

U.S. Department of Labor

Assistant Secretary for
Occupational Safety and Health
Washington, D.C. 20210



SEP 29 1994

*Ex. 8
ACCSH1994-4*

MEMORANDUM FOR: ADVISORY COMMITTEE ON CONSTRUCTION SAFETY AND HEALTH

FROM: JIM E. LAPPING
SPECIAL ASSISTANT

SUBJECT: Engineering Work Group Final Report

Bill Rhoten, Acting Chair, has requested that the attached Work Group report be placed on the October 1994 meeting agenda for review and action by the full committee.

Attachment

U.S. Department of Labor
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

ADVISORY COMMITTEE

ON

CONSTRUCTION

SAFETY AND HEALTH

ENGINEERING WORK GROUP

FINAL REPORT

October 12, 1994

Submitted by Acting Chair
William Rhoten

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- American Society of Civil Engineers 1994 Policies and Priorities - Construction Site Safety

FORWARD

During the August, 1993 meeting of the U.S. Department of Labor Advisory Committee on Construction Safety and Health the committee formed an Engineering Work Group. The work group was charged with the responsibility to research OSHA standards relevant to construction and make a determination where "Competent Persons," "Qualified Persons" and "Professional Engineers" are required - or should be required - to make decisions impacting work place safety and health.

The Work Group held the following meetings:

<u>Date</u>	<u>Location</u>
November 1, 1993	AFL-CIO - Washington, D.C.
March 10, 1994	U.S. Department of Labor Washington, D.C.
May 9, 1994	American Society of Civil Engineers Washington, D.C.
July 25, 1994	American Consulting Engineers Council Washington, D.C.
September 23, 1994	National Society of Professional Engineers Alexandria, Virginia

U.S. Department of Labor
Advisory Committee on Construction Safety and Health
Engineering Work Group

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**Advisory Committee on Construction Safety and Health
Occupational Safety and Health Administration
U.S. Department of Labor
Washington, D.C. 20210**

Meeting Notes and Final Report

Engineering Workgroup Meeting, September 23, 1994
National Society of Professional Engineers
Alexandria, Virginia

The meeting was attended by Jim Lapping, William C. Rhoten, Charles Worischek, Charley Campbell, Michael Charles, Val Ericson, Lee Garrigan, Kevin Sikora, Dale Cavanaugh, Matt Burkart, Peter C. Huddleston, Don Miller, Pat Finn, J.A. Padgett, Jr.

Mr. William Rhoten served as Acting Chair.

Item 1 The commentary on the Meridian Report submitted by Charles Worischek (NSPE) and reviewed during the July 25, 1994 meeting was approved for inclusion in the Workgroup final report.

Item 2 The definition of Engineer was approved as follows:

The term engineer is defined as a Professional Engineer, licensed or registered in the state where the work is to be performed, and who is designated and agrees to perform the required tasks as contained in this Part (1926)

Item 3 The following was also approved:

A site specific list of those operations or tasks that require the services of an engineer shall be compiled prior to the start of work. This list shall include a description of the engineering services required and shall be updated throughout the project to identify the designated engineer prior to the start of the designated operation or task and to incorporate newly identified tasks or activities requiring the services of an engineer.

Item 4 The following was approved on March 10, 1994:

The "design professional" who is employed directly by the owner and who is not involved in the ways, means, and methods of the construction process should not be responsible for worker safety and health; and

Design work or other engineering practices required for safe construction should be performed by a qualified engineer employed by a contractor.

Item 5 The following was approved on July 25, 1994:

Construction Employers shall notify the owner of requirements under OSHA regulations/standards to provide professional services and their intention to provide such services as required. This would include Licensed Professional Engineers, Certified Industrial Hygienist and Certified Safety Professionals.

Item 6 The following was approved on July 25, 1994:

It is recommended that OSHA adopt the following general requirements to be applicable to all construction work:

Licensed Professional Engineer shall approve the erection (construction) sequence, the bracing and bolting procedures and sequences and design interim bracing and shoring as required.

Item 7 The following was discussed during the July 25, 1994 meeting without formal recommendations:

There was a general discussion regarding the qualifications of Competent Persons when they have been assigned duties that may require the services of a Licensed Professional Engineer. For example, inspecting shoring to determine if there is damage requiring reinforcement. 1926.703(b)(4).

In such instances the Competent Person shall be capable of determining when a Licensed Professional Engineer is required. In some instances where a Competent Person is assigned duties that may require a Licensed Professional Engineer OSHA might require that a Licensed Professional Engineer approve the Competent Person as being qualified to perform those specific duties. In other situations a Licensed Professional Engineer may be required to be immediately available to the Competent Person or the Competent Person would be required to remove employees from hazardous conditions until a determination is made by a Licensed Professional Engineer that a hazard does not exist.

There also may be conditions where Licensed Professional Engineer would be required to establish Standard Operating Procedures to be followed or monitored by a Competent Person approved by the Licensed Professional Engineer.

Item 8 The report prepared by Ernie Jorgensen (August 4, 1994) describing the duties of Competent Persons, Qualified Persons and Engineers is included for information.

Item 9 The report prepared by Kevin Sikora listing those standards that contain requirements for Qualified Persons is included for information.

Item 10 The definitions provided by NSPE are included for information.

Item 11 The Canadian Guidelines for Design and Inspection of Formwork and Falsework on Construction Projects is included for information.

Item 12 The American Society of Civil Engineers policy on Construction Site Safety is included for information.

ITEM 1

National Society of Professional Engineers

Charles A. Worischeck, P.E.

Engineering Work Group

ACCSH

Meetings of 5/9/94 & 7/25/94

Commentary on the use of the terms Professional Engineer, qualified engineer, structural engineer and similiar terms in OSHA Construction Standards (29 CFR 1926) and the use of the terms "qualified person" and "competent person" as used in various sections of the Standards.

The comments are focused on the Final Report prepared by Meridian Research, Inc., dated August 9, 1993.

A.-Recommended useage of description for Licensed Professional Engineer

NSPE recommends the use of the term " Licensed Professional Engineer " wherever a requirement for the signing and sealing of plans and documents is required.

The definition of Licensed Professional Engineer as used in the Standards should conform to the wording used in Subpart P - Excavations for a Registered Professional Engineer, the only change suggested being the substitution of "Licensed" for "Registered.

Since the use of many pieces of purchased equipment that meet the required specifications is common, it is recommended that the certification of these pieces be current and that the embossed seal of a Licensed Professional Engineer be applied to the documents certifying that the equipment continues to meet the Standard and has not been altered or allowed to deteriorate. My experience has been that much of this equipment is used for many years and often has defects caused by alteration or deterioration and should not be used.

B.-Provisions in Osha Construction Standards that require the services of a professional engineer.

References are to pages in the Meridian report for convenience.

1. Page 1 - Subpart L - Scaffolding

1925.451 (b)(16) Replace qualified engineer with Licensed Professional Engineer.

1926.451 (c)(5);(e)(9);(g)(3) make all three consistent by the use of Licensed Professional Engineer in place of registered professional engineer.

1926.550 (a)(1) Replace qualified engineer with Licensed Professional Engineer. This change should conform to the definition in Subpart P-Excavations to provide for a Professional Engineer licensed in any state since much of this equipment is used in many localities.

Page 2 - Subpart N - Cranes,Derricks,Hoists,Elevators and Conveyors

1926.550 (g)(4)(i) Replace qualified engineer or a qualified person with Licensed Professional Engineer.

1926.552 (a)(1);(b)(7);(c)(17)(i) Make all three paragraphs consistent by using Licensed Professional Engineer instead of professional engineer or registered professional engineer.

1926.552 (c)(17)(i) change last phrase to read: erected under the supervision of a Licensed Professional Engineer competent in this field.

Page 2 - Subpart P - Excavations

1926.650 (b) Replace the term registered professional engineer with Licensed Professional Engineer. Replace the word registered with Licensed in the second paragraph.

Pages 3, 4, 5 Subpart P-Excavations

Replace the term registered professional engineer with Licensed Professional Engineer wherever it occurs.

Page 6 - Subpart Q-Concrete and Masonry Construction

1926.703 (b)(8)(i) Replace the terms qualified engineer and engineer qualified in design with Licensed Professional Engineer.

1926.705 (a);(k)(i);Appendix Replace the term registered professional engineer with Licensed Professional Engineer.

C.-Provisions in OSHA Construction Standards that imply or can be interpreted as implying that the expertise of a Professional Engineer is required.

Page 8 Subpart E-Personal Protective and Life Saving Equipment

1926.104 (b) There is little question that the determination of anchorage or structural capacity to support the minimum weight would require an analysis by a structural engineer. Tie points should be determined in advance (during design) or analyzed for capacity by a licensed engineer. There are few jobs with field personnel capable of this analysis. Needs a Licensed P.E.

Subpart F-Fire Protection and Prevention

1926.152 (b)(4)(ii) There is considerable controversy over the design of automatic extinguishing systems by P.E.'s only or by Fire Control System Firms and state laws vary. The intent of this paragraph emphasizes the total system including adequate drains to safe location and liquid-tight wall-floor joints. The design of the total system undeniably requires the expertise of a Licensed Professional Engineer.

Page 9 - Subpart L - Scaffolding

1926.451 (c)(1);(c)(2);(c)(3)- The use of standard 2" O.D. steel scaffolds is well defined. The use of other sizes of steel tubing or other materials which may be used calls for an engineering analysis to assure sufficient strength and stability. I suggest the use of a Licensed Professional Engineer be required for this purpose.

Page 10 - Subpart L - Scaffolding

1926.451 (h)(1);(h)(6) Masons' adjustable multiple-point suspension scaffolds seem, in general, to be loosely specified. It is possible that providers of this equipment issue instructions with this equipment, however it seems that better definition of the criteria should be part of the Standard. The Meridian comment that a Licensed Professional Engineer may be required is correct, particularly in the instance of the provision of additional beams and the change of spacing for overhangs exceeding 6'6".

1926.451 (w)(1) Float or ship scaffolds are generally well specified, however the Meridian comment on substitute designs is correct and the use of a Licensed Professional Engineer should be required.

Pages 11 & 12 - Subpart M-Floor and Wall Openings

1926.500 Guard Rails, Handrails and Covers

The Standards cover common useages, however the specific details of the entire protection systems may not necessarily fulfill the basic requirements for strength. The definition of "minimum deflection" defies quantification. A particular source of trouble is the attachment of protective devices on odd shaped structures. It would appear that some method of field testing for required strength or certification by a Licensed Professional Engineer is in order.

Pages 13, 14 & 15 - Subpart N-Cranes, Derricks, Hoists, Elevators and Conveyors

1926.550 g(2) The determination of modifying (if only temporary) of the structural integrity of a structure to provide for access by means other than crane or derrick supported platforms would certainly require the expertise of the Licensed Professional Engineer who designed the structure

1926.550 g(5)(vi) The design of the personnel platform as well as the witnessing of the proof test and the design of modifications to correct any deficiencies should be performed by a Licensed Professional Engineer.

1926.550 (g)(6)(vii) The body belt/harness system should be an integral part of the personnel platform design and therefore should be designed by a Licensed Professional Engineer, particularly in the attachment of the fall system to the platform if industry-standard lanyards are used.

1926.552 (c)(16) Material Hoists, Personnel Hoists and
Elevators

The design of these devices should be performed by a Licensed Professional Engineer and recertified from job to job to insure that modifications made or possible deterioration have not affected safe use for the purpose intended. (I did not have ANSI A10.4-1963 to refer to)

Page 15 - Subpart O-Motor Vehicles, Mech. Equip. & Conveyors

1926.603 - Pile Driving Equipment- (a)(12) The design of special devices, other than standard equipment provided by the manufacturer, used to support or stabilize pile driving (and other) equipment should be designed by a Licensed Professional Engineer, preferably provided by the manufacturer of the original equipment. The design of the original equipment should be performed by a Licensed Professional Engineer and recertified for use periodically.

Pages 16, 17 & 18 - Subpart P-Excavations

1926.651 (c)(1)(i) The design of structural ramps for access or egress from excavations should be performed by a Licensed Professional Engineer.

