D) Access gates, including sliding or folding gates, shall be equipped with a restraining device to prevent accidental opening.
(g)(4)(ii)(E) Headroom shall be provided which allows employees to stand upright in the platform.
(g)(4)(ii)(F) In addition to the use of hard hats, employees shall be protected by overhead protection on the personnel platform when employees are exposed to falling objects.
(g)(4)(ii)(G) All rough edges exposed to contact by employees shall be surfaced or smoothed in order to prevent injury to employees from punctures or lacerations.
(g)(4)(ii)(H) All welding of the personnel platform and its components shall be performed by a qualified welder familiar with the weld grades, types and material specified in the platform design.
(g)(4)(ii)(I) The personnel platform shall be conspicuously posted with a plate or other permanent marking which indicates the weight of the platform, and its rated load capacity or maximum intended load.

(g)(4)(iii) *Personnel platform loading.*
(g)(4)(iii)(A) The personnel platform shall not be loaded in excess of its rated load capacity, When a personnel platform does not have a rated load capacity then the personnel platform shall not be loaded in excess of its maximum intended load.
(g)(4)(iii)(B) The number of employees occupying the personnel platform shall not exceed the number required for the work being performed.
(g)(4)(iii)(C) Personnel platforms shall be used only for employees, their tools and the materials necessary to do their work, and shall not be used to hoist only materials or tools when not hoisting personnel.
(g)(4)(iii)(D) Materials and tools for use during a personnel lift shall be secured to prevent displacement.

(g)(4)(iii)(E) Materials and tools for use during a personnel lift shall be evenly distributed within the confines of the platform while the platform is suspended.

(g)(4)(iv) *Rigging.*
(g)(4)(iv)(A) When a wire rope bridle is used to connect the personnel platform to the load line, each bridle leg shall be connected to a master link or shackle in such a manner to ensure that the load is evenly divided among the bridle legs.
(g)(4)(iv)(B) Hooks on overhaul ball assemblies, lower load blocks, or other attachment assemblies shall be of a type that can be closed and locked, eliminating the hook throat opening. Alternatively, an alloy anchor type shackle with a bolt, nut and retaining pin may be used.
(g)(4)(iv)(C) Wire rope, shackles, rings, master links, and other rigging hardware must be capable of supporting, without failure, at least five times the maximum intended load applied or transmitted to that component. Where rotation resistant rope is used, the slings shall be capable of supporting without failure at least ten times the maximum intended load.
(g)(4)(iv)(D) All eyes in wire rope slings shall be fabricated with thimbles.
(g)(4)(iv)(E) Bridles and associated rigging for attaching the personnel platform to the hoist line shall be used only for the platform and the necessary employees, their tools and the materials necessary to do their work and shall not be used for any other purpose when not hoisting personnel.

(g)(5) *Trial lift, inspections and proof testing.*
(g)(5)(i) A trial lift with the unoccupied personnel platform loaded at least to the anticipated lift weight shall be made from ground level, or any other location where employees will enter the platform to each location at which the personnel platform is to be hoisted and positioned. This trial lift shall be performed immediately prior to placing personnel on the platform. The operator shall determine that all systems, controls and safety devices are activated and functioning properly; that no interferences exist; and that all configurations necessary to reach those work locations will allow the operator to remain under the 50 percent limit of the hoist's rated capacity. Materials and tools to be used during the actual lift can be loaded in the platform, as provided in paragraphs (g)(4)(iii)(D), and (E) of this section for the trial lift. A single trial lift may be performed at one time for all locations that are to be reached from a single set up position.
(g)(5)(ii) The trial lift shall be repeated prior to hoisting employees whenever the crane or derrick is moved and set up in a new location or returned to a previously used location. Additionally , the trial lift shall be repeated when the lift route is changed unless the operator determines that the route change is not significant (i.e. the route change would not affect the safety of hoisted employees.)
(g)(5)(iii) After the trial lift, and just prior to hoisting personnel, the platform shall be hoisted a few inches and inspected to ensure that it is secure and properly balanced. Employees shall not be hoisted unless the following conditions are determined to exist:
(g)(5)(iii)(A) Hoist ropes shall be free of kinks;
(g)(5)(iii)(B) Multiple part lines shall not be twisted around each other;
(g)(5)(iii)(C) The primary attachment shall be centered over the platform, and
(g)(5)(iii)(D) The hoisting system shall be inspected if the load rope is slack to ensure all ropes are properly stated on drums and in sheaves.
(g)(5)(iv) A visual inspection of the crane or derrick, rigging, personnel platform, and the crane or derrick base support or ground shall be conducted by a competent person immediately after

the trial lift to determine whether the testing has exposed any defect or produced any adverse effect upon any component or structure.
(g)(5)(v) Any defects found during inspections which create a safety hazard shall be corrected before hoisting personnel.
(g)(5)(vi) At each job site, prior to hoisting employees on the personnel platform, and after any repair or modification, the platform and rigging shall be proof tested to 125 percent of the platform's rated capacity by holding it in a suspended position for five minutes with the test load evenly distributed on the platform (this may be done concurrently with the trial lift). After proof testing, a competent person shall inspect the platform and rigging. Any deficiencies found shall be corrected and another proof test shall be conducted. Personnel hoisting shall not be conducted until the proof testing requirements are satisfied.

(g)(6) *Work practices.*
(g)(6)(i) Employees shall keep all parts of the body inside the platform during raising lowering, and positioning. This provision does not apply to an occupant of the platform performing the duties of a signal person.
(g)(6)(ii) Before employees exit or enter a hoisted personnel platform that is not landed, the platform shall be secured to the structure where the work is to be performed, unless securing to the structure creates an unsafe situation.
(g)(6)(iii) Tag lines shall be used unless their use creates an unsafe condition.
(g)(6)(iv) The crane or derrick operator shall remain at the controls at all times when the crane engine is running and the platform is occupied.
(g)(6)(v) Hoisting of employees shall be promptly discontinued upon indication of any dangerous weather conditions or other impending danger.
(g)(6)(vi) Employees being hoisted shall remain in continuous sight of and in direct communication with the operator or signal person. In those situations where direct visual contact with the operator is not possible, and the use of a signal person would create a greater hazard for the person, direct communication alone such as by radio may be used.

(g)(6)(vii) Except over water, employees occupying the personnel platform shall use a body belt/harness system with lanyard appropriately attached to the lower load block or overhaul ball, or to a structural member within the personnel platform capable of supporting a fall impact for employees using the anchorage. When working over water the requirements of 1926.106 shall apply.

(g)(6)(viii) No lifts shall be made on another of the crane's or derrick's loadlines while personnel are suspended on a platform.

(g)(7) *Traveling.*
(g)(7)(i) Hoisting of employees while the crane is traveling is prohibited, except for portal, tower and locomotive cranes, or where the employer demonstrates that there is no less hazardous way to perform the work.
(g)(7)(ii) Under any circumstances where a crane would travel while hoisting personnel, the employer shall implement the following procedures to safeguard employees:
(g)(7)(ii)(A) Crane travel shall be restricted to a fixed track or runway;
(g)(7)(ii)(B) Travel shall be limited to the load radius of the boom used during the lift; and

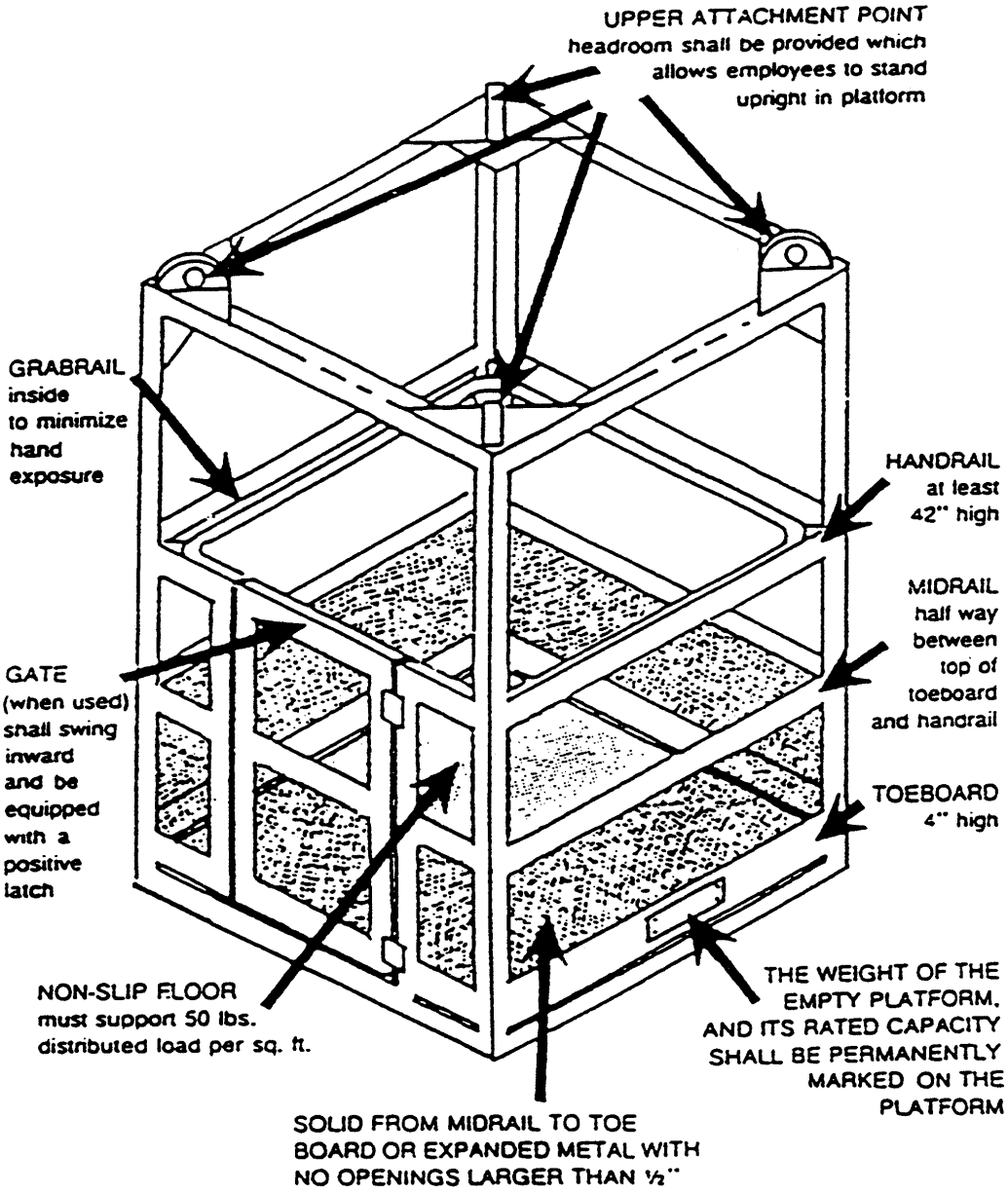
(g)(7)(ii)(C) The boom must be parallel to the direction of travel.
(g)(7)(ii)(D) A complete trial run shall be performed to test the route of travel before employees are allowed to occupy the platform. This trial run can be performed at the same time as the trial lift required by paragraph (g)(5)(i) of this section which tests the route of the lift.
(g)(7)(ii)(E) If travel is done with a rubber tired-carrier, the condition and air pressure of the tires shall be checked. The chart capacity for lifts on rubber shall be used for application of the 50 percent reduction of rated capacity. Notwithstanding paragraph (g)(5)(i)(E) of this section, outriggers may be partially retracted as necessary for travel.

(g)(8) *Pre-lift meeting.*
(g)(8)(i) A meeting attended by the crane or derrick operator, signal person(s) (if necessary for the lift), employee(s) to be lifted, and the person responsible for the task to be performed shall be held to review the appropriate requirements of paragraph (g) of this section and the procedures to be followed.
(g)(8)(ii) This meeting shall be held prior to the trial lift at each new work location, and shall be repeated for any employees newly assigned to the operation.

End of section

MANBASKET CONSTRUCTION

(Shall be approved by a Qualified Engineer)



Steel Erection

Subpart R

Common Citations and Abatement Guideline

Steel Erection

1) **No fall protection for the connector, bolter, or decker.** This is a tough issue affecting the industry. Common abatement methods can be by the use of safety nets, fall arrest systems incorporating horizontal lifelines and vertical stanchions, and use of aerial lifts. Each system used must be carefully planned in advance in order to work.

2) **Employees do not want to wear fall arrest equipment.** Many employees take pride in the fact that they can perform tough, physical work in high elevation without protection. They have used analogies similar to the entertainment industry in that they chose this work of their own free will. They often point to the fact that many ironworkers have done this work for years without injury. The problem is that falls are the leading cause of death for the ironworker and most of them dying are from high work above 16 feet. The employer must enforce the use of fall arrest equipment as part of an effective accident prevention program. For difficult employees, thought should be given to the use of passive fall protection such as safety nets versus fall arrest equipment.

3) **Employee uses a six-foot lanyard with a safety belt.** The use of safety belts has caused injuries when employees have fall six feet without a shock-absorbing lanyard. A free fall of 6 feet with a nylon rope lanyard can result in forces of 3500 pounds or more for a 220 pound employee. Employees who have fallen this distance have suffered ruptured internal organs and spinal damage. A fall arrest lanyard should incorporate a shock absorber that meets the 1910.66 Appendix C standard. This standard allows a maximum fall force of 900 pounds when work with a belt and 1800 pounds when worn with a body harness. Harnesses should be given first consideration for most fall-arrest operations.

4) **Christmas treeing.** Hoisting of multiple loads has killed employees when the upper beam or object hit the employee handling the lower load. Christmas treeing must not be performed if there is an exposure to being hit with the other load.

5) **No taglines.** Taglines are used to control swinging loads. A short tagline can be used when loads are lifted several stories.

Subpart R - Steel Erection and Fall Protection

Overview

- Effects of falls
- 1910.66 requirements for fall arrest
- Steel erection fall protection abatement

Citations

- No fall protection above 6 feet
- No Christmas treeing allowed where employees are exposed to overhead hazard
- No tagline for handling loads
- Employees wearing PPE incorrectly

Major Points

- Connectors are not exempt from fall protection requirements.
- Steel erectors must provide fall protection under 105(a) and 750 (b) above 25 feet and under 5(a)(1) under 25 feet.
- Abatement for falls can be accomplished by the use of aerial lifts, horizontal stanchion systems, and safety nets.
- The force of a 6-foot fall with a nylon rope lanyard can be 3,500 to 4,200 pounds.

Fatalities

- Falls account for the largest cause of death for the steel erector in a four-year period, 1988-1991.

Directives

CPL 2-1.34 - Inspection policy and procedures for OSHA's steel erection standards for construction

Directives - Table of Contents

- **Record Type:** Instruction
- **Directive Number:** CPL 2-1.34
- **Title:** Inspection policy and procedures for OSHA's steel erection standards for construction
- **Standard Number:** 1926
- **Information Date:** 03/22/2002

OSHA INSTRUCTION

DIRECTIVE NUMBER: CPL 2-1.34	EFFECTIVE DATE: Friday, March 22, 2002
SUBJECT: Inspection policy and procedures for OSHA's steel erection standards for construction.	

ABSTRACT

Purpose: This instruction describes OSHA's inspection policy and procedures and provides clarification to ensure uniform enforcement by field enforcement personnel of the steel erection standards for construction.

Scope: OSHA-wide

References: Construction Safety and Health Standards, Subpart R, 29 CFR 1926.750-761, Subpart M, 1926.502 and §1926.105; Federal Register, Vol. 66, No. 12, January 18, 2001, pages 5196-5280, Final Rule; Safety Standards for Steel Erection; Federal Register, Vol. 66, No. 137, July 17, 2001, pages 37137-37139, Final Rule; Delay of Effective Date; OSHA Instruction CPL 2.103, The Field Inspection Reference Manual (FIRM); and Occupational Safety and Health Act of 1970, Section 5(a)(1).

Cancellations: All interpretations (including letters of interpretation and memoranda) of the previous version of Subpart R issued prior to January 18, 2001.

State Plan Impact:	This instruction describes a Federal Program change for which State adoption is not required.
Action Offices:	National, Regional and Area Offices
Originating Office:	Directorate of Construction
Effective Date:	The effective date for the steel erection standard is January 18, 2002 except that §1926.754(c)(3) will not take effect until July 18, 2006. Certain other provisions are subject to a phase-in period (see Chapter 1, Section X).
Contact:	Mark Hagemann (202) 693-2345 Directorate of Construction N3468, FPB 200 Constitution Ave., N.W. Washington, D.C. 20210
Approval:	By and Under the Authority of John L. Henshaw Assistant Secretary

Executive Summary

This instruction implements the inspection policy and procedures necessary for uniform enforcement of OSHA's new steel erection standard. To achieve this objective, the Agency has included in this instruction a list of anticipated questions and answers along with a Compliance Officer Guide containing inspection tips.

Significant Changes

The new standard addresses the hazards that have been identified as the major causes of injuries and fatalities in the steel erection industry. Concepts addressed by the standard include:

- Site layout and construction sequence
- Site-specific erection plan
- Hoisting and rigging

- Structural steel assembly
- Column anchorage
- Beams and columns
- Open web steel joists
- Systems-engineered metal buildings
- Falling object protection
- Fall protection
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E. STRUCTURAL STEEL ASSEMBLY - §1926.754.

F. COLUMN ANCHORAGE - §1926.755.

CHAPTER 1.

BACKGROUND

I. **Purpose**. This instruction describes OSHA's inspection policy and procedures and provides clarification to ensure uniform enforcement by field enforcement personnel of the steel erection standards for construction.

II. **Scope**. This instruction applies OSHA-wide.

III. **Cancellation**. All interpretations (including letters of interpretation and memoranda) regarding the previous version of Subpart R issued prior to January 18, 2001 are cancelled.

IV. **Significant Changes**. The new standard's provisions that are significantly different from the previous steel erection standard include:

A. **Site layout and construction sequence**.

1. Requires notification of proper curing of concrete in footings, piers, etc. for steel columns.
2. Requires controlling contractor to provide erector with a safe site layout.

B. **Site-specific erection plan**.

1. Requires pre-planning of key erection elements, including coordination with controlling contractor before erection begins, in certain circumstances.

C. **Hoisting and rigging**.

1. Provides additional crane safety for steel erection.
2. Minimizes employee exposure to overhead loads through pre-planning and work practice requirements.
3. Prescribes proper procedure for multiple lifts (Christmas-treeing).

D. **Structural steel assembly**.

1. Provides safer walking/working surfaces by eliminating tripping hazards and minimizing slips through new slip resistance requirements (effective July 18, 2006).
2. Provides specific work practices regarding safely landing deck bundles and protecting against fall hazards from interior openings.

E. **Column anchorage**.

1. Requires 4 anchor bolts per column along with other column stability requirements.
2. Requires procedures to ensure adequacy of anchor bolts that have been modified in the field.

F. **Beams and columns**.

1. Eliminates collapse hazards associated with making double connections at columns.

G. **Open web steel joists**.

1. Erection bridging and attachment requirements to minimize risk of collapse of lightweight steel joists.
2. Requirements for bridging terminus anchors, with illustrations and drawings in a non-mandatory appendix.
3. Requirements addressing how to place loads on steel joists to minimize risk of collapse.

H. **Systems-engineered metal buildings**.

1. Requirements to minimize collapse in the erection of these specialized structures.

I. **Falling object protection**.

1. Performance provisions that address hazards of falling objects in steel erection.

J. **Fall protection**.

1. Deckers in a Controlled Decking Zone (CDZ) and connectors must be protected at heights greater than two stories or 30 feet.
2. Connectors between 15 feet and two stories or 30 feet must wear fall arrest or restraint equipment and be able to be tied off or be provided another means of fall protection. Deckers working between 15 feet and two stories or 30 feet may be protected by a CDZ.
3. Requires fall protection for all others engaged in steel erection at heights greater than 15 feet.

K. **Training**.

1. Requires qualified person to train exposed workers in fall protection.
2. Requires qualified person to train exposed workers engaged in special, high risk activities.

V. **References**.

A. Construction Safety and Health Standards, Subpart R, 29 CFR 1926.750-761 and Subpart M, 1926.502.

B. Federal Register, Vol. 66, No. 12, January 18, 2001, pages 5196-5280, Final Rule; Safety Standards for Steel Erection.

C. Federal Register, Vol. 66, No. 137, July 17, 2001, pages 37137-37139, Final Rule; Delay of Effective Date.

D. OSHA Instruction CPL 2.103, Field Inspection Reference Manual (FIRM)

E. Occupational Safety and Health Act of 1970, Section 5(a)(1).

VI. **Application**. This instruction applies to construction, alteration and/or repair involving steel erection activities.

VII. **Action Information**.

A. **Responsible Office**. Directorate of Construction (DOC)

B. **Action Offices**. Regional Offices, Area Offices, State Plan States

C. **Information Offices**. Information copies of this Instruction are provided to OSHA Directorate heads and the Solicitor of Labor (SOL)

/III. **Action**. Regional Administrators and Area Directors shall ensure that compliance officers are familiar with the contents of this instruction and that the enforcement guidelines are followed. This instruction will be re-evaluated after one year.

IX. **Federal Program Change**. This instruction describes a Federal program change for which State adoption is not required. States were notified on July 18, 2001 of the requirement to adopt a standard equivalent to the Federal standard for steel erection by January 18, 2002.

NOTE: In order to effectively enforce safety and health standards, guidance to compliance staff is

necessary. Although adoption of this instruction is not required, States are expected to have standards, enforcement policies and procedures which are at least as effective as those of Federal OSHA.

X. **Phase-in of certain requirements**.

A. **Component requirements**. Component requirements are provisions that address the safety of certain structural members. These are provisions that: prohibit shear connectors on members before they are erected (§1926.754(c)(1)(i)); require all columns to be anchored by a minimum of 4 anchor bolts, which must meet specified strength requirements (§1926.755(a)) (there is a comparable requirement for systems-engineered metal buildings, §1926.758(b)); set requirements for double connections (§1926.756(c)(1)) (there is a comparable requirement for systems-engineered metal buildings §1926.758(e)); require column splices to be at a specified height and meet a strength requirement (§1926.756(d)); require perimeter columns to have holes or other devices for perimeter safety cables (§1926.756(e)); in some instances require a vertical stabilizer plate to stabilize steel joists (§1926.757(a)(1)(i)); require certain joists to be strong enough to allow one employee to release the hoisting cable without the need for erection bridging (§1926.757(a)(3)), and require certain joists to be fabricated to allow for field bolting during erection (§1926.757(a)(8)(i)).

1. For building construction, the component requirements of the final rule will not be applied: (1) where the building permit was obtained prior to January 18, 2001, or (2) where steel erection began on or before September 16, 2001 (see volume 66 of the Federal Register, page 37137-37139).

2. For bridge construction, the component requirements of the final rule will not be applied where: (1) the bridge project has a contract date before January 18, 2001; or (2) steel erection began on or before September 16, 2001.

B. **Column joist requirements in §1926.757(a)(3)**.

1. Until July 18, 2003, for all joists at or near columns that span 60 feet or less, employers will be considered to be in compliance with §1926.757(a)(3) if they erect these joists either by: (1) installing bridging or otherwise stabilizing the joist prior to releasing the hoisting cable, or (2) releasing the cable without having a worker on the joists. This will allow the joist industry the necessary time to develop joists that will meet the requirement.

C. **General Schedule Inspection Delay**

1. The Agency will not conduct general schedule inspections of steel erection until March 18, 2002.

CHAPTER 2.

STANDARD OVERVIEW

I. This section is a quick overview of the subjects addressed in the new standard. References to sections of the standard that pertain to these subjects are included.

A. **§1926.750 Scope of coverage for Subpart R, Steel Erection, Final Rule (§1926.750-761 and Appendices A-H).**

1. Defines what activities are always covered by Subpart R [§.750(b)(1)]

2. Provides examples of job activities that are covered only when they occur during and as a part of steel erection [§.750(b)(2)]

3. Lists specific activities that are not covered [§.750(a)]

4. Defines the duties of the controlling contractor as including, but not limited to, the duties specified in §§1926.752(a) and (c), 1926.755(b)(2), 1926.759(b), and 1926.760(e). [§.750(c)]

B. **§1926.751 Definitions**.

Key terms used throughout the standard are defined in this section.

C. **§1926.752 Site layout and construction sequence**.

1. Prior to commencement of steel erection:

a. Controlling contractor must ensure that the steel erector is provided with written notification that concrete has attained sufficient strength for steel erection activities [§.752(a)(1)]

Note: The steel erector is prohibited from erecting steel until it receives written notification that the concrete has cured enough to support steel erection [§.752(b)]

b. Controlling contractor must ensure that the steel erector is provided with

written notification of any repairs, replacements and modifications to anchor bolts.[§.752(a)(2)] — ***requirements are also found in #167; .755(b)***

c. Controlling contractor must ensure that the worksite has adequate access and storage areas [§.752(c)]

d. Hoisting operations must be pre-planned to reduce employee exposures to overhead loads [§.752(d)]

2. Allows ***Site-specific erection plans*** as substitute for certain requirements ***(Appendix A contains sample plans)*** [§.752(e)].

a. Safety latches on hooks activated [§.753(c)(5)]

b. Setting joists 60'+ at/near columns in tandem [§.757(a)(4)]

c. Landing decking on steel joists [§.757(e)(4)]

D. **§1926.753 Hoisting and rigging**.

1. Crane safety: All provisions of §1926.550 apply to hoisting and rigging with the exception of §1926.550(g)(2). In addition, §1926.753(c) through (e) contain additional hoisting and rigging requirements. [§.753]

2. Pre-shift inspection requirements

a. Pre-shift inspection must be done by a competent person [§.753(c)]
b. Qualified rigger (rigger who is also a qualified person) must inspect the rigging prior to each shift. [§.753(c)(2)]

3. Responsibilities during crane operations

a. Safety latches on hooks may not be deactivated unless a qualified rigger determines it is safer to place purlins and joists without them, or equivalent protection is provided in a site specific erection plan

[§.753(c)(5)]
   b. The standard allows employees engaged in initial steel erection or hooking/unhooking to work under loads in some specific instances. When that occurs, the load must be rigged by a qualified rigger [§.753(d)]
   c. Operators are responsible for operations under their control and have the authority to stop and refuse to handle loads until safety has been assured [§.753(c)(2)(iv)]

4. Rules for crane operations

   a. Prohibits the use of cranes to hoist personnel unless all provisions of §1926.550 are met except §1926.550(g)(2) [§.753(c)(4)]
   b. When employees work under loads (allowed in specified instances), requirements in this section must be followed [§.753(d)]
   c. Multiple lift rigging ("Christmas Treeing") is permitted as long as the requirements in this section are met [§.753(e)]

E. **§1926.754 Structural steel assembly and stability**.

1. Stability requirements

   a. Structural stability must be maintained at all times during the erection process [§.754(a)]. This section contains a number of specific requirements for stability (Note: Requirement for four anchor bolts found in §1926.755(a)(1))
   b. Additional requirements for multi-story structures [§.754(b)]
   c. Requirements applicable when plumbing up [§.754(d)]

2. Decking requirements

   a. Requirements for hoisting, landing, and placing metal decking [§.754(e)(1)]
   b. Requirements for installing metal decking at roof and floor holes/openings [§.754(e)(2)]

3. Other requirements

   a. Requirements for skeletal steel walking surfaces [§.754(c)] (NOTE: These do not go into effect until July 18, 2006).