1926.651 (h)(1) The design of special support or shield systems should be performed by a Licensed Professional Engineer.

1926.651 (i)(1);(i)(2);(i)(2)(i);(i)(3) A Licensed Professional Engineer should be required to determine the stability of adjacent structures and to design appropriate support systems.

1926.652 (e)(1)(iii) and(iv)(C.W. Addition) The design for the bracing and rebracing of excavation support systems must be performed by a Licensed Professional Engineer if the system sequences do not conform with standard forms of support in the Standards. Where special designs (other than those in the Standards) are required, the sequence of removal or rebracing of should be part of the original P.E. design or by consultation with the P.E. if changed conditions occur.

Appendix B - (c)(3)(iii) While a competent person is allowed to make such judgements, the combination of loads possible make it advisable to consult with a Licensed Professional Engineer where a combination of these factors is present.

Appendix D - Do not see this as requiring other than a competent person

Pages 19,20, & 21 - Subpart Q-Concrete and Masonry
Construction

1926.701 - Gen'l Requirements - A Licensed Professional Engineer should be required to determine if a concrete structure is capable of supporting the loads intended to be placed on it.

1926.702 (e)(1) Supports for concrete pumping systems where supported on the ground or on other continuous supports such as floors or roofs can be satisfactorily planned by a competent or qualified person. Where the concrete pumping system is elevated or rises vertically, the support system should be designed by a Licensed Professional Engineer with due regard for thrust created by pumping pressures as well as weight.

1926.703 (a)(1) General Requirements for formwork - I did not have ANSI A10.9-1983 for reference (Appendix), however the loading of forms and the structural design to provide for the combination of vertical, lateral and impact loads require the expertise of a Licensed Professional Engineer both in support and in suitability of the form for the purpose intended.

1926.703 (b)(4) Shoring equipment - Shoring equipment should be recertified for use on each job, however a Licensed Professional Engineer should be required to determine the shoring strength and to determine the required reinforcement. Deterioration or modification of shoring equipment should be assessed before erection by a Licensed Professional Engineer.

1926.704-Requirements for Precast Concrete

(a) It would appear that a licensed Professional Engineer should analyze and design the erection sequence and the interim bracing and shoring systems until permanent connections are completed.

Page 21- Subpart R-Steel Erection

1926.750 (a)(1),(2)

1926.752 (d)(4)

A licensed Professional Engineer should analyze and design the erection sequence, the bracing and bolting procedures and sequences used on multi-story structures. (This might better be a general requirement)

(This entire section is, I believe, being discussed by another advisory group. This item should be brought to their attention.)

Page 22 and 23- Subpart S-Underground
Construction,Caissons,Cofferdams and Compressed Air

1926.800-Underground Construction

(c) There is little question that a licensed Professional Engineer should determine the structural integrity of underground facilities during all phases of construction.

(o)(1),(2),(3)(i)(A,B),(iii),(v),(vi),(vii),(viii),(4)(i),
(iiA)

All supports, temporary or permanent, should be designed by a licensed Professional Engineer experienced in underground work.

(o)(3)(iv)(A),(B)

Normally the design provided by the owner provides for the use of torque wrenches, the necessary torque and the testing frequency. If this is not the case, a licensed Professional Engineer should determine such requirements.

1926.803 (b)(10) The medical lock should be designed by a licensed Professional Engineer, and,in addition, should be certified for use at the beginning of construction and recertified periodically during construction on long projects.(? 1 yr.or more)

1926.801 Caissons
1926.802 Cofferdams

Caissons and Cofferdams should be designed by a licensed Professional Engineer. (addendum to the Meridian report)

Subpart T-Demolition

1926.850 - Preparatory Operations

(a) For multiple story buildings, a licensed Professional Engineer should make this survey. For single story buildings a competent person shall determine if a Licensed Professional Engineer is required to analyze demolition procedures. Competent persons making these inspections should have immediate access to a licensed Professional Engineer qualified to determine stability and to design support systems as required.

(b) The shoring and bracing of walls and floors in damaged multiple story buildings should be designed by a licensed Professional Engineer. (Addenda to Meridian report)

(k) Sidewalk sheds or canopies should be designed by a licensed Professional Engineer for all loading conditions expected. (Addenda to Meridian report)

1926.857- A licensed Professional Engineer should be required to analyze the stability of the structure.

1926.858- A licensed Professional Engineer should determine if demolition procedures will overstress structural members. (steel or any other material)

1926.859- Competent persons making these inspections should have immediate access to a licensed Professional Engineer qualified to determine stability and to design support systems as required.

Subpart W-Rollover Protection Structures

1926.1001(a)
1926.1003(a)(1)

A licensed Professional Engineer should be required to design these structures.

Subpart X-Stairways and Ladders

1926.1053(a)(22),(23) - A licensed Professional Engineer should design employer-built or installed safety devices to conform with these standards.

ITEM 1.1

**PROVISIONS IN OSHA CONSTRUCTION STANDARDS (29 CFR 1926)
THAT REQUIRE THE EXPERTISE OF A PROFESSIONAL ENGINEER**

FINAL REPORT

Prepared for:
Occupational Safety and Health Subcommittee
Environment, Safety and Health Advisory Committee
U.S. Department of Energy

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Prepared under:
Task No. 4, Subcontract No. 194470-A-II
With Pacific Northwest Laboratories

August 9, 1993

INTRODUCTION

The Occupational Safety and Health Subcommittee of the Environment, Safety and Health Advisory Committee (ESHAC), Department of Energy (DOE), requested that Meridian Research, Inc., under the terms of Meridian's subcontract with Pacific Northwest Laboratories' contract with the DOE, identify and interpret all provisions in OSHA's Construction Industry standards (29 CFR Part 1926) that either specifically require the services of a professional engineer or could be interpreted as requiring such services.

The first section of the report presents the actual text of those provisions of the construction standards that specifically call for the services of a registered professional engineer. The second section of the report, which begins on page 7, presents the actual text of those provisions of the standards that could be interpreted as implying that an employer may have to obtain the services of an engineer to achieve compliance. In other words, the regulatory provisions in the second part of this report imply, rather than specify, that such services are or may be necessary to achieve compliance. For example, several provisions in the construction standards require that a "competent person" design a particular piece of equipment. This "competent person" may need to be a professional engineer, depending on the complexity or uniqueness of the design, local regulatory requirements, and other considerations. In other cases, an employer has the option either of purchasing a piece of equipment meeting the standard's specifications or of hiring an engineer to design the equipment to meet these specifications. Because the requirements in the second part of this report are implied rather than specified, they are subject to interpretation. The interpretations in this report are not official; for an official interpretation of these requirements, readers should contact the Occupational Safety and Health Administration.

**PART I. PROVISIONS IN OSHA CONSTRUCTION STANDARDS (29 CFR 1926)
THAT SPECIFICALLY REQUIRE THE SERVICES OF
A PROFESSIONAL ENGINEER**

Construction Standards (29 CFR 1926) Specifically Requiring the Services of a Professional Engineer

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
1926.451	Wood Pole Scaffolds	<p align="center">Subpart L--Scaffolding</p> <p>(b)(16) All wood pole scaffolds 60 feet or less in height shall be constructed and erected in accordance with Tables L-4 to L-10. If they are over 60 feet in height, they shall be designed by a qualified engineer competent in this field and shall be constructed and erected in accordance with such design.</p>
	Tube and Coupler Scaffolds	<p>(c)(5) All tube and coupler scaffolds shall be constructed and erected to support four times the maximum intended loads, as set forth in Tables L-10, L-11, and L-12, or as set forth in the specifications by a licensed professional engineer competent in this field.</p>
	Tubular Welded Frame Scaffolds	<p>(e)(9) Drawings and specifications for all frame scaffolds over 125 feet in height above the base plates shall be designed by a registered professional engineer.</p>
	Outrigger Scaffolds	<p>(g)(3) Unless outrigger scaffolds are designed by a registered professional engineer competent in this field, they shall be constructed and erected in accordance with Table L-13. Outrigger scaffolds, designed by a registered professional engineer, shall be constructed and erected in accordance with such design.</p>
	Subpart N--Cranes, Derricks, Hoists, Elevators, and Conveyors	
1926.550	General Requirements	<p>(a)(1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field, and such determinations will be appropriately documented and recorded. Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer.</p>

Construction Standards (29 CFR 1926) Specifically Requiring the Services of a Professional Engineer (Continued)

SECTION	SUBJECT	PARAGRAPHS/TEXT OF REQUIREMENT
Subpart N—Cranes, Derricks, Hoists, Elevators, and Conveyors (Cont.)		
1926.550 (Cont.)	Crane or Derrick Suspended Personnel Platforms	(g)(4)(i) The personnel platform and suspension system shall be designed by a qualified engineer or a qualified person competent in structural design.
1926.552	Material Hoists, Personnel Hoists, and Elevators General Requirements	(a)(1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all hoists and elevators. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determination of a professional engineer competent in the field.
	Material Hoists	(b)(7) All material hoist towers shall be designed by a licensed professional engineer.
	Personnel Hoists	(c)(17)(i) Personnel hoists used in bridge tower construction shall be approved by a registered professional engineer and erected under the supervision of a qualified engineer competent in this field.
Subpart P—Excavations		
1926.650	Scope, Application, and Definitions Applicable to This Subpart	(b) "Accepted engineering practices" means those requirements which are compatible with standards of practice required by a registered professional engineer. "Registered professional engineer" means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

Construction Standards (29 CFR 1926) Specifically Requiring the Services of a Professional Engineer (Continued)

SECTION	SUBJECT	PARAGRAPHS/TEXT OF REQUIREMENT
1926.650 (Cont.)	Scope, Application, and Definitions Applicable to This Subpart (Cont.)	<p align="center">Subpart P—Excavations (Cont.)</p> <p>"Stable rock" means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.</p> <p>"Tabulated data" means tables and charts approved by a registered professional engineer and used to design and construct a protective system.</p>
1926.651	General Requirements	<p>(i)(2) Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:</p> <p>...</p> <p>(iii) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or</p> <p>(iv) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.</p>

Construction Standards (29 CFR 1926) Specifically Requiring the Services of a Professional Engineer (Continued)

SECTION	SUBJECT	PARAGRAPHS/TEXT OF REQUIREMENT
1926.652	<p align="center">Requirements for Protective Systems</p> <p>-- Design of Sloping and Benching Systems</p> <p>-- Option (3)-- Designs Using Other Tabulated Data</p>	<p align="center">Subpart P--Excavations (Cont.)</p> <p>(b)(3)(i) Designs of sloping and benching systems shall be selected from and be in accordance with tabulated data, such as tables and charts.</p> <p>(b)(3)(iii) At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.</p>
	<p>-- Option (4)-- Design by a Registered Professional Engineer</p> <p>-- Design of Support Systems, Shield Systems, and Other Protective Systems</p> <p>-- Option (3)-- Designs Using Other Tabulated Data</p>	<p>(b)(4)(i) Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under paragraph (b) of this section shall be approved by a registered professional engineer. Designs shall be in written form and shall include at least the following:</p> <p>-- (C) The identity of the registered professional engineer approving the design.</p> <p>(c)(3)(i) Designs of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, such as tables and charts.</p> <p>(c)(3)(iii) At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.</p>

Construction Standards (29 CFR 1926) Specifically Requiring the Services of a Professional Engineer (Continued)

SECTION	SUBJECT	PARAGRAPHS/TEXT OF REQUIREMENT
1926.652 (Cont.)	<p align="center">--- Option (4)--- Design by a Registered Professional Engineer</p>	<p align="center">Subpart P--Excavations (Cont.)</p> <p>(c)(4)(i) Support systems, shield systems, and other protective systems not utilizing Option 1, Option 2 or Option 3, above, shall be approved by a registered professional engineer.</p> <p>(c)(4)(iii) Designs shall be in written form and shall include the following:</p> <p>... (B) The identity of the registered professional engineer approving the design.</p> <p>(d)(3) When material or equipment that is used for protective systems is damaged, a competent person shall examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.</p>
Appendix B	Sloping and Benching	Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.
Appendix F	Selection of Protective Systems	Protective systems for use in excavations more than 20 feet in depth must be designed by a registered professional engineer in accordance with 1926.652 (b) and (c).

Construction Standards (29 CFR 1926) Specifically Requiring the Services of a Professional Engineer (Continued)

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
Subpart Q—Concrete and Masonry Construction		
1926.703	Requirements for Cast-in-Place Concrete	(b)(8)(i) Design of the shoring shall be prepared by a qualified engineer and the erect shoring shall be inspected by an engineer qualified in structural design.
1926.705	Requirements for Lift-Slab Construction Operations	(a) Lift-slab operations shall be designed and planned by a registered professional engineer who has experience in lift-slab construction.
		(k)(1) No employee, except those essential to the jacking operation, shall be permitted in the building/structure while any jacking operation is taking place unless the building/structure has been reinforced sufficiently to insure its integrity during erection. The phrase "reinforced sufficiently to insure its integrity" used in this paragraph means that a registered professional engineer, independent of the engineer who designed and planned the lifting operation, has determined from the plans that if there is a loss of support at any jack location, that loss will be confined to that location and the structure as a whole will remain stable.
	Appendix to 1926.705	In paragraph 1926.705(k), OSHA requires employees to be removed from the building/structure during jacking operations unless an independent registered professional engineer, other than the engineer who designed and planned the lifting operation, has determined that the building/structure has been sufficiently reinforced to insure the integrity of the building/structure.

**PART II. PROVISIONS IN OSHA CONSTRUCTION STANDARDS
(29 CFR 1926) THAT IMPLY OR CAN BE INTERPRETED AS IMPLYING
THAT THE EXPERTISE OF A PROFESSIONAL ENGINEER IS REQUIRED**

**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
Subpart E--Personal Protective and Life Saving Equipment			
1926.104	Safety Belts, Lifelines, and Lanyards	(b) Lifelines shall be secured above the point of operation to an anchorage or structural member capable of supporting a minimum dead weight of 5,400 pounds.	An engineer may be required to determine the strength of the structural member.
Subpart F--Fire Protection and Prevention			
1926.152	Flammable and Combustible Liquids Indoor Storage of Flammable and Combustible Liquids	(b)(4)(ii) Where an automatic extinguishing system is provided, the system shall be designed and installed in an approved manner. Openings to other rooms or buildings shall be provided with noncombustible liquid-tight raised sills or ramps at least 4 inches in height, or the floor in the storage area shall be at least 4 inches below the surrounding floor. Openings shall be provided with approved self-closing fire doors. The room shall be liquid-tight where the walls join the floor. A permissible alternate to the sill or ramp is an open-grated trench, inside of the room, which drains to a safe location. Where other portions of the building or other buildings are exposed, windows shall be protected as set forth in the Standard for Fire Doors and Windows, NFPA No. 80-1970, for Class E or F openings. Wood of at least 1-inch nominal thickness may be used for shelving, racks, dunnage, scuffboards, floor overlay, and similar installations.	An engineer may be required to design automatic extinguishing systems.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.451	Scaffolding Tube and Coupler Scaffolds	<p align="center">Subpart L—Scaffolding</p> <p>(c)(1) A light duty tube and coupler scaffold shall have all posts, bearers, runners, and bracing of nominal 2-inch O.D. steel tubing. The posts shall be spaced no more than 6 feet apart by 10 feet along the length of the scaffold. Other structural metals when used must be designed to carry an equivalent load. No dissimilar metals shall be used together.</p> <p>(c)(2) A medium duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal 2-inch O.D. steel tubing. Posts spaced not more than 6 feet apart by 8 feet along the length of the scaffold shall have bearers of nominal 2.5-inch O.D. steel tubing. Posts spaced not more than 5 feet apart by 8 feet along the length of the scaffold shall have bearers of nominal 2-inch O.D. steel tubing. Other structural metals, when used, must be designed to carry an equivalent load. No dissimilar metals shall be used together.</p> <p>(c)(3) A heavy duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal 2-inch O.D. steel tubing, with the posts spaced not more than 6 feet by 6 feet-6 inches. Other structural metals, when used, must be designed to carry an equivalent load. No dissimilar metals shall be used together.</p>	An engineer may be required to determine design requirements and capabilities if structural metals other than 2-inch O.D. steel tubing is used.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.451 (Cont.)	Scaffolding (Cont.) Mason's Adjustable Multiple-Point Suspension Scaffolds	Subpart L—Scaffolding (Cont.)	
		(h)(1)	The scaffold shall be capable of sustaining a working load of 50 pounds per square foot and shall not be loaded in excess of that figure.
		(h)(6)	Where the overhang exceeds 6 feet 6 inches, outrigger beams shall be composed of stronger beams or multiple beams and be installed under the supervision of a competent person.
	Float or Ship Scaffolds	(w)(1) Float or ship scaffolds shall not be used to support more than three men and a few light tools, such as those needed for riveting, bolting, and welding. They shall be constructed as designed in paragraphs (w)(2) through (o) of this section unless substitute designs and materials provide equivalent strength, stability, and safety.	Where substitute designs or materials are used, an engineer may be required to determine if equivalent strength, stability, and safety are provided.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.500	Guardrails, Handrails, and Covers Standard Specifications	<p align="center">Subpart M—Floor and Wall Openings</p> <p>(f)(1)(iii) For structural steel railings, posts, and top and intermediate rails shall be of 2-inch by 2-inch by 3/8-inch angles or other metal shapes of equivalent bending strength, with posts spaced not more than 8 feet on centers.</p> <p>(f)(1)(iv) The anchoring of posts and framing of members of railings of all types shall be of such construction that the completed structure shall be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail, with a minimum of deflection.</p> <p>(f)(1)(vi) Other types, sizes, and arrangements of railing construction are acceptable provided they meet the following conditions:</p> <p>(f)(1)(vi)(B) A strength to withstand at least the minimum requirement of 200 pounds top rail pressure with a minimum of deflection.</p>	<p>If 2" X 2" X 3/8" angles are not used, an engineer may be required to determine if the metal shapes used have equivalent bending strength.</p> <p>An engineer may be required to design posts and framing members for railings to withstand 200 pounds applied in any direction at any point on the top rail.</p>

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer Is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.500 (Cont.)	Guardrails, Handrails, and Covers Standard Specifications (Cont.)	<p align="center">Subpart M—Floor and Wall Openings (Cont.)</p> <p>(f)(7) Wall opening protection shall meet the following requirements:</p> <p>(f)(7)(i) Barriers shall be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least 200 pounds applied in any direction (except upward), with a minimum of deflection at any point on the top rail or corresponding member.</p> <p>(f)(7)(ii) Screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied horizontally at any point on the near side of the screen. They may be of solid construction, of grill work with openings not more than 8 inches long, or of slat work with openings not more than 4 inches wide with length unrestricted.</p>	<p>An engineer may be required to design wall opening barriers and screens to withstand 200 pounds applied in any direction at any point on the top rail or corresponding member, or on the near side of the screen.</p>
	Guarding of Low-Pitched Roof Perimeters During the Performance of Built-Up Roofing Work Warning Lines	<p>(g)(3)(ii)(c) 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 Newtons) applied horizontally against the stanchion, 30 inches (0.76 meters) above the roof surface, perpendicular to the warning line, and in the direction of the roof edge.</p>	<p>An engineer may be required to design stanchions capable of resisting a 16-pound force applied horizontally at 30 inches without tipping.</p>

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.550	Cranes and Derricks	(g)(2) 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.	An engineer may be required to determine if the structural design of a worksite prohibits the use of a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold.
	Crane or Derrick Suspended Personnel Platforms	(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.	An engineer may be required to identify and assess any potential defects to components or structure resulting from testing.
	General Requirements	(g)(5)(v) Any defects found during inspections which create a safety hazard shall be corrected before hoisting personnel.	

Subpart N—Cranes, Derricks, Hoists, Elevators, and Conveyors

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.550 (Cont.)	<p align="center">Subpart N—Cranes, Derricks, Hoists, Elevators, and Conveyors (Cont.)</p> <p>Cranes and Derricks</p> <p>Crane or Derrick Suspended Personnel Platforms</p> <p>Trial Lift, Inspection, and Proof-Testing (Cont.)</p>	<p>(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.</p>	<p>An engineer may be required to determine if defects will adversely affect the components or structure and to design appropriate corrections.</p>
	Work Practices	<p>(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 Sec. 1926.106 shall apply.</p>	<p>An engineer may be required to determine if a structural member is capable of supporting the fall impact of an employee and is therefore suitable as a personnel fall protection anchorage point.</p>

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
Subpart N—Cranes, Derricks, Hoists, Elevators, and Conveyors (Cont.)			
1926.552	Material Hoists, Personnel Hoists, and Elevators Personnel Hoists	(c)(16) All personnel hoists used by employees shall be constructed of materials and components which meet the specifications for materials, construction, safety devices, assembly, and structural integrity as stated in the American National Standard A10.4-1963, Safety Requirements for Workmen's Hoists. The requirements of this paragraph (c)(16) do not apply to cantilever type personnel hoists.	An engineer may be required to design personnel hoists to assure the hoist is constructed in accordance with ANSI A10.4-1963.
Subpart O—Motor Vehicles, Mechanized Equipment, and Marine Operations			
1926.603	Pile Driving Equipment General Requirements	(a)(12) Guys, outriggers, thrustouts, or counterbalances shall be provided as necessary to maintain stability of pile driver rigs.	An engineer may be required to determine necessary guys, outriggers, thrustouts, or counterbalances to maintain stability of pile driver rigs.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer Is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.651	<p>General Requirements Access and Egress Structural Ramps</p>	<p align="center">Subpart P—Excavations</p> <p>(c)(1)(i) Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.</p>	<p>An engineer may be required to design structural ramps used for access or egress of equipment.</p>
	<p>Protection From Hazards Associated With Water Accumulation</p>	<p>(h)(1) Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.</p>	<p>An engineer may be required to design special support or shield systems to protect employees from cave-ins in excavations where water is accumulating.</p>