F. **§1926.755 Column anchorage**.

1. General requirements for stability

a. Minimum of 4 anchor bolts required on columns [§.755(a)(1)]

b. Requirement to withstand 300 pound load [§.755(a)(2)]

c. All columns must be evaluated by competent person [§.755(a)(4)]

2. Repair, replacement, or field modification of anchor rods/bolts

a. Approval required by the project structural engineer [§.755(b)(1)]

b. Written notification to steel erector [§.755(b)(2)]

G. **§1926.756 Beams and columns**.

1. This section of the standard focuses on increasing safety for employees involved in connecting solid web beams and columns.

a. Requires that solid web structural members remain attached to the hoisting line until members are secured with at least two bolts per connection drawn up wrench tight [§.756(a)(1)]

b. Competent person shall determine if more than two bolts are necessary to ensure the stability of cantilevered members [§.756(a)(2)]

c. Solid web structural members used as diagonal bracing shall be secured by at least one bolt per connection drawn up wrench tight [§.756(b)]

d. Requires that one wrench-tight bolt or a seat (or seat equivalent) secure the first member and column throughout the entire double connection process [§.756(c)]

e. Requires column splices to be designed to resist a minimum eccentric gravity load of 300 pounds (136.3 kg) [§.756(d)]

f. Sets requirements for the erection of perimeter columns [§.756(e)]

H. **§1926.757 Open web steel joists**.

1. This section focuses on increasing safety for employees involved in connecting open web steel joists. (Some requirements may be modified through a site-specific erection plan [§§.757(a)(4) and .757(e)(4)])

   a. Requirements for stabilizing steel joists and girders before releasing hoisting cables [§.757(a)]
   b. Requirements for attaching steel joists and steel joist girders (includes requirements for "K," "LH," and "DLH" series steel joists) [§.757(b)]
   c. Requirements for the erection of steel joists (short span and long span) [§.757(c)]
   d. Requirements for the erection of erection bridging (short span and long span) [§.757(d)]
   e. Requirements for landing and placing loads on joists [§.757(e)]

I. **§1926.758 Systems-engineered metal buildings**.

1. All the requirements of the standard apply to the erection of systems-engineered metal buildings except §1926.755 (column anchorage) and §1926.757 (open web steel joist). In addition:

   a. All columns are to have a minimum of four anchor rods/bolts [§.758(b)]
   b. The rigid frames must have 50$ of their bolts or the number specified by manufacturer (whichever is greater) installed and tightened before the hoisting equipment is released [§.758(c)]
   c. Construction loads prohibited unless the framework is adequately secured [§.758(d)]
   d. Requirements for girt and eave-to-strut connections [§.758(e)]
   e. Steel joists must be secured before releasing hoisting cables, allowing employees on the joist, or placing construction loads on the joists. [§.758(f)]
   f. Purlins and girts are not to be used as anchorages for fall arrest systems unless written approval is obtained from a qualified person [§.758(g)]
   g. Only after permanent bridging has been installed and fall protection provided can purlins be used as a walking/working surface when installing safety systems [§.758(h)]
   h. Limitations on placing construction loads on joists [§.758(i)]

J. §1926.759 Falling object protection

1. All materials, equipment, and tools that are not being used must be secured against accidental displacement [§.759(a)]

2. The controlling contractor must bar other construction processes below steel erection unless overhead protection is provided for the employees working below [§.759(b)]

K. §1926.760 Fall protection

1. All employees must be protected at 15 feet, except for deckers in controlled decking zones and connectors [§.760(a)]

2. Exception for connectors — protected at 30 feet or two stories, whichever is less [§.760(b)]

3. Controlled decking zone requirements [§.760(c)]

4. Exception for deckers in controlled decking zones - protected at 30 feet or two stories above lower deck, whichever is less [§.760(c)(1)]

5. Criteria for fall protection [§.760(d)]

6. Responsibility of controlling contractors to choose whether to accept responsibility for fall protection equipment [§.760(e)]

L. **§1926.761 Training**.

1. Requirements found in this section supplement those found in §1926.21

2. Training conducted by qualified person(s) [§.761(a)]

3. Requirements that must be included in training [§.761(b)]

4. Special training programs required for multiple lift rigging, connectors, and controlled decking zones [§.761(c)(1) through (3)(ii)]

CHAPTER 3.

COMPLIANCE OFFICER GUIDE AND INSPECTION TIPS

I. **INTRODUCTION**.

This section is designed to assist compliance officers in the practical aspects of conducting enforcement inspections under the new Steel Erection rule. The suggestions below should be considered helpful hints.

The new steel erection rule addresses a wide range of issues related to steel erection safety. The new standard not only addresses fall protection for iron workers, but places a heavy emphasis on maintaining the structural integrity of the building during the erection process.

NOTE On Effective Date: See Steel Erection Delay Notice (Federal Register #66 pages 37137-37139) to determine if component requirements of the new standard are in effect for a particular project. A number of provisions in the final rule address the safety of certain structural components. These provisions ("component requirements") contain requirements for these components to help ensure that the structure can be erected safely. There are provisions that: prohibit shear connectors on members before they are erected (§1926.754(c)(1)(i)); require all columns to be anchored by a minimum of 4 anchor bolts, which must meet specified strength requirements (§1926.755(a)) (there is a comparable requirement for systems-engineered metal buildings, §1926.758(b)); set requirements for double connections (§1926.756(c)(1)) (there is a comparable requirement for systems-engineered metal buildings §1926.758(e)); require column splices to be at a specified height and meet a strength requirement (§1926.756(d)); require perimeter columns to have holes or other devices for perimeter safety cables (§1926.756(e)); in some instances require a vertical stabilizer plate to stabilize steel joists (§1926.757(a)(1)(i)); require certain joists to be strong enough to allow one employee to release the hoisting cable without the need for erection bridging (§1926.757(a)(3)), and require certain joists to be fabricated to allow for field bolting during erection (§1926.757(a)(8)(i)).

1. For building construction, the component requirements of the final rule will not be applied: (1) where the building permit was obtained prior to January 18, 2001, or (2) where steel erection began on or before September 16, 2001 (see volume 66 of the Federal Register, page 37137-37139).

2. For bridge construction, the component requirements of the final rule will not be applied where: (1) the bridge project has a contract date before January 18, 2001; or (2) steel erection began on or before September 16, 2001.

The Agency will not conduct general schedule inspections of steel erection until March 18, 2002.

II. **OPENING CONFERENCE**.

Consider obtaining the information outlined below at the opening conference and during the initial observations of the steel erection site. Note that a number of the tips suggest asking for various documents. This does not mean that those documents are required by the standard. ***While it is advisable to obtain the documents mentioned below, the only documents an employer is required to have are those specified in Subpart R or other standards.***

A. During the opening conference with the controlling contractor, consider doing the following:

1. Obtain a copy of the blueprints and consult with someone knowledgeable in blueprint reading (engineer). Note the name of the structural engineer of record from the blueprints.

2. Find out when the steel erection began and on what date they obtained the permits for the job. (This information will only be important during the first few months after the standard becomes effective.)

3. Ask for a copy of the written notification to the steel erector that the concrete in the footings, piers and walls and the mortar in the masonry piers and walls has attained the required strength [.752(a)(1)]. You will also want to find out when the concrete was poured, how long after the pour they waited before allowing steel erection to begin, and what compressive strength of concrete was required.

4. Ask if there have been any changes to anchor bolts. Ask for a copy of the written notifications of repairs/replacements/modifications.

5. Determine if, prior to the erection of columns, they provided written notification to the steel erector if any repairs, replacements and modifications to the anchor bolts were conducted. [§§.752(a)(2) and .755(b)]. Were these repairs, replacements and modifications performed with approval of the project structural engineer of record? If so, obtain a copy.

6. Was the fall protection provided by the steel erector left in the area where steel erection activity has been completed for use by other trades?

    a. If yes, ask the following: Did you or your authorized representative direct the steel erector to leave the fall protection in place? Have you or your authorized representative inspected and accepted control and responsibility of the fall protection prior to authorizing persons other than

steel erectors to work in the area? (the answer to both of these questions must be yes to be in compliance with §1926.760(e))

b. If no, the controlling contractor is not required to take any further action with regard to this section.

B. During the opening conference with the steel erector, consider doing the following:

1. Determine if they are using open web joists (also known as bar joists).

2. Determine the current stage of the erection process.

3. Ask for a copy of the lift procedure (if kept).

4. Determine who is the competent person and qualified rigger.

5. Determine if they are using a site specific steel erection plan (a plan is only required in some circumstances. See Chapter 2, Section I, Paragraph C).

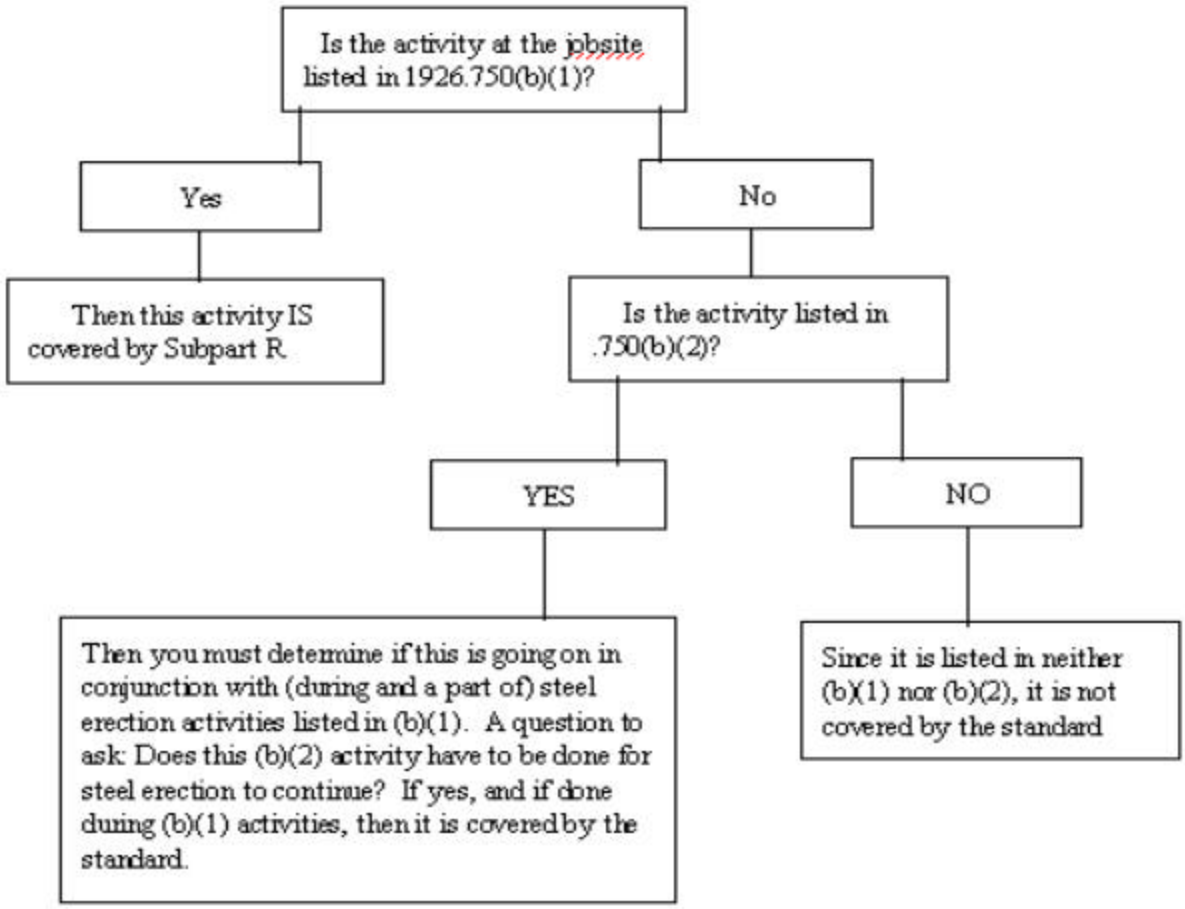
III. **STANDARD SECTIONS**. The following is a section-by-section description of observations the CSHO should make and questions the CSHO should ask while performing a steel erection inspection.

A. **SCOPE - §1926.750**.

1. Subpart R does **NOT** cover - precast concrete, electrical transmission towers, communication and broadcast towers, or tanks. NOTE on tanks: a tank is defined as a container for holding gases, liquids, or solids. Subpart R **does** apply to the construction of the steel structure that supports a tank. Construction of the tank would be covered under Subpart E - 1926.105.

2. The CSHO must initially determine if the activity being inspected is covered by Subpart R. The first question to ask: Is this activity listed in §1926.750(b)(1)? If so, then it is covered by the standard.

3. If the activity is listed only in §1926.750(b)(2), then you must determine if it is going on in conjunction with ("during and [is] a part of") steel erection activities listed in §1926.750(b)(1). A question also to ask: Does this (b)(2) activity have to be done for the steel erection to continue? The following flow chart may help:



NOTE: Paragraph .750(b)(2) lists a number of activities that are covered by subpart R when they occur during and are a part of the steel erection activities described in paragraph (b)(1). Paragraph (b)(2) explicitly states that coverage depends on whether an activity occurs during and is a part of steel erection. For example, there are standing seam metal roofing systems that incorporate a layer of insulation under the metal roof. In the installation process, a row of insulation is installed, which is then covered by a row of metal roofing. Once that row of roofing is attached, the process is repeated, row by row, until the roof is completed. The installation of the row of insulation is a part of the installation of the metal roofing (which is steel erection), and so the installation of the insulation is covered by Subpart R.

B. **DEFINITIONS - §1926.751**.

The following definitions, which are in the standard, should be helpful when conducting the walk around inspection (see photos in Chapter 5):

1. ***Anchored bridging*** means that the steel joist bridging is connected to a bridging terminus point.

2. ***Bolted diagonal bridging*** means diagonal bridging that is bolted to a steel joist or joists.

3. ***Bridging clip*** means a device that is attached to the steel joist to allow the bolting of the bridging to the steel joist.

4. ***Bridging terminus point*** means a wall, a beam, tandem joists (with all bridging installed and a horizontal truss in the plane of the top chord) or other element at an end or intermediate point(s) of a line of bridging that provides an anchor point for the steel joist bridging.

5. ***Choker*** means a wire rope or synthetic fiber rigging assembly that is used to attach a load to a hoisting device.

6. ***Cold forming*** means the process of using press brakes, rolls, or other methods to shape steel into desired cross sections at room temperature.

7. ***Column*** means a load-carrying vertical member that is part of the primary skeletal framing system. Columns do not include posts.

8. ***Competent person*** (also defined in §1926.32) means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

9. ***Connector*** means an employee who, working with hoisting equipment, is placing and connecting structural members and/or components.

10. ***Constructibility*** means the ability to erect structural steel members in accordance with Subpart R without having to alter the overall structural design.

11. ***Construction load*** (for joist erection) means any load other than the weight of the employee(s), the joists and the bridging bundle.

12. ***Controlled decking zone*** (CDZ) means an area in which certain work (for example, initial installation and placement of metal decking) may take place without the use of guardrail systems, personal fall arrest systems, fall restraint systems, or safety net systems and where access to the zone is controlled.

13. ***Controlled load lowering*** means lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with maximum control using the gear train or hydraulic components of the hoist mechanism. Controlled load lowering requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load.

14. ***Controlling contractor*** means a prime contractor, general contractor, construction manager or any other legal entity which has the overall responsibility for the construction of the project -- its planning, quality and completion.

15. ***Critical lift*** means a lift that (1) exceeds 75 percent of the rated capacity of the crane or derrick, or (2) requires the use of more than one crane or derrick.

16. ***Decking hole*** means a gap or void more than 2 inches (5.1 cm) in its least dimension and less than 12 inches (30.5 cm) in its greatest dimension in a floor, roof or other walking/working surface. Pre-engineered holes in cellular decking (for wires, cables, etc.) are not included in this definition.

17. ***Derrick floor*** means an elevated floor of a building or structure that has been designated to receive hoisted pieces of steel prior to final placement.

18. ***Double connection*** means an attachment method where the connection point is intended for two pieces of steel which share common bolts on either side of a central piece.

19. ***Double connection seat*** means a structural attachment that, during the

installation of a double connection, supports the first member while the second member is connected.

20. ***Erection bridging*** means the bolted diagonal bridging that is required to be installed prior to releasing the hoisting cables from the steel joists.

21. ***Fall restraint system*** means a fall protection system that prevents the user from falling any distance. The system is comprised of either a body belt or body harness, along with an anchorage, connectors and other necessary equipment. The other components typically include a lanyard, and may also include a lifeline and other devic es.

22. ***Final interior perimeter*** means the perimeter of a large permanent open space within a building such as an atrium or courtyard. This does not include openings for stairways, elevator shafts, etc.

23. ***Girt*** (in systems-engineered metal buildings) means a "Z" or "C" shaped member formed from sheet steel spanning between primary framing and supporting wall material.

24. ***Headache ball*** means a weighted hook that is used to attach loads to the hoist load line of the crane.

25. ***Hoisting equipment*** means commercially manufactured lifting equipment designed to lift and position a load of known weight to a location at some known elevation and horizontal distance from the equipment's center of rotation. "Hoisting equipment" includes but is not limited to cranes, derricks, tower cranes, barge-mounted derricks or cranes, gin poles and gantry hoist systems. A "come-a-long" (a mechanical device, usually consisting of a chain or cable attached at each end, that is used to facilitate movement of materials through leverage) is not considered "hoisting equipment."

26. ***Leading edge*** means the unprotected side and edge of a floor, roof, or formwork for a floor or other walking/working surface (such as deck) which changes location as additional floor, roof, decking or formwork sections are placed, formed or constructed.

27. ***Metal decking*** means a commercially manufactured, structural grade, cold rolled metal panel formed into a series of parallel ribs; for this subpart, this includes metal floor and roof decks, standing seam metal roofs, other metal roof systems and other products such as bar gratings, checker plate, expanded metal panels, and similar products. After installation and proper fastening, these decking materials serve a combination of functions including, but not limited to: a structural element designed in combination with the structure to resist, distribute and transfer loads, stiffen the structure and provide a diaphragm action; a walking/working surface; a form for concrete slabs; a support for roofing systems; and a finished floor or roof.

28. ***Multiple lift rigging*** means a rigging assembly manufactured by wire rope rigging suppliers that facilitates the attachment of up to five independent loads to the hoist rigging of a crane (Note: Under §1926.753(e)(2), components from several manufacturers may be assembled by a qualified rigger. See Question and Answer #18).

29. ***Opening*** means a gap or void 12 inches (30.5 cm) or more in its least dimension in a floor, roof or other walking/working surface. For the purposes of this subpart, skylights and smoke domes that do not meet the strength requirements of §1926.754(e)(3) shall be regarded as openings (Note: The definition of "opening" in subpart R is different than the definition of "opening" in subpart M).

30. ***Permanent floor*** means a structurally completed floor at any level or elevation (including slab on grade).

31. ***Personal fall arrest system*** means a system used to arrest an employee in a fall from a working level. A personal fall arrest system consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combination of these. The use of a body belt for fall arrest is prohibited.

32. ***Positioning device*** means a body belt or body harness rigged to allow an employee to be supported on an elevated, vertical surface, such as a wall or column and work with both hands free while leaning.

33. ***Post*** means a structural member with a longitudinal axis that is essentially vertical, that: (1) weighs 300 pounds or less and is axially loaded (a load presses down on the top end), or (2) is not axially loaded, but is laterally restrained by the above member. Posts typically support stair landings, wall framing, mezzanines and other substructures.

34. ***Project structural engineer of record*** means the registered, licensed professional responsible for the design of structural steel framing and whose seal appears on the structural contract documents.

35. ***Purlin*** (in systems-engineered metal buildings) means a "Z" or "C" shaped member formed from sheet steel spanning between primary framing and supporting roof material.

36. ***Qualified person*** (also defined in §1926.32) means 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.

37. ***Safety deck attachment*** means an initial attachment that is used to secure an initially placed sheet of decking to keep proper alignment and bearing with structural support members.

38. ***Shear connector*** means headed steel studs, steel bars, steel lugs, and similar devices which are attached to a structural member for the purpose of achieving composite action with concrete.

39. ***Steel erection*** means the construction, alteration or repair of steel buildings, bridges and other structures, including the installation of metal decking and all planking used during the process of erection.

40. ***Steel joist*** means an open web, secondary load-carrying member of 144 feet (43.9 m) or less, designed by the manufacturer, used for the support of floors and roofs. This does not include structural steel trusses or cold-formed joists.

41. ***Steel joist girder*** means an open web, primary load-carrying member, designed by the manufacturer, used for the support of floors and roofs. This does not include structural steel trusses.

42. ***Steel truss*** means an open web member designed of structural steel components

by the project structural engineer of record. For the purposes of this subpart, a steel truss is considered equivalent to a solid web structural member.

43. ***Structural steel*** means a steel member, or a member made of a substitute material (such as, but not limited to, fiberglass, aluminum or composite members). These members include, but are not limited to, steel joists, joist girders, purlins, columns, beams, trusses, splices, seats, metal decking, girts, and all bridging, and cold formed metal framing which is integrated with the structural steel framing of a building.

44. ***Systems-engineered metal building*** means a metal, field-assembled building system consisting of framing, roof and wall coverings. Typically, many of these components are cold-formed shapes. These individual parts are fabricated in one or more manufacturing facilities and shipped to the job site for assembly into the final structure. The engineering design of the system is normally the responsibility of the systems-engineered metal building manufacturer.

45. ***Tank*** means a container for holding gases, liquids or solids.

46. ***Unprotected sides and edges*** means any side or edge (except at entrances to points of access) of a walking/working surface, for example a, floor, roof, ramp or runway, where there is no wall or guardrail system at least 39 inches (1.0 m) high.

C. SITE LAYOUT, SITE-SPECIFIC ERECTION PLAN AND CONSTRUCTION SEQUENCE - §1926.752.

This section of the standard sets forth OSHA's requirements for communication between the controlling contractor and the steel erector prior to the beginning of steel erection, and pre-planning by the steel erector to minimize overhead exposure during hoisting operations.

1. During an inspection, visually determine the following:

    a. Did the controlling contractor provide adequate road access on the site for the delivery and movement of derricks, cranes, trucks, steel erection materials and other equipment? (Note: This requirement does not apply to roads outside of the construction site.) [§.752(c)(1)]
    b. Did the controlling contractor provide means and methods for pedestrian and vehicular control? [§.752(c)(1)]
    c. Did the controlling contractor provide a firm, properly graded, drained area, readily accessible to the work with adequate space for the safe storage of materials and safe operation of the erectors' equipment?

[§.752(c)(2)]

d. Did the controlling contractor either bar other construction processes below steel erection or provide overhead protection for the employees below? (This relates only to protection from falling objects other than materials being hoisted.) [§.759(b)]

2. Site-specific erection plan [§.752(e)]. A site-specific erection plan is required only when the contractor has decided to use alternative means to protect employees from three specific hazards:

   a. When safety latches on hooks are being deactivated or made inoperable. [§.753(c)(5)]
   b. When joists (which span more than 60 feet) at or near columns are not being set in tandem with all bridging installed. [§.757(a)(4)]
   c. When bundles of decking are being placed on steel joists before all bridging has been installed and anchored and all joist bearing ends attached. [§.757(e)(4)]

3. If it is determined that any of the above three conditions exist, a site-specific erection plan is required. The employer may use Appendix A as a framework for the plan. Methods for providing alternative worker protection from the above three conditions must be specified in the plan.

4. Determine if there is a plan available at the site. (Note: The plan does not need to be in writing - only §1926.757(e)(4)) requires a written plan.

D. **HOISTING AND RIGGING - §1926.753**.

The requirements of §1926.753 supplement the existing crane and rigging standards in §1926.251 and §1926.550. The requirements of Subpart R cover every type of crane. All the provisions of §1926.550 apply to hoisting and rigging with the exception of §1926.550(g)(2).

1. Questions to ask the steel erector:

   a. Who is the qualified rigger?
   b. Did they do a pre-shift inspection of the rigging?
   c. Who is the competent person assigned to inspect the crane?

2. Questions to ask the crane operator and/or qualified rigger:

   a. Do they have load charts, operator manual or riggers' handbook?
   b. Has the heaviest anticipated lift been calculated?

(Note: See the June 1994 booklet "Mobile Crane Inspection Guidelines for OSHA Compliance Officers")

3. Paragraph(c)(2) requires the qualified rigger inspect the below-hook rigging before each shift. Section 1926.251 inspection procedures will be applied for each type of rigging equipment to be used during the shift. In addition, paragraph (c)(5)(i) allows the safety latch on hoisting hooks to be deactivated when the qualified rigger makes a determination that it is safer for the connectors during the placement of purlins and single joists (Note that a safety latch is required to be used only where: (1) the manufacturer has equipped the hook with a latch, or (2) when working under suspended loads pursuant to §1926.753(d)).

   a. Observe hooks with deactivated safety latches for anything other than single joists or purlins.
   b. Refer to the site-specific erection plan for equivalent protection.
   c. Talk to the qualified rigger.

4. Paragraph (d) addresses the hazards associated with overhead loads. Specifically, these hazards include failure of the lifting device, which would create a crushing hazard, and items falling from the load, which creates a struck-by and crushing hazard, among others. Given the nature of the loads used in steel erection, either of these events could result in serious injury or death.

   a. See if employees are exposed to overhead loads. If you see employees working under loads, determine if the route was pre-planned (and exposure minimized) by interviewing the competent person, crane operator, etc. (The exception being connectors doing initial connection; or riggers hooking or unhooking of the load. These employees may work under the load.)

5. **MULTIPLE LIFT RIGGING PROCEDURE (MLRP)**.

   Paragraph (e)(1) lists the prerequisite conditions for multiple lift procedures (MLRP assembly, maximum of 5 pieces of steel per lift, only beams or similar structural members allowed, only by specifically trained employees, and the crane manufacturer must allow.)

   a. If the steel erector is performing multiple-lifts:

      (1) Request a copy of their multiple-lift procedure (if kept).
      (2) Determine the number of pieces being lifted (no more than 5 are allowed).
      (3) Check for certification of the rigging assembly from the qualified rigger (whether a manufacturer supplied rigging or the qualified rigger assembled it) and inspect the rigging equipment.
      (4) Review the rigging chart and calculate the total load.
      (5) Check the crane for controlled load lowering capability.
      (6) Assure that the rigging is 7 feet or more apart.

b. The MLRP rigging assembly must be specifically designed for the structural steel members to be lifted. The design must incorporate the maximum anticipated load for each component part as it will be used in the assembly.

c. On a manufacturer-assembled rig, check for a tag or other means to specify the limits of the rig.

d. On a qualified rigger-assembled rig, check that the qualified rigger certified the maximum loading of the assembly and its component parts.