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.651 (Cont.)	Stability of Adjacent Structures	<p align="center">Subpart P—Excavations (Cont.)</p> <p>(i)(1) Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.</p> <p>(i)(2) Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:</p> <p>(i)(2)(i) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; ...</p> <p>(i)(3) Sidewalks, pavements, and appurtenant structure shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.</p>	An engineer may be required to determine the stability of adjacent structures and to design appropriate support systems.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
Subpart P—Excavations (Cont.)			
1926.652	Requirements for Protective Systems Installation and Removal of Support General	(e)(1)(iii) Individual members of support systems shall not be subjected to loads exceeding those which those members were designed to withstand.	An engineer may be required to determine the loads on individual structural members.
Appendix B—Sloping and Benching	Requirements Actual Slope	(c)(3)(iii) When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved. Surcharge loads from adjacent structures shall be evaluated in accordance with Sec. 1926.652(i).	An engineer may be required to determine surcharge loads and to determine the required reduction in slope.
Appendix D—Aluminum Hydraulic Shoring for Trenches	Basis and Limitations of the Data	(d)(ii) When any of the following conditions are present, the members specified in the Tables are not considered adequate. In this case, an alternative aluminum hydraulic shoring system or other type of protective system must be designed in accordance with Sec. 1926.652. (d)(ii)(A) When vertical loads imposed on cross braces exceed a 100 pound gravity load distributed on a one foot section of the center of the hydraulic cylinder....	An engineer may be required to determine the vertical loads on cross braces and to design alternative protective systems where necessary.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
Subpart Q—Concrete and Masonry Construction			
1926.701	General Requirements Construction Loads	(a) No construction loads shall be placed on a concrete structure or portion of a concrete structure unless the employer determines, based on information received from a person who is qualified in structural design, that the structure or portion of the structure is capable of supporting the loads.	An engineer may be required to determine if a concrete structure is capable of supporting the loads intended to be placed upon it.
1926.702	Requirements for Equipment and Tools Concrete Pumping Systems	(e)(1) Concrete pumping systems using discharge pipes shall be provided with pipe supports designed for 100 percent overload.	An engineer may be required to design supports for piping for concrete pumping systems.
1926.703	Requirements for Cast-in-Place Concrete General Requirements for Formwork	(a)(1) Formwork shall be designed, fabricated, erected, supported, braced and maintained so that it will be capable of supporting without failure all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork. Formwork which is designed, fabricated, erected, supported, braced, and maintained in conformance with the Appendix to this section will be deemed to meet the requirements of this paragraph.	An engineer may be required to determine expected vertical and lateral loads and to design formwork to support these loads.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.703 (Cont.)	Requirements for Cast-in-Place Concrete (Cont.) Shoring and Reshoring	<p align="center">Subpart Q—Concrete and Masonry Construction (Cont.)</p> <p>(b)(4) Shoring equipment that is found to be damaged or weakened after erection, such that its strength is reduced to less than that required by 1926.703(a)(1), shall be immediately reinforced.</p>	An engineer may be required to determine the degree to which shoring equipment strength has been reduced and to determine the required reinforcement.
	Vertical Slip Forms	<p>(c)(1) The steel rods or pipes on which jacks climb or by which the forms are lifted shall be:</p> <p>(i) Specifically designed for that purpose; and</p> <p>(ii) Adequately braced where not encased in concrete.</p> <p>(c)(2) Forms shall be designed to prevent excessive distortion of the structure during the jacking operations.</p> <p>(c)(3) All vertical slip forms shall be provided with scaffolds or work platforms where employees are required to work or pass.</p> <p>(c)(4) Jacks and vertical supports shall be positioned in such a manner that the loads do not exceed the rated capacity of the jacks.</p> <p>(c)(5) The jacks or other lifting devices shall be provided with mechanical dogs or other automatic holding devices to support the slip forms whenever failure of the power supply or lifting mechanism occurs.</p> <p>(c)(6) The form structure shall be maintained within all design tolerances specified for plumbness during the jacking operation.</p> <p>(c)(7) The predetermined safe rate of lifts shall not be exceeded.</p>	<p>An engineer may be required to:</p> <ol style="list-style-type: none"> (1) Determine adequate bracing for jack rods or pipes; (2) Design forms to prevent excessive distortion; (3) Determine appropriate position of jacks and supports; and (4) Determine the safe rate of lift.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.704	Requirements for Precast Concrete	<p align="center">Subpart Q—Concrete and Masonry Construction (Cont.)</p> <p>(a) Precast concrete wall units, structural framing, and tilt-up wall panels shall be adequately supported to prevent overturning and to prevent collapse until permanent connections are completed.</p>	An engineer may be required to determine the necessary support for precast concrete structures.
1926.750	Flooring Requirements Permanent Flooring—Skeleton Steel Construction in Tiered Buildings	<p align="center">Subpart R—Steel Erection</p> <p>(a)(1) The permanent floors shall be installed as the erection of structural members progresses, and there shall be not more than eight stories between the erection floor and the uppermost permanent floor, except where the structural integrity is maintained as a result of the design.</p>	Where there are more than 8 stories between the erection floor and the uppermost permanent floor, an engineer may be required to determine structural integrity.
1926.752	Bolting, Riveting, Fitting-up, and Plumbing-up Plumbing-up	<p>(d)(4) Plumbing-up guys shall be removed only under the supervision of a competent person.</p>	An engineer may be required to determine if the structure is properly supported prior to removal of the plumbing-up guys.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*	
1926.800	<p align="center">Subpart S—Underground Construction, Caissons, Cofferdams, and Compressed Air</p> <p>Underground Construction</p> <p>Check-in/Check-out</p>	(c) The employer shall maintain a check-in/check-out procedure that will ensure that aboveground personnel can determine an accurate count of the number of persons underground in the event of an emergency. However, this procedure is not required when the construction of underground facilities designed for human occupancy has been sufficiently completed so that the permanent environmental controls are effective, and when the remaining construction activity will not cause any environmental hazard or structural failure within the facilities.	An engineer may be required to determine the structural integrity of underground facilities under construction to determine the need for the check-in/check-out procedure.	
			(o)(2) The employer shall ensure ground stability in hazardous subsidence areas by shoring, by filling in, or by erecting barricades and posting warning signs to prevent entry.	An engineer may be required to determine ground stability and to design appropriate protective systems.
		Underground Areas	(o)(3)(i)(A) A competent person shall inspect the roof, face, and walls of the work area at the start of each shift and as often as necessary to determine ground stability.	An engineer may be required to determine ground stability and to design appropriate protective systems.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
Subpart S--Underground Construction, Caissons, Cofferdams, and Compressed Air (Cont.)			
1926.800 (Cont.)	Underground Construction Ground Support Underground Areas (Cont.)	(o)(3)(iv)(A) Torque wrenches shall be used wherever bolts that depend on torsionally applied force are used for ground support. (o)(3)(iv)(B) A competent person shall determine whether rock bolts meet the necessary torque, and shall determine the testing frequency in light of the bolt system, ground conditions and the distance from vibration sources.	An engineer may be required to determine appropriate torque and to determine the testing frequency.
1926.803	Compressed Air Medical Attendance, Examination, and Regulations	(b)(10) The medical lock shall: ...(vii) Be designed for a working pressure of 75 psig...	An engineer may be required to design a medical lock to withstand 75 psig.
Subpart T--Demolition			
1926.850	Preparatory Operations	(a) Prior to permitting employees to start demolition operations, an engineering survey shall be made, by a competent person, of the structure to determine the condition of the framing, floors, and walls, and possibility of unplanned collapse of any portion of the structure. Any adjacent structure where employees may be exposed shall also be similarly checked. The employer shall have in writing evidence that such a survey has been performed.	An engineer may be required to perform the required engineering survey.

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**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
Subpart T—Demolition (Cont.)			
1926.852	Chutes	(g) Chutes shall be designed and constructed of such strength as to eliminate failure due to impact of materials or debris loaded therein.	An engineer may be required to design chutes.
1926.857	Storage	(d) Floor arches, to an elevation of not more than 25 feet above grade, may be removed to provide storage area for debris, provided that such removal does not endanger the stability of the structure.	An engineer may be required to determine if floor arch removal will endanger the stability of the structure.
1926.858	Removal of Steel Construction	(d) Any structural member being dismembered shall not be overstressed.	An engineer may be required to determine if a structural member is being overstressed.
1926.859	Mechanical Demolition	(g) During demolition, continuing inspections by a competent person shall be made as the work progresses to detect hazards resulting from weakened or deteriorated floors, or walls, or loosened material. No employee shall be permitted to work where such hazards exist until they are corrected by shoring, bracing, or other effective means.	An engineer may be required to determine structural stability and to design appropriate support systems.

* In the case of regulatory provisions that contain equipment or material specifications, the services of an engineer would not be necessary if the employer chooses to purchase equipment that meets the required specifications. These interpretations are not official; OSHA should be contacted for official interpretation.

**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer Is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
Subpart W--Rollover Protective Structures; Overhead Protection			
1926.1001	Minimum Performance Criteria for Rollover Protective Structures for Designated Scrapers, Loaders, Dozers, Graders, and Crawler Tractors General	<p>(a) This section prescribes minimum performance criteria for rollover protective structures (ROPS) for rubber-tired self-propelled scrapers; rubber-tired front-end loaders and rubber-tired dozers; crawler tractors and crawler-type loaders; and motor graders. The vehicle and ROPS as a system shall have the structural characteristics prescribed in paragraph (f) of this section of each type of machine described in this paragraph.</p>	<p>An engineer may be required to design the ROPS to assure that structural characteristics prescribed in paragraph 1926.1001(f) are met.</p>
1926.1003	Overhead Protection for Operators of Agricultural and Industrial Tractors General Purpose	<p>(a)(1) When overhead protection is provided on wheel-type agricultural and industrial tractors, the overhead protection shall be designed and installed according to the requirements contained in this section. The provisions of section 1926.1001 for rubber-tired dozers and rubber-tired loaders may be used in lieu of the standards contained in this section. The purpose of the standard is to minimize the possibility of operator injury resulting from overhead hazards such as flying and falling objects, and at the same time to minimize the possibility of operator injury from the cover itself in the event of accidental upset.</p>	<p>An engineer may be required to design overhead protection for agricultural and industrial tractors.</p>

* In the case of regulatory provisions that contain equipment or material specifications, the services of an engineer would not be necessary if the employer chooses to purchase equipment that meets the required specifications. These interpretations are not official; OSHA should be contacted for official interpretation.

**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.1053	Ladders General	<p align="center">Subpart X--Stairways and Ladders</p> <p>(a)(22) Ladder safety devices, and related support systems, for fixed ladders shall conform to all of the following:</p> <ul style="list-style-type: none"> (i) They shall be capable of withstanding without failure a drop test consisting of an 18-inch (41 cm) drop of a 500-pound (226 kg) weight; (ii) They shall permit the employee using the device to ascend or descend without continually having to hold, push or pull any part of the device, leaving both hands free for climbing; (iii) They shall be activated within 2 feet (.61 m) after a fall occurs, and limit the descending velocity of an employee to 7 feet/sec. (2.1 m/sec.) or less; (iv) The connection between the carrier or lifeline and the point of attachment to the body belt or harness shall not exceed 9 inches (23 cm) in length. 	An engineer may be required if an employer designs his or her own ladder safety devices and mountings.

* In the case of regulatory provisions that contain equipment or material specifications, the services of an engineer would not be necessary if the employer chooses to purchase equipment that meets the required specifications. These interpretations are not official; OSHA should be contacted for official interpretation.

**Construction Standards (29 CFR 1926) That Imply or Could Be Interpreted as Implying
That the Expertise of a Professional Engineer is Required (Continued)**

SECTION	SUBJECT	ACTUAL TEXT	INTERPRETATION*
1926.1053 (Cont.)	Ladders General (Cont.)	<p align="center">Subpart X--Stairways and Ladders (Cont.)</p> <p>(a)(23) The mounting of ladder safety devices for fixed ladders shall conform to the following:</p> <ul style="list-style-type: none"> (i) Mountings for rigid carriers shall be attached at each end of the carrier, with intermediate mountings, as necessary, spaced along the entire length of the carrier, to provide the strength necessary to stop employees' falls. (ii) Mountings for flexible carriers shall be attached at each end of the carrier. When the system is exposed to wind, cable guides for flexible carriers shall be installed at a minimum spacing of 25 feet (7.6 m) and maximum spacing of 40 feet (12.2 m) along the entire length of the carrier, to prevent wind damage to the system. (iii) The design and installation of mountings and cable guides shall not reduce the design strength of the ladder. 	An engineer may be required to design mountings and cable guides to provide the strength necessary to stop an employee's fall and to ensure the mounting and cable guides do not reduce the strength of the ladder.

* In the case of regulatory provisions that contain equipment or material specifications, the services of an engineer would not be necessary if the employer chooses to purchase equipment that meets the required specifications. These interpretations are not official; OSHA should be contacted for official interpretation.

ITEM 8

PROFESSIONAL SAFETY CONSULTANTS CO. INC.

BUILD A SAFER TOMORROW

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August 4, 1994

Mr. Jim Lapping
Building and Construction Trades Department
AFL/CIO
815 Sixteenth Street NW - #600
Washington D.C. 20006

Dear Jim:

In connection with our participation on the ACCSH Engineering Work Group and in consonance with the assignment to review the OSHA standards for the use of the words/phrases competent and qualified I have the following observations to offer. In the past we have focused on this data as it appeared in the construction standards (1926). This time I conducted a total review of all the standards and this included General Industry (1910), Maritime (1915) and Longshoring (1917).

In the full volume of standards the word competent is used 229 times within 112 sections; qualified is used 276 times within 129 standards; and, engineer(s) is used 157 times within 77 sections. The variables are considerable. The basics consist of Competent Person, Qualified Person and Engineer(s). However the other uses range from "a person qualified", "qualified Engineer" to a "competent person qualified".