E. **STRUCTURAL STEEL ASSEMBLY - §1926.754**.

1. Paragraph (a): This paragraph requires that structural stability be maintained throughout the structural steel erection process. While guy wires (steel cable) are not specifically required, they are often used for this purpose. (See also §.755(a)(4)). These guy wires may also be used to plumb the building and add support to resist wind conditions.

   a. Look for guying and bracing and see if any apparent problems exist.

2. Paragraph (c)(1): Shear connectors and similar devices. The standard requires that, where used, shear connectors must be field-installed rather than shop-installed.

   a. Check steel beams for shear connectors. There should not be any shear connectors on beams without the decking or other walking/working surface in place, unless conventional fall protection is used (see Q & A # 25).
   b. Ask the steel erector if they field-install shear connectors and what procedures are followed.

3. Paragraph (c)(3): **THIS PROVISION ONLY APPLIES AFTER JULY 18, 2006**. Once in effect, this will require documented or certified slip resistance of any painted or coated structural steel that an employee would walk on.

   a. After July 18, 2006, observe the following conditions: Does the site have any painted or coated steel? If so, ask the steel erector for documentation or certification of slip resistance. This would probably be something the steel erector would obtain from the steel fabricator and/or paint manufacturer certifying the slip resistance of the paint.

4. Paragraph (d)(1): Plumbing-up.

    a. Look for plumbing-up equipment. Guy wires (steel cable) and turnbuckles are generally used to plumb structures. Check for proper installation -- see if the wire rope components (U clips) were installed according to the manufacturers' requirements.

5. Paragraph (e)(1)(i) (general prohibition against using bundle packaging and strapping for hoisting): This hazard usually occurs while unloading trucks, when the metal decking bundles are tightly packed together and the rigging is difficult to attach and the end of the bundle is lifted with the bundles banding straps.

    a. Ask the steel erector or observe if these straps are marked as approved for lifting.

6. Paragraph (e)(1)(iii)-(iv)(requirements for landing metal decking bundles). Generally, the competent person (foreman) will layout specific locations for the placement of bundles of decking for the ease of installation.

    a. Look for metal decking landed on joists. Climb the ladder and ensure that bridging is installed and all joist ends are attached. Check the placement of the decking bundles. Refer to §1926.757(e)(4) for specific requirements.

    b. Look for metal decking landed on solid web framing members. Check placement and support of bundles.

7. Paragraph (e)(2): Roof and floor holes and openings.

    a. Look for any "decking holes" and "openings" on the site. Framed openings in metal decking must have structural members turned down. Any openings (as defined in the standard) that do exist because of constructibility or design constraints must be covered or employees protected by fall protection [.760(a)(1)].

8. Paragraph (e)(3): Covers for roof and floor openings. Look for any covers on the site. If covers exist:

    a. Are they secured?
    b. Are they painted, or marked visibly with "HOLE" or "COVER"?

F. **COLUMN ANCHORAGE - §1926.755.**

1. Paragraph (a) contains requirements to ensure that columns remain stable during the erection process.

2. Paragraph (a)(1) requires 4 anchor rods/bolts on all columns. However, this requirement does not include posts. The standard defines these terms as follows: A column is a load-carrying vertical member that is part of the primary skeletal framing system. A post is a structural member with a longitudinal axis that is essentially vertical, that: (1) is axially loaded (a load presses down on the top end) and weighs 300 pounds or less, or (2) is not axially loaded, but is laterally restrained by the above member. Posts typically support stair landings, wall framing, mezzanines and other structures.

    a. Determine whether a vertical member is a column. If it is, check if it has the required 4 anchor rods/bolts. Remember that a post can have less than 4.

3. Paragraph (a)(2) requires that columns be able to withstand a specified load.

    a. Check for unusually small bolts, insufficient length or failure.
    b. Request documentation of the design criteria from the contractor.

4. Paragraph (a)(3) is intended to ensure that the column is properly set.

    a. If leveling nuts are used, make sure the weight of the column rests on all 4 nuts. If shims are used, look for loose shims or instances where only a few shims are supporting the load.

5. Paragraph (a)(4) requires that a competent person evaluate the columns to determine whether guying or bracing is needed. If guying or bracing is needed, it must be provided. All columns need to be evaluated; in some instances the 4 anchor bolts/rods may not provide sufficient stability.

    a. Ask the contractor who their competent person is and ask the competent person if and how this evaluation was performed.

6. Paragraph (b) requires that all anchor bolt/rod repairs be approved by the project structural engineer of record and that all such repairs be communicated in writing to the steel erector.

a. Ask for a copy of the notification when it is suspected that anchorage bolts/rods have been damaged, repaired, replaced or field-modified.

G. BEAMS AND COLUMNS - §1926.756.

1. Paragraph (c)(1): Double connections at columns and /or at beam webs over columns.

   a. Ask the steel erector's representative/competent person if the structure's design includes double connections at columns and/or beam webs over columns. If the answer is yes, you should observe the double connection operation.

   b. Ask the employer the following questions on how the connectors are being protected during this type operation:

      (1) Are the connectors able to maintain at least 1-bolt and nut at least wrench tight at a common connection hole at all times? Among the ways of doing this are to use clipped end connections or staggered connections.
      (2) If not, is the erector using seats or equivalent connection devices that were supplied with the member?
      (3) If a seat or equivalent device is used, is it attached to both the supporting member and the first member before the nuts on the shared bolts are removed?
      (4) If a seat or equivalent device is used, has it been adequately bolted or welded to both a supporting member and the first member **before** the nuts on the shared bolts are removed to make the double connection?

2. Paragraph (d): Column splices.

   a. If a need arises to determine if column splices were designed to resist a minimum eccentric gravity load of 300 pounds located 18 inches from the extreme outer face of the column in each direction at the top of the column shaft, ask the project structural engineer of record.
   b. The perimeter columns must extend a minium of 48 inches above the finish floor and have holes or other devices attached to them at 42 - 45 inches above the finish floor (and also at the mid-point) to permit the installation of perimeter safety cables. If this requirement is not met, and the employer claims that constructibility does not allow meeting the requirement, ask the employer why constructibility does not allow this and what the employer is doing in the mean time to provide protection to the employees exposed to the perimeter.

H. OPEN WEB STEEL JOISTS - §1926.757.

Some of the most serious risks facing the ironworker are encountered during the erection

of open web steel joists, particularly from landing loads on unbridged joists and improperly placing loads on joists.

1. Questions to ask the steel erector and the ironworkers with regard to steel joists:

a. What type of joists are you installing?
b. What's the elevation?
c. Are you installing joists in bays? If so, how many joists per bay and how many bays?
d. What are the spans of the joists and are there different types of joists being installed?
e. Are you familiar with the Steel Joist Institute and/or OSHA's requirements for the safe installation of steel joists?
f. Can I see the steel erection drawings and can you explain the joist pattern?
g. Are you following a site specific erection plan? If so, may I see a copy?
h. How are you bracing/bridging the joists? Diagonal and/or horizontal?
i. What bridging is required? What type of bridging is being used?
j. When is the erection bridging installed and by whom is it installed?
k. How much and what type of erection bridging is required by the plans?
l. At what point during the installation process is the erection bridging installed?
m. Is all the erection bridging designated in the drawings being installed? If not, why not?
n. How are you lifting the joists?
o. What are the qualifications of the crane operator?
p. How are the joists rigged? Is a qualified rigger being used?
q. Is the erection bridging installed before or after releasing the joist from the crane?
r. How are the joists released from the crane? (Open hooks? Remote release? Ironworker walks the joists? From an aerial lift?)
s. Are the joist connections bolted or welded? If welded, do welds meet the standard's requirements [.757(b)]?
t. Are joists in bays of 40 feet or more bolted? If not, why not? If the employer claims that constructibility does not allow field-bolting, ask its basis for making that claim.
u. What type of fall protection is being used during joist installation and during the installation of erection bridging?
v. Are you setting joists in tandem?
w. How are you securing your joists - are both sides of the seat at one end of the joist secured?
x. Have there been any stability problems? Problems with anchor bolts or wall pockets?
y. Have there been any change orders? May I see the change log (if kept)?
z. Are you field bolting your joists at the columns?
aa. Are the columns framed in at least two directions?
bb. When landing joists, how are you securing them against accidental displacement?
cc. What kind of bridging terminus points are you using? Please identify them.
dd. Are you placing any loads on the joists? If so, what are they (e.g., bundles of bridging or deck or joists)? How much load is being placed on the joists and across how many joists is the load spread?

I. SYSTEMS-ENGINEERED METAL BUILDINGS - §1926.758.

1. When performing an inspection on a systems-engineered metal building, be aware that all the requirements in subpart R apply to these structures except for §1926.755 (column anchorage) and §1926.757 (steel joist erection).

    a. Check column base plates for four anchor bolts/rods [§.758(b)]
    b. Check for any double connections on the structure and ensure that either a seat or similar connection device is being used for double connections.
    c. If joists are being installed, observe the operation to ensure that joists are fully bolted or welded prior to release of the hoisting cable, allowing an employee on the joists or placing any construction load on the joist.

J. FALLING OBJECT PROTECTION - §1926.759.

1. Under paragraph (b), when it is necessary to have work performed below on-going steel erection activities (other than hoisting), effective overhead protection must be provided to those workers to prevent injuries from falling objects.

2. If this protection is not provided, work by other trades is not to be permitted below steel erection work -- the controlling contractor must institute measures to keep employees out of the area below the steel erection activities.

    a. Check the site for unsecured materials, tools and equipment that are not in use [§.759(a)].
    b. If you see workers below where steel erection activities are being performed, ask some of the employees if they know of any tools or other materials that have fallen from the worksite above. If they have, look into what falling hazards are present and what has and is being done to protect the employees.

K. FALL PROTECTION - §1926.760.

1. Paragraph (a): The first thing that needs to be determined is if the activity is covered by Subpart R (see §1926.750(b)) or by Subpart M.

    a. Ask the general contractor about their fall protection program and what they require their subcontractors to follow. Then ask the erectors. Check to see if the employers are effectively communicating and enforcing the standard. If the erector allows employees to work unprotected between 15 and 30 feet, make sure that the unprotected workers meet the connector definition or are working on the leading edge of a decking operation in a CDZ (see definitions of connector, leading edge, and controlled decking zone).

b. Establish by observation and asking employees the following:

(1) What fall protection system are you using?
(2) Who are the connectors? (Note: Come-a-longs and chain-falls are not hoisting equipment, so employees cannot be considered connectors simply on the basis of using these to move steel into place.)
(3) How often do you inspect your fall protection equipment?
(4) For decking operations between 15 and 30 feet/2 stories, are you using fall protection or CDZs?
(5) Are all employees over 30feet/2 stories protected by conventional fall protection?

2. Paragraph (c): Controlled decking zone

a. If the employer is using a CDZ between 15 and 30 feet/2 stories, observe the operation to determine if the employer is complying with the requirements of §1926.760(c).
b. Physically inspect CDZ from outside the zone if possible. Measure the size and ask employees working in the zone about their training and what activities are performed in the zone.

3. Paragraph (a)(2): Perimeter cables

a. Look at the perimeter cables. Do they meet the criteria of §1926.502(g)? Are the perimeter cables being installed as soon as the metal decking is completed?

L. **TRAINING - §1926.761**.

Section 1926.761 supplements §1926.21(b)(2) training requirements. Failure to train on hazards not covered by this section should be cited under §1926.21(b)(2) (for example: training on falling objects, bolting, impalement hazards from rebar). Subpart R does not require a certification that training has been conducted.

1. Employees must be provided the training prior to exposure to the hazard.

a. Ask the employer whether it trained the employees or relied on a third-party trainer. If a third-party trainer was used, ask how the employer determined that the training meets the standard.
b. Subpart R does not include a testing requirement. However, an effective training program necessarily involves some means of determining whether the instruction was understood. Ask the employer how it makes this determination (this can be done in a variety of ways, such as formal oral, or written tests, observation, or through discussion). Also, ask employees about their training.

2. Section (a): Requires that all training required by this section be provided by a qualified person.

3. A qualified person, is defined in §1926.751 as one who by possession of a recognized degree, certificate, or professional standing, or 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.

CHAPTER 4.

QUESTIONS AND ANSWERS

Note: Several questions and answers that appeared in the draft version of this directive have been removed pending further consideration.

I. **GENERAL GUIDANCE**.

Question 1: What is the effective date of the standard?

Answer: The effective date for the final rule has been changed to January 18, 2002. Note also that the effective date of §1926.754(c)(3)(slip resistance requirement for coated skeletal structural steel) is July 18, 2006.

NOTE: The Agency will not conduct general schedule inspections of steel erection until March 18, 2002.

For more information on how the new standard will be phased-in, see Question and Answer 2 below.

Question 2: On February 1, 2002, a contractor receives the columns at the site to be erected. They have only 2 anchor bolts, and column splice locations do not meet the standard's requirements. The design and/or fabrication of these columns was done prior to the new effective date (January 18, 2002) of the final rule. Is the contractor required to comply with §1926.755 (a)(1)(requirement for 4 anchor bolts) and §1926.756(d) (requirement for column splice height)?

Answer: In two situations the component requirements (provisions that address the safety of certain structural members) of the final rule will not be applied: (1) where the building permit was obtained prior to January 18, 2001, or (2) where steel erection began on or before September 16, 2001 (see volume 66 of the Federal Register, page 37137-37139). Steel erection begins when a steel erection activity covered by the standard begins.

In this scenario, the answer depends on when the building permit was obtained and when steel

erection began. If the building permit was obtained before January 18, 2001 (the date the final rule was published), these component requirements would not be applied to these columns. If steel erection began on or before September 16, 2001, the component requirements would not apply, irrespective of when the building permit was obtained. Otherwise, the requirements would apply.

For bridge construction, OSHA will exempt a bridge project from the component requirements of the new steel erection standard if: (1) the project has a contract date before January 18, 2001; or (2) steel erection began on or before September 16, 2001.

Question 3: Which provisions in the standard are considered "component requirements"?

Answer: A number of provisions in the final rule address the safety of certain structural components. These provisions contain design requirements for these components to help ensure that the structure can be erected safely. For example, there are provisions that prohibit shear connectors on members before they are erected (§1926.754(c)(1)(i)); require all columns to be anchored by a minimum of 4 anchor bolts, which must meet specified strength requirements (§1926.755(a)) (there is a comparable requirement for systems-engineered metal buildings, §1926.758(b)); set requirements for double connections (§1926.756(c)(1)) (there is a comparable requirement for systems-engineered metal buildings §1926.758(e)); require column splices to be at a specified height and meet a strength requirement (§1926.756(d)); require perimeter columns to have holes or other devices for perimeter safety cables (§1926.756(e)); in some instances require a vertical stabilizer plate to stabilize steel joists (§1926.757(a)(1)(i)); require certain joists to be strong enough to allow one employee to release the hoisting cable without the need for erection bridging (§1926.757(a)(3)), and require certain joists to be fabricated to allow for field bolting during erection (§1926.757(a)(8)(i)).

II. SECTION 1926.750-SCOPE.

Question 4(a): The structural steel and decking has been completed on floor 4. Structural steel is being erected for floor 6. Is the installation of an item listed only in §1926.750(b)(2) on floor 4 considered steel erection?

Answer: No. The activities listed in §1926.750(b)(1) are covered by the standard. The activities listed in §1926.750(b)(2) are covered by the standard only if they are installed "during and are a part of" steel erection activities listed in (b)(1).

In this scenario no (b)(1) activities are taking place on the 4th floor, the ongoing steel erection activities have progressed to the 6th floor, and the installation of the (b)(2) item is not part of the work on floor 6. The work on floor 4 is not covered by Subpart R.

Question 4(b): Some structural steel work (listed in (b)(1)) is taking place in the northeast corner of floor 5. In the southwest corner of floor 5, some work listed in (b)(2) is taking place. Is the installation of the (b)(2) item covered by subpart R?

Answer: No. As long as the §1926.750(b)(1) activities can proceed irrespective of the progress on the §1926.750(b)(2) activities, the (b)(2) activities are excluded from coverage under Subpart R.

Question 5: When a tank is to be supported by a structure that falls under the scope of Subpart R, does construction of the tank also fall within the scope of Subpart R?

Answer: No. 1926.750(a) excludes tank construction from the scope of Subpart R. It is excluded because it is considered to be a specialized industry based upon its unique use of cylindrical construction techniques. The construction of the tank itself would not be steel erection even though the structure supporting the tank is covered by subpart R.

Question 6: When installing an integrated metal roof decking system, which includes the metal banding, insulation, and screw down clips, is the entire process considered steel erection?

Answer: Yes. These operations take place in a repeating sequence of steps. Once the banding is in place, a row of insulation is put down, metal decking is laid over it and then secured with clips. The metal decking forms both the structural and weather-proofing roof surface. Working from that completed row, the next row of insulation and decking is then installed and the process repeated across the building.

The installation of the metal roof decking is covered by subpart R under 1926.750(b)(1). Because the metal banding, insulation and screw-down clips are installed "during and [as] a part of" the installation of the metal decking, these activities are covered by subpart R under 1926.750(b)(2).

Question 7: Is the construction of a house framed with metal studs within subpart R?

Answer: No. Metal studs are not mentioned in §1926.750, and while the installation of "structural steel" is covered, the definition of structural steel in §1926.751 includes metal studs only where those studs are "integrated with the structural steel framing of a building." Since such a house has no such structural steel framing, but simply the cold-formed metal studs, a house framed with metal studs is not covered by subpart R. The use of one or several hot-formed I-beams in such a structure would not constitute "structural steel framing" [emphasis added], so their use in such a house would not change the answer; subpart R would apply only to the installation of the hot-formed I-beams.

Question 8: When would the installation of metal studs be covered by subpart R?

Answer: The installation of metal studs is covered by subpart R when the studs are "integrated with the structural steel framing of a building." For example, in some buildings, the skeletal frame is composed of hot-formed columns and beams. However, the filler walls and roof structure, which are attached to that frame, are constructed with metal studs. In that case, the installation of the metal studs are covered by subpart R.

Question 9: Is the installation of metal stairways, and the installation of an iron fence and gate outside a completed building, considered "miscellaneous metals" and covered by subpart R?

Answer: Yes. The activities listed in §1926.750 (b)(1), which are covered by Subpart R, include installing "miscellaneous metals, [and] ornamental iron . . ." An iron fence and gate have traditionally been considered ornamental iron, and so are covered. Metal stairways have also traditionally been considered miscellaneous metals and would be covered by the standard.

Question 10: Scenario: A prefabricated tank is installed on a pad. The tank has connection points for a catwalk pre-installed by the manufacturer. The catwalk will be installed by a crane crew after the tank is installed. Do the fall protection requirements of Subpart R apply to the installation of the catwalk?

Answer: Yes, the installation of the catwalk on a completed tank is covered by Subpart R. Catwalks traditionally have been considered "miscellaneous metals." The installation of miscellaneous metals are covered by Subpart R pursuant to §1926.750(b)(1). Therefore, fall

protection by use of a guardrail system, safety net system, personal fall arrest system, positioning device system or fall restraint system is required by §1926.760 (a)(1) at heights more than 15 feet above a lower level.

Question 11: Subpart R does not apply to transmission towers. Some power lines are supported with steel poles. Is the installation of these steel poles covered by subpart R?

Answer: No. Although such poles are not "towers," 1926 Subpart V (Power Transmission and Distribution) is a more specifically applicable standard. Under 1926.950(a), Subpart V applies to "the construction of electric transmission and distribution lines and equipment." "Equipment" is defined in §1926.960(s) as including "fittings, devices, appliances, fixtures, apparatus, and the like, used as part of, or in connection with, an electrical power transmission and distribution system, or communication systems." Steel poles used to support power lines meet this definition. Therefore, the installation of these poles is covered by 1926 Subpart V, not Subpart R.

III. SECTION 1927.752-SITE LAYOUT, SITE-SPECIFIC ERECTION PLAN AND CONSTRUCTION SEQUENCE.

Question 12: Before any steel erection begins, who is responsible for performing the test to determine whether the concrete has cured to 75% of the intended minimum compressive design strength or cured enough so that it can support the loads imposed during steel erection?

Answer: The controlling contractor must ensure that written notification is given to the steel erector that the concrete has cured to the level required by the standard. The standard does not require any specific entity to perform the test. The choice of who will do the test is left to the controlling contractor. Since it is the controlling contractor's responsibility to ensure that the notification is given to the steel erector, the controlling contractor must select an entity that has the expertise to perform the test. The controlling contractor may do the test itself if it has the expertise to do so. In the preamble of the final rule (page 5206), OSHA stated:

In the proposed rule, the controlling contractor would have had to provide the ASTM test results to the steel erector. The final rule has been changed to reflect that the controlling contractor must ensure that the test results are provided to the steel erector. This rephrasing will allow the controlling contractor to have a contractor familiar with the ASTM test methods perform the test and provide the results to the steel erector.

Question 13: Can the controlling contractor contract with subcontractors to perform the work required by §1926.752(a)? If so, is the controlling contractor still responsible for these duties after subcontracting them out?

Answer: Under §1926.752 (a), the controlling contractor "shall ensure that the steel erector is provided" with written notification that the concrete has cured to the specified degree. While the controlling contractor may contract with subcontractors to do the requisite tests and provide the written notification, the controlling contractor remains responsible for ensuring that the subcontractor does that work. If the subcontractor fails to do the test and provide the notification, the controlling contractor may be cited for a violation under §1926.752(a).

Question 14: Section 1926.752(a)(1) requires the controlling contractor to ensure that the steel erector is provided with written notifications that the concrete and masonry meet certain specified strength requirements. To what extent is the controlling

contractor responsible for the accuracy of the strength assessments in the written notifications?

Answer: As explained in Q&A #12, the controlling contractor can choose to either: (1) conduct the tests itself, if it has the expertise to do so; or (2) select an entity that has the expertise to do the test. If the controlling contractor does the tests itself, it is responsible for the accuracy of the tests.

If the controlling contractor selects someone else to do the tests, it is responsible for exercising reasonable care in the selection of the testing entity. As long as it has a reasonable basis for believing that the testing entity is competent and capable of doing the work, and the controlling contractor has no actual knowledge that the tests results are wrong, erroneous test results will not constitute a violation of 1926.752(a).

Question 15: Section 1926.752(a)(1) and (b) require that an appropriate ASTM standard test method be used to determine that field-cured concrete/mortar testing samples have attained 75% of the intended minimum compressive strength or sufficient strength to support loads imposed during steel erection before that erection begins. Can I rely on cure time instead of doing such a test?

Answer: No. The standard does not provide that cure time may be used instead of the ASTM test. Because of the many factors that influence cure rates (temperature, humidity, ingredient ratios, etc.), cure time is an unreliable means of assessing how much the concrete has cured.

Question 16(a): Does the written notification from the controlling contractor to the steel erector about concrete footings, etc. in §1926.752(a) and (b) have to be maintained on site?

Answer: Once the written notification is given to the erector, there is no requirement that it be maintained at the site.

Question 16(b): Does the anchor bolt repair, replacement or field-modification approval from the Structural Engineer of Record (SER) required by §1926.755(b)(1) have to be maintained on site?

Answer: No. Where an anchor bolt repair, replacement or field-modification is made, §1926.752(a)(2) requires that the controlling contractor ensure that the steel erector is provided with written notification that the requirements in §1926.755(b) were met. Section 1926.755(b)(1) requires that, prior to erection, the repair, replacement or field-modification must be approved by the SER. Once the written notification is given to the erector under §1926.752(a)(2), there is no requirement that it be maintained at the site. Also, there is no requirement that a record of the SER's approval be maintained at the site.

IV. SECTION 1926.753-HOISTING AND RIGGING.

Question 17: Section 1926.753(e)(4) requires the members be rigged at least 7 feet apart on a multiple lift rigging assembly (Christmas tree rig). If they are rigged 7' apart and the connector needs to slacken the line to unhook the lower beam, the beam above now has less than 7' of clearance. Does a 7' clearance need to be maintained at all times?

Answer: No. The 7 feet specifically refers to the distance as rigged.

Question 18: Does the standard permit a qualified rigger to design and assemble a "multiple lift rigging" assembly on the jobsite by mixing components from one rigging supplier or by mixing components from several rigging suppliers?

Answer: Yes. In §1926.751, "Multiple lift rigging" is defined as "a rigging assembly manufactured by wire rope rigging suppliers . . . ." The use of the plural "suppliers" reflects that an assembly may be made from components from more than one manufacturer. This is also reflected in the fact that §1926.753(e)(2) allows a qualified rigger to certify the capacity of an assembly instead of a manufacturer: "Components of the multiple lift rigging assembly shall be specifically designed and assembled with a maximum capacity for total assembly and for each individual attachment point. This capacity, certified by the manufacturer or a qualified rigger, shall be based on the manufacturer's specifications with a 5 to 1 safety factor for all components." [Emphasis added].

The preamble to the final rule also shows that an assembly may be either put together from separately produced manufactured components, or obtained as a single, manufactured unit: "[t]he rigging must be certified by the qualified rigger who assembles it or the manufacturer who provides the entire assembly to ensure that the assembly can support the whole load . . . ." (Volume 66 of the Federal Register at page 5211). The provision, then, permits a qualified rigger to assemble the multiple lift rigging from manufactured components. These may be from either a single or multiple suppliers.

Question 19: How often must the multiple lift rigging assembly be inspected?

Answer: In §1926.753(c)(2), the standard requires a qualified rigger to inspect the rigging before every shift in accordance with §1926.251, ***Rigging equipment for material handling***. Additional inspections of the rigging assembly where service conditions warrant are required under §1926.251(a)(6).

Question 20: Section 1926.753(c)(1)(i) requires a pre-shift visual inspection of cranes to be done by a competent person. Section 1926.753(c)(1)(iv) states that "the [crane] operator shall be responsible for those operations under the operator's direct control. Whenever there is any doubt as to safety, the operator shall have the authority to stop and refuse to handle loads until safety has been assured."

Scenario: The crane is rented, and the operator is supplied by the crane rental company. The steel erector designates the operator as the competent person for purposes of the pre-shift inspection requirements. Is the steel erector still responsible for compliance with the pre-shift inspection requirements? Is the steel erector responsible for crane operations under the direct control of the operator?

Answer: Under §1926.750(a), "the requirements of [subpart R] apply to employers engaged in steel erection unless otherwise specified." Section 1926.753 (c)(1)(iv) specifies the operator as responsible for operations that are "under the operator's direct control." However, those are only operations involving the actual operation of the crane.