The duties associated with being designated as a Competent Person, Qualified Person, and Engineer are similar in many instances yet they also have distinct definitions relating to various task descriptions. Engineer is used in a rather empirical fashion. Typical task assignments for engineers are:

- Design
- Verify
- Approve
- Inspect

We have taken the liberty to interpret some of the language to develop consistency in presenting the data. For instance; the process of design appears fairly easy to interpret. It often involves the development of data, tabular material, specifications, etc. from scratch. The word analysis is frequently used but it generally seems to be a second stage after the design process. We have combined this to be either verify or approve.

We have limited this task to those entries keying on the words engineer and engineers. Occasionally the word engineering is used in a fashion to require an engineer's services and this has been included.

Yours truly,

A handwritten signature in cursive script, appearing to read "Ernie".

Ernest B. Jorgensen, Jr

enggp.bct

August 5, 1994

OSHA Standards for **ENGINEER**

Keywords V = Verify A = Approve I = Inspect D = Design

I	<p>1903.8(c) Compliance Safety and Health Officers Representatives of employers and employees</p> <p>(c) The representative(s) authorized by employees shall be an employee(s) of the employer. However, if in the judgment of the Compliance Safety and Health Officer, good cause has been shown why accompaniment by a third party who is not an employee of the employer (such as an industrial hygienist or a safety engineer) is reasonably necessary to the conduct of an effective and thorough physical inspection of the workplace, such third party may accompany the Compliance Safety and Health Officer during the inspection.</p>
D	<p>1908.6 On site consultative visits Conduct of a visit</p> <p>(g) "Written report." A written report shall be prepared for each visit which results in substantive findings or recommendations, and shall be sent to the employer. The timing and format of the report shall be approved by the Assistant Secretary. The report shall restate the employer's request and describe the working conditions examined by the consultant; shall, within the scope of the request, evaluate the employer's program for ensuring safe and healthful employment and provide recommendations for making such programs effective; shall identify specific hazards and describe their nature, including reference to applicable standards or codes; shall identify the seriousness of the hazards; and, to the extent possible, shall include suggested means or approaches to their correction. Additional sources of assistance shall also be indicated, if known, including the possible need to procure specific engineering consultation, medical advice and assistance, and other appropriate items. The report shall also include reference to the completion dates for the situations described in 1908.6(f) (1) and (2).</p>

D	<p>1910.28(d) Safety Requirements for Scaffolding</p> <p>(11) Drawings and specifications for all frame scaffolds over 125 feet in height above the base plates shall be designed by a registered professional engineer and copies made available to the employer and for inspection purposes.</p>
D	<p>1910.28(e) Safety Requirements for Scaffolding</p> <p>(3) Unless outrigger scaffolds are designed by a licensed professional engineer, they shall be constructed and erected in accordance with table D-16. Outrigger scaffolds designed by a registered professional engineer shall be constructed and erected in accordance with such design. A copy of the detailed drawings and specifications showing the sizes and spacing of members shall be kept on the job.</p>
D	<p>1910.28(e) Safety Requirements for Scaffolding</p> <p>(6) Where additional working levels are required to be supported by the outrigger method, the plans and specifications of the outrigger and scaffolding structure shall be designed by a registered professional engineer.</p>
D I	<p>1910.28(f) Safety Requirements for Scaffolding</p> <p>(17) Each scaffold shall be installed or relocated in accordance with designs and instructions, of a registered professional engineer, and supervised by a competent, designated person.</p>

<p>D I</p>	<p>1910.28(h) Safety Requirements for Scaffolding</p> <p>(10) Each scaffold shall be installed or relocated in accordance with designs and instructions of a registered professional engineer, and such installation or relocation shall be supervised by a competent designated person.</p>
<p>A</p>	<p>1910.29(b) Manually propelled mobile ladder stands and scaffolds (towers)</p> <p>(5) "Erection." Only the manufacturer of a scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet in height above the base, unless such structure is approved in writing by a registered professional engineer, or erected in accordance with instructions furnished by the manufacturer.</p>
<p>A</p>	<p>1910.29(c) Manually propelled mobile ladder stands and scaffolds (towers)</p> <p>(7) "Erection." Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet in height above the base, unless such structure is approved in writing by a licensed professional engineer, or erected in accordance with instructions furnished by the manufacturer.</p>

A	<p>1910.29(d) Manually propelled mobile ladder stands and scaffolds (towers)</p> <p>(3) "Erection." Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet in height above the base, unless such structure is approved in writing by a licensed professional engineer, or erected in accordance with instructions furnished by the manufacturer.</p>
V	<p>1910.66(c) Powered platforms for building maintenance</p> <p>(2) Building owners shall base the information required in paragraph (c)(1) of this section on the results of a field test of the installation before being placed into service and following any major alteration to an existing installation, as required in paragraph (g)(1) of this section. The assurance shall also be based on all other relevant available information, including, but not limited to, test data, equipment specifications and verification by a registered professional engineer.</p>
D I	<p>1910.66(d) Powered platforms for building maintenance "Definitions"</p> <p>"Registered professional engineer" means a person who has been duly and currently registered and licensed by an authority within the United States or its territories to practice the profession of engineering.</p> <p>"Verified" means accepted by design, evaluation, or inspection by a registered professional engineer.</p>

D	<p>1910.66(e)(1) Powered platforms for building maintenance</p> <p>(i) Structural supports, tie-downs, tie-in guides, anchoring devices and any affected parts of the building included in the installation shall be designed by or under the direction of a registered professional engineer experienced in such design.</p>
V	<p>1910.66(e)(2) Powered platforms for building maintenance</p> <p>(iv) Tie-in guides for building interiors (atriums) may be eliminated when a registered professional engineer determines that an alternative stabilization system, including systems in paragraphs (e)(2)(iii) (A), (B) and (C), or a platform tie-off at each work station will provide equivalent safety.</p>
D	<p>1910.66(f)(1) Powered platforms for building maintenance</p> <p>(i) Equipment installations shall be designed by or under the direction of a registered professional engineer experienced in such design;</p>
I A	<p>1910.66 App A Powered platforms for building maintenance Guidelines</p> <p>11. "Suspension and Securing of Powered Platforms (Equivalency)." One acceptable method of demonstrating the equivalency of a method of suspending or securing a powered platform, as required in paragraphs (e)(2)(iii), (f)(3) and (f)(5)(i)(F), is to provide an engineering analysis by a registered professional engineer. The analysis should demonstrate that the proposed method will provide an equal or greater degree of safety for employees than any one of the methods specified in the standard.</p>

<p>A</p>	<p>1910.111(b)(1) Storage and handling of anhydrous ammonia</p> <p>(iv) It is a custom-designed and custom-built unit, which no nationally recognized testing laboratory, or Federal, State, municipal or local authority responsible for the enforcement of a Federal, State, municipal, or local law, code or regulation pertaining to the storage, transportation and use of anhydrous ammonia is willing to undertake to accept, certify, list, label or determine to be safe, and the employer has on file a document attesting to its safe condition following the conduct of appropriate tests. The document shall be signed by a registered professional engineer or other person having special training or experience sufficient to permit him to form an opinion as to safety of the unit involved. The document shall set forth the test bases, test data and results, and also the qualifications of the certifying person.</p>
<p>V I</p>	<p>1910.119 App C Compliance Guidelines and Recommendations for Process Safety Management (non-mandatory)</p> <p>5. Operating Procedures and Practices. Operating procedures describe tasks to be performed, data to be recorded, operating conditions to be maintained, samples to be collected, and safety and health precautions to be taken. The procedures need to be technically accurate, understandable to employees, and revised periodically to ensure that they reflect current operations. The process safety information package is to be used as a resource to better assure that the operating procedures and practices are consistent with the known hazards of the chemicals in the process and that the operating parameters are accurate. Operating procedures should be reviewed by engineering staff and operating personnel to ensure that they are accurate and provide practical instructions on how to actually carry out job duties safely.</p>

<p>A</p>	<p>1910.146 App B Procedures for Atmospheric Testing</p> <p>(1) Evaluation testing. The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Evaluation and interpretation of these data, and development of the entry procedure, should be done by, or reviewed by, a technically qualified professional (e.g., OSHA consultation service, or certified industrial hygienist, registered safety engineer, certified safety professional, certified marine chemist, etc.) based on evaluation of all serious hazards.</p>
<p>V</p>	<p>1910.177(d)(3) Servicing multi-piece and single piece rim wheels</p> <p>(iv) Restraining devices or barriers removed from service shall not be returned to service until they are repaired and re-inspected. Restraining devices or barriers requiring structural repair such as component replacement or rewelding shall not be returned to service until they are certified by either the manufacturer or a Registered Professional Engineer as meeting the strength requirements of paragraph (d)(3)(i) of this section.</p>
<p>A</p>	<p>1910.179(b) Overhead and gantry cranes</p> <p>(3) Modifications. Cranes may be modified and rerated provided such modifications and the supporting structure are checked thoroughly for the new rated load by a qualified engineer or the equipment manufacturer. The crane shall be tested in accordance with paragraph (k) (2) of this section. New rated load shall be displayed in accordance with subparagraph (5) of this paragraph.</p>

D	<p>1910.217(c)(3)(vii) Mechanical power presses</p> <p>{d} Two hand controls shall be fixed in position so that only a supervisor or safety engineer is capable of relocating the controls.</p>
D	<p>1910.217(c)(3)(viii) Mechanical power presses</p> <p>{d} Two hand trips shall be fixed in position so that only a supervisor or safety engineer is capable of relocating the controls.</p>
A	<p>1917.43 Powered industrial trucks</p> <p>(b) General. (1) After October 3, 1983 modifications, such as adding counterweights, that might affect the vehicle's capacity or safety shall not be performed without either the manufacturer's prior written approval or the written approval of a professional engineer experienced with the equipment who has consulted with the manufacturer, if available. Capacity, operation and maintenance instruction plates, tags or decals shall be changed to conform to the equipment as modified.</p>

<p>D</p>	<p>1917.45(b) Cranes and derricks</p> <p>(3) Designated working loads shall not be increased beyond the manufacturer's ratings or original design limitations unless such increase receives the manufacturer's approval. When the manufacturer's services are not available or where the equipment is of foreign manufacture, engineering design analysis shall be performed or approved by a person accredited for certifying the equipment under Part 1919 of this chapter. Engineering design analysis shall be performed by a registered professional engineer competent in the field of cranes and derricks. Any structural changes necessitated by the change in rating shall be carried out.</p>
<p>D</p>	<p>1917.50(a) Certification of marine terminal material handling devices</p> <p>(2) In cases of foreign manufactured cranes, there shall be an owner's warranty that the design is adequate for the intended use. The warranty shall be based on a thorough examination of the design specifications by a registered professional engineer familiar with the equipment.</p>
<p>D</p>	<p>1926.65 App C Occupational Health and Environmental controls - Compliance guidelines</p> <p>For the development and implementation of the program to be the most effective, professional safety and health personnel should be used. Certified Safety Professionals, Board Certified Industrial Hygienists or Registered Professional Safety Engineers are good examples of professional stature for safety and health managers who will administer the employer's program.</p>

I	<p>1926.451(b) Scaffolding</p> <p>(16) All wood pole scaffolds 60 feet or less in height shall be constructed and erected in accordance with Tables L-4 to 10. If they are over 60 feet in height, they shall be designed by a qualified engineer competent in this field, and it shall be constructed and erected in accordance with such design.</p>
D	<p>1926.451(c) Scaffolding</p> <p>(4) Tube and coupler scaffolds shall be limited in heights and working levels to those permitted in Tables L-10, 11, and 12. Drawings and specifications of all tube and coupler scaffolds above the limitations in Tables L-10, 11, and 12 shall be designed by a qualified engineer competent in this field.</p>
D	<p>1926.451(c) Scaffolding</p> <p>(5) All tube and coupler scaffolds shall be constructed and erected to support four times the maximum intended loads, as set forth in Tables L-10, 11, and 12, or as set forth in the specifications by a licensed professional engineer competent in this field.</p>
V	<p>1926.451(d) Scaffolding</p> <p>(9) Drawings and specifications for all frame scaffolds over 125 feet in height above the base plates shall be designed by a registered professional engineer.</p>

D	<p>1926.451(g) Scaffolding</p> <p>(3) Unless outrigger scaffolds are designed by a registered professional engineer competent in this field, they shall be constructed and erected in accordance with Table L-13. Outrigger scaffolds, designed by a registered professional engineer, shall be constructed and erected in accordance with such design.</p>
D	<p>1926.453(b) Manually propelled mobile ladder stands and scaffolds (towers)</p> <p>(7) "Erection." Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet (15.2 m) in height above the base, unless such structure is approved in writing by a licensed professional engineer, or erected in accordance with instructions furnished by the manufacturer.</p>
A	<p>1926.550 Cranes and derricks</p> <p>(a) General requirements. (1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded. Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer.</p>

D	<p>1926.550(g) Cranes and derricks</p> <p>(4) Personnel Platforms. - (i) Design criteria. (A) The personnel platform and suspension system shall be designed by a qualified engineer or a qualified person competent in structural design.</p>
D	<p>1926.552 Material hoists, personnel hoists, and elevators</p> <p>(a) General requirements. (1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all hoists and elevators. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a professional engineer competent in the field.</p>
V	<p>1926.552(b) Material hoists, personnel hoists, and elevators</p> <p>(7) All material hoist towers shall be designed by a licensed professional engineer.</p>
D	<p>1926.552(c) Material hoists, personnel hoists, and elevators</p> <p>(17) - (i) Personnel hoists used in bridge tower construction shall be approved by a registered professional engineer and erected under the supervision of a qualified engineer competent in this field.</p>

<p>A I</p>	<p>1926.650 Excavations Scope, application, and definitions applicable to this subpart</p> <p>(b) Definitions applicable to this subpart. Accepted engineering practices means those requirements which are compatible with standards of practice required by a registered professional engineer.</p>
<p>V</p>	<p>1926.650(b) Excavations Definitions</p> <p>Registered Professional Engineer means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.</p>
<p>D</p>	<p>1926.650(b) Excavations Definitions</p> <p>Tabulated data means tables and charts approved by a registered professional engineer and used to design and construct a protective system.</p>
<p>A D</p>	<p>1926.651(i)(2) Excavations General Requirements</p> <p>(iii) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or (iv) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.</p>

A	<p>1926.652(b)(3) Excavations General Requirements</p> <p>(iii) At least one copy of the tabulated data which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request. (4) Option (4) - Design by a registered professional engineer. (i) Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under paragraph (b) of this section shall be approved by a registered professional engineer. (C) The identity of the registered professional engineer approving the design.</p>
A D	<p>1926.652(c)(3) Excavations General Requirements</p> <p>(iii) At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.</p>
V A	<p>1926.652(c) Excavations General Requirements</p> <p>(4) Option (4) - Design by a registered professional engineer. (i) Support systems, shield systems, and other protective systems not utilizing Option 1, Option 2 or Option 3, above, shall be approved by a registered professional engineer. (ii) Designs shall be in written form and shall include the following: (A) A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and (B) The identify of the registered professional engineer approving the design.</p>

<p>D A</p>	<p>1926.652(d) Excavations General Requirements</p> <p>(3) When material or equipment that is used for protective systems is damaged, a competent person shall examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.</p>
<p>V A</p>	<p>1926 Subpt P App B Scope and Benching</p> <p>Footnote(3) Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.</p>
<p>D</p>	<p>1926.703(8)(i) Requirements for cast in place concrete</p> <p>(i) The design of the shoring shall be prepared by a qualified designer and the erected shoring shall be inspected by an engineer qualified in structural design.</p>
<p>D</p>	<p>1926.705 Requirements for lift-slab operations</p> <p>(a) Lift-slab operations shall be designed and planned by a registered professional engineer who has experience in lift-slab construction. Such plans and designs shall be implemented by the employer and shall include detailed instructions and sketches indicating the prescribed method of erection. These plans and designs shall also include provisions for ensuring lateral stability of the building/structure during construction.</p>

<p>D V</p>	<p>1926.705(k) Requirements for lift-slab operations</p> <p>(1) No employee, except those essential to the jacking operation, shall be permitted in the building/structure while any jacking operation is taking place unless the building/structure has been reinforced sufficiently to ensure its integrity during erection. The phrase "reinforced sufficiently to ensure its integrity" used in this paragraph means that a registered professional engineer, independent of the engineer who designed and planned the lifting operation, has determined from the plans that if there is a loss of support at any jack location, that loss will be confined to that location and the structure as a whole will remain stable.</p>
<p>D V I</p>	<p>1926.705 App Lift slab operations</p> <p>In paragraph 1926.705(k), OSHA requires employees to be removed from the building/structure during jacking operations unless an independent registered professional engineer, other than the engineer who designed and planned the lifting operation, has determined that the building/structure has been sufficiently reinforced to insure the integrity of the building/structure.</p>
<p>D</p>	<p>1926.850 Demolition Preparatory Operations</p> <p>(a) Prior to permitting employees to start demolition operations, an engineering survey shall be made, by a competent person, of the structure to determine the condition of the framing, floors, and walls, and possibility of unplanned collapse of any portion of the structure. Any adjacent structure where employees may be exposed shall also be similarly checked. The employer shall have in writing evidence that such a survey has been performed.</p>

ITEM 9



MERIDIAN RESEARCH, INC.

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May 6, 1994

Jim E. Lapping
Chairman, ACCSH Engineering Work Group
Building and Construction Trades Dept.
AFL-CIO Building
815-16th Street NW, Suite 603
Washington, DC 20006

Dear Mr. Lapping:

Attached is the report on the use of the terms "qualified" and "qualified person" in the OSHA Construction Industry standards (29 CFR Part 1926). The report is provided in response to the discussions held during the March 10, 1994 meeting of the ACCSH Engineering Work Group concerning the use of the term "qualified person" in Subpart P-Excavation, of the construction standards and fulfills action item 6 of the meeting minutes distributed on March 11, 1994.

The report identifies the paragraphs and provides the actual text of provisions of the construction standards that include the terms "qualified person" or "qualified." As indicated in the report, the term "qualified person" is not used in Subpart P but is used throughout the other subparts of the standards. The term "qualified" is also used throughout the standards and in general its application is both clear and consistent.

If you have any questions or comments regarding the above information or the attached report, or if I can be of any other assistance, please feel free to call me at (301) 585-7665.

Sincerely,

Kevin J. Sikora, CIH, CSP

**PROVISIONS IN THE OSHA CONSTRUCTION STANDARDS (29 CFR PART 1926)
USING THE TERM "QUALIFIED" OR "QUALIFIED PERSON"**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
Subpart C--General Safety and Health Provisions		
1926.20	General safety and health provisions	(b)(4) The employer shall permit only those employees qualified by training to operate equipment and machinery
1926.32	Definitions	"Qualified" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work or the project.
Subpart D--Occupational Health and Environmental Controls		
1926.54	Nonionizing radiation	(a) Only qualified and trained employees shall be assigned to install, adjust, and operate laser equipment.
1926.55	Gases, vapors, fumes, dusts, and mists	(b) To achieve compliance with paragraph (a) of this section, administrative or engineering controls must first be implemented whenever feasible. ... Any equipment and technical measures used for this purpose must first be approved for each particular use by a competent industrial hygienist or other technically qualified person.
1926.57	Ventilation	(i)(9)(vi) ...Respirators shall be approved by the U.S. Bureau of Mines, U.S. Department of the Interior and shall be selected by a competent industrial hygienist or other technically qualified source. ...
1926.64	Process safety management of highly hazardous chemicals	(f)(1)(i)(D) [Written operating procedures shall address] Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.
Appendix C--Compliance Guidelines and Recommendations for Process Safety Management		(9) Equipment installation jobs need to be properly inspected in the field for use of proper materials and procedures and to assure that qualified craftsmen are used to do the job.

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
Subpart D—Occupational Health and Environmental Controls continued		
1926.65	Hazardous waste operations and emergency response	<p>(a)(3) Qualified person means a person with specific training, knowledge, and experience in the area for which the person has the responsibility and the authority to control.</p> <p>(c)(2) A preliminary evaluation of a site's characteristics shall be performed prior to site entry by a qualified person in order to aid in the selection of appropriate employee protection methods prior to site entry. Immediately after initial site entry, a more detailed evaluation of the site's specific characteristics shall be performed by a qualified person in order to further identify existing site hazards and to further aid in the selection of the appropriate engineering controls and personal protective equipment for the tasks to be performed.</p> <p>(e)(5) Qualifications for trainers. Trainers shall be qualified to instruct employees about the subject matter that is being presented in training.</p>
Subpart E—Personal Protective and Life Saving Equipment		
1926.103	Respiratory protection	<p>(g)(2) The correct respirator shall be specified for each job. The respirator type is usually specified in the work procedures by a qualified individual supervising the respiratory protective program.</p> <p>(g)(4) Frequent random inspections shall be conducted by a qualified individual to assure that respirators are properly selected, used, cleaned, and maintained.</p>
Subpart F—Fire Protection and Prevention		
1926.152	Flammable and combustible liquids	<p>(h)(2)(v)(I) The flow capacity of tank venting devices 12 inches (30.48 cm) and smaller in nominal pipe size shall be determined by actual tests of each type and size of vent. These flow tests may be conducted by the manufacturer if certified by a qualified impartial observer, or may be conducted by an outside agency.</p>

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
Subpart K—Electrical		
1926.403	General requirements	<p>(i)(2)(i) ...electric equipment operating at 50 volts or more shall be guarded against accidental contact by cabinets or other forms of enclosures or by any of the following means:</p> <p>(i)(2)(i)(A) By location in a room, vault, or similar enclosure that is accessible only to qualified persons.</p> <p>(i)(2)(i)(B) By partitions or screens so arranged that only qualified persons will have access to the space within reach of the live parts.</p> <p>(j)(2) Electrical installations in a vault, room, closet or in an area surrounded by a wall, screen, or fence, access to which is controlled by lock and key or other equivalent means, are considered to be accessible to qualified persons only. ... The entrances to all buildings, rooms or enclosures containing exposed live parts or exposed conductors operating at over 600 volts, nominal, shall be kept locked or shall be under the observation of a qualified person at all times.</p> <p>(j)(2)(i) Electrical installations having exposed live parts shall be accessible to qualified persons only and shall comply with the applicable provisions of paragraph (j)(3) of this section.</p>
1926.404	Wiring design and protection	<p>(f)(1)(v)(B) The conditions of maintenance and supervision assure that only qualified persons will service the installation.</p> <p>(f)(7)(iii)(F)(1) [The following need not be grounded:] Enclosures for switches or circuit breakers used for other than service equipment and accessible to qualified persons only; ...</p>

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
Subpart K—Electrical continued		
1926.405	Wiring methods, components, and equipment for general use	<p>(a)(2)(iii) Guarding. For temporary wiring over 600 volts, nominal, fencing, barriers, or other effective means shall be provided to prevent access of other than authorized and qualified personnel.</p> <p>(d) Switchboards that have any exposed live parts shall be located in permanently dry locations and accessible only to qualified persons. Panelboards shall be mounted in cabinets, cutout boxes, or enclosures designed for the purpose and shall be dead front. However, panelboards other than the dead front externally-operable type are permitted where accessible only to qualified persons.</p> <p>(h) Portable cables over 600 volts, nominal. ... Termination enclosures shall be marked with a high voltage hazard warning, and terminations shall be accessible only to authorized and qualified personnel.</p> <p>(j)(4)(iv)(A) ...Exposed live parts of motors and controllers operating at 50 volts or more between terminals shall be guarded against accidental contact by any of the following: (1) By installation in a room or enclosure that is accessible only to qualified persons;...</p>
1926.408	Special systems	<p>(a)(1)(i) ...open runs or non-metallic-sheathed cable or of bare conductors or busbars may be installed in locations which are accessible only to qualified persons.</p> <p>(a)(2)(i) Circuit breakers located indoors shall consist of metal-enclosed or fire-resistant, cell-mounted units. In locations accessible only to qualified personnel, open mounting of circuit breakers is permitted.</p>