While an operator may be designated as a competent person for purposes of the pre-shift inspection, §1926.753(c)(1)(i) does not specify who is responsible for compliance with the pre-shift inspection requirements. Therefore, a designation by the steel erector of the crane owner's operator as the competent person would not absolve the steel erector of responsibility for making sure that the pre-shift inspection was done (Note, though, that the steel erector is not expected to have the same level of expertise regarding those inspections as either the crane owner or the competent person).

Question 21: Does §1926.753(e) permit beams of different sizes to be lifted in a multiple lift?

Answer: Yes.

Question 22: Section 1926.753(e)(2) requires that the capacity of each multiple lift rigging component and the total assembly be certified by the manufacturer or qualified rigger. Does that certification have to be in writing?

Answer: Yes, a certification is a written document.

V. SECTION 1926.754-STRUCTURAL STEEL ASSEMBLY.

Question 23: Section 1926.754 (b)(3) requires a "fully planked or decked floor or nets" within two stories or 30 feet, whichever is less. Can an employer's requirement that workers be protected by fall arrest equipment at all times above 15 feet (or less) take the place of nets and temporary floors?

Answer: Yes. Where an employer establishes, communicates and enforces a requirement to be protected by fall arrest equipment at all times above 15 feet (or less), the failure to comply with §1926.754(b)(3) is considered a ***de minimis*** violation and will not be cited.

Question 24: Prior to installation of a bridge girder, a contractor welds a limited number of shear connectors (the minimum needed for a fall protection system) on the top flange of the girder. Each shear connector is encapsulated by a split collar, a tee joint and line post/anchor post (or a round pipe). These are designed to serve as supports for horizontal lifelines in a fall protection system. Is this a violation of §1926.754(c)(1)(i)?

Answer: In this scenario, the spacing and height requirements for the supports would essentially eliminate the tripping hazards. Since the shear studs will be encapsulated by a fall protection anchor device, prior to the beam being erected, the provision in §1926.754(c)(1)(i) regarding shear connectors does not apply. Section 1926.753(c)(1)(i) does not apply when: (1) the shear connector studs are encapsulated by the line post or anchor post prior to erecting the member; and (2) the encapsulated studs serve as an integral part of the fall protection system's fixed anchor point.

Question 25: I have beams with shop-installed shear connectors at 20 feet. If the employer requires the use of fall protection for all workers, including connectors and deckers, would the presence of the shop-installed shear connectors on these beams still be a violation under 1926.754(c)(1)?

Answer: No. If an employer requires that all workers, including those engaged in connecting and in decking (as well as deckers in a CDZ), be protected from falls by conventional fall protection, then the failure to meet the requirements of §1926.754(c)(1) would be considered ***de minimis*** and no citation would be issued.

Question 26: If a roof void is 11 inches by 25 feet, does it need to be covered for steel erection purposes (§1926.754(e)(3) and definition of "opening").

Answer: No. The definition of "opening" in §1926.751 refers to a gap or void whose ***least*** dimension is 12 inches (30.5 cm) or more. Thus a roof void whose least dimension is 11 inches would not be an "opening" under subpart R and would not need to be covered during steel erection. Note that this void is too large to be considered a "decking hole" (a term that is also defined in §1926.751) under subpart R since its ***greatest*** dimension is more than 12 inches.

Question 27: Is §1926.754(b)(3)(fully planked floor or nets) a form of interior fall protection?

Answer: This provision requires that fully planked or decked floors or nets be maintained within two stories or 30 feet, whichever is less. Use of nets to meet the provision would provide interior fall protection. Use of decked floors does not provide the equivalent of fall protection (such floors do limit interior fall distances as workers ascend to or descend from their work locations).

Question 28: Are bundle packaging and strapping that have been designed for hoisting purposes marked accordingly? If not, who is responsible under §1926.754(e)(1)(i) for determining whether they are designed for hoisting? How is this determination to be made?

Answer: Under §1926.754(e)(1)(i), employers engaged in steel erection are responsible for ensuring that bundle packaging and strapping, if used for hoisting, are specifically designed for hoisting purposes. Some manufacturers design metal decking bundle packaging and strapping, applied at the factory to keep bundles together, to be used as a lifting device. However, subpart R does not require that they be so marked. We are not aware that the manufacturers mark these bundles uniformly or consistently.

When bundle packaging/strapping is used for hoisting, it is considered rigging. Under §1926.753(c)(2), a qualified rigger must inspect the rigging prior to each shift in accordance with §1926.251. Therefore, the employer would use a qualified rigger in making this determination.

VI. SECTION 1926.755-COLUMN ANCHORAGE.

Question 29: To make a field repair to an anchor rod (anchor bolt), must there be a written order from the project's engineer of record?

Answer: Section 1926.755(b)(1) prohibits such repairs "without the approval of the project structural engineer of record." While the standard requires approval, it does not require the approval to be in writing.

Question 30: The requirements in §1926.755(b) apply to the "repair, replacement or field modification of anchor rods (anchor bolts)." Is hitting an anchor bolt with a hammer to line it up with the base plate holes considered a modification?

Answer: Generally, hitting an anchor bolt with a hammer to line it up with the base plate holes would not be considered a modification, since those minor adjustments do not normally affect the structural integrity of the rod or the concrete. However, unbending a bolt is considered a modification since that will weaken it.

VII. SECTION 1926.757-OPEN WEB STEEL JOISTS.

Question 31: Is it acceptable to use a forklift to raise and set in place roof joists?

Answer: Yes. It is acceptable to use a forklift to raise and set joists in steel erection provided all the necessary safety requirements for landing and placing loads contained in §1926.757(e) are followed. In addition, the employer must comply with the requirements of §1926.602 - Material

handling equipment - for the use and operation of the forklift equipment itself.

Question 32: Section 1926.757(a)(3) requires: "where steel joists at or near columns span 60 feet or less, the joist shall be designed with sufficient strength to allow one employee to release the hoisting cable without the need for erection bridging." Joist manufacturers have stated that, for some lengths, there are no existing joist designs that would provide the necessary stability (even with the stabilizer plate). These are primarily joists in the 55-60 foot length range. The manufacturers state that it will take a period of time to develop a formula, build the formula into the design of these joists and have the joists manufactured for use in construction. How will OSHA enforce this provision during this period?

Answer: Until July 18, 2003, for all joists at or near columns that span 60 feet or less, employers will be considered to be in compliance with §1926.757(a)(3) if they erect these joists either by: (1) installing bridging or otherwise stabilizing the joist prior to releasing the hoisting cable, or (2) releasing the cable without having a worker on the joists. This will allow the joist industry the necessary time to develop joists that will meet the requirement.

Question 33: Is installation of "erection bridging" considered connecting?

Answer: Yes.

Question 34: If workers are on a one story building that is 20' tall (top of steel) and the joists require horizontal bridging, is fall protection is required for employees installing this bridging?

Answer: Normally, yes. Fall protection by use of a guardrail system, safety net system, personal fall arrest system, positioning device system or fall restraint system is required by §1926.760 (a)(1) to be provided at heights more than 15 feet above a lower level. The requirements in §1926.760(a)(1) apply irrespective of whether the building is single or multi-story. The connector exception will not normally apply in situations like this. Horizontal bridging is not erection bridging. These workers typically will not be working with hoisting equipment when installing horizontal bridging. So, employees installing horizontal bridging at a height of 20 feet, on a single story building, working without hoisting equipment, would be required to have fall protection in accordance with §1926.760(a)(1).

Question 35: Section 1926.757(c)(2) requires that joists over 60 feet be attached in accordance with §1926.757(b). Section 1926.757(b) allows either bolting or welding of the joist ends. However, §1926.757(a)(8) requires that all joists over 40 feet be bolted (with an exception for constructibility). Do these provisions conflict?

Answer: No. Section 1926.757(b)(2) refers to the final connection of the member; §1926.757(a)(8) refers to the initial connection of the member. They work together as follows:

Under §1926.757(c)(2), there are several requirements that must be met before the hoisting cables can be released from these joists. One of these requirements is that the joist be attached as specified in §1926.757(b)(2). Under that provision, the **final** connection can be either a bolted or welded connection.

In contrast, §1926.757(a)(8) refers to the **initial** connection of certain members. Under this provision, these members must be initially bolted (unless constructability does not allow). However, the final connection can be either bolted or welded. The initial bolting is typically done with an erection bolt, which would either be replaced with a high-strength bolt for the final connection or the final connection would be welded.

So, §1926.757(c)(2)'s requirement that joists over 60 feet be attached in accordance with §1926.757(b) means that there must be a final connection -- whether bolted or welded -- that meets the §1926.757(b) requirements before the hoisting cable is released. While these joists had to be initially bolted, the final connection could be either by bolting or welding.

Question 36(a): Section 1926.757(c)(3) and (d) contain requirements that refer to Table A (Erection Bridging for Short Span Joists) and Table B (Erection Bridging for Long Span Joists). How do I read these tables?

Answer: Joists are manufactured in a variety of types and lengths. Some types need no erection bridging at any length. Other types need bridging if they are a certain length or greater.

Each table has two columns. The left-hand column, titled "Joist," identifies specific types of joists. The right-hand column, titled "Span," indicates at what length erection bridging is required. Many of the joists have "NM" (for "not mandatory") marked in the Span column. That means that the type of joist designated does not require erection bridging, irrespective of its length. (**NOTE: the definition of "NM" printed in the Tables is incorrect** -- it says "NM=diagonal bolted bridging not mandatory for joists under 40 feet." The clause "for joists under 40 feet" was mistakenly taken from the proposed rule, and was not supposed to be included in the final rule. Please disregard that clause; it will be removed in later printings).

Other joists have numbers marked in the Span column. For example, in Table A, Joist 12K1 has "23-0" marked in the Span column. That means that 12K1 joists that are 23 feet 0 inches in length or longer require erection bridging. Shorter lengths of this type of joist do not require erection bridging.

In Table B, joist 32LH06 has "47-0 through 60-0" in the Span column. That means that 32LH06 joists 47 feet long, up through 60 feet long, require erection bridging.

Also in Table B, joist 32LH09 has "NM through 60-0" in the Span column. That means that erection bridging is not required for lengths through 60 feet. However, lengths over 60 feet 0 inches do require erection bridging.

Once it is determined that erection bridging is required, the erection bridging must be installed in accordance with §1926.757(d).

Questions 36(b): Section 1926.757(c)(3) states that, "[o]n steel joists that do not require erection bridging under Tables A and B, only one employee shall be allowed on the joist until all bridging is installed and anchored." If a joist does not require erection bridging under the Tables, what bridging is required under this provision before allowing additional employees on the joist?

Answer: Under this provision, if a steel joist does not require erection bridging (bolted diagonal bridging) under §1926.757(c)(3), bridging that is called for in the erection drawings must be installed prior to additional employees going out on the joist. This includes any horizontal bridging or bolted diagonal bridging that is specified in the drawings.

Question 37: Section 1926.757(a)(6) requires that, "[w]hen steel joists are landed on a structure, they shall be secured to prevent unintentional displacement prior to installation." Do all joists remaining in a bundle have to be re-secured each time a joist is removed to be installed?

Answer: In the preamble to the final rule, OSHA stated that this provision:

"addresses the hazard that arises when a single steel joist or a bundle of joists are

placed on the structure and then left unattended and unattached. . . [T]he bundles must remain intact prior to installation until the time comes for them to be set. This paragraph also prevents those ironworkers who are shaking out the filler joists from getting too far ahead of those workers welding the joists, a practice that leaves many joists placed but unattached. Paragraph (b)(3) of this section . . . requires that at least one end of each steel joist be attached immediately upon placement in its final erection position and before additional joists are placed. Another example of a situation addressed by this paragraph is if the exact dimensions of a piece of mechanical equipment to be installed in the decking are not known. A common practice, when this occurs, is to leave a joist unattached until the dimension is known. This paragraph requires such a joist to be secured . . .pending its final attachment." (Volume 66 of the Federal Register at page 5231).

The joists remaining in the bundle do not have to be re-secured while workers are in the process of removing them from the bundle and installing them. However, if, for example, an erector lands all of the joist bundles for a section of a building and will not install the joists until the following day, the joists must be secured to prevent unintentional displacement.

/III. SECTION 1926.759-FALLING OBJECT PROTECTION.

Question 38: An 80 foot long beam has been initially connected, if ironworkers are now bolting-up the beam, is the controlling contractor required to protect (or bar) operations under the beam in areas where the ironworkers are not working in accordance with §1926.759(b)? For example, if an ironworker is working at one end of a beam bolting-up, and another is bolting-up the other end (80 feet away), do operations below the middle of the beam have to be protected or barred?

Answer: As stated in the preamble to the final rule (page 5243), the intent of this provision is to protect employees from falling objects. If there are no tools or materials located at the middle of the beam that could be displaced, then employees working below the middle of the beam would not be subjected to the hazard of falling objects. In that case, protection/barring of operations would not be required below the middle area of the beam.

IX. SECTION 1926.760-FALL PROTECTION.

Question 39: Section 1926.760(c) says that employees in a CDZ can work unprotected up to 30 feet. However, in 1926.760(c)(1), it requires employees at the leading edge to be protected from fall hazards of "more than two stories or 30 feet, whichever is less." At which height, 30 feet or two stories, is conventional fall protection required to be used to protect deckers?

Answer: The answer depends on whether the building is single or multi-story, and, if multi-story, whether two stories is less than 30 feet. Under paragraph §1926.760(c), a CDZ "may" be established up to 30 feet and used as a substitute for fall protection required in 1926.760(a), depending on certain prerequisites being met. Under 1926.760(c)(1), one of the prerequisites for using a CDZ instead of fall protection as high as 30 feet is that, if the building is multi-story, two stories must be 30 feet. Otherwise, where two stories are less than 30 feet, the CDZ may be used as a substitute for fall protection only up to two stories. In a single story structure, the prerequisite is automatically met -- the CDZ can be used as a fall protection substitute up to 30 feet.

Question 40: Does some decking need to be in place for a CDZ to begin?

Answer: A CDZ can be implemented in an area where metal decking is being installed and forms the leading edge of the work surface. One or more panels will normally need to be installed before the control line is erected. These panels can be installed while workers are positioned on ladders, elevated platforms, protected by conventional fall protection, or otherwise protected from falling.

Question 41: A CDZ is defined as an area where certain work may take place "without the use of guardrail systems, personal fall arrest systems, fall restraint systems, or safety net systems . . ." Are employees required to use a positioning device when working in a CDZ?

Answer: No. Positioning device systems, as defined in the standard, are systems used on vertical surfaces, such as walls or columns. In a CDZ, workers are installing the horizontal surface on which they will be standing and working. No mention was made of positioning device systems in the CDZ definition since (as defined) they are not to be used while on a horizontal surface.

Question 42: A connector initially connects one end of a beam. Do OSHA standards allow the connector to then walk across the beam to connect the other end while the beam remains suspended from the crane?

Answer: Yes; this practice is allowed in steel erection. At the time of the SENRAC negotiations, it was a common industry practice to have the ironworker walk across the beam while it is still connected to the crane. This is evidenced by the American National Standard Institute's 1989 consensus standard for Steel erection Safety Requirements (ANSI A10.13-1989), section 9.2 and 9.4. Section 9.2 states: "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 . . .".

It is also reflected in the Steel Joist Institute's 1994 manual for steel joists, section 105 A.2., which specifically recognizes that two erectors may be on certain joists if the joist is "stabilized by the hoisting cables . . ." For example, in section 105 A. 2. (for LH and DLH series joists), it states that "a maximum weight of two erectors shall be allowed on any unbridged joist if 1) the joist is stabilized by the hoisting cable(s) . . .".

In view of the industry history recognizing this as a safe practice, where a connector initially connects one end of a beam and then walks across to connect the other end while the beam remains suspended from the crane, the violation of 1926.550 for being on a crane load is considered ***de minimis*** and no citation will be issued.

Question 43: Does a connector have to be tied off above 15 feet while moving to an initial beam connection location and while moving to or from subsequent beam connection locations if the crane is busy getting the next piece?

Answer: No. The process of connecting includes moving on the steel to and from initial and subsequent points at which these connections are made.

Question 44: Under §1926.760 (c)(2), only those employees involved in "leading edge work" are allowed to have access to the CDZ. The rule defines the term "leading edge" but not "leading edge work." What constitutes leading edge work in a CDZ?

Answer: In a CDZ, leading edge work consists of the placement and initial installation (by safety deck attachments, which typically are tack welds) of decking to create a deck. The leading edge of the deck changes location as this work progresses.

Question 45: At what height are connectors required to be protected from falls? Is

there a conflict between §§1926.760(b)(1) and 1926.760(b)(3)?

Answer: There is not a conflict between §1926.760(b)(1) and §1926.760(b)(3). Section 1926.760(b)(3) requires that at all times between 15 and 30 feet, an employee must be provided with fall protection equipment and be able to tie-off. This provision addresses circumstances under which an employer must provide fall protection, whereas, §1926.760(b)(1) addresses when an employee must use the fall protection equipment.

For clarification, under the requirements of §1926.760(b)(1), connectors working on a single story structure do not need to tie-off until they are above 30 feet since the 2-story criteria would not apply. Furthermore, connectors working on a multi-story structure do not need to tie-off until they are above 2 stories or 30 feet, whichever is less.

Question 46: Section 1926.760(c)(2) states that "access to a CDZ shall be limited to only those employees engaged in leading edge work." Installation of perimeter fall protection does not meet the standard's definition of leading edge work. Are workers prohibited from installing perimeter fall protection in a CDZ?

Answer: Installation of perimeter cables inside a CDZ will be considered a ***de minimis*** violation of 1926.760(c)(2) where **all** of the following conditions are met: (1) the workers installing the perimeter cables are protected by conventional fall protection; (2) their work does not interfere with the deckers, and (3) they have been trained on the hazards associated with decking. In a situation where all three conditions are met, the violation will be considered ***de minimis*** and a citation for that provision will not be issued

Question 47: Section 1926.760(c)(2) requires that access to a CDZ be limited to those engaged in leading edge work. Typically one crew lays down the metal decking and another crew comes behind and tack welds the sheets in place. Can the tack weld work be done in a CDZ?

Answer: Yes. Tack welding, if done for safety deck attachments, can be done in a CDZ. Section 1926.760(c)(6) gives criteria for performing safety deck attachments in the CDZ and states that they shall be performed from the leading edge back. However, 1926.760(c)(7) does not allow final deck attachments to be performed in a CDZ.

Question 48: Section 1926.760(c)(3) & Appendix D: The suggested example in the appendix states that "any other means that restricts access" may be used instead of control lines. What are some examples of other means?

Answer: Section 1926.760(c)(3) requires that the boundaries of the CDZ be marked "by the use of control lines or the equivalent." In a CDZ, the control line restricts access by visually warning employees of an unprotected area (66 FR 5247). Control lines can be made of rope, wire, tape, or other equivalent materials, but they must clearly designate the CDZ. Examples of other acceptable methods would be a perimeter wall, guardrail system, or even a restraint system rigged so that non-leading edge workers could not access the area. In contrast, a line painted on the floor would not be considered to be equivalent to control lines since it would be less visible than a control line.

Question 49: When do perimeter cables have to be installed?

Answer: Section 1926.760(a)(2) requires perimeter safety cables to be installed in multi-story structures. Under this provision, they must be installed "as soon as the metal decking has been installed." Employers may choose to install them earlier.

Question 50: Section 1926.760: Can controlling contractors require connectors to tie off between 15 and 30 feet?

Answer: Yes. The standard does not prohibit controlling contractors from imposing stricter requirements than those in the standard.

Question 51: Section 1926.760(d)(2) states that "fall arrest system components shall be used in fall restraint systems and shall conform to the criteria in §1926.502 . . . either body belts or body harnesses shall be used in fall restraint systems." Section 1926.502 prohibits the use of body belts. Is this section internally inconsistent?

Answer: No. Section 1926.502(d) prohibits the use of body belts "as part of a personal fall arrest system." A fall restraint system, as defined in §1926.751, is a system that "prevents the user from falling any distance;" rather than arresting a fall towards a lower level, it prevents it. Therefore, body belts are permitted to be used in restraint systems.

Question 52: Section 1926.760(e) requires that fall protection provided by the steel erector remain in place after steel erection in that area has been completed to be used by other trades only if the controlling contractor directs the steel erector to leave it and inspects and accepts responsibility for it. What, if any, documentation does OSHA require when the steel erector leaves and the fall protection is left in place under this provision?

Answer: No written documentation is required by the standard.

X. **SECTION 1926.761-TRAINING**.

Question 53: Can third-party training be used to comply with §1926.761? Can an employer be cited for deficiencies in the third party training of employees?

Answer: Third party training can be used to comply with the requirements of §1926.761. The preamble to this section states:

The employer can choose the provider, method, and frequency of training that is appropriate for the employees being trained. The provider may be an outside, professional training organization or other qualified entity, or the employer may develop and conduct the training in-house [Volume 66 Federal Register at page 5152].

The preamble also states that ***"the program must meet the requirements of this section, and each employee must be provided the training prior to exposure to the hazard."*** [same Federal Register page as above]. It is the responsibility of the employer to take reasonable steps to assess the third party trainer's ability to adequately train the employees in accordance with this section. For example, discussing the curriculum and instructors' qualifications with the third party trainer to determine if they were sufficient, coupled with evaluating the employee's knowledge after completing the training, would be considered reasonable steps.

If a third party training program is deficient, and an employer failed to take reasonable steps to assess it, or used it knowing that it was deficient, the employer may be cited.

Question 54: Does a steel erector need to provide refresher training to its employees? When would an employee have to be given additional training?

Answer: There is no specific requirement for scheduled retraining. However, where technologies or techniques of steel erection have changed, resulting in new hazards, the employee would have

to be trained regarding the new technologies, techniques, and associated hazards. Training in the recognition and avoidance of any new hazards, including unique, site-specific hazards, would be required under §1926.21(b)(2). Page 5251 of the preamble to the final steel erection standard states:

While retraining/refresher training is not specifically addressed, the employer is responsible for making sure that it has programs necessary to comply with the training requirements in §1926.21(b)(2): 'The employer shall instruct each employee in the recognition of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.' Steel erection involves progressive sequences of erection, so that the work environment on any one day may involve entirely different or unique new hazards than the day before and that new employees may enter into the erection process when it is already underway. In order to apply §1926.21 during steel erection activities, an employer would have to assess the type of training needed on a continuing basis as the environment and changes in personnel occur. It is the employer's responsibility to determine if an employee needs retraining in order to strengthen skills required to safely perform the assigned job duties and whenever the work environment changes to include newly recognized or encountered hazards. This is a key element in the employer's accident prevention program. [Volume 66 Federal Register at page 5152]

Question 55: Is receiving training through union apprenticeship programs the only way to meet the requirements of this standard?

Answer: No. Appendix E of the final rule states that "the training requirements of §1926.761 will be deemed to have been met if employees have completed a training course on steel erection . . . that has been approved by the U.S. Department of Labor Bureau of Apprenticeship." Union apprenticeship programs are mentioned in the preamble as an example of an option an employer might choose for training its employees. However, union apprenticeship programs are not the only way to provide employee training.

An employer may elect to identify a qualified person (in or out of the employer's organization) or a third party organization whose training program meets the requirements of section §1926.761 to train those employees. The new steel erection standard defines a qualified person in section §1926.751 (definitions) as:

..[o]ne 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.

As discussed in the answer to Question 53, the employer is responsible for assessing the third party organization's or qualified person's qualifications and experience as they relate to the training program requirements and subject areas described in section 1926.761. The proficiency of the employees in their work activities as determined by the employer is important evidence of an effective training program. [see page 5152 of January 18, 2001 FR]

Question 56: Does any required training under §1926.761 have to be documented? Does the employer have to keep a record of employee training?

Answer: No.

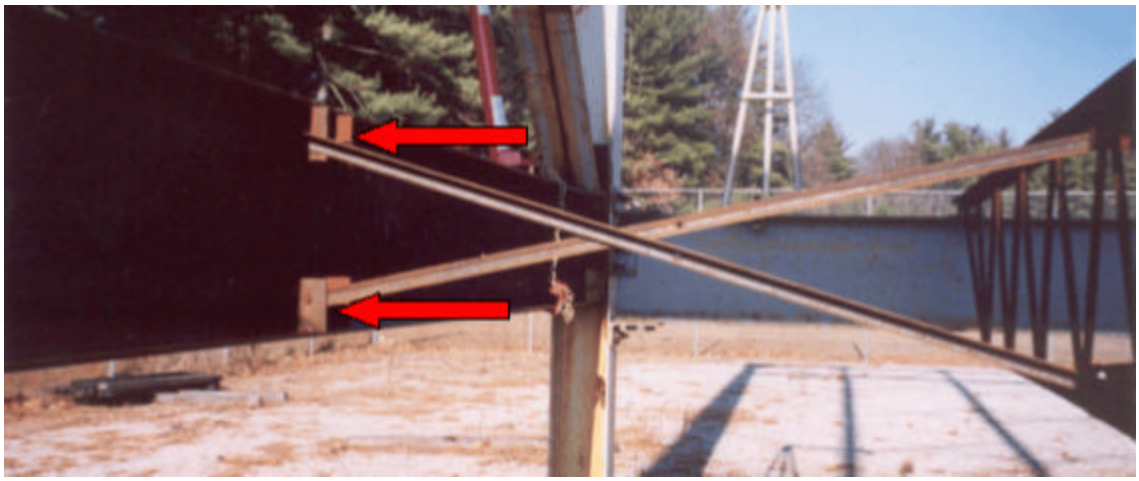
CHAPTER 5.

DEFINITIONS AND PHOTOS

The photographs and illustrations in this section are simply examples, for illustrative purposes only. They are not intended to be comprehensive depictions. While we hope that they are helpful in understanding some of the standard's terms and provisions, they are not to be viewed as modifying the standard.

Anchored bridging

Steel joist bridging is connected to a bridging terminus point.