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
1926.416	General requirements	<p style="text-align: center;">Subpart K—Electrical continued</p> <p>(a)(4) Work on energized equipment. Only qualified persons may work on electric circuit parts or equipment that have not been deenergized under the procedures of 1926.417(d) of this section.</p> <p>(f)(1) Interlocks. Only a qualified person following the requirements of paragraph (c) of this section may defeat an electrical safety interlock, and then only temporarily while he or she is working on the equipment.</p> <p>(f)(7) Test instruments and equipment-Use. Only qualified persons may perform testing work on electrical circuits or equipment.</p> <p>(g)(1) Work on energized equipment. Only qualified persons may work on electric circuit parts or equipment that have not been deenergized under the procedures of paragraph (b) of this section.</p> <p>(g)(2)(ii) Qualified persons. When a qualified person is working in the vicinity of overhead lines, whether in an elevated position or on the ground, the person may not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in Table K-2 unless [the provisions of paragraphs (g)(2)(ii)(A)-(C) are met].</p> <p>(g)(2)(iii)(3) If the equipment is in an aerial lift insulated for the voltage involved, and if the work is performed by a qualified person, the clearance ... may be reduced to the distance given in Table K-2.</p>

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
1926.417	Lockout and tagging of circuits	<p style="text-align: center;">Subpart K—Electrical continued</p> <p>(d)(4)(i) A qualified person shall operate the equipment operating controls or otherwise verify that the equipment cannot be restarted.</p> <p>(d)(4)(ii) A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are deenergized.</p> <p>(d)(5)(i) A qualified person shall conduct tests and visual inspections, as necessary, to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed, so that the circuits and equipment can be safely energized.</p> <p>(d)(5)(iii) Each lock and tag shall be removed by the employee who applied it or under his or her direct supervision. However, if this employee is absent from the workplace, then the lock or tag may be removed by a qualified person designated to perform this task provided that [the provisions of paragraphs (d)(5)(iii) (A) and (B) are met].</p>
1926.449	Definitions applicable to this subpart	<p>The definitions given in this section apply to the terms used in Subpart K. The definitions given here for "approved" and "qualified person" apply, instead of the definitions given in 1926.32, to the use of these terms in Subpart K.</p>

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
1926.449 cont.	Definitions applicable to this sub-part cont.	<p style="text-align: center;">Subpart K—Electrical continued</p> <p>"Acceptable". An installation or equipment is acceptable to the Assistant Secretary of Labor, and approved within the meaning of this Subpart K;</p> <p>(a) If it is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by a qualified testing laboratory...</p> <p>(b) With respect to an installation or equipment of a kind which no qualified testing laboratory accepts, certifies, lists, labels, or determines to be safe...</p> <p>"Accepted". An installation is "accepted" if it has been inspected and found to be safe by a qualified testing laboratory.</p> <p>"Certified". Equipment is "certified" if it:</p> <p>(a) Has been tested and found by a qualified testing laboratory to meet applicable test standards or to be safe for use in a specified manner and</p> <p>(b) Is of a kind whose production is periodically inspected by a qualified testing laboratory.</p> <p>"Identified" (for the use). ...Suitability of equipment for a specific purpose, environment, or application is determined by a qualified testing laboratory where such identification includes labeling or listing.</p> <p>"Labeled". Equipment or materials to which has been attached a label, symbol or other identifying mark of a qualified testing laboratory which indicates compliance with appropriate standards or performance...</p> <p>"Listed". Equipment or materials included in a list published by a qualified testing laboratory whose listing states either that the equipment or material meets appropriate...</p> <p>"Qualified person". One familiar with the construction and operation of the equipment and the hazards involved.</p> <p>"Qualified testing laboratory". A properly equipped and staffed testing laboratory which has capabilities for and which provides [the following services listed in paragraphs (a)-(e)].</p>

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
Subpart L--Scaffolding		
1926.451	Scaffolding	<p>(b)(16) All wood pole scaffolds 60 feet or less in height shall be constructed and erected in accordance with Tables L-4 to L-10. If they are over 60 feet in height, they shall be designed by a qualified engineer competent in this field and shall be constructed and erected in accordance with such design.</p> <p>(c)(4) Drawings and specifications of all tube and coupler scaffolds above the [height] limitations in Tables L-10, 11, and 12 shall be designed by a qualified engineer competent in this field.</p>
1926.453	Manually propelled mobile ladder stands and scaffolds (towers)	<p>(b)(7) Erection. Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet (15.2 m) in height above the base, unless such structure is approved in writing by a licensed professional engineer or erected in accordance with instructions furnished by the manufacturer.</p>
Subpart N--Cranes, Derricks, Hoists, Elevators, and Conveyors		
1926.550	Cranes and derricks	<p>(a) General requirements. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded.</p> <p>(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.</p> <p>(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.</p>
1926.552	Material hoists, personnel hoists, and elevators	<p>(c)(17)(i) Personnel hoists used in bridge tower construction shall be approved by a registered professional engineer and erected under the supervision of a qualified engineer competent in this field.</p>

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
Subpart P--Excavations		
1926.651	General requirements	(c)(1)(i) ...Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.
Subpart Q--Concrete and Masonry Construction		
1926.701	General requirements	(a) Construction loads. No construction loads shall be placed on a concrete structure unless the employer determines, based on information received from a person who is qualified in structural design, that the structure or portion of the structure is capable of supporting the loads.
1926.703	Requirements for cast-in-place concrete	(a)(8)(i) The design on the shoring shall be prepared by a qualified designer and the erected shoring shall be inspected by an engineer qualified in structural design.
Subpart S--Underground Construction, Caissons, Cofferdams and Compressed Air		
1926.800	Underground construction	(r)(18)(i) If personnel-cars must be pushed and visibility of the track ahead is hampered, then a qualified person shall be stationed in the lead car to give signals to the locomotive operator.
1926.803	Compressed air	(b)(1) There shall be retained one or more licensed physicians familiar with and experienced in the physical requirements and the medical aspects of compressed air work and the treatment of decompression illness. ... He shall himself be physically qualified and be willing to enter a pressurized environment. (b)(2) No employee shall be permitted to enter a compressed air environment until he has been examined by the physician and reported by him to be physically qualified to engage in such work. (b)(4) After an employee has been employed continuously in compressed air for a period designated by a physician, but not to exceed one year, he shall be reexamined by the physician to determine if he is still physically qualified to engage in compressed air work.

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
Subpart U--Blasting and Use of Explosives		
1926.900	General provisions	(a) The employer shall permit only authorized and qualified persons to handle and use explosives.
1926.901	Blaster qualifications	(c) A blaster shall be qualified by reason of training, knowledge, or experience, in the field of transporting, storing, handling, and use of explosives, and have a working knowledge of State and local laws and regulations which pertain to explosives.
Subpart V--Power Transmission and Distributions		
1926.955	Overhead lines	(e)(4) All work shall be personally supervised by a person trained and qualified to perform live-line bare-hand work.
1926.956	Underground lines	(b)(1) While work is being performed in manholes, an employee shall be available in the immediate vicinity to render emergency assistance as may be required. ... This requirement does not preclude a qualified employee, working alone, from entering for brief periods of time, a manhole where energized cables or equipment are in service, for the purpose of inspection, housekeeping, taking readings, or similar work if such work can be performed safely.
1926.960	Definitions applicable to this sub-part	(o) "Designated employee". The term means a qualified person delegated to perform specific duties under the conditions existing. (ll) " Qualified person ". The term means a person who by reason of experience or training is familiar with the operation to be performed and the hazards involved.

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
Subpart Z--Toxic and Hazardous Substances		
1926.1128	Benzene	<p>(i)(8)(iv) Whenever an employee is temporarily removed from benzene exposure ... the employer shall transfer the employee to a comparable job for which the employee is qualified (or can be trained for in a short period) and where benzene exposures are as low as possible, but in no event higher than the action level.</p> <p>(i)(8)(v) Whenever an employee is removed permanently from benzene exposure based on a physician's recommendation...the employee shall be given the opportunity to transfer to another positionfor which the employee is qualified...</p>
1926.1144	1,2-dibromo-3-chloropropane Appendix B--Substance Technical Guidelines for DBCP	<p>IV.B. Since many of the duties relating to employee protection are dependent on the results of monitoring and measuring procedures, employers should assure that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.</p> <p>IV.A.8. Each [semen] sample should be evaluated...within two hours after collection, ideally by the same or equally qualified examiner.</p>
1926.1145	Acrylonitrile Appendix B--Substance Technical Guidelines for Acrylonitrile	<p>IV.B. Since many of the duties relating to employee exposure are dependent on the results of monitoring and measuring procedures, employers should assure that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.</p>

**Provisions in the OSHA Construction Standards (29 CFR Part 1926)
Using the Term "Qualified" or "Qualified Person" cont.**

SECTION	SUBJECT	PARAGRAPH/TEXT OF REQUIREMENT
Subpart Z--Toxic and Hazardous Substances continued		
1926.1147	Ethylene oxide Appendix B--Substance Technical Guidelines for Ethylene Oxide (Non-Mandatory)	IV.B. Since many of the duties relating to employee exposure are dependent on the results of measurement procedures, employers should assure that the evaluation of employee exposures is performed by a technically qualified person.
1926.1148	Formaldehyde	(1)(8)(vi) When an employee is removed ... the employer shall transfer the employee to comparable work for which the employee is qualified or can be trained in a short period...
	Appendix A to 1926.1148-- Substance Technical Guidelines for Formalin	Inhalation (Breathing):... Qualified first-aid or medical personnel should administer oxygen, if available, and maintain the patient's airways and blood pressure until the victim can be transported to a medical facility.

ITEM 10



**National Society of
Professional Engineers**

Date: September 13, 1994

To: Charlie Campbell

From: Arthur Schwartz

Subject: Response to Request for Definitions

Per your request, below is a list of commonly understood definitions of the following terms and their general application to the engineering design and construction process. I have put the definitions in order from lowest to highest level of scrutiny. Some of the terms are very close in definition with subtle differences:

1. Observe -- to take note of, to visually watch.
2. Review -- to evaluate, assess, examine
2. Inspect -- to look, to view or oversee for the purpose of ascertaining the quality or condition of the thing for the purpose of examination.
3. Approve -- to be satisfied with, confirm, ratify, sanction, or consent to some act or thing done by another.
4. Verify -- to confirm, attest to, or substantiate by oath.
5. Design -- To form a plan, drawing or depiction of an original plan or conception to be used in the manufacturing or construction process. Following design, the licensed engineer is expected to sign and seal the plan, drawing, etc.

Sign -- to affix one's name to a writing or instrument for the purpose of authenticating it or to give its effect as one's act. In general, the signature accompanies the seal.
Seal -- a particular sign made to attest in the most formal manner, the execution of an instrument. Under the engineering licensing laws, the seal is an indication by the licensee that the work was performed under the licensee's direction and control and shall be placed on all specifications, reports, drawings, plans, design information, and calculations whenever presented to a client or any public or private governmental agency.

In the context of general design/construction issues, it would seem that "Observe," "Review," "Approve," and "Design" (including "Sign" and "Seal") would mostly apply to the activities of the design engineer in connection with the completed project/facility while "Inspect" and "Verify" would apply generally to the activities of the engineer retained by the construction contractor.

In contrast, in the context of issues relating to construction site safety, it would appear that "Observe" would apply to the activities of the design engineer. All of the other definitions would apply to the engineer retained by the construction contractor in connection with the means, methods, techniques, sequences, procedures and safety programs relating to construction.

ITEM 11

New Guideline from Ministry of Labour

In October 1993, the Ontario Ministry of Labour issued a new guideline called **Design and Inspection of Formwork and Falsework on Construction Projects**.

The guideline is intended to help professional engineers, constructors, employers, supervisors, and workers with practical ways of complying with the construction regulations that apply to formwork and falsework installations.

Specifically the guideline addresses the following points:

- the types of formwork and falsework that **must** be designed by a professional engineer

- the situations where "standard" designs **may** be permitted
- the situations where otherwise "standard" designs **must** be specifically designed for the site conditions or application, and
- the selection and appointment of competent workers to carry out inspections of formwork and falsework.

The text of the Ministry's guideline is reprinted below.

Questions or comments on the guideline should be directed to your local Ministry of Labour office.

Design and Inspection of Formwork and Falsework on Construction Projects

1.0 INTRODUCTION

When the amendments to the Regulations for Construction Projects (Ontario Regulation 213/91) came into effect in August of 1991, the types of falsework structures required to be designed by a professional engineer were expanded to include additional types of formwork installations. The purpose of these amendments was to address the increasingly complex nature of these temporary structures by providing more information regarding their design, installation, and removal. In addition, to ensure that these temporary structures are constructed in accordance with the design drawings, a written inspection report is also required prior to the placement of concrete.

The purpose of this guideline is to clarify the various types of falsework, formwork, and shoring installations which must be designed by a professional engineer under the requirements of the regulations and to provide guidance for practical procedures for the field inspection of these structures.

2.0 DEFINITIONS AND TERMINOLOGY

2.1 Terms Defined in Regulation

The following definitions have been extracted from Section 1, subsection (1) of the Regulations for Construction Projects (Ontario Regulation 213/91), and are provided below for reference in this guideline:

- 2.1.1 "competent worker", in relation to specific work, means a worker who,

- (a) is qualified because of knowledge, training, and experience to perform the work,
- (b) is familiar with the *Occupational Health and Safety Act* and with the provisions of the regulations that apply to the work, and
- (c) has knowledge of all potential or actual danger to health and safety in the work.

Note: In the context of formwork and falsework inspections the competent worker must be able to read and interpret formwork and falsework drawings and have a good knowledge of scaffold and shoring systems.

2.1.2 "falsework", in relation to a form or structure, means the structural supports and bracing used to support all or part of the form or structure:

2.1.3 "form" means the mould into which concrete or other material is to be placed:

2.1.4 "formwork" means a system of forms connected together:

2.1.5 "professional engineer" means a person who is a professional engineer within the meaning of the *Professional Engineers Act, 1984*.

2.2 Terminology

In addition to the definitions extracted from the regulations, the following terms are defined for the purposes of this guideline:

2.2.1 "flying formwork" refers to a formwork system which is designed to be hoisted between levels as a unitized structure and depends on its own structural integrity during hoisting operations;

2.2.2 "formwork contractor" refers to the employer who is responsible for the erection or installation of the formwork and falsework and who may be a subcontractor, a general contractor, or the constructor;

2.2.3 "formwork engineer" refers to the professional engineer who is responsible for the coordination of the overall formwork, falsework, and shoring design under the requirements of Section 89;

2.2.4 "gangforms" refer to large form panels designed to be hoisted as a unit for convenience in erecting, stripping, and re-use;

2.2.5 "knock-down formwork" refers to a formwork installation constructed on site and supported by traditional falsework and proprietary shoring equipment and which is not intended to be moved as a unitized system;

2.2.6 "panel" refers to a unitized sectional form intended to be connected together;

2.2.7 "permanent structure engineer" refers to the professional engineer responsible for the design and construction of the permanent building or structure;

2.2.8 "proprietary equipment" refers to equipment or hardware normally designed and manufactured under patent or similar arrangements;

2.2.9 "regulations" refer to the Regulations for Construction Projects, Ontario Regulation 213/91;

2.2.10 "specialty formwork" refers to a formwork system specially designed for a particular type of concrete structure or concrete placing technique.

3.0 DESIGN REQUIREMENTS

3.1 Formwork and Falsework (Designed by a Professional Engineer)

Formwork and falsework structures generally fall into three broad categories: flying formwork, knock-down formwork, and specialty formwork. The following describes the types of formwork and falsework installations which are required to be designed by a professional engineer as referenced in Section 89 (1) of the regulations.

3.1.1 Flying Formwork

(a) Slab Panel Forms

Slab panel forms are large prefabricated horizontal units of formwork, designed to be hoisted as a unitized structure and to rely on their own structural integrity during hoisting operations. They include all of the necessary braces, trusses, frames, and components.

(b) Wall Panel Forms

These forms, which are also sometimes referred to as gangforms, are large prefabricated vertical units of formwork intended to be hoisted as a unit and to rely on their own structural integrity during hoisting operations. They normally include access work platforms as an integral part of the formwork structure. These types of forms must have the crane attachment points indicated on the design drawings and clearly identified on the form panel.

3.1.2 Falsework and Knock-Down Formwork (Built-in-Place)

(a) Slab Formwork, Falsework, and Shoring

This covers the broad range of temporary structures erected to support the forms during the placement of concrete. It is normally composed of vertical shoring, frames, trusses, beams and associated bracing and is not intended to be moved or hoisted as a unitized structure.

(b) Wall Formwork and Bracing

Built-in-place wall formwork which is over 3.8 metres (12' 6") in height is included in this category.

(c) Column Formwork and Bracing

Column formwork which is more than 3.8 metres (12' 6") in height is included in this category. The design drawings may include typical details and alternative bracing arrangements to allow for practical erection and construction methods to address site conditions.

3.1.3 Specialty Formwork Systems

These specially designed formwork systems normally incorporate a specific concrete placement technique and a special removal and installation sequence. Examples include concrete slip forms, silo formwork systems, chimney forms, tunnel lining forms, and self-supporting beam and column formwork structures. The design drawing for these systems must include the concrete placement procedures and the installation and removal procedures.

3.2 Formwork Panels 2.4 to 3.8 metres (8' 0" to 12' 6") in Height

These types of formwork panels are required to be designed by a professional engineer; however, the drawings may be standardized and are not required to reference specific projects.

3.2.1 Prefabricated Panels

Many wall forming systems are constructed from a series of modular prefabricated panels and connected by specialized proprietary hardware. These systems are used extensively in low-rise building construction for concrete walls which are less than 3.8 metres (12' 6") in height.

The drawings and written instructions for these systems must be approved by a professional engineer and should contain details of the connecting hardware, concrete pouring rates and placing sequence, and relevant installation instructions. These documents are not required to reference specific projects but should indicate standard details to address typical site conditions.

The inspection for this type of formwork should be performed by a competent worker designated by the formwork contractor. The designation by a professional engineer would not normally be necessary unless an engineer had specifically designed the formwork for the project or structure.

3.2.2 Knock-Down Formwork

Knock-down or built-in-place formwork for walls and other irregularly shaped structures is normally constructed from plywood and timber members and connected by proprietary hardware. When this type of formwork is to be constructed to a height of 2.4 metres (8' 0") or greater, but less than 3.8 metres (12' 6"), standardized drawings for typical arrangements must be approved and reviewed by a professional engineer. As indicated above for prefabricated panels, these documents are not required to reference specific projects but should indicate standard details which address typical site conditions. Where changes are necessary which are not covered in the standardized drawings, the formwork contractor should advise the engineer in order to provide further design information. The drawings and instructions should be kept on the project.

As indicated in 3.2.1, the inspection for this type of formwork must also be performed by a competent worker designated by the formwork contractor. The designation by a professional engineer would not normally be necessary unless the engineer had specifically designed the formwork for the project or structure.

3.3 Formwork Engineer

In many cases several professional engineers may be involved in portions of the formwork design. This occurs quite often where formwork and shoring design services are provided by suppliers of proprietary equipment. The design provided is usually applicable to the proprietary equipment only. Such items as mud sills, ledgers, timber members, and other critical components supplied by the contractor are often not included in the design by the supplier.

In addition, the engineer providing the design services from the proprietary equipment supplier may not wish to perform site inspections or designate a competent worker or engineer as required by the regulations.

In both these situations the constructor or formwork contractor must employ or retain a professional engineer (the formwork engineer) who will be responsible for the coordination of the overall formwork and shoring design, including the designation of the competent worker as required by Section 89 of the regulations.

Where it is necessary to revise or change the original formwork design due to site conditions or other circumstances, the formwork engineer must be advised by the formwork contractor or constructor. It is the

responsibility of the formwork contractor and constructor to ensure that the appropriate approval for the design changes has been obtained from the formwork engineer.

4.0 INSPECTION

Section 89, subsections (3) and (4), of the regulations require that formwork and falsework installations be inspected by a professional engineer or by a competent worker designated in writing by the professional engineer prior to the pouring of concrete. A written report of the inspection is also required.

4.1 Purpose

The purpose of these field inspections is to verify that the formwork and falsework has been constructed in accordance with the design of the formwork engineer as indicated on the design drawings. The inspection is not intended to provide a procedure to approve design changes or deviations from the design drawings.

Although the regulation allows for the formwork inspection to be carried out by a competent worker designated by the formwork engineer, it is recommended that for complex installations the formwork engineer or a designated engineer perform the inspection.

4.2 Deviations and Design Changes

When deviations or design changes are necessary, it is the responsibility of the constructor and formwork contractor to advise the formwork engineer in order to obtain approval. Where the formwork engineer approves a design change, the formwork contractor and constructor should be advised in writing and the drawings revised as necessary. These revisions may sometimes be addressed by a small area drawing which indicates the changes rather than a revision and issuance of the entire drawing or set of drawings.

The designated competent worker cannot approve design changes. The responsibility of the designated competent worker is to inspect the installation and provide a written report indicating whether the formwork has been constructed in accordance with the design drawings. Where deviations are observed, they should be noted in the report and forwarded to the formwork contractor and constructor for further action.

4.3 Designated Competent Worker

In certain circumstances, it may be practical for an employee of the constructor or formwork contractor to be the designated competent worker. This procedure is acceptable provided the worker has been identified in writing following consultation with the formwork engineer.

The designation of the competent worker must be set out in writing by the formwork contractor or constructor and acknowledged by the formwork engineer. It is recommended that the information describing the designation be provided on a standard form similar to the one attached to this guideline.

5.0 ADDITIONAL INFORMATION

For additional information please contact a representative of the Ministry of Labour.

Recommended Standard Form

**Appointment of a Designated Competent Worker
for the Inspection of Formwork and Falsework**

To comply with Section 89, subsections (3) and (4) of the Regulations for Construction

Projects, the Formwork Contractor or Constructor _____
(Company Name)

has appointed _____
(Name and Occupation of Individual)

as the designated competent worker in consultation with _____
(Company Name)

_____ for the project identified as
(Name of Formwork Engineer)

(Project Name, Location, Constructor, Notice of Project Number)

The designated competent worker shall be responsible for the inspection of the formwork and shoring and for the preparation of a written report which indicates whether the formwork or falsework has been installed or erected in accordance with the associated design drawings.

The inspection is for the purpose of verifying that the formwork and shoring has been constructed in accordance with the design. He/she will advise the formwork contractor or constructor of any deviations or discrepancies but will not approve any design changes or deviations.

Dated this _____ day of _____, 199 ____.

(Formwork Contractor or Constructor)

Acknowledged by:

(Formwork Engineer)

- Copies: Designated Competent Worker
- Formwork Contractor
- Constructor
- Formwork Engineer
- File copy (to be posted with the Notice of Project)

ITEM 12

1994 Policies and Priorities

American Society of Civil Engineers

CONSTRUCTION SITE SAFETY

ASCE, while recognizing that construction activities can be dangerous, believes that improvements can and should be made in safety on construction sites, and further believes that attention and dedication to safety by all participants are essential to achieving these improvements. ASCE supports legislation which includes the following: 1) preserves the construction contractor's responsibility and authority for general supervision of a construction project and for construction site safety; 2) provides that the general or prime construction contractor place his or her employee or consultant, who is trained and qualified in construction safety principles, rules and practices appropriate for the particular project, in responsible charge of the safety aspects of each project, and give that person appropriate authority; 3) **provides that critical temporary construction needed to facilitate completion of a permanent facility be designed by a registered professional engineer who is a consultant to or an employee of the construction contractor;** and 4) provides for development of safety training and education programs and supports their utilization by government inspectors, construction contractors, construction employees and engineers. (Pol. 350 - 4/89) (Emphasis added)