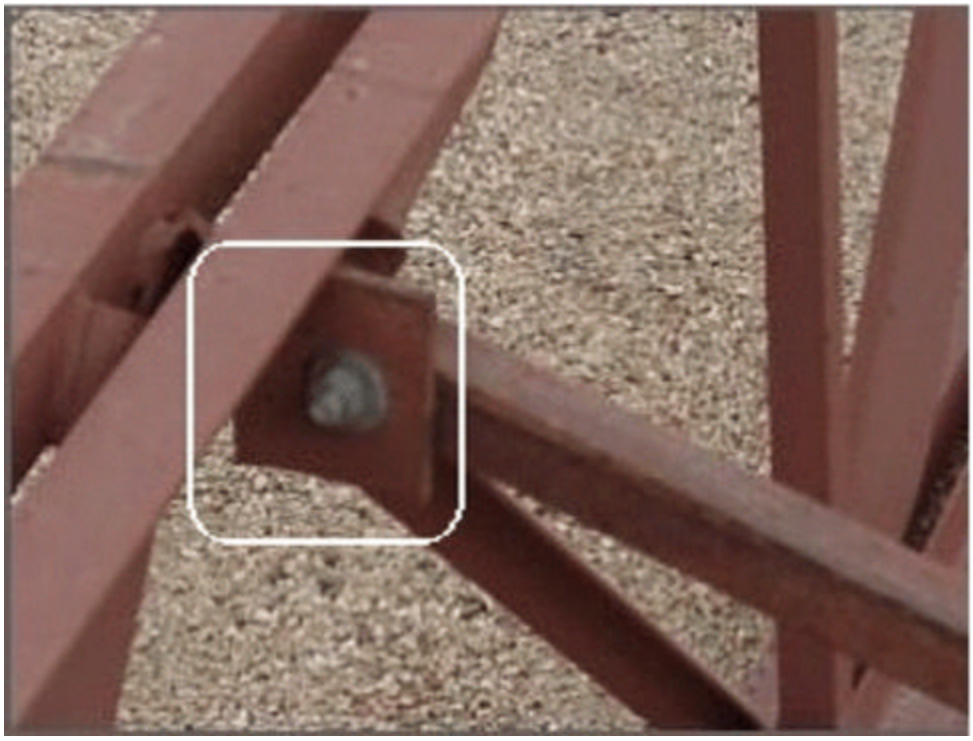


Bolted diagonal bridging

Diagonal bridging that is bolted to a steel joist or joists.

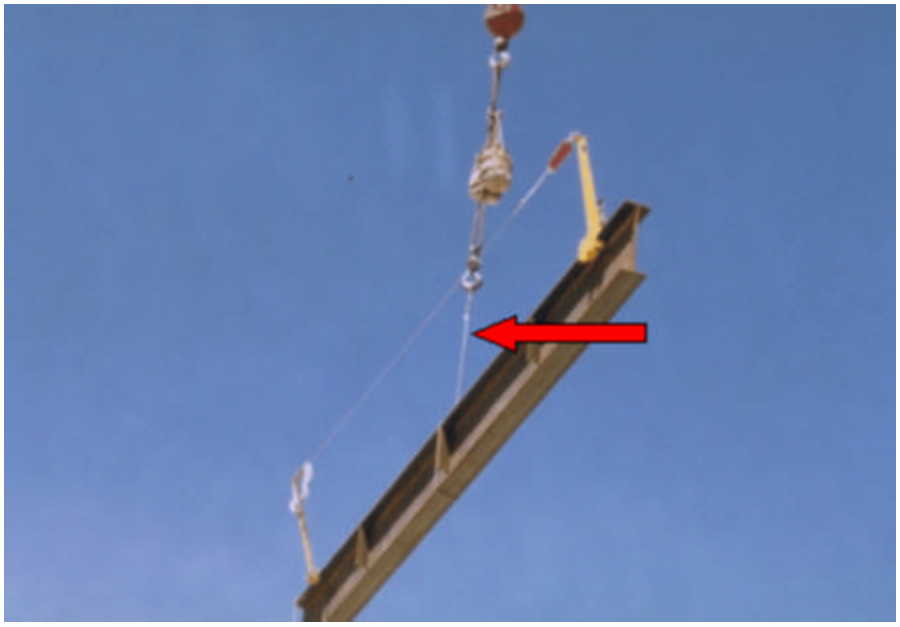
Bridging clip

A device that is attached to the steel joist to allow the bolting of the bridging to the steel joist.



Choker

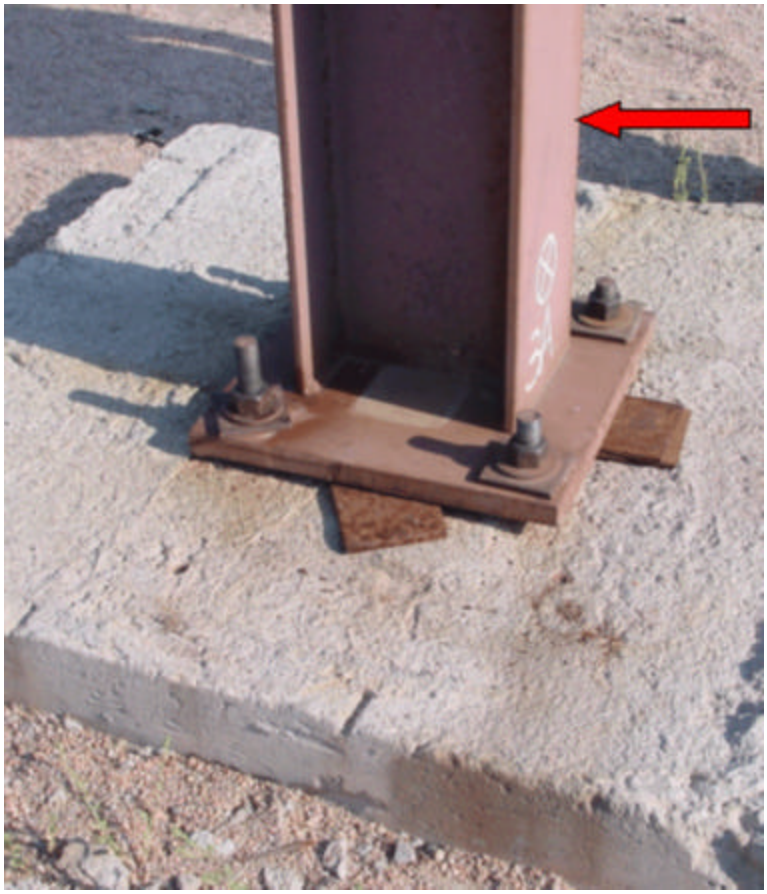
A wire rope or synthetic fiber rigging assembly that is used to attach a load to a hoisting device.



Column

A load-carrying vertical member that is part of the primary skeletal framing system.

(Columns do not include posts)



Connector

An employee who, working with hoisting equipment, is placing and connecting structural members and/or components.

Controlled decking zone (CDZ)

An area in which certain work may take place without the use of guardrail systems, personal fall arrest systems, fall restraint systems, or safety net systems and where access to the zone is controlled.

(For example, initial installation and placement of metal decking)

Controlled load lowering

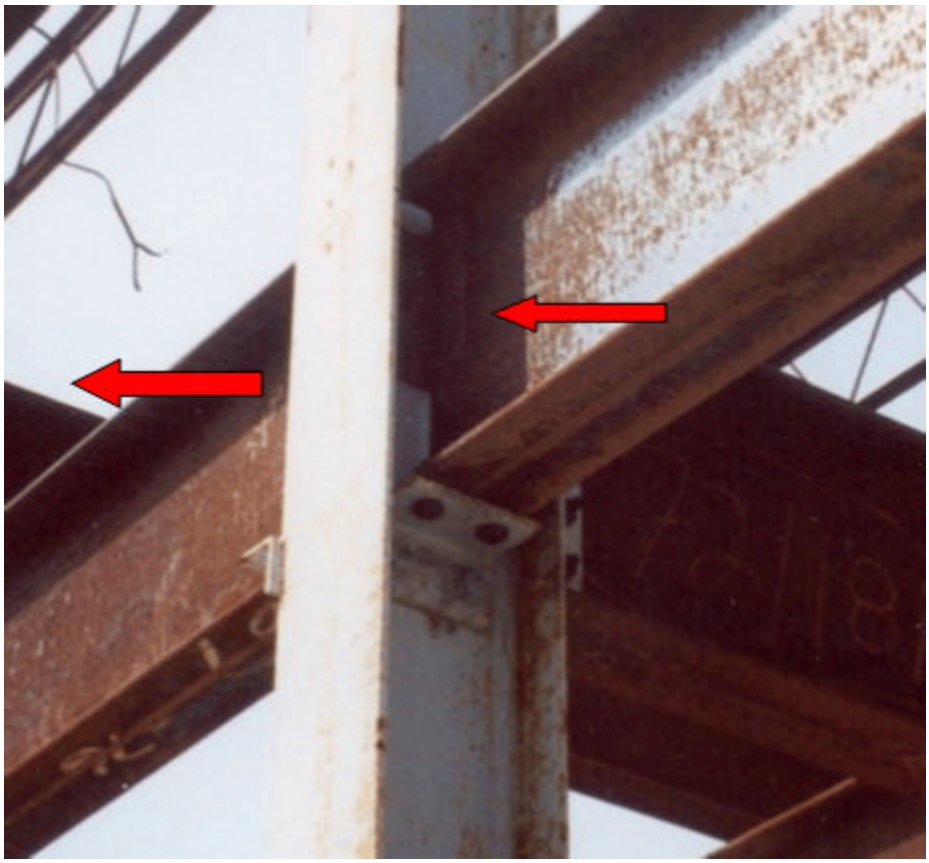
Lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with a maximum control using the gear train or hydraulic components of the hoist mechanism. Controlled load lowering requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load.

Critical lift

A lift that (1) exceeds 75 percent of the rated capacity of the crane or derrick, or (2) requires the use of more than one crane or derrick.

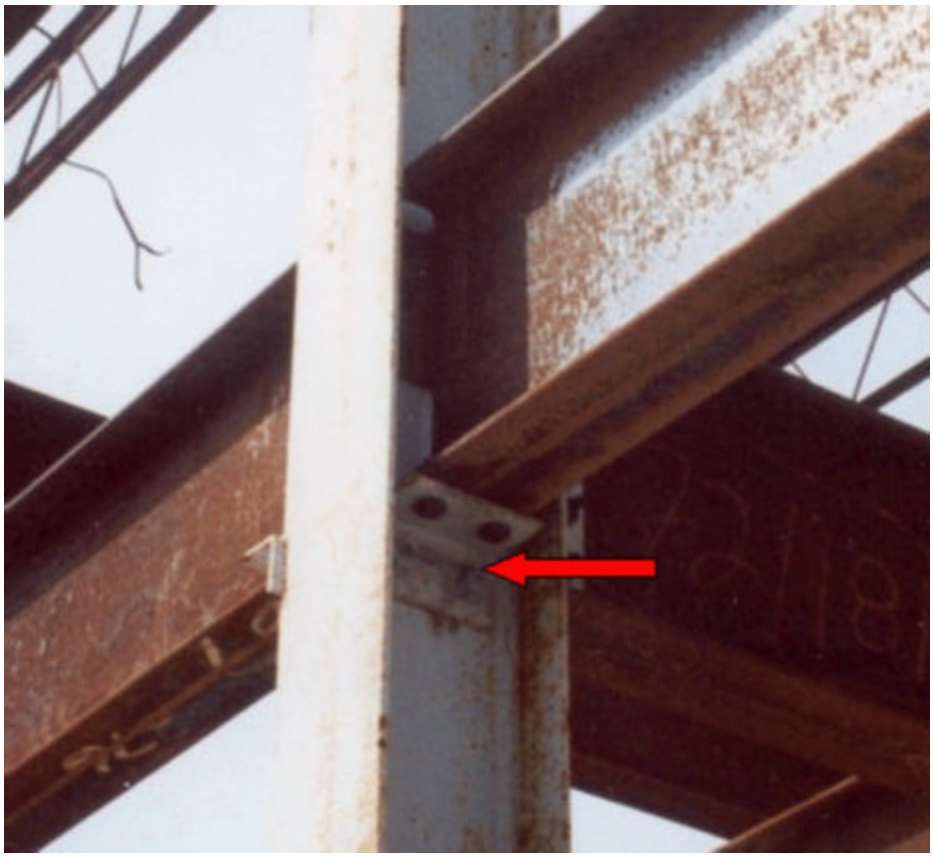
Double connection

Attachment method where the connection point is intended for two pieces of steel which share common bolts on either side of a central piece.



Double connection seat

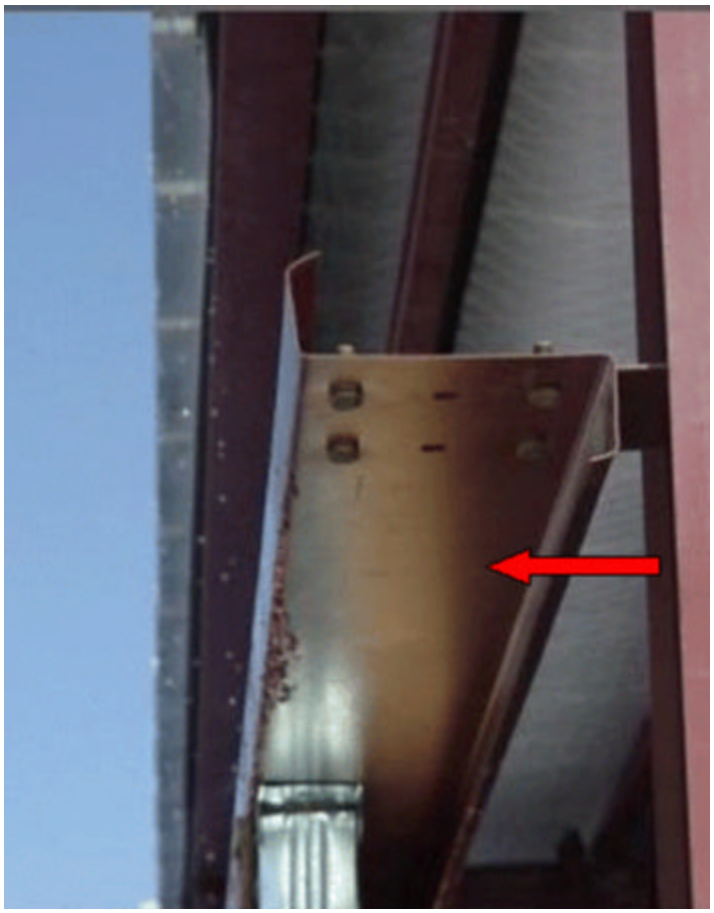
A structural attachment that, during the installation of a double connection, supports the first member while the second member is connected.



Girt

In systems-engineered metal buildings, a "Z" or "C" shaped member formed from sheet steel spanning between primary framing and supporting wall materials.

"Z" shaped girt



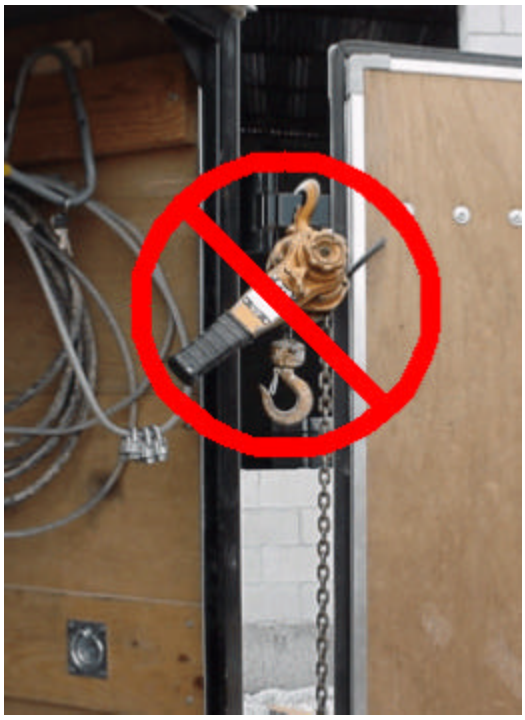
Headache ball

A weighted hook that is used to attach loads to the hoist load line of the crane.

Hoisting equipment

Commercially manufactured lifting equipment designed to lift and position a load of known weight to a location at some known elevation and horizontal distance from the equipment's center of rotation.

A "come-a-long" (a mechanical device usually consisting of a chain or cable attached at each end, that is used to facilitate movement of materials through leverage) is NOT considered "hoisting equipment."



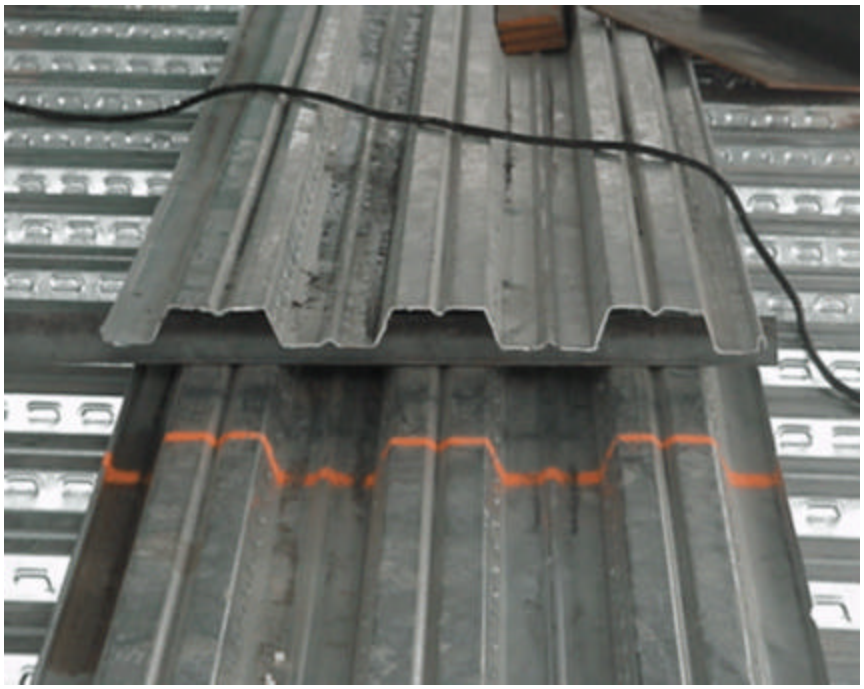
Leading edge

An unprotected side and edge of a floor, roof, or formwork for a floor or other walking/working surface which changes location as additional floor, roof, decking or formwork sections are placed, formed or constructed.

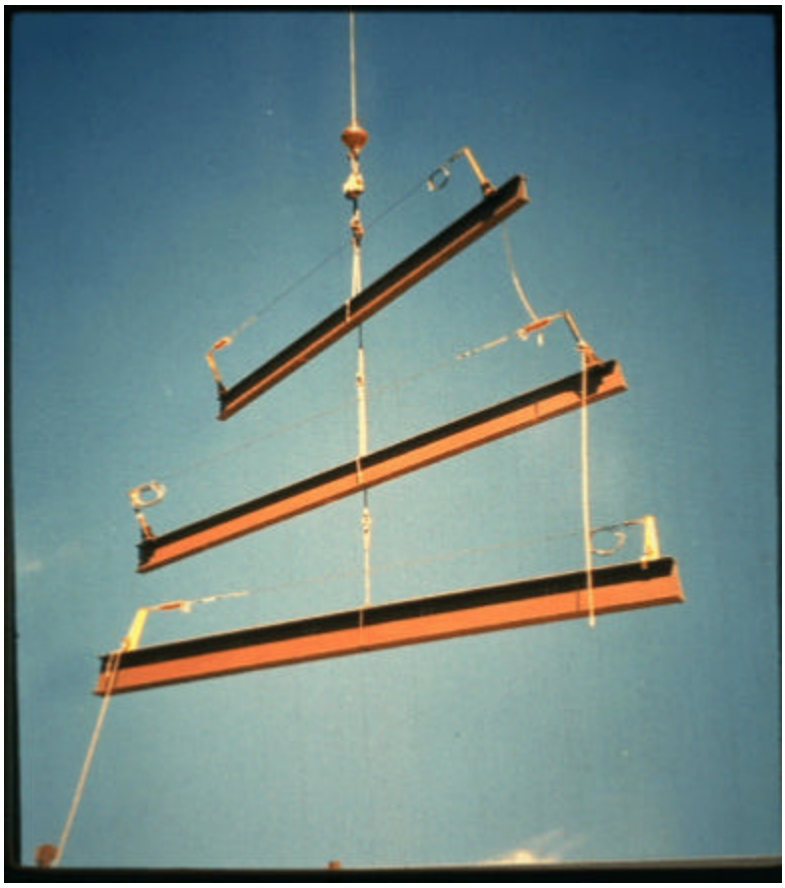
Metal decking

Commercially manufactured, structural grade, cold rolled metal panel formed into a series of parallel ribs.

(Metal decking includes metal floor and roof decks, standing seam metal roofs, other metal roof systems and other products such as bar gratings, checker plate, expanded metal panels, and similar products)



Multiple lift rigging procedure (MLRP)
("Christmas Treeing")



Multiple lift rigging

A rigging assembly manufactured by wire rope rigging suppliers that facilitates the attachment of up to five independent loads to the hoist rigging of a crane.

Opening

A gap or void 12 inches or more in its least dimension in a floor, roof or other walking/working surface.

(Skylights and smoke domes that do not meet the strength requirements of a cover, are considered openings)

Personal fall arrest system

A system used to arrest an employee in a fall from a working level. System consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline or suitable combination of these.

(The use of a body belt for fall arrest is prohibited.)

Positioning device

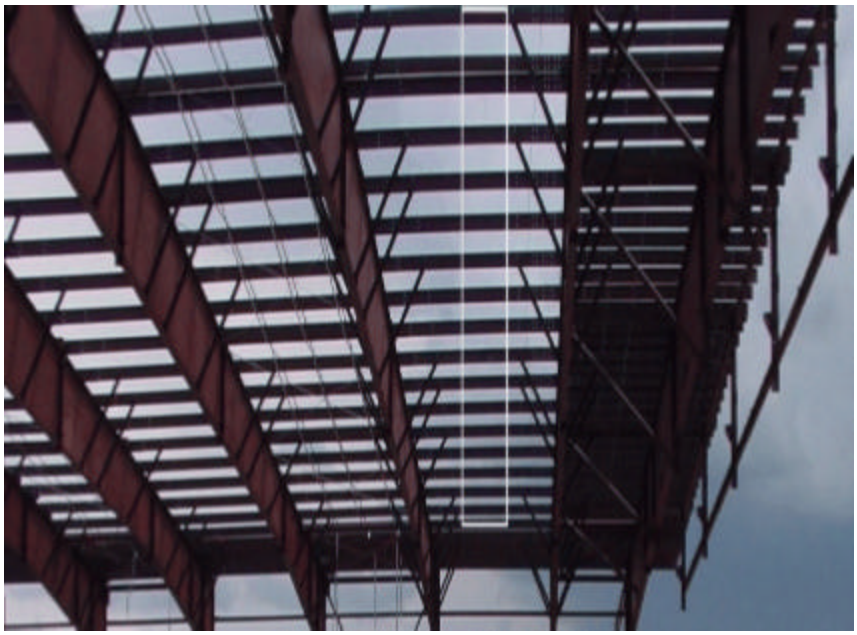
A body belt or body harness rigged to allow an employee to be supported on an elevated, vertical surface, such as a wall or column and work with both hands free while leaning.

Post

A structural member with a longitudinal axis that is essentially vertical, that: (1) is axially loaded (a load presses down on the top end) and weighs 300 pounds or less, or (2) is not axially loaded, but is laterally restrained by the above member. Posts typically support stair landings, wall framing, mezzanines and other substructures.

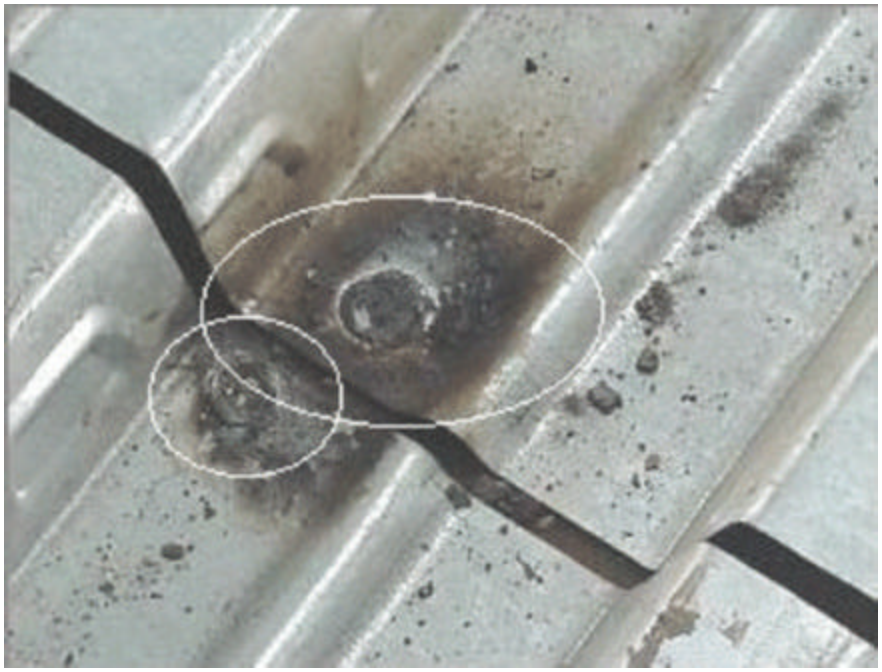
Purlin

In systems-engineered metal buildings, a "Z" or "C" shaped member formed from sheet steel spanning between primary framing and supporting roof material.



Safety deck attachment

An initial attachment that is used to secure an initially placed sheet of decking to keep proper alignment and bearing with structural support members.



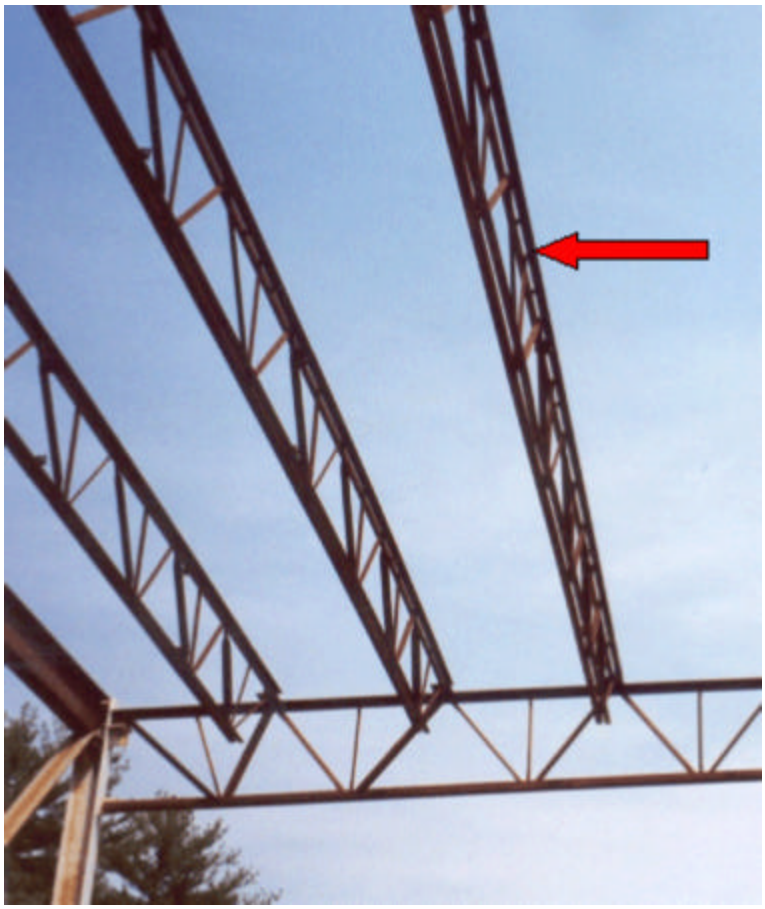
Shear connector

Steel bars, steel lugs, headed steel studs, and similar devices that are attached to a structural member for the purpose of achieving composite action with concrete.

Steel joist

An open web, secondary load-carrying member of 144 feet or less, designed by the manufacturer, used for the support of floors and roofs.

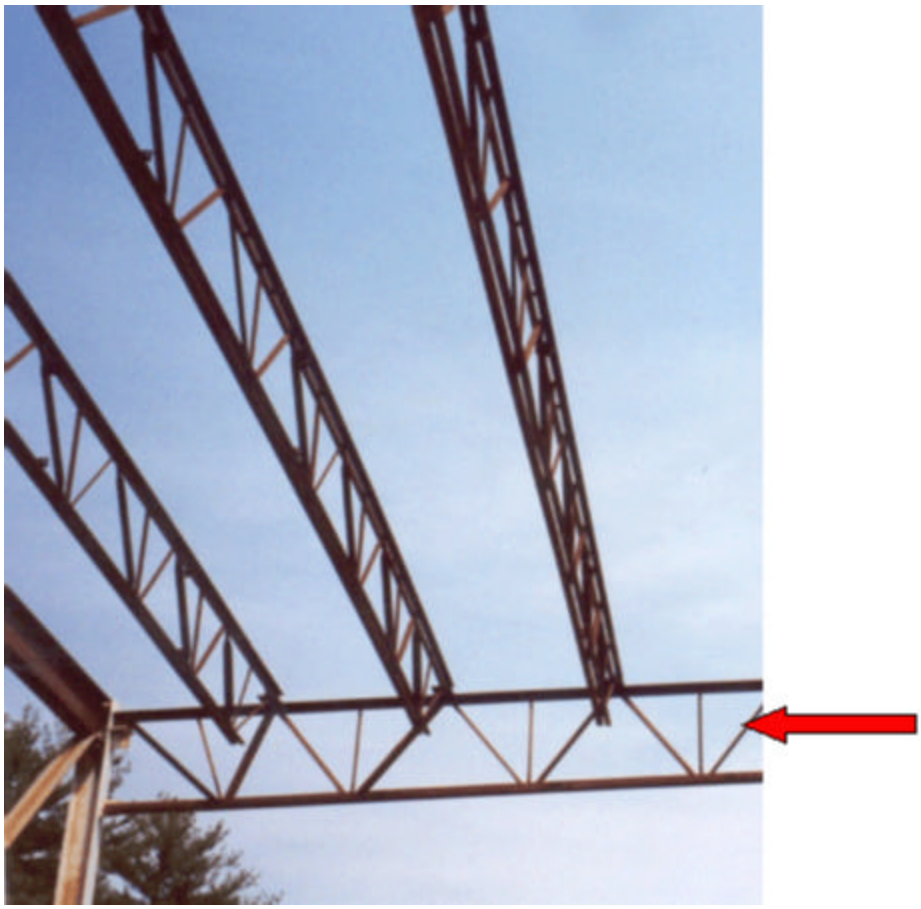
(This does not include structural steel trusses or cold-formed joists)



Steel joist girder

An open web, primary load carrying member, designed by a manufacturer, used for the support of floors and roofs.

(This does not include structural steel trusses or cold-formed joists)



Systems-engineered metal building

Field-assembled building system consisting of framing, roof and wall coverings.

CHAPTER 6.

ILLUSTRATIONS OF CONCEPTS

[RESERVED: ILLUSTRATIONS ARE BEING PREPARED AND WILL BE ADDED]

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FACT SHEET

REVISED STEEL ERECTION STANDARD

Key provisions of the revised steel erection standard include:

Site Layout and Construction Sequence

- Requires certification of proper curing of concrete in footings, piers, etc. for steel columns.
- Requires controlling contractor to provide erector with a safe site layout including pre-planning routes for hoisting loads.

Site-Specific Erection Plan

- Requires pre-planning of key erection elements, including coordination with controlling contractor before erection begins, in certain circumstances.

Hoisting and Rigging

- Provides additional crane safety for steel erection.
- Minimizes employee exposure to overhead loads through pre-planning and work practice requirements.
- Prescribes proper procedure for multiple lifts (christmas-treeing).

Structural Steel Assembly

- Provides safer walking/working surfaces by eliminating tripping hazards and minimizes slips through new slip resistance requirements.
- Provides specific work practices regarding safely landing deck bundles and promoting the prompt protection from fall hazards in interior openings.

Column Anchorage

- Requires 4 anchor bolts per column along with other column stability requirements.
- Requires procedures for adequacy of anchor bolts that have been modified in the field.

Beams and Columns

- Eliminates extremely dangerous collapse hazards associated with making double connections at columns.

Open Web Steel Joists

- Requirements minimizing collapse of lightweight steel joists by addressing need for erection bridging and method of attachment.
- Requirements for bridging terminus anchors with illustrations and drawings in a non-mandatory appendix (provided by SJI).
- New requirements to minimize collapse in placing loads on steel joists.

Systems-Engineered Metal Buildings

- Requirements to minimize collapse in the erection of these specialized structures which account for a major portion of steel erection in this country.

Falling Object Protection

- Performance provisions that address hazards of falling objects in steel erection.

Fall Protection

- Controlled decking zone (CDZ) provisions to prevent decking fatalities.
- Deckers in a CDZ and connectors must be protected at heights greater than two stories or 30 feet. Connectors between 15 and 30 feet must wear fall arrest or restraint equipment and be able to be tied off or be provided another means of fall protection.
- Requires fall protection for all others engaged in steel erection at heights greater than 15 feet.

Training

- Requires qualified person to train exposed workers in fall protection.

- Requires qualified person to train exposed workers engaged in special, high risk activities

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Occupational Safety & Health Administration
200 Constitution Avenue, NW
Washington, DC 20210

Tunneling Operations and Equipment

Subpart S

OSHA Regulations (Standards - 29 CFR)
Underground Construction - 1926.800
Subpart S

- **Standard Number:** 1926.800
- **Standard Title:** Underground Construction
- **SubPart Number:** S
- **SubPart Title:** Underground Construction, Caissons, Cofferdams, and Compressed Air

(a) *Scope and application.*
(a)(1) This section applies to the construction of underground tunnels, shafts, chambers, and passageways. This section also applies to cut-and-cover excavations which are both physically connected to ongoing underground construction operations within the scope of this section, and covered in such a manner as to create conditions characteristic of underground construction.
(a)(2) This section does not apply to the following:
(a)(2)(i) Excavation and trenching operations covered by Subpart P of this part, such as foundation operations for above-ground structures that are not physical connected to underground construction operations, and surface excavation: nor
(a)(2)(ii) Underground electrical transmission and distribution lines, as addressed in Subpart V of this part.

…….

(q) *Drilling.*
(q)(1) A competent person shall inspect all drilling and associated equipment prior to each use. Equipment defects affecting safety shall be corrected before the equipment is used.
(q)(2) The drilling area shall be inspected for hazards before the drilling operation is started.
(q)(3) Employees shall not be allowed on a drill mast while the drill bit is in operation or the drill machine is being moved.
(q)(4) When a drill machine is being moved from one drilling area to another, drill steel, tools, and other equipment shall be secured and the mast shall be placed in a safe position.
(q)(5) Receptacles or racks shall be provided for storing drill steel located on jumbos.
(q)(6) Employees working below jumbo decks shall be warned whenever drilling is about to begin.
(q)(7) Drills on columns shall be anchored firmly before starting drilling, and shall be retightened as necessary thereafter.
(q)(8)(i) The employer shall provide mechanical means on the top deck of a jumbo for lifting unwieldy or heavy material.

(q)(8)(ii) When jumbo decks are over 10 feet (3.05 m) in height, the employer shall install stairs wide enough for two persons.

(q)(8)(iii) Jumbo decks more than 10 feet (3.05 m) in height shall be equipped with guardrails on all open sides, excluding access openings of platforms, unless an adjacent surface provides equivalent fall protection.

(q)(8)(iv)(A) Only employees assisting the operator shall be allowed to ride on jumbos, unless the jumbo meets the requirements of paragraph (r)(6)(ii) of this section.
(q)(8)(iv)(B) Jumbos shall be chocked to prevent movement while employees are working on them.

(q)(8)(v)(A) Walking and working surfaces of jumbos shall be maintained to prevent the hazards of slipping, tripping and falling.
(q)(8)(v)(B)Jumbo decks and stair treads shall be designed to be slip-resistent and secured to prevent accidental displacement.

(q)(9) Scaling bars shall be available at scaling operations and shall be maintained in good condition at all times. Blunted or severely worn bars shall not be used.
(q)(10)(i) Blasting holes shall not be drilled through blasted rock (muck) or water.
(q)(10)(ii) Employees in a shaft shall be protected either by location or by suitable barrier(s) if powered mechanical loading equipment is used to remove muck containing unfired explosives.
(q)(11) A caution sign reading "Buried Line," or similar wording shall be posted where air lines are buried or otherwise hidden by water or debris.

…….

(t) *Hoisting unique to underground construction.* Except as modified by this paragraph (t), the following provisions of Subpart N of this part apply: Requirements for cranes are found in 1926.550 of this part. Paragraph (g) of 1926.550 applies to crane-hoisting of personnel, except that the limitation in paragraph (g)(2) does not apply to the routine access of employees to the underground via a shaft. Requirements for material hoists are found in 1926.552(a) and (b) of this part. Requirements for personnel hoists are found in the personnel hoist requirements of 1926.552(a) and (c) of this part and in the elevator requirement of 1926.552(a) and (d) of this part.

(t)(1) *General requirements for cranes and hoists.*
(t)(1)(i) Materials, tools, and supplies being raised or lowered, whether within a cage or otherwise, shall be secured or stacked in a manner to prevent the load from shifting, snagging or falling into the shaft.
(t)(1)(ii) A warning light suitably located to warn employees at the shaft bottom and subsurface shaft entrances shall flash whenever a load is above the shaft bottom or subsurface entrances, or the load is being moved in the shaft. This paragraph does not apply to fully enclosed hoistways.
(t)(1)(iii) Whenever a hoistway is not fully enclosed and employees are at the shaft bottom, conveyances or equipment shall be stopped at least 15 feet (4.57 m) above the bottom of the shaft and held there until the signalman at the bottom of the shaft directs the operator to continue lowering the load, except that the load may be lowered without stopping if the load or conveyance is within full view of a bottom signalman who is in constant voice communication with the operator.

(t)(1)(iv)(A) Before maintenance, repairs, or other work is commenced in the shaft served by a cage, skip, or bucket, the operator and other employees in the area shall be informed and given suitable instructions.
(t)(1)(iv)(B) A sign warning that work is being done in the shaft shall be installed at the shaft collar, at the operator's station, and at each underground landing.
(t)(1)(v) Any connection between the hoisting rope and the cage or skip shall be compatible with the type of wire rope used for hoisting.
(t)(1)(vi) Spin-type connections, where used, shall be maintained in a clean condition and protected from foreign matter that could affect their operation.
(t)(1)(vii) Cage, skip, and load connections to the hoist rope shall be made so that the force of the hoist pull, vibration, misalignment, release of lift force, or impact will not disengaged the connection. Moused or latched open-throat hooks do not meet this requirement.
(t)(1)(viii) When using wire rope wedge sockets, means shall be provided to prevent wedge escapement and to ensure that the wedge is properly seated.

(t)(2) *Additional requirements for cranes.* Cranes shall be equipped with a limit switch to prevent overtravel at the boom tip. Limit switches are to be used only to limit travel of loads when operational controls malfunction and shall not be used as a substitute for other operational controls.

(t)(3) *Additional requirements for hoists.*
(t)(3)(i) Hoists shall be designed so that the load hoist drum is powered in both directions of rotation, and so that brakes are automatically applied upon power release or failure.
(t)(3)(ii) Control levers shall be of the "deadman type" which return automatically to their center (neutral) position upon release.
(t)(3)(iii) When a hoist is used for both personnel hoisting and material hoisting, load and speed ratings for personnel and for materials shall be assigned to the equipment.
(t)(3)(iv) Material hoisting may be performed at speeds higher than the rated speed for personnel hoisting if the hoist and components have been designed for such higher speeds and if shaft conditions permit.

(t)(3)(v) Employees shall not ride on top of any cage, skip or bucket except when necessary to perform inspection or maintenance of the hoisting system, in which case they shall be protected by a body belt/harness system to prevent falling.

(t)(3)(vi) Personnel and materials (other than small tools and supplies secured in a manner that will not create a hazards to employees) shall not be hoisted together in the same conveyance. However, if the operator is protected from the shifting of materials, then the operator may ride with materials in cages or skips which are designed to be controlled by an operator within the cage or skip.
(t)(3)(vii) Line speed shall not exceed the design limitations of the systems.
(t)(3)(viii) Hoists shall be equipped with landing level indicators at the operator's station. Marking the hoist rope does not satisfy this requirement.
(t)(3)(ix) Whenever glazing is used in the hoist house, it shall be safety glass, or its equivalent, and be free of distortions and obstructions.

(t)(3)(x) A fire extinguisher that is rated at least 2A:10B:C (multi-purpose, dry chemical) shall be mounted in each hoist house.
(t)(3)(xi) Hoist controls shall be arranged so that the operator can perform all operating cycle functions and reach the emergency power cutoff without having to reach beyond the operator's normal operating position.
(t)(3)(xii) Hoists shall be equipped with limit switches to prevent overtravel at the top and bottom of the hoistway.
(t)(3)(xiii) Limit switches are to be used only to limit travel of loads when operational controls malfunction and shall not be used as a substitute for other operational controls.
(t)(3)(xiv) Hoist operators shall be provided with a closed-circuit voice communication system to each landing station, with speaker microphones so located that the operator can communicate with individual landing stations during hoist use.
(t)(3)(xv) When sinking shafts 75 feet (22.86 m) or less in depth, cages, skips, and buckets that may swing, bump, or snag against shaft sides or other structural protrusions shall be guided by fenders, rails, ropes, or a combination of those means.
(t)(3)(xvi) When sinking shafts more than 75 feet (22.86 m) in depth, all cages, skips, and buckets shall be rope or rail guided to within a rail length from the sinking operation.
(t)(3)(xvii) Cages, skips, and buckets in all completed shafts, or in all shafts being used as completed shafts, shall be rope or rail-guided for the full length of their travel.
(t)(3)(xviii) Wire rope used in load lines of material hoists shall be capable of supporting, without failure, at least five times the maximum intended load or the factor recommended by the rope manufacturer, whichever is greater. Refer to 1926.552(c)(14)(iii) of this part for design factors for wire rope used in personnel hoists. The design factor shall be calculated by dividing the breaking strength of wire rope, as reported in the manufacturer's rating tables, by the total static load, including the weight of the wire rope in the shaft when fully extended.
(t)(3)(xix) A competent person shall visually check all hoisting machinery, equipment, anchorages, and hoisting rope at the beginning of each shift and during hoist use, as necessary.
(t)(3)(xx) Each safety device shall be checked by a competent person at least weekly during hoist use to ensure suitable operation and safe condition.
(t)(3)(xxi) In order to ensure suitable operation and safe condition of all functions and safety devices, each hoist assembly shall be inspected and load-tested to 100 percent of its rated capacity at the time of installation; after any repairs or alterations affecting its structural integrity; after the operation of any safety device; and annually when in use. The employer shall prepare a certification record which includes the date each inspection and load-test was performed; the signature of the person who performed the inspection and test; and a serial number or other identifier for the hoist that was inspected and tested. The most recent certification record shall be maintained on file until completion of the project.
(t)(3)(xxii) Before hoisting personnel or material, the operator shall perform a test run of any cage or skip whenever it has been out of service for one complete shift, and whenever the assembly or components have been repaired or adjusted.
(t)(3)(xxiii) Unsafe conditions shall be corrected before using the equipment.

(t)(4) *Additional requirements for personnel hoists.*
(t)(4)(i) Hoist drum systems shall be equipped with at least two means of stopping the load, each of which shall be capable of stopping and holding 150 percent of the hoist's rated line pull. A

broken-rope safety, safety catch, or arrestment device is not a permissible means of stopping under this paragraph.
(t)(4)(ii) The operation shall remain within sight and sound of the signals at the operator's station.
(t)(4)(iii) All sides of personnel cages shall be enclosed by one-half inch (12.70 mm) wire mesh (not less than No. 14 gauge or equivalent) to a height of not less than 6 feet 91.83 m). However, when the cage or skip is being used as a work platform, its sides may be reduced in height to 42 inches 1.07 m) when the conveyance is not in motion.
(t)(4)(iv) All personnel cages shall be provided with positive locking door that does not open outward.
(t)(4)(v) All personnel cages shall be provided with a protective canopy. The canopy shall be made of steel plate, at least 8/16-inch (4.763 mm) in thickness, or material of equivalent strength and impact resistance. The canopy shall be sloped to the outside, and so designed that a section may be readily pushed upward to afford emergency egress. The canopy shall cover the top in such a manner as to protect those inside from objects falling in the shaft.

(t)(4)(vi) Personnel platforms operating on guide rails or guide ropes shall be equipped with broken-rope safety devices, safety catches or arrestment devices that will stop and hold 150 percent of the weight of the personnel platform and its maximum rated load.

(t)(4)(vii) During sinking operations in shafts where guides and safeties are not yet used, the travel speed of the personnel platform shall not exceed 200 feet (60.96 m) per minute. Governor controls set for 200 feet (60.96 m) per minute shall be installed in the control system and shall be used during personnel hoisting.
(t)(4)(viii) The personnel platform may travel over the controlled length of the hoistway at rated speeds up to 600 feet (182.86 m) per minute during sinking operations in shafts where guides and safeties are used.
(t)(4)(ix) The personnel platform may travel at rated speeds greater than 600 feet (182.86 m) per minute in completed shafts.

End of Section

Electric Transmission and Distribution Lines

Subpart V

OSHA Regulations (Standards - 29 CFR)
General requirements. - 1926.950
Subpart V

- **Standard Number:** 1926.950
- **Standard Title:** General requirements.
- **SubPart Number:** V
- **SubPart Title:** Power Transmission and Distribution

a) *Application.* The occupational safety and health standards contained in this Subpart V shall apply to the construction of electric transmission and distribution lines and equipment.
(a)(1) As used in this Subpart V the term "construction" includes the erection of new electric transmission and distribution lines and equipment, and the alteration, conversion, and improvement of existing electric transmission and distribution lines and equipment.
(a)(2) Existing electric transmission and distribution lines and electrical equipment need not be modified to conform to the requirements of applicable standards in this Subpart V, until such work as described in paragraph (a)(1) of this section is to be performed on such lines or equipment.
(a)(3) The standards set forth in this Subpart V provide minimum requirements for safety and health. Employers may require adherence to additional standards which are not in conflict with the standards contained in this Subpart V.

- **Standard Number:** 1926.951
- **Standard Title:** Tools and protective equipment.
- **SubPart Number:** V
- **SubPart Title:** Power Transmission and Distribution

(b) *Personal climbing equipment.*
(b)(1) Body belts with straps or lanyards shall be worn to protect employees working at elevated locations on poles, towers, or other structures except where such use creates a greater hazard to the safety of the employees, in which case other safeguards shall be employed.
(b)(2) Body belts and safety straps shall meet the requirements of 1926.959. In addition to being used as an employee safeguarding item, body belts with approved tool loops may be used for the purpose of holding tools. Body belts shall be free from additional metal hooks and tool loops other than those permitted in 1926.959.
(b)(3) Body belts and straps shall be inspected before use each day to determine that they are in safe working condition.

(b)(4)(i) Lifelines and lanyards shall comply with the provisions of 1926.502.
(b)(4)(ii) Safety lines are not intended to be subjected to shock loading and are used for emergency rescue such as lowering a man to the ground. Such safety lines shall be a minimum of one-half-inch diameter and three or four strand first-grade manila or its equivalent in strength (2,650 lb.) and durability.
(b)(5) Defective ropes shall be replaced.

- **Standard Number:** 1926.959
- **Standard Title:** Lineman's body belts, safety straps, and lanyards.
- **SubPart Number:** V
- **SubPart Title:** Power Transmission and Distribution

(a) *General requirements*. The requirements of paragraphs (a) and (b) of this section shall be complied with for all lineman's body belts, safety straps and lanyards acquired for use after the effective date of this subpart.
(a)(1) Hardware for lineman's body belts, safety straps, and lanyards shall be drop forged or pressed steel and have a corrosive resistive finish tested to American Society for Testing and Materials B117-64 (50-hour test). Surfaces shall be smooth and free of sharp edges.
(a)(2) All buckles shall withstand a 2,000-pound tensile test with a maximum permanent deformation no greater than one sixty-fourth inch.
(a)(3) D rings shall withstand a 5,000-pound tensile test without failure. Failure of a D ring shall be considered cracking or breaking.
(a)(4) Snaphooks shall withstand a 5,000-pound tensile test without failure. Failure of a snaphook shall be distortion sufficient to release the keeper.

(b) *Specific requirements.*
(b)(1)(i) All fabric used for safety straps shall withstand an A.C. dielectric test of not less than 25,000 volts per foot "dry" for 3 minutes, without visible deterioration.
(b)(1)(ii) All fabric and leather used shall be tested for leakage current and shall not exceed 1 milliampere when a potention of 3,000 volts is applied to the electrodes positioned 12 inches apart.
(b)(1)(iii) Direct current tests may be permitted in lieu of alternating current tests.
(b)(2) The cushion part of the body belt shall:
(b)(2)(i) Contain no exposed rivets on the inside;
(b)(2)(ii) Be at least three (3) inches in width;
(b)(2)(iii) Be at least five thirty-seconds (5/32) inch thick, if made of leather; and
(b)(2)(iv) Have pocket tabs that extended at least 1 1/2 inches down and three (3) inches back of the inside of circle of each D ring for riveting on plier or tool pockets. On shifting D belts, this measurement for pocket tabs shall be taken when the D ring section is centered.
(b)(3) A maximum of four (4) tool loops shall be so situated on the body belt that four (4) inches of the body belt in the center of the back, measuring from D ring to D ring, shall be free of tool loops, and any other attachments.
(b)(4) Suitable copper, steel, or equivalent liners shall be used around bar of D rings to prevent wear between these members and the leather or fabric enclosing them.

(b)(5) All stitching shall be of a minimum 42-pound weight nylon or equivalent thread and shall be lock stitched. Stitching parallel to an edge shall not be less than three-sixteenths (3/16) inch from edge of narrowest member caught by the thread. The use of cross stitching on leather is prohibited.
(b)(6) The keeper of snaphooks shall have a spring tension that will not allow the keeper to begin to open with a weight of 2 1/2 pounds or less, but the keeper of snaphooks shall begin to open with a weight of four (4) pounds, when the weight is supported on the keeper against the end of the nose.
(b)(7) Testing of lineman's safety straps, body belts and lanyards shall be in accordance with the following procedure:
(b)(7)(i) Attach one end of the safety strap or lanyard to a rigid support, the other end shall be attached to a 250-pound canvas bag of sand:
(b)(7)(ii) Allow the 250-pound canvas bag of sand to free fall 4 feet for (safety strap test) and 6 feet for (lanyard test); in each case stopping the fall of the 250-pound bag:
(b)(7)(iii) Failure of the strap or lanyard shall be indicated by any breakage, or slippage sufficient to permit the bag to fall free of the strap or lanyard. The entire "body belt assembly" shall be tested using one D ring. A safety strap or lanyard shall be used that is capable of passing the "impact loading test" and attached as required in paragraph (b)(7)(i) of this section. The body belt shall be secured to the 250-pound bag of sand at a point to simulate the waist of a man and allowed to drop as stated in paragraph (b)(7)(ii) of this section. Failure of the body belt shall be indicated by any breakage, or slippage sufficient to permit the bag to fall free of the body belt.

End of Section

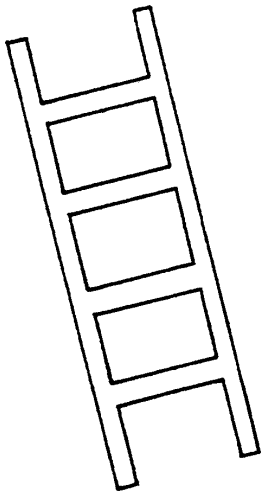
Stairways & Ladders

Subpart X

Subpart X

1926.1051

Ladders



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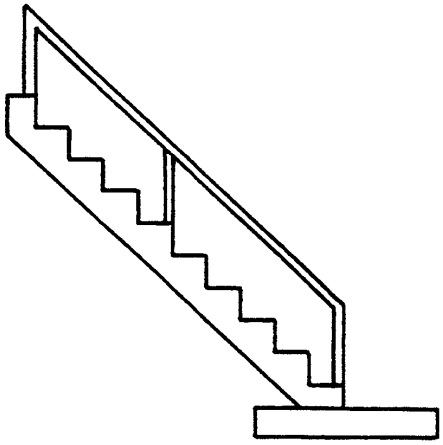


Stairways

General Requirements

Applies to Ladderways and Stairways

1926.1051

a) Stairway/ladder needed when elevation changes by 19"

1) No temporary spiral stairs in construction

2) Two or more ladders or double-cleated ladder needed with 25 employees or more

3) Keep access to ladder/stairway clear

4) One access point shall be kept clear at all times

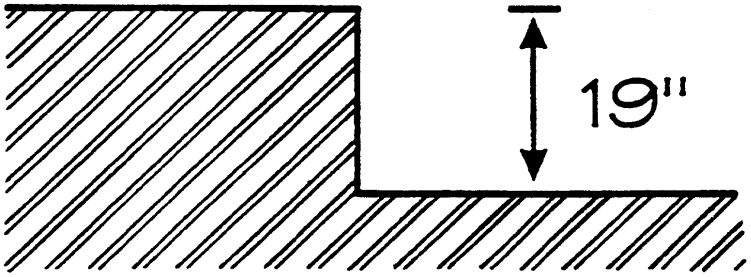
b) Employers must provide safe ladderways/stairways prior to any other work at the elevated areas

General Requirements

Applies to Ladderways and Stairways

1926.1051

a) break in elevation of 19”



Do's and Don'ts

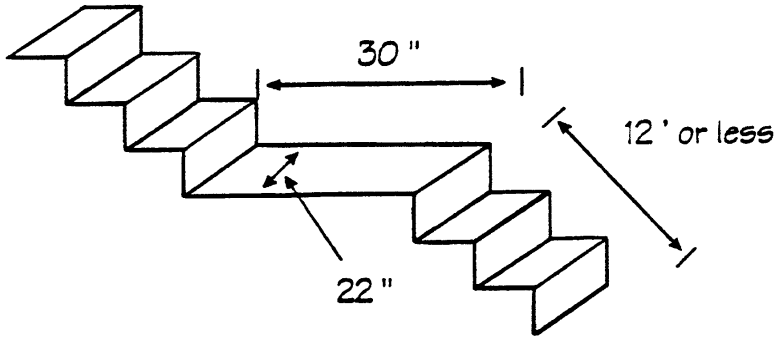
- Ladders shall not be tied or fastened together unless specifically designed (a) (7)

- Using 2 or more portable ladders to gain access must have offset platform (a) (10)

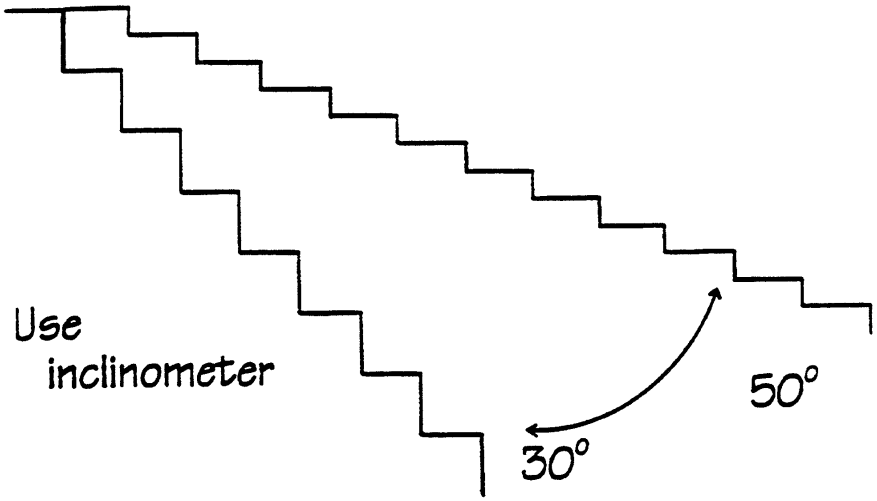
- Don't varnish wood ladders (a) (12)

1052 a)

1) Temporary stairway landings

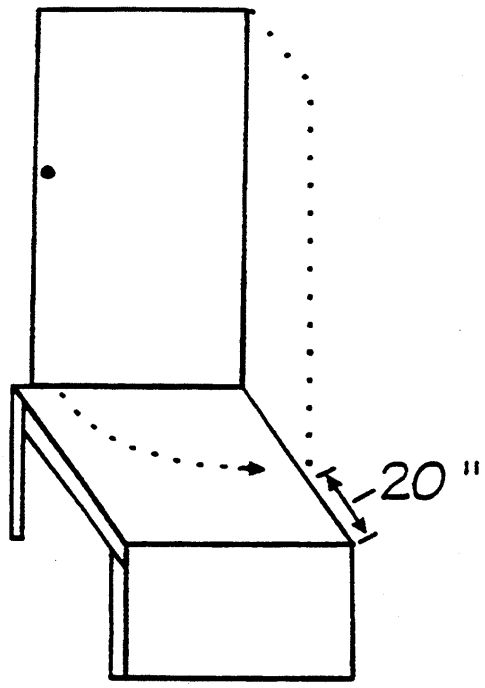


2) Installed between 30° and 50° horizontal



1052 a)

4) Platform constructed to 20" beyond door/gate swing radius



5) Secure from movement all metal pan stairs/landings prior to filling with materials

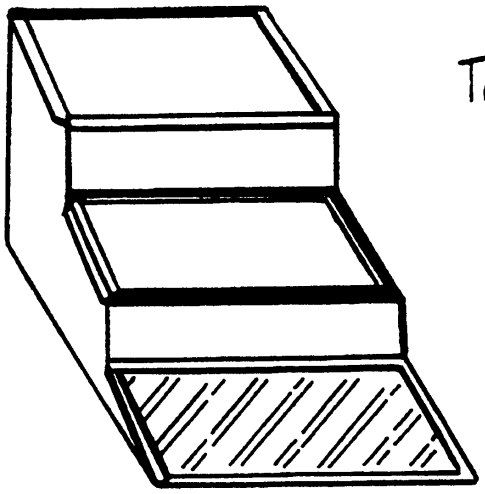
6) All parts of stairway, free of onstructions, projections

7) Eliminate slippery conditions before use

SNOW Grease ICE OIL

1052 b)

1) Fan tread/stairs/landings shall be filled



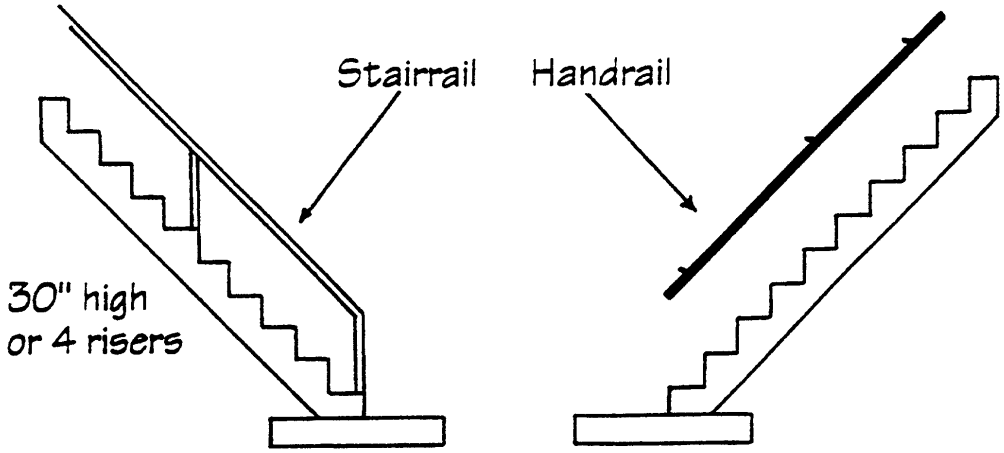
Temporary service

2) No foot on skelton metal stairs inless temporary treads installed

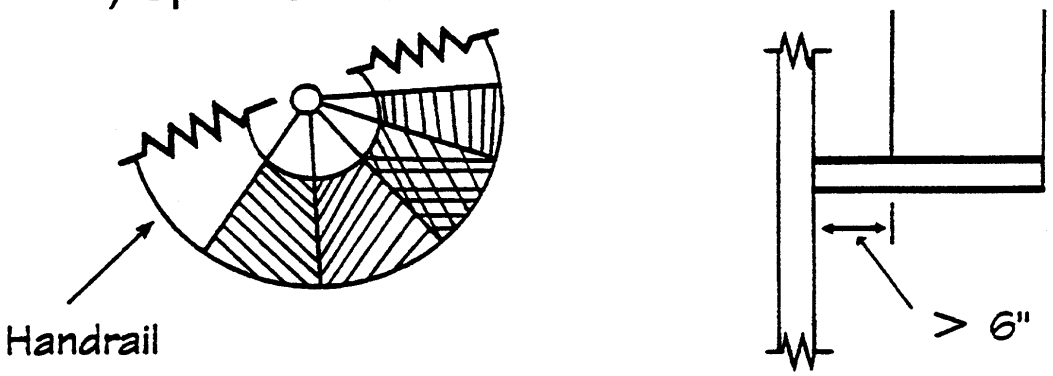
3) Temporary treads made of solid material and full width and depth of stairs

C)

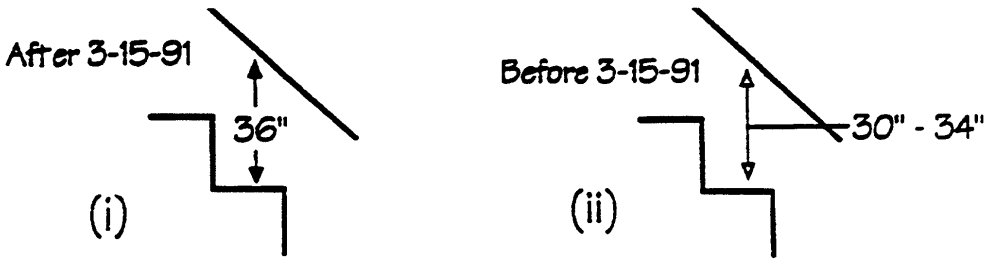
1)



2) Spiral Stairs



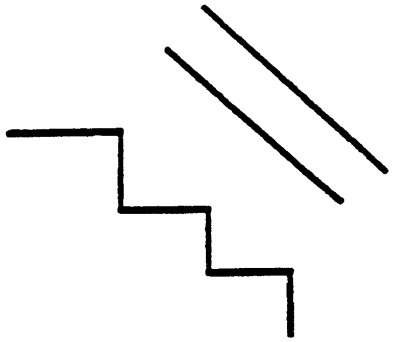
3) Height of Stairails



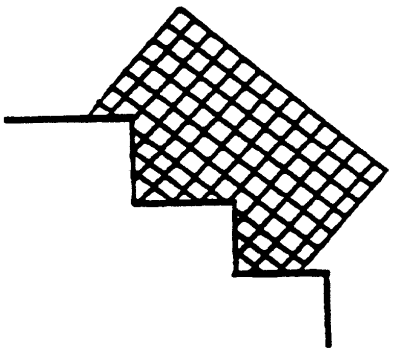
C)

4) On open side of stairs — screens, mesh, vertical members, horizontal members

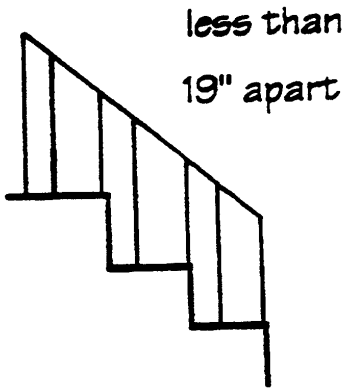
i) midrail (horizontal members)



ii) screen/mesh



iii) vertical members

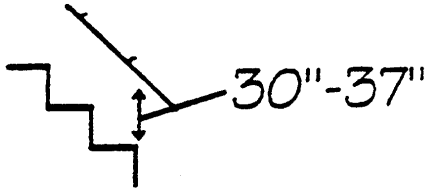


iv) other equivalent means
no openings larger than 19"

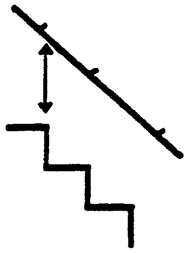
C)

5) Handrails are constructed to 200 lb. of out/down force

6) Handrail height 30" - 37"

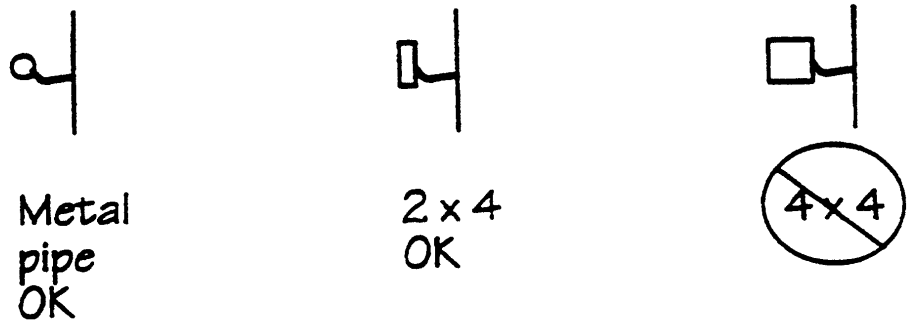


7) Rail must start at horizontal of upper stair



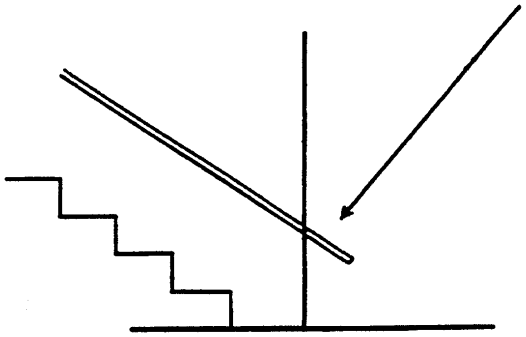
8) Stair/handrails shall be surfaced to prevent injury
- metal burrs, nails
splinters, slag

9) Rails must be adequate as a handhold

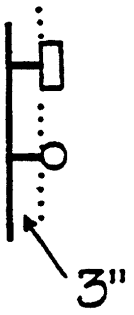


C)

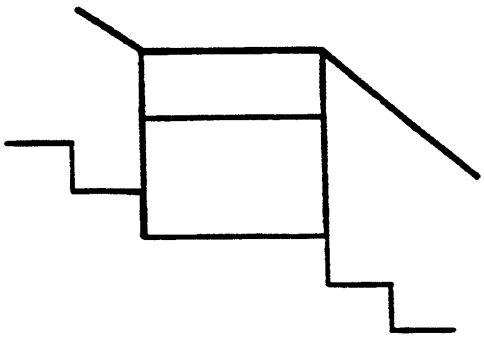
10) Rail end must not cause a projection hazard



11) Minimum handrail construction distance 3"



12) Stairway landings must be guarded



GROUP ACTIVITY

Describe the fall hazards in the pictures.

List other potential hazards. (i.e.- Personal protective equipment, safe work practices, etc.)

What are some possible solutions to these hazards?

- **Record Type:** Instruction
- **Directive Number:** STD 3-1.1
- **Standard Number:** 1926.20; 1926.21; 1926.23; 1904.2
- **Subject:** Clarification of Citation Policy
- **Information Date:** 06/22/1987

OSHA Instruction STD 3-1.1
June 22, 1987
Office of Construction and Maritime
Compliance Assistance

SUBJECT: Citation Policy Regarding 29 CFR 1926.20, 29 CFR 1926.21 and Related General Safety and Health Provisions

A. Purpose. This instruction clarifies the citation policy for 29 CFR 1926.20, General Safety and Health Provisions, 29 CFR 1926.21. Safety Training and Education, 29 CFR 1926.23, First Aid and Medical Attention, and 29 CFR 1904.2, Recordkeeping Requirements.

B. Scope. This instruction applies OSHA-wide.

C. Action. OSHA Regional Administrators and Area Directors shall ensure that the policy set forth in this instruction is applied in enforcing the referenced standards for the construction industry.

D. Federal Program Change. This instruction describes a Federal program change which affects State programs. Each Regional Administrator shall:

1. Ensure that this change is promptly forwarded to each State designee.

2. Explain the technical content of this change to the State designee as requested.

3. Ensure that State designees are asked to acknowledge receipt of this Federal program change in writing, within 30 days of notification, to the Regional Administrator. This acknowledgment should include a description either of the State's plan to implement the change or of the reasons why the change should not apply to that State.

4. Review policies, instructions and guidelines issued by the State to determine that this change has been communicated to State personnel. Routine monitoring shall also be used to determine if this change has been implemented in actual performance.

E. Interpretation. When a construction inspection is performed, the following guidelines will be followed:

1. An evaluation of the safety and health program will be completed. (See sample guidelines in Appendix A.) These guidelines will be modified, based on the CSHO's professional judgment, to account for size and type of construction. A key indicator of an effective program will be the degree of knowledge which employees have of potential site specific safety and health hazards. This knowledge requires training (site familiarization) of skilled as well as nonskilled crafts in hazard recognition based on the employee's specific work environment and job related hazards.

2. Program deficiencies such as lack of management policy, safety and health rules, inadequate assignment of responsibility, or poor employee awareness/participation shall be discussed with the employer.

3. Violations of the requirements for instruction, first aid, recordkeeping, and identification and control of hazards shall be cited as indicated in the appropriate section of 29 CFR 1926.20, 29 CFR 1926.21, 29 CFR 1926.23, or 29 CFR 1904.2.

4. Where the conditions warrant a citation for violation of 1926.20 or 1926.21, it may be issued even if additional 29 CFR 1926 alleged violations were not documented. Note that 1926.21(b) requires only safety and health instructions. Employers are required to implement a safety and health program in accordance with the above mentioned standards. However, employers should be encouraged to implement a formal safety and health training program with the guidelines in Appendix A.

5. Violations for 29 CFR 1926.20(b) in a routine inspection may be cited as other-than-serious or serious as circumstances warrant.

6. Recordkeeping violations (29 CFR 1904) shall be cited where records are not available for the individual site. Where construction employees are subject to common supervision, but do not report or work at a fixed establishment on a regular basis or where employees are engaged in physically dispersed activities, records for such employees shall be maintained as follows:

a. Records must be maintained either at the field office or at the mobile base of operations.
b. Records may also be maintained at an established central location. If records are maintained centrally:

(1) The address and telephone number of the place where the records are kept must be available at the worksite, and

(2) There must be personnel available at the central location during normal business hours to provide information from the records.

NOTE: The sections above describe the proper location of OSHA records. Although the supplementary record and the summary must be maintained according to the aforementioned criteria, it is possible to prepare and maintain the log at an alternate location or by means of data processing equipment, or both. Two criteria must be met:

(1) Sufficient information must be available at the alternate location to complete the log within 6 workdays after receipt of information that a recordable case has occurred, and

(2) A copy of the log updated to within 45 calendar days must be present at all times in the establishment.

F. Background. Due to OSHA's increasing emphasis on preventing construction injuries and illnesses, OSHA is reemphasizing the review of the contractor's safety citation policy regarding 29 CFR 1926.20 through 1926.23 and 29 CFR 1904.2. It also provides uniform field procedures for evaluation of safety and health programs in the construction industry.

John A. Pendergrass
Assistant Secretary

DISTRIBUTION: National, Regional and Area Offices
Compliance Officers
State Designees
7(c)(1) Project Managers
NIOSH Regional Program Directors

Appendix A

EMPLOYER'S SAFETY AND HEALTH PROGRAM

Yes No

A. Management Commitment and Leadership.
   1. Policy statement: goals established, issued, and communicated to employees.
   2. Program revised annually.
   3. Participation in safety meetings, inspections; agenda item in meetings.
   4. Commitment of resources is adequate.
   5. Safety rules and procedures incorporated into site operations.
   6. Management observes safety rules.

B. Assignment of Responsibility.
   1. Safety designee on site, knowledgeable, and accountable.
   2. Supervisors (including foremen) safety and health esponsibilities understood.
   3. Employees adhere to safety rules.

C. Identification and Control of Hazards.
   1. Periodic site safety inspection program involves supervisors.
   2. Preventative controls in place (PPE, maintenance, engineering controls).
   3. Action taken to address hazards.
   4. Safety Committee, where appropriate.
   5. Technical references available.
   6. Enforcement procedures by management.

D. Training and Education.
   1. Supervisors receive basic training.
   2. Specialized training taken when needed.
   3. Employee training program exists, is ongoing, and is effective.

E. Recordkeeping and Hazard Analysis.
   1. Records maintained of employee illnesses/injuries, and posted.
   2. Supervisors perform accident investigations, determine causes and propose corrective action.
   3. Injuries, near misses, and illnesses are evaluated for trends, similar causes; corrective action initiated.

F. First Aid and Medical Assistance.
   1. First aid supplies and medical service available.
   2. Employees informed of medical results.
   3. Emergency procedures and training, where necessary.

Fall Protection

Hierarchy of Control

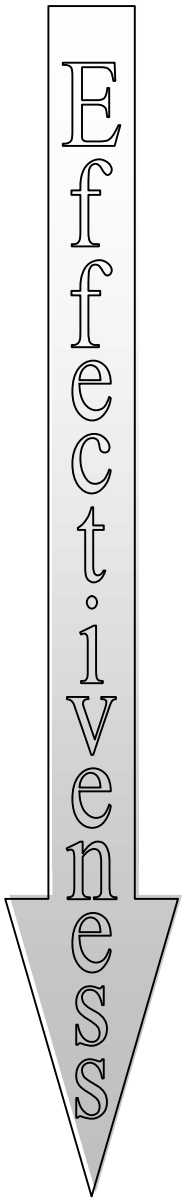
Elimination of Hazards

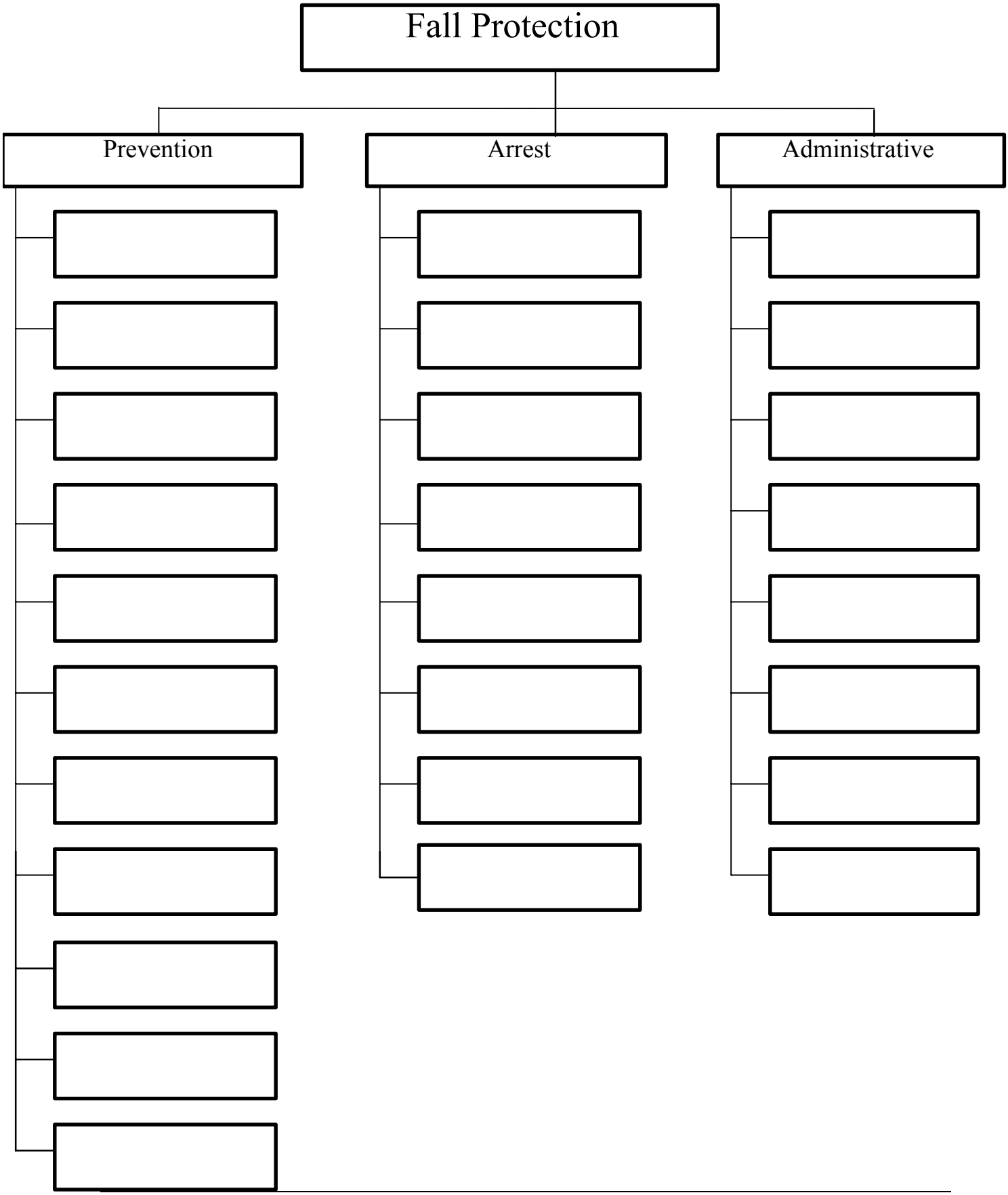
Engineering Controls

Warnings

Training

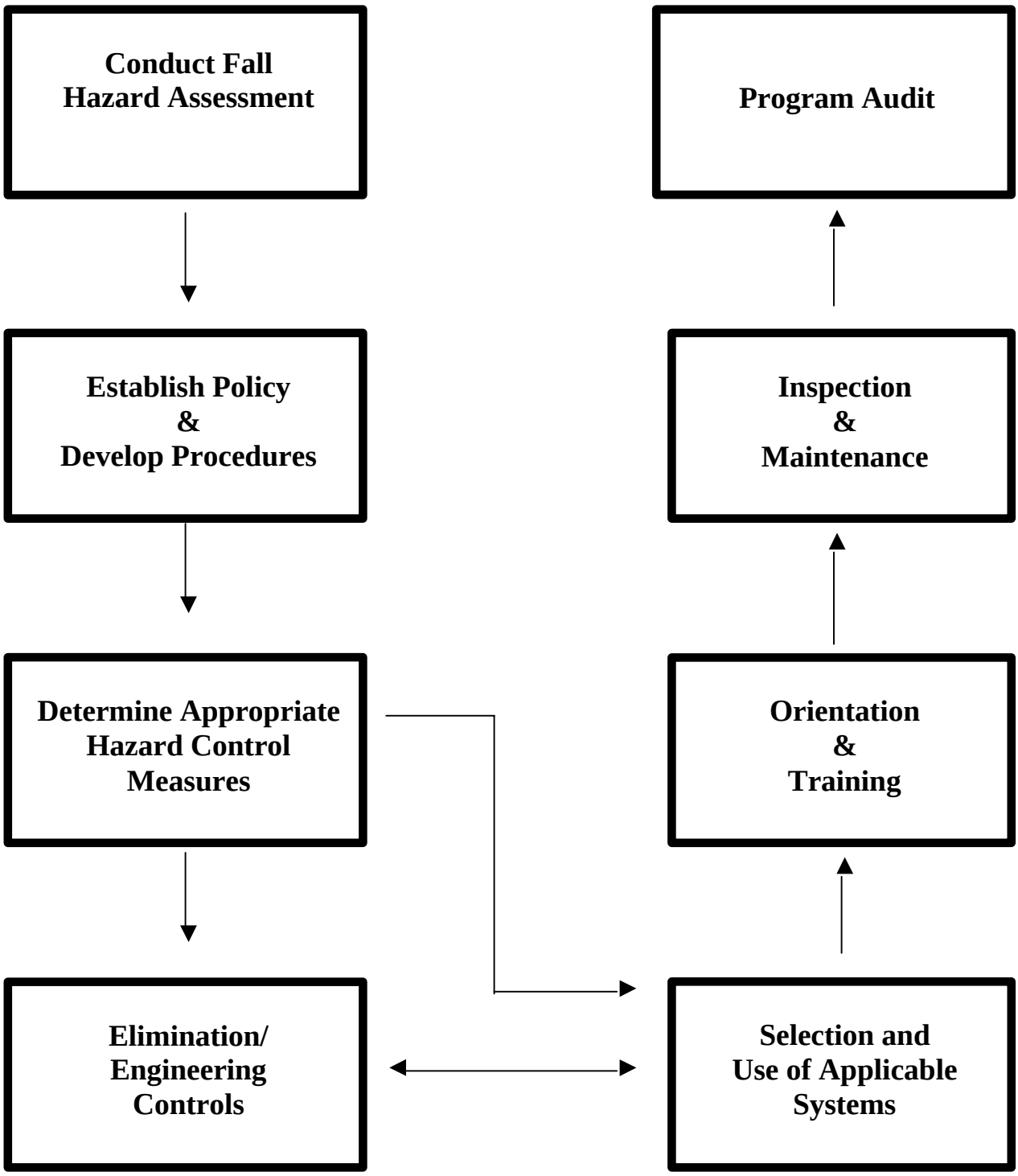
Personal Protective Equipment




Fall Protection
Prevention
Arrest
Administrative

Developing a

Fall Protection Program



Fall Protection Program

Policy

The company is firmly committed to providing each of its employees a safe and healthy work environment. It is the policy of this company to ensure all personnel are protected from the hazards of falling from elevated walking/working surfaces over 6 feet. In order to attain this goal, all employees are not only expected to, but morally obligated to, protect themselves and their co-workers.

(Name of person or position) will have the overall responsibility for coordination of the program for the company and copies of this program will be available at all jobsites and our offices.

The Superintendent/Foreman/Lead Person will have the responsibility of conducting regular inspections of the site to evaluate the fall protection systems to ensure proper installation, maintenance, and use.

Each employee of the company on site will be responsible for following the requirements of this program relative to the systems being used.

General Procedures and Provisions

The company has taken the responsibility to initiate and maintain a Fall Protection Program. The program will provide for regular inspections of the jobsite to evaluate overall fall protection needs and areas of concern. This regular site inspection will evaluate all relevant types of fall protection systems, devices and equipment required by the program and OSHA standards to assure their proper installation, maintenance and use.

Any defective fall protection items found shall be immediately corrected and/or tagged out of service and removed from the site. Any damaged or inadequate systems, such as guardrails and covers, shall be immediately repaired or replaced. Employees will be removed from the area of the fall hazard if the corrections cannot be made immediately.

All employees, including temporary employees, will be appropriately informed and trained by a competent on the requirements of these procedures and OSHA standards relating to fall protection. This training and instruction will enable employees to recognize potential fall hazards on the site and the procedures to be followed in order to prevent a fall.

Fall Protection Equipment, Systems, and Devices

Guardrails and Guardrail Systems

Guardrail system means a barrier erected to prevent employees from falling to lower levels. The top edge height of toprails must be 42 inches (plus or minus 3 inches) above the walking/working level. When employees are using stilts, the top edge height of the top rail must be increased an amount equal to the height of the stilts.

Toprails and midrails of guardrails systems must be at least one-quarter inch nominal diameter or thickness to prevent cuts and lacerations. If wire rope is used for toprails, it must be flagged at not more than 6 feet intervals with high-visibility material. Steel and plastic banding cannot be used as toprails or midrails. Manila, plastic, or synthetic rope used for toprails or midrails must be inspected frequently to ensure strength and stability.

Midrails, screens, mesh, intermediate vertical members, or equivalent structural members are installed between the top edge of guardrail systems and walking/working surface when there is no wall or parapet wall at least 21 inches high.

Midrails are installed midway between the top edge or guardrail system and the walking/working surface. Screens and mesh, when used, extend from the top rail to the walking/working level and along the entire opening between rail supports.

Guardrail systems must be capable of withstanding, without failure, a force of at least 200 pounds applied within 2 inches of the top edge, in any outward or downward direction, at any point. Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members must be capable of withstanding, without failure, a force of at least 150 pounds applied in any downward or outward direction at any point.

Guardrail systems must be surfaced as to prevent injury from punctures or lacerations and snagging of clothing.

Guardrail systems used at hoisting areas require a chain, gate or removable guardrail section placed across the access opening between guardrail sections when hoisting operations are not taking place.

At holes, guardrail systems must be set up on all unprotected sides or edges. When holes are used for the passage of materials, the hole shall have not more than two sides with removable sections. When the hole is not in use, it must be covered or provided with guardrails along all unprotected sides or edges.

If guardrail systems are used around holes that are used as access points (such as ladderways), gates must be used or the point of access must be offset to prevent accidental walking into the hole.

If guardrails are used at unprotected sides or edges of ramps and runways, they must be erected on each unprotected side or edge.

Personal Fall Arrest Systems

These consist of an anchorage, connectors, and a body belt or body harness and may include a deceleration device, lifeline, or suitable combinations. If a personal fall arrest system is used for fall protection, it must do the following:

- Limit maximum arresting force on an employee to 1,800 pounds when used with a body harness;
- Be rigged so an employee can neither free fall more than 6 feet, nor contact any lower level;
- Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet; and
- Have sufficient strength to withstand twice potential impact energy of an employee free falling a distance of 6 feet or the free fall distance permitted by the system, whichever is less.

Personal fall arrest systems must be inspected prior to each use for wear damage, and other deterioration. Defective components must be removed form service. Dee-rings and snaphooks must have a minimum tensile strength of 5,00 pounds.

Snaphooks shall be sized to be compatible with the member to which they will be connected, or shall be of a locking configuration. Effective January 1, 1998, only locking type snaphooks are permissible.

On suspended scaffolds or similar work platforms with horizontal lifelines which may become vertical lifelines, devices used to connect to horizontal lifeline must be capable of locking in both directions on the lifeline.

Horizontal lifelines will be designed , installed and used under the supervision of a qualified person, as part of a complete fall arrest system maintaining a safety factor of at least two. Lifelines shall be protected against being cut or abraded.

Self-retracting lifelines and lanyards that automatically limit free fall distance to 2 feet or less shall be capable of sustaining a minimum tensile load of 3,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.

Self-retracing lifelines and lanyards that do not limit free fall distance to 2 feet or less, ripstitch lanyards, and tearing or deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.

Anchorage's shall be designed, installed, and used under the direct supervision of a qualified person, as part of a complete personal fall arrest system that maintains a safety factor of at least two, capable of supporting at least twice the weight expected to be imposed upon it.

Anchorage's used to attach personal fall arrest systems shall be independent of any anchorage being used to support or suspend platforms and must be capable of supporting at least 5,000 pounds per person attached.

Attachment point of a body belt will be located in the center of a wearer's back. Attachment point of a body harness will be located in the center of the wearer's back near shoulder level, or above the wearer's head.

Body belts, harnesses and components will be used only for employee protection and not to hoist materials. Personal fall arrest systems and components subjected to impact loading will be immediately removed form service and not used again for employee protection until inspected and determined by a competent person to be undamaged and suitable for reuse.

Personal fall arrest systems may not be attached to guardrail systems. When a personal fall arrest system is used at hoist areas, it is rigged to allow movement of employees only as far as the edge of the walking/working surface.

Prompt rescue of employees will be provided in the event of a fall when they cannot rescue themselves.

Positioning Device Systems

Positioning devices must be rigged so an employee cannot free fall more than 2 feet.

They shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds, whichever is greater.

Requirements for snaphooks, dee-rings, and other connectors used with positioning device systems must meet the same criteria as those for personal fall arrest systems.

Controlled Access Zones

Controlled Access Zone (CAZ) means an area which certain work (e.g., overhand bricklaying) may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is controlled.

Covers

Hole means a gap or void 2 inches or more in its least dimension, in a floor, roof, or other walking/working surface. Covers for holes in floors, roofs, and other walking/working surfaces will meet the following requirements:

- Covers located in roadways and vehicular aisles must be capable of supporting, without failure, at least twice the maximum axle load of the largest vehicle expected to cross over the cover.
- All other covers must be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed.
- All covers will be secured when installed to prevent accidental displacement by wind, equipment, or employees.
- All covers will be color coded or marked with the word "HOLE" or "COVER" to provide warning of the hazard.

Safety Net Systems

Safety net systems shall be installed as close to the work surface as possible but in no case more than 30 feet below the surface.

Safety nets shall extend outward from the outer most projection as follows:

Vertical Distance From Working Level to Horizontal Plane of Net	Minimum Required Horizontal Distance Net Must Extend From Edge of Work Surface
Up to 5'	8'
More than 5' up to 10'	10'
More than 10'	13'

Safety nets shall be installed with sufficient clearance under them.

On the job testing, consisting of a 400 lb. bag of sand dropped from the highest walking/working surface into the net, must be done after initial installation, whenever relocated, after major repairs, and at 6 month intervals if left in place.

Nets must be inspected at least once a week and defective nets must be removed from service.

Debris shall be removed as soon as possible and at least before the next shift.

Maximum mesh size shall be 36 inches square (6” x6”).

Net borders shall have a 5,000 lb. minimum breaking strength.

Connections between net panels shall be as strong as the integral net components and shall be spaced not more than 6 inches apart.

Fall Protection Training Requirements
1926.503

Training Program

Each employer must provide a training program for employees who might be exposed to fall hazards. The Program must enable the employees to recognize fall hazards and also train employees in the procedures to be followed to minimize the hazards. The employer shall assure that each employee has been trained by a competent person qualified in the following areas:

- The nature of fall hazards in the work place;
- The correct procedures for erecting, maintaining, disassembling, and inspecting the systems to be used;
- The use and operation of guardrail systems, personal fall arrest systemssafety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection to be used;
- The role of each employee in the safety monitoring system and fall protection plan when they are used;
- The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs;
- The correct procedures for handling and storage of equipment and materials and the erection of overhead protection;
- The standards contained in Subpart M.

Certification of Training

The employer must verify a training program is in place by preparing a written certification record. This record must contain the name of the employee trained, the date(s) of training, and signature of the person who conducted the training or the signature of the employer. If the employer relies on training conducted by another employer or completed prior to the effective date, the record must indicate the date the employer determined the training was adequate rather than the actual date of training.

Retraining

When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by the training program, the employer shall retrain such employee. Circumstances where retraining is required could include situations where:

- Changes in the workplace and types of fall protections systems or equipment to be used render previous training obsolete.
- Inadequacies in an affected employee's knowledge or use of fall protection systems indicate that the employee has not retained the requisite understanding or skill.

Considerations in the Selection of Anchorage Points for Lanyards and Lifelines

1. Will you preselect the required anchorage points (tie-off points, installation points) for the predicted work area? Will you allow webbing or rope lanyards to be attached over sharp angled structures and then hooked back into the lanyard? Will you allow lifelines and lanyards to be wrapped around angle iron or each other and knotted?

2. Unless an engineered system is used, anchorage points must be 5,000 lbs. minimum strength for fall protection systems that allow free falls up to six feet, or alternatively 3,000 lbs. for retracting lifelines only that allow free falls of two feet or less. Since no worker can tell the true strength of a structural member, what must management do to increase fall safety reliability without exposing the worker to understrength anchorage points?

3. Can you designate each anchorage point location by painting it yellow or another bright color? Can you use specific bolt holes in I-beams or perhaps arrange overhead horizontal lifelines?

4. Can you make the anchorage rigid, independent or the workstation, or must you use cables? Have you calculated forces or fall from a horizontal lifeline to be sure the anchorage's are strong enough?

5. Have you determined that the anchorage must be at least waist height to limit free fall from lanyard systems or alternatively overhead height for reeling type lifelines and escape systems?

6. How does the worker move form one work station to another work station or climb up and down form a work station without increased exposure to falls?

7. What will you have the worker anchor to when there is nothing above them but air?

8. Can you think of a safe method to install the fall devices so that the first worker up is not exposed to a fall?

9. Can you think of a safe method to remove the fall device or lifeline form the anchorage so the last worker down is not exposed to a fall?

10. Can you anticipate dangerous swing fall hazards on lanyards or fall devices which call for additional anchorage considerations or horizontal lifeline installation?

Body Belt/Harness Inspection

Belts and Rings - Beginning at one end, holding the body side of the webbing toward you, grasp the webbing in your hands 6 to 8 inches apart. Bend the webbing in an inverted "U". The surface tension resulting makes damaged fibers or cuts easier to. see. Follow this procedure for the entire length of the webbing. Watch for frayed edges, broken fibers, pulled stitches, cuts or chemical damage.

Dee Rings - check the dee ring metal wear pad for distortion, cracks, breaks, and rough or sharp edges. The dee ring bar should be at a 90 degree angle with the long axis of the belt and should pivot freely.

Buckle Attachments - and dee rings should be given special attention. Note any unusual wear, frayed or cut fibers, or distortion of the buckles or dee's. Rivets should be tight and unmovable with fingers. Body side rivet base and outside rivet burr should be flat against the material. Bent rivets will fail under stress.

Inspect for Frayed or Broken Strands - broken webbing strands generally appear as tufts on the webbing surface. Any broken, cut or burned stitches will be readily seen.

Tongue or Billet - receives heavy wear form repeated buckling and unbuckling. Inspect for loose, distorted or broken grommets. Belts should not have additional, punched holes.

Tongue Buckle - buckle tongues should be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their socket. Roller should turn freely on frame. Check for distortion or sharp edges.

Friction Buckle - Inspect the buckle for distortion. The outer bars and center bars must be straight. Pay special attention to corners and attachment points of the center bar.

Lanyard Inspection

Hardware

Snaps - inspect closely for hook and eye distortions, cracks, corrosion, or pitted surfaces. The keeper should seat into the nose without binding and should not be distorted or obstructed. The keeper spring should exert sufficient force to firmly close the keeper. Keeper locks must prevent the keeper from opening when the keeper closes.

Thimbles - the thimble must be firmly seated in the eye of the splice, and the splice should have no loose or cut strands. The edges of the thimble must be free of sharp edges, distortion, or cracks.

Steel Lanyard - while rotating the steel lanyard watch for cuts, frayed areas, or unusual wear patterns on the wire. Broken strands will separate from the body of the lanyard.

Web Lanyard - while bending webbing over a pipe or mandrel, observe each side of the webbed lanyard. This will reveal any cuts or breaks. Swelling , discoloration, cracks, charring are obvious signs of chemical or heat damage. Observe closely for any breaks in the stitching.

Rip-Stitch Lanyards - the outer portion of the pack should be examined for burn holes and tears. Stitching on areas where the pack is sewn to dee rings, belts, or lanyards should be examined for loose strands, rips, and deterioration.

Considerations in the Selection of Vertical Lifelines

Performance Requirements

- How far are you willing to allow for workers to free fall? How will they recover or be recovered from a fallen position?
- What specific kinds of ropes or cables will you allow in your lifeline application and what kinds will you not allow?
- How far is the foreseeable vertical and horizontal movement?
- How much shock absorption id desirable?
- How long will the lifeline be left outdoors, and in what kind of weather?
- What component changes are you willing to accept without affecting the system's integrity?
- How many different applications are you trying to solve with one device? Is this safe? Have you listed each application and carefully considered the implications?
- What capability tests has the proposed system met in the configuration of your application? What is the total distance to stop?
- What can go wrong? What parts of the system can be replaced without authorization? Can the device be installed upside down? Will snaphooks accidentally become unfastened? Will the fall exceed system design? Will chemicals affect rope strength? Will belts/harnesses be worn properly? Will the lifeline be used for other applications?

Installation

- Have you clearly identified the specific anchorage points of suitable design and strength? Will these be erected permanently for foreseeable scheduled workstations and work areas?
- Are you prepared to have engineering drawings made, showing the approved methods of installation?

Lanyard Inspection

Hardware

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Considerations in the Selection of Horizontal Lifelines

Performance Requirements

- Will you purchase a complete lifeline designed for horizontal use or construct it yourself?
- What length of line do you envisage?
- How many workers will use the line simultaneously?
- What strength anchorage points do you need?
- What sag in the line is tolerable?
- Will you use lanyards or retracting lifelines attached to the line and how will you attach them?
- Is the line temporary, semi-permanent or permanent in nature?
- Are you intending to use perimeter cables meant for restraint instead of fall protection and are they strong enough for the intended application?
- Do you need to construct anchorage posts if no supporting steel id available?
- Can you move lanyards past anchorage posts without detaching the snap hook?
- What can go wrong?
  - Can all workers fall at one time? What will happen?
  - Can lanyard snap hooks detach accidentally from the line?
  - What happens if a crane load hits one of the anchorage points?
  - Will the lanyard or retracting lifeline slide smoothly without causing a swing fall hazard?

Installation Program

- Can you install the lines without exposure to falls, for example at ground level before hoisting?
- How will you remove temporary lines without exposure to a fall hazard?
- Has the degree of installation sag and sag following a fall been taken into account?

Training

- Will the work procedure have to change when the lifeline is used? Why?

Do workers feel safe if they use the line as a handrail? Should you be using a horizontal safety rail or more intermediate posts? Will other contractor personnel be required to use this line?

Maintenance Program

- Will you use colored marker flag to designate year of purchase and date of formal inspection?
- Will the inspector actually observe each part of the system close up or will he do so from the ground?

Program Coordination

- Who will coordinate the material acquisition, installation and maintenance program?
- Who will coordinate necessary changes tin the system to speed work production and how will that come about?

Resources Available from the Division of Safety & Hygiene (DSH) Libraries

(800) 644-6292 (614) 466-7388
library@bwc.state.oh.us
www.ohiobwc.com

Safety training:

- Safety talks, outlines and scripts - DSH Safety leader's discussion guide, Training Center's One-hour safety presentations, reference books, web resources
- Videos – hundreds of safety and health topics
- Books and articles on training techniques

Machine and equipment safety:

- Safety standards (ANSI, NFPA, CGA)
- Books and articles on power presses, material handling equipment, lockout/tagout, etc.

Sample written programs:

- DSH program profiles and sample written programs
- Reference books
- Internet resources

Illness and injury statistics:

- Statistics from the U.S. Bureau of Labor Statistics
- National Safety Council's *Injury Facts*
- National Institute of Occupational Safety & Health (NIOSH) studies

Hazard communication and chemical safety:

- Chemical safety information
- Material safety data sheets (MSDSs)
- Sample written programs
- Videos
- Internet resources

Safety standards

- American National Standards Institute (ANSI) standards (including standards for construction, machinery and equipment, personal protective equipment)
- National Fire Protection Association (NFPA) fire codes (including the Life Safety Code and the National Electrical Code)
- Compressed Gas Association (CGA) standards

Other topics of interest (books, articles, magazines, videos and standards):

- Confined spaces
- Electrical safety
- Job safety analysis
- New employee orientation
- Powered industrial trucks
- Respiratory protection
- Scaffolds
- Spill response

Directories and lists of vendors of safety equipment

Occupational Safety & Health Administration (OSHA) regulations

Manual of Uniform Traffic Control Devices (MUTCD)

Recommendations of useful Internet sites

BWC publications

Saving You Time and Research

Requests for copies of OSHA standards, information on starting a safety committee, a video on accident investigation techniques -- these are some of the thousands of inquiries BWC's Division of Safety & Hygiene (DSH) libraries receive each year.

DSH has two libraries to serve you:

- The central library in the William Green Building in downtown Columbus;
- The resource center and video library located at the Ohio Center for Occupational Safety and Health (OCOSH) in Pickerington.

Both libraries are open 8 a.m. to 4:45 p.m., Monday through Friday. Your need for information does not require a visit to the library. You can phone, fax, or e-mail your requests and receive a quick response.

The central library provides free information services on the topics of occupational safety and health, workers' compensation and rehabilitation.

The OCOSH resource center provides similar services for those who visit OCOSH for meetings and training center classes.

The video library offers an extensive collection of videotapes to supplement your organization's safety and health training program. It is a convenient and popular source for Ohio employers to borrow quality occupational safety- and health-related training aids.

Visit our Web site at **www.ohiobwc.com.**

Central library
30 W. Spring St., Third Floor
Columbus OH 43215-2256
1-800-OHIOBWC
(614) 466-7388
(614) 644-9634 (fax)
library@bwc.state.oh.us

OCOSH resource center
13430 Yarmouth Drive
Pickerington OH 43147
1-800-OHIOBWC
Resource center (614) 728-6464
Video library (614) 644-0018

INTERNET WEB SITES
FOR
OCCUPATIONAL SAFETY & HEALTH INFORMATION
April 2005

GENERAL

NATIONAL SAFETY COUNCIL (NSC)
http://www.nsc.org/

The NSC has a user friendly web site for innovative and current information on home, farm and community, on the road and workplace safety and as well statistical data and charts.

NORTH DAKOTA WORKFORCE SAFETY & INSURANCE
http://www.workforcesafety.com/

For workplace safety, North Dakota's WSI site puts forth their "safe operating procedures" page where they give information on accident and near miss reports, substance abuse, material handling and storage, walking and working surfaces, and safety program development and orientation.

OCCUPATIONAL & INDUSTRIAL SAFETY RESOURCES
http://www.khake.com/page59.html

Maintained by a Vocational Information Center, this web site provides links to occupational and industrial safety with lists of directories, national centers, hotlines and help lines as well as specific area coverage such as emergency, disaster and natural hazards, and tool, machine and equipment safety options.

OKLAHOMA STATE UNIVERSITY
http://www.pp.okstate.edu/ehs/

The Department of Environmental Health & Safety at OSU offers an online safety resource library that is constantly being updated with topics from A-Z including specific areas of safety such as fire, construction, HAZCOM and training. Go to the "Links Library" option.

SAFETY DIRECTORY
http://www.safetydirectory.com/

Safety Directory.com is an Internet gateway to occupational health & safety sites. This web site is indexed with information on industry specific topics, training, illness and injury, as well as safety publications and resources.

FEDERAL GOVERNMENT

CENTERS FOR DISEASE CONTROL & PREVENTION (CDC)
http://www.cdc.gov/

The CDC is always a good resource for current medical issues throughout the United States. Health topics from A-Z give an in-depth look at most communicable diseases as well as topics such as safe driving, violence, and air pollution, and workplace safety and health topics.

FEDERAL EMERGENCY MANAGEMENT ASSOCIATION (FEMA)
http://www.fema.gov/

For up-to-date information on active disasters and emergencies nationwide access this web site first. Publications include options for emergency preparedness and prevention, response and recovery, disaster fact sheets, and public awareness information.

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY & HEALTH (NIOSH)
http://www.cdc.gov/niosh/homepage.html

NIOSH's web site provides current information on many services as well as safety research, including ergonomics programs, respirators, and mining safety. At the chemical page you will find databases and other helpful resources, information on personal protective equipment, as well as government agency web sites of interest.

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION (OSHA)
http://www.osha.gov

OSHA'S official web site includes media releases, online publications, statistics, standards & directives, "Technical Links," training center courses, "hot topics," and "what's new" as well a very useful A-Z index page.

INTERNATIONAL RESOURCES

HEALTH & SAFETY EXECUTIVE (HSE)
http://www.hse.gov.uk/

The United Kingdom has an international safety web site with a good deal to offer on occupational safety & health. Drop down boxes offer A-Z industry information, health and safety topics, tools, research, as well as publications and statistics.

ERGNET
http://www.sunderland.ac.uk/~ts0gli/ergnet.htm

The University of Sunderland in the UK is an international web site directory of "places for ergonomics and human factors". Featuring lists of sources such as societies, organizations, government bodies, institutes, centers and laboratories, this site also gives links to journals, a research database and other general ergonomic sites.

OHIO

OHIO EPA (OEPA)

http://www.epa.state.oh.us

At the official web site for Ohio's Environmental Protection Agency; use the "Topic Index" to find regulations and information on permits, hazardous waste, pollution prevention, wastewater, wetlands, and much more.

OHIO STATE LIBRARY/OHIOLINK
http://winslo.state.oh.us

At **OhioLink**, a statewide library and information network, you can search the State Library of Ohio's collection for the BWC's Division of Safety & Hygiene library books as well as other Ohio College and university library collections. Also available at this web site are searchable versions of Ohio Administrative laws and rules, electronic databases, and other Ohio library directories.

SPECIFIC (BY SUBJECT)

CONSTRUCTION
http://www.cdc.gov/elcosh/index.html

CDC's **eLCOSH** is a comprehensive library of construction-related safety information presented in both English and Spanish with items listed under trade, hazard, job site, and others. Also see: The Construction Industry Safety Council, a Center to Protect Workers' Rights resource center at ***http://www.buildsafe.org/RSC.htm*** for OSHA publications in PDF and hazard alerts.

ERGONOMICS
http://www.ergoweb.com

ERGOWEB provides current information on ergonomics and human factor science. Offered are: research, case studies, reference material and a forum for questions, answers and discussion.

LABORATORY SAFETY
http://safety.science.tamu.edu/

Texas A&M University College of Science is an optional choice for safety in the laboratory information. From hazard identification to waste disposal this web site offers thorough coverage of laboratory safe practices.

MATERIAL SAFETY SHEETS
http://www.ilpi.com/msds/index.html

This web site offers many solutions for finding MSDS (100 free sites) as well as chemical manufacturers and suppliers, pesticides including fertilizers, government sites, and other miscellaneous locations for chemical data. Also check any toxicological effects at *http://www.atsdr.cdc.gov/toxprofiles/* and health and safety information on household chemical ingredients at *http://householdproducts.nlm.nih.gov/*.

MOTOR CARRIER SAFETY PROGRAMS

http://www.fmcsa.dot.gov/safetyprogs/saftprogs.htm

The Federal Motor Carrier Safety Administration (FMCSA), an administration within the U.S. Department of Transportation, regulates and supports the Nation's interstate commercial carrier industry. The FMCSA web page offers several safety programs in PDF format such as brake safety, fatigue, HAZMAT safety, speed management, sharing the road safely, and other insurance and licensing information.

RADIATION
http://www.physics.isu.edu/radinf/

The Radiation Information Network offers a web site that is in-depth with information on radiation topics and issues. In addition to what's new in the field and general information there are regulatory, organizational and society links as well as research and educational resources available to access.

SAFETY STATISTICS
http://stats.bls.gov/

Occupational health and safety statistics by industry and occupation can be researched for injuries, illnesses, and fatality data at this web site starting with the "Overview of BLS Statistics on Worker Safety and Health" page.

SAFETY BRIEFINGS, MANUALS, PRODUCTS & PROGRAMS

OSHA POWERPOINT SAFETY PRESENTATIONS
http://esf.uvm.edu/sirippt/powerpt.html

An extensive safety PowerPoint presentation library is available at this web site featuring A-Z topics such as accident investigations, bomb threats, chemical spills, construction, electrical, hand tools, emergency response, fire safety, forklifts, JSA, laser, OSHA compliance, PPE, razor knife safety, safe lifting, and many more.

SAFETY PUBLICATIONS & VIDEO RESOURCES
http://www.cbs.state.or.us/external/osha/standards/pub.htm

A valuable resource for safety resources, the Oregon State's Department of Consumer and Business Publications web site is packed with downloadable information. Areas covered are agriculture, asbestos abatement, occupational exposures, HAZCOM, HAZMAT, HAZWOPER, safety practices, writing manuals and programs, tools of the trade, workers' compensation and ergonomics